Exceptional service in the national interest

SandiaLabNews

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Sandians celebrate Asian Pacific Islander American Heritage Month.

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Sandia/NNSA partnership builds on strong foundations

NNSA Sandia Field Office Manager Jeff Harrell, Sandia Labs Director Steve Younger optimistic — with caveats — about Labs' future

In late April, just before National Technology & Engineering Solutions of Sandia — NTESS — assumed management of Sandia for DOE/NNSA, soon-to-be Labs Director Steve Younger and NNSA Sandia Field Office Manager Jeff Harrell sat down with the Lab News *to share their thoughts about the relationship between the Labs and NNSA, Sandia's unique mission, its strengths, and its importance to the nation's security. The two leaders identified some pressing concerns that need to be addressed over the next few years.* Lab News *editor Bill Murphy conducted the interview in Harrell's office.*

***Lab News:** Thanks for sitting down with us today. To start things off, let me ask: How do you envision the relationship between NNSA and Sandia developing over the next few years?*

Jeff Harrell: The relationship with the Laboratories and the Labs leadership is excellent, both at the NNSA headquarters and here in the Field Office. So when you say "developing," I'm not sure I would say we need to develop, which would almost suggest there's something we need to fix. I think we'll continue to build on the positives and the very good relationship that we already have.

Steve Younger: I see this as a true partnership, building on the past. We provide goods and services to the government with a national security focus. We're expected to do that efficiently and we will work with the Field Office to provide the data it needs to assess our performance and ensure we're carrying out the mission in a safe and secure manner.

***LN:** Jeff, you mention building on the positives in this relationship. In what way?*

JH: One of the things that we've seen, especially in just the past several years, is an increased effort in transparency. After talking to Steve about this at length, I think we share the vision that transparency is something we'll continue to improve — not that there's a problem, in fact it's very strong, but it will get better.

SY: As Jeff said, there's already a strong relationship between the Laboratories and

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NNSA SANDIA FIELD OFFICE Manager Jeff Harrell, left, and Sandia Labs Director Steve Younger discuss ways to enhance the already-strong partnership between the Labs and NNSA to ensure mission success. (Photo by Randy Montoya)

Trash into treasure

Sandia could help biofuel pay for itself with goods made from waste

RESEARCHERS Amanda Kohler and Ken Sale study the bacteria they used to produce LigM. (Photo by Dino Vournas)

By Jules Bernstein

A recent discovery by Sandia researchers may unlock the potential of biofuel waste — and ultimately make biofuels competitive with petroleum.

Fuel made from plants is much more expensive than petroleum, but one way to decrease the cost would be to sell products made from lignin, the plant waste left over from biofuel production.

Lignin typically is either burned to produce electricity or left unused in piles because no one has yet figured out how to convert it into useful products, such as renewable plastics, fabrics, nylon, and adhesives. The electricity isn't even available to the general public; it's only used by companies that create large amounts of lignin, like pulp and paper manufacturers. Now Sandia scientists, working with researchers from Lawrence Berkeley National Laboratory at the Joint BioEnergy Institute, have decoded the structure and behavior of LigM, an enzyme that breaks down molecules derived from lignin.

The group's work on LigM appears in the April 18 issue of the *Proceedings of the National Academy of Sciences*. The enzyme has little in common with other, better understood proteins, which previously made it impossible for scientists to guess how it functions. This paper marks the first time anyone has solved the struc-

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Inside . . .

Forbes *ranks Sandia a top US employer*

By Kristen Meub

Forbes business magazine ranked Sandia 20th on its 2017 Best Employers list in the large company category. A total of 500 employers were included on the list, and Sandia ranked first among large aerospace and defense companies.

The results were based on a survey of 30,000 American workers that asked how they liked where they work and how likely they were to recommend their friends and family apply to work there as well.

While every Sandian has a unique reason for working at the Labs, many appreciate the meaningful and challenging nature of Sandia's mission, says Human Resources Center 3500 Director Rob Nelson. He adds that the nature of the work and the culture at the Labs help attract top talent.

A surprise and an honor

"We have an amazing opportunity to connect the really great people who work at the Labs with important national security work," Rob said during an interview with *Albuquerque Business First*. "When you think about what our purpose is, it's really to develop advanced technologies that ensure global peace, and when you work at Sandia you have the opportunity to tackle tough problems with top scientists and engineers while still being able to maintain work-life balance."

Sandia has not ranked on the *Forbes* Best Employers list in previous years, and the news of this year's ranking was both a surprise and an honor for Sandia's leadership team.

"I want to share my thanks and congratulate everyone who helps make the Labs a great place to work," Labs Director Steve Younger says. "Each of us contribute to Sandia's mission and impact the work environment. I also want to share my appreciation for the leadership and contributions of Jill Hruby and her team in shaping Sandia's culture. Their vision and efforts helped make Sandia into what it is today."

In its survey, done with help from the research firm Statista, *Forbes* noted how historic low unemployment numbers have increased the competition for great workers. The top three large employers for 2017 were retail giant Costco, Google, and the REI outdoor store.

That's that

What with new colleagues coming on board from Honeywell and Northrop Grumman, new Sandians hired over the past several months, and a wave of summer interns joining us from schools across the country, I thought I'd share a few thoughts about living in New Mexico.

First, there are lots of great books about the state, books that can give you the kinds of insights you can only get from great storytelling. Some of my favorites, in no particular order, include *Bless Me, Ultima, Red Sky at Morning, Death Comes for the Archbishop,* and *Blood and Thunder*. Then there are the novels (all of them) by Tony Hillerman and the works — nonfiction and fiction — by Frank Waters. These books and countless others do a great job of conveying the history, the culture, the texture, and the diversity (geographic and demographic) of this most unique and extraordinary place.

As full and rich and satisfying as great books can be, though, they don't tell you everything. As such, I'd like to share a couple of insights I've gained over the course of several decades of living in the Land of Enchantment, things I know now that I wish I'd known when we moved here permanently in the early 1980s.

First, come mid-April, without fail it's going to get hot (hot being a relative term at that time of year) and you'll be sorely tempted to get up on your roof and hook up your swamp cooler. My advice: DON'T.

You should know that in Albuquerque, hooking up the cooler is an annual affair with some ritualistic aspects. It's a process that for most households here also entails disconnecting your furnace. It's one or the other: heater or cooler, you can't have both. During that April warm spell, sweat it out for a few days. Because just as sure as can be, before the month is out, it will turn cold again. And you're going to need that furnace (as we did in my household last night — May 17 — when it got down into the low 40s and there was a dusting of snow on the Sandias).

The flip side of this advice is also true: Come that first cold snap in September, you'll want to go up on the roof, disconnect and winterize the cooler, and fire up the furnace. My advice: DON'T. You'll end up wishing you hadn't when it warms back up into the 80s right into October (and at that time of year, 80 is the new 90!).

DON'T plant tomatoes in April — that is, unless you just won the lottery and are on a real lucky streak. Chances are, we're going to get one last hard freeze some night before the end of the month and those lovely plants are not going to make it.

Enjoy the state's unique cuisine and learn the distinction between Mexican food and *New* Mexican food. It's important. But DON'T order the hottest chile, be it red or green. Being a New Mexican now, you'll be tempted to, but it can be really hot, hot to the point where you can't taste it — or anything else — at all. At the very least, have the kitchen put it on the side. That's perfectly okay. As an aside on this subject, years ago my parents were visiting and we stopped at a restaurant in Chama. My dad asked the waitress which was hotter, the red or the green. I've always remembered her reply and respected her honesty. "I don't know," she said. "They're both too hot for me."

Over time, you'll find that New Mexico is mostly a DO sort of state. There are a lot more DOs than DON'Ts around these parts.

DO try to attend dances at our nearby Pueblos; many of the dances are open to the public and you'll feel privileged to share the experience with communities that date back hundreds and hundreds of years.

DO get around the state; northern New Mexico, home to Santa Fe, Taos, several ski areas, and high mountain forests, is the focus of a lot of tourist activity and understandably so, but don't miss the chance to explore the rest of the state. There is so much diversity and interest that you can easily spend many happy years absorbing it all.

DO go see the Isotopes and the Lobos and the Albuquerque Youth Symphony. DO take in the State Fair and the Balloon Fiesta and the luminarias in Old Town on Christmas Eve. DO enjoy the smell of burning pinon and roasting chiles. DO walk along the bosque trail and DO hike in the Sandias.

And DO enjoy the rain. And DON'T feel foolish when your out-of-town guest sees you excuse yourself from the dining room table to dash to your porch to watch it. And when your visitor says, in some alarm: "What is it?" DON'T be embarrassed to say, with a happy grin: "It's raining!" And if you go into your yard to feel the rain on your face, DON'T worry if your guest thinks you've taken leave of your senses. But DO watch out for lightning!

Welcome to New Mexico.

See you next time.

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

'Help the Homeless' campaign collects 100s of toiletries

By Michael Padilla

TRACEY GRAVES (8700), top left, and Karelyn Baker (8210), top right, Luz Espinoza (8510), bottom left, and Kathy Boyan (8533), bottom right, organize toiletries collected for First 5 Alameda County. (Photo by Michael Padilla)

Sandia/California is helping people experiencing homelessness in the Bay Area.

"Help the Homeless" is a new Sandia/California employee giving campaign aimed at collecting unused hotel toiletries for First 5 Alameda County. Single-use toiletries, such as those found in hotels and airplanes, are very useful to the homeless who may not be able to carry around larger containers.

The campaign aims to encourage those who travel often to collect complimentary toiletries and drop them off at "Help the Homeless" boxes around the site.

