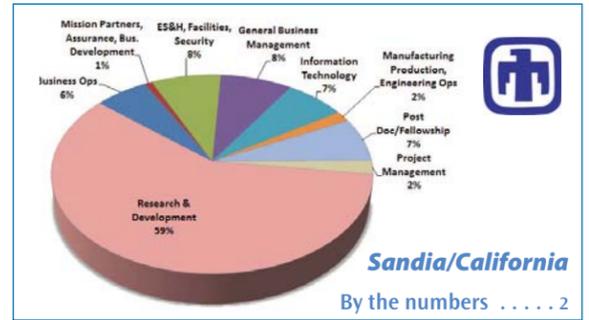




Sandia researchers Seema Singh and Jian Sun and their JBEI colleagues study the use of CO<sub>2</sub> to streamline the production of biofuels. Story on page 7.

# Livermore, California Sandia **LabNews**

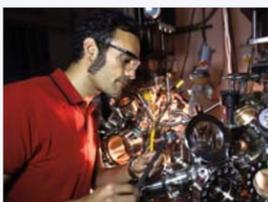
  
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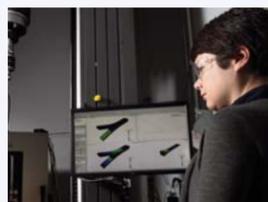
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# Taking on the new frontier of illicit commerce

Sandia helps federal law enforcement develop a Bitcoin forensics tool

By Michael Padilla



**A BITCOIN FOR YOUR THOUGHTS** — Andrew Cox (8116) leads a team that is helping law enforcement get a better handle on tracking illicit digital currency transactions. (Photo by Dino Vournas)

As Bitcoin, the most widespread cryptocurrency in use, becomes an increasingly accepted medium of exchange across the global economy, criminals have turned to the digital currency for their transactions, making it harder for law enforcement to keep track of users.

To assist law enforcement, Sandia researchers have created a set of requirements for an analysis tool that can be used to overcome the challenges brought by Bitcoin.

Andrew Cox (8116), who is leading the work for Sandia, says the law enforcement community has identified the need for new approaches and tools to aid in a variety of investigation scenarios, including complex money-laundering schemes, cyber thefts, and straightforward transactions of illegal goods. Law enforcement's most immediate need is to reduce the time and resources necessary to trace illicit commerce.

### Advantages, but a dark side, too

"Our job was to understand how Bitcoin works," says Andrew. "Bitcoin is a new semi-anonymous currency that holds the potential to change the way all sorts of transactions work in a way that might really benefit the economy. Some of the potential benefits include making monetary transactions much more efficient, and thereby driving down the costs of doing business, making transaction histories more transparent, which could help both financial markets and financial regulation, and — depending on who you ask — reducing the risks associated with inflation and reliance on centralized monetary institutions. All that being said, it has been clear that criminals have been pioneers in using Bitcoin. They use it for drugs, for guns, child pornography, and

(Continued on page 8)

## Transforming the California Site

By Denise Koker

As we celebrate the California site's 60th anniversary, I've been reflecting on how the site has responded to a changing world – namely, Sandia/California's efforts to help evolve our mission to meet new national security imperatives while developing and maintaining capabilities. How does a relatively small, highly diversified site support the following value proposition:

*Sized for innovation and agility, Sandia's California Laboratory specializes in developing end-to-end science and engineering solutions for cyber, chemical, biological, radiological, and nuclear security; nuclear weapons system engineering; and transportation energy, drawing upon extraordinary technical depth across all Sandia locations.*

Sandia/California's Site Development Plan, created in 2012, lays out a future state that is both evolutionary and revolutionary. This vision includes homes for Division 8000's foundational capabilities, reconfigured security zones spanning open to closed areas, restoration and removal of substandard facilities, and the full realization of the Livermore Valley Open Campus (LVOC).

The 21st-Century world in which the DOE national security laboratories operate is a stark contrast to the world the labs opened to in the mid-20th Century. The national security R&D landscape is more complex, and the United States faces increasing worldwide competition in science and technology (S&T). Today's top S&T graduates have more – and vastly different – opportunities than they had in the past, creating a strong pull to the commercial sector. In addition, employee expectations of the work environment have dramatically changed. New methods are needed to attract talent to Sandia. How can our physical site help address these issues?

The LVOC, which was established in 2010, positions Sandia to continue meeting the national security challenges faced by the nation and industry by establishing a welcoming "front door" with designated areas for collaboration. The LVOC also enhances our site operations by locating work in the right place with the right space.

We started by moving fences on the site's east side to shift entire buildings—including those housing our combustion, hydrogen, and biology programs – into an open campus. An east side entrance was opened so that visitors and collaborators could drive to the California site more easily. In 2015, Sandia/California broke ground on a new 18,000-square-foot building (926) for human resources, training, new hires, employment candidates, and student interns. Building 926 is the first specifically designed as part of our site reconfiguration effort – open on the east and closed on the west.

By moving functions best performed in the open, we can repurpose space on the west side for our growing classified mission work. Building 911 – one of the site's six original 1950s-era buildings and the former home of Sandia/California's badge office, human resources, and procurement departments – is being brought into the limited area and repurposed for the growing Telemetry and Joint Test Assembly programs. Building 912, another original building that houses work from across Sandia's mission space, is targeted for modernization in multiple phases (~8), with phase 1 completed in 2014 and phase 2 scheduled for completion in 2018.

The completion of buildings 926 and 911 will enable the removal of old, substandard mobiles currently on site. But it is Collaboration in Research and Education for Advanced Technology and Education (CREATE) – Sandia/California's proposed alternative-financed building – that will help us fully realize a more far-reaching site transformation.

LVOC expansion continues as we work with the Sandia Field Office to receive approval from the NNSA and DOE, as well as concurrence from the Office of Management and Budget, to acquire CREATE. This 86,000-square-foot, mixed-use building will be an intellectual and collaborative center for the California site, bringing together programs in hydrogen science and engineering, cybersecurity, additive manufacturing, bioscience, and energy.

The Site Development Plan paves the way for Sandia/California to realize the promise of our site's value proposition – leveraging our small size for an innovative, agile response to evolving national security needs. The plan also enables us to improve operational effectiveness; provide modern, attractive workspace; and supply much-needed space for our burgeoning programs.

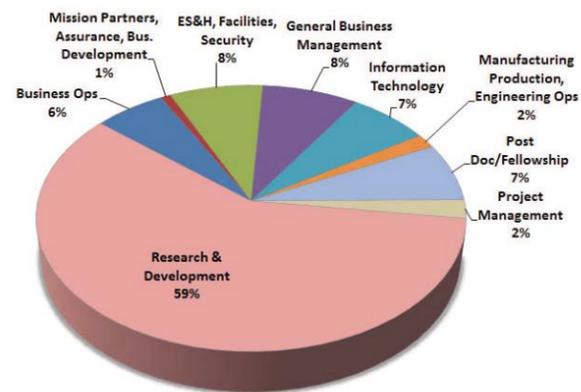
On the 60th anniversary of Sandia's California site, I had an epiphany. I have been here for more than half its life and for more than half my life. Wow! In 1980 when I started, the Combustion Research Facility was just being built. East Avenue was open. Employees and visitors could drive right into the parking lot...like now. Things change; some for good while some return to the way they were.

\* \* \*

*Denise Koker is the director for Sandia/California's Site Operations Center (8500), which is dedicated to providing people, physical infrastructure, and business systems in an integrated way to meet the vision and strategy for the site.*

## SANDIA/CALIFORNIA AT A GLANCE

### California job families



### Our people

Sandia/California brings together 1,342 members of the workforce (regular, LTE, postdoctoral, staff aug., students).

- 93 postdocs/fellowships: 1 Harry S. Truman Fellowship; 2 JBEI postdoctoral fellows; 15 JBEI postdocs; and 75 Sandia/California postdocs — 7 percent of workforce

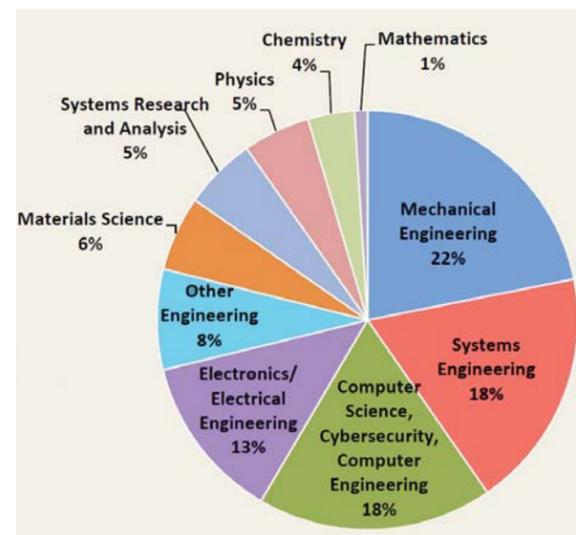
- 32 LTEs

### Education

- 83 percent of our exempt workforce (regular and temporary) have at least a master's degree or PhD.

- 89 percent of our exempt R&D workforce (regular and temporary) have at least a master's or PhD.

### Technical disciplines represented



### Our assets

Sandia's California campus resides on 400 acres with 900,000 gross square feet of building space. Our assets include the Combustion Research Facility, Livermore Valley Open Campus, and the Joint BioEnergy Institute.

### Economic development

- Support for area business and economic development organizations, including iGATE, Innovation TriValley, Livermore Chamber of Commerce, Bay Area Council and Bay Area Science and Innovation Council, and East Bay Economic Development Authority.

- Research and validation support to local technology entrepreneurs.



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### 10th annual California edition



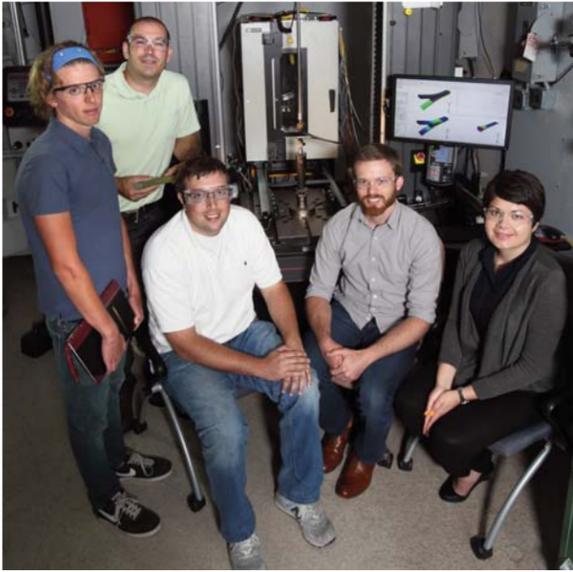
Madeline Burchard, Patti Koning and Michael Padilla (all 8524) share the *Sandia Lab News* editor's seat for the 10th anniversary of the California issue. For this issue, the three contributing editors sought ideas from directors, managers, researchers, and others from throughout the site.

Madeline is the Community Relations officer for Sandia/California and she manages the Communicator blog, which highlights interesting events, stories, and people at the California site. Patti Koning is acting manager for 8241 and still finds time to write for *Lab News* including stories on homeland security, biology, material science, and hydrogen. Michael Padilla covers cybersecurity, nuclear weapons, and the Combustion Research Facility.

# STRONG ENOUGH

## Composite materials testing part of Sandia's national security mission

By Michael Padilla



COMPOSITE COLLABORATORS — Sandia scientists and engineers continue to collaborate on fracture, failure of advanced structural materials. They include, from left, Alex Hanson (8259), Tim Briggs (8222), Brian Werner (8343), Shawn English (8248), and Stacy Nelson (8259). (Photo by Dino Vournas)

Sandia scientists and engineers are developing computer simulation tools capable of making realistic and reliable predictions on the performance of composite materials and structures.

"Sandia is interested in composite materials as part of its national security mission," says stress analyst Stacy Nelson (8259). "We need to improve our understanding of how the composites behave when they are subjected to different types of loading environments."

Currently, Sandia is conducting research on the fracture and failure of advanced materials, specifically fiber-reinforced composite materials and their response to different loading environments, which can include mechanical shocks

and vibrations as well as large temperature variations.

"Composites are of interest to Sandia for a number of structural applications," Stacy says. "To optimize composite design, we need state-of-the-art computer simulation tools to make predictions regarding the behavior of a composite structure and know that they're accurate."

Stacy and her computational team collaborate with experimentalists in other Sandia departments. Experiments can occur while models are running, allowing immediate comparisons to ensure the work is on the right track.

The team has published several papers and the research has been well-received at conferences. The team includes Stacy, Shawn English (8248), Alex Hanson (8259), Timothy Briggs (8222), and Brian Werner (8343).

Arthur Brown, manager of Multi-Physics Modeling and Simulation Dept. 8259, says the team does an excellent job of improving the modeling tools, using uncertainty quantification and validation methods to improve model credibility, and working directly with customers to provide the design support they need.

"The team of modelers and experimentalists has formed a well-integrated effort, even setting up external collaborations with researchers at the Air Force Research Laboratory," Arthur says.

### Composite materials 101

Composite materials are made from two or more materials. An example is a fiber-reinforced composite, in which strong, stiff fibers are embedded in a matrix material. In general, since the fibers are strong and stiff, they are the load-carrying members of the composite, while the matrix materials keep the fibers properly oriented and protected from the environment. The blending of different fibers with matrix materials can produce a combination of properties that can be tailored to a specific loading environment, ensuring that the composite is strong enough to withstand any intended weights or pressures.

In addition to their use in Sandia's national security mission, composite materials are also used in lightweight vehicles, racecars, and wind turbine blades.

Composites have many advantages, including superior strength-to-weight and stiffness-to-weight ratios. But design-

ing with composites can be difficult.

"Composites are of interest both academically and for actual applications," Stacy says. "The challenges associated with modeling them aren't new."

### Surprising effects of residual stress

To design and move forward with composite structures, the Sandia team is validating and verifying analysis tools to ensure computer predictions and their expected behaviors are accurate.

The team is currently using a building-block methodology in which materials experiencing fracture are isolated and examined individually prior to investigating more complex combinations of fracture-related behaviors. Researchers study the interaction of a composite material's makeup at the microscale.

"We start at small scale and look at each individual phenomenon and then expand from there," she says. "This provides material properties that we can use in simulations of a macroscale. Then we try to look at interlaminar delamination, or the debonding of adjacent layers in a composite and at the effects of fabrication-induced residual stresses."

Moving forward, researchers combine the two phenomena to create a larger, more realistic structure.

Stacy says residual stress is one of the most interesting aspects of the current research. "If fiberglass and carbon fiber are bonded together, residual stresses will form in the structure because carbon fiber and fiberglass expand and contract differently during the thermal cycles," she adds.

"We've observed that these residual stresses increase the load at which the composite will delaminate, meaning the composite can actually bear more weight. Intuitively one would think that these residual stresses that live in the composite from the very beginning would perhaps lower its load-bearing capacity. But it looks like it is increasing. This is very promising, since these residual stresses could potentially be taken advantage of and incorporated into structures to increase their performance."

As the computational methods under development continue to be numerically verified and experimentally validated, these analysis techniques can be implemented with increasing confidence to support various aspects of Sandia's national security mission, says Stacy.

## California site test drives 4/10 alternative work schedule

### Pilot available to exempt staff at the California site or in Div. 8000

By Patti Koning

As the clock inches closer to 6 p.m. on a Thursday, mechanical engineer Chris Damitz (8222) is still busy wrapping up work even though his day began

around 7 a.m. That's because Chris's work week is about to end — he's on the 4/10 alternative work schedule (AWS) being piloted in Div. 8000 and at the California site.

"This schedule provides many benefits to my life," he says. "It's one less day of my long commute. Since I enjoy taking weekend trips, a 3-day weekend every week is a dream. And, my wife and I just had our first child, so having three straight days to bond is important. I would rather just buckle down and get my work done in four longer days."

Chris is one of about 220 employees participating in the 4/10 AWS pilot. Since the beginning of July, this group has worked a schedule of 10-hour days Monday through Thursday with every Friday off.

Nearly 25 percent of eligible employees — exempt-level staff either in Div. 8000 or working at the California site — are trying the new schedule option. "We are thrilled with the level of participation," says California Human Resources Manager Kim Edson (8522). "Not only does this give us a good sample size for assessing the effects of the AWS, it also makes clear that people want this schedule."

Friday is the designated day off to minimize disruptions to operations. The 83 percent of the California site workforce on the 9/80 schedule are already scheduled to be off on alternate Fridays. All of the participants in the 4/10 AWS were already on the 9/80 schedule.

### Driven by attraction and retention

The 4/10 AWS was one of several ideas that emerged from an Attraction and Retention Study that systems analysts from Center 8100, Homeland Security and Defense Systems, co-led with Human Resources. The study, which included management, interns, new hires, and staff with decades at Sandia, looked at non-compensation factors that could improve attraction and retention, a particular concern for the California site.

"It's a good recruiting tool," says Paul Spence (8248), W80-4 System Integration I manager. "Employees like to select the schedule that works best for their lifestyle. I have a number of early career staff that enjoy three-day weekends for trips like skiing or camping."

Human resources and HBE are developing programs around other ideas that emerged from the study. Another pilot is underway to provide rental-location services for relocating employees, similar to the assistance available for relocating employees purchasing homes.

### Commuting just one reason

"The 4/10 schedule emerged in response to the long commutes some of our employees face," says Human Resources business partner Angel Fernandez (8522-1). "One less day of commuting is a good benefit for many people, but we are finding that participants in the study have many reasons."

Environmental and global warming concerns were material scientist and biophysicist Seema Singh's (8624) primary reason for choosing the 4/10 schedule. "One less day of driving 120 miles roundtrip helps reduce my carbon footprint," she says. "This is a big deal in terms of

greenhouse gas emissions."

A longer workday means more availability for employees in service roles. Human Resources business partner Linda Behers (8522-1) finds that she can schedule more individual appointments that don't conflict with other meetings. "My customers like that they can meet with me early before their day gets into high gear or near the end when things quiet down," she says.

Nationally, 4/10 schedules have been shown to decrease absenteeism, reduce turnover, improve job satisfaction, and boost morale. A 2008 study by Brigham Young University reported that 60 percent of respondents felt more productive on a four-day workweek. A shorter workweek gives employees more time to run errands and schedule

(Continued on next page)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
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10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

# Rising to the top:

## SWE recognizes Jill Hruby's success

By Nancy Salem

The Society of Women Engineers has named Sandia President and Laboratories Director Jill Hruby the recipient of its Suzanne Jenniches Upward Mobility Award. One of the worldwide group's top awards, it recognizes a woman with at least 20 years of experience "who has succeeded in rising within her organization to a significant management position such that she is able to influence the decision-making process and has created a nurturing environment for other women in the workplace."

Jill says she shares the award with all of Sandia. "The Laboratory has created opportunities for me and other women like Christine Coverdale [see sidebar] that allowed our careers to thrive," she says. "This award recognizes a culture that values diversity and encourages every individual to succeed."

Jill joined Sandia in 1983 at the Labs' Livermore, California, site. She

worked six years in thermal and fluid sciences, solar thermal energy, and nuclear weapons components then was promoted to technical manager. Over the next eight years, she led teams focused on the maturation of certain nuclear weapon components, analytical chemistry and materials selection for nuclear weapons systems, and materials management for advanced energy storage devices including batteries and capacitors.

### R&D 100 Award

Jill became a senior manager and for six years was technical deputy director, leading a portfolio of programs ranging from microtechnologies to weapons components to materials processing. In 1999 her team, in partnership with industry, won an R&D 100 award for developing radiation detectors that could make accurate measurements operating at room temperature, a technology used in X-ray radiography, environmental cleanup, nuclear materials safeguarding, treaty verification, and tumor detection.

Jill moved into executive management in 2003 as director of the Materials and Engineering Sciences department at the California site. She led a team of about 200 working in hydrogen science and engineering, and nanosystem science and fabrication. She went on to direct the Homeland Security and



JILL HRUBY



Defense organization, which oversaw Sandia's programs with the Department of Homeland Security, National Institutes of Health, and numerous partners. She and her team focused on homeland work preventing and countering weapons of mass destruction, infrastructure protection, and cybersecurity.

Jill came to Sandia New Mexico in 2010 as vice president for both Div. 6000 Energy, Non-Proliferation and High Consequence Security and the International, Homeland, and Nuclear Security (IHNS) program management unit. The IHNS PMU includes projects in nuclear nonproliferation, arms control, nuclear weapons and nuclear materials security, nuclear incident response, biological and chemical defense and security, counterterrorism, and homeland security.

