Partnerships, mission synergy will shape Sandia's future, Jill Hruby says at her first State of the Labs address

By Bill Murphy • Photos by Randy Montoya

As Sandia adapts to meet the evolving challenges the nation faces in a complicated 21st-century world, a robust network of trusted partnerships with academia, industry, and other federal laboratories and agencies will become increasingly important, President and Laboratories Director Jill Hruby said at her first State of the Labs presentation last week.

"We have to have trusted partnerships," Jill said. "We cannot be a 12,000-employee laboratory by ourselves."

A key component of building stronger partnerships, Jill said, will be Sandia's Academic Alliance initiative. Under the initiative, and with NNSA Sandia Field Office approval, several Sandia managers will serve temporary assignments at strategically important universities: Georgia Tech, Purdue, the University of Illinois at Urbana-Champaign, and the University of Texas at Austin. These on-campus Sandians will play an important role in helping with curriculum decisions, identifying opportunities for research collaborations, and serving as front-line recruiters to bring the best engineering and science graduates to the Laboratories.

"We can't be insular," Jill said, adding that the alliances with academia are an important part of ensuring that Sandia remains at the forefront of engineering excellence. She added that Sandia will be increasingly proactive in seeking out collaboration opportunities with other federal laboratories, agencies, and industrial partners, noting at one point that "engineering doesn't happen in a vacuum."

In opening remarks, Jill told an audience of Sandians at the Steve Schiff Auditorium (the event was also videostreamed to Sandia's Carlsbad office) that "we had a great year" in FY15, with solid funding, significant, sustained accomplishments in key mission area programs, and measurable progress in important Labs-wide safety initiatives.

Sandia "had a great year" in FY15, with solid funding, significant, sustained accomplishments in key mission area programs, and measurable progress in important Labs-wide safety initiatives.

Changing demographics

Jill noted that some 24 percent of the Labs workforce has been hired in the past three years, adding that she is proud of the strides that have been made in establishing a more balanced demographic spectrum, which in recent years had tilted toward retirement-eligible employees.

One change that has been very apparent to the workforce, Jill said, is the fact that 11 percent of management employees are in new positions compared to a year ago. While that may have required some adjustment by employees, the trend is healthy for the Labs as a whole as managers move around, learn new things, and take what they learn to new roles.

Sandia, Jill said, is evolving from what has been considered a multiprogram laboratory to a multimission labora-

(Continued on page 4)

Big Shots at Cygnus and RITS-6

Two workhorses for NNSA X-ray radiography have reached milestones: Cygnus has fired its 3,000th shot and RITS-6 has fired 2,000 shots. See **page 7.**

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Crowd funding

ECP beats its goals as Sandians join hands to help the less fortunate

By Nancy Salem

Sandia's Employee Caring Program (ECP) kept its focus on people in 2015 and crossed the finish line ahead of last year's pace.

ECP, which raises funds for the United Way of Central New Mexico (UWCNM), ran Oct. 5-23 and featured events including a nonprofit agency fair, book sales, leadership activities, presentations, ice cream socials, pizza parties, shaved heads, wigs, cakes, athletic challenges, and a dunk tank.

On the heels of a long series of record-breaking fundraising years, the 2015 goals put participation up front:

- Increase overall participation to 78 percent.
- Increase new employee participation to 70 percent.

Sandia came through, pushing participation to 80 percent overall, up 3 percent from last year, and 71 percent for new employees, up 2 percent. As of mid-November, employees had pledged $5.5 million, up 6 percent from the same point last year. Retiree donations are still coming in, and the campaign total is projected to be more than $6.8 million, which would set a record. Last year's total was $6.5 million. Community Fund donation results will be available in December and final campaign numbers in February.

"I am profoundly moved by Sandia's generosity," says Ted Kreifels, manager of System Surety Engineering III Dept. 424

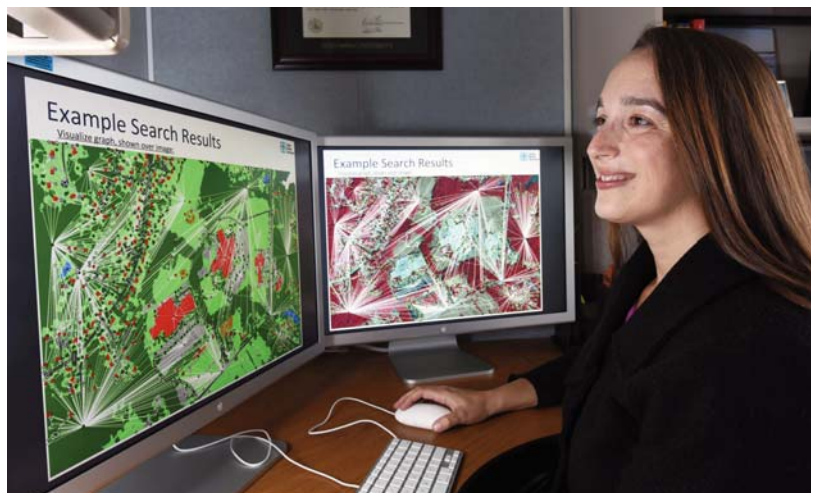
(Continued on page 2)

Managing the data deluge

PANTHER research rethinks finding patterns in motion, makes sensor images searchable

By Heather Clark

After a disaster or national tragedy, bits of information often are found later among vast amounts of available data that might have mitigated or even prevented what happened, had they been recognized ahead of time.



KRISTINA CZUCHLEWSKI (5346) is principal investigator for the 26-member PANTHER team, which has accomplished a number of breakthroughs in rethinking how to compare motion and trajectories; developing software to represent remote sensor images, couple them with additional information, and present them in a searchable form; and conducting fundamental research on visual cognition. (Photo by Randy Montoya)

In this information age, national security analysts often find themselves searching for a needle in a haystack. The available data is growing much faster than analysts' ability to observe and process it. Sometimes they are unable to make key connections and often they are overwhelmed struggling to use data for predictions and forensics.

A three-year project at Sandia called Pattern Analytics to Support High-Performance Exploitation and Reasoning (PANTHER) has made progress on this problem. It's developing ways to help analysts work smarter, faster, and more effectively when sifting through huge, complex data sets in real-time, stressful environments where the consequences could be life or death.

PANTHER's 26-member team has accomplished a num-

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That's that

Got an email the other day that probably should have gone straight to the junk drawer, but somehow found its way to my inbox. Seems there's a new start-up business out there that has developed a virtual reality chemistry set, one that uses modern technology to enhance the traditional experience many of us had with our old-school test tube-and-beaker-based chem sets from the days of yore.

The idea here, the email explains, is to combine real chemistry experiments – delivered as kits to your door each month via subscription – with app-based virtual reality explorations of what is actually going on in the reactions.

Sounds cool to me . . . and brings back memories – sans the app and special effects – of many a fun Saturday in my youth literally playing with fire, doing experiments that would make things burn and sizzle and snap and crackle and pop.

When I was 10 or so just about every kid I knew had chemistry set, a microscope, a pocket knife, and a BB gun – the accoutrements of post-World War II kid-dom. All of us with chemistry sets back then were on a quest for the Holy Grail – the elusive magical combination of powders, crystals, and liquids that would not only go pop, but BANG.

Our scientific method was trial-and-error – lots of trial and nothing but errors. Looking back, I think we'd all been had: Surely the developers of those kits were careful to ensure that no conceivable combination of chemicals included in the set could be made to explode. But we tried.

Who knows how many eventual chemistry majors those sets inspired, but even for those of us whose lives and interests went another way, they made science a part of our everyday world. Those early forays into science – the chemistry experiments, the examination of pond life through a microscope, a look at the rings of Saturn or the craters of the moon through a telescope – all of those things awakened a sense of wonder in a young mind and instilled a conviction that a quest for knowledge is an intrinsically worthy aspiration.

For all of that high-minded sentiment, though, the bottom line is way less complicated: It was fun. But you know what would have been even more fun? If we could have made one of those experiments go BANG!

* * *

We're just coming off another hugely successful ECP (Employee Caring Program) campaign drive: Collectively we and our retirees this year have pledged at least $6.8 million to charitable causes in our community, a new record. We are far and away the leaders in the Greater Albuquerque area in stepping up, walking the talk, and giving back to the community we call our home. Our giving culture at Sandia captures the spirit expressed in an old phrase that has gained new currency lately: "Be kind; everyone you meet is fighting a hard battle that you know nothing about." Read more about this year's successes in the story beginning on page 1.

* * *

Regarding giving, let me call your attention to a very special program that was born and bred right here at the Labs, our annual Shoes for Kids campaign.

This annual holiday tradition started with just two Sandians. More than 50 years ago, these two scientists chose to donate money to buy new shoes for local children instead of buying each other holiday gifts. This selfless gesture has blossomed into a Lab-wide giving program that each year provides about 500 children with a new pair of shoes. The shoe drive ensures that children who don't have all of the comforts many of us take for granted will have a good and well-fitted pair of shoes for the remainder of the winter and the school year. This year, kids from several APS schools and schools in Bernalillo, Los Lunas, and Belen will benefit.

All funds come from Sandia employees and retirees; the Sandia Laboratory Federal Credit Union operates the Shoes for Kids account and accepts donations at all branches; and Payless SHOESOURCE provides the shoes at a discounted price and fits each child with practical shoes. Principals, counselors, and teachers at 10 area schools select 50 of the neediest students from their school to receive a pair of shoes.

How can you participate? Make contributions in person at any SLFCU location to account number 223180, Shoes for Kids Fund. Via telephone, call 293-0500 or 1-800-94-SLFCU. To do an online transfer, log in to your SLFCU website account and use the following information: 223180, 90-01 - Lastname = shoes.

See you next time.

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

ECP wrap-up

(Continued from page 1)

and 2015 ECP campaign chairman. "This year we brought out the C in ECP — C for courage, C for compassion, and C for connection. The three Cs add up to Caring.

"We are a professional community on a shared mission to help others. Through communication, that shared mission is closing the gap between new hires and long-time Sandians. We come together in exceptional service to the nation and to our community."

More departments hit 100 percent

Pam Catanach (3652), the Community Involvement specialist who coordinates the ECP, says the 96 campaign representatives in centers and divisions can take credit for this year's success. "We had so many organizations that achieved 100 percent participation, and we exceeded all our goals," Pam says. "The ECP reps are the heart and soul of the campaign as they engage with employees. They really make a difference. I can attribute the closing of the gap between new and longer term employees to the reps tirelessly talking to new hires about Sandia's culture of giving and impact on the community."

Some 148 departments hit 100 percent participation, 10 more than last year. And two divisions, 5000 and 1000, each gave more than $1 million.

Ted praised the work of Pam, who puts months of planning into each ECP campaign. She plans to retire early next year, so this was her final ECP after 11 years of running the campaign.

"The ECP is as good and well-executed a plan as any I've had the honor to be part of in my 30-plus year career and it's due to Pam's consummate professionalism, support from Community Involvement, Creative Services, and other departments, and our hard-working, passionate, and creative reps," he says.

'Part of something really big"

Since the ECP was launched in 1957, Sandia has been the single largest supporter of the UWCNM's annual campaign, donating more than $94 million. The Labs' per capita giving ranks in the top among companies of its size nationwide.

Sandia employees and retirees in 2014 increased donations by 8.2 percent over the previous year, giving $6,556,666, up $491,595. The retiree share was $851,109.

"I want to thank everyone who contributed to the ECP," Ted says. "I am truly grateful. Sandia is about service. Our employees are part of something really big. Our collective impact on the community is tremendous."

Ed Rivera, UWCNM's president and CEO, says Sandia's generosity inspires the entire community and drives the larger campaign. "We talk about the culture of giving that is Sandia," Rivera says. "It's infectious. It's huge.

"We thank you for that from the bottom of our hearts and from all those who benefit from what you do. Sandians are thoughtful people who are informed about the challenges in our community. You give money and time so generously. You change lives."

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LOCKHEED MARTIN

Jeff Koplow receives SunShot Innovation Fellowship

Jeff Koplow (8366) has been selected as the inaugural recipient of the Innovator in Residence Fellowship by the SunShot Initiative, a DOE enterprise to make solar energy fully cost-competitive with traditional energy sources by 2020.

JEFF KOPLOW

Jeff and his team will apply a multidisciplinary problem-solving approach that they have successfully applied to many other innovation challenges in technology areas relevant to DOE's SunShot Initiative.

The new program, launched Oct. 1, will provide Jeff and his team $500,000 per year over three years to support the SunShot Initiative's goals..

"We are very honored by this award and very motivated to make an impact," says Jeff. "Sandia is a great place to undertake multidisciplinary innovation because of all the world-class subject matter expertise we have on hand. These resources will be used in conjunction with guidance from DOE SunShot leadership to target long-standing objectives in solar energy."

4 R&D 100 awards

Jeff has demonstrated his forward thinking on energy problems with several inventions, including the Sandia Cooler, a breakthrough technology for air-cooled heat exchangers, and Twistact, a fundamentally new concept that enables novel wind turbine designs that eliminate rare-earth materials and high-maintenance components.

He is the recipient of four R&D 100 Awards, currently has 10 active licenses on previous inventions, and has given several invited talks on the subject of multidisciplinary technical innovation.

Lidija Sekaric, acting director of DOE's Solar Energy Technologies Office, said, "We credit SunShot's progress to date to the many creative researchers working on SunShot projects across private industry, academia, and the national labs. Through the Innovator in Residence Fellowship, Dr. Jeff Koplow and his proven team will provide us yet another tool for solving some of the critical issues that still face solar energy." *— Patti Koning*

Perfecting marksmanship

Sandia California Security Police Officers train to improve skills

By Michael Padilla

Photos by Dino Vournas

Sandia CaliforniaNews

TRAINING INSTRUCTOR Pablo Maurino, left, discusses a tactical situation with Supervisor Lt. Dan Atkins, SPO Rayle Sanchez, Captain Gary Gilbert and SPO Jeremiah Johnston.

Training trumps everything.

Security Police Officers (SPO) at Sandia/California continue to far exceed the minimum standard of required training.

Pablo Maurino (8511), the lead training instructor for the site, says the Protective Force conducts training throughout the year and officers participate in live fire training eight to 10 times a year. Firearms training is typically an eight-hour day; however, SPOs may also receive live fire training on the range in shorter durations while on shift as scheduling permits. Each SPO has to qualify semi-annually with a duty-issued Glock 9mm and the H&K 416 rifle.

"We all understand that 99 percent of an SPO's career will consist of protecting a facility, its people, and classified documents, constantly deterring but never seeing the enemy," says Pablo. "We train for the 1 percent, the one time we have to get it right."

He says the most important part of training is the support required to train. There is no lack of talent or desire within the Protective Force. "Our success is ultimately determined by the support we receive from managers, oversight, safety, and the laboratory workforce," he says.

Having a live fire range on site is a tremendous resource for the SPOs, Pablo says. The range is also used for weapons manipulation, which is a key component to being an efficient operator. Many hours are spent on these fundamentals using dummy ammunition or dry practice — no ammo used.

Sandia follows DOE's readiness training program adopted from the military known as EMETL (Enterprise Mission Essential Task List). This program takes everything an SPO is required to do within his or her job scope and identifies it as task. These tasks are then categorized as collective, leader, or individual. There are 15 collective, 27 leader, and 36 individual tasks. The EMETL system is used to develop leaders and SPOs. The training department is tasked with identifying which skills SPOs need to improve to become more efficient. Training is then developed around what has been identified. On duty, SPOs receive additional training from their supervisors using the EMETL field manual as a guideline.

Keeping training fresh

Dennis Baker (8511), manager of Sandia/California's Security and Emergency Management, says there are many challenges facing the Protective Force.

"Understanding that the world around us is changing rapidly is our greatest challenge," Dennis says. "The need to adapt and remain relevant through training is critical."

Since the world is continuously changing, Sandia is careful not to approach new problems with old strategies. The workplace violence/active shooter is an example of an evolving threat. In training, the Protective Force has looked carefully at this threat to identify trends, courses of action, and response techniques. It has been made a top priority and the Protective Force trains every day to prevent this threat and respond accordingly should the situation ever arise.

A recent training venture for Sandia Pro Force is the integration of leadership training with Lawrence Livermore National Laboratory's Protective Force. This training consisted of tabletop exercises and a force-on-force scenario.

Pablo was recently selected by NNSA to attend an Adaptive Leadership course taught by former members of the Army's elite Delta Force. Pablo incorporated many of the concepts and strategies with training at Sandia/California. As a subject matter expert for active shooter training for DOE's National Training Center in Albuquerque, Pablo has begun training the Protective Force on rapid response.

State of the Labs

(Continued from page 1)

tory. The words sound similar, she said, but the difference between the two is more than semantic; the change in language emphasizes that the Labs is not program-based, but mission-focused, with seven key mission areas that address critical national needs.

Jill said she "couldn't be prouder" of the accomplishments over the past year in the Labs' nuclear weapons program, which remains on schedule and on budget. "There is still a lot of work to be done," she said, "but we're in great shape right now."

'A tremendous body of work'

Jill called the efforts over the past year in the Labs' Stockpile Surveillance Program "truly impressive, a tremendous body of work." That ongoing program provides the technical basis for the annual stockpile assessment letter she signed in September and delivered to the secretaries of Energy and Defense and the chair of the Nuclear Weapons Council.

The breadth and depth of Sandia's work on Nonproliferation Treaty implementation technologies "really opened some eyes" among treaty signatories, Jill said, providing important reassurance of the nation's commitment to the treaty.

Other work she highlighted included key initiatives in addressing the Ebola crisis, both with work at the Department of Homeland Security-sponsored, Sandia-Los Alamos-operated National Infrastructure Simulation and Analysis Center and with Sandia personnel on the ground in West Africa. The work was funded by the Defense Threat Reduction Agency and the US Department of State.

Jill also cited the Labs' new Counterfeit Detection Center (CDC) as an important model for Sandia's future. "This is an incredible capability Sandia has established for a group of sponsors to assess components from the micro to the macro level looking for counterfeits," she said. Jill noted that the CDC is especially significant because it represents infrastructure investment by sponsors beyond DOE/NNSA.

Sandia has played a role in climate change studies for some time, Jill said, but noted that the Labs' latest work, led by Mark Taylor (1446) in partnership with 15 other institutions "really puts Sandia on the map" in climate change science. Mark's team developed ACME — the Accelerated Climate Modeling for Energy — to examine "big science" questions that drive climate change: water cycle, biogeochemistry, and the cryosphere. In the years ahead, ACME will be able to leverage increased supercomputer power as it becomes available.

In another area, Jill highlighted Pavel Bochev (1442), who was honored by DOE with the prestigious E.O. Lawrence Award for important, breakthrough work in advanced mathematics.

Noting that the Sandia's Mission Support organizations are an essential component of the Labs' ability to deliver with excellence, Jill said that significant new office space was brought on-line in both California and New Mexico "on budget, on time, and with a perfect safety record." She also praised the Sandia initiative to centralize waste disposal, an initiative that saved some $400,000 last year alone.

The Labs FY16-FY20 Strategic Plan, Jill noted, has been consolidated and simplified from five objectives to three:

- Amplify our national security impact.
- Strengthen our Laboratories' foundation to maximize mission impact.
- Advance an exceptional work environment that enables and inspires our people in service to our nation.

Jill said the Labs leadership has identified two so-called "crosscuts" — considerations that affect all three objectives — that will impact how effective Sandia will be in realizing those objectives: trusted partnerships and exceptional performance.

Pledging to make contract re-bid a non-issue for workforce

In a brief discussion of the 2016 budget situation, Jill said she remains hopeful that Sandia and NNSA will have a real FY16 budget appropriation this year rather than having to work again from continuing resolution funding.

She also addressed the issue of the re-bid by DOE/NNSA of the Management and Operations contract for Sandia. Lockheed Martin is managing the Labs on a contract extension that expires at the end of April 2017. Jill said she does not expect that contract to be extended again, adding that a re-bid is a certainty. She pledged that she and the leadership team will do everything they can to ensure that the Labs' work environment remains as stable as possible. "We'll try to make this a non-issue for you," she said.

Noting that her first three months in her new role have been filled with consequential activities, she said, "It has been an enormous honor to represent you throughout the country and the world," concluding, "Keep up the good work."

New program lets researchers help companies that license their inventions

By Nancy Salem

In a boost to technology transfer, Sandia has launched a program that lets researchers consult for companies that license their Sandia work.

"There is a need for this. We hear often in the business community that it would help a lot if our people could consult on their inventions," says Pete Atherton, senior manager for Industry Partnerships Dept. 1930. "Licensees, especially small businesses, really need the technical guidance to take the next steps."

A researcher who wants to consult for a company that licenses his or her technology must first get a green light from the Labs. Work would be done on the researcher's own time.

"This is another way to give scientists and engineers with an entrepreneurial spirit an avenue to explore business without leaving the Labs and help their work make it to the commercial market," Pete says. "And it gives companies expertise to help commercialize a technology."

He says the availability to consult should lead to more licensing as businesses learn they can get follow-up technical help from Sandia. "Businesses may not know how much consulting they will need until they get started," Pete says. "This is a flexible approach that opens the door."

The program is one of a number of ways Sandia supports technology transfer and the business community.

- The New Mexico Small Business Assistance (NMSBA) program lets for-profit companies team with Sandia researchers free of charge to solve technical challenges. In 2014, Sandia provided $2.31 million in assistance to 197 New Mexico small businesses in 27 counties. The funds come from money that Sandia otherwise would owe to the state of New Mexico in gross receipts taxes.
- Scientists can leave Sandia to launch technology companies or expand existing ones through the Entrepreneurial Separation to Transfer Technology (ESTT) program, which guarantees reinstatement if the researcher chooses to return to Sandia within three years.
- The Sandia Science and Technology Park is a 340-acre technology community adjacent to Sandia and Kirtland Air Force Base where startups and mature companies can collaborate with the Labs on a variety of technologies, products, and services. The park's Center for Collaboration and Commercialization, or C3, now in the planning stages, will offer programs and services to strengthen partnerships, technology transfer, and ties to the community.

LAB TO MARKET — Pete Atherton, senior manager of Industry Partnerships Dept. 1930, says a new program that allows researchers to consult on their own time for companies that license their Sandia inventions should increase technology transfer. (Photo by Randy Montoya)

If you are interested in consulting on a licensed technology or through the NMSBA or ESTT, contact Genaro Montoya (1933) at gmontoy@sandia.gov or 505-284-0625.

And companies can contract to work with Sandia through Collaborative Research and Development Agreements (CRADA) and Strategic Partnership Projects, Non-Federal Entity (SPP/NFE) agreements. "These are good if the work supports a Sandia mission but more difficult for a small or startup company that is trying to understand and possibly commercialize a technology on a lean budget and time frame," Pete says.

Andy McIlroy, Sandia's deputy chief technology officer and director of the Research Strategy and Partnerships Center 1900, says the consulting option will enhance tech transfer. "Through an innovative portfolio of mutually reinforcing initiatives, Sandia continues to be a leader in effectively transferring technology to the private sector for the widest possible benefit to the taxpayer," he says.

PANTHER

(Continued from page 1)

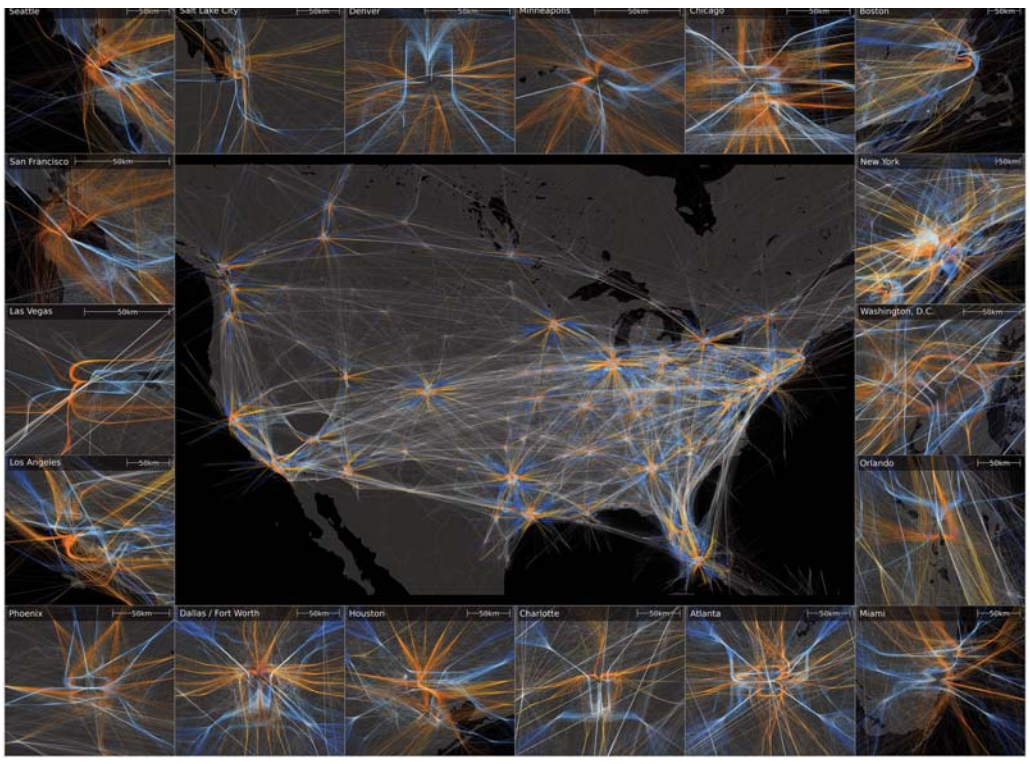
ber of breakthroughs in rethinking how to compare motion and trajectories; developing software to represent remote sensor images, couple them with additional information and present them in a searchable form; and conducting fundamental research on visual cognition, says Kristina Czuchlewski, PANTHER's principal investigator and manager of Sandia's Intelligence Surveillance and Reconnaissance Systems Engineering and Decision Support Dept. 5346.

The PANTHER team looked at raw data and ways to pre-process and analyze it to make it searchable and more meaningful. The project also conducted fundamental research in cognitive science to inform the design of software and tools to help those viewing the data and make information of interest or trends easier to uncover.

PANTHER led to a strong partnership between the Labs' Science & Technology and Defense Systems & Assessments organizations, "creating seminal technical achievements that are having direct impacts on Sandia's ability to provide solutions for some of our nation's most challenging national security intelligence problems," says senior manager Steve Castillo (5340).

PANTHER, which is funded by Sandia's Laboratory Directed Research & Development program, is providing deeper insights from complex data sets in minutes, as compared to months, and covering hundreds, as opposed to dozens, of miles.

"PANTHER developed the foundation for transforming how massive, complex data sets can be quickly analyzed to provide the nation's decision-makers with new perspectives on situations and circumstances," says Anthony Medina, director of Radio Frequency & Electronic Systems Center 5300. "If analysts are collecting information on a specific location over time and learn that something of interest might be occurring there, they probably don't have the tools they need to quickly gather and analyze information from all relevant data sets that might corroborate the forecast. But PANTHER is probably the nation's best bet right now to get to that point quickly."



THE IMAGE ABOVE DEPICTS CIVILIAN AIR TRAFFIC over the US and Canada on one fairly quiet day, with insets showing activity around some high-traffic airports. Orange areas indicate take-offs, blue indicates landings, and white lines represent aircraft moving at fairly constant altitude and speed. Trajectory databases such as this one afford the opportunity to develop novel methods to cluster flights based on their behavior and shape, predict where newly detected aircraft may be going, and identify anomalies at scales from a single aircraft to large groups detouring around severe weather. Similar algorithms apply to sea-going traffic, auto traffic, and even gaze tracking. (Image courtesy of PANTHER team)

Tracktable code automates observation of motion, trajectories

Danny Rintoul (1462) developed the Tracktable code along with Andy Wilson (1461) and others to automate the observation of motion and trajectories. The code could be applied to any problem that examines movement, such as airliners, ships, or people.

Current approaches to getting meaningful information from trajectories focus on comparing one trajectory to another. If you have millions of trajectories to consider, that could mean trillions of comparisons, which takes a lot of time and computer power, Danny says.

"We've developed a way to store and represent trajectories so that computers can compare them all at once in a very fast and effective manner," he says. Instead of trillions of comparisons, the software does the same job in millions of comparisons, which is manageable.

An analyst concerned about the number of airliners stuck in holding patterns could ask Tracktable about aircraft trajectories that made a certain pattern of turns. Tracktable then calculates geometric features, such as the number of 90-degree turns an aircraft flew or the length of a straight line. By associating a type of motion with these features and assigning a number to each feature, the computer can quickly group flights that behave in similar ways and show them to the viewer for interpretation.

"If you have millions and you're not interested in precise comparisons, but general groupings of them, this is very effective," Danny says.

PANTHER also examined the predictive capability of the information buried in data. If an analyst looks at the first half of a flight, considers historical data about similar flight paths, and then looks at the second half of the flight, any deviation from the pattern might cue an analyst to take a closer look. Finding that outlier from millions of flights that have flown before takes about a second with Tracktable, Danny says. The analyst is alerted because PANTHER team members are using the advances in cognitive science to design visual results that will highlight the odd behavior of the single aircraft. By studying how analysts use visual data, Sandia researchers are figuring out ways to make an outlier pop out of a screen full of detail to demand an analyst's attention.

The team is now looking at integrating motion and trajectories into a system called GeoGraphy.

GeoGraphy helps analysts search for items of interest, shows changes over time

GeoGraphy, initially funded by NNSA, is a software system that converts remote sensing images expressed in pixels into nodes and edges in a graph to show changes over time and make the data searchable, says Randy Brost (1462), a computer scientist who led the team that developed the software.

GeoGraphy breaks the images into categories, such as buildings, trees, or rivers. This pre-processing creates something like a very complex paint-by-number that shows the categories of everything visible in the image. The program uses nodes and edges — nodes are analogous to the beige hubs in Tinkertoys, while edges are the colored connecting rods — to describe relationships between objects, such as distance or time, Randy and Kristina say.

In addition to the imagery, the software package could include such information as phone books or county records to provide a single searchable database of all the information that shows what's changed over time.

For example, to find a high school, the analyst tells the program to search for large buildings near regions that look like parking lots, football fields, and tennis courts and defines those items. The analyst then can choose from among the results the computer provides.

The system is hierarchical, so once analysts identify high schools, they can ask the program to find high schools the next time without describing them. And should they doubt that something is a high school, the software makes the raw data available so they can verify the results, Randy says.

"The purpose of these codes — GeoGraphy and Tracktable — is to assist humans, not to replace them or to automatically do their jobs. It's to enhance their ability to do their jobs well and to allow them to be more effective in dealing with large sets of evidence," Randy says. "In the end, basically they are suggestion systems that say, 'Hey, based on what you told me you're interested in, you ought to look here, here, and here.'"

The PANTHER team also included researchers focused on enhancing the viewer experience. Researcher Laura Matzen and others are conducting cognitive science experiments to learn how analysts' expertise affects their visual cognition and to create a model of how top-down visual attention — when a user approaches an image with a goal in mind — works. The researchers hope to use the answers they find to such fundamental cognitive science questions to inform the design of new tools to improve interactions between humans and computers, Laura says.

At the start of the three-year program, PANTHER's diverse team of computer scientists and experts in sensors, human factors, digital signal processing, and machine learning had to take time to understand how each discipline approached the problem, Kristina says.

The team created a small shared workspace that "has done wonders to get everyone to be comfortable with each other," she says.

PANTHER's next steps

The prototype products and ideas developed under PANTHER are now ready for the next step in their development: to be tested in real-world environments, Kristina says.

The researchers have proposed research into new problems illuminated by PANTHER, while other agencies are solidifying the foundation PANTHER has developed. Other projects will use PANTHER's ideas to address real-world problems, the researchers say.

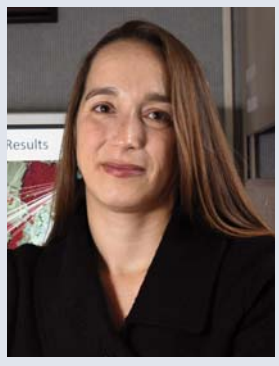
"We went into PANTHER thinking we were going to do one thing, we're going to improve the lives of image analysts," Kristina says. "And, in the research process, we did a whole lot more."

The PANTHER team included: Karin Butler, Kerstan Cole, and Susan Stevens-Adams (all 431); Cindy Phillips (1400); Michael Haass, Matt Peterson, Dave Robinson, Tim Shead, Andy Wilson, and Diane Woodbridge (all 1461); Randy Brost, Danny Rintoul, and David Stracuzzi (all 1462); Mika Armenta, Kristin Divis, Laura Matzen, and Mike Trumbo (all 1463); Andrew Patterson (5337); Robert Riley (5342); Max Chen, Kristina Czuchlewski, Stephen Dauphin, Rebecca Malinas, Laura McNamara, Dan Morrow, Andrew Pound, and Derek West (all 5346); Jeremy Goold (5348); Jim Chow (5349); Mark Koch, Mary Moya, Ryan Steinbach, and Tu-Thach Quach (all 5448); Chris Valicka (5523); John Ganter (5537); David Perkins (5541); Jamie Coram (5544); and Philip Kegelmeyer (8900).

Kristina Czuchlewski always knew she was going to be a scientist or engineer

Ask Kristina Czuchlewski about her travels and it's no surprise she works at Sandia. Kristina first visited New Mexico on a college field trip to study geology for a week.

"I remember it was really sunny and we were studying for a differential equations test. We were all engineers taking geology and great friends, so we were hiking around New Mexico quizzing each other about partial differential equations," she says. "It was super nerd-out time."



KRISTINA CZUCHLEWSKI

But Kristina's exposure to science and higher education came even earlier on family trips when her mom and dad, a high school chemistry teacher, took her to science museums, aquariums, and college campuses from an early age.

"We would make special side trips to visit every science museum for fun when we were on vacation," she recalls. "I always knew I was going to be a scientist or engineer in some form and I always knew I was going to go to college."

As an undergraduate in civil engineering at Princeton University enrolled in the geological engineering program, Kristina became interested in the way the earth worked and excited about how to deal with and understand natural disasters, though she had never been in one.

In graduate school at Columbia University, Kristina focused on seismology and geophysics, but her natural curiosity led her toward work with radar remote sensing, and she started exploring how to use the unique properties of radar imaging to study and respond to natural disasters.

When she arrived at Sandia, she saw an immediate connection between national security work and the civil applications she had studied in school. Both types of research focused on trying to help people, they used the best technology available, and there was a sense of urgency and very high consequences. Sandia became a natural fit.

"While at Sandia, I've been able to keep that theme of exploring deep technical concepts, while broadly applying new knowledge to meaningful problems," she says.

Sandia shares stage at DOE Labs Day on the Hill, Stockpile Stewardship events

By Cathy Ann Connelly • Photos courtesy of NNSA

BRIG. GEN. S.L. Davis, right, acting deputy administrator for Defense Programs, NNSA, talks with Sandia Deputy Labs Director and Executive VP for National Security Programs Steve Rottler, center, at the Stockpile Stewardship Program 20th anniversary event.

The success, benefits, and challenges of sustaining the US nuclear deterrent without full-scale underground nuclear testing through science-based stockpile stewardship, and what such science-based virtual testing may look like in the future, were the focus of two recent back-to-back high-profile events in the nation's capital.

Among those in attendance were Secretary of State John Kerry, Energy Secretary Ernest Moniz, DOE Under Secretary for Nuclear Security and NNSA Administrator Lt. Gen. (retired) Frank G. Klotz, congressional representatives and staff, Sandia President and Labs Director Jill Hruby, and other national security lab directors, staff scientists and engineers, policy officials, and other high-level leadership from DoD and the broader national security community.

Today, full-scale nuclear explosive testing has been replaced by an annual assessment process that examines each weapons system in scientific, engineering, and computational detail in a manner that is instilled with scientific rigor and allows peer review. National lab scientists and engineers have developed and are using advanced experimental, component testing, and computational tools to assure the continued safety, security, and effectiveness of the nation's nuclear deterrent. This is stockpile stewardship.

THE STOCKPILE STEWARDSHIP PROGRAM 20th anniversary event kicks off with an address by DOE Under Secretary for Nuclear Security and NNSA Administrator Lt. Gen. (ret.) Frank Klotz.

Sponsored by NNSA, the Oct. 21 morning event, marking the 20th anniversary of the successful science-based Stockpile Stewardship Program, highlighted the role of recruitment and retention of world-class scientists and engineers as critical elements of this program's future. The afternoon event, National Security Labs Day on Capitol Hill, sponsored by DOE, featured top scientists and engineers using displays and hands-on examples to explain first-hand how and why they do what they do. They discussed advanced engineering, science, and computing capabilities that enable stockpile stewardship and also cross over to benefit other national security missions, such as nuclear nonproliferation, homeland security, cyber and space threats, and national emergency response, which also had displays at the event.

A theme for both events emphasized the need to continue recruiting and retaining top talent. During morning panels, Jill said Sandia has addressed the issue by encouraging young technical talent to participate in a wide variety of national security programs, not only for NNSA but also other government agencies.

SANDIA ENGINEER HEATHER KRAEMER (0254) (pointing), was part of the stockpile stewardship team at National Security Labs day on Capitol Hill. The display included a to-scale mock-up of the B61-12 nuclear weapon (foreground) currently undergoing life-extension, along with miniature models of other weapons in the US nuclear deterrent.

SANDIA LABS DIRECTOR JILL HRUBY with US Sen. Angus King, I-Maine, during the VIP tour of the displays at the National Security Labs Day on Capitol Hill.

"By doing this, what we have found is a very interesting ability to stay at the state of the art, translate it into the high-reliability applications of nuclear weapons, and go back around again," she said.

Jill also emphasized, "Our processes are firm and our science base has advanced significantly; for example, we have a great modern facility for our strategically hardened microelectronics. All the pieces are in place. Our challenge now, I believe, is to keep our preparedness moving forward — not to stop or believe we're done. There is so much going on in the world of science and technology relevant to our missions and that our people care about. We just have to make sure we are always at the cutting edge. We must make sure we have the right alliances with industry, academia, and each other, and that we have full faith and confidence in the great people we've been able to hire."

New owners get key to Sandia-sponsored Habitat home

THE GREATER GOOD — On Oct. 31, a disabled veteran and his two children received the keys to the 14th Habitat for Humanity home sponsored by Sandia and Lockheed Martin. More than 280 Sandia volunteers helped build the three-bedroom, two-bathroom home in southwest Albuquerque. (Photo by Patty Zamora)

CYGNUS MILESTONE — In this photo from 2004, now-former Sandian Isidro Molina, left, and Gene Ormond (1656-1) check over Cygnus. The dual-axis flash X-ray radiography system, which was designed by Sandia and is located at the Nevada National Security Site, has fired its 3,000th shot.

BIG SHOTS

Sandia X-ray radiography workhorses reach milestones

By Sue Major Holmes • Photos by Randy Montoya

Two workhorses for NNSA X-ray radiography have reached milestones: Cygnus has fired its 3,000th shot and RITS-6 has fired 2,000 shots.

Cygnus, a Sandia-designed, multi-laboratory dual-axis flash X-ray radiography system at the Nevada National Security Site (NNSS), was originally envisioned for only a single series of subcritical experiments more than a decade ago. Sandia's RITS-6 facility, a flash X-ray source, has operated for about a decade.

A team from National Securities Technologies (NSTec), Sandia, and Los Alamos National Laboratory (LANL) fired the milestone Cygnus shot Aug. 27. It tested the firing system's timing to ensure signals for diagnostics get where they're needed at the right time since a subcritical shot lasts only tens of milliseconds. This was in preparation for a Sept. 23 subcritical experiment called Orpheus, a surrogate materials test in a series called Lyra that will conclude with a subcritical plutonium experiment in 2017.

Experiments by both Cygnus and RITS-6 support nuclear weapons stockpile stewardship.

Performance has to be perfect

"It's as if you are spending a year practicing for a piano recital, and you can't make a mistake on the day you are to perform," says Dan Bozman (16561), team lead for Nevada Support. "If you miss one note, it's a failure. That one performance has to be absolutely perfect, with it lasting less than a second. It's a lot of practice, it's boring, hard to do, and repetitious. On that one day you can't image how high the tensions are. Everyone is watching, and you don't want to be the one to miss a note."

RITS-6, for Radiographic Integrated Test Stand, reached its milestone Sept. 2. RITS-6 develops a flash X-ray source for thick-object radiography, labeled that because things grow thicker as they implode, "so you have to look through a lot of mass with a short duration X-ray pulse," explains manager Mark Kiefer (1656). "You have less than one millionth of a second to freeze motion, then there's a tremendous X-ray dose to see through things."

RITS-6 AT WORK — Derek Ziska, left, and Dan Nielsen (both 1656) stand on the pulse-forming line platform to check the magnetic core reset mechanism on the RITS-6 cavities as Advanced Radiographic Technologies manager Mark Kiefer (also 1656) looks on from the walkway above. RITS-6, a flash X-ray source, has operated for about a decade and recently fired its 2,000th shot.

It's a very challenging radiography to take, he says, since "things move very fast because the implosion is created with high explosives."

Sandia designed Cygnus when LANL needed images to look at the physical properties of plutonium during a subcritical experiment. While getting that ready, Sandia decided to use a vessel to contain the experiments to preserve the facility, which lies 1,000 feet below the desert floor. Cygnus' identical locomotive-size pulsed X-ray machines, Cygnus-1 and Cygnus-2, can be fired separately, which lets an experimenter capture images at two separate times during an implosion, Dan says.

It's called Cygnus after Cygnus X-1 of the Cygnus constellation, one of the brightest binary X-ray sources in the northern sky. Cygnus in Nevada has two "arms," so it's a binary.

Cygnus, jointly built and operated with Los Alamos and NNSS operator NSTec, originally was intended for a plutonium experiment in 2004, not to exceed 300 shots. Since then, the team has executed five subcritical plutonium shots, each preceded by a multitude of test shots for diagnostics, imaging, and diode development as well as confirmatory shots executed like plutonium shots. They were followed by post-event shots to verify imaging and dose data.

Cygnus, RITS-6 capture important data

Dan says Cygnus' subcritical tests have generated more plutonium implosion data than all previous subcritical tests combined. At least four more series are expected, with a 4000th shot around 2022.

The facility operates 10-hour days Monday through Thursday. "It's a grueling schedule, and as we get closer to shot days, the days get even longer and we'll work Fridays as well," Dan says. During experiments, the crew stays in on-site housing to be available 24 hours. "The job requirements are excruciating, and this is one of the most dedicated teams I've ever seen," Dan says. Some have been with Cygnus since its beginning.

RITS-6 was built to evaluate flash X-ray sources — very short, intense pulses — for radiography of hydrodynamic testing, Mark says. It uses a type of X-ray source called a Self-Magnetic Pinch (SMP) diode and can be configured various ways, allowing the experimenter to tailor the output for each experiment. RITS-6 has studied many other types of flash X-ray sources.

Sandia operated a demonstration system with one accelerating cavity, called RITS-1, from 2000-2001. A complete accelerator with three cavities, RITS-3, was built and operated from 2002-2005. It was upgraded to its current six-cavity size and renamed RITS-6, which did its first experiment in September 2005.

When RITS-6 was built, its flexibility in creating a very high power electrical pulse for X-ray sources exceeded anything else at the time, Mark says. Over the years, Sandia has operated it with different diodes, and "in that way we've fulfilled the mission of why it was built, to test many different types of X-ray sources and find one that meets requirements," he says.

"We've been doing X-ray source development as a way to get X-ray images at a lower cost than other methods," Mark says. It's staffed by six Sandians augmented by staff from NSTec, a key participant since the facility's earliest days.

Over the last year, the RITS-6 staff has zeroed in on an X-ray source producing a very small X-ray spot. "A smaller spot equals better image resolution," Mark says. "We've demonstrated that."

RITS-6 probably will shut down in December because program requirements have changed. Mark says the program wants at least two radiographic frames along the same view to better see stopped motion during experiments, but the SMP diode can do only one stop-frame. However, it's likely the facility will be used for a different job in the future, he says.

Sandia Admin Professionals boost their creative genius at annual Forum

Photos by Randy Montoya

More than 200 Sandia administrative professionals attended one of the two sessions of the 2015 Administrative Professionals Forum in New Mexico. HR and Communications Div. 3000 VP Melonie Parker opened the sessions, welcoming the admins and sharing her career story from administrative assistant to vice president.

Visual goal setter and motivational speaker Patti Dobrowolski captivated and inspired the administrative professionals at the forum using the business leadership tool Drawing Solutions. She is a TEDx speaker, critically acclaimed comic performer, writer, and business consultant. According to Executive Assistant and forum planning team member Monica Lovato Padilla (6000), attendees said they found Dobrowolski's innovative visual keynotes, break-out, and game-storming sessions to be inspiring and energizing.

"Admins at all levels were able to set goals, envision their desired future to create positive change, accelerate team performance for a better bottom line, and network with one another," Monica says.

In addition to Monica, other planning team members included Deborah Marchand (00001), executive assistant; Kathleen Bowers (3500), senior management assistant; and Pauline Marquez (2100), senior management assistant. Training support was provided by Charlotte Hendrix (3523) and Nicole Chavez (3523).

Sandia goal of Zero Waste goes above and beyond recycling

By Karli Massey

For nearly 20 years people across the country have been taking the pledge to Keep America Beautiful by participating in America Recycles Day (Nov. 15) activities. Sandia joins in those efforts by raising awareness at events that demonstrate how members of the workforce can participate in recycling efforts in their own workspaces.

"Leading up to America Recycles Day last year, Materials Sustainability and Pollution Prevention (MSP2) team members were on hand at the Thunderbird Café to help people identify what can be recycled, what can be composted, and what is waste," says environmental technical professional Sam McCord (4144).

AMERICA RECYCLES 2015
Activities at Sandia
Nov 16-18
11 a.m.-1 p.m.
Thunderbird Café

Sandia is making significant strides to divert office waste from the landfill. Over the past three years, the Labs has averaged 67 percent diversion, primarily by recycling and reuse, but also increasingly by source reduction. This has inspired a goal of Zero Waste by 2025.

"While many Sandians are on board with our various recycle streams, we cannot achieve Zero Waste solely by recycling," says Ralph Wrons (4144), coordinator of the MSP2 program.

The Zero Waste by 2025 goal uses the US Zero Waste Business Council performance metric, which calls for companies to achieve and maintain 90 percent or greater diversion of waste from the landfill or incinerator. "Sandia's baseline is 1,035 tons of waste, which was the amount we sent to the landfill in 2008," says Ralph. Last year, Sandia diverted 67 percent of commercial waste by recycling 1,525 tons.

Other strategies for reaching the Zero Waste goal include being effective in material use and buying only what is needed, adds Ralph. To make that point, he cites the figure that for every ton of commercial solid waste disposed at a landfill; 71 tons of waste are created upstream from mining, processing, manufacturing, transporting, distributing, and other factors.

SANDIA/NEW MEXICO'S Solid Waste Collection and Recycling Center processes waste from the Labs. Sorting activities help identify 1,525 tons of recyclable materials. (Photo by Lloyd Wilson)

International visitors learn about Sandia's nuclear weapons, nonproliferation work

By Heather Clark

International visitors participating in the second Nuclear Nonproliferation Treaty Transparency Visit were concerned about whether Sandia's life extension programs are modernizing the military capabilities of US nuclear weapons.

A goal of the Oct. 27 visit to Sandia was to correct this kind of misperception through briefings and visits to technical facilities used to support the stockpile stewardship and nuclear nonproliferation programs.

"These life extension programs are not providing any new military capabilities," NNSA Principal Deputy Administrator Madelyn Creedon told the visitors. "They are replacing all the other parts and pieces of the warhead that just simply don't last."

The US stockpile is older than ever, with the current average weapon's age being greater than 27 years, Creedon said. Making nuclear weapons more reliable by replacing worn-out parts means that the nation can retain confidence in the deterrent while reducing the total number of warheads, she added.

In the US, the number of nuclear warheads peaked during the Cold War at 31,255, but at the end of 2014, the US had 4,717 warheads in the stockpile and about 2,500 retired warheads awaiting dismantlement, Creedon said.

"We're not designing any new systems — new warheads, new nuclear bombs — with new military capabilities. What we are doing is just taking these old systems, replacing their parts, and making sure that they can survive another period of time. For the most part, that's 20 years," she said.

Sandia President and Labs Director Jill Hruby; Gary Sanders, VP of Weapons Engineering & Product Realization Div. 2000; and Rodney Wilson, director of Global Security & Cooperation Center 6800, also addressed the visitors in the morning session.

The guests, who included diplomats from Austria, Finland, Jordan, Nigeria, Poland, Singapore, and Sweden, and a NATO representative, visited Los Alamos National Laboratory on the first day of their trip to New Mexico.

In addition to senior representation from NNSA, the US Department of State was represented by Ambassador Adam Scheinman, special representative of the president for nuclear nonproliferation in the Bureau of International Security and Nonproliferation, and Anita Friedt, principal deputy assistant secretary for nuclear and strategic policy in the Bureau of Arms Control, Verification, and Compliance.

NNSA PRINCIPAL DEPUTY Administrator Madelyn Creedon addresses international visitors touring Sandia as part of the second Nuclear Nonproliferation Treaty Transparency Visit. (Photo by Randy Montoya)

Visitors learn about LEP work at the Labs

Gary discussed Sandia's current life extension programs (LEPs) for the W76-1 and the B61.

Gary and Creedon explained that as the weapons age, the non-nuclear parts are wearing out, including the wires, plastics, and other materials, vacuum tube radars, batteries, spin rockets, and parachutes.

The Labs historically tests 11 of each type of weapon per year, Gary said, by taking the physics package out and running flight and lab tests to determine whether the non-nuclear parts work properly.

Replacing aging batteries is one task of the LEPs, Gary explained. "What we are making sure of is that the modern one has the same capability that the old one did. Now, we can make the battery last 30 years, versus 20 years, but it doesn't do anything to the ability to hit a new target set. It doesn't change the yield. There are no new targets at risk. There are not new flight parameters. Nothing else is happening," he said. "It doesn't change the deterrence. The part of the weapons being modernized are the safety features."

RYAN KAMM, manager of Z Pulsed Power Systems Dept. 1679, explains to a delegation of international visitors some of the principles behind Sandia's Z machine and how it is used in advancing nonproliferation goals. (Photo by Randy Montoya)

During their visit to Sandia, the group toured facilities involved in testing nuclear weapons through science-based stockpile stewardship, such as the Thermal Test Complex (TTC) and the Z pulsed-power machine. They also visited the Training and Technology Demonstration Area to learn about the Labs' nonproliferation, arms control, nuclear security, and international work.

Sandia modernizing facilities, workforce during LEPs

If any modernization is happening, it's in Labs' facilities and workforce, Gary said.

Earlier in his career, he said, testing non-nuclear parts of weapons for their safety in accidental fires took place outside in a jet fuel pool. Today, the TTC provides an environmentally safe way to test nuclear weapons parts in an enclosed chamber that can recreate any possible combination of accident scenarios to make sure a weapon is safe, Gary said.

"The bombs are designed to use insensitive high explosives. You can throw one into a fire and it just melts," he said. "You can crash it. You can shoot bullets into it, and it doesn't react."

Nuclear weapons have used environmental sensing switches to sense the intended conditions of an intended launch and deceleration of the missile. In addition to these conditions, Sandia added other elements to the W76-1 extension design to make a weapon even safer, he said.

"We're adding in safety features every time we have the chance to," he said.

And, the size of the nuclear weapons enterprise is shrinking to match the smaller stockpile. Three decades ago, there were approximately 30 facilities across the country in the complex, compared with eight sites plus NNSA headquarters today, Gary said.

The workforce, too, is changing. Thirty to 40 percent of Sandia's workforce is retirement-eligible, Gary said. So it's important to bring in a new generation of employees who can learn from those nearing the ends of their careers or those who have retired but continue to pass along their knowledge.

Creedon also wanted the visitors to understand that expertise in Sandia's weapons programs flows into the Labs' work to prevent, counter, and respond to nuclear dangers worldwide.

"The technology, the science, and the people worrying about our weapons programs have been able to make our nonproliferation programs even stronger, so that we understand what other people are doing, what are they looking for, what are they designing, what are they buying, and what are they doing in respect to materials production," she said. "It's allowed us to be very strong leaders on the nonproliferation side."

Benn Tannenbaum elected APS Fellow for career on the Hill

By Mollie Rappe

BENN TANNENBAUM

Benn Tannenbaum (164), manager of the Sandia's Washington, D.C., office, has been elected a Fellow of the American Physical Society. He was nominated by its Forum on Physics and Society.

Benn was honored "for outstanding contributions to international peace and security by addressing nuclear arms control, nonproliferation, and terrorism; and for mentoring young scientists and educating students to bring science to bear on societal challenges," according to the citation.

Benn says, "I'm delighted and honored to be recognized for my work; I've been fortunate to work in a field where I can have an impact."

Many of Benn's contributions came while he served as program director of the Center for Science, Technology, and Security Policy at the American Association for the Advancement of Science, before joining Sandia in December 2010.

While with AAAS, Benn connected leading scientists with policymakers, particularly congressional staff, on a variety of national security topics through monthly seminars and other venues. He also directed expert advisory reports on such topics as nuclear forensics and nuclear weapons policy.

Commitment to mentoring

"We need more scientists and engineers to engage in the policymaking process, and I want to help all who want to participate," says Benn. "I want to help others understand how they can work in policy, either as a career or while continuing to work as academics."

Benn earned his PhD at the Fermi National Accelerator Laboratory. Following a postdoctoral fellowship at UCLA, Benn made the transition from high-energy particle physics to public policy and nonproliferation through an American Physical Society Congressional Fellowship. He says the transition was a mix of "sheer happenstance" and a determination to forge his own path, which informed his commitment to guiding others through their own career transitions.

Kristen Hajduk, a mentee of Benn's and currently an adviser for Special Operations & Irregular Warfare in the Office of the Assistant Secretary of Defense for Special Operations/Low-Intensity Conflict, says, "His mentorship is a boundless source of career insights, up-to-date information on the nuclear security community, even advice on balancing professional and personal priorities. Despite his manifold interests and occupations, Benn always has time to discuss and debate with me as a professional and intellectual equal."

Liz Chesney, a former graduate student of Benn's and a consultant for federal agencies in policy analysis and strategic communications, adds, "Dr. Tannenbaum's mentorship has been a steady source of encouragement, helping me to bridge the world of science and translate it into effective public policy. His vast expertise and personable approach to mentoring make him a wonderful mentor and great source of professional guidance."

Benn will be inducted with other new Fellows at the American Physical Society meeting March 14-18 in Baltimore, Maryland.

Previously, Sandian Arian Pregenzer was nominated by the Forum on Physics and Society and elected in 2012 for her work in advancing arms control monitoring and verification technologies.

Annual Exercise an earth-shaking activity

Story by Lindsey Kibler • Photos by Randy Montoya

More than 100 employees from across the Labs participated Oct. 14 in the 2015 Emergency Management full-scale exercise at Sandia/New Mexico. Emergency Management uses the annual event as a self-assessment to verify the effectiveness of its program in accordance with the site's plans and procedures and the DOE order covering the comprehensive emergency management system.

In this year's scenario — Dust in the Wind — a 5.6 magnitude earthquake shook the greater Albuquerque area. The epicenter was just south of the Albuquerque International Sunport, causing widespread panic and severe damage within a 20-mile radius. Twenty-three Sandia buildings sustained damage and 37 employees were injured, prompting evacuations and the establishment of the Family Assistance Center.

In the scenario, the Sandia Pulsed Reactor Facility (SPRF) was accepting three drums from a Radioactive Mixed Waste Management Facility vehicle at the time of the earthquake. As the exercise played out, one of the drums fell onto a worker and popped its primary and secondary lids, contaminating him. A 13Kv transformer near the transfer site exploded, injuring two more workers.

Emergency response teams were dispatched the area to assess the casualties. One "injured" patient was triaged and sent to the University of New Mexico Hospital, which participated in this year's exercise to test its contamination procedures. Other outside organizations that took part were the Sandia Field Office, NNSA and DOE headquarters, and Albuquerque Ambulance Service.

Sandia Classified Ads

MISCELLANEOUS

CRAFT FAIR, Manzano High School band, Nov. 14, 10 a.m.-3 p.m., cafeteria, 12200 Lomas Blvd. NE. Wilkins, 977-3386.

MATTRESS, pillow-top, Simmons Beautyrest, 5 mos. old, $400; metal soccer goal posts (no net), $39, negotiable; pet gate, $30; elevated large dog bed, $25. Brewster, 238-4704, ask for Julie.

BIKE RACK, holds 4 bikes, Yakima, tilt-away hitch-mounted, fits both 1-1/4" and 2" hitch, $100. Alam, 363-7369.

FLOOR MATS, front & rear, premium, all weather, black, for '15 Chevrolet Silverado, never used, $75. Elliott, 792-1002.

ARMOIRE & HUTCH, dark cherry finish, $700/both. Hennessey, 505-269-6243.

DIGITAL VIDEO CAMERA, Sony Handycam Digital 8 NTSC, model DCR-TRV460, like new, $150. Goy, 505-410-0514.

WICKER PLANTER, vintage white, 10" x 10" x 23"H, $15; wicker stand, vintage white, 17"W x 13"D x 37"H, 3 shelves, $25. Dockerty, 828-0745.

CONVERTIBLE CRIB, w/matching dresser, tan, high quality, heavy, sturdy, $375; double stroller, sit & stand, great shape, $125. Davis, 505-610-1309.

VACATION CONDO, Durango/Pagosa, fully-equipped, weekends/holiday break, 2-3 nights, 1-2 bdr., ride Polar Express train, $100-$140/night. Fernandez, 505-238-4722.

MOTORCYCLE COLD WEATHER GEAR, leather & cloth coats w/removable liners, helmets, gloves, more, photos available. Manning, 239-6634.

TIMESHARE, Kauai, HI, 1 wk., well-appointed condo, North Shore, many available weeks, $1,100. Hatfield, 505-858-3375.

DRESSER CHANGING TABLE, 3 large drawers, small drawer w/divider, door w/shelf, solid wood, $140. Nordquist, 505-400-1535.

UPRIGHT PIANO, Kranich & Bach, w/chair, US made, great sound & perfect tuning, you move, http://albuquerque.craigslist.org/msg/5293908214.html, $800. Brener, 239-9691.

TWO-SIDED GAS FIREPLACE, Regency P121, unused, 39,000-Btu, thermostat, propane kit, black louvers, $2,800. Karas, 505-750-1405.

LIFT CHAIR, Monarch Medium, sandstone velour, used only 6 mos., excellent condition, paid $1,000, asking $650. Boruff, 505-239-1026.

WOOD SPLITTER, Woodeze, 4-ton, electric, like new, $500. Farkash, 771-0057.

WOOD STOVE, 1978 Garrison, unused 20+ years, fine condition, environmentally unfriendly & grossly heavy, make offer. Shaw, 505-980-7491.

DINING ROOM FURNITURE, oak, china cabinet, double pedestal table, 2 20-in. leaves, 6 chairs, excellent condition, $500. Pelletier, 884-3726.

SLEIGH BED, queen, medium oak finish, like new, $250. Gonzales, 505-352-2339.

TV, Mitsubishi, WD-65738, 65-in., full 1080p, 3D, rear-projection, internet, low lamp hours, ~2,800, $300 OBO. Lujan, 299-2218.

TELESCOPE PