

Diamonds Aren't Forever

Sandia, Harvard team create first quantum computer bridge

By Neal Singer

By forcefully embedding two silicon atoms in a diamond matrix, Sandia researchers have demonstrated for the first time on a single chip all the components needed to create a quantum bridge to link quantum computers together.

“People have already built small quantum computers,” says Ryan Camacho (1131). “Maybe the first useful one won’t be a single giant quantum computer but a connected cluster of small ones.”

Distributing quantum information on a bridge, or network, could also enable novel forms of quantum sensing, since quantum correlations allow all the atoms in the network to behave as though they were one single atom.

The joint work with Harvard University used a focused ion beam implanter at Sandia’s Ion Beam Laboratory designed for blasting single ions into precise locations on a diamond substrate. Sandia researchers Ed Bielejec (1111), Jose Pacheco (1513), and Daniel Perry (1111) used implantation to replace one carbon atom of the diamond with the larger silicon atom, which causes

(Continued on Page 4)

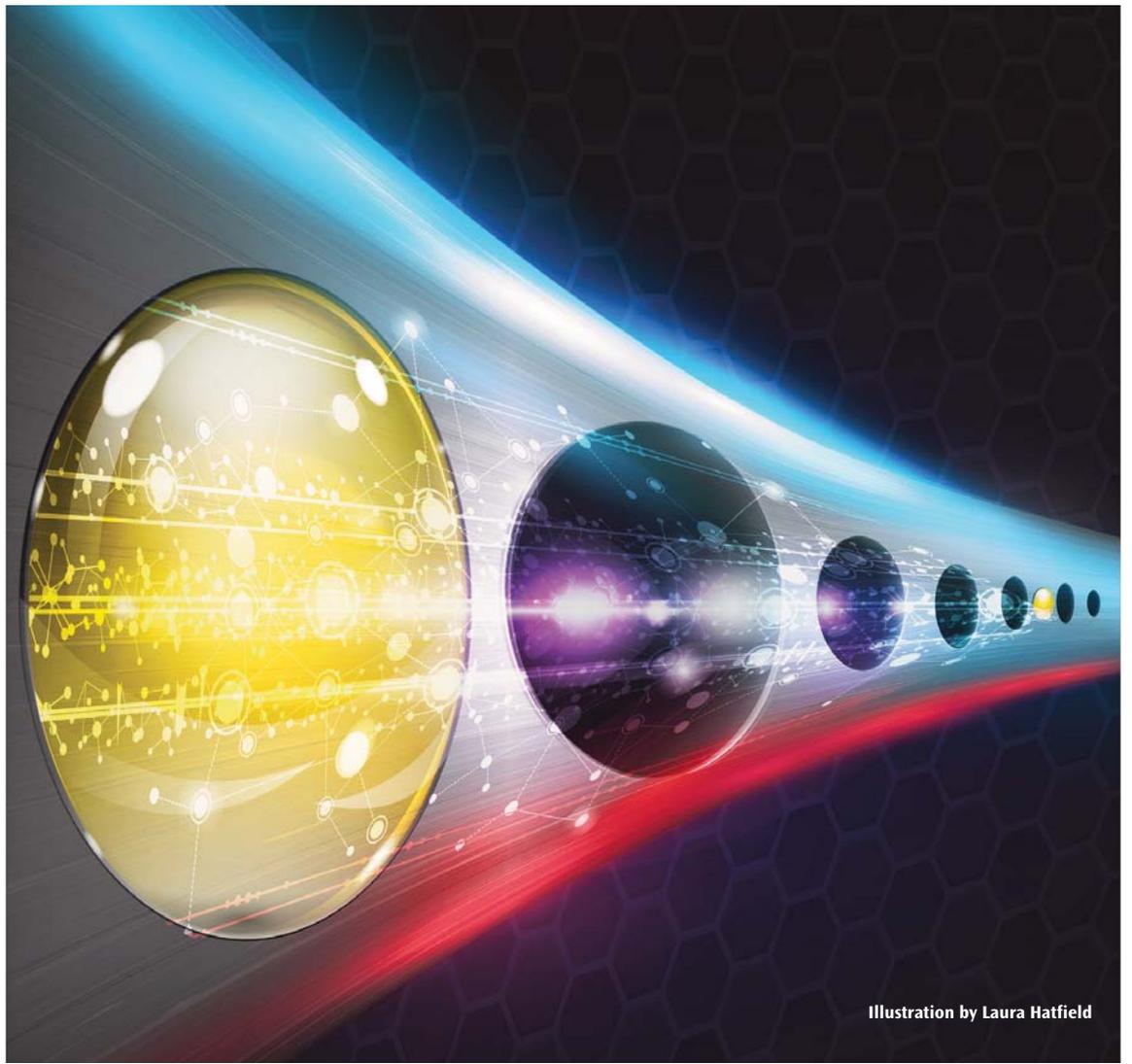


Illustration by Laura Hatfield

THIS STYLIZED ILLUSTRATION of a quantum bridge shows an array of holes etched in diamond with two silicon atoms placed between the holes.

‘We need to be both smart and good’

Jill Hruby addresses career options at nuclear issues conference



About 50 young nuclear scholars and professionals, joined by staff from Sandia and other national laboratories, came to Albuquerque from across the nation and overseas this month to discuss a broad swath of global issues and hear from President and Laboratories Director Jill Hruby and Deputy Labs Director and Executive VP for National Security Programs Steve Rottler.

Jill welcomed attendees at the conference of the Project on Nuclear Issues outlining the breadth of Sandia’s work and urging conferees to value intellectual openness, develop strength of character, and — like Sandians — “think ahead to technologies that will stand the test of time.”

The policy research organization Center for Strategic and International Studies launched PONI in 2003 to develop the next generation of policy, technical, and operational nuclear professionals through outreach, mentorship, research, and debate. Sandia

(Continued on page 4)

IN WELCOMING REMARKS at the Project on Nuclear Issues Fall Conference, Labs Director Jill Hruby challenged attendees — mostly young nuclear scholars and professionals — to “think ahead to technologies that will stand the test of time.” (Photo by Randy Montoya)



License agreement signed to use SpinDx technology in drug analysis. Page 3.



Sandia B-61 team wins Lockheed Martin Nova Award. Page 12.

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Sandia evaluates if computational neuroscientists are on track. Page 5.

That's that

I grew up in the era that birthed the phrase “idiot box” in reference to television. Also, it was at that time that then-Federal Communications Commission Chairman Newton Minow lambasted network television honchos in a famous speech in which he derided their product as “a vast wasteland.” (Sidebar: In the hit TV show *Gilligan's Island*, which seemed to epitomize everything Minow hated but that audiences loved, the *SS Minnow* was named in “honor” of the FCC chair, the ultimate thumb in his eye.)

As a kid with literary pretensions and a not-small dose of (surely misplaced) intellectual elitism, the indictments of America's real national pastime – television watching – struck a chord.

When my wife and I were married, she was more or less on the same page as me. We agreed that in our household we wouldn't have one of *those* – televisions, that is. It was a happy home in those salad days: walks at night along the waterfront in coastal Maine, checking out the boats at the public landing, Sunday afternoons exploring off-the-beaten-path Down East towns.

Then a funny thing happened: I started hearing about this PBS show called *Cosmos*. It was hosted by a curiously engaging guy called Carl Sagan. All of a sudden he seemed to be everywhere and *Cosmos* was the It thing around 1980 or so. For the very first time, I felt like I wanted to be part of the conversation about a television program. I had to check it out. And that meant – yep – getting a TV.

We became hooked – like so many millions of others – on *Cosmos* and I became a huge Carl Sagan fan. I watched his TV show, devoured his books, and made a point of staying up late to watch the *Tonight Show* whenever the brilliant Johnny Carson had him as a guest, which was often. All of a sudden the “idiot box” rap seemed not only unfair, but inaccurate. *Cosmos* was smart, accessible television that was both elevating and entertaining.

Carl Sagan died in 1996 at the far-too-young age of 62 but his influence abides. I suspect his preference would be to be remembered for his consequential research and his efforts to influence public policy in areas that mattered to him, but inevitably his indelible mark will be in his role as an educator/communicator and his efforts to address what he considered a very dangerous trend. As he put it: “We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology.” Only an informed citizenry, he believed, was capable of making smart decisions about the role of science and technology in civic life.

To remember him and his work, NNSA is celebrating Carl Sagan Day on Nov. 9 (his birthday) with a social media campaign. Sandia will be right in the thick of it, sharing on the Labs' Facebook and Twitter sites thoughts from Sandia researchers who were inspired to pursue STEM careers thanks to Sagan.

Sagan understood that science is a way of thinking much more than a body of facts. Not that facts didn't matter to him. They mattered supremely. In his last book, *The Demon-Haunted World*, Sagan offered up what he politely called a “Baloney Detector Kit” to help readers determine whether an assertion should be accepted as fact. Here are a few of the tools in the kit:

- Wherever possible there must be independent confirmation of the “facts.”
- Encourage substantive debate on the evidence by knowledgeable proponents of all points of view.
- Arguments from authority carry little weight – “authorities” have made mistakes in the past. They will do so again in the future. . . . [I]n science there are no authorities; at most, there are experts.
- Spin more than one hypothesis. If there's something to be explained, think of all the different ways in which it could be explained. Then think of tests by which you might systematically disprove each of the alternatives. What survives, the hypothesis that resists disproof in this Darwinian selection among “multiple working hypotheses,” has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.
- If there's a chain of argument, every link in the chain must work (including the premise) – not just most of them.

(You can read more online; just look up Sagan's Baloney Detector Kit.) What made Sagan so compelling and charismatic a figure was his healthy skepticism – it was he who said “Extraordinary claims require extraordinary evidence” – and his boundless capacity for wonder. He once said, “Somewhere, something incredible is waiting to be known.” I'm glad I got to know him, thanks to that used, staticky TV we bought back in 1980. Oh, my wife and I still took moonlit walks by the waterfront, but we often talked about *Cosmos* when we did.

See you next time.

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

Master Research Agreement

Sandia, University of Akron to collaborate in materials science

By Sue Major Holmes



The University of Akron

Sandia and the University of Akron have signed a Master Research Agreement to work together in additive manufacturing, advanced materials research, and related areas.

Sandia will work principally with the university's College of Polymer Science and Polymer Engineering, which includes polymer chemistry and polymer physics groups and specialized labs for synthesis and measurements.

“The combination of diverse university and Sandia capabilities should improve our knowledge of materials structure, properties, and performance and help expand our processes to produce, transform, and analyze materials.”

— Center 1800 Director Terry Aselage

“The combination of diverse university and Sandia capabilities should improve our knowledge of materials structure, properties, and performance and help expand our processes to produce, transform, and analyze materials,” says Center 1800 Director Terry Aselage. “Further, we anticipate access to more than 350 polymer science and engineering students and postdocs will foster a strong hiring pipeline for organic chemistry and polymer science and engineering research staff.”

The agreement will allow Sandia and University of Akron researchers to work together in such areas as carbon nanomaterials and conjugated polymer developments; understanding the role of adhesion, friction, and wear play in coatings, lubricants, and adhesives to help develop novel materials; and studying biomimicry with the goal of creating advanced adhesives for engineering applications and biological adhesives and developing technologies, such as carbon nanotube-based coatings to reduce drag or inhibit ice formation. It also establishes a framework for managing intellectual property that may be developed during the collaborations.

“Together we will collaborate to develop new scientific insights and material innovations to benefit the Laboratories' missions and the materials research community,” says senior manager Mike Valley (1810). For example, the university's research into aging effects, such as radiation damage to polymers, will augment Sandia's research on the aging of materials.

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2017 Open Enrollment • See pages 6-7

Open Enrollment is your annual opportunity to review and update your benefit elections.



- Active Employees: Oct. 31-Nov. 17
- PreMedicare Retirees: Oct. 15-Nov. 18
- Medicare Retirees: Oct. 15-Dec. 7

More info on pages 6-7 of this issue.

Or check out hbe.sandia.gov.

You are invited

The 2016 Operational Innovation

RECOGNITION Ceremony

November 9, 9-10:30 a.m.
Bldg. 810 Auditorium

Hosted by Group 710 (Operational Innovation) to recognize the teams and individuals who have contributed to capturing, evaluating, sharing, and reporting on efficiencies at SNL during FY16.



Questions? Contact the OI Team at: Olteam@sandia.gov

SHARE

Giving Campaign Kick-off

By Rebecca Brock

Photos by Randy Wong

Soaring above expectations with a superhero theme, “Anyone Can Be a Hero,” the 2016 SHARE (Sandia Helps and Reaches Everyone) giving campaign drew hundreds of employees from Sandia/California for the site-wide event Oct. 11 at GAA Event Pad. Employees enjoyed music and street tacos with colleagues, along with donation drives for warm coats and canned food, raffles, and a silent auction featuring gift baskets from various Sandia/California departments to benefit those less fortunate.

Div. 8000 VP Marianne Walck kicked off the event, saying, “The SHARE campaign is a great demonstration of our commitment to community well-being by making charitable contributions through United Way. We want to thank you for your continued support for the community and for Sandia/California.”

SHARE Chair Gayle Thayer (8959) says, “The event was outstanding with an excellent staff turnout, a successful auction to benefit the Make-A-Wish foundation, terrific tacos, and beautiful weather. The dedication and experience of the core planning team showed with the event running so smoothly.”

Community Involvement officer Madeline Burchard (8524) led the planning for the fundraising event along with a team of Sandia volunteers from various centers.

“The SHARE campaign encourages people to give in at least one of three ways — time, treasure, and talent. We believe that no matter who you are or what you have, you can be a superhero for others in your community,” says Madeline.

The dual purpose of the event was to celebrate the success of the 2015 SHARE campaign, which raised \$200,000 for nonprofits, and to encourage employees to enroll in charitable payroll deductions.



Sandia inks license agreement with Lifeloc to develop drug abuse technology

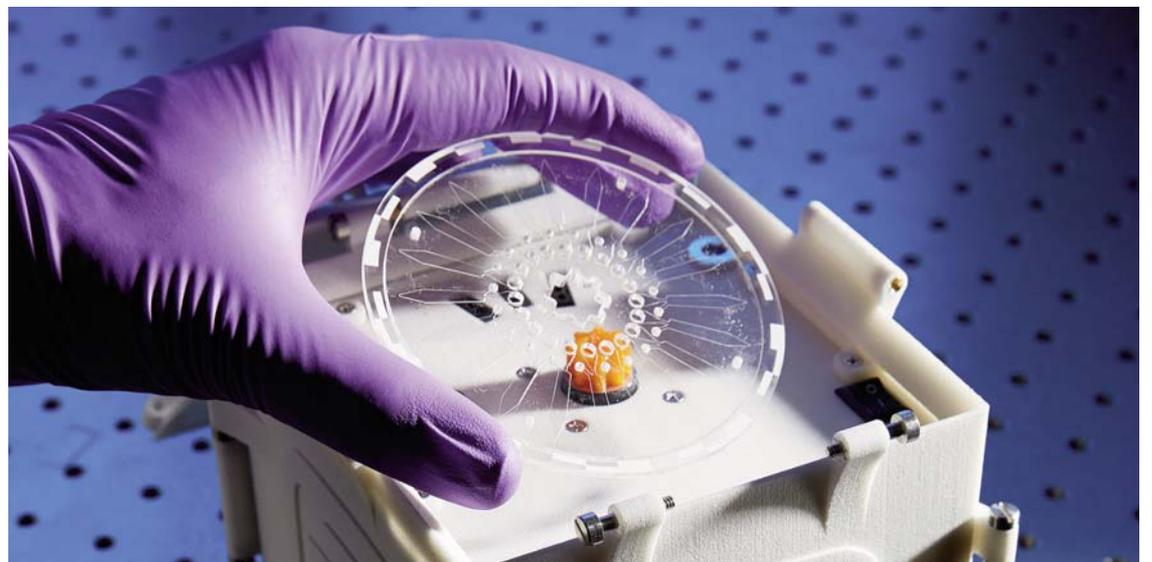
Sandia has signed a licensing agreement with Lifeloc Technologies Inc. that will allow the manufacturer to develop and market Sandia’s patented SpinDx technology to detect drug abuse.

SpinDx uses a centrifugal disk with microfluidic flow paths that allows multiple tests to be carried out on a single, small sample. This technology, sometimes referred to as “lab on a disk,” could be used to develop devices and tests for roadside, emergency room, and workplace environments to rapidly and quantitatively detect a panel of drugs of abuse.

“SpinDx can run multiple assays in a minute from a single drop of blood or other bodily fluid, making it a great fit in Lifeloc Technologies’ work in helping to detect drug abuse,” says Anup Singh (8600), director of Sandia’s Biological and Materials Sciences Center. “SpinDx has broad application beyond detection of drugs of abuse to food and water safety, medical diagnostics, and bio-agent detection.”

Lifeloc Technologies manufactures and exports breath alcohol testers and related training and supplies for workplace, law enforcement, corrections, and international customers.

Lifeloc CEO Wayne Willkomm says the license agreement is a great way for Lifeloc to leverage Sandia’s technical resources to advance SpinDx to development and ultimately into commercialization.



“As marijuana legalization spreads across the country and the world, the need to get rapid and reliable testing methods to law enforcement officers will only increase,” Willkomm says. “Providing this technology is consistent with Lifeloc’s corporate mission to make our roads and workplaces safer.”

This technology began with Sandia’s basic research

to develop devices to rapidly identify trace levels of biotoxins to combat terrorism. It has been advanced to drugs of abuse through years of work under a cooperative research and development agreement between Lifeloc and Sandia. Feasibility of detection has already been demonstrated for very low levels of delta-9-THC, cocaine, and methamphetamine.

Conference

(Continued from page 1)

has hosted two previous PONI conferences.

Careers in support of the nation's nuclear weapons program are rewarding, Jill told attendees, noting that Sandia has been fortunate to see a "wave of incredibly



"It takes commitment. It takes curiosity. It takes willingness to be open and honest in a way that very few other careers do in national security."

— Labs Director Jill Hruby

talented young people coming through" — nearly a third of the staff over the past five years.

When she joined Sandia in 1983, Jill said, Mutually Assured Destruction and nuclear winter dominated the debate, and she soon got a chance to work on the highly sophisticated W84 warhead. Since then she's seen support for the Labs' primary mission wax and wane, leading to the current modernization program, the largest set of weapons activities for Sandia



PANEL MEMBERS at the Fall Conference of the Project on Nuclear Issues in Albuquerque lead a discussion on "The Future of Deterrence." (Photo by Randy Montoya)

Diamonds

(Continued from page 1)

the two carbon atoms on either side of the silicon atom to feel crowded enough to flee. That leaves the silicon atom a kind of large landowner, buffered against stray electrical currents by the neighboring non-conducting vacancies.

Though the silicon atoms are embedded in a solid, they behave as though floating in a gas, and therefore their electrons' response to quantum stimuli are not clouded by unwanted interactions with other matter.

"What we've done is implant the silicon atoms exactly where we want them," says Ryan. "We can create thousands of implanted locations that all yield working quantum devices because we plant the atoms well below the surface of the substrate and anneal them in place. Before this, researchers had to search for emitter atoms among about a thousand randomly

CSIS

CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

A brief history of CSIS

The Washington, D.C., based Center for Strategic and International Studies sponsors the Project on Nuclear Issues, among many other vital public policy-focused initiatives.

At the height of the Cold War in 1962, Adm. Arleigh Burke and David Abshire founded the Center for Strategic Studies at Georgetown University in Washington, D.C. The institution was dedicated to the simple but urgent goal of finding ways for the United States to survive as a nation and prosper as a people.

Since its founding, CSIS has been at the forefront of solutions to the vexing foreign policy and national security problems of the day. In 1966, CSIS research triggered House hearings on the watershed Sino-Soviet split. In 1978, CSIS convened the first public hearing on Capitol Hill on the Cambodian genocide, sparking major changes in congressional and executive branch perceptions of the tragedy.

In 1985, a CSIS panel led to the Goldwater-Nichols legislation to reform the Defense Department and Joint Chiefs of Staff. In 1998, it was a report from a CSIS retirement commission that became the bipartisan benchmark of the Social Security reform debate. In 2007, the CSIS Smart Power Commission provided a diagnosis of America's declining standing in the world and offered a set of recommendations for a smart power approach to America's global engagement. These are but a few of the highlights.

Today, CSIS is one of the world's preeminent public policy institutions on foreign policy and national security issues. An independent not-for-profit organization since 1987, CSIS marked its first half-century of existence by moving into a new state-of-the-art headquarters in downtown Washington, D.C.

With its traditional defense and security programs, initiatives focused on global challenges such as health and energy, and research projects dedicated to every corner of the globe, CSIS is well positioned for another 50 years of providing strategic insights and policy solutions to the world's decisionmakers.

in the past 25 years.

Maintaining a viable stockpile can be frustrating for engineers, whose character is to make things happen, she said. "You have to believe that nuclear weapons are deterrents to be in this business."

Jill encouraged conferees at this early stage in their careers to develop an intellectual respect for the views of their colleagues and those outside the nuclear community, as well as strength of character, saying, "We need to be perceived as both smart and good."

"It takes commitment. It takes curiosity. It takes willingness to be open and honest in a way that very few other careers do in national security," Jill said.

In his keynote address to attendees, Steve related personal stories to illustrate the value of hands-on work on the nation's nuclear deterrent for those "dedicated to serving something bigger than oneself."

"I was part of the last generation to see underground testing," Steve said. While acknowledging the tests as remarkable instances of large-scale engineering, he emphasized that Sandia's ability to study and simulate the entire spectrum of weapon conditions goes far beyond what he ever thought possible.

"In some cases, our capabilities allow us to simulate with greater fidelity than testing underground," he said.

Sandia's efforts to attract its next generation have succeeded, Steve said, emphasizing the importance of providing challenging work and opportunities such as the Weapon Intern Program.

"They've been exposed to way more things than we were," Steve said, adding that he frequently praises the technical talent and initiative



"They've been exposed to way more things than we were . . . It's so important to put the new hires to work on important problems right away."

— Executive VP Steve Rottler

of newer employees to the veterans of Sandia's weapons program. "It's so important to put the new hires to work on important problems right away."

Steve expressed hope that some of the early-career PONI conference attendees might live long enough to see a world without nuclear weapons, but until then, maintaining the safety, security, and effectiveness of the stockpile will remain an excellent way to build a career based on national service.

"Each of you has an opportunity to make a profound impact on national and global security," he said. "There are many ways to serve."

"We can create thousands of implanted locations that all yield working quantum devices because we plant the atoms well below the surface of the substrate and anneal them in place."

— Researcher Ryan Camacho

occurring defects — that is, non-carbon atoms — in a diamond substrate of a few microns to find even one that emitted strongly enough to be useful at the single photon level."

Once the silicon atoms are settled in the diamond substrate, laser-generated photons bump silicon electrons into their next higher atomic energy state; when the electrons return to the lower energy state, because all things seek the lowest possible energy level, they

spit out quantized photons that carry information through their frequency, intensity, and the polarization of their wave.

"Harvard researchers performed that experiment, as well as the optical and quantum measurements," says Ryan. "We did the novel device fabrication and came up with a clever way to count exactly how many ions are implanted into the diamond substrate."

At the Center for Integrated Nanotechnologies (CINT), Sandia researcher John Abraham (1111) and other Sandia researchers developed special detectors — metal films atop the diamond substrate — that showed the ion beam implants were successful by measuring the signal produced by single ions.

"Pretty cool, huh?" says Ryan.

The journal *Science* thought so. The work was published last week (Oct. 14).

The research was supported by Sandia's Laboratory Directed Research and Development program. CINT is a DOE Office of Basic Energy Sciences nanoscale science research center operated as a national user facility by Los Alamos and Sandia national laboratories.



COMPUTATIONAL NEUROSCIENTIST FRANCES CHANCE (far left), the primary investigator for the MICrONS program, examines a sample computer-generated object with her team (left to right) Tim Shead, Warren Davis, Kim Pfeiffer, Craig Vineyard, and Brad Aimone. Sandia is serving as a referee for the IARPA's MICrONS program. (Photo by Randy Montoya)

Brain games and tests

Sandia evaluates if computational neuroscientists are on track

By Mollie Rappe

Advanced computers may have beaten experts in chess and Go, but humans still excel at “one of these things is not like the others.”

Even toddlers excel at generalization, extrapolation, and pattern recognition. But a computer algorithm trained only on pictures of red apples can't recognize that a green apple is still an apple.

Now, a five-year effort to map, understand, and mathematically re-create visual processing in the brain aims to close the computer-human gap in object recognition. Sandia is refereeing the brain-replication work of three university-led teams.

The Intelligence Advanced Research Projects Activity (IARPA) — the intelligence community's version of DARPA — this year launched the Machine Intelligence from Cortical Networks (MICrONS) project, part of President Obama's BRAIN Initiative.

Three teams will map the complex circuitry in the visual cortex. This portion of the brain receives visual input from the eyes and makes sense of it. By understanding how our brains see patterns and classify objects, researchers hope to improve how computer algorithms do this. Such advancements could improve how Facebook recognizes faces, help find patterns in huge data sets, and even have national security and intelligence applications.

The three university teams involved in the challenge include Carnegie Mellon University and the Wyss Institute for Biologically Inspired Engineering at Harvard University; Harvard University; and Baylor College of Medicine, the Allen Institute for Brain Science, and Princeton University.

Researchers from the Cyber Engineering Research Laboratory led by Frances Chance (1462), a computational neuroscientist, will test the resulting algorithms and evaluate whether they are on the right path.

“Research in neuroscience is a new area for Sandia, with potential to contribute to new scientific discoveries and mission needs in signal processing, high-consequence decision making, low-power high-performance computing, and auto-associative memory,” says John Wagner (1462), cognitive sciences manager at Sandia.

From neural networks to theoretical models to artificial intelligence

The teams each will use different techniques to map the network of interconnecting neurons that makes up the visual cortex. They'll take those network maps and generate new models of how the brain works. And from the models they hope to create vastly superior computer algorithms for object recognition.

“What is nice about the way the MICrONS program has been structured is that it is a beginning-to-end path. It goes from very basic neuroscience — anatomy at the nanometer and micrometer level — moving up into functional behavior of neural circuits in vivo, to theoretical models of how the brain works, and then machine learning models to do real-world applications. It's the ideal of what brain-inspired algorithms should be, but it's rarely done like this,” says Brad Aimone (1462), a computational neuroscientist.

Brad and his group will evaluate how much neuroscience the machine learning algorithms incorporate by focusing on the computational neuroscience models. These models are an important intermediate step. Each team will have to consolidate a lot of data into a few key insights. And the model has to be both representative of the brain and inspire advances in computer algorithms, says Brad.

Augmented with a few external experts, Brad's group also will serve as a peer-review panel, comparing the university-led teams' conclusions to what is already known about the brain. This group includes Michael Haass (1461), Christy Warrender (1462), and Fred Rothganger (1462).

Additionally, Brad's group is applying validation and verification approaches such as uncertainty quantification and sensitivity analysis, common in engineering models, to computational neuroscience. A big challenge is that the mathematics needed for even a simplistic explanation of neural networks is amazingly complex. His example neural models can include thousands of different parameters.

Putting artificial intelligence to the test

Sandia also will test the resulting machine learning algorithms. Beginning a year from now, the group will see whether the brain-inspired algorithms actually perform like human brains.

“What's interesting is that you and I would separate objects the same way even though we just met and we've had completely different life experiences. Somehow the way our brain is interacting with the world, we're forming some internal set of rules by which we classify things that we see. And all of us have a similar set of rules in our heads. Would brain-inspired machine learning algorithms automatically separate it the same way?” asks Frances.

Computer scientist Warren Davis (1461) heads the group that will evaluate whether the algorithms can sort images of computer-generated objects in the same manner as humans, termed similarity discrimination. The algorithms get one example and must pick out the other members of the class from thousands of other images.

Computer scientist Tim Shead (1461) is designing the test images according to known human classification rules. His group will also confirm that real people classify the images as expected before the evaluations begin. Also involved in the MICrONS project are project manager Kim Pfeiffer (1720) and computer scientists Kristofor Carlson (1462), Brad Carvey (1461), Jacob Hobbs (6132), Kiran Lakkaraju (1463), Steve Verzi (6132), and Craig Vineyard (1462).

Next, the algorithms will have to sort an array of test images into classes. They will have to sort these images the same way humans do, even though the algorithms have never seen these images before. Finally, at the end of the five years, the teams will pick a difficult, real-world task, like creating captions for photos, which show off their individual algorithm's strengths. The algorithms also will be tested on their ability to recognize objects that have been stretched, rotated, partially hidden, or otherwise modified.

Brad says, “MICrONS is like the Hubble telescope. We're building better tools to see things that we were unable to see before and we're trying to come up with theories to explain what we've observed. Just like Hubble didn't explain everything about the universe, MICrONS isn't going to solve the brain. The hope is that it will tell us something that will make our models better so we could use them to do interesting things. A successful algorithm from MICrONS could be something that Google would want to put it into YouTube or help Netflix make better recommendations.”

Open Enrollment 2017

Open Enrollment is an annual opportunity to review your various benefit elections and make any needed changes or updates

2017 Active Open Enrollment

Open Enrollment is an annual opportunity to review your various benefit elections and make any needed changes or updates. You may also enroll in certain Sandia benefits (medical, dental, vision, flexible spending accounts, etc.) and change dependent enrollments. Sandia is committed to providing you with benefits that promote your health and well-being. If you have any questions about Open Enrollment, contact HBE Customer Service at 844-HBES (4237).

Open Enrollment Dates:

Active Employees: Monday, Oct. 31-Thursday, Nov. 17, 5 p.m. MST

Changes for Employees

The changes listed below are effective Jan. 1, 2017. Details about each plan and the Open Enrollment newsletter can be found at hbe.sandia.gov.

- Sandia Total Health plan premiums are increasing between \$2 and \$22 depending on

health plan and tier level.

- Sandia Total Health will cover Applied Behavioral Analysis (ABA) treatment services for Autism Spectrum Disorder (ASD).
- MTC employees will be able to purchase up to 80 hours of vacation buy for 2017 during open enrollment.
- Sandia Total Health members enrolled in Kaiser Permanente are eligible for the Davis Vision eye examination benefit by enrolling in Davis Vision. Kaiser members will no longer have access to this benefit through Kaiser.

Reminder(s)

- Employees may opt to receive a 2016 electronic 1095-C form by December 23, 2016, which provides proof of health insurance coverage, in HR Self-Service in lieu of a paper form. By Jan. 31, 2017, all employees should receive a 1095-C form, which should be kept as supplemental documentation for your 2016 taxes.

2017 Retiree Open Enrollment

Open Enrollment Dates:

PreMedicare: Saturday, Oct. 15-Friday, Nov. 18

Medicare: Saturday, Oct. 15-Wednesday, Dec. 7

Changes for PreMedicare and Medicare retirees

The changes listed below are effective Jan. 1, 2017:

PreMedicare:

- Sandia Total Health members enrolled in Kaiser Permanente will no longer have access to the eye exam benefit; please refer to your Davis Vision Discount Program for vision benefits.
- Sandia Total Health Plan will cover Applied Behavioral Analysis (ABA) treatment services for Autism Spectrum Disorder (ASD).

Medicare:

- In 2017, there will be an increase in Your Spending Account (YSA) allowance and premiums.
- The Lovelace Medicare HMO plan will officially change its name to Blue Cross Medicare Advantage (HMO) and all members will receive a new ID card. There will also be a new pharmacy vendor, Prime, and a new mail order pharmacy, PrimeMail.
- Presbyterian PPO members will be part of the Presbyterian Senior Care HMO-POS plan. Benefits will remain the same, and PCPs are not required. All members will receive a new ID card.

For info: Details about the Sandia retiree plans and OneExchange can be found by calling OneExchange Customer Service at 888-598-7809 or in the 2017 PreMedicare and Medicare Benefit Choices and Open Enrollment Guides, which are posted online at:

PreMedicare: www.sandiaetireebenefits.com
 Medicare: medicare.oneexchange.com/sandia

Employee and Spouse Benefit Fairs					
Date	Thursday, Nov. 3	Saturday, Nov. 5	Monday, Nov. 7	Saturday, Nov. 12	Tuesday, Nov. 15
Location	Sandia Labs Bldg. 825, Steve Schiff Auditorium	Sandia Laboratory Federal Credit Union Juan Tabo Branch 3707 Juan Tabo Blvd. 87111	Sandia Labs Bldg. 904 Auditorium 7011 East Ave. Livermore, CA	Sandia Laboratory Federal Credit Union Cottonwood Branch 3740 Ellison Rd. 87114	Sandia Labs Bldg. 825, Steve Schiff Auditorium
Audience	Employees	Employees and Spouses	Employees	Employees and Spouses	Employees
Fair Time	9 a.m.-2 p.m.	9 a.m.-12:30 p.m.	Noon-2 p.m.	9 a.m.-12:30 p.m.	9 a.m.-2 p.m.

Retiree Benefit Fairs			
Date	Wednesday Oct. 26	Monday Nov. 7	Wednesday, Nov. 9
Location	UNM Continuing Education Conference Center 1634 University Blvd. 87102	Sandia Labs - Livermore Building 904	UNM Continuing Education Conference Center 1634 University Blvd. 87102
Fair Time	9 a.m.-12:30 p.m.	8:30-11:30 a.m.	12:30-3:30 p.m.
Presentation Time	9:30-10:30 a.m. PreMedicare 11 a.m.-noon Medicare	9-10 a.m. PreMedicare 10-11 a.m. Medicare	1-2 p.m. Medicare 2-3p.m. PreMedicare
Presenters	OneExchange Presbyterian BCBSNM & UHC	OneExchange Kaiser BCBSNM & UHC	OneExchange Presbyterian BCBSNM & UHC

OPTIMIZE your benefits

Not all healthcare is created equal — especially when it comes to out-of-pocket costs. There can be significant price differences in the healthcare services you receive. Sandia works with our Sandia Total Health plan administrators (Blue Cross Blue Shield of New Mexico [BCBSNM], UnitedHealthcare [UHC], and Kaiser Permanente [Kaiser]) who negotiate with providers in their network to contract specific rates for care — which is why going to a provider in-network is much less expensive than going to an out-of-network provider.

A little legwork can go a long way! Here are some other ways to save on your healthcare costs:

- Check out your health plan's cost estimator tool to estimate the price of services and procedures before you schedule an appointment.
- Check out the prescription comparison tool through Express Scripts.
- Consider enrolling in a Healthcare FSA, Day Care FSA, or Transportation Spending Account (if eligible). These accounts let you set aside tax-free dollars from your paycheck for eligible expenses.
- If you're enrolled in Sandia Total Health, you can take an annual health assessment, enroll in a Health Action Plan, and participate in Virgin Pulse to earn funding for your Health Reimbursement Account (HRA). The HRA is a Sandia-funded tax-free account you can use to help pay for covered medical, prescription, dental, and vision expenses.
- If you're enrolled in Sandia Total Health administered by BCBSNM, consider using a provider within the Sandia Health Partner Network (SHPN). The SHPN is a custom network of physicians, facilities, and suppliers within BCBSNM that provides a better benefit and lower out-of-pocket expenses for you and your dependents. Find a listing of SHPN providers at bcbsnm.com/sandia.
- If you're enrolled in Delta Dental, consider using a provider within the Delta Dental PPO network. The same benefit levels apply to both the PPO and Premier networks; however, Delta Dental has negotiated with dentists in the PPO network and they have agreed to charge you less for the services they provide. Because you pay a portion of the costs for services, when the total cost of care is reduced, your out-of-pocket costs are also lower.

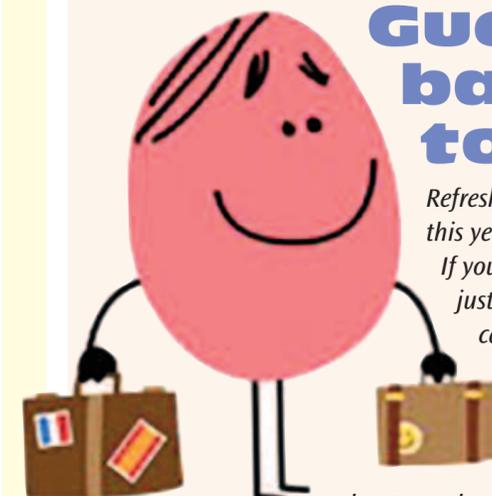
With many options for getting care, how do you choose? The chart at right can help you understand where to go for what — and how you can save money.

Learn more at hbe.sandia.gov

Where to get care	What it is	Type of care (examples)	Cost
Sandia Medical Clinic	Ideal for when you're at work and need care	<ul style="list-style-type: none"> Allergies/rashes Bladder infection Bronchitis Cough/colds Fever/sore throat Pink eye Earaches Seasonal flu Sinus issues Stomach ache 	Free for employees only
Nurseline	The Nurseline connects you with registered nurses 24/7	<ul style="list-style-type: none"> Choose appropriate medical care Find a doctor or hospital Understand treatment options Medical questions answered 	No additional cost
Virtual Visit	See a doctor via your smartphone, tablet or computer	<ul style="list-style-type: none"> Allergies Bladder infection Bronchitis Cough/colds Fever/sore throat Pink eye Rashes Seasonal flu Sinus issues Stomach ache 	\$
Primary Care Physician	Go to a doctor's office when you need preventive or routine care	<ul style="list-style-type: none"> Check-ups Vaccinations General health management Preventive services (free for Sandia Total Health members) 	\$\$
Urgent Care	Ideal for when you need care quickly, but it's not an emergency and your PCP isn't available	<ul style="list-style-type: none"> Sprains/strains Small cuts that may need stitches Minor burns Minor infections Minor broken bones 	\$\$\$
Emergency Room	For life-threatening or very serious conditions that require immediate care	<ul style="list-style-type: none"> Heavy bleeding Large open wounds Chest pain Major burns/broken bones Severe head injuries 	\$\$\$\$

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Former Sandia VP named to National Science Board

By Nancy Salem

President Barack Obama has appointed former Sandia VP and Chief Technology Officer Julia Phillips to a seat on the National Science Board of the National Science Foundation.

The president said Julia and other new appointees and nominees to national boards and committees are “fine public servants who bring a depth of experience and tremendous dedication to their important roles.”

“I look forward to working with them,” he said.

Julia, a Sandia executive emeritus, says she was humbled by the six-year appointment. “When you look at the list of past and present members of the National Science Board, it feels like a who’s who of people in science and engineering who have made contributions in personal research and in policy,” she says. “I am honored to be among them.”

The 25-member board supports the goals and functions of the National Science Foundation, including the duty to “recommend and encourage the pursuit of national policies for the promotion of research and education in science and engineering.” It establishes the policies of the foundation by identifying issues critical to its future and approving strategic budget directions and new programs and awards. The board also serves as an independent body of advisers to the president and Congress on policy matters and education in science and engineering.

At Sandia, Julia was acting vice president and chief technology officer from 2013 to 2014, director of Laboratory Research Strategy and Partnerships Center 1900 from 2011 to 2013, director of Nuclear Weapons Science and Technology Center 1200 from 2010 to 2013, and director of the Physical, Chemical, and Nano Science Center 1100 from 2001 to 2010.



STAYING AHEAD — Julia Phillips, whose Sandia career spanned 14 years and a variety of management positions, says she will work to keep the US at the forefront of science and engineering as a member of the National Science Board. (Photo by Randy Montoya)

Before joining the Labs, Julia was a member of the technical staff and a manager at AT&T Bell Laboratories from 1981 to 1995. At Bell Labs, her research was in the areas of epitaxial metallic and insulating films on semiconductors, high temperature superconduct-

ing, ferroelectric and magnetic oxide thin films, and novel transparent conducting materials.

Julia was elected to the National Academy of Engineering (NAE) in 2004 and to the American Academy of Arts and Sciences in 2005. She is home secretary of the NAE, an elected position responsible for membership and running the organization’s elections. She is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and the Materials Research Society. She received the 2008 George E. Pake Prize of the American Physical Society for outstanding achievements in physics research combined with major success as a manager of research or development.

She has a Bachelor of Science degree from the College of William and Mary and a doctorate from Yale University in applied physics.

Julia, who retired in 2015 but continues to do technical work for Sandia and a few other DOE labs, says she was pleasantly surprised by the National Science Board appointment. “I didn’t expect it,” she says.

Her focus will be on keeping the US at the forefront of science and engineering. “I have a daughter in grad school in chemistry and I would like to think that she will have a great career in science research in this country,” she says. “But science and engineering here are in a precarious state.”

She says the US was the top dog in science from World War II until not long ago. “But now the published papers in high-profile journals are coming from all over the world,” she says. “The economic competitiveness of our country depends on our continuing to be in that top group of nations in advancing science and engineering. I’m very interested in doing anything I can to try to help make that be the case. It’s really important for our country.”

Calling all entrepreneurs

Managers say researchers do good by going into business

By Nancy Salem

Three Sandia managers who had staff researchers leave the Labs to work in the entrepreneurial world say they wouldn’t hesitate to again encourage team members to give business a shot.

“It’s a really cool option for Sandians,” said Victoria VanderNoot, manager of Biotechnology and Bioengineering Dept. 8621. “Not everyone offers it, so it draws talent to the Labs. It supports innovation and helps us interact with the community.”

Victoria spoke at a recent roundtable that brought dozens of managers together to talk about Entrepreneurial Separation to Transfer Technology, the Sandia program that lets researchers take technology out of the Labs and into the private sector. ESTT was started in 1994, and since then 153 Sandians have left the Labs, 68 of them to start a business and 85 to help expand an existing one. Some 105 companies, most of them in New Mexico, have been impacted by ESTT.

The program guarantees Sandia employees reinstatement if they return within two years, and a third-year extension can be requested. Forty-two Sandians returned to the Labs from ESTT and 107 did not. Four are currently on ESTT leave. A 2014 survey showed that ESTT has brought Sandia expertise into the private sector, created jobs, and contributed to economic development. More than 379 jobs have been created as a result of the program.

Rob Leland, Div. 1000 vice president and chief technology officer, told the group he valued the experience of leaving the Labs twice, though not through ESTT, and returning. “I encourage people to take advantage of this program,” he said. “It is the longest-running entrepreneurial leave program in the DOE and is considered a model in technology transfer.”

Tech transfer is a mission of the Labs, and Sandia has a responsibility to the community to make its talent

available and help the economy, Rob said. He said the Labs’ intellectual property strategy is rooted in the public good. “It’s the right thing — for employees, the local community, and the nation,” he said.

ESTT builds goodwill and gives researchers an opportunity to make a difference, Rob said. “You can go out into the world and create something with lasting value,” he said. “You can live out your passion.” He said the program sends a message to the workforce that “we care about your aspirations.”

Genaro Montoya (1933), who oversees ESTT, said two-thirds of the people who left through the program were able to commercialize a technology. He said researchers can take a licensed technology, often one they invented, to the private sector, or bring a skillset or expertise to a startup or existing company.

Lori Parrott, manager of Policy and Decision Analytics Dept. 6924, said Robert Taylor (6924) left on ESTT to start a company and later returned to Sandia. “The exit is an easy process,” she said. “Sometimes the return can be more difficult if there isn’t an opening in the original department, but it works out in the end. And people who return bring a new skillset.”

Keith Ortiz, manager of MEMS Technologies Dept. 1719, said he lost three researchers to ESTT at the

same time, including Murat Okandan, who left Sandia to form the company mPower Technologies Inc. Following their progress has been gratifying, and he said he would encourage other managers to look into it for their employees.

Rob said ESTT builds a cycle of loyalty and integrity at the Labs by encouraging entrepreneurs while giving them the option to return. He quoted hockey star Wayne Gretzky, who said “You miss 100 percent of the shots you don’t take.”

“We need more shots on goal to get this program really going,” he said. “There is tremendous potential to contribute through ESTT.”



TECH TRANSFER MODEL — Div. 1000 VP and Chief Technology Officer Rob Leland told managers at a roundtable that Sandia’s Entrepreneurial Separation to Transfer Technology is the longest-running entrepreneurial leave program in the DOE and is considered a model in tech transfer.

(Photo by Linda von Boetticher)

Program gives Sandians the scoop on business

Jackie Kerby Moore, manager of Technology and Economic Development Dept. 1933, says Sandia’s Entrepreneurial Exploration program is designed to invigorate an entrepreneurial culture at the Labs and inspire researchers to either go into the business world or develop that mindset. “We want to encourage people to think and act like entrepreneurs,” she says.

The program has been in place a year and a half and includes entrepreneur office hours, when researchers can meet and talk to members of the business community; workshops; roundtables; bootcamps; and social gatherings.

Entrepreneurial Exploration offers one event a month. Speakers have included Gary Oppedahl, the city of Albuquerque’s economic development director; Lawrence Chavez, CEO of Lotus Leaf Coatings; and Chris Yeh of Wasabi Ventures.

Among the programs were:

- A bootcamp that gave an overview of Lean Startup methodology and helped identify the commercial applications and markets for ongoing research. Fifteen mentors including seasoned entrepreneurs and investors worked with 18 Sandia principal investors to adapt scientific discoveries into real-world technological solutions.
 - A roundtable featuring Katie Szczepaniak Rice, senior associate at the technology venture capital funding firm EPIC Ventures, focused on early stage technology investments, the funding process, and common startup pitfalls and traps and how to avoid them.
 - A workshop by Sandia Six Sigma black belt David Sais taught the Design Thinking process by matching customers’ needs with technology to create a viable business strategy.
 - The bootcamp “Commercializing Technology: Value Proposition Design” showed participants how to make their ideas fundable by choosing and delivering a winning customer value proposition.
 - A roundtable looked at the science of beer with Abbey Brewing Co. General Manager Berkeley Merchant. He shared Abbey’s unique entrepreneurial success story and the brewery’s origin in the remote mountains of northern New Mexico.
- “More than 700 community leaders, entrepreneurs, and Sandians have attended the Entrepreneur Exploration events,” Jackie says. “It links the community to Sandia with opportunities for entrepreneurs.”

Tritium introduced in fusion experiments at Sandia

More powerful fuel to boost Z Machine's neutron and energy output

By Neal Singer

Continuing their attempts to create more intense fusion reactions through use of increasingly powerful electromagnetic fields, Z machine researchers have opened a new chapter in their 20-year journey by introducing tritium, the most neutron-laden isotope of hydrogen, to their targets' fuel.

When Z fires, its huge magnetic fields crush pre-warmed fuel, forcing it to fuse. Tritium-enriched fuel should release much more energy than previous maximums. This would provide more detailed data for nuclear weapons simulations and possibly enter the condition known as "high-yield," where more energy is created than the amount needed to provoke the reaction.

"This thing about creating energy where none existed before — we don't yet have a bonfire, but we're squirting starter on the grill," says Mike Cuneo, project manager and senior manager of Pulsed Power Accelerator S&T (1650).

The output of Sandia's Z machine has been used over decades to provide information for computer simulations that test the readiness of America's nuclear stockpile without exploding an actual weapon. It's also used by astrophysicists using the machine's momentarily astounding pressures and temperatures to understand conditions in stars and the cores of planets. And some hope that pressures created mainly by electricity and magnetism one day may reach nuclear fusion conditions suitable for energy production.

The introduction of tritium is of high technical interest because a 50/50 mix of tritium and deuterium — the two isotopes of hydrogen — emits 80 times more neutrons, and 500 times more energy, than deuterium alone. It's a lot to look forward to. Energy from deuterium — in a manner of speaking, a relatively low-octane fuel — has been the upper limit on output at Z.

Cautiously introducing tritium

But this is still an early stage. A dry run on July 12, testing containment hardware and instrumentation, preceded Z's first tritium experiment on Aug. 3, when a fraction of a percent was cautiously introduced into the experiment's fuel.

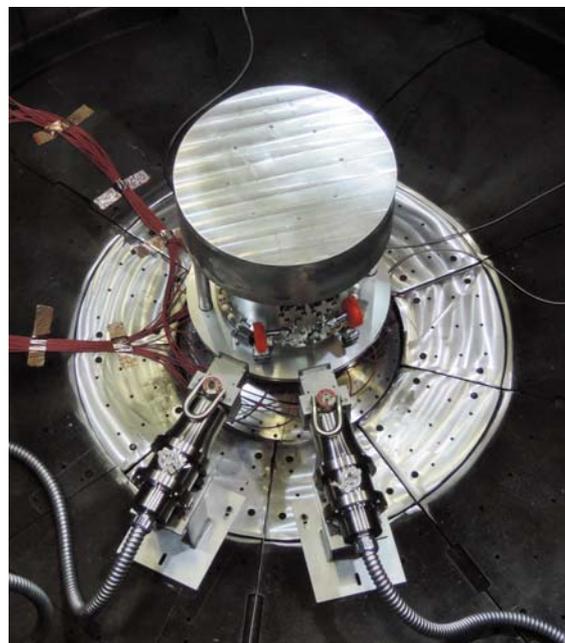
"We're going to crawl before we walk and run," says Mike. "We will gradually increase that fraction in contained experiments as we go."

Only two other DOE-supported research sites, at Lawrence Livermore National Laboratory and the Laboratory for Laser Energetics at the University of Rochester, had been approved to use tritium, a potential environmental hazard. That's because, says Mike, their method uses lasers to compress spherical targets the size of a thimble in chambers relatively easy to clean.

The Sandia experiments use electromagnetics to smash Z's more massive target and its entire target support area like they were hit by a sledgehammer. Under those conditions, introducing tritium into the target requires extreme care and forethought in the design, transport, and containment of tritium to meet rigorous safety standards.

"Tritium's like sand at the beach, it gets into everything," says Mike. "So for now, we can't let it go anywhere." The isotope is a small molecule with a lot of mobility, and the first big hurdle, he says, is to make sure the radioactive material with its 12-year half-life doesn't migrate to the million-gallon pools of water and oil that insulate Z's pulsed power components. "Laser facilities don't have these pools," he points out.

Tritium could also bond to the metal walls of Z's



TWO FAST NEUTRON radiation-effects cassettes aim toward the center of the containment system for tritium within the Z vacuum chamber. The setup's gas transfer system is housed within the containment system.



TRITIUM SHOT PI DEAN ROVANG checks out Z's tritium gas transfer system (Z-GTS), which was built in Sandia/California and filled with trace tritium (0.1 percent) at Sandia/New Mexico. (Photo by Randy Montoya)

central area, presenting a potential radioactive hazard where technicians enter daily to scrub after each shot.

However, using the same unique design that has contained plutonium on previous Z shots, no tritium was released. Through a Hostile Environments LDRD Grand Challenge, led by Pat Griffin (1300), researchers

"We're going to crawl before we walk and run. We will gradually increase that fraction in contained experiments as we go."

— Sandia Senior Manager Mike Cuneo

brought in people from a variety of organizations to handle each complex detail.

Building on decades of experience

"There was a high level of integration on facility containment and radiation protection, to do it right," says Brent Jones, manager of Neutron and Particle Diagnostics (1677) and facility integration lead. "The Sandia-California gas transfer group, with decades of experience dealing with tritium, developed a method of housing, delivering, and containing the material. They built a device that could load a small but defined quantity of tritium; the neutron generator people filled the target with tritium; the plutonium confinement folks contributed their shot expertise, and the Grand Challenge enabled us to build what we needed and pull in people from all over the Labs.

"Dean Rovang (1688), tritium project lead, has put together an amazing team through the Hostile Environments Grand Challenge LDRD effort to apply critical thinking and to engineer mitigations that enable us to take this step. It wouldn't have been possible without the support of the Neutron Generator Analytical Lab (Jessica Bierner, Henry Peebles, both 2026, et al.) which is providing the tritium and helping to implement tritium measurements at Z, and the Sandia/California gas transfer team (Dorian Balch 8241 et al.) who have engineered, tested, and delivered the gas fill system for Z. Then Radiation Protection and all of the Z support teams took the final steps to execute the experiment."

"Joel Lash, senior manager of Z research and development (1670), played an important role in ensuring the trace tritium experiment was done to principles of

engineered safety. He also engaged with our DOE partners well in advance," says Mike.

For others who helped, see box below.

First step on a journey

The team now must evaluate whether tritium can be used safely in uncontained experiments, its ultimate goal. Confined tests can evaluate the compatibility of tritium with Z's materials and pressures, but don't accurately measure fusion outputs.

"The use of contained tritium on Z is the first step on this journey," says Mike. "There is much more work to do.

"One idea [for an uncontained experiment] is to purge the tritium immediately after a shot so that it doesn't stick to the walls of the Z chamber," says Mike. "We need to be able to efficiently purge the center section back to a safe level before technicians enter to refurbish it."

Uncontained experiments, he says, will begin with very small levels of tritium and gradually ramp up in a several-year process. "We hope to find that we will be able to safely handle 1-3 percent tritium in uncontained experiments, enough to advance Inertial Confinement Fusion applications, other weapons science applications, and neutron effects testing."

In addition to careful handling of tritium to promote radiation safety, other areas of concern are the Z facility's neutron limit authorization and post-shot activation generated by neutron emissions that might make Z components themselves radioactive.

A path to safe uncontained experiments

"But in our containment experiments over the last few months," says Mike, "it looks like 97 percent of the post-shot inventory is the tritium molecule T₂ rather than tritiated water, T₂O. T₂ is 10,000 times less hazardous than T₂O to personnel. This provides some confidence that there is a path to safe uncontained experiments."

Another concern is personnel radiation safety from larger numbers of higher energy neutrons — 14.1 MeV instead of 2.45 MeV. "That is a large concern and we will have to design new methods to shield personnel from neutrons," Mike says.

It will be at least three years before experiments approach 50/50, Mike says, depending on funding and Sandia and NNSA priorities regarding Z. While the work over the last three years has been paid for by the "Hostile Environments on Z" Grand Challenge, work going forward will be funded by the NNSA Science and ICF program.

Only some of the support staff for the tritium experiments

According to lead Brent Jones, "Drew Johnson, Shawn Radovich, et al. supported interface of Z-GTS and ion chamber instrumentation at Z. Members of the containment community have engaged with the tritium effort, particularly Pete Wakeland, Lance Baldwin, Kelly Seals, and Jeff Gluth. The gas fill team, Center Section crew, and load hardware team have supported the Z gas transfer system and containment fielding. Terrence Bock has facilitated vacuum activities. Aaron Edens has worked extensively on concept of operations and shot timeline planning. Shawn Howry has stepped in to help with Technical Work Document

review, and Heidi Herrera helped earlier with an FMEA exercise. I would also like to thank Z facility management for engaging closely in the planning and supporting the work, especially Hazel Barclay, Michael Jones, Ryan Kamm, and Randy McKee.

In sum, nearly 100 people — more than Lab News can easily name — contributed directly to the effort to field the first tritium experiment on Z. They were from Sandia organizations 1300, 1600, 1800, 2100, 2700, 4100, 5400, 8100, and 8200. Also participating were researchers from General Atomics, Los Alamos National Lab, the University of New Mexico, and Utah State University."

Mileposts



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



Jane Ann Lamph
35 8237

Recent Retirees




Grace Miran
40 8523



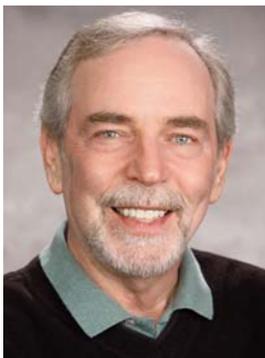
Suzanne Kelly
35 1220



Esther Hernandez
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Karen Krafcik
30 8344



Jim Lauffer
30 8231



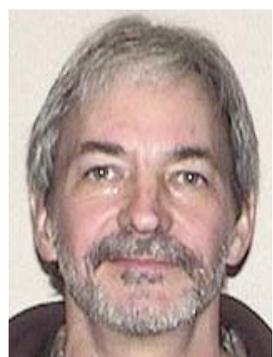
William Ballard
34 8200



Kevin Schroder
32 8137



Michael McDonald
31 5624



Tim Meeks
30 9514



Clayton Pryor
30 9537



Greg Corbett
25 5959



Tom Dickman
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Ron Pate
30 6926



Dwayne Knirk
23 424



Todd Culp
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Carol Eubanks
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Samantha Flores
25 4221



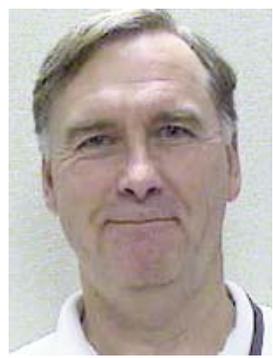
Elsa Glassman
25 3520



Kasumi Nixon
25 2913



Leanna Minier
20 2554



Jim Cox
15 1554



Vivian George
15 2951



Charlie Morrow
15 6223



Tyson Phillips
15 2712



Bill Spotz
15 6913



CINT manager elected president of Materials Research Society

By Mollie Rappe

Sandia manager Sean Hearne (1132), who served as acting co-director of the Center of Integrated Nanotechnology (CINT), has been elected president of the Materials Research Society. MRS is an international organization that promotes interdisciplinary materials research with 15,000 members from academia, industry, and national labs.

Sean will serve as vice president beginning in January 2017, transition to president in 2018, and wrap up his three-year term as past president in 2019. Sean concludes his second three-year term as MRS secretary this December.

"It's a great honor to be elected to represent the international materials community that makes up the society. It's



SEAN HEARNE

an opportunity for the national labs to contribute to advancing the needs of the community for collaboration and visibility, both of which are critical components to accelerating new materials development," says Sean. "Sandia has had a very strong role in the MRS over the decades, and I am honored to be part of that."

As the society's 43rd president, Sean will be the fifth MRS president from Sandia — the most from any national lab. Julia Phillips, who served as an acting vice president and chief technology officer for the Labs, was MRS president in 1995.

"Sandia has a long history of engagement with the Materials Research Society, since MRS focuses on many materials topics that are of great interest to the Labs. It is important for Sandia to support the MRS and other professional societies that provide forums for experts to discuss their latest results," says Julia. "I'm particularly pleased that Sean is continuing in the long line of Sandians who have made significant contributions to the governance of this important organization."

A need for speed and research with an impact

After being trained as a commercial pilot, Sean went back to school to study physics. While working on his doc-

torate in solid state physics at Arizona State University, he started at Sandia as a student intern.

Over the years he progressed from a postdoc, LTE, staff member, manager, and earlier this year to acting co-director and senior manager of CINT, which provides free access to world-leading equipment and scientists for researchers advancing the scientific understanding of how to fabricate, characterize, and model nanoscale materials. It is a DOE Office of Basic Energy Science-funded user facility jointly operated with Los Alamos National Laboratory.

There is a natural affinity between CINT and MRS, according to Sean. Both are institutions where people from many disciplines, from biology to metallurgy and everything in between, can collaborate to push the forefront of research. Sean says, "Materials science is a nexus of discovery science with application that can enable a better, more efficient world. Materials are everywhere — everything — and there are incredible opportunities for advancement in areas such as quantum materials and energy generation and storage."

Though Sean no longer flies, he spends his weekends racing Spec Miata and vintage formula cars and won the 2014 SouthWest MotorSport Spec Miata series championship.

The Common Engineering Environment

By Stephanie Holinka



The Common Engineering Environment (CEE) is a new portal that brings together engineering tools and software, support services, best practices, processes, and training for engineers and scientists.

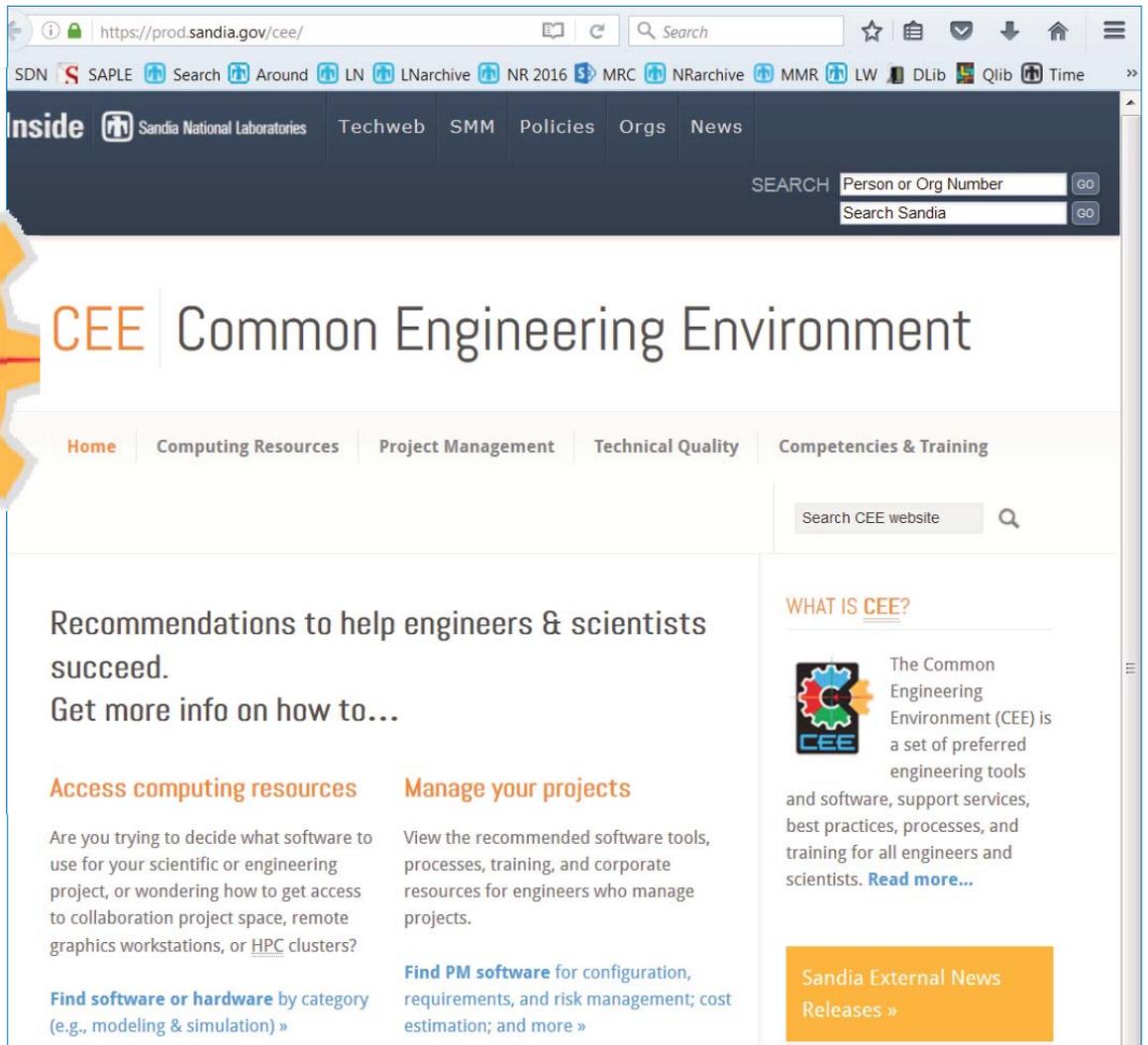
The portal started out a few years ago as a set of tools to be used by engineers, but its mission has greatly expanded.

More than 3,000 people are now using the portal.

“The development of CEE is a very positive, exciting step for Sandia,” says Rob Leland, Div. 1000 VP and chief technology officer. “The original vision was, by way of analogy with the Common Operating Environment for our business tools, to provide strong and consistent support for our engineering tools across the enterprise. We wanted to include Sandia-developed tools in addition to commercial tools commonly used at the Labs, and to provide a convenient interface to leverage our high performance computing resources.

“That vision is now coming true, and there’s some really substantial and important content on best practices in engineering, how to navigate the various formal engineering processes at Sandia, and most recently we’ve hosted some great community forums on hot topics in engineering,” Rob says

“It has grown way beyond the original intent, which



CHECK OUT THE COMMON ENGINEERING ENVIRONMENT website on Sandia’s TechWeb at <https://prod.sandia.gov/cee/>.

was to see what everyone was using,” says project originator and Systems Mission Engineering Center 5500 Director John Zepper. “We wanted to get tools and off-the-shelf products into the hands of scientists and engineers who used them, and figure out what tools people were requesting.”

Standardizing engineering resources

John says CEE’s mission has expanded to include gathering examples of best practices, and providing a repository for work that could be useful to other researchers at the Labs, allowing people to share those tools and models..

“If you spent a few months doing a CAD model for a weapons system, it would be nice to be able to share,” John says.

The portal is managed by the Common Engineering Environment Steering Committee, the governing body that includes representatives from across the Laboratories. The committee decides what new tools come into the CEE. It looks for ways for the CEE to standardize Sandia’s engineering resources, to encourage a

disciplined approach to engineering, while not limiting the options for researchers.

“Using CEE resources is not a requirement,” John says.

John notes the portal is especially useful for new hires, since gathering up common resources in one place gives new people a one-stop shop for getting started.

The portal also offers opportunities for engineers to connect. The various communities of practice allow engineers/scientists doing similar work to meet and share best practices. Plug discussion boards connect

“The cluster allows me to process something in days that would take years on just one machine.”

— Researcher Dan Guildenbecher

users and provide a place to share Web articles of interest or ask questions of other people.

Researchers can also browse for team members using the MySites area, which is searchable by expertise, and they can fill out their own MySites profile so that other researchers can contact them.

Economies of scale

The data analytics in the portal tracks how many people are using the various software packages. Over time, this will allow Sandia to make more efficient buying options, making it possible to take advantage of the economies of scale.

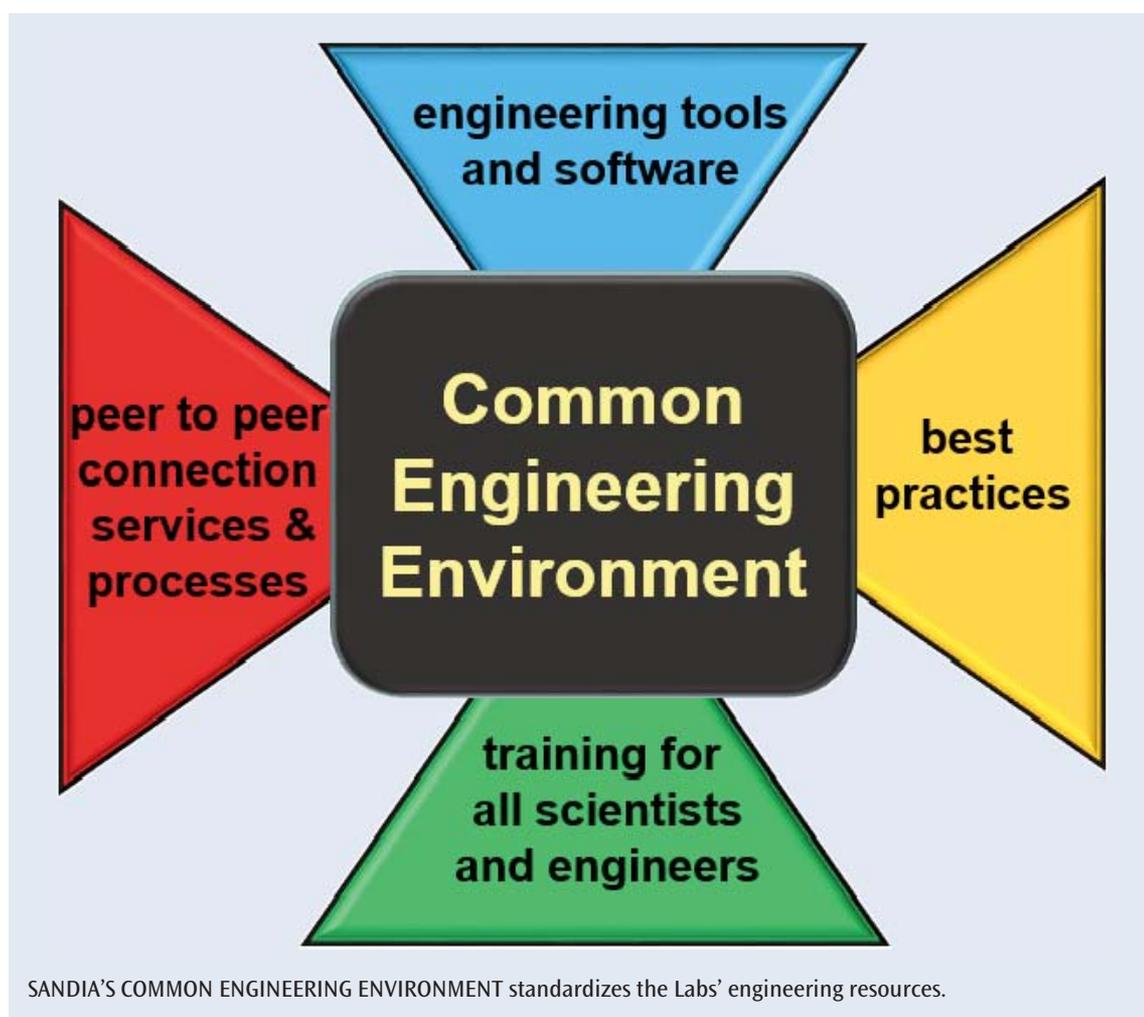
One advantage for consolidating engineering tools in one place is that researchers can take greater advantage of the tool licenses already available at the Labs. Those advantages can be seen by those who generate a lot of data that would take a long time to be analyzed on a single lab machine.

Mechanical engineer and experimentalist Dan Guildenbecher (1512) is using a newly created Matlab cluster to drastically reduce the time it take to process testing data, allowing him to return data to his customer much more quickly than relying on his single lab computer.

“Experimentalists use a lot of high-speed equipment that gather incredible amounts of data really quickly. Processing that data can take a lot of time on conventional equipment,” Dan says.

Dan says that since the CEE has launched new tools, the CEE team created a 1,000-license cluster of Matlab machines.

“The cluster allows me to process something in days that would take years on just one machine, allowing me to take an idea from experiment to analysis in a fraction of the time it would take if I was just trying to analyze on my own machine,” Dan says.



SANDIA’S COMMON ENGINEERING ENVIRONMENT standardizes the Labs’ engineering resources.

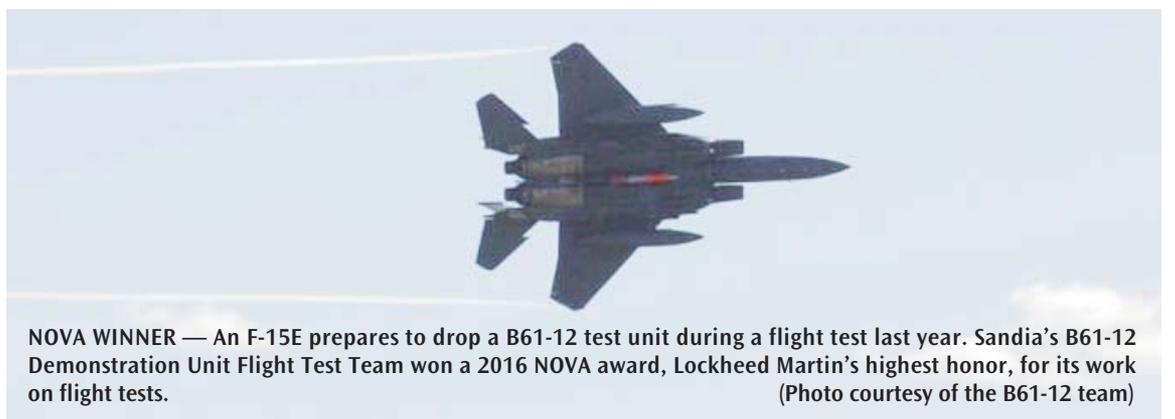


FALL SPLENDOR AT SANDIA — Annette Aranda (3000, left) and Karen Siebring (3553) enjoy unseasonably warm fall weather outside Bldg. 800 South on a sunny October afternoon. (Photo by Randy Montoya)

Sandia B61-12 team wins prestigious Lockheed Martin NOVA Award

“We could have had 200, 300, 400 people on that Employee Recognition Award. Everyone contributed so much. We were the ones leading the charge, if you will, but it was the dedicated people up and down the line who contributed in so many ways to the common goal of a flight test.”

— Lee Post, B61-12 flight test lead



NOVA WINNER — An F-15E prepares to drop a B61-12 test unit during a flight test last year. Sandia’s B61-12 Demonstration Unit Flight Test Team won a 2016 NOVA award, Lockheed Martin’s highest honor, for its work on flight tests. (Photo courtesy of the B61-12 team)

By Sue Major Holmes

Sandia’s B61-12 Demonstration Unit Flight Test Team has won a 2016 NOVA award, Lockheed Martin’s highest honor.

The award recognized the team “for technical excellence demonstrated through successful execution of three B61-12 F-15E flight tests,” according to the citation. The NOVA award, created in 1995, recognizes stellar employee achievements.

Flight tests completed last year were a significant accomplishment, demonstrating early design robustness in the B61-12 War Reserve and Joint Test Assembly designs.

Lee Post, Sandia’s test lead for the B61-12 flight tests, accepted the award on behalf of the team at the Labs’ annual Employee Recognition Award (ERA) dinner Aug. 27. Sandia’s executive leadership looks at the ERA winners and nominates some for NOVA awards. Nominees are forwarded to Lockheed Martin Space Systems and later to Lockheed Martin headquarters, where the winner is announced.

Lee says the 25-member ERA team represents contributions from countless people all across Sandia.

“We could have had 200, 300, 400 people on that ERA. Everyone contributed so much,” Lee says. “We were the ones leading the charge, if you will, but it was the dedicated people up and down the line who contributed in so many ways to the common goal of a flight test.”

The flight tests involved more than a dozen organizations, including Los Alamos National Laboratory and the Boeing Corporation. About half of the organizations were from the Air Force, Lee says.

“Every organization had specific goals for what their organization wanted out of each flight test. The princi-

“Every time a test unit is released from an aircraft, watching it perform as planned, seeing the spin rocket motor function and impacting in the target area is very exciting. It’s the culmination of a huge amount of work for everyone.”

pal objective of the test team is to try to achieve as many of the goals as we can for each test,” he says. “Negotiation between all the organizations is a key component of any team, while ensuring the tests always achieve their primary objectives.”

Timing was another factor. Every organization provides hardware, software, or some other component, and delays always occur along the way. Lee says that meant working through the timelines for delivery of each piece of hardware, the test unit assembly, pre-testing, and availability of test equipment, aircraft, and the test range.

After all the work, “every time a test unit is released from an aircraft, watching it perform as planned, seeing the spin rocket motor function and impacting in the target area is very exciting,” he says. “It’s the culmination of a huge amount of work for everyone.”

Team members were a little shocked when they first heard about the NOVA award, Lee says. “Once the surprise wore off a little and the team realized the magnitude of this award, they were very proud of the accomplishment and appreciative of the recognition.”

SPIN ROCKET MOTORS engage as a B61-12 bomb drops to the ground during one of three successful flight tests last year. (Photo courtesy of the B61-12 team)