Five years later, Jill became the first woman to lead a national security laboratory. Sandia is the nation's largest national lab with more than 10,000 employees and a \$2.8 billion annual budget.

### Collaboration inside and outside the Labs

Partnership has been a constant throughout Jill's career. She has worked to bring industry, academia, and other national laboratories into her projects. "I believe that diverse teams should work together to solve difficult problems," she says. "Sandia is a place where, starting with leadership, people collaborate inside and outside the Labs. Partnerships create an environment where people encourage each other to succeed and reach their full potential."

Jill has been a longtime mentor and advocate to women in engineering. She worked with the Sandia Women's Action Network in New Mexico and the Sandia Women's Connection in California. She has been a role model to dozens of women at the Labs and inspired them to become leaders. And through community outreach, she has encouraged female high school and college students to consider careers in engineering.

Jill will receive the SWE award at the society's WE16, the world's largest conference and career fair for women in engineering and technology, Oct. 27-29 in Philadelphia. About 9,000 people are expected to attend. The goal of the 30,000-member SWE is to stimulate women to achieve their full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving quality of life, and demonstrate the value of diversity.

"I am honored to receive this award on behalf of Sandia, where I was encouraged every step of the way," Jill says. "It is the kind of inclusive and supportive environment where future leaders will be developed."

## Prism Award goes to Sandia physicist

Plasma physicist Christine Coverdale won the Society of Women Engineers (SWE) 2016 Prism Award, which honors "a woman who has charted her own path throughout her career, providing leadership in technology fields and professional organizations along the way."

"I am very grateful for this award," Christine (5957) says. "I have been lucky to have had many opportunities at Sandia to lead interesting and challenging projects, be mentored by highly capable people, and ultimately give back and mentor students and newer staff members."



CHRISTINE COVERDALE

SWE said a Prism winner must have 15 to 20 years of experience and demonstrate outstanding leadership in her organization, exhibit a clear understanding of how her career path contributed to her achievements, work to enrich the conversation of what it means to be a successful woman in STEM, and demonstrate activities supporting SWE's mission.

Christine joined Sandia in 1997 and in 2011 was named a Distinguished Member of the Technical Staff. She has been involved in a broad range of experiments at the Saturn and Z pulsed power facilities centered around nuclear weapons certification and other national security projects. She most recently worked on radiation detection systems and diagnostics to assess warm and hard X-rays from Z-pinch plasmas.

Christine, who has a doctorate in plasma physics from the University of California, Davis, has authored or co-authored more than 120 papers and regularly presents at conferences. She won the 2016 IEEE Plasma Science and Applications Committee Award. She served three terms on the Executive Committee of the IEEE Plasma Science and Applications Committee and was technical program chair for the IEEE International Conference on Plasma Science in 2009, 2010, 2012, and 2015. She also served a four-year term on the IEEE Nuclear Plasma Sciences Society Administrative Committee.

Christine served a three-year term on the Executive Committee of the American Physical Society (APS) Division of Plasma Physics and is senior editor for High Energy Density Physics for IEEE Transactions on Plasma Science. She is a Fellow of both the IEEE and APS.

A mother of three, Christine has worked through IEEE and APS to include more women in technical programs and award nominations, and has promoted work-life balance. She mentors women in her field and speaks to aspiring female engineers through IEEE-sponsored diversity events. She also organizes and judges science fairs in local elementary schools.

"I have been able to take advantage of the many programs that encourage community involvement," Christine says. "I appreciate that my family has been supportive of my career throughout, and receiving awards such as the Prism helps reinforce my belief that the skills I have developed to balance work and family are useful in both areas."

— Nancy Salem

## Piloting the 4/10 work week

(Continued from preceding page)

appointments outside of work hours.

"Being in the office earlier makes me more productive," says engineer Mark McConkie (8231). "I have several hours a day when the phones aren't ringing, email slows to a crawl, and no one is stopping by with urgent questions. And I have an extra day to decompress over the weekend."

Engineer Franklin Cocchi (8126) finds that the 4/10 schedule simplifies his life. "It brings more structure to my work week, since it is the same every week," he says. "The extra day off makes my life easier because I have time to go to the bank, receive packages, and do other chores that aren't always possible on weekends."

### Only exempt staff for now

The 4/10 AWS pilot is only available to exempt staff because of California labor laws. State law requires a vote with at least 67 percent of the non-exempt population in favor of adding an additional work schedule option.

"If a decision is made at the end of the pilot to offer the 4/10 AWS Lab-wide, then we will hold a vote of non-exempt staff in California," says Kim. The vote would be similar to one held in February 2015 when the non-exempt staff voted overwhelmingly to extend the 9/80 AWS to eligible interns.

### Assessing success

The human factors group in New Mexico is partnering with California Human Resources to run surveys and assess the impacts of the 4/10 AWS. A pre-pilot survey had a strong participation rate, with 40 percent of managers and 70 percent of employees surveyed responding. The survey includes employees who are participating in the 4/10 AWS and those who are not as a control group.

Angel and her human resources colleagues are also talking with participants regularly to learn how participants are adjusting to the new schedule.

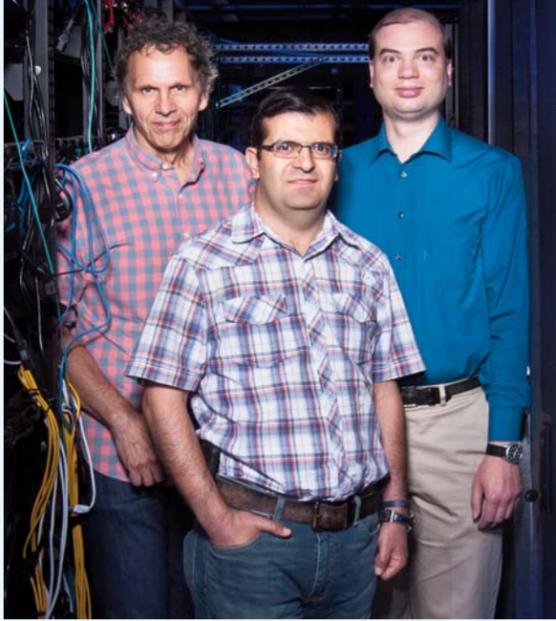
Kim says she hopes to report metrics in January. At that time, Sandia leadership will decide whether to offer the 4/10 AWS to the entire Laboratory.

"We have to remember, this new benefit is about the employees," she says. "A 4/10 schedule is not for everyone and that's why we have other options. But the participation rate, which is much higher than we expected, shows that this schedule is very attractive for a lot of our staff."

# Mitigating silent hardware errors in scientific computing

*Sandia researchers focus on enhancement of quality, performance of calculations*

By Michael Padilla



MITIGATING COMPUTING ERRORS — Rob Armstrong, Maher Salloum (both 8956) and Jackson Mayo (8953) work on mitigating silent errors in computer hardware.

(Photo by Randy Wong)

simulating is important, whether it be for nuclear weapons, for simulations related to climate change, or for other fairly high-stakes computations. Not just getting an answer, but being sure we get the right answer, matters to people making those decisions.”

Jackson and team members Rob Armstrong and Maher Salloum (both 8956) specifically look at ways of more efficiently using the characteristics of ASC applications, typically continuum physics simulations, to build in resilience against silent errors so it is intrinsic to the computation. The researchers take an application-targeted approach, using the properties of what is being computed to check for nonsensical behaviors and achieve a reliable result.

Understanding and pinpointing errors in scientific computing helps maintain trustworthiness and accuracy in simulations at an affordable cost — that’s according to ongoing research conducted at Sandia.

The work, done in support of Sandia’s Advanced Simulation and Computing (ASC) program, focuses on mitigating silent errors in computer hardware, which refers to the development of an incorrect state due to some physical upset such as a cosmic ray striking a piece of silicon and flipping a bit, says project leader Jackson Mayo (8953).

“Sandia’s mission requires very large scale computations that have to be carefully performed to ensure accuracy and trust,” Jackson says. “What we are

“Some of these errors may be detected or corrected within the hardware automatically, but a silent error is one that doesn’t get detected or corrected that way, so it would actually appear to be normal,” Jackson says. “The application would not know that anything was wrong unless it did its own check or other mechanism to ensure that the answer is right.”

## Integrating algorithms

Mahe develops silent error detection and correction algorithms and integrates them in the software frameworks used at Sandia and at other DOE institutions.

“There are a lot of smart ideas to treat silent errors but they are restricted to a few small applications,” Mahe says. “However, unlike such academic-style research, what we are developing aims to have a large impact on a wide variety of applications and code frameworks.”

The algorithms used at Sandia are required to be efficient in detecting and correcting the errors. “Developing fast mathematical algorithms for error detection and correction has been the most challenging aspect of this work,” he says, “especially while at the same time meeting the software engineering needs such that the algorithms are generalizable and maintainable in large software frameworks used at Sandia and in the DOE.”

## Co-design helps mitigate errors

A part of the solution for mitigating silent errors in computer hardware is to concentrate on a concept called co-design, Jackson says. This combines hardware and software design in an iterative process, so advances in software can guide the development of hardware.

“With broad and efficient silent-error mitigation, our goal is to contribute software techniques for extreme-scale simulations that may help under a variety of future co-design scenarios,” Jackson says.

The work can support co-design by mitigating errors that might be unpredictable in extreme-scale architectures and widening design choices for those architectures. It also provides a diagnostic capability to detect silent errors, he says.

“The choice of future hardware will be influenced and optimized based on what kind of software we can produce,” he says. “If we show that in software we can handle certain types of errors that would otherwise be unacceptable, that would otherwise corrupt our calculations, if we can handle those in the software, then the hardware doesn’t have as stringent a requirement on its reliability.” Jackson says more efficient hardware and software will save money and provide better reliability and performance for the user. The software techniques may also be useful for improving cybersecurity because an attacker deliberately tampering with data may be detectable in the same way as an accidental hardware error.

# Sandia/California going strong after 60 years



DAVID REYNA (8127) shows an example of radiation detection material to one of the youngest event goers. (Photo by Randy Wong)

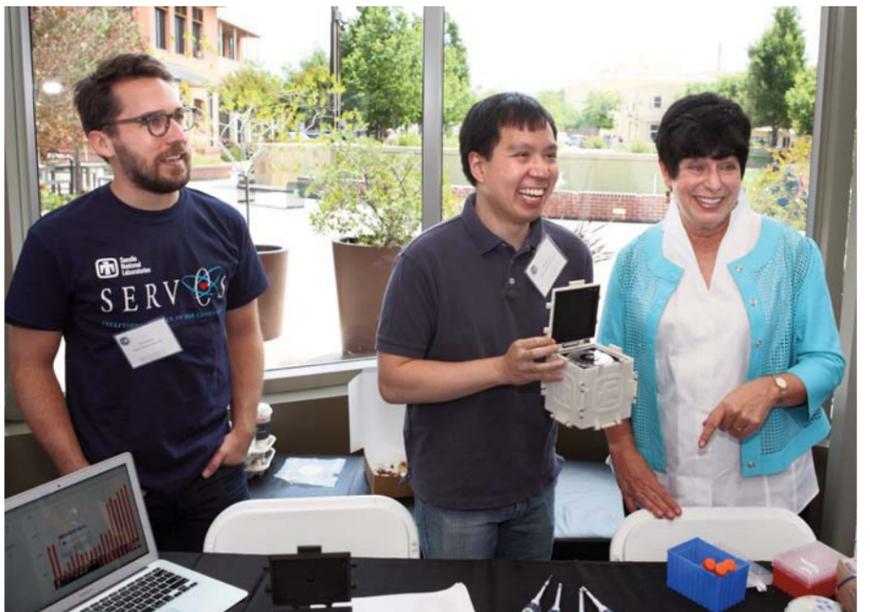
## Six decades of exceptional service at Sandia’s Livermore site

Earlier this year, Sandia/California celebrated its 60th anniversary and for the first time ever, the site was showcased in the community at an event in downtown Livermore.

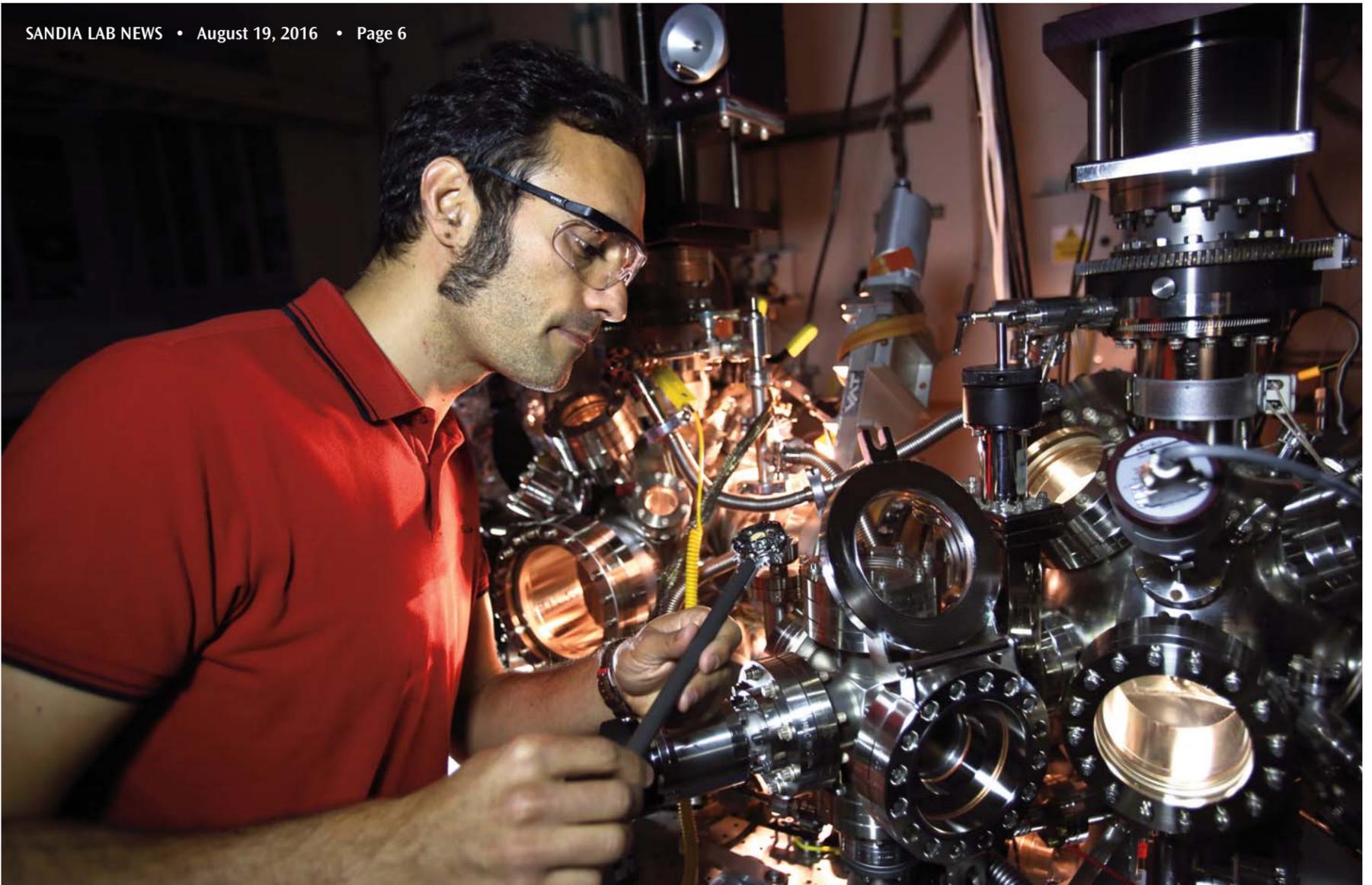
More than 500 community members attended the event and viewed 18 displays and met with more than 30 Sandia engineers and scientists. The event brought together Sandia’s education outreach programs with hands-on scientific activities from Family Science Night and Expanding Your Horizons volunteers.

The event greatly exceeded expectations, both in the number of attendees and the level of interest from the general public.

“This was the first time that we have had a lab-wide event out in the community,” said Marianne Walck, 8000 VP. “It was terrific to see so much passion and dedication for our work displayed at the event.”



FORMER DIV. 8000 VP Mim John stops by one of the booths at the 60th anniversary event. (Photo by Dino Vournas)



PHOTOELECTRON SPECTROSCOPY – Farid El Gabaly (8342) adjusts the X-ray photoelectron spectroscopy instrument.

(Photo by Dino Vournas)

# Understanding hazardous combustion byproducts helps reduce factors impacting climate change

## Sandia researchers focus on soot, furans, oxygenated hydrocarbons

By Michael Padilla

Researchers in Sandia's Combustion Research Facility (CRF) are developing the understanding necessary to build cleaner combustion technologies that will in turn reduce climate impact.

Their work focuses on understanding the oxidation chemistry of organic carbon species critical to many processes, including those that control emissions of toxic combustion by-products that contribute to climate change. Researchers expect this to work to benefit geosciences, astrophysics, and energy applications.

"Soot released from combustion sources is of global concern, as it causes premature deaths, global warming, and hydrological changes," says Olof Johansson (8353). "In addition, furans and other large oxygenated hydrocarbons are highly toxic and very frequently observed in combustion emissions."

Their research was published in the July 2016 issue in the *Proceedings of the National Academy of Sciences* in a paper titled "Formation and emission of large furans and oxygenated hydrocarbons from flames." The paper is coauthored by Olof, Hope Michelsen, Paul Schrader, Matthew Campbell (all 8353), and Farid El Gabaly (8342); Tyler Dillstrom, and Angela Violi, University of Michigan; Matteo Monti, Stanford University; and Denisia Popolan-Vaida, Nicole Richards-Henderson, and Kevin Wilson, Lawrence Berkeley National Laboratory.

### Understanding furans, oxygenated hydrocarbons

Oxygenated hydrocarbons are molecules that contain oxygen in addition to carbon, hydrogen, and various other elements present during combustion. Many of these molecules are toxic pollutants. The molecules may influence cloud formation and have a significant climate impact if they end up on soot particles released from combustion sources.

Olof says there are many significant studies on these species, but the precise chemical formation pathways and their links to carcinogenic polycyclic aromatic hydrocarbon (PAH) molecules are unknown.

"We show that oxygen adds to PAH molecules via reactions that involve OH and O<sub>2</sub> to generate these large oxygenated hydrocarbons," Olof says. "The molecular sites where oxygen

is added are targets for additional reactions that can lead to formation of a five-member ring containing four carbon atoms and an oxygen atom, which is known as a furan."

Furans are particularly toxic and carcinogenic. The work shows that furans are the main group of large oxygenated molecules formed during combustion.

Combustion sources of furans include biomass burning, cigarette and pipe smoke, waste incineration, electronic waste recycling, and volcanic activity. Previous studies have shown that soot's ability to absorb and hold water is greatly enhanced by the presence of oxygen on the surface of soot particles. Understanding how oxygen becomes incorporated into PAH species and soot particles during combustion is a key step in designing technologies that can mitigate the release of large oxygenated hydrocarbons.

Hope Michelsen (8353) says understanding the mechanisms leading to formation and destruction of hazardous combustion byproducts is the key to controlling their formation and emission.

"Soot particles have a very short life cycle in the atmosphere compared to greenhouse gases, such as carbon dioxide and methane," Hope says. "Still, soot particles are projected to be second only to carbon dioxide when it comes to anthropogenic climate impact. Hence, developing the understanding necessary to build cleaner combustion technologies that reduce the climate impact of soot would have almost immediate effects."

### Spawning additional research

The present work is intended to provide a guidebook to the oxygen chemistry and importance of different oxygenated functional groups. The work may assist other researchers in interpreting data from soot measurements by providing the masses of oxygenated species formed during different combustion conditions. The current work might also aid in designing new experiments as it provides information on molecular structures.

"Hopefully, our work will spark new ideas among our colleagues," Olof says. "One important outcome of the present study, which we think may advance the work done at the CRF, is that large oxygenated species need to be considered for the hydrocarbon growth chemistry under many combustion conditions."

The present research can be viewed as a continuation of the work performed by Craig Taatjes (8353) and his colleagues when they were the first combustion scientists to detect small enols in flames.

"Our work shows that enols larger than those Craig and colleagues were able to detect play an important role as intermediate species on the chemical route toward furans," says Olof.

One of the most intriguing challenges of this research is laying out the transition from gas-phase molecules to solid particles as they first form in a combustion environment, Olof says.

"Measurements in combustors are very difficult because there are few diagnostic techniques that do not perturb the combustion chemistry, and the techniques available do not provide all of the necessary information," he says. "Implementation and interpretation of experiments can be challenging. Modeling, on the other hand, is also challenging because the combustion systems are large and complex. Using a close combination of measurements and modeling allowed us to uncover new chemical mechanisms."

After the researchers revealed the existence of oxygenated carbon species, the next step was to know their arrangement — to determine what molecular species were actually being formed.

"The process is comparable to having a number of letters but not knowing what word they came from because there can be several ways to combine them," says Farid. "This riddle can be resolved with information about how certain letters are connected to others."

In terms of chemistry, this means that experimental evidence of the types of chemical bonds between carbon, hydrogen, and oxygen species was needed, Farid says. The researchers used a model to predict what chemical species could be formed but the experimental confirmation came from X-ray photoelectron spectroscopy (XPS) measurements performed by Farid in his materials physics laboratory. The XPS instrument uses X-ray light to produce photo-emitted electrons from atomic levels inside carbon and oxygen from collected soot samples. These electrons carry information about what bonds carbon and oxygen have between them and with hydrogen. The bonding information revealed that the theoretically predicted furan molecular structure was in fact being generated.

# Using CO<sub>2</sub> to streamline production of ethanol

By Michael Padilla

Carbon dioxide (CO<sub>2</sub>), a major greenhouse gas, is typically considered a problem. However, researchers at Sandia are using it as a solution to address significant obstacles to expanding the market for biofuels: efficiency and cost. When added during the deconstruction phase of biofuel production, CO<sub>2</sub> gas neutralizes the toxicity of ionic liquids.

Working at the DOE-funded Joint BioEnergy Institute (JBEI), the researchers discovered that adding CO<sub>2</sub>, generated during the fermentation process of cellulosic ethanol, to the pretreatment step could lower production costs by 50 to 65 percent compared with conventional ionic liquid-based pretreatment methods and overall make the process greener, according to the researchers.

The study, “CO<sub>2</sub> enabled process integration for the production of cellulosic ethanol using bionic liquids,” was published in July’s issue of the journal *Energy and Environmental Sciences*. Seema Singh (8624), director of Biomass Pretreatment at JBEI, led the research.

“Pretreatment is the most expensive part of the biofuels production process, second only to the cost of growing and obtaining the feedstock itself,” she says.

Recently developed renewable ionic liquids or “bionic liquids,” help overcome the challenges associated with the integration of pretreatment unit operation with downstream saccharification and fermentation. The study shows that the most effective bionic liquids known to date for biomass pretreatment form extremely basic pH solutions in the presence of water, and therefore require neutralization before the pH range is acceptable for the enzymes and microbes used to complete the biomass conversion process.

James Sun (8624), first author of the paper, says that microbes generate carbon dioxide as a byproduct of fermentation, so harnessing that gas for use in the pretreatment



ADDITIVE LIQUIDS – JBEI scientists have advanced the use of ionic liquids, shown here, to break down cellulosic biomass. The latest development involves the use of carbon dioxide to reversibly adjust the pH level of ionic liquids, greatly simplifying the biofuel production process and lowering cost. (Photo by Roy Kaltschmidt at Lawrence Berkeley National Laboratory)

phase leads to an even greener source of energy. Since ionic liquids interact strongly with CO<sub>2</sub> and in the presence of water, amine group of the ionic liquid becomes protonated; adding CO<sub>2</sub> into IL in the presence of water leads to acidification of the system, adds Singh.

## Screening ionic liquid

As part of the research, 15 types of ionic liquid at various concentrations were screened. Cholinium lysinate was determined to be the most compatible solvent with commercially available enzyme mixtures and fermentation hosts. Researchers also conducted tests with various concentrations and pressures of carbon dioxide.

Applying up to 145 pounds per square inch of

carbon dioxide to the system shifted the pH to a range that was optimal for the enzymes and microbes. Following the application of carbon dioxide to the system, researchers were able to get more than 83 percent of the theoretical yield of ethanol from the glucose initially present in biomass.

Seema says this novel strategy to overcome pH mismatch of unit operations eliminates costly separation steps, making the ionic liquid-based one-pot process industrially viable.

The next step is to modify this process for advanced biofuels and applicable to a variety of other industrial fermentation hosts.



ADDING CO<sub>2</sub> – Researchers at JBEI are studying the use of CO<sub>2</sub> to streamline the production of biofuels. From left, Feng Xu, Corinne Scown, Tanmoy Dutta, Seema Singh, Jian ‘James’ Sun, Blake Simmons, and Murthy Konda. (Photo by Arthur H. Panganiban/JBEI at Berkeley Lab)

## JBEI's mission

**jbei**  
Joint BioEnergy Institute

Inside JBEI’s Emeryville labs, researchers are using the latest tools in molecular biology, chemical engineering, and computational and robotic technologies to transform biomass into fuels.

Led by Krissy Galbraith (8524), this first-of-its-kind program is designed to enhance the employee experience, foster an inclusive environment, and provide opportunities for Sandians to make real connections.

The Sandian Snapshot can be found on the Division 8000 webpage under Blogs and Updates.

Meet the people, learn about their background, interests, and say hello.

Here are a few of the Snapshots:

Fresh out of school, Richinder “Richie” Rehal (8136) joined the Telemetry & Stockpile RDCS department as an electronics engineer. “There is a lot of knowledge around. From a fresh-out-of-school perspective, it’s amazing to me. I’m just trying to absorb it all,” he says.



Kenton Chung (8531) is the newest project controller in the NW Mission Partners department. Attracted to Sandia’s culture, work-life balance, and sense of community, Kenton felt this would be a good place for him to jumpstart his career.



Alexis Abelow (8344) is the newest materials scientist to join the Materials Chemistry group. As a scientist, she considers the national labs an ideal place to work. She was intrigued by the unique opportunities Sandia offers, especially the freedom to explore, collaborate, design, and implement various systems.



## Sandia/California launches new hire profile program:

# Sandian Snapshot

# Hard work pays off at 2016 Intern Symposium

By Madeline Burchard • Photos by Dino Vournas

The summer internship season culminated on July 28 at the 2016 Intern Symposium, an all-day event that showcases intern projects and gives students the chance to network with the rest of the Sandia community.

Undergraduate intern Rebecca Harmon (8351) presented one of 37 posters on display on the DISL patio. Her work this summer on uncertainty quantification was both an opportunity to expand intellectually and explore a career in the national labs. Standing proudly beside the poster was Moe Khalil (8954), who, along with Habib Najm (8351), served as one of Rebecca's mentors.

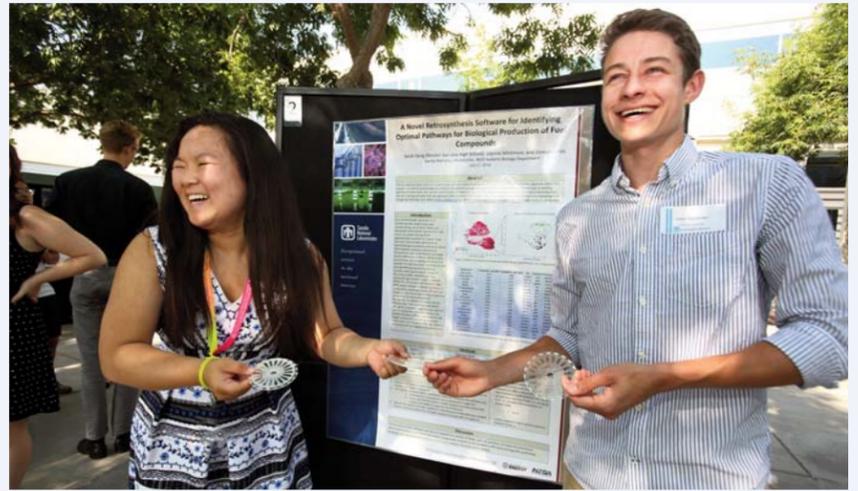
"Internships like this open up avenues for them after undergraduate work," Moe says. "It highlights the avenues for doing research outside of academia. Especially for young engineers, the prospect of doing work that is outcome-oriented with a clear goal can be very appealing."

After the poster showcase, seven presentations were hosted in the Combustion Research Facility auditorium.

This summer, Sandia/California hosted a record 184 interns. Intern program coordinator Nicole George (8522) says that the number of interns was equally matched by the support and excitement from staff throughout the season and at the symposium.



FRANK CHARBONIER (8621), left, and John Giblin (8621), right, holding a new SpinDx disk tested by Frank.



SARAH DENG (8633) and Frank Charbonier (8621) share a light moment.



GILLIAN KRAUTMAN (8954) talks to attendees about her summer project.



LUC OLSSTHOORN (8973) talks about modular web frameworks for geographic data.

## Bitcoin forensics

(Continued from page 1)

all sorts of terrible stuff."

Sandia's work, conducted for the Department of Homeland Security (DHS) Science and Technology (S&T) directorate, could ultimately be delivered to other federal law enforcement agencies. DHS S&T requested Sandia to set up a graphical user interface or a front end on the research environment so agents can test the algorithms Sandia is using in actual investigations.

"This will allow us to adjust what we're doing to make sure we're being of maximal use to them," says Andrew.

The Sandia team includes Mark Boyd (8962), Lynne Burks (8116), Maggie Todd (8116), Kiran Lakkaraju (1463), Jovana Helms, Patricia Cordeiro (5635), and Ethan Chan (8954).

### Keeping up with spawning innovations

Challenges faced by law enforcement include the significant time and resources needed to pinpoint users, especially since traditional means of establishing identity are not always possible. Since Bitcoin will likely spawn innovations that will enable new forms of both legitimate and illicit commerce, authorities have few battle-tested legal, policy, and technical tools to counter those illicit uses.

"The basic obstacle was trying to truly understand all of the various patterns associated with Bitcoin transactions," Andrew says. "We can use past investigations as examples of patterns that will enable us to find other configurations."

There is not a "silver bullet" algorithm to effectively de-anonymize Bitcoin, says Andrew, explaining that to do so would involve cross-referencing anonymous data with other, traditional sources of investigative data to identify suspects.

"To be successful, the reality is it's going to take different types of algorithms and additional types of investigative techniques including good old-fashioned police work," he says. "They're all going to have to be combined."

A prime example of law enforcement trying to overcome a Bitcoin challenge, Andrew says, was an online market called Silk Road that was used to sell drugs. The market was successful for several years before law enforcement was able to eventually shut it down. The success of Silk Road also demonstrated the effectiveness of The Onion Router (Tor) in maintaining the anonymity of online criminals. By using Tor, the site's operators supported up to \$1.2 billion in drug sales from more than 950,000 registered users.

## What's a Bitcoin?

Created in 2009 by Satoshi Nakamoto, Bitcoin is a digital currency based on cryptographic mathematics. The underlying software is a decentralized operation that includes a network of users that verifies the validity of transactions, rather than a bank. Bitcoin is highly anonymous and it is difficult to know who is sending and receiving funds. The main risks of using Bitcoin — difficulties in liquidating funds and currency volatility — could be offset by the ease of transport and anonymization.

Once the Bitcoin application is downloaded to a user's computers, spending the currency is as easy as sending an email.

"Bitcoin transactions refer to their precedent transactions, says Sandia researcher Andrew Cox. "Unlike cash, which doesn't have memory of where you got that dollar that you paid for your coffee

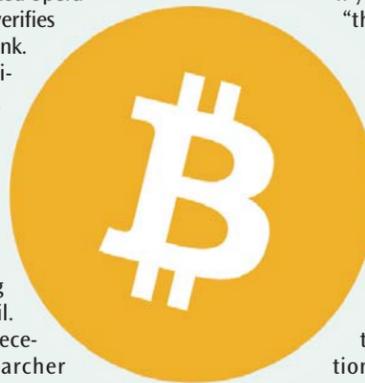
or your tea, with Bitcoin that's not the case. Bitcoin actually refers back to previous transactions."

"If you have received 10 Bitcoins," Andrew says, "then Bitcoin refers backwards in time to all of the previous transactions that allowed you to ultimately receive that 10 Bitcoin."

If you know the identity of those people who sent you those Bitcoin and whatever those previous transactions are, you know who that person is interacting with."

He says the transactions have a key or a hash that says "for this transaction, refer back to these other transactions."

"We know that the money came from this transaction," he says. "This transaction in turn has a hash or a key that says all my money came from these three transactions. And so forth all the way back to the beginning."



"Even with the shutdown of the most famous example," Andrew says, "the problem didn't really abate. It just sort of slowed down but then has picked up pace again."

Whatever its legitimate benefits, as the acceptance of Bitcoin spreads, its use as a means of conducting illicit commerce is likely to increase as well. Criminal enterprises have used Bitcoin at least in part because of the perceived ease with which transactions can be anonymized. Although anonymization of Bitcoin transactions is far from fool-proof, it has proved to be a non-trivial barrier to authorities slowing the growth of electronic illicit commerce.

"In many ways," says Andrew, "figuring out how to effectively combat illicit Bitcoin commerce and reduce its perception as a tool of criminals can encourage more people and companies to adopt Bitcoin for legitimate purposes."

### Setting up the requirements

Sandia conducted a systems analysis of illicit e-commerce focusing on Bitcoin. The team set up a research environment to experiment with other algorithms that can de-anonymize illicit Bitcoin users. The research includes a mix of traditional and novel investigative techniques, along with existing financial regulation and innovative policy and process tools.

Once de-anonymization occurs, law enforcement can link the Bitcoin addresses to a specific alias and they will know all of the Bitcoin addresses they need to deal with.

"When you exchange Bitcoin, you don't have information such as an e-mail address," Andrew says. "Instead, it's a completely random set of numbers and an anonymous Bitcoin address. Bitcoin users can use one or many Bitcoin addresses. This allows criminals to evade obvious patterns of transactions."

The researchers were able to use some published methods to track down and understand that the same users are using the different Bitcoin addresses. They are now in the process of generating their own methods by characterizing transactions of Bitcoin users and applying machine learning methods to uncover patterns of interest.

"It doesn't mean that we get their actual name because there aren't any names associated with Bitcoin," Andrew says, "But it will show that some transactions are controlled by the same user."

Sandia will continue to work on the algorithmic research and focus on developing a graphical user interface so law enforcement officers can easily interact and make queries against Sandia's research environment and what Bitcoin calls the "blockchain."

"Our clients are happy about the requirements we've developed and the research we've done on what types of tools and capabilities are needed," Andrew says. "The bottom line is, the work is about spending time with law enforcement officers and making sure that we put their needs first."

# You had me at hello

By Patti Koning

Conversation — that one word sums up the essence of Talent Development. “The Talent Development program came about because we realized that managers were not having enough conversations — or enough meaningful conversations — with their employees,” says Kim Edson (8522), manager of human resources for the California site. One goal is to enable staff and management to have effective conversations about critical topics like performance and career growth. The program also aims to empower employees to define and meet their career goals.

“An important concept is the idea that you are in charge of your own career. That can be easier said than done,” says Div. 8000 VP Marianne Walck. “The Talent Development program addresses this with a framework to develop the skills to manage your career.”

## Need for dialogue outside of performance reviews

The seeds of Talent Development were sown in the responses to several 2014 Leadership Blog posts on performance reviews by then-Div. 8000 VP Steve Rottler (00002), who is now the deputy Labs director and executive vice president for National Security Programs. Various members of the workforce honestly and passionately shared their frustration with the performance review process.

“Many valid issues were raised in those comments,” says Steve. “One theme really stood out to me — that some people felt the only time they talked one-on-one with their management was during their performance reviews. To help shift the focus in these important relationships, we created a new talent development framework to drive a focus on the development of people as professionals, for which performance feedback is only one element.”

Steve challenged Kim and the Human Resources department to find a way to jump-start those conversations. They responded by developing a Talent Development model that focuses on four core areas: career development, coaching and feedback, mentoring, and succession development.

“Talent Development up close is about one-on-one conversations in each of these areas,” says Kim. “From a distance, though, it’s about translating strategic goals to mission success.”

## You own your career development

When it comes to career development, managers shouldn’t be dictating career aspirations and goals to employees. Instead, it’s up to employees to examine their interests and goals and then start dialogues with their managers. The manager’s responsibility is to learn each employee’s career aspirations, interests, motivators, and development needs.

“Too often, we think of career growth as moving up the ladder. But many careers are a journey,” says Traci Ryan (8522-1), team lead for Human Resources Business Partners. “In the career development workshop, we guide staff through steps in planning for a meaningful career conversation and introduce the tools available.”

Chris Shaddix (8351), manager of the Reacting Flow Research group, thinks the new focus on Talent Development is long overdue and very much appreciated by research staff.

“Before, as a manager, I had a vague idea of what the long-term goals of my different staff members were, but we rarely spoke directly toward that, and my perceptions were occasionally mistaken,” he explains. “Now, it is an important aspect of every performance-related conversation I have with my staff members. In particular, those staff who have some interest in going into management are encouraged to explore that interest by filling in for me at managers’ meetings and taking preparatory coursework.”

## Demystifying difficult conversations

After looking into the concerns raised in the comments to the Leadership Blog posts, Kim and her team realized that many managers simply didn’t know where to begin with coaching and feedback conversations.

“Many of the skills needed to manage difficult conversations and behavior are often referred to — in a rather derogatory tone — as ‘soft.’ But there’s nothing soft about dealing with an emotion or confrontation,” says Tamara Cagney (8527), a certified employee assistance professional and counselor at Sandia/California. “To manage a difficult conversation, both managers and employees need to think carefully about the way they communicate, their ability to take control of a meeting, and their levels of self-knowledge. Training can help give everyone the confidence they need.”

To support managers in this endeavor, the Div. 8000 Human Resources team created a Difficult Conversations class for managers, and a complementary class for employees, Effective Communication Skills for Difficult Conversations.

“This class gives employees tools and best practices to deal with difficult conversations they may face in the workplace,” says Traci. “Too often, difficult conversations occur without planning the best approach.”

To better equip managers and employees to engage in performance conversations, two new courses are now being offered Sandia-wide: Receiving and Applying Performance Feedback for employees and Giving and Receiving Effective Feedback for Leaders. Managers and employees with five years or less of service are being asked to take the appropriate class.

Difficult conversations done right can strengthen the relationship between an employee

# Talent development starts with a conversation



COUNSELOR TAMARA CAGNEY (8527) and Human Resources Business Partners team lead Traci Ryan (8522-1) coach managers and employees at the California site to prepare for difficult conversations. The two developed the Difficult Conversations classes that are a cornerstone of the Division 8000 Talent Development program. (Photo by Dino Vournas)

and manager by building trust and respect. That relationship is one of the most critical factors in job satisfaction. On the flip side, it’s one of the top three reasons people cite in deciding to change employers.

The Society for Human Resource Management’s 2014 Employee Job Satisfaction and Engagement Survey supports this idea. Nearly three-fourths of respondents rated “respectful treatment of employees at all levels” as very important, making it the top contributor to overall employee job satisfaction. “Trust between employees and senior management” was the second most important factor, with 62 percent of respondents rating it very important.

## Mentoring

Want to succeed? Find a mentor, and then be a mentor.

For proof, just look at tech industry leaders who are probably all six degrees of separation from Apple founder Steve Jobs. Robert Noyce, coinventor of the microchip, was one of Jobs’s mentors. Jobs mentored Facebook founder Mark Zuckerberg and Google founders Sergey Brin and Larry Page. All three are now mentoring the next generation of technology innovators.

Marianne regrets not taking advantage of mentoring early in her career. “In graduate school and when I first began working at Sandia, I did not want to ask for help because I was afraid of appearing weak or unprepared,” she says. “This was a mistake. Early in my career, I didn’t understand the value of networking. It was a tough proposition

as the overwhelming majority of my colleagues were male, but one that I should have worked harder at. A mentor might have shown me that value earlier.”

Traci says successful mentoring is well defined from the start. “Decide what you want to accomplish before looking for a mentor. It’s really about transferring skills and knowledge from one person to another,” she says.

For more information regarding Sandia’s Mentoring Program, visit the Leader Resource Center at <http://tiny.sandia.gov/wvr7>.

## Want the boss’s job?

Succession development is the process of pipeline planning and development focused on management roles. This critical process identifies employees with the skills to help them move up in an organization or on to other positions — or the potential to develop such skills.

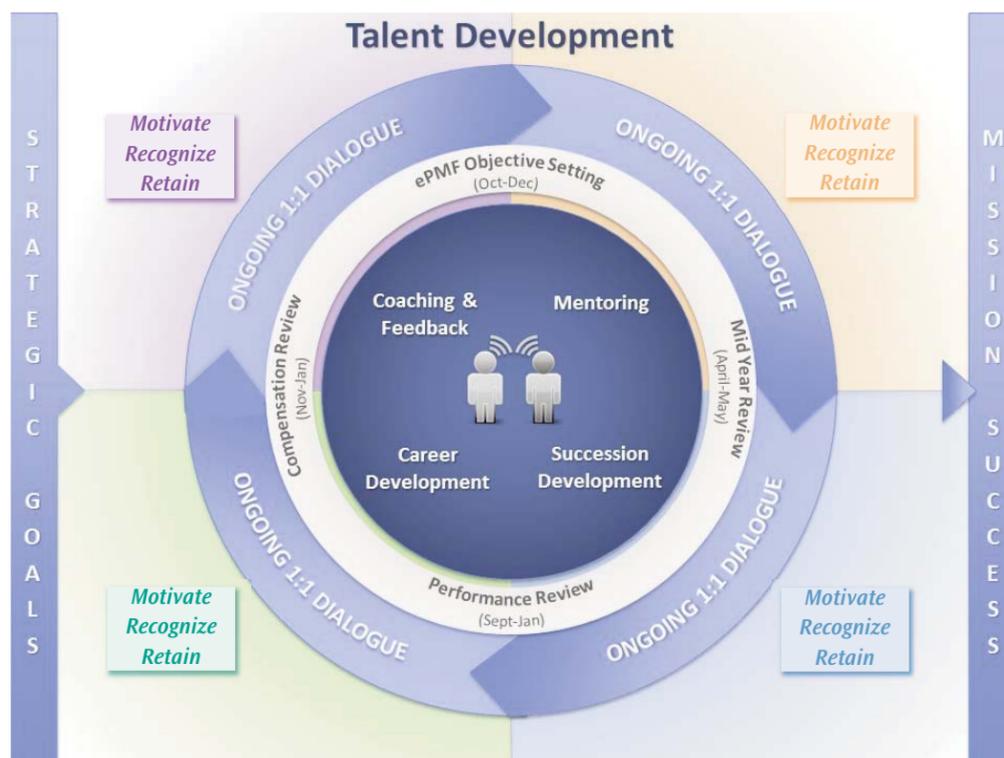
“This is an opportunity for employees interested in management, even if it’s not something that they want to do right away, to position themselves for leadership opportunities,” says Kim. “We encourage anyone interested in management to discuss this with their managers and explore leadership opportunities and classes available to staff.”

## Talent Development is for everyone

Kim says she hopes managers and staff in Div. 8000 will tailor the tools available through Talent Development to their own needs.

“This is for everyone, not just those looking to advance up the organizational chart. Whether you are seeking a change or growth in your current position, this model has tools to help you succeed,” says Kim. “Ultimately, each employee owns their own career, and management is there to act as a coach.”

Based on the success in California, New Mexico’s Human Resources department plans to pilot a Talent Development program, in partnership with Kim’s team, in New Mexico starting with the Executive Support Division in FY17 with an eye to roll it out Labs-wide in the future.



# Mileposts



*New Mexico photos by Michelle Fleming  
California photos by Randy Wong*



Richard Stump  
40 6634

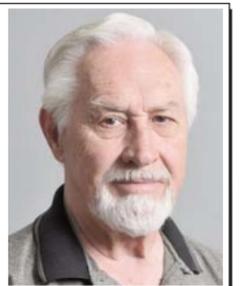


Richard Farwell  
35 5098

## Recent Retiree



*New Mexico photos by Michelle Fleming*



Tom Snowden  
47 2723



John Garcia  
35 4824



Mike Johnson  
35 5600



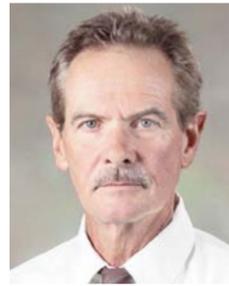
Suzanne Kelly  
35 1220



Dale Marsh  
35 4848



Adrian Romero  
35 2734



John Saylor  
35 2913



Larry Shapnek  
35 5433



Barbara Surbey  
35 157



Chuck Townsend  
35 5403



Dale Dubbert  
30 5345



Muhammad El  
25 2716



Darrick Jones  
25 1528



Mark Koch  
25 5448



Daniel Schell  
25 9335



Dave Wheeler  
25 5964



Michael Wong  
25 1554



Heidi Smartt  
20 6831



David White  
20 9300



Mike Baker  
15 2632



Marie Capitan  
15 3010



Julie Cordero  
15 4879



Jason Gale  
15 2243



Steven Garcia  
15 2521



James Griego  
15 4848



Sarah Hostetler  
15 5623



Tony King  
15 1534



Joseph Martinez  
15 2982



R. Scott McEntire  
15 5491



Armon McPherson  
15 1675



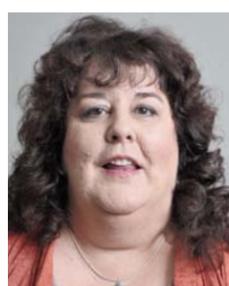
Kathryn Pape  
15 2221



Nathan Peterson  
15 1555



Robin Reeves  
15 10511



Lynette Rocheleau  
15 11500



Jose Rodriguez  
15 5532



Daniel Sinars  
15 1600



Chad Staiger  
15 6124



Barton Wohl  
15 415



Jason Verley  
15 1355

Exceptional service in the national interest



## Sandia LabNews

### Lab News rack locations:

Bldg. 802, elevator lobby  
Bldg. 810, east lobby  
Bldg. 822, south entrance  
Bldg. 858 EL, lobby  
Bldg. 880, Aisle D, lobby  
Bldg. 892, lobby  
Bldg. 894, east lobby  
Bldg. 898, east lobby  
Bldg. 887, lobby  
Bldg. 891, lobby  
Bldg. 836, lobby  
Bldg. 831/832 north lobby  
Bldg. 861, Cafeteria lobby  
Bldg. 870, lobby  
Bldg. 823, lobby  
Bldg. 701, next to elevator  
IPOC, lobby  
CGSC, lobby

CRSI, lobby  
M.O. 308, lobby  
Bldg. 960, lobby  
Bldg. 962 (TA III), lobby  
Bldg. 6585 (TA V), lobby  
Bldg. 905, lobby  
800(A), outside of Vicki's



## SANDIA CLASSIFIED ADS

## MISCELLANEOUS

REFRIGERATOR, full size, 65"H x 32"W x 27"D, no freezer compartment, clean, \$200. Meyer, 298-0311.

WOOD HEADER, laminated, for patios, 2"T x 12"W x 20'L, \$75; exercise bike, \$30; 16-ft. ladder, \$50; RV camping lounge chairs, \$45 ea.; more. Garcia, 554-2690.

GRAND 'L' PIANO, 1926 Baldwin, 6' 3", mahogany, tuned at concert pitch, beautiful, excellent condition, \$6,700. Smith, 505-440-6903.

PATIO FURNITURE, glass-top table, 6 chairs, 2 that swivel/rock, w/cushions, \$250. Baggett, 254-770-7017.

GUITAR AMP, Peavey 6505, 120-W head unit, missing foot switch, \$600. Guffey, 913-219-4583.

HOCKEY TABLE, \$75; treadmill w/workout settings, \$150. Ruiz, 238-8606.

DALLAS COWBOYS TICKETS: Sept 11 (Giants), Oct. 9 (Bengals), Nov. 24 (Redskins), sec. 454, row 3, seats 1&2, \$300/pair. McCandless, 553-5281, ask for Suzanna.

PS4 GAME, 'Uncharted 4: A Thief's End', new, unopened, \$40. Walton, 897-0092.

DINING TABLE, seats 8, 83" x 44-1/2", 2 extensions totaling 104-in., protector pad, elegant, photos available, \$3,500. Miller, 505-298-3815.

TIMESHARE, for sale, plan ahead, New Orleans in springtime, Hotel De L'Eau Vive, 3 bdrs., 2 baths, full kitchen. Reis, 505-856-1138.

REFRIGERATOR, Kenmore, French door, bottom freezer, ice maker, white, \$800 OBO; washer/dryer, Maytag, top-load, \$50 ea.; dining set. Jensen, 505-270-5581.

REEL-TO-REEL TAPE RECORDER, TEAC, needs belt, Garrard turn table, Sansui Turner amplifier, instructions, tapes, \$225. Williams, 505-271-4902.

iPHONE 6S, 128 GB, under warranty, w/Otterbox, mint condition, rarely used, \$625. Hernandez, 505-239-0255.

ALFALFA, quality, barn-stored, no rain, \$6/bale. Barnard, 220-4427, ask for Jason.

DRUM SET, 6-pc., clean, Sabian cymbals, soft cases, hardware travel coffin, throne, \$1,000 firm. Estrada, 505-480-1776.

COUCH & LOVESEAT, dark green fabric, w/wood legs, photos available, \$200/both OBO. Reece, 505-414-3018, text preferred.

EXERCISE EQUIPMENT: Soloflex, complete w/butterfly & leg attachments, \$450 OBO; InMotion compact elliptical, w/upper body cords, \$50. Hagerman, 505-401-1402.

PRECIOUS MOMENTS: 500+, figurines, dolls, ornaments, photos available, make offer for individual pcs., sets, or all. Brisenno, 505-659-1350.

LEATHER JACKET, one-of-a-kind, British Classic moto patches, men's size medium, photos available, negotiable. Lopez, 291-0010.

UTILITY TRAILER, '13 Haul-Rite, 5' x 8' x 28"H side rails, \$1,350. Jones, 218-1147, call or text, ask for Robert.

FOLDING RAMPS, 2, 6-ft. long, carrying handles, aluminum, brand new, \$150 ea. Felix, 573-0595.

COMPACT REFRIGERATOR, 2.7-cu. ft., w/freezer, 19" x 19" x 26", white, dorm or man cave, \$50. Dukart, 505-296-0155.

BACKPACKING TENTS, sleeping bags, backpack, excellent condition, call for info. Graham, 505-379-8798.

BADGE LANYARDS, beautiful, all colors/styles, bejeweled & plain, \$10-\$20. Barela Olivas, 505-321-9542.

LOVESEAT, w/2 pillows, 62" x 38" x 37", Google 'Collin spa loveseat' for photos, like new, \$195. Kraus, 275-1005.

SLEIGH BED, new, full size, complete frame, \$300. Cardenas, 249-0142.

## How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday.

Submit by one of these methods:

- EMAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 1468 (Dept. 3651)
- INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902.

Because of space constraints, ads will be printed on a first-come basis.

## Ad rules

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

SOFA, LOVESEAT, WOOD COFFEE TABLE, \$400; kid's bdr. set, twin bed, nightstand, table, chair, 7-ft. bookshelf, \$250; all good condition, photos available. Dai, 505-990-9116.

STUDENT ALTO SAX, good condition, \$325; Yamaha keyboard, 61 keys, w/stand, \$75; Bounty Hunter metal detector, \$45. Aragon, 888-3473.

## TRANSPORTATION

'09 HONDA CIVIC HYBRID, gray, amazing condition, 156K miles, 40+mpg, loves road trips, \$6,500. Gutierrez, 505-814-3688.

'01 FORD RANGER XLT, silver, top, brush guard, extras, replaced engine, new one only few yrs. old, \$6,000 OBO. Pierce, 505-610-0613.

'11 HYUNDAI SONATA SE, standard transmission, beige, Katzkin leather, lumbar & Liquicell seat, 37K miles, excellent, \$11,750. Smith, 505-463-0911.

'06 TOYOTA MATRIX, 5-sp., PW, PL, cruise, charcoal/gray, 141K miles, newer tires & struts, 40-mpg, very good condition, runs perfect, \$4,000. Dwyer, 505-271-1328.

'84 F150, 4x4, 302-cu. in. V8, manual transmission, Edelbrock 4-barrel carburetor, great mountain truck, \$2,000. Gallegos, 410-7827.

## RECREATION

'81 KZ440 LTD, great commuter bike, 6,700 actual miles, new battery, windshield, luggage rack, runs great, excellent condition, \$1,500. Bendure, 331-6344.

'12 YAMAHA FZ6R SPORT BIKE, 600 cc, 3,800 miles, good condition, recent service, clean title, \$4,500 OBO. Long, 505-554-5747.

'13 ZERO S MOTORCYCLE, 100% electric, 100-mile avg. range, 4K miles, \$9,000 OBO. Delhotal, 505-659-1492.

MOUNTAIN BIKE, Niner Jet, brand new, XL for tall rider, Deore, Rock Shox silver/monarch, \$1,700. Newton, 505-271-1754.

'06 R-VISION MAX-LITE M-23RS, loaded, sleeps 6, w/queen & bunk beds, \$7,000. Sulteimer, 505-259-0686 or gssulte@centurylink.net.

## REAL ESTATE

314 ACRES, forested, fields, streams & house, nestled in Jemez Mountains, development potential, \$11,000 income, \$650,000. Marron, 505-345-4006.

4-BDR. HOME, 3 baths, 2,200-sq. ft., 2-car garage, detached workshop, tall garage, hot tub, lake front, boat dock, Pagosa Springs, \$399,000. Grady, 382-7978, ask for Debbie.

4-BDR. HOME, 2 baths, 2-car garage, 2,093-sq. ft., recently built, new appliances, fire place, NW 98th, owner financing, little down, \$275,000. Sanchez, 505-515-5997, ask for Joseph.

4-BDR. HOME, 2,575-sq. ft., Sandia mountains view, pool/spa, end lot, NE neighborhood, MLS#870099, new price, \$350,000. Mason, 505-307-6017.

## WANTED

ROOMMATE, 3-bdr. home, 2-1/2 baths, 2,100-sq. ft., Ventana Ranch, no pets, internet, cable & utilities included, \$550 mo. Davidson, 832-701-8880.

WANT TO CLEAR YOUR FREEZER, my dogs would love last year's meat, especially game. Beggs, 505-414-2757.

USED TV/DVD COMBO, free or very reasonably priced, my birds love SpongeBob. Andreoni, 505-400-9563, text preferred.



# Operation Backpack delivers

## Sandia/California rallies to deliver a record 65 backpacks to children of military families

By Madeline Burchard

For the third year in a row, Div. 8000 has exceeded expectations set from previous years, collecting 65 backpacks filled with school supplies for children of local military families, beating the record set last year of 48 backpacks. Some 50 backpacks were delivered to US Army Reserves Garrison Camp Parks, in Dublin, California, and 15 were sent to Travis Air Force Base in Fairfield, California.

Operation Backpack was founded as a way for the site to thank military families for their sacrifice in service to the nation. The back-to-school season can be a stressful and costly time for any family, but can be especially trying for military families with a deployed family member or single-earner households.

By providing school supplies, the Operation Backpack planning committee hopes to alleviate the stress and let military families know that they are supported by the Sandia/California community.

"We would like to sincerely thank everyone who helped the Division's mission to continue to support Operation Backpack," says Rachel Sowell (8000). "Without your generous donations, we would not be able to fulfill our commitment to support the nation's military families."



OPERATION BACKPACK organizers Karelyn Baker (8210), left, and Rachel Sowell (8000), right, talk to Sandia/California VP Marianne Walck about this year's collection of backpacks filled with school supplies that were donated by Sandia California employees. (Photo by Dino Vournas)



MADLINE BURCHARD (8524) and Sandra Funk (8234) deliver backpacks to Garrison Camp Parks in Dublin, California. (Photo courtesy Garrison Camp Parks)



SANDRA FUNK (8234) delivers backpacks donated to kids of military families. (Photo by Madeline Burchard)



MADLINE BURCHARD (8524), Sandra Funk (8234), and Bill McAllister (8511) show off backpacks filled with school supplies. (Photo by Michael Padilla)

# From hamsters to horses, Jon Baldwin helps them all

## Sandia retiree helps set up pop-up shelters during disasters

By Madeline Burchard

**W**hen residents of Amador County, a rural community east of Sacramento, saw a black column of smoke on the horizon, their first thoughts were likely of evacuation. But when Jon Baldwin (8247) saw that same column of smoke, his mind immediately went to how quickly he could set up horse stalls inside the Amador County Fairgrounds.

On Sept. 9, 2015, a power line hit a pine tree and started the Butte Fire, one of the most catastrophic wildfires in the history of Amador County and California. When the fire began, Jon was in an outdoor training session for volunteers with the Amador County Animal Response Team (ACART) — an all-volunteer emergency animal shelter group.

Jon and the other volunteers recognized the impending fire and made their way to the Amador County Fairgrounds to set up the emergency animal shelter. By the end of the day, they stood ready to accept the animals that would be displaced by the Butte Fire.

### Putting to use his animal expertise

In 1980, Jon and his wife Marilyn moved from Idaho to the Bay Area when Marilyn started attending law school. When Jon began his work at Sandia, they wanted to settle in an area that would provide the natural beauty and peace they enjoyed in Idaho, but would be close enough to Livermore to allow Jon to work at Sandia. Amador County offered the best of both worlds and has been their home ever since.

During the work week, Jon stayed in Livermore and worked at Sandia as an engineer in the dimensional metrology laboratory and then as a weapons systems engineer for the W80 and W87 projects. In 2010, he retired and sought opportunities to become involved in his home community of Amador County.

Jon's friends, knowing his love of animals, tipped him off to ACART. Jon was instantly drawn to the group's impact on the lives of residents affected by disasters.

In 2013, he became the organization's vice president, a role that requires him to be everything from webmaster to recruiter to fundraiser during downtimes. During crises such as large wildfires, Jon spends his waking hours helping supervise shelter operations and the intake and care of hundreds of animals.

### Sheltering everything from hamsters to horses

Over the 13 days of the Butte Fire operations, Jon and other volunteers oversaw the check-in and processing of 450 animals and the general operations of the 24/7 animal shelter. Their familiarity with nearly every type of animal in the county has served them well.

"Ever since I was little, I've had everything from dogs to cattle," Jon says. "I've been a lifelong animal lover."

When ACART is activated and the emergency shelter opens, Jon never quite knows what is going to come through the fairground gates.

"The most unusual animal we've ever seen was the 600-pound hog that a family brought in. It was a family pet, just like a dog," Jon says. "That and the goat that gave birth at the shelter."

In the midst of the Butte Fire operation, Jon and his volunteers, supported by local veterinarians, found themselves delivering and caring for newborn goats, or kids. The reunion between the goats and their human family was one of the most emotional that Jon has ever witnessed.

### Seeing the best in people during the worst

When families arrive at the ACART shelter to drop off their animals, they are often at their most emotional, Jon says. Non-service animals are not allowed at human disaster shelters, forcing many people to part with their animals at ACART before heading to temporary lodging. However, Jon says he often sees the best in people during these times of extreme stress.

"I'm amazed at the variety of people and attitudes. The people you think would be at the end of their rope are often the most collected," he recalls. "One family was so appreciative that they bought pizza for our entire crew."

Jon is also regularly amazed by how much others rally around ACART and the displaced animals. Businesses and organizations from Amador County and beyond regularly donate much-needed supplies during emergency operations. When ACART finds itself with too many animals or too few resources, animal rescue and shelter groups from neighboring counties donate goods or take in animals themselves.



JON BALDWIN has had everything from cats to cattle. These days he keeps two dogs as his animal companions.

### Advice for pet owners

You don't have to live in a rural area to be impacted by natural or man-made disasters. Jon recommends that all pet and animal owners prepare now for the unexpected.

"Make a 'go-kit' for your animals so that when disaster strikes you are ready to evacuate," Jon recommends. "Make prior arrangements with people you know to house your animals in case of emergency. Shelters like ours should be your last resort."

For more information on what to pack in a go-kit and how to prepare for caring for your animal friends in an emergency, check out the "Be Prepared" section of ACART's website at [www.amadoranimalresponse.org](http://www.amadoranimalresponse.org).



VOLUNTEERS and veterinary staff help deliver kids during the Butte Fire.



ACART VOLUNTEERS prep crates for incoming animals.