



Exceptional service in the national interest

# Sandia LabNews

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SANDIA'S NEW GTEM — Megan Daily and Leonard Martinez (both 1353) prepare for a test in Sandia's newly installed Gigahertz Transverse ElectroMagnetic (GTEM) test chamber, which manufacturer ETS-Lindgren says is the largest GTEM in the world. The chamber is rated for continuous operation from direct current to more than 1 gigahertz and short duration operation up to electrical fields of 125,000 volts per meter for simulation of nuclear electromagnetic pulse. The large working volume GTEM is the latest addition to a growing suite of state-of-the-art test and experiment capabilities in Center 1300's Electrical Sciences Group. The GTEM will support ongoing and future nuclear weapons qualification programs, advanced simulation and computing research, weapons systems assessment technologies research, and multiple strategic partnering programs. (Photo by Randy Montoya)

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## Looking from space for nuclear detonations

By Sue Major Holmes

Sandia's Jaime Gomez was too busy to celebrate the successful launch of the latest nuclear detonation detection system — he was already deep into the next generation.

The Global Burst Detection (GBD) system launched from Cape Canaveral aboard the 70th Global Positioning System (GPS) satellite. The GBD looks for nuclear detonations around the world, offering real-time information about potential activity to US policymakers.

As project lead, Jaime (5796) oversaw teams responsible for everything from development to post-launch testing. The launch Feb. 5 was the 12th and final of the Block IIF (GPSIIF) series of GPS satellites in medium Earth orbit.

Project manager Bridget McKenney (5796) says that even before the final GPSIIF launch, Sandia was producing and delivering another generation of GBDs for a new round of eight satellites, GPSIII, being built by Lockheed Martin.

Sandia is already looking ahead to detectors for the launch series after that, dubbed Prime.

(Continued on page 4)

GLOBAL BURST DETECTOR — Researcher Rachel Trojahn prepares one of the boxes that makes up Sandia's Global Burst Detector for a test in the Labs' Flight Test Chamber. The chamber exposes individual boxes and the fully assembled flight system to the vacuum and thermal environment they'll experience in orbit. The box or full system will be worked as if on orbit while it's under vacuum conditions.

(Photo by Randy Montoya)



## That's that

Okay, I'll be the first to admit it: I don't get "Go" – Pokémon Go, that is. Let me rephrase that: I "get" it in the sense that I understand the premise of the game, but I just can't get into it. For me it's not that the game isn't fun; clearly it is, as millions of players of all ages bear witness. It's more a case of déjà vu all over again, as Yogi Berra might say. Been there, done that.

When my kids were little, we had fun taking our GPS device out into the field for geocaching adventures. We placed caches in some awesome locations in the Sandias, and one summer on our big trip to some of the great national parks we left geocaches up and down the Rockies. So I've done my bit with the "use GPS to find stuff" gig.

While I'm not interested in playing Pokémon Go, I am fascinated by how quickly it has caught on around the globe. It has reached that marketers' sweet spot where it has crashed through all the boundaries that separate games from "real life." It has become, in very short order, a bona fide craze.

I've been around long enough to see several crazes in my life: Davy Crockett, hula hoops; the Twist; the Beatles; bellbottoms; *Jaws*; *Star Wars*; Pac Man; disco and the accompanying leisure suits (sorry to implant that image); and the list goes on.

It seems to be a law of nature that every couple of years any given population is psychologically compelled to indulge in a round of collective obsession. I was into all of them (well, not disco – you can say a lot about me, but you can never accuse me of wearing a leisure suit). I had my coonskin cap and was an indefatigable hula hoopster, which was a great way to show off a skill set. That was important – even at 9 years old I knew what Napoleon Dynamite knew: "You know, like nunchuck skills, bow hunting skills, computer hacking skills. Girls only like guys who have great skills." That mattered a lot.

And the Beatles? Let's put it this way: It took all of 5 seconds of seeing girls screaming for the Fab Four for me to decide to give up the trumpet and pick up the guitar, a decision my parents did NOT approve.

Oh, and then there was the CB craze. By the 1970s, citizen's band radio had been around for a while and was a staple of every long-haul trucker's toolkit. But as the technology got cheaper and a nationwide 55 mph speed limit was adopted in response to the Energy Crisis, just about everybody wanted a CB radio in their Chevy Impala or AMC Gremlin. Why? So they'd get a heads up on where Smoky had set up a speed trap on the interstate. And to be cool! With a CB radio in their dashboard, insurance salesmen from Dubuque could assume whole new personas – sort of like Second Life for the pre-Internet age.

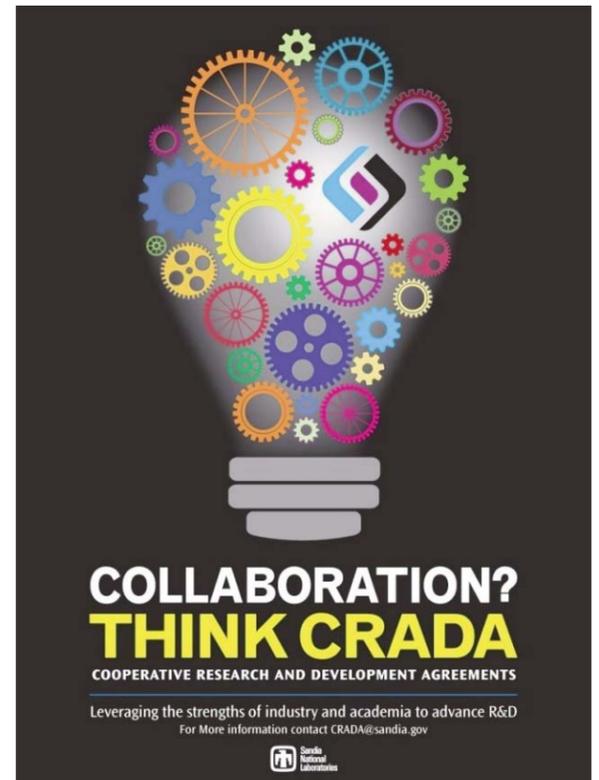
I had a CB in my 1967 VW camper and it kept me company on my drives across the country from Washington, D.C., to school out in Missoula, Montana. I don't think I ever said a word over the air, but it was hilarious to listen to. Most memorable to me was the half hour or so I was in range of a trucker (or maybe an insurance salesman from Dubuque) who went by the handle (that was your CB nickname) Reefer. Don't know if that was because of what he was drivin' or what he was smokin' – in CB lingo a "reefer" was a refrigerator truck. Anyhow, Reefer never said a word but he communicated, alright. Other truckers would call out to him and ask him questions: were there any speed traps up ahead? Any detours? Was the Frito pie at that truckstop up ahead any good? They'd ask him all sorts of stuff and it was always something that required a simple yes or no answer. For a "yes" Reefer would burp once; for "no" he'd burp twice. I was a writer-in-training who valued an economy of words but Reefer set a pretty high (or low) bar. He was into binary code long before most of us knew what it meant.

So that's my story about national crazes. Any questions? Yes or no only, please.

See you next time.

– Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

## CRADA workshop set for Aug. 18



Have you ever wondered how to collaborate with industry? Are you interested in working with a university, small/large company, or even a foreign institution? Would you like to know how to leverage a Cooperative Research & Development Agreement (CRADA) or Strategic Partnership Project (SPP) to benefit your research? If you answered yes to any of the preceding questions, we are pleased to provide a forum in which such topics and more will be discussed.

Team representatives from the CRADA and SPP teams are holding a Labs wide training and information session focusing on CRADAs and SPPs on Thursday, Aug. 18, 1:30-2:30 p.m. in the Bldg. 810 auditorium. Some areas of discussion will be:

- A description of CRADAs and SPPs as conduits for technology transfer
- What benefits do each mechanism confer on Sandia in general and a principal investigator in particular
- Potential funding sources for a CRADA
- What distinguishes a CRADA from an SPP
- How to solicit a potential collaborator using a Federal Business Opportunity Announcement

All members of the workforce are encouraged to attend; a Q&A session will follow the presentation. For more information, contact CRADA@sandia.gov.



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Bill Murphy, Editor . . . . . 505/845-0845

Randy Montoya, Photographer . . . . . 505/844-5605

Patti Koning, California site contact . . . . . 925/294-4911

Michael Lanigan, Production . . . . . 505/844-2297

Contributors: Michelle Fleming (Ads, Milepost photos, 844-4902), Neal Singer (845-7078), Stephanie Holinka (284-9227), Darrick Hurst (844-8009), Heather Clark (844-3511), Sue Holmes (844-6362), Nancy Salem (844-2739), Valerie Larkin (284-7879), Lindsey Kibler (844-7988), Tim Deshler (844-2502), Rebecca Brock (844-7772), Mollie Rappe (844-8220), Michael Padilla (925-294-2447), Valerie Smith, manager (844-6167)

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Bldg. 962 (TA III), lobby  
Bldg. 6585 (TA V), lobby  
Bldg. 905, lobby  
800(A), outside of Vicki's



# Saving lives on the battlefield through engineering

**Portable blood clotting monitor wins UC Davis/Sandia Engineering Design Award**

By Madeline Burchard

At the University of California, Davis, Engineering Design Showcase, a team of biomedical engineering students debuted CoagVISTA, a portable, durable device for assessing blood clotting in trauma patients on the battlefield. The team won the Sandia Engineering Design Award for its innovative solution to a critical need among battlefield medics.

## Risky gamble for military medics

When soldiers are injured on the battlefield, medics often do not have access to conventional blood monitoring devices seen in brick-and-mortar hospitals. Conventional devices are too sensitive to withstand the dust, heat, wind, vibration, and other environmental stressors found in combat environments, too complex to calibrate in the field, and too large to move with medics.



coagVista

Without the ability to monitor a patient's blood clotting after trauma, medics in already stressful environments are left with a dangerous gamble. If they administer pro-clotting treatment to a patient who doesn't need it, the patient can develop a life-threatening blood clot. If a medic does not provide treatment to a patient who needs it, the patient could bleed to death.