First 5 Alameda County collects hotel toiletries throughout the year and makes care packages for people experiencing homelessness. First 5 is one of the recipient agencies for the site's Holiday Spirit Gift Campaign.

Karelyn Baker (8210) helped spearhead the Help the Homeless campaign for the site.

"Sandians have a big heart for assisting those less fortunate in our communities," says Karelyn. "It must be very challenging to be homeless. We hope that our donations will make their lives a little easier." Sandians can help by dropping off unopened hotel toiletries at any "Help the Homeless" box on site.

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Sandia recognizes top female high school students in math, science in California Bay Area

Mentorship emerged as theme for this year's program

By Madeline Burchard

Female scholars from the junior class from San Francisco Bay Area high schools recently gathered at Sandia's California site for the 26th annual Sandia Math and Science Awards.

The Sandia Math and Science Awards program recognizes high-achieving young women for their accomplishments in STEM (science, technology, engineering, and math) subjects and encourages their future studies by pairing them with Sandia mentors. Teachers from 19 northern California high schools in Livermore, Dublin, Pleasanton, Tracy, Lathrop, Manteca, and Oakland nominated students they deemed outstanding in math and science.

In her keynote address, Heidi Ammerlahn (8700), director of Homeland Security and Defense Systems, touched upon her academic and professional journey and the role Sandia plays in ensuring global peace.

"At the beginning of my career, I knew I wanted to do something with math and computer science," Heidi said. "But I also wanted to be involved in public service and serving my country. Sandia has allowed me to do both."

Heidi also discussed a major theme that emerged in this year's nominations — mentorship.

"You all aren't just incredibly hard-working. You also went out of your way to motivate your peers and help others," she said. "It says so much about you as human beings and future leaders."

Kelsey Tresemer (8713), an engineer with Sandia's Advanced and Exploratory Systems group, shared her journey from a freshman theater major to nuclear engineer. She impressed upon the awardees not to be afraid to explore and change their minds.

Sandia Business Development Manager Annie Garcia (8539), who led the Math and Science Awards planning committee for the first time, said she was proud to be part of the program.

"I was drawn to the Math and Science Awards because of its impact on young women during a pivotal time of their lives," Annie says. "We all need a little encouragement from time to time, so it is a pleasure to be a part of something that recognizes the achievements of the next generation of STEM leaders."

The winners of the 2017 Sandia Math and Science Awards include:

Outstanding Achievement in Mathematics

- April Chen, Amador Valley High School
- Jailene Lopez, Castlemont High School
- Christine Haggin, Dublin High School
- Stephanie Plumb, East Union High School
- Elena Zhang, Foothill High School
- Gabriella Bond, Granada High School
- Danielle Gallo, Lathrop High School
- Ivy Tang, Livermore High School
- Genna Vieira, Livermore Valley Charter Preparatory
- Kaitlynn Funsch, Manteca High School
- Jade Ou, Merrill F. West High School
- Islah Zareef-Mustafa, MetWest High School
- Jaqueline Hurtado, Millennium High School
- Tiffany Ngo, Oakland High School
- Lesly Carrillo Cazares, Sierra High School
- Ivy Tu, Skyline High School
- Gabrielle Arrieta, Tracy High School

Outstanding Achievement in Science

- Makenzie Melby, Amador Valley High School
- Sruthi Mukkamala, Dublin High School
- Rashim Hakim, East Union High School
- Peggi Li, Foothill High School
- Meenakshi Singhal, Granada High School
- Sara Hawk, John C. Kimball High School
- Marissa Briseno, Lathrop High School
- Melia Miller, Livermore High School
- Ariel Kenfack, Livermore Valley Charter Preparatory
- Surayya Sakhi, Manteca High School
- Chaztine-Xiana Embucado, Merrill F. West High School
- Jasmin Galvan, Met West High School
- Yvonne Ng, Millennium High School
- Zayra Cornejo Ibette Rivera, Oakland Tech High School
- Emily Cunial, Sierra High School
- Helen Nguyen, Skyline High School
- Kiana Soeung, Tracy High School

The Excellence in Math award winners.

The Excellence in Science award winners.

Sandia CaliforniaNews
Exceptional service in the national interest

Testing for Zika virus: There's an app for that

By Jules Bernstein

Add rapid, mobile testing for Zika and other viruses to the list of things that smartphone technology is making possible. Sandia researchers have developed a smartphone-controlled, battery-operated diagnostic device that weighs under a pound, costs as little as $100, and can detect Zika, dengue, and chikungunya within 30 minutes.

Testing for these mosquito-borne viruses currently requires a laboratory, and patients can wait days for results. The tests require instruments that are roughly the size of a microwave oven and can cost up to $20,000. This makes rapid testing unrealistic for limited-resource clinics in developing countries where the viruses are prevalent.

The Sandia team describes its rapid-testing prototype in a paper published recently in the journal *Scientific Reports*, "A smartphone-based diagnostic platform for rapid detection of Zika, chikungunya, and dengue viruses."

Early research and development of the prototype device was sponsored by Sandia's Laboratory Directed Research and Development (LDRD) program.

Smartphone technology is a key feature of the device. "In addition to creating an app that serves as a simple interface to operate the device, we were able to adapt smartphone camera sensors to replace traditional laboratory sample analysis tools, allowing for unprecedented mobility," says chemical engineer and lead author Aashish Priye (8621).

Laboratory in a box

The Sandia team's device is based on the loop-mediated isothermal amplification (LAMP) diagnostic method, which eliminates the need to process a biological sample, such as blood or urine, before testing. Conventional viral testing involves transporting a sample to a laboratory, extracting DNA or RNA from it, and then multiplying the genetic materials through a process called polymerase chain reaction (PCR). This process involves heating and cooling the sample many times, so that any viral DNA/RNA in the sample is replicated enough to be detected.

Repeatedly heating and cooling the sample is power-intensive and demands the complexity of PCR machines.

AASHISH PRIYE offers a view into the Zika box prototype, along with co-authors Sara Bird, a virologist, center, and Cameron Ball, a biomedical engineer.

(Photo by Randy Wong)

Detection of the copied viral material also requires expensive components such as fluorimeters. The complexity and expense of traditional PCR machines have been major hurdles in moving them outside of laboratories and into the clinics where they are most needed.

Like PCR, LAMP copies viral DNA/RNA, but without the heating and cooling cycle a heavy-duty power source isn't needed. The addition of a few carefully designed biochemical agents allows a LAMP box to test a sample that is heated only once to 65 degrees Celsius (150 degrees Fahrenheit) for half an hour.

LAMP also eliminates the need for extra sample preparation before testing. "We've demonstrated that the chemistry we're using can amplify viral RNA directly from raw, unprocessed samples," says chemical engineer and project lead Robert Meagher (8621). "That is the ideal for a point-of-care testing scenario because you don't want to have extra equipment for isolating DNA or RNA."

Robert and his team previously developed a method to combine LAMP with an additional detection technique so they could test multiple viruses simultaneously. This other technique, known as quenching of unincorporated amplification signal reporters (QUASR), involves tagging fragments of synthesized viral DNA called primers with fluorophores — molecules that emit bright light signals. The primers incorporate into the heated and amplified sample DNA. QUASR then causes samples containing viral DNA/RNA to appear bright, while negative reactions remain dark.

One-touch testing

For the Zika project, Robert's team developed a novel algorithm that allows a smartphone sensor to act as a fluorimeter, detecting QUASR LAMP light signals if they appear. LAMP works so simply that the user need only place the smartphone on top of the LAMP box and open an app. The app turns on the heater to initiate the LAMP reaction.

Once the 30-minute testing period is up, the smartphone photographs the sample. The app then employs a novel image analysis algorithm to accurately determine the color and brightness of the glow emitted from the LAMP reaction. This smartphone-based image analysis offers much greater detection certainty than the lab technician's naked eye.

Zika virus has been linked to severe fetal abnormalities, including microcephaly and congenital blindness, as well as neurological disorders that can strike people at any age. By enabling diagnosis in half an hour, the device could help clinicians make faster decisions about patient care and isolation, and rapidly alert public health authorities so they can take measures to prevent spread of the virus.

Furthermore, Zika, dengue, and chikungunya are spread by the same mosquito type and have similar early symptoms. Sandia's prototype diagnostic tool could enable care providers to test quickly for all three at the same time, preventing misdiagnoses. The same tool can also be adapted to detect other human or animal pathogens.

The cost of making a LAMP box prototype to test for these viruses depends largely on the cost of the phone selected for use with it. "There are billions of smartphones in the world, even in developing countries, and this tool doesn't require the highest-end smartphone on the market," Aashish says. "It only needs to have an optical sensor and be able to run the app." The smartphone used in Sandia's successful tests of the prototype cost a mere $20. Ultra-accessible and ultra-portable, the Zika box prototype could one day become a staple in point-of-care clinics worldwide.

NNSA and Sandia
Partnering for mission success

(Continued from page 1)

the Field Office. In building on that, I would note that I'm a big believer in data-driven management; that is, show me the numbers, prove that you are performing up to expectations or exceeding expectations. We would like to move a little more in that direction, data-driven management.

***LN:** Across the board?*

SY: Across the board — particularly on the support side of the Laboratories, but also on the technical.

***LN:** Clearly, Sandia and NNSA are of one mind about where the focus of the Laboratories should be, and that is on the mission. Given that, what factors do you see as helping to ensure mission success?*

SY: Mission success rests on a foundation of what I call the enabling functions, which include Finance, Human Resources, Procurement, and Safety and Security. If you get those things right the efficiency of mission delivery only increases.

JH: I completely agree and I'll add that our motto in NNSA is "Mission First, People Always." I think that is always going to be a key piece of mission success — taking care of the people.

***LN:** Steve, as someone who's been around the weapons complex a long time, have you ever seen situations where the lack of focus on safety or security got in the way of mission success?*

SY: Several examples come immediately to mind. Not paying attention to safety and security can have serious consequences for the well-being of your people and for the mission. Y-12 National Security Complex in Oak Ridge had a security problem, Los Alamos National Laboratory had safety issues in their plutonium facility and elsewhere; both caused significant impacts on mission. And that, of course, impacts

"Our motto in NNSA is 'Mission First, People Always.' I think that is always going to be a key piece of mission success — taking care of the people."

national security. Safety and security are both every day, every hour efforts.

***LN:** Jeff, we know safety and security are extremely important issues, priority issues, for NNSA. Does NNSA see a continued investment in a strong technical basis at the Laboratory to be a high priority, too?*

JH: Absolutely, and that ties back to mission. Without a robust technical basis you really can't advance the mission. Any investment in the technical basis is an investment in the future and that is absolutely essential.

***LN:** Speaking of investments, NNSA Administrator Lt. Gen. Frank Klotz and others have talked about the need to modernize a lot of the infrastructure across the nuclear weapons enterprise. Is that a concern here at Sandia?*

JH: Oh, it's definitely a concern across the entire enterprise. Fortunately for Sandia — and Steve and I have talked about this — the situation here isn't as urgent as it is at some of the other NNSA sites. That doesn't mean it doesn't need attention here. It is something that NNSA and DOE are looking at right now. I think you'll see even more emphasis on this issue going forward.

***LN:** I'm going to shift gears a little bit and talk about Sandia employees. Steve, you've noted that you've been coming to Sandia and working with Sandians for a long time. Is there anything special you've noted about Sandia, about Sandia employees, that you've picked up over the years?*

SY: As a matter of fact, there is something special about Sandia. The climate in which national security laboratories operate has changed over the past several decades. There was a time when industrial concerns, the big aerospace companies, for example, had large R&D efforts, when the military services had large R&D laboratories. Those efforts have decreased over time. And that leaves Sandia as the dominant national security R&D laboratory. That is a critical mission for the nation. Fortunately, Sandia has a long tradition of collaboration, both within the Laboratories and between the Labs and other national security entities, that has served the country well.

JH: What strikes me as making Sandia, as a laboratory, different, is the breadth of the work done here — it's amazing. This month marks two years that I've been at the Sandia Field Office and I still learn something new every day about work being done at Sandia. So I think that diverse scope of work is one big differentiating factor. And while I can't speak for all of NNSA, I'd say the relationship between the Field Office here and the Laboratories is the strongest I've seen personally and I think that does make it somewhat special, at least in my eyes.

There have been several times just in the past month where people I don't even know stop me in the hallway and say, "I just want you to know I appreciate the relationship that your office —the field office — has with us in our workplace." I think that's very positive, an affirmation of our great relationship.

***LN:** Again talking about Sandia employees, over the years we've prided ourselves on hiring the best and brightest technical staff, going the extra mile to find the best people to come here and help contribute. How important is it that we put that kind of rigor into hiring our support staff?*

SY: I strongly believe it's equally important. Things happen because of a combination of three things: people, places, and processes. Nothing happens unless someone does it; it all happens in some facility, be it an office, a laboratory, or production facility; and processes enable those things to happen.

So they are not just the foundation; the processes are the lubricants that make everything else happen. So, yes, hiring talented people, giving them the training that they need, giving them the facilities that they need, is equally important across the Laboratories.

***LN:** Let's move on and talk in broad strokes about the Labs' culture. Sandia has a legacy of exceptional service in the national interest that goes back 70 years. How do you see the new senior leadership team as building on that legacy?*

SY: We embrace that theme of exceptional service in the national interest; it's rare that the president of the United States gives you a theme that strong and that enduring, so I'll just leave it at that: We embrace that theme.

***LN:** Sandians have taken that concept of "exceptional service" and applied it at the community level as well. Is that going to continue to be an emphasis during your tenure?*

SY: It'll certainly continue under our tenure. I've been a proud New Mexican for decades. New Mexico is a state rich in culture and diversity. However, there are issues involving education, involving employment, where I think we can make a difference. We would like to help the city and the state address those issues to the extent that's possible within our contract with DOE and NNSA.

***LN:** Steve, looking out five years from now, what would you like Sandia to look like?*

SY: I would like Sandia to continue on the path it is on, to continue to deliver with excellence on its national security missions and to look at the additional value that it can provide to national security by improving the efficiency by which it contributes those things.

***LN:** And the Laboratory Operating System you've discussed in other venues — what role will that play in improving efficiencies at the Laboratories?*

SY: It will be a major part of our aim of introducing best business practices in a systematic fashion across the Laboratories. We're talking about practices that have proven their worth in many different venues; they can work here, too.

***LN:** Taking a longer view, if you could look forward another 70 years, Steve, what would you hope historians will say about the mark that NTESS has left on Sandia?*

SY: I hope that history judges us as having made the Laboratory even better, even stronger than it is today, particularly improving the business processes and the services. We have outstanding, dedicated people in our support organizations. I want to give them the best tools, the best processes, just as we give the best tools to our scientists and engineers. The technical quality of work done at the Sandia is extraordinary. That's the reason the Laboratories are here and we absolutely want to maintain that. At the same time, we're convinced that better business practices can reduce frustration and improve productivity across the Labs.

***LN:** Jeff, from NNSA's perspective, what are the biggest challenges and opportunities that need to be addressed over the next several years to make Sandia the best that it can be?*

JH: I'm a little hesitant to speak for all of NNSA, but let me give you my perspective. The first part would be that if we ever get to the point — and I say "we" because

"I'm a big believer in data-driven management; that is, show me the numbers, prove that you are performing up to expectations or exceeding expectations."

I do think this is a team effort — if we ever say that we're the best that we can be and rest on our laurels, then we've stopped getting better. We don't ever want to get to that point. We can always do better even if what we do now is tremendous.

I think one of our biggest challenges — and this applies to both the Field Office and the Labs — is staffing, getting the right talent. It's a very competitive world out there, especially in some technical fields. So that is something we have to focus on both in the Laboratories and from a federal perspective, too.

Another big challenge — and it's one we've already discussed briefly — is infrastructure. That is going to become a critical concern in the next few years with several of the facilities here that will have to be addressed. Infrastructure of course ties into budget — having the funds available to do what you need to do is always a challenge, not just this year, next year, or the year after that. It will always be the case. I don't think we'll ever get everything we want. Getting what we need, I think will be very a critical concern in the future.

***LN:** Anything else that you want to add at this point? Jeff or Steve?*

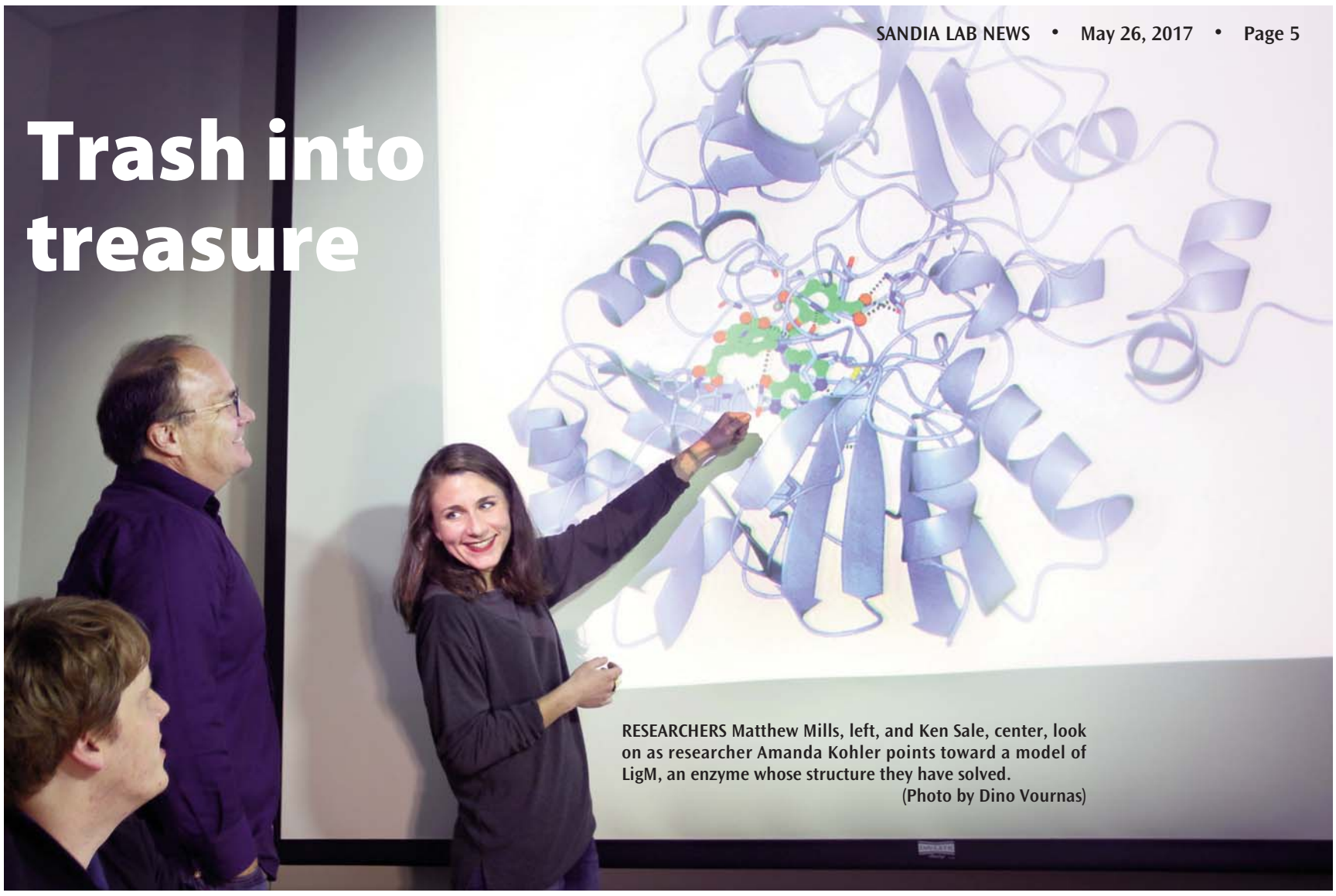
JH: Steve and I and other members of the new leadership team have worked very closely together for the past several months — since January 18 to be exact — and it has been an incredibly wonderful relationship. It's clear that everybody is focused on the same goal: keeping this laboratory on the successful track that it's on right now.

I'm very proud of the relationship we have as a federal office with the current leadership that's in place and that's not going to change, I can tell that already. I am optimistic and excited about the future.

Steve: As am I. The way I see it, the relationship between the national laboratories and the Department of Energy and NNSA has gone through three phases.

The first phase was when the national laboratories were almost autonomous entities and the Department of Energy and its predecessors provided funding and generic oversight. However in the 1990s and early 2000s a series of problems occurred where the Department was pressured to provide greater oversight to the laboratories and to the plants and that led to close transactional oversight. I think we're now entering the third phase and that is true partnership between the field offices and the national laboratories and the plants, and we look forward to strengthening that partnership.

Trash into treasure



RESEARCHERS Matthew Mills, left, and Ken Sale, center, look on as researcher Amanda Kohler points toward a model of LigM, an enzyme whose structure they have solved.
(Photo by Dino Vournas)

(Continued from page 1)

ture of LigM, opening a path toward new molecules and new, marketable products.

Revealing nature's closely guarded secrets

For decades, scientists have wrestled with the problem of breaking down lignin, the part of plant cell walls that provides structure and protection from bacterial and insect attacks. This strength also makes lignin difficult to deconstruct, though there have been recent breakthroughs.

The plant matter used to produce ethanol can be chemically or physically pretreated so that the lignin is deconstructed in the process. However, these methods can be expensive and reduce the amount of biofuel that can be harvested. They could also interfere with later-stage lignin harvesting. That's why some researchers are focused on finding enzymes that convert lignin naturally and gently.

Lead author Amanda Kohler (8614) says her team knew enzymes could metabolize lignin and its derivatives because there are decades-old records of bacteria using enzymes for this purpose. *Sphingomonas* bacteria was discovered living in the waste water of a pulp mill more than 30 years ago. Once researchers realized the bacterium's unique enzymatic pathways enabled it to live on lignin, their challenge was then to understand the enzymes in these pathways so they could mimic what nature had already done, and use that understanding productively.

Amanda and her team focused on LigM, an enzyme used by *Sphingomonas*, because it performs a key step in the conversion of lignin derivatives and it is the simplest of the known enzyme systems that perform this function. "When trying to mimic natural systems in a laboratory setting, the simplest, most direct systems are the best," Amanda says.

The team found that half of LigM's structure is composed of a common protein architecture found in all forms of life, from bacteria to humans. The rest of the enzyme — the active portion — is not found in any other known protein structure. This unique structure gives LigM the ability to bind specifically to molecules derived from lignin.

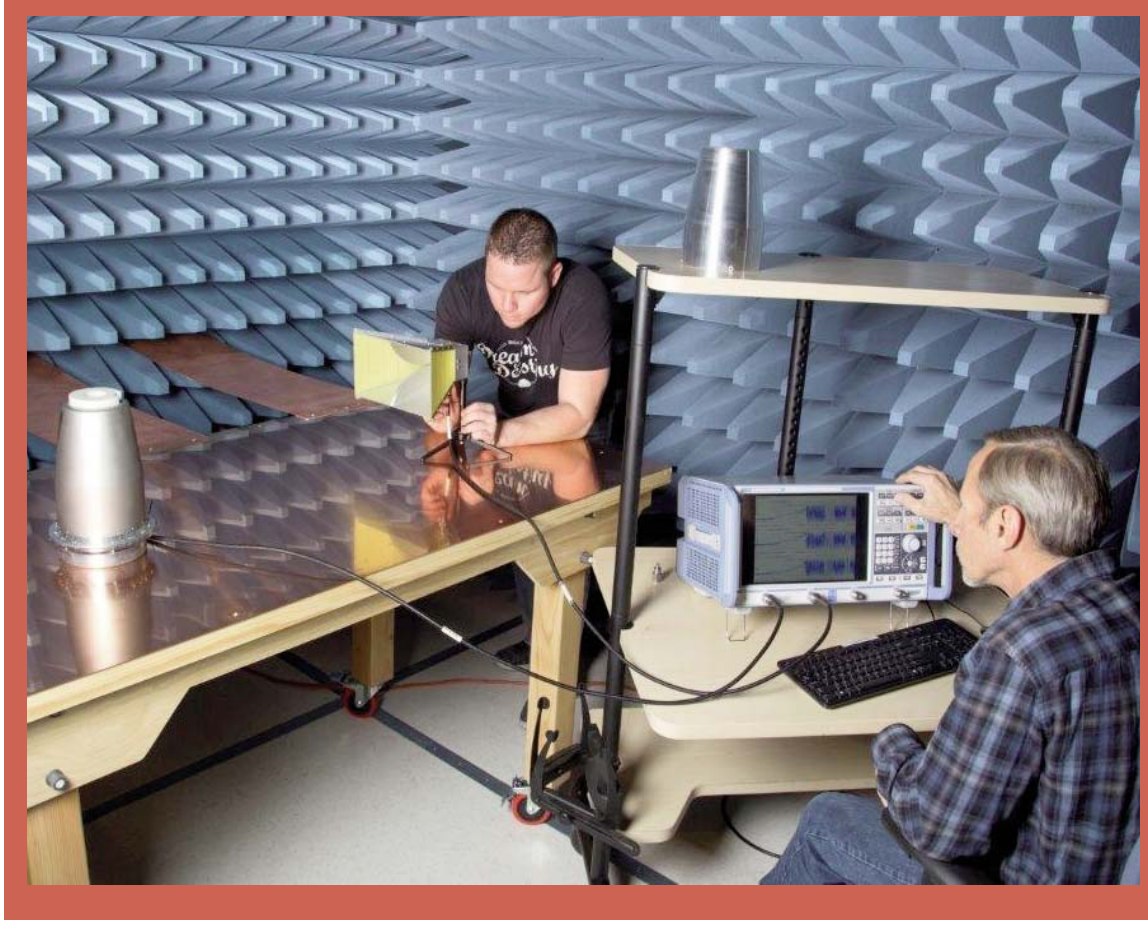
"Solving the structure allows us to understand how the organism may have evolved its unique function, which I think is scientifically one of the most interesting findings," says paper co-author Ken Sale (8614). The team used the Advanced Light Source Synchrotron at Lawrence Berkeley National Laboratory, along with high-performance computing and fundamental biochemistry to gain their insights into LigM.

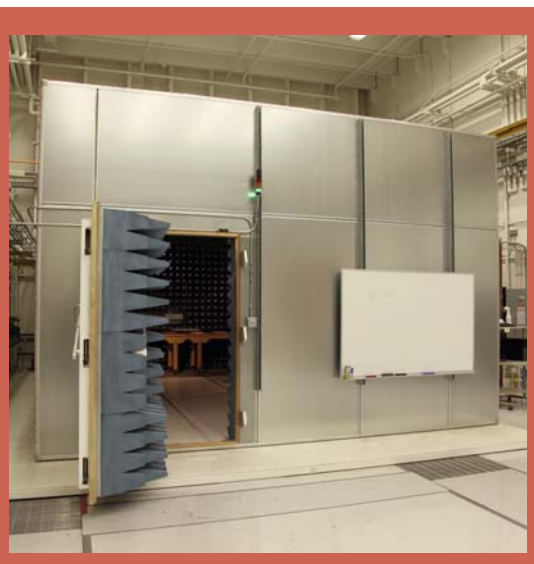
One key step in a longer pathway

LigM is designed to break down lignin derivatives, not lignin itself. It is important to understand that LigM's function is only one key step in a longer pathway of reactions needed to fully deconstruct lignin. One active area of research involves finding other organisms, possibly fungi, that can execute the first step of breaking down large lignin mass into smaller fragments. Some of the Sandians who solved LigM's structure, Ken and Matthew Mills (8614), have recently learned more about another enzyme that helps drive the breakdown of lignin into smaller fragments.

LigM works on a later stage in the process, when smaller lignin fragments already have been converted into a molecule called vanillic acid. "There is still work to be done to figure out the whole reaction pathway," Amanda says. "But now we have a much-needed understanding of a key step in this process, and are developing enzymes to fit our end goals of lowering the cost of biofuels by making products from lignin."

Sandia's new electromagnetic test cell





ENGINEERING SUPPORT TECHNOLOGISTS Alfred Baughman, left, and Joseph Rudys (both 1353) check out Sandia's recently added electromagnetic test cell, which expands the experimental capabilities of Electrical Sciences Group 1350 in continuous wave electromagnetic and electromagnetic pulse research and qualification. Making the new test cell a reality took the collaborative efforts of Electrical Sciences Depts. 1353 and 1354, Mk21 Arming and Fuzing Assembly Development and Qualification Depts. 2135 and 2138, Facilities, and the test cell's manufacturer and installer, ETS Lindgren. Joseph led the facility preparation while technologist Romeo Fabia (1354) led the assembly and commissioning.
(Photo left by Lloyd Wilson; right by Estevan Sisneros)

A tale of friendship, loss, and love

On Memorial Day, a Sandia veteran recalls the story of one Marine's death and the friend who carried his legacy through family

By Nancy Salem
Photos courtesy of John Bailon and Jeff Hunter

To John Bailon and Jeff Hunter, Memorial Day is personal. They served together as Marines in the war in Iraq and saw nearly two dozen comrades fall. "Memorial Day isn't about those of us who served. It's about the people who died fighting an enemy," Hunter says. "It's a select group. They didn't just die. They were killed."

Every name, every face has a story. One with special meaning to John (5823), a Sandia cyber technologist, centers on Hunter and fellow Marine Christopher Lyons, a story of shattering loss followed by surprising joy.

New kid on the block

John and Hunter met in Albuquerque as Marines in Delta Company 4th Recon Battalion. Their unit was too small to deploy alone so in January 2005 they were sent to California to train with Lima Company, a reserve infantry battalion out of Columbus, Ohio. The Albuquerque group was scattered, with John and Hunter going to different squads in the same platoon. Lyons befriended Hunter, the new kid on the block.


FELLOW MARINES — Sandia's John Bailon, right, met Jeff Hunter, left, in 2004 when they were Marines in Albuquerque. They served together in Iraq in 2005 and later returned to Albuquerque where they remain good friends.

"All the Ohio guys knew each other. I'll never forget getting to California and walking into the Quonset hut with all the cots inside. There was only one left; nobody wanted it. They gave it to me," Hunter says. "Christopher moved his cot next to mine to help me out, make me feel welcome."

Thus began a friendship that grew stronger as Hunter and Lyons were assigned to the same four-man fire team in their squad. "We figured out during the two months of training that we had a lot in common," Hunter says. "We had great conversations."

John says the Marines have a tribal dynamic, with the fire team the smallest tribe. "You literally work with your fire team 24/7," he says. "You learn how they walk, what they eat, their temperament, how they handle stress, assess situations. There's no personal space, no privacy. You're with these people every day, learning about them. It's a very personal experience, the first layer of family. Jeff and Chris had that from the very beginning."

Lima Company was deployed to Al Anbar Province in Iraq in March 2005. Hunter and Lyons were still on the same fire team with Hunter the corporal in charge. They often found themselves together through long hours of guard duty, talking to stay awake. "Our friendship grew," Hunter says. "You know how you meet people and become friends and know it will last a long time? We were like that. We talked about everything from the deeply spiritual to the mundane. We got into funny situations and life-and-death struggles. We made plans to see each other after the war. I only knew him for six months, but he was like a brother."

Lyons also talked about his wife Bethany who was expecting their first child in April. He picked up the nickname Daddy Lyons because he talked so much about his family. "Christopher was artistic and poetic," Hunter says. "He enlisted in the Marine Corps as a journalist but was assigned to be an infantryman in boot camp. He worked for a newspaper in Ohio and sent stories from Iraq that were published. He loved to write."

When Lyons's daughter Ella was born on April 27, he was called back from the front and saw her over web cam. "He was so excited," Hunter says. "It was a big deal for him."

> *"It's a select group. They didn't just die. They were killed."*

A mission gone wrong

Before dawn the morning of July 28, John, Hunter, Lyons, and their platoon set out to clear two small towns. That involved going door to door searching houses for weapons and insurgents. It was routine and they expected to be back for lunch. "Of all the missions to go wrong," Hunter says. "We did far more dangerous things than we did that day."

John's squad started knocking on doors while Hunter's stood guard on a rooftop. Hunter was now the squad leader and Lyons his radio operator. Half way through the first town, John's squad approached a house and was fired upon. A bullet hit and killed the fire-team leader walking next to John.

Nine insurgents were in the house and while three ran out the back carrying AK-47s, the others continued firing on John's squad. Hunter's group shot at the men who ran but they got to a nearby building under construction and took cover. The firefight raged on both fronts. "It was very dynamic, very chaotic, but that's the way combat is," Hunter says. "We were well trained and knew what we were doing. We were going to win. That's what Marines do."

John says it was clear the insurgents were not locals but among the many foreigners from places like Syria, Yemen, and the Sudan who came to Iraq to die on a mission and fulfill their religious duty. "They were there to kill as many of us as they could and die doing so," he says. "Those were the people we fought the most."

Hunter says the company had lost about 20 Marines since it arrived in Iraq in March, "and we weren't playing games at this point." Tanks were called in to fire on the two houses. Afterward, people had to go in and make sure no one was still alive. The house under construction was picked first. "The captain asked for volunteers and I said my squad would do it," Hunter says. "We were right there."

He took two fire teams with him while one watched from a rooftop. He asked Lyons to bring up the rear. "I was trying to keep him out of harm's way," Hunter says. "The first guy in takes the risk, and we rotate that role. I was going to lead us in."


A LIFE CUT SHORT — Christopher Lyons was 23 when he was killed in action in Iraq. John Bailon and Jeff Hunter were in the same platoon as Lyons and in the firefight the took his life. Lyons, of Ohio, and Hunter were fire team partners and had grown as close as brothers. Lyons enjoyed writing and wanted to be a journalist.

Hunter threw a grenade and fanned through the building. No bodies were found. "Did we get it wrong?" he recalls thinking. "I saw three people run in there." From the rooftop someone shouted to check two animal pens in the back. Lyons was near them with another Marine, who walked into the first one. It was clear. At the second pen it was Lyons's turn to go in first and as he did, he was hit in the head by bullet, in a small spot not covered by his helmet.

"I watched them go toward the pens and I remember thinking, 'These guys are awesome. They look so professional. I was proud," Hunter says. He looked away briefly then heard gunfire. "Christopher dropped in the doorway," he says. "The shooter opened fire on the rest of us. All I could think about was Christopher's family. He had to be alive and I was going to get him out of there."

The gunfire continued for several hours as Hunter tried to get to Lyons. At one point, the shooter pulled Lyons into the pen and Hunter lost sight of his body. Eventually, a tank operator used heat-seeking equipment to locate and fire on the insurgent.

Hunter was the first one through the door. The shooter was dead and he saw Lyons's body in a corner of the dark room. "I can see his face. I can tell he's gone. I've seen him asleep, I've seen him smile, seen him cry, seen him happy, seen him sad, and I can tell there's no life in that face. I fall to my knees and free him from some rubble. I'm the only one in the room. No one followed me in. I was done, physically spent. I called for help and we got Christopher out of the hole. We called in the medevac. We laid him on the same bench he was sitting on when they brought us in that morning. I walked out, the door went up, and that's the last time I saw him."


FAMILY TRADITION — Jeff and Bethany Hunter and their four children celebrate the life of Christopher Lyons every July 28, the day he died in Iraq. "It's a special day for us," Hunter says. "We remember Christopher."


MISSION DRIVEN — John Bailon, left, and Jeff Hunter, right, in Iraq with fellow Marines. Their platoon conducted numerous offensive missions and suffered about 20 casualties in a seven-month deployment.

A new family from the ashes of loss

John, Hunter, and the rest of the company returned to the US in October, and Hunter, who was awarded the Silver Star for his actions the day Lyons died, traveled to Ohio to visit with the families of fellow Marines who lost their lives. Bethany Lyons had reached out to Hunter through email while he was still in Iraq wanting to know more about her husband's death, and she and Hunter struck up a correspondence. They met in Ohio and continued to write and visit each other after Hunter returned to Albuquerque.

"We fell in love," Hunter says. "I was head over heels." Hunter and Lyons were married April 28, 2006, and Hunter adopted Ella. Hunter and Bethany went on to have three children of their own.

Every year the family recognizes July 28, the day Christopher died. "We take the day off and do things as a family," he says. "The day has special meaning."

So does Memorial Day. "I was fighting for the guys standing next to me: my fire team, my squad, my platoon," says Hunter, now a Bernalillo County Sheriff's deputy. "Death in general is tough to deal with. But when it's a violent death on foreign soil in a war zone, it's even more so. Memorial Day is a time for the country to think about those things."

As John reflects on the story of his friends Hunter and Lyons, he says he was proud to be part of a "company of heroes."

"I was profoundly moved by the guys I served with," he says. "And it goes deeper with the ones we lost in that deployment. They remind us to not let our fire burn out and to continue to live good lives and pursue our goals, be good fathers and good stewards. We must not waste an ounce of our lives in honor of the people who died."


NOT FORGOTTEN — Bethany Hunter visits the national cemetery where Christopher Lyons is buried. Lyons was married to Bethany and they had just had their first child when he was killed in Iraq. She later married his friend and fellow Marine Jeff Hunter. Together they honor Lyons's memory through family. "He will never be forgotten," Hunter says.

What if?

Sandians answer tough questions in first-ever Strategy Challenge

By Monique Otis

What if an adversary of the US developed a super-powerful artificial intelligence capability and unleashed it on America's infrastructure? How would climate change-related drought affect the Southwest? What would be the impact of a disruption in the Global Positioning System? These are a few of the questions addressed by the 21 teams participating in the first-ever Sandia Strategy Challenge, a week-long activity that encouraged Sandians to think about strategy in new, out-of-the box ways.

The challenge was structured around a set of team-based events designed to engage Sandians of all disciplines and expertise to think creatively, critically, and collaboratively about Sandia's future. In all, more than 100 Sandians from across the Labs participated in the challenge.

After a kickoff that introduced some strategic thinking principles, participants formed teams and began creating scenarios depicting the impacts and responses to hypothetical events, including wars and terrorist attacks, pandemics, natural disasters, disruptive technologies, and more. Using scenario planning methods, teams designed their possible futures around conditions or characteristics defined in a quad chart, considering the national security implications, and the implications and possible roles for Sandia.

On the final day of the challenge, the 21 teams presented their conclusions to Sandia's senior leadership and were scored on a set of criteria that included creativity, feasibility, and impact of recommendations or solutions. Winners were named in several categories, including overall effectiveness, presentation, out-of-the box, creativity, and Sandia impact. The winning teams are listed in the box below.

"The Challenge was useful because we were able draw upon the immense wealth of experiences from the workforce that will contribute to the future mission of the Labs," says Tyson Bailey (9424), a member of the winning team in the creative category. Tyson's team sought to answer the question of malicious artificial intelligence being unleased against the US. His team developed a set of policy and technology recommendations around deter, detect, and defend. His team also looked at Sandia-specific strategies around studies to investigate vulnerabilities, ways to harden the Labs' infrastructures, investing in AI technology, and more.

"From a staff level, this was a good opportunity to communicate with leadership about possible avenues the Labs should look into when considering future research and capabilities," he says.

MONEY MATTERS — Rahni John, left, presents her team's report on the strategic challenge it considered: the New Age of Money. The team examined how cryptocurrencies such as Bitcoin could impact the global economy, US national security, and Sandia. Other team members, to the right of Rahni, look on. The team took a first place in the "presentation" category. (Photo by Randy Montoya)

The winning teams

- **Overall:** "Climate change drought in southwest US" by Team 19 — Christina Beppler (2555), Summer Ferreira (2546), Stephanie Teich-McGoldrick (6752)
- **Presentation:** "Cryptocurrencies made popular in global economy" by Team 8 — Andre Huynh (10661), Monique Otis (111), Allison Fetterolf (9428), Rahni Johnson (10626), Angelo Valencia (10664)
- **Creativity (tie):** "Malicious AI deployed against US" by Team 28 — Tyson Bailey (9424), Bryant Dentiger (9428), Jason Lechtenberg (5322), and "Food shortage" by Team 10 — Brian Head (2625), David Carter (5844), Severiano Sisneros (5843), Anna Miller (2569)
- **Sandia impact:** "Russian NATO provocation" by Team 3 — Ben Bonin (8712), Brandon Heimer (8712), Jason Reinhardt (8710), Kelsey Tresemer (8713), Lynn Yang (8716)
- **Out of the box:** "Inexpensive extraction of CO_2" by Team 27 — Patrick Burton (6633), Jessica Rimsza (8865), Andrew Knight (8865), Ken Nunez (6633), Scott Olson (6633)

Challenge lead John Foley says the challenge accomplished what it set out to do. "Our goal was to open up the strategy process to all Sandians. From a strategy perspective, Sandia stands much to gain by drawing on the wealth of creativity and critical thinking from across the Labs."

Participants say they benefitted from the experience by being able to share ideas with leadership and network with each other, and said they appreciated the chance to take a break from their "everyday job" to think outside of the box.

The 21 teams came from every division and included a range of students, office administrators, business professionals, engineers, and scientists. In some cases, team members didn't even know each other before participating. "We would have been happy with five teams and thrilled to have as many as eight or 10." John says. "The turnout was wonderful and demonstrated people are interested in this type of work."

According to event organizers, the Strategy Challenge is one of several initiatives the Labs will be taking to open up the way Sandians think about strategy and how to better incorporate the ideas of the workforce in the strategic planning process.

"The goal now is to take this forward and continue to find ways to regularly solicit staff ideas for Sandia's future," John says. Visit the Sandia Strategy Challenge website for a list of the presentations and results.

Sandia intern named Goldwater Scholar

By Mollie Rappe

Sandia intern Randy Ko (1882) was named a 2017 Goldwater Scholar. Randy just finished his junior year at the University of New Mexico double majoring in biochemistry and East Asian studies.

He is an intern working with George Bachand (1882) at the Sandia/Los Alamos National Laboratory Center for Integrated Nanotechnologies (CINT).

The Goldwater Scholarship is a national undergraduate scholarship established in 1986 by Congress to honor former Sen. Barry Goldwater. The foundation provides $7,500 to 240-250 science, mathematics, and engineering students their senior year for tuition, fees, books, and room and board.

In George's lab, Randy studies the stabilization of microtubules using osmotic pressure. Microtubules help maintain the structure of cells and are metastable biopolymers assembled from tubulin proteins. The osmotic pressure levels studied are comparable to those of crowded cellular conditions instead of a dilute test tube. Randy's part of the project was seeing if this osmotic pressure can counter calcium's destabilizing effect on microtubules, says George. DOE's Office of Basic Energy Sciences funds this research, in part, with a goal of understanding microtubule self-assembly ultimately to design synthetic polymers with the same self-regulated polymer dynamics.

"One of Randy's greatest strengths is that he's intellectually very curious. He really has a desire to understand the fundamental science," says George. "He's also one of the most self-motivated people that I've ever met. Randy has a strong aspiration to go into an MD/PhD program heading into biomedical research. I have no doubt he's going to be successful."

RANDY KO

Diverse research experience from around the globe

Randy's introduction to research was when he was a high school junior as a student intern in Sandia's STAR (Science, Technology, and Research) program. Through the program he was involved in computer science research. An influential high school teacher, Kathleen Rutter at Albuquerque High School, fanned his interest in the life sciences.

The summer after high school, Randy went halfway around the globe to study genomic dermatology in Hefei, China, with Dr. Xuejun Zhang. This research led to four scientific publications and introduced him to the scope of biomedical research from clinical studies to fundamental genomics techniques.

During the spring of Randy's freshman year at UNM he was an intern in Sandia's International Biological and Chemical Threat Reduction (IBCTR) program working under Lora Grainger (6826). He helped maintain a library of biosafety and biosecurity training materials as part of the Global Biorisk Management Curriculum training team. A few months after beginning the IBCTR internship, he missed bench work and started doing research at the UNM Cancer Center under Dr. Montaser Shaheen. There he studied melanoma, both seeing patients and conducting cell biology lab-based research.

The next year he started interning in George's lab.

"Research takes a long time, there are a lot of failures — you're probably going to fail a lot of times before you have a success, but when you do have that success you're going to impact so much of science," says Randy. "That one percent you do find out pushes that forefront of science. I think that's one of the coolest things about research."

Albuquerque native with a future in cancer research

After research in George's lab, Randy wants to combine his interests in cancer research and nanotechnology, possibly using nanotechnology to target cancerous cells. Randy wants to do something challenging that can positively affect the lives of lots of people.

Randy was born and raised in Albuquerque and attended Albuquerque High School. His parents own Ko Palace restaurant and he is a first generation college student. Randy says his father has taught him not to be afraid of going after opportunities, such as prestigious scholarships.

The Goldwater scholarship is national recognition for his research, and is an amazing steppingstone, he says.

In 2016, Randy ran for UNM student body president and barely lost. He was a student government senator during his sophomore year. He volunteers with the UNM Alumni Association through the UNM Trailblazers. He also swims and, on occasion, gets the chance to play video games.

Build for the future

Sandia awards $135 million in construction contracts to NM businesses

By Nancy Salem

Fourteen New Mexico companies, most of them small businesses, have been chosen to provide about $135 million in general, electrical, mechanical, and civil construction work at Sandia.

The companies are subcontractors for the Labs and will compete for individual construction projects as they occur, says Krista Smith, senior manager of Procurement Dept. 10240. The general construction subcontracts run five years and the civil, mechanical, and electrical three years.

In New Mexico, Sandia for years has competed construction work through construction partnership agreements, bundled together by discipline. "Having a pre-qualified group of subcontractors allows for competitive prices, a quick turnaround, and allows suppliers to gain experience and know-how with Sandia's facilities requirements," Krista says. "Construction partnerships also have improved Sandia's construction safety performance over the past decade."

The subcontractors selected for general construction projects are Applied Construction Technologies 2, Engineering Constructors Inc., H+P Construction Services, SDV Construction, Summit Construction Co., and TEF Construction. The electrical contractors are Applied Construction Technologies 2, Del Rio Enterprises Inc., Enterprise Electrical Services, and U.S. Electrical Corp. The mechanical contractors are HDL&M Construction Services, H+P Construction Services, Rupert Plumbing and Heating Co., and Scoggin Mechanical Industries Inc. The civil contractors are RMCI Inc., Summit Construction Co., and TLC Plumbing and Utility.

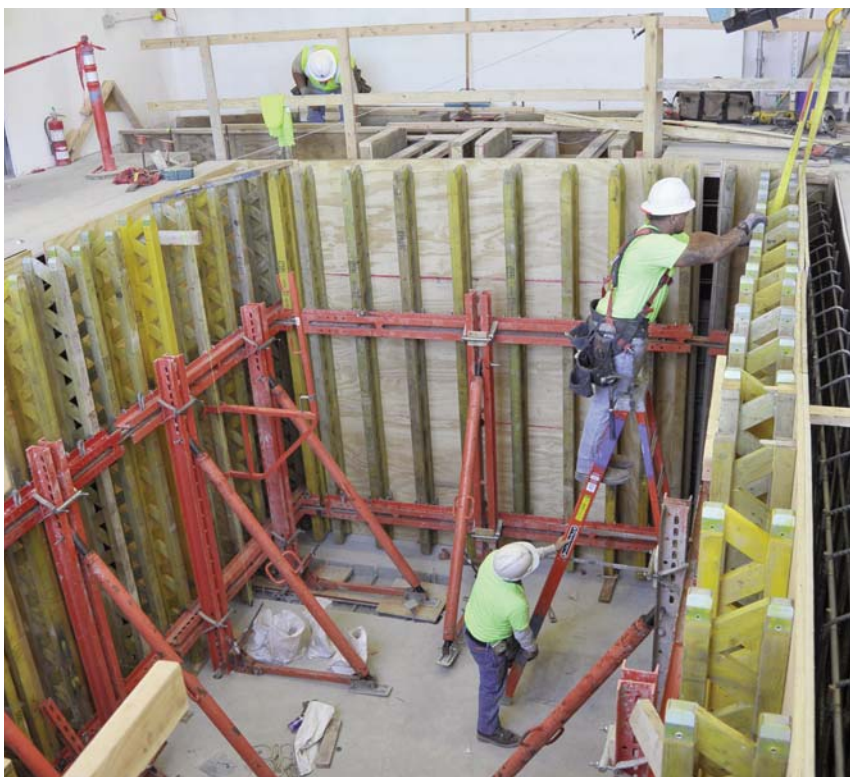
All the companies are New Mexico based and all but two, RMCI and TLC, are small businesses.

"The review team is to be commended for its unwavering commitment to the small business community," Krista says. "Sandia is dedicated to finding and using diverse, highly qualified, small business suppliers to help the Laboratories achieve its national security mission. These construction partnership agreements demonstrate and reinforce our commitment to New Mexico's small business community."

Sandia's reviewers informed suppliers in the community last year about the re-bidding of the construction partnership agreements through a variety of outreach efforts, Krista says. The selected companies were among 25 firms that submitted bids. More than 70 companies expressed interest in the agreements.

The bidders underwent a competitive and rigorous selection process that included meeting minimum mandatory requirements, providing information about their qualifications and technical skills, undergoing a review by a six-member technical and safety team at Sandia, and completing multiple reviews by NNSA, says Devin DeMenno (10243), a Sandia subcontract manager. "All the partners are pre-qualified for facility clearances, safety, quality, and technical capability to allow for us to safely and effectively execute mission requirements," he says.

The minimum requirements included being in business for at least five years, being licensed for the applicable construction discipline, and having a safety record that meets certain Occupational Safety and Health Administration requirements, Devin says.



UNDER CONSTRUCTION — A crew from Summit Construction Co. of Albuquerque works on a project in Bldg. 895. Summit is one of 14 New Mexico companies chosen to provide construction work at Sandia in the coming years.

While much of the construction at Sandia falls under the partnership agreements, there are many other types of construction work that companies can bid on, often found on the Labs' Business Opportunities website. Such projects include maintenance, demolition, and large-scale construction projects. Partnership subcontractors are listed on Sandia's website and may be contacted for potential subcontracting opportunities.

"The construction partnerships are a strategic sourcing plan to ensure that construction projects at Sandia will be procured and executed as quickly, efficiently, and safely as possible," Krista says. "We also want to ensure there are as many opportunities as possible for companies that want to work with Sandia."

Mechanical engineering society elects fellows from Sandia

By Kristen Meub

Fellows of the American Society of Mechanical Engineers make up only 3.1 percent of ASME's 107,895 members. Sandia engineers Cliff Ho, Hy Tran, and Kevin Dowding now are members of that elite group. Election as a fellow "recognizes exceptional engineering achievements and contributions to the engineering profession," according to the organization.

Cliff Ho: innovating in solar, water, and environmental research

Cliff Ho (8823) recently led a team that developed the world's first high-temperature falling particle receiver system for concentrating solar power. Cliff's work helped improve concentrating solar power performance and capabilities while lowering the cost for the large-scale source of clean energy. His falling particle receiver won an R&D 100 award in 2016. He won another R&D 100 award earlier in his career for a tool that mitigates hazardous glare from solar panels and was adopted by the Federal Aviation Administration and Department of Defense to improve safety near airports and military sites.

CLIFF HO

Cliff led several water programs sponsored by the Department of Energy and the Environmental Protection Agency to ensure safe and sustainable water supplies, including the US Central Regional Workshop to examine the energy-water nexus. He led research in water treatment and distribution security, including ultraviolet disinfection and modeling to predict how contaminants would move through water distribution networks, and he developed microchemical sensors to monitor environmental contaminants in wells. Cliff also led a large project to develop modeling for subsurface heat and fluid flow for nuclear waste management, and his approach has been broadly used for a variety of energy and environmental applications.

Cliff received his master's and doctorate in mechanical engineering from the University of California, Berkeley and his bachelor's from the University of Wisconsin. He received the National Asian American Engineer of the Year award in 2010, holds 10 patents, has published two books and serves as the associate editor for the *Solar Energy Journal*. He was an adjunct professor at the University of New Mexico from 1996 to 2003 and received the university's Outstanding Professor Award in 1997.

Hy Tran: calibrating with nanoscale accuracy

Hy Tran (2500) provides technical leadership for all dimensional, force, and mass measurement science (metrology) with the DOE and NNSA enterprise. He has improved the accuracy of high fidelity measurements and standards needed for high-reliability nuclear weapons components through innovative statistical modeling. He has expanded the research done at Sandia's Primary Standards Laboratory, and his leadership in measurement science outreach and education through professional organizations has helped expand ASME's role in metrology.

HY TRAN

Hy won an R&D 100 award for a three-dimensional micro-machined calibration reference standard that improves measurement accuracy in Mesoscale Measurement Machines used for high-volume parts manufacturing. His calibration reference standard is 10 times more accurate and less expensive than its predecessor, and can be used in the manufacture of miniaturized devices such as fuel injectors, watch components, and inkjet printers.

Hy received his doctorate and master's degrees in mechanical engineering from Stanford University, and holds bachelor's degrees in life sciences and mechanical engineering from MIT. He performs educational outreach through his involvement with the Accreditation Board for Engineering and Technology and serves as the vice president for learning and development for the National Conference of Standards Laboratories International.

Kevin Dowding: computational modeling for national security

Kevin Dowding (1544) has made significant technical and leadership contributions to national security by developing computational modeling for nuclear weapon design. He has served as the technical lead to integrate computational modeling for the design and qualification of Sandia's B61 life extension program and pioneered computational approaches for understanding and measuring margins and uncertainty in abnormal thermal environments.

KEVIN DOWDING

Kevin is a founding member and co-author of the verification and validation standard released by the ASME Committee for Verification and Validation of Computational Fluid Dynamics and Heat Transfer. He has been a reviewer for more than 10 journals and the National Science Foundation. He earned his bachelor's, master's, and doctorate in mechanical engineering from Michigan State University.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong


George Wagner
40 6815


Arlen Weishuhn
40 5865


Larry Arellano
35 10735


Wahid Hermina
35 1850


Liz Huffman
35 1819


Terry MacDonald
35 8882


Bob Mata
35 6620


Rosemae McKillip
35 10666


Tom Brown
30 9411


Paul Claassen
30 5358


Eric Detlefs
30 2545


Jake Deuel
30 6532


Brad Mickelsen
30 2170

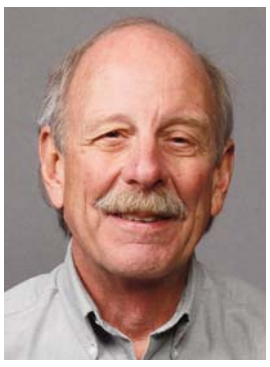

Susan McRee
30 9328


Brad Parks
30 6630


Jim Stromberg
30 9354


Lane Yarrington
30 5852


Tom Wubbels
30 10769


Albert Bendure
25 632


Russ Clark
25 10762


Richard Garcia
25 3522


Elaine Martinez
25 6362


Rico Ortiz
25 4824


Camille Reyes
25 4856


Piaboon Tangyunyong
25 5255


Larry Varoz
25 9412


Mark Wong
25 632


Ana Luisa Barraza
20 10223


Lora Bonano
20 8872


Matthew Brito
20 4877

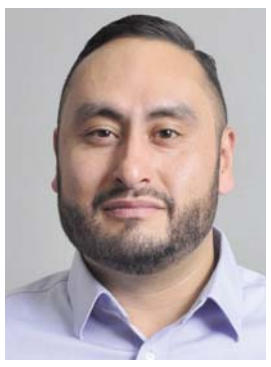

Jeremy Giron
20 2623


Lilly Ingham-Hill
20 6792


Darryl Melander
20 9365


Jeanne Torres
20 4255


Doug White
20 6784


Bobby Butler
15 8872


Annie Casias
15 10656


Marcus Chang
15 9360


Jason Crenshaw
15 10777


Smitha Gianoulakis
15 10779

SANDIA CLASSIFIED ADS

MISCELLANEOUS

'DIRTY DANCING' TICKETS, 2, Popejoy, June 17, 8:30 p.m., orchestra, aisle, row M, donor lounge access, $125. Bickes, 271-2581.

DIGITAL PIANO, Yamaha CLP-525 Clavinova, polished ebony, excellent condition, $1,250. Hamlet, 505-331-7633.

DOWNSIZING, furniture & more, living room, dining room, bdr. & misc., call for details. Pelletier, 884-3726.

WEIGHT MACHINE, Pacific Fitness Newport, bench press, pulldown, leg extension, etc., $350; free-standing pull-up tower, $60. Rivera, 505-280-7742.

STEEL AMMO CANS, authentic US military, model PA120, good seals, 18.76 x 6.38 x 10.39, $20 ea. Myers, 505-908-7887.

BLACKSMITH STANDING VISE, antique, heavy-duty, $400; Ford longbed red camper shell, sliding windows, $350. Schroeder, 917-4516.

LILY TOMLIN TICKETS, Popejoy, Sat., Sept. 23, orchestra level, aisle & adjacent seat, $45 ea. Witt, 505-991-1878.

COWBOYS TICKETS, 2, home games, sec. 454, row 3, seats 1 & 2, $300/pair. McCandless, 553-5281, ask for Suzanna.

MEN'S MASONIC GOLD RINGS, 2, 1 w/European-cut 1-carat diamond, other w/cubic zirconia, will consider selling diamond separately, consider offers. Kovarik, 897-2188.

VACATION WEEK, in the Rockies, Winter Park CO, starts July 28, sleeps 6, no pets, $600. Buck, 353-2667.

LEA LOFT BED, twin, white, no mattress, w/assembly instructions, $300. Vrooman, 505-249-5592.

SECTIONAL, Ashley, w/ottoman, large, grey, brand new, $1,750. Ochoa, 575-202-1393.

KOI, ~12, ranging in size, must arrange for pick-up & transport, free. Creange, 710-7517.

SPEAKERS, Kenwood, 3-way, 25" x 15" x 13", can handle high volume, excellent condition, $100/pair. Alsup, 235-0599.

GLASS: panels, small pcs., scraps, for stained glass projects, 3 boxes, $30. Brown, 366-1505.

'06 DRZ400S PARTS/GEAR: Givi V46, $140; WR250W/X skid-plate, $50; HP CV41, $80; photos & prices at http://www.smugmug.com/gallery/n-hvZWG. Yazzie, 505-449-8086.

DINING/GAME TABLE, w/leaf, round, 40-in. diameter, pedestal, Formica top, walnut base, 4 chairs, $375. Durkee, 255-4211.

C4 SLEEP NUMBER BED, California King, wireless remote, 3-in. memory foam, no frame, $1,000 OBO. Brown, 823-9155.

'DIRTY DANCING' TICKETS, 2, Popejoy, June 18, retail $110, asking $100 OBO. Dayile, 505-980-5460.

TRANSPORTATION

'14 CHRYSLER TOWN & COUNTRY MINIVAN, 7-passenger, leather, AM/FM/CD/DVD, satellite, Bluetooth, 25-27-mpg, 71K miles, $17,000 OBO. Babb, 228-5225.

'06 HONDA CIVIC EX, 2-dr., 4-cyl., white, sunroof, new tires, 137K miles, good condition, $3,500. Clary, 505-934-4579.

'13 NISSAN ALTIMA 2.5SV, 4-cyl., convenience pkg., moonroof, tan, 38-mpg, 52K miles, nice, $10,000. Ritterbush, 298-0802.

'00 FORD RANGER SUPERCAB, XLT pkg., 1/2-ton, V6, 2-dr., 5-spd., bedliner, trailer hitch, 200K miles, rebuilt engine '15, $3,500. Crosby, 260-1070.

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.

'06 HUMMER H3, adult driven, new BFG KO2 tires, tow pkg., 85K miles, excellent condition, reliable, $15,900. Burr, 505-293-2588.

'78 MG MIDGET, British green, excellent paint, no rust, 92K miles, runs great, $4,000. Luehring, 505-321-5917.

'16 CHEVROLET TAHOE LTZ, 4WD, w/every option, 14K miles, excellent condition, $57,000 OBO. Fleming, 505-263-7570.

'08 HONDA ACCORD COUPE EX-L, V6 engine, gray, brand new tires & brakes, 68K miles, $9,000. Hymel, 505-228-1723.

'06 FORD F350, dually, crew cab, diesel 6.0L, 4WD, long bed, 124K miles, $15,500. Reynolds, 505-507-8057.

RECREATION

'08 HONDA SHADOW SPIRIT, 750 cc, belt-drive, top case, throttle lock, extras, 9.3K miles, excellent condition, $3,000. Zeuch, 505-300-4655.

'14 HONDA FORZA SCOOTER, 300 cc, 75-mpg, 5,433 miles, see photos on Craigslist, $3,200. Spletzer, 228-4384.

'01 NEWMAR MOUNTAINAIRE, 41-ft., diesel pusher, dual slides, 95K miles, great condition, easy driving, $48,000. Kennicott, 505-259-0826.

INFLATABLE KAYAK, Aire Sawtooth, reinforced bottom, new side bladders, 2 seats, foot pump, excellent condition, $450. Manko, 412-719-2766.

'05 DURANGO 5TH WHEEL, 28-ft., 1 slideout, great condition, $12,000. Shelland, 980-2357, call or text

REAL ESTATE

VACANT LAND, Tome NM, near Tome Hill & UNM extension, $40,000/acre, owner will negotiate price. Ramos, 304-593-3425 or 304-561-5612.

2-ACRE BLDG. LOT, Sandia Park, gorgeous, fenced, electric & phone, ready-to-build, owner finance, $120,000. Mihalik, 281-1306.

3-BDR. HOME, 2 baths, 1,800+-sq. ft., 2-car garage, w/custom cabinets, Four Hills, solar panel, open concept, fully remodeled, $275,000. Newell, 331-0187, ask for Pania or Robert.

3-BDR. HOME, 2 baths, 2,000-sq. ft., custom built in '08, gated community, low maintenance, Vista Del Norte, $350,000. Rosales, 505-550-5550.

4-BDR. HOME, 2-3/4 baths, NE Heights, well-maintained, good condition, $165,000. Mozley, 884-3453.

3-BDR. HOME, 2 baths, 1,641-sq. ft., updated throughout, move-in ready, awesome Taylor Ranch neighborhood, MLS#888560, $199,900. Angus, 505-261-1334, ask for James.

WANTED

NEW MEMBERS, Optimist Club of Albuquerque, optimists bring out the best in youth, our communities & ourselves. Trussell, 280-4509, ask for Fred.

SMALL FEMALE ADULT DOG, fixed, chipped, housebroken, 11-yr.-old Pekingese needs new friend. Andreoni, 505-400-9563, text.

Mileposts

New Mexico photos by Michelle Fleming

California photos by Randy Wong


Louis Griego
15 10620


Corey Hensley
15 2252


Dann Jernigan
15 1533


Carlo Juarez
15 2244


Susan Wilson
15 6368

Recent Retirees

New Mexico photos by Michelle Fleming

California photos by Randy Wong


Mary Anne Heise
40 10627


Ken Lee
40 8231


Mike Hightower
38 6614


James Miller
35 1815


Randy Shibata
30 10247

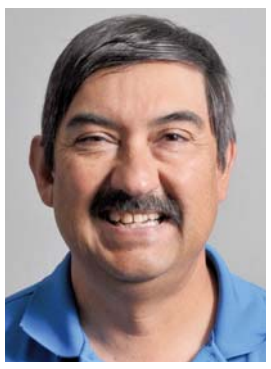

Irene Kolb
27 2992

Bill Kolb
34 6123


Pamm St. John
23 8233


Marisela Sanchez
20 10668


Joe Rudys
18 1353


Javier Chavez
4 5246

Sandia celebrates Asian Pacific Islander American Heritage Month

Photos by Lin Zheng

Almost 600 Sandians, friends, families, and members of the community came out to the National Museum of Nuclear Science and History earlier this month to celebrate Asian Pacific Islander American Heritage Month.

After welcoming remarks from Museum Director Jim Walther and Esther Hernandez, Sandia's Chief Diversity Officer, attendees were treated to dances and demonstrations by several Albuquerque-based troupes and organizations, including a lion dance, a Polynesian dance, Taiko drumming, a children's dance, Mongolian dance and singing, a martial arts demonstration, food sampling, origami, floral arranging, and more.

The event was sponsored by Sandia's Asian Leadership & Outreach Committee (ALOC), Talin Market, and Chopstix Chinese Cuisine. Vendors included the Asian Family Center, Ikebana International Chapter 41, Japan America Society of NM Inc., Ichiyo School of Ikebana – Albuquerque Chapter, the New Mexico Chinese School of Arts & Language, and Kimo's Hawaiian BBQ Food Truck.

The planning committee included Tim Crofton, Shivonne Haniff (5421), Jennifer Hayden, Ung Tae Jeong (9358), Tian Ma (6321), Claudia Madrid, Tammy Strickland (9352) (ALOC chair), and Lili Xiao (5355).

Sandians observe National Day of Prayer

More than 400 Sandians and others from across Kirtland Air Force Base participated in a National Day of Prayer gathering at the Steve Schiff Auditorium. The event was sponsored by Sandia's Christians in the Workplace Networking Group in partnership with the Kirtland Air Force Base (KAFB) chaplain's office.

Prayer leads for the day included Executive Pastor David Eiffert of the Believers' Center of Albuquerque, retired Albuquerque police officer Adam Garcia, KAFB Wing Chaplain Lt. Col. Darren Duncan, and Sandian Cindy Fulcher.

Other attendees included Labs Director Steve Younger; Associate Labs Director, Infrastructure Operations John Clymo; Associate Labs Director, Mission Assurance Mark Sellers; Senior Director, Human Resources and Communications John Myers; Airman First Class Calan Lamberti, 377th Weapons Systems Security Squadron; the KAFB Honor Guard; and God's House Choir. (Photos by TSgt. Oneika Banks, USAF, 377 Air Base Wing Public Affairs)