## Serving those who serve

In the fall of 2015, the CoagVISTA team met with clinicians from the UC Davis Medical Center to investigate technology needs in the medical community. A vascular trauma surgeon who has worked with military units in Afghanistan recommended that they create a portable and durable device that would allow medics like him to accurately mea-



SANDIANS WITH THE WINNERS of the Sandia Design Award at the Engineering Design Showcase at UC Davis. Left to right: Jim Schaaf (UC Davis), Jordan Thayer (8238), Helen Smith (8248), Brent Weyers (CoagVISTA), Victoria Chiu (CoagVISTA), Jeffrey-Annguye Le (CoagVISTA), Kevin Leung (CoagVISTA), Jacob Kilbane (8222), Anthony Passerini (UC Davis). (Photo provided by Chris Moen)



sure blood clotting in wounded patients.

Over the school year, the team went through the entire engineering design process from interviewing clients to demonstrating proof-of-concept to testing their prototypes. The device owes its durability and portability to a sensor that tests the electrical conductivity of a blood sample. As blood clots, the electrical conductivity of blood goes down.

## Real world experience for new engineers

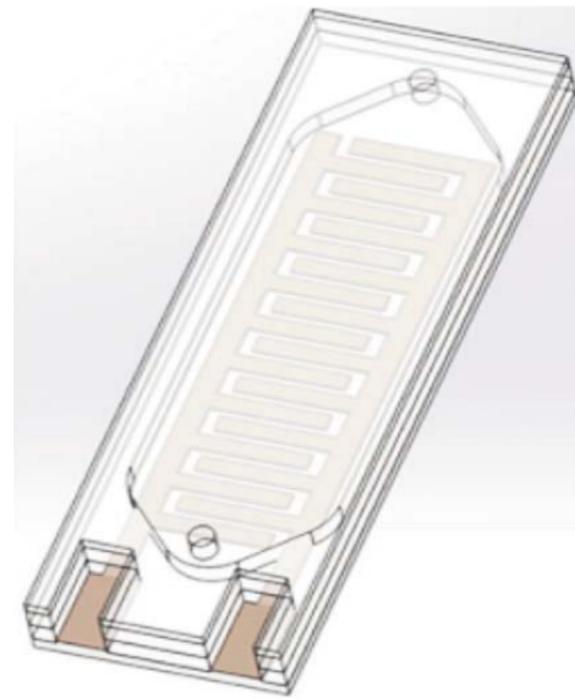
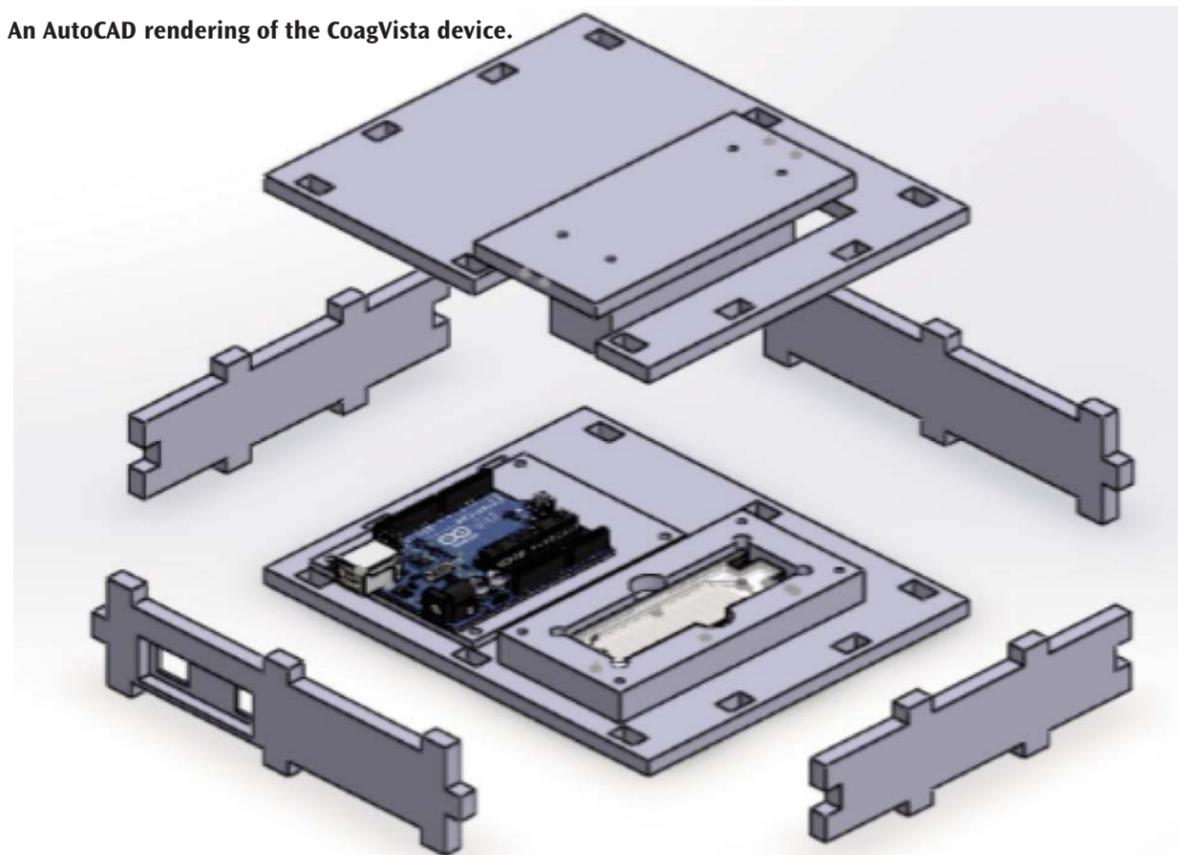
The projects at the UC Davis Engineering Design Showcase are the culmination of year-long senior capstone projects for undergraduate students across the College of Engineering. Students work in teams under the guidance of a faculty member to develop novel solutions to real-world problems using what they've learned throughout their

undergraduate career.

"The Senior Design Experience is the pinnacle of their undergraduate studies," says Tony Passerini, the faculty advisor for the CoagVISTA team. "They learn how to work together as a team, interact with industry professionals and subject matter experts, and go through the process of creating their prototypes. These experiences are very valuable when they apply for jobs."

The Sandia Engineering Design Award, funded by Lockheed Martin Gifts and Grants, is awarded at the UC Davis Engineering Design Showcase held in June. Winners are honored with an inscription on an official plaque in Kemper Hall on the UC Davis campus. Judging is performed by a team of UC Davis College of Engineering faculty and Sandia technical staff.

An AutoCAD rendering of the CoagVista device.



## Complete Sensor

A rendering of the CoagVISTA sensor, which tests the electrical conductivity of a blood sample to gauge how much it has clotted.



ARTIST'S RENDERING of a GPS Block IIF satellite in orbit high above the Earth.  
(US Air Force image)

## Global burst detection

(Continued from page 1)

“We work 10 years ahead, from the time we get a concept for what the next generation of improved technologies and sensing will be,” Bridget says. Each GBD program starts with the initial concept, followed by approvals, engineering development, an extensive and complex design cycle, and production. The work is funded by the NNSA.

Sandia has been in the business of nuclear detonation detection for more than 50 years, starting with the 1963 launch of the first of 12 US Vela satellites to detect ground or atmospheric nuclear testing and verify compliance with the Limited Test Ban Treaty of 1963 and subsequently the Threshold Test Ban Treaty of 1974. That marked the start of the US Nuclear Detonation Detection System that supports treaty monitoring.

### GPSIII set to launch next year

Defense Support Program satellites followed, succeeded by GPS satellites in 1978. The first of the IIF series was launched in 2010. The first GPSIII is expected to launch in 2017.

From the start, GPS satellites were seen as an ideal platform to look for nuclear detonations. Jaime says the sheer numbers planned meant there would always be many GBD systems in space, a detection redundancy highly prized during the Cold War. Today, GPS satellites are important for treaty verification and countless civilian uses, including timing signals for communications networks, financial markets, and power grids, ship navigation, and even pinpointing where crops might need more water or fertilizer.

Sandia's GBD mission is appealing to Jaime and the rest of the Sandia team because it deals with space. “I think we're all fascinated by space,” says Jaime, deputy project manager for the generation to fly on GPSIII. “And the treaty verification work is meaningful to a lot of folks.”

Detection was a natural extension for the labs that designed the early stockpile. They understood the physics and engineering of the weapons and the detectable optical, electromagnetic pulse, and X-ray signals they produce. “Those are the three that make it to space and what the GBD tries to detect,” Jaime says. Sandia develops the optical sensors; Los Alamos National Laboratory is responsible for electromagnetic pulse and X-ray sensors.

It takes about two years to build, test, and integrate GBD hardware into a satellite system, Jaime says. Five subsystems — what the teams call “boxes” — of sensors and instruments make up a GBD: three from Sandia and two from Los Alamos.

### Sandia integrates system

Sandia integrates it all into an overall system and performs seemingly endless tests. When a satellite launches, everything

aboard faces extreme temperatures, vibration, and shock. Sandia's testing and computer models help determine how the rigors of launch and deployment will affect the GBD.

Teams assemble printed circuit boards, wiring harnesses, and other mechanical hardware, conducting electrical and thermal testing on individual modules and pieces before assembly into the box. They follow with integration, electrical, functional, thermal, and vibration tests for each box. The five boxes together become a GBD system or payload. The entire system is then subjected to integration, functional, electrical, thermal-vacuum, and other tests before it's shipped to the space vehicle contractor. Further electrical



SATELLITE — A GPSIIF satellite is shown in production at Boeing's Satellite Development Center in El Segundo, California. Such satellites carried the most recent generation of Sandia National Laboratories' Global Burst Detectors into space.

(Photo courtesy of Boeing)

testing is done at the contractor site.

“Teams that build the hardware here develop a test plan suited for their subsystem and do that testing. Then we integrate the payload as the five boxes and do additional testing,” Jaime says. “At every level of integration, whether it's the box level or a whole system at the vehicle level, you add

to the testing to make sure that at every integration point the payload is operating.”

That's especially important because the hardware can't be repaired in space.

### 'A very good track record'

“Some things you can fix through software but you depend on building something that has high reliability,” Jaime says. Bridget adds, “We have a very good track record for that. I think we can say that our payloads have substantially exceeded their design life.”

About 30 satellites and their detectors, representing several generations, remain in operation, some well past their design life, Jaime and Bridget say. The satellite generation before IIF was designed for 7.5 years, IIF was designed for 12 years, and GPSIII and Prime will be designed for 15 years.

“GPS drives us because we want our payload to last as long as the bird does,” Bridget says.

Sandia teams work where the payloads go as they move toward launch. Jaime described the process for IIF: Once testing showed the GBD met requirements, Sandia shipped its payload to the satellite contractor, Boeing in El Segundo, California, for more tests. Sandia employees at the Boeing site provided GBD components for Boeing to install. Then the satellite went through months of additional tests, aided by the on-site Sandia team. Some 60 to 90 days before launch, Boeing shipped the satellite to Cape Canaveral, where ground crews aided by Sandia also did tests. Days after launch, a Sandia team arrived at Schriever Air Force Base, Colorado, for about a month of early orbit testing before the system was handed over to the Air Force to operate.

### Sandia also develops ground stations

Even that isn't the end. “We have a group that examines telemetry coming down from our payloads so we can monitor the state of health,” Bridget says. Developers use that information to improve next-generation technology. Under an agreement with the Air Force, Sandia also develops ground station components that support the Nuclear Detonation Detection System and integrate data from all the satellites.

As project lead, Jaime worked with the program office headed by Bridget, subsystem managers, team leaders, and colleagues at Los Alamos to ensure GBD development and delivery stayed on schedule. “It's very much about schedule because our payload is integrated on a satellite that the Air Force is paying a subcontractor to build,” he says. “We have equipment that bolts onto that satellite so we need to be there and we need to be there with a product that works.”

He smiled and quoted a 2015 tweet from astronaut Scott Kelly that's been informally adopted by members of Sandia's satellite group: “Space is hard.”

# Albuquerque area outstanding young engineers

By Mollie Rappe

**W**hen Derek Lamppa (5445) was 9 he was convinced he could fix his mother's dead hairdryer. He ended up only playing with the bits and bobs, perhaps predisposing him to his current career as an electrical engineer.

Similarly, Jay Johnson (6112) spent part of his childhood helping his sculptor father figure out how to assemble his massive sculptures, leading him to his career as a mechanical engineer.



DEREK LAMPPA

Both Derek and Jay won the IEEE Albuquerque Section's Outstanding Young Engineer award this May for their technical contributions at Sandia.

## Making things work at the Z Machine

Derek was honored for his "engineering excellence and leadership in establishing the Systems Integration Test Facility and developing and testing novel systems that significantly impact all science programs on the Z Pulsed-Power

Facility at Sandia National Laboratories" according to the citation.

Derek grew up in Albuquerque and his father, Kerry Lamppa (5349), is also an electrical engineer at Sandia. Derek got his bachelor's at New Mexico Institute of Mining and Technology and his master's at the University of New Mexico through Sandia's Tuition Assistance Program (TAP). He is working on his doctorate at UNM, also through TAP.

"The award is almost secondary to the fact that Ryan McBride (1688) was willing to write the nomination and track down the people to write the recommendations. I think I value that more than the award itself, because they put in the time to do that. I know the people I work with value what I contribute," says Derek. "Winning the award is almost like the icing on the cake."

Derek works on testing systems prior to integration into the Z machine. As he put it, the physicists know the requirements they need for their pulsed power experiments, and Derek's team figures out how to make it happen. Two of the innovations Derek helped make happen are the gas puff Z-pinch system — a way to use a column of gas as Z's target — and an applied magnetic field coil system — a way to magnetize and stabilize the hydrogen fuel for fusion experiments.

Derek's advice for engineering students and interns is make sure they truly enjoy and retain what they're learning now, as they are collecting the building blocks for their career. What they are learning will likely be relevant throughout their career, and they will be expected to be responsible for that knowledge.

## A passion for photovoltaics

Jay was honored for his "extensive contributions to the field of photovoltaic system integration" according to the citation. He got his bachelor's from the University of Missouri at Rolla, now the Missouri University of Science and Technology. He got his master's at the Georgia Institute of Technology.

"Getting this award is a nice way to call attention to all the hard work that goes into developing photovoltaic codes and standards. These code-making efforts are very important to the industry, and it is done by a very small group of people working on very difficult technical problems. When you do a



JAY JOHNSON

good job it's almost seamless and nobody sees it from the outside world," says Jay.

Jay has a passion for renewable energy, which is what drew him to his work in solar energy. Power swings from photovoltaic systems can cause voltage and other problems on the grid, but using inverters in sophisticated ways can smooth things out. Jay is involved in writing the rules and standards for using these advanced inverters. He was also involved in a project that tested smoothing and control algorithms in a real-world environment, the Mesa del Sol Aperture Center.

Jay's advice for young engineers at Sandia is do good work and you'll be able to "work your way into the role that best fits you. It's nice; Sandia is very accommodating on those sorts of things." As part of the Outstanding Young Engineer award, Jay will be giving a continuing education talk on his photovoltaic grid integration work. The talk will be held on Sept. 15 at the UNM campus.



STUDENTS PONDER a computing challenge during the ThunderBird Cup, a STEM outreach activity designed to interest students in the field of cybersecurity. Sandia student intern Andrew Chu (5620-1), second from left, co-lead the new cybersecurity program along with colleagues Tyler Morris (5620-1) and Wellington Lee (9312). (Photo by Randy Montoya)

# CECOR students launch ThunderBird Cup

Sandia researchers and interns kicked off the first annual ThunderBird Cup, introducing 17 students, grades 6-12, from diverse schools in the Albuquerque area to the field of cybersecurity. The three-day STEM outreach took place at the Research and Engineering Cyber Operations and Intelligence Lab (RECOIL) in the CERL building. The program was led by Tyler Morris (56201), Andrew Chu (56201), and Wellington Lee (9312)

as part of Sandia CECOR (Consortium Enabling Cybersecurity Opportunities & Research). In addition, seven CECOR student interns acted as mentors during the event.

Sandia CECOR project manager Tommie Kuykendall (10597) says, "The goal is to get kids excited about pursuing cybersecurity careers. Many have the misconception that cybersecurity is just programming and working

in a room by yourself. The ThunderBird Cup demonstrates that there is more to it; you get to work in teams, and it takes all kinds of people."

CECOR is funded through a DOE Minority Serving Institution Pipeline Program. Its aim is to link national labs with Historically Black Colleges and Universities to increase the number of students engaged in cybersecurity and STEM careers.

# ‘On the internet, no one knows you’re a dog’

## A conversation with Len Napolitano and Matt Trigg about Sandia’s smart authentication effort

*Note: The new smart authentication requirement affects every Sandian. To find out more about what it is and why we’re doing it, Lab News writer Phyllis Teague sat down with Acting Div. 9000 VP and Chief Information Officer Len Napolitano and CIO Strategies and Architectures Dept. 9011 Manager Matt Trigg for some answers.*

### Lab News: What is multifactor (or smart) authentication and why is Sandia implementing it?

LEN NAPOLITANO: It’s logging in with a highly secure credential that provides extra assurance of your identity. After the OPM data breach and large information leaks such as from Bradley Manning and Edward Snowden, the Executive Branch said we needed a way to positively verify that people on our networks were actually who they claimed to be.

There’s that classic *New Yorker* cartoon, “On the internet, no one knows you’re a dog.” In a government computing environment, this means we need a more effective authentication method than just a single password and username. That’s what multifactor authentication is. DOE and NNSA require that users log in with strong multifactor authentication.

MATT TRIGG: In NIST 800-63, “strong” means a Level of Assurance 4 credential that provides very high confidence in validating someone’s identity. And the scope of this effort is all of DOE, as well as all the M&O sites and all the national laboratories.

### LN: How are we implementing smart authentication at Sandia?

NAPOLITANO: The HSPD-12 badge is one of the few credentials that meet the stringent requirements, so this is how we’ve chosen to do it. We’re giving everyone a device that can read their credentials. We’ve made changes to operating systems and network connection software to work with the credentials. We have also conducted a series of White Glove events to do demonstrations and walk people through the process. The Corporate Computing Help Desk provides support to resolve issues around the credential working with a computer.

Currently, we are enforcing the requirement through administrative controls. We direct people to log in with their badges, and we are monitoring and reporting that usage. Sometime later in the fall, we will implement technical controls that lock your system unless you use smart authentication.

### LN: How do you think the rollout is going?

NAPOLITANO: We are currently on schedule to meet the required deployment for normal users by the end of the fiscal year.

### LN: How does implementing smart authentication play out in Sandia’s complex computing environment?

NAPOLITANO: We are currently focusing on Windows and Mac because we have good technical solutions for those platforms. We’re actually farther along in the Mac deployment than many of our sister institutions, so we feel pretty proud of that. We don’t yet have a complete solution that works across our many flavors of Linux, so we will address Linux in a future phase of the project.

I should also point out this entire effort is focused on traditional computing systems. We don’t require multifac-



*“There’s that classic *New Yorker* cartoon, ‘On the internet, no one knows you’re a dog.’ In a government computing environment, this means we need a more effective authentication method than just a single password and username. That’s what multifactor authentication is. DOE and NNSA require that users log in with strong multifactor authentication.”*

— Sandia Chief Information Officer  
Len Napolitano

tor authentication for mobile devices (smart phones and iPads). In fact, mobile devices are exempt across the entire Department of Energy for now.

### LN: Does smart authentication apply to other networks?

TRIGG: For now, we are focusing on the SRN. We are addressing the SPN and SCN in a sister project that has a different timeline. The SON is not included in the initial phase of the project, but we’ll address it in a future phase. Foreign nationals on the SON can continue to use their regular credentials to access Sandia’s network.

### LN: What about remote access?

TRIGG: People who remote in from Sandia-owned computers may either log in with their badges or with CryptoCards, which continue to be fully allowable. People who remote in from personally owned computers must use CryptoCards because DOE does not allow the use of HSPD-12 badges or PIV-C cards on non-government-furnished computers.

We’ve gotten feedback from the remote access community that using your HSPD-12 badge with VPN is so much easier than using a CryptoCard, and badge login is fully

## Facts about smart authentication

- Get a card reader from Password Administration (at no cost to you)
- Use your HSPD-12 badge every time you log in to or unlock your Sandia-owned computer
- If you don’t have an HSPD-12 badge or if you have a DaaS desktop that you access with a thin- or zero-client, request a PIV-C (alternative smart card) through WebCARS
- If you forget your badge PIN, change it at one of the badge kiosks listed on <http://smartauth.sandia.gov> or visit the Badge Office; visit Password Admin to change a PIV-C passcode
- Go to the Badge Office to report lost, stolen, or broken HSPD-12 badges, then request a temporary PIV-C card so you can continue to use smart authentication
- It’s not a security incident to walk away from your badge inside the Limited Area, but if you leave your badge in the Limited Area, you must contact someone to bring it to you
- NEVER escort someone who forgot their badge into the Limited Area; bring the badge to them instead
- Contact CCHD for smart authentication help, and see <http://smartauth.sandia.gov> for more information.

supported in our Juniper VPN Pulse client software.

### LN: Are there options for people who say they can’t use smart authentication?

NAPOLITANO: We are required to get to full compliance, so any exception other than for purely technical reasons is unlikely to be looked upon favorably. If we use government-furnished equipment on government-owned networks, this is what we have to do.

This would be a lot easier if we had one standard configuration and one standard computer and one standard version of software. But we’re actually trying to allow our diverse computing approaches and to not proscribe a particular modality simply because we have to implement this additional control.

My goal is for multifactor authentication to become almost invisible to the workforce and have the minimum amount of overhead possible for people to use Sandia computers. I don’t want this technology to impede peoples’ work activities at all.

*“My goal is for multifactor authentication to become almost invisible to the workforce and have the minimum amount of overhead possible for people to use Sandia computers. I don’t want this technology to impede peoples’ work activities at all.”*

— Len Napolitano



*“We’ve gotten feedback from the remote access community that using your HSPD-12 badge with VPN is so much easier than using a CryptoCard, and badge login is fully supported in our Juniper VPN Pulse client software.”*

Dept. 9011 Manager Matt Trigg

### LN: How can the workforce help make this a successful effort?

NAPOLITANO: Just use your badge to log in. I’m not asking people to give up precious bodily fluids or provide DNA samples. Do I want it to be easier to use? Absolutely. We’re trying to make this as lightweight as possible, and I’m going to work continuously to make sure that it is easier to use.

Remember, we are driven by schedules and deadlines that were given to us, not that we would have chosen. Had it been us and we had done this internally first and organically, we might have picked a longer timeline and taken a broader look at possible technical solutions.

We don’t have any ‘druthers. You have to have a badge. Most people have to have a clearance. You have to go in for a random drug test if you get called. I don’t get to make the rules. Sometimes I’m just trusted to make sure they get enforced with the minimum amount of hassle possible.

# 2016 PLAN SPONSORS OF THE YEAR

## Sandia's 401(k) plan recognized among the best of the best

By Bill Murphy

Sandia has long offered employees an option to enroll in the Sandia Corporation Savings and Income Plan, also known as a 401(k) plan, which includes a company match of 2/3 of the first 6 percent of pay the employee contributes to the plan. That benefit was provided as a supplement to Sandia's defined benefit pension plan.

When Sandia, following industry trends nationwide, closed its defined pension benefit to new employees and rehires, the Labs' Board of Directors knew it was important to offer individuals hired after the closure an alternative path to retirement security.

For employees not eligible for the pension, the Labs added an enhanced 401(k) benefit of an automatic up-front company contribution of 6 percent of the employee's salary into their 401(k) account. These employees are also eligible to receive the company match.

Sandia's 401(k) plan, held in trust through Fidelity Management Trust Company, is popular with employees; participation rate is 90 percent and plan assets total more than \$3 billion.

Sandia's efforts to ensure a smooth transition from the pension benefit to the enhanced 401(k) benefit did not go unnoticed — *PlanSponsor* magazine named the Labs a 2016 Plan Sponsor of the Year finalist in the category Corporate 401(k) Plans with Assets of Greater than \$1 billion.

### 'An obligation to our workforce'

In an interview with *PlanSponsor*, Mary Romero Hart (3510), senior manager of HR's Total Rewards organization, said, "Sandia feels very strongly that we have an obligation to our workforce to provide them with a well-defined path to save. Bringing contributions to a higher level is definitely one of those goals. As we let go of our defined benefit plan, we wanted to build a strong campaign around our 401(k) to help employees understand how they can use this vehicle for their savings."

Leah Mitchell, senior manager in Sandia's Retirement Investment Management Group 10520 in Sandia's Finance Division, says the *PlanSponsor* recognition is not about the transition itself, but about Sandia's best practices and how those best practices facilitated the transition and ensure a positive experience for plan participants.

"One of the unique things about Sandia's plan is that we really have two groups dedicated to making sure our plan is both well-administered and closely monitored," Leah says.

Administration of the plan is handled in Sandia's Total Rewards organization in HR, with key individuals including Mary and Bob Martinson, a CPA and benefits, finance, and program analyst for the 401(k) plan.

That administrative aspect of the 401(k) plan management is essential, says Leah. "What's more uncommon is my team — the Retirement Investment Management Group. We work with Sandia's Investment Committee to make sure we have the appropriate investment information available to our participants and that we are maintaining the highest quality of investment choices at very low fees. Having a team like ours that works with the Investment Committee — that's much more unusual."

The Investment Committee, made up of four Sandia executives and two Lockheed Martin executives, is appointed by the Labs' Board of Directors to have fiduciary responsibility for the savings plan and the pension plan. Leah's group does much of the heavy lifting of the Investment Committee. "We do the day-to-day monitoring of the investments and the investment policies that have been set and we advise and consult with the Investment Committee, which has the



ONE OF THE KEYS to the recent recognition of Sandia's 401(k) program by *PlanSponsor* magazine is that unlike most corporate 401(k) plans, Sandia has two dedicated teams — from both the HR and Finance organizations — focused on making the plan the best it can be. Pictured here, representing the two teams, are Connie Lee, CFA, an investment manager in Sandia's Retirement Investment Management Department and assistant secretary to the Investment Committee; and Bob Martinson, CPA, benefits, finance and programs analyst for the 401(k) plan in Sandia's Total Rewards Department. (Photo by Lloyd Wilson)

express responsibility for acting independently in the best interest of the plan participants."

### A team effort

Bob says administration of Sandia's 401(k) plan is a team effort. "There are a lot of talented people with a lot of deep experience involved," Bob says, "not only within Sandia but among our service providers, as well. We work together to help with the plan design, the administration of the plan, and compliance with federal regulations."

When the transition from the pension benefit to the enhanced 401(k) benefit occurred, Bob says, "There was a lot of communication to explain the changes and processes put

in place to make sure new employees are thoroughly informed about the enhanced contribution and their other savings and investment options."

Connie Lee (10520), a Chartered Financial Analyst and an investment manager in Leah's group, says Sandia's enhanced 401(k) benefit — the 6 percent up-front company contribution plus the 4 percent match on the next 6 percent — "are considered a very good contribution level compared with other plan sponsors . . . Most new hires come in recognizing that; when they compare our benefits to the benefits — including the retirement benefits — offered by other employers, ours is excellent."

### 'Put in the effort up front'

Says Leah, "All of our efforts are aimed at making this the best 401(k) plan we can. That's the goal, that people who come in as new hires will be able to have a stable retirement income when they get to that stage . . ."

Adds Connie, ". . . as long as they put in the effort up front. It does take a little bit of work on the part of each individual employee. As long as our new hires put in that effort up front and ongoing throughout their careers, they can establish a good nest egg. Our challenge is to make sure we're educating them about saving and investing."

Regarding specific investment advice, Sandia has partnered with independent, registered investment advisor Financial Engines to work with individual employees on asset allocations using the 401(k) investment option lineup. Employees, depending on their need for professional investment management or desired level of involvement in managing their investments, have the option to use either the Online

Advice (paid for by Sandia) or Professional Management (fee based on account assets) service offered through Financial Engines.

Connie, who attended the *PlanSponsor* awards ceremony earlier this year, says, "One of the things they highlighted is that these awards are given to plan sponsors who really aren't just checking the box, you know, just providing the options and meeting the regulatory requirements of the 401(k) plan. The awards are presented to plan sponsors who are going above and beyond what's required by regulation, providing options and educating and really putting forth the effort to ensure that participants have good retirement outcomes."

## Sandians doing all the right things

Bob Martinson, a CPA and Sandia's 401(k) program analyst, does the math to show that employees who take full advantage of the Labs' 401(k) plan can look forward to a good retirement income.

"Assuming that somebody that's newly hired contributes 6 percent to get the full company match — which would be 4 percent — the employee would be, with the help of Sandia, contributing 16 percent of their compensation to their 401(k)," Bob says. "Current industry rules of thumb say anything near 15 percent, including company contributions, is a good benchmark. So we're doing that."

"Then there's another measure: Based on preliminary analysis of data gathered by Fidelity of employees who are not pension-eligible, they are collectively on target to replace 55 percent of their pre-retirement income. If you add as a back-of-the-envelope estimate of 20 to 25 percent for Social Security that gets them near the 80 percent range, which a lot of experts say is a good goal for retirement — and that would not include any outside investment. The message here is that collectively, our enhanced 401(k) benefit is designed well to help people reach the goal, and the people at Sandia are doing all the right things to get to a successful retirement."

**P**lants guard their energy with rock-solid cell walls to keep insects, fungi, and other predators out. At a village-like lab in Emeryville, California, a team of crack scientists is building an arsenal of tools to liberate that power and turn it into renewable fuels.

By Patti Koning

Plants vs. scientists. That's one way to frame the Joint BioEnergy Institute's (JBEI) quest to transform dry plant matter, known as lignocellulosic biomass, into biofuels.

Lignocellulosic biomass is everywhere. The term describes what's left on the ground after harvest as well as grasses like switchgrass and miscanthus that grow naturally on marginal lands, requiring little water or fertilizer. Such grasses do not compete for resources with crops grown for food. Biofuels derived from this readily available biomass could provide clean, renewable,

homegrown power for

all of our country's cars,

trucks, and jet planes.

Over millions of

years of evolution,

plants have developed

fortress-like cell walls to

protect their energy,

which takes the form of

complex polysaccharide

sugars. Lignin, the

material that makes

cell walls almost imper-

vious, lets plants hold

themselves upright,

move water, and pro-

tect themselves from

predators. Plants can't

run, so their defenses

have to be rock solid.

Scientists, on the

other hand, have been

working on cellulosic

biofuels for just a few

decades. Even research

into ethanol fuel, made

from common crops

like potatoes and corn,

only goes back about

150 years.

To overcome this

imbalance, JBEI

researchers have amassed

an impressive arsenal of

tools and methods to

liberate the energy stored

in plants and transform

it into renewable fuels

and chemicals. These

tools include

"bionic" liquids, designer

feedstock crops, microbial

fuel factories, microbiology

robots, engineered

enzymes, and filamentous

fungi, just to name a few.

## Higher level of science and technology

JBEI is like a self-sufficient village populated with diverse and richly experienced research scientists. A DOE Bioenergy Research Center founded in 2007, JBEI today has seven partner institutes: Sandia, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Pacific Northwest National Laboratory, the Carnegie Institute for Science, and the Berkeley and Davis campuses of the University of California.

Blake Simmons, senior manager of Sandia's advanced bio-manufacturing group and JBEI's chief science and technology officer, says that it's hard to overstate how ambitious JBEI's mission was back at the start.

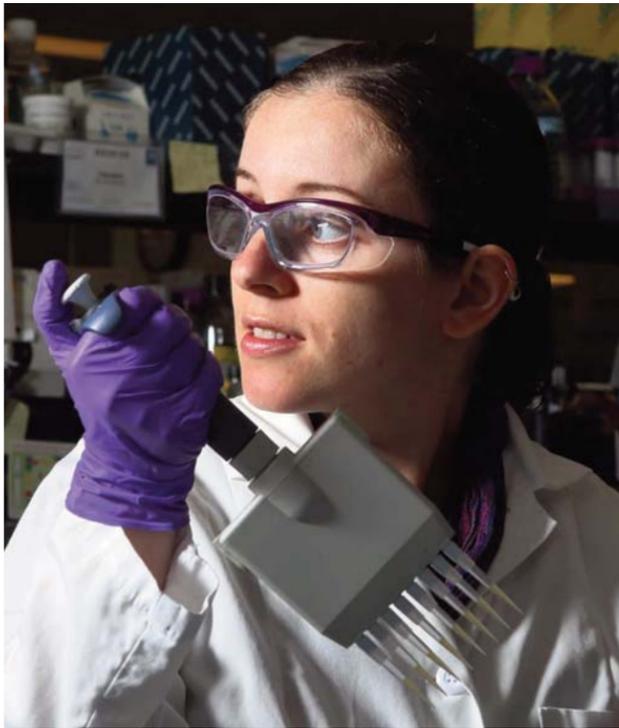
"No one had done any of this before — focusing on the production of 'drop-in,' fungible biofuels realized through synthetic biology. Ionic-liquid pretreatment was a nascent field, and our Feedstocks group was taking a very different approach than had been tried previously," says Blake. "These were deliberate choices on our part. We wanted to push the envelope and lift the entire biofuel enterprise to a different level of science and technology."

Creating biofuels from biomass was just the start. To be truly successful, those biofuels would need to be both compatible with existing infrastructure and engines and economically competitive with gasoline and other transportation fuels.

"What's crazy is that we weren't ambitious enough," he adds. "What we have accomplished in eight years blows away what we thought we could do when we started. In 2007, we simply could not imagine where we have ended up. And we aren't finished yet — not by a long shot."

## Sunlight-to-biofuels pipeline

In a departure from traditional research organizations, which typically focus deeply on a specific scientific challenge,



POSTDOCTORAL RESEARCHER Taya Feldman works on a JBEI team that is developing cost-effective enzyme mixtures. They analyze protein structure and genetic sequences of enzymes to better understand the properties that will allow them to tolerate potential biorefinery conditions, such as extremes of temperature, pH, and the presence of ionic liquids.

JBEI brings the entire cellulosic biofuels production cycle together under one roof.

The institute is organized into divisions to match that cycle. Feedstocks breeds specialized fuel crops. Deconstruction seeks

to release complex polysaccharide sugars from plant cell walls and reduce them to fermentable sugars. Fuels Synthesis engineers microbes to transform sugars into energy-rich biofuels, and the Technology division develops advanced analytical and software tools for all of JBEI.

Sandia researchers are concentrated in Deconstruction and Technology, with many directing key programs: John Gladden, Fungal Biotechnology; Ken Sale, Enzyme Optimization; Seema Singh, Biomass Pretreatment; and Anup Singh, Analytical Technology.

JBEI houses experts from many different research disciplines, including plant geneticists, biochemical engineers, chemists, physicists, microbiologists, electrical engineers, microfluidicists, and computer scientists. This gathering of diverse research expertise has accelerated JBEI's research program by uncovering unforeseen opportunities.

"Colocation created remarkable synergy between the

teams," says Blake. "When we wrote the original proposal, for instance, we intended to use synthetic biology for the Fuels Synthesis division only. But now the Feedstocks and Deconstruction divisions have incorporated synthetic biology into their programs. We are creating a synthetic biology platform that benefits all of JBEI that is cross-divisional."

## Taming ionic liquids

Ionic liquids are one of JBEI's greatest success stories. Led by Seema Singh, JBEI researchers have been demolishing the arguments against using ionic liquids for biomass pretreatment.

"Ionic liquids effectively and efficiently dissolve biomass, but everyone said they were too expensive to be commercially viable," says Seema. "The problem seemed impossible, but the best science can happen when your back is against the wall. We hit upon a novel idea to synthesize an ionic liquid from lignin and hemicellulose, which are byproducts of biorefinery production."

The result was "bionic" liquids, which matched the performance of imidazolium-based ionic liquids, the current gold standard for dissolving biomass. The next hurdle was compatibility with the enzymes that perform the next step in the deconstruction process.

Imidazolium-based ionic liquids don't play well with the enzymes. In fact, some ionic liquids can be toxic to enzymes. Thus, costly and time-consuming washing steps are typically needed to remove ionic liquids from biomass before enzyme treatment can begin.

However, these steps could be eliminated if other JBEI teams succeed in their mission to find enzymes that are durable, heat-tolerant, and uninhibited by ionic liquid. Discovering these enzymes is critical to the biomass-to-biofuel process.

# WARRIORS

With the desired characteristic set in mind, the Microbial Communities group searches for enzymes in unique ecosystems, such as rainforest floors, salt marshes, and compost. Another dedicated team, the Enzyme Optimization group, seeks to design ideal enzymes through enzyme engineering — specifically, via a method called directed evolution.

## Perfect enzymes through directed evolution

Directed evolution both mimics and accelerates natural selection by subjecting a gene to iterative rounds of mutagenesis. Researchers can then screen for desired characteristics.

There are thousands of potential enzymes, but this search takes the needle-in-a-haystack concept a step further. "More like looking for a needle in a haystack when you don't know what a needle looks like," says Ken. "We don't know what makes an enzyme functional in ionic liquid. And there is a lot of variety in ionic liquids."

A further complication is that the researchers aren't looking for a single enzyme. A cocktail of several enzymes is needed to completely convert the sugars that make up the polymers in plant cell walls into the monomeric sugars used by engineered fuel-synthesizing host organisms.

"The goal is to discover ionic-liquid-tolerant versions of these enzymes to build a minimal enzyme cocktail," says Ken. "Enzymes are expensive. They represent about a third of the total cost of converting biomass to biofuels, so anything we can do to drive down the cost matters."

In addition to screening large numbers of enzymes, the team is working to engineer ionic-liquid tolerance into enzymes identified as good candidates. Using error-prone polymerase chain reaction (PCR) methods, the researchers make random mutations to the DNA that codes for the proteins, grow thousands of different mutated versions of the proteins in *E. coli*, and screen the mutated versions based on their activity in ionic liquids. Mutants with improved performance in ionic liquids are then subjected to additional rounds of random mutagenesis and screening to generate top performers.

*E. coli* is a good host for exploration. It grows quickly and is used broadly in the microbiology community, so there are many tools available for working with the bacteria. Unfortunately, *E. coli* is not reliable at producing larger quantities of enzymes.

The Fungal Biotechnology group, added in 2012, seeks to address this shortcoming by using the fungi *Aspergillus niger* as a genetic toolbox for more efficient protein production. The group's research focuses on expediting the discovery of high-performance, industrial-strength enzyme cocktails.

"Our goal is to understand how *A. niger* is able to express and secrete such high concentrations of enzymes so that we can manipulate this organism to produce our engineered

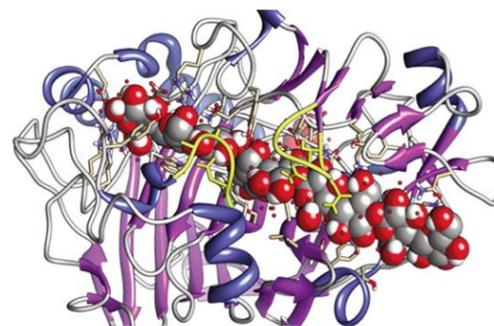
ionic-liquid-tolerant enzymes inexpensively and at industrially relevant concentrations," John says.

## Biology on a chip

Creating and screening thousands of cells with conventional methods would be costly and time-consuming. However, Anup's Analytical Technology group, which is part of JBEI's Technologies division, is developing ways to accelerate and automate screening for a number of applications relevant to biofuels research. Using Sandia's microfluidics expertise, his team is developing an automated platform for "synthetic biology on a chip."

While engineering pathways in *E. coli* to produce chemicals, including biofuel molecules, has become routine, such research still requires many time-consuming and costly experiments. The Analytical Technology group's goal is to automate the entire process in a microfluidic chip. The team has proven

(Continued on next page)



JBEI'S ENZYME OPTIMIZATION group develops databases of cellulases and lignin degrading enzymes that are stable and active under pretreatment conditions and optimizes mixtures of these enzymes for maximum production of cheap, clean, fermentable sugars and lignin fragments using minimum enzyme doses.

# Perspiration and passion are the secrets to success

By Mollie Rappe

Ken Armijo (6123), the keynote speaker for Sandia's Student Intern Symposium, has a lot of advice for Sandia's latest crop of interns. Remembering back to his time as a Sandia intern, he told the standing-room-only crowd that success in science and engineering takes imagination, inspiration, determination, and perspiration. He added, "If a farm boy from southern New Mexico can do it, so can you." Ken also counseled the interns to discover their passion and never settle for anything less than their dreams.



SYMPOSIUM KEYNOTE SPEAKER Ken Armijo inspired interns with insights on building a successful career.

(Photo by Mollie Rappe)

The New Mexico symposium, held July 26, showcased the work of some of Sandia's approximately 1,200 summer and year-round interns. There were more than 60 posters on topics ranging from cybersecurity to biology and materials science. The California symposium held July 27 followed a similar format and was also well attended by students, managers, and mentors.



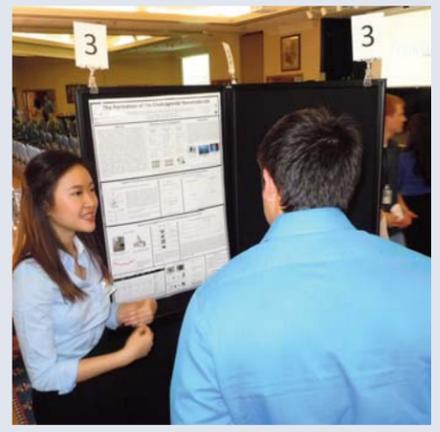
ISAAH GRIGSBY (9315), a summer undergraduate intern from Clark Atlanta University, explains his cybersecurity poster.

(Photo by Mollie Rappe)



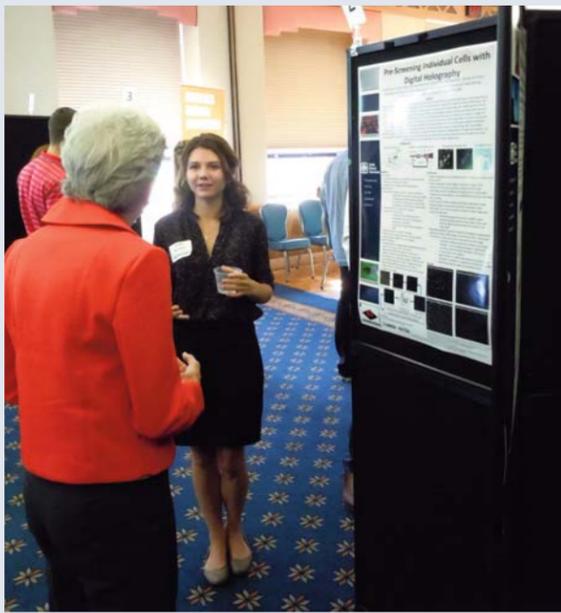
"IF A FARM BOY from southern New Mexico can do it, so can you," keynote speaker Ken Armijo told a rapt audience at the annual student symposium.

(Photo by Dani Martinez)



THAO NGUYEN (1815), a summer high school student intern, explains her materials science poster.

(Photo by Dani Martinez)



ANNE NOONAN (8631), a summer undergraduate intern from Carnegie Mellon University, explains her biology poster to Margaret Quinn (3555), manager of Recruiting and Student Programs.

(Photo by Dani Martinez)



SUMMER INTERNS, mentors, and managers talk at Sandia's Student Intern Symposium.

(Photo by Dani Martinez)

## Joint BioEnergy Institute

(Continued from preceding page)

that the concept can work in an experimental setting with 10 assays running simultaneously. The next step is to scale up and eventually create an end-to-end device.

"We want to be able to program a desired pathway into a computer, which will identify the potential genes," says Anup. "Then our device will synthesize the DNA, introduce it into *E. coli*, grow the *E. coli* cells, and test whether the desired molecules are produced. This is the most ambitious project I have worked on in my career at Sandia. We might fail, but if we don't try, we will never succeed."



JBEI'S RANDY DREVLAND holds plates of *E. coli* used to evolve more stable enzymes for biofuel production.

The same microfluidic technology is also being used for finding better enzymes and cocktails of enzymes. Rather than think too much about what mutants of enzymes to make, Anup says, "we use error-prone PCR to generate large libraries of mutants and then use our chip to screen for the ones that work the best. Our automated platform can also quickly screen for enzyme combinations with the best activity in ionic liquids and discard the ones that don't work."

Another reason to take on such an ambitious project is the commercial potential. "If we succeed, we hope to spin off a company," he says. "This type of inexpensive multiplexing has a lot of applications in human health."

### Aiming for the marketplace

Spinning off companies, licensing technology and intellectual property (IP), and creating fruitful partnerships are all key markers of JBEI's success. All of the technological advances wouldn't mean much if they couldn't be translated to the marketplace.

"We recognized early on that for our mission pull, just doing great science was not acceptable," says Blake. "We had to do great science that was driven by the needs of the marketplace

and of industry. The world was not just going to come to us. To succeed in the realm of biofuels and renewable energy, we'd have to engage with industry and work on the things that matter the most and that industry can't do."

As proof of the institute's success, Blake points to the long list of JBEI patents, IP licenses, and spin-off startup companies. "Roughly speaking, half of our technology disclosures turn into patents, and half of those have already been licensed," he says. "Those are astronomical numbers."

That success didn't happen by accident. As research programs were developed, the JBEI founders also built an industry partnership program and created a one-stop shop for IP and licensing. This means interested industry partners work with JBEI only, not the individual home institutions of the inventors.

Another key element is the Techno-Economic Modeling program, which is available to all JBEI researchers and the outside community at [econ.jbei.org](http://econ.jbei.org). "This team can set up a baseline biorefinery and run different scenarios — what would happen if we change the pretreatment process or establish a new biofuel production process — and find those intersections between our research and what really matters to industry," says Blake.

### Beyond bionic liquids

While basking in the success of her bionic liquids, Seema received a reality check from an authority in the lignocellulosic biorefinery world. Although he praised the team's advances with bionic liquids, he urged them to reconsider their reliance on specialized enzymes and microbes that aren't commercially available.

"He said he'd love to implement our ionic-liquid-based methods to maximize sugar and fuel in an upcoming bioenergy plant if a commercial cocktail could be used," she says. "I realized that industry wants simple solutions and that companies are ready today if the economics make sense."

This drove Seema and her team to create a biocompatible bionic liquid that works with commercially available enzymes. For this task, they had to first overcome a pH mismatch between the pretreatment and hydrolysis processes when using basic biocompatible ionic liquids.

"We are currently exploring biocompatible ionic liquids that have pH levels between 8 and 14, but the hydrolysis process requires a pH level of about 6 to 7. Adding acid, a common way to lower pH, causes salt formation, which renders the bionic liquid unrecyclable," she says.

With their backs against the wall again, the research team came up with another novel approach that may solve the pH mismatch. Those results will be published this year.

The next frontier, says Seema, is reducing the severity of the pretreatment process. Currently, pretreatment is conducted at temperatures of 120-160 degrees Celsius.

"We are screening for ionic liquids that work at lower temperatures and in the presence of water. We have found promising candidates that work at 70 degrees C. That's good, but I think we can do better," she says. "By using designer solvents, I believe biomass pretreatment can be performed at room temperature. We are also striving for commercially viable and scalable one-pot pretreatment-conversion processes for biomass so that biofuels can replace the commodity fuels and chemicals made from a barrel of oil."

**Employee death:**

# Rick Knudson brought high intensity and kindness to his work and his life

“What would Rick do?”

When Rick Knudson had to start missing work, waging a brave struggle against the illness that took his life, that’s what his colleagues in Radar Fuzing Dept. 5353 would ask. Once they figured out the answer, they’d follow that path, the one Rick would have followed, and end with a great result.

Rick, a distinguished member of the technical staff, passed away in mid-July at the age of 63.

John Williams, Rick’s line manager, recalls that in addition to the many significant contributions Rick made in the areas of RF and radar development, “he was an exceptional mentor and friend to many of our current management, staff, and technicians.”

John says Rick will be long remembered “for his soft-spoken, humble, and friendly manner,” and his willingness to pitch in to get the job done wherever needed.

“He will be sorely missed by all those who were fortunate enough to cross paths with him during his impactful tenure at Sandia,” John says.

That mild manner belied a fierce passion for his work: Rick lived and breathed radar and RF; in the course of a nearly 40-year career, as he grew in technical proficiency, knowledge, insight, and wisdom, he led teams that developed radar transmitters and receivers for several major weapon programs.

Colleagues Christopher Gibson, Jeff Pankonin, and Jack Harder (all 5353) shared their thoughts about Rick’s approach to his work. “He was a unique combination of high intensity and kindness,” they say. “He could be seen rushing about the halls, always ‘in the zone,’ but with bright eyes, a smile, and warm ‘hello.’ During meetings, when he had a comment or a question, the room fell immediately quiet, so that we could all take in his sage advice.” Rick’s decisions, they say, “were very quick yet they led to success, an ability honed by decades of experience in the trenches.”

“Rick loved his work at Sandia from day one,” says recent Sandia retiree Richard Heintzleman, who hired in with Rick in the radar department in January 1977. Both men spent



RICK KNUDSON

their entire careers there. Richard has special reason to remember Rick fondly — Rick introduced his sister Martha to Richard while she was on a visit from Wisconsin.

“We all set up a casual dinner date at his apartment,”

Richard recalls. “When I arrived that evening I found that Rick had ‘unexpectedly’ gone in to work, providing a less awkward situation for Martha and me. . . . we were married in 1980. We will miss him tremendously, at work and at home.”

Rick was active as an elder in his church in Los Lunas; his spiritual life was as important to him as his family and his work at Sandia. For Christopher Gallegos, that spiritual aspect of Rick’s nature was always evident but never intrusive. As far as Chris was concerned, Rick was the real deal, a man who walked the talk.

“Once in a while you meet a person who truly lives up to the standard we would all like to achieve,” Chris says. “Rick was that person: He was a man of integrity, honesty and truth. . . . His devotion to the Lord was complete and unwavering. He lived his life true to his faith right to the very end.”

Rick’s work required that he make frequent trips to the Kansas City Plant (now the Kansas City National Security Campus). Dave Bonds, a staff member there, says that even though he only worked with Rick for a brief time, “he left quite an impression on me.” Some important things about Rick were clear to Dave from their very first interactions, notably Rick’s “immense sense of optimism” and his deep love for his family. “His grandkids were a source of profound joy for him,” Dave says. And this: “Rick was a giver rather than a taker in life, and he gave humbly. I knew Rick only briefly, but I’ll never forget him. He’ll be truly missed here in K.C.”

Rick kept a magnificent garden at his home in Los Lunas and loved regaling his grandchildren with tales of camping and Boy Scout adventures. He always had projects going on around the house and did them with precision and perfection. He died peacefully at home surrounded by family and friends. He is survived by wife, Karen, two children, three grandchildren, his mother, four sisters, and many nieces, nephews, and in-laws. — Bill Murphy

## Sandia honors 2016 HENAAC nominees



LEADING THE WAY – The HENAAC Awards recognize the top Hispanic engineers and scientists in the nation. From left to right, the 2016 Sandia nominees are Tito Bonano (6220), Samuel Subia (1541), Bernadette Hernandez-Sanchez (1815), Adrian Chavez (5629), Nancy Linarez-Royce (2137), and Vincent Urias (9526), not pictured. (Photo by Randy Montoya)

**By Rebecca Brock**

Six Sandians have been nominated by their managers for the prestigious 2016 Hispanic Engineer National Achievement Awards (HENAAC), and two will go on to compete at the national level. The HENAAC Awards and Conference honors the top Hispanic engineers and scientists in the nation.

At Sandia’s HENAAC Recognition Event on July 19, Div. 6000 VP Jim Chavez, executive champion of Sandia’s Hispanic Leadership Outreach Committee (HLOC), addressed the nominees. Jim said, “Thank you for putting yourself out there as role models. HENAAC recognition is important, because it shows you as an example for others

at Sandia and in our community.”

Sandia chemist Bernadette Hernandez-Sanchez (1815) and computer scientist Vincent Urias (9526) were selected to compete for the national awards. Sandia will find out if there is a winner by early August. All winners will be formally recognized Oct. 5-9 in Anaheim, California. Bernadette is nominated for Outstanding Technical Achievement and Vincent is recommended for Most Promising Engineer or Scientist. Both Bernadette and Vincent started their careers as interns at Sandia. The other nominees are Tito Bonano (6220), Adrian Chavez (5629), Nancy Linarez-Royce (2137), and Samuel Subia (1541).

Jaime Moya, Center 4100 director, leads the nomination committees for Sandia and HENAAC. At Sandia’s recogni-

tion event, Jaime said, “It’s a joy to look at the Hispanic talent here at the Labs. I am continually amazed by their contributions to their technical fields and to the community.”

2015 HENAAC Lifetime Achievement winner Patrick Sena, senior engineer for Nuclear Weapons and New Mexico Stockpile Systems Center 2200, participated as keynote speaker at Sandia’s recognition event. Pat told the nominees, “You have proven your passion to keep our country secure and you have proven your dedication to the community. Now it is time to think about how to inspire others to be as successful as you are.”

In the past 20 years, 34 Sandians have won HENAAC awards. The national HENAAC Awards and Conference are coordinated by the nonprofit, Great Minds in STEM.

## SANDIA CLASSIFIED ADS

## MISCELLANEOUS

COMPUTER MONITOR, Vizio, 26-in., w/built-in speakers, \$80; large collection of 90's football cards, best offer. Walkington, 505-235-1025.

SOFA, Ethan Allen (90-in.), loveseat (60-in.), brown pattern, excellent, can email photos, \$1,500. Adams, 934-6294.

ROOSTERS, 2 Boardwalk, 4 Rhode Island Reds, <6 mos., free. Larsen, 263-5053.

LAWN MOWER, newly refurbished, Troy-Bilt, \$150 OBO; dog house, custom made, sturdy & beautiful, up to 90-lb.-dog, photos available, \$200. Hill, 205-1496.

REFRIGERATOR, stainless steel, 18.3-cu. ft., \$325; microwave, over-range, stainless steel, \$350; Greenfire pellet stove, \$450. Pickett, 293-0470.

SOUR DOUGH STARTER, 100 yrs. old. Nelson, 881-0148.

SPINET PIANO, Wurlitzer, beautiful, needs tuning, 1 string needs replacing, \$50 OBO; loft bed, needs twin mattress, \$50 OBO. Lauben, 505-980-2915.

REFRIGERATOR, Frigidaire, 15-cu. ft., top freezer, white, w/crisper, glass shelves, new, \$475 OBO. Roybal, 210-677-2081.

TV, Akai, 20-in. w/DVD/VCR, \$50; 4-poster bed frame, double, cherry, w/canopy, \$75. Pechewlys, 856-6878.

ROCKER, Bentwood-style, w/needlepoint upholstery, \$100. Steiner, 505-401-8114.

CHAIRS, 2, vintage, hardwood, ladder-back, photos <http://www.wmstubblefield.com/sale-items/>, \$60 ea. Stubblefield, 263-3468.

BED FRAME, queen, box springs, mattress, excellent condition, \$200 OBO. Mann, 505-604-4236, ask for Brandon.

DRUM SET, Ludwig, primo condition, Sabian cymbals, hard-shell drum cases, nylon cymbal/hardware cases, foldable stool, \$800 OBO. Powell, 919-368-2626, ask for Amy.

'LION KING' TICKETS, 3, orchestra, row 8, seats 108-110, Popejoy, Friday, Oct. 14, \$450. Padilla, 292-8936.

## TRANSPORTATION

'09 KIA RIO LX, white, new tires, well maintained, clean title, 113K miles, mostly highway, \$4,500. Abeyta, 505-573-8195.

'68 MUSTANG COUPE PROJECT, solid body, TCI front/rear suspension, Shelby fiberglass, 302-C4 & more, \$20,000 OBO. Jabour, 505-235-2214.

'69 CHEVY C10 PICKUP, long bed, 4-spd. manual transmission, mint green, 124K miles, runs & looks great. Carrington, 505-883-4402.

'10 FORD TAURUS SHO, fully loaded, like new, <http://albuquerque.craigslist.org/cto/5693858718.html>, \$13,900. Hernandez, 313-850-0420.

'00 SUBARU OUTBACK, green, cold weather & tow pkgs., new tires, great student car, \$2,000 OBO. Holliday, 303-845-0939.

'03 GMC SLT HD 2500, 4x4, 5.6 diesel engine, turbo, 120K miles, \$16,000. Diego, 850-7373.

'11 CHEVY TRAVERSE LT, AWD, 60K miles, well maintained, great family car, \$17,000. Noe, 505-268-6620, ask for Rachael.

'63 VOLKSWAGEN BEETLE, blue, 96K miles, matching numbers, new paint/tires, rebuilt engine, new upholstery, \$5,500. Osuna, 505-339-4110.

## 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 ([classesads@sandia.gov](mailto:classesads@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.

'00 HONDA ACCORD EX, V6, leather, white, regularly maintained, 180K miles, great condition, \$2,200 OBO. Beckett, 801-709-4639.

'81 JEEP CJ7, same owner for 20 yrs., lovingly cared for, runs great, new tires, \$6,500. Reeder, 553-4786.

'13 FORD CMAX HYBRID, 4-dr., all options, green, 15.8K miles, excellent condition, \$15,000. Mata, 505-620-9664.

'02 TOYOTA SEQUOIA, V8, AT, 4WD, AT, 8-passenger, beige, 163K miles, good condition, \$7,000 OBO. Fernandez, 280-6151.

'85 CHEVY C10 PICKUP, 4.3 V6, standard transmission, \$1,900; '48 Ford 8N tractor, w/5-ft. blade, \$3,000. Coon, 286-2394.

3-BDR. HOME, 2-1/2 baths, 1,471-sq. ft., upgrades, mature landscaping, Rio Rancho, MLS#869849 lovely, \$165,000. Ramos, 505-220-5201.

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, 505-515-5597, ask for Joseph.

3-BDR. HOME, 2-1/2 baths, 2,300-sq. ft., move-in ready, elegant MBA, awesome backyard, 3 miles from base, Volterra, \$265,000. Gerty, 505-414-4650.

4-BDR. HOME, 2,575-sq. ft., end lot, Sandia mountain views, in-ground pool/spa, NE neighborhood, MLS#870099, \$360,000. Hillskemper, 505-307-6017.

## RECREATION

'09 HARLEY-DAVIDSON XR 1200, somewhat rare, 6.4K miles, extras, photos available, \$8,000. Hanks, 505-249-1931, call or text.

'09 CROSSROADS FIFTH WHEEL, 26-ft., fiberglass exterior, 1 slide out, upgraded cabinets & carpet, new tires, \$19,500. Sanchez, 296-7784.

'03 FLEETWOOD RV TIOGA, 26-ft., sleeps 6, only 25K miles, immaculate condition, \$19,500 OBO. Ortiz, 505-917-7372.

## REAL ESTATE

5-BDR. HOME, 2-1/4 baths, 2-car garage, 2 living areas, solar heat, adjacent park, walk to school, private shaded backyard, furniture option, MLS#863154, \$264,900. Atwood, 918-2598, ask for Chuck.

5-BDR. HOME, 5 baths, 3-car garage, 4,040-sq. ft., large rec room, sunroom, large balcony, 7250 Whippoorwill Ln. NE, \$350,000. Sanchez, 500-400-0030.

## WANTED

PET SITTER, for 2 wks., end of Sept., call if interested & available. Cleland, 323-1824.

VENDORS, for Canterbury Craft Fair, Sept. 10, St. Thomas of Canterbury Episcopal church, 425 University NE. Hughes, 296-8940.

ROOMMATE, 2 bdr. apt., NW of I 40 & Coors, call for details, \$335/mo. plus half gas/electric. Petraglia, 720-291-7210.

ROOMMATE, home in Heights, close to base, UNM, available Aug. 1, \$400/mo., utilities included. Roche, 505-366-3884.



## Sandia builds global energy storage database

By Stephanie Holinka

Sandia engineers have teamed with experts at Strategen Consulting to create a database that provides free, up-to-date information about grid-connected energy storage projects in the US and worldwide.

The goal of the Global Energy Storage Database (GESD) is to encourage research, development, and deployment of energy storage technologies by providing a single platform where project information can be shared. It benefits energy storage systems users, researchers, and other stakeholders.

The GESD is a resource for power generators, utilities, and customers interested in adding energy storage to their systems to learn what storage technologies and rated power options are in use, what the primary use cases are for the grid, and how long each technology type can store energy.

"Energy storage is vital to grid resiliency and reliability during emergencies like power outages from natural disasters, equipment failure, accidents, or terrorist events," says Sandia researcher and project lead Jaci Hernandez (6111).

The work is supported by DOE's Energy Storage Program in the Office of Electricity Delivery and Energy Reliability.

In addition to providing backup power for emergencies, Jaci says energy storage can instantaneously balance power supply and demand and thereby facilitate expanded use of highly variable renewable resources like wind and solar on the grid.

"As we add more renewable energy capacity on the grid, we need energy storage to bridge the gaps between times when electricity is widely available and when it isn't," Jaci says.

The database describes 1,577 operational projects in 69 countries.

It provides information on 53 energy storage technologies divided into five categories: electro-chemical, electro-mechanical, hydrogen storage, pumped hydro storage, and thermal storage. Information about the amount of storage, how that storage is connected to the grid, who owns it, and how the storage is used is included for each location.

DOE GLOBAL ENERGY STORAGE DATABASE  
Office of Electricity Delivery & Energy Reliability

HOME PROJECTS POLICIES

SEARCH

The DOE Global Energy Storage Database provides free, up-to-date information on grid-connected energy storage projects and relevant state and federal policies.

All information is vetted through a third-party verification process. All data can be exported to Excel or PDF. Our hope is that this site will contribute to the rapid development and deployment of energy storage technologies.

Projects Policies

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NEWSLETTER SIGN UP First Name Last Name Email

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The policy section includes landmark decisions like Federal Energy Regulatory Commission orders and up-to-date DOE policy mandates that affect energy storage. GESD will eventually include current docket information for energy cases in state and regional regulatory bodies in the US and elsewhere.

"Energy storage systems owners and developers provide dynamic data to the database. That kind of detailed information is hard to find because not all storage owners share information about their systems widely," Jaci says.

The database shows that the United States has the most energy storage capacity on its grid, followed by Spain, Ger-

many, Japan, and China.

Jaci says the database will provide continually more accurate data that will improve user comparisons and analyses. To include smaller projects in the database, Sandia and Strategen Consulting are developing a way to include in GESD all energy storage projects greater than one megawatt that are currently part of the comprehensive data collection of the US Energy Information Agency.

Jaci says future GESD plans include more information about relevant energy policies, more technical data, a platform to share ESS codes and standards, improved data visualization, and an advisory board.

# Sandia committees promote PTSD awareness through understanding

Two committees dedicated to supporting the diverse Sandia population again joined forces to host Post-Traumatic Stress Disorder Awareness Day, an event to promote knowledge of PTSD and connect participants with available resources at Sandia and in the community.

The Military Support Committee and Disability Awareness Committee assembled a panel that included a wide range of experts from the Albuquerque Police Department, Paws & Stripes, Albuquerque's Veterans Administration Hospital, and Vet Center. Representatives were joined by Tony Kreuch (3334), a clinical psychologist with Sandia's Employee Assistance Program, and combat veteran David Torres (5627), an engineering support technologist and member of the Wounded Warrior Career Development Program.

According to the Department of Veterans Affairs' National Center for PTSD, between 7 and 8 percent of the population will have PTSD at some point in their lives. Although 8 million adults have PTSD in any given year, this number reflects only a small portion of those who have experienced trauma.

Roughly 10 percent of the Sandia workforce are military veterans and while each of those nearly 1,000 people may not be experiencing PTSD, it is important for everyone to learn more about the condition as a way to promote awareness of it.



## 'It's not just a combat thing'

**EDITOR'S NOTE:** The following column was written by Rob Mitchell (4021), a combat veteran and ES&H coordinator and Safeguards & Security coordinator hired under the Wounded Warrior Career Development Program. Rob served in the US Army and was deployed to Iraq during some of the deadliest fighting in the more than decade-long war. Rob also served as an officer with the Albuquerque Police Department prior to beginning his Sandia career. Here he shares how he has survived his battle with PTSD and how to support those who may be suffering from it.

**A**s an infantryman in the 1st Cavalry Division, I was deployed to the eastern Baghdad suburb of Sadr City in support of Operation Iraqi Freedom II from 2004 to 2005. During my 12-month deployment, I was struck by an IED on three separate occasions, and I survived more than 1,400 mortar attacks and countless patrols. I survived with no visible injuries, but that doesn't mean I escaped unscathed. I have been diagnosed with Severe Chronic PTSD and Mild Traumatic Brain Injury.

PTSD is not limited to those who have experienced combat, and my reactions to my triggers are different than even those of other veterans. June was PTSD Awareness Month, and we should take the time to recognize that PTSD and its many forms affect a large portion of the population, not just veterans. Not everyone is as open about their struggle as I am. Many times they fight their battle in silence and solitude. In my 12 years of dealing with it, I have learned there are three key things to surviving PTSD.

The first is a strong support network — trusted friends and family, counselors, clergy, or any other person you can share your experiences with and feel safe doing so. Your support network does not have to be huge and just having one person you trust can be enough.

The second is constructive outlets. So



ROB MITCHELL and his son enjoying time together.

many of those who struggle with PTSD discover destructive coping mechanisms like alcohol, drugs, physical outbursts, extreme isolation, or even suicide. By having a constructive outlet that allows you to express your feelings in a safe manner, you are able to release some of the negative energy often associated with PTSD and can become equipped to handle triggers and everyday stresses. Outlets can be anything from art to music to exercising.

The final, and most important piece, is the will to fight. You must be willing to overcome the struggle and you must be ready to face it head-on with the mindset that you will win. Winning is not defined by having a cure — research has not discovered an all-out cure for PTSD — but I like to define winning as having more good days than bad. If you are not personally affected by

PTSD perhaps you know someone who is. Here are some things to keep in mind if you know or work with someone with PTSD.

Triggers are different for everyone, and sometimes the person may not even know what triggers them. Anything and everything could be a potential trigger, from a distinct cologne or perfume, a certain color, a sound, a movement, riding in a vehicle, taking stairs, or taking elevators. Anything can be a trigger so don't take things personally.

Often times, someone with PTSD may not even realize they have been triggered but their body will begin to react. These reactions can be anywhere from distraction to hypervigilance, to being short-tempered, forgetfulness, and as extreme as verbal outbursts, crying, physical outbursts, or panic attacks. If you know a person well enough, you will be able to recognize when they are having a bad day.

If you recognize this, don't be afraid to ask if there is anything you can do to help. Not everyone will accept the offer, but it is often comforting for the person to know that you care enough to ask. There is a ton of research out there about PTSD and how it affects someone, as well as how to be there for someone with PTSD. I encourage everyone to take the time to do the research. One of the best tools is knowledge.

We shouldn't fear PTSD; we should learn about it.

An *Understanding PTSD* booklet, published by the Department of Veterans Affairs, is available free of charge at <http://goo.gl/zYYOBm>. Additional information is available at the Military Support Committee and Disability Awareness Committee SharePoint pages on Sandia's Techweb.

**WHAT A HOOT** — Employees at Sandia had a rare opportunity recently to observe several great horned owls that had perched in one of the large trees in front of Bldg. 800. The raptors made appearances over the course of several days, enabling many the opportunity to enjoy their presence. According to an entry in Wikipedia, the great horned owl, also known as the hoot owl, is a large owl native to the Americas. It is an extremely adaptable bird with a vast range and is the most widely distributed true owl in the Americas. (Photo by Tami Moore, NNSA)



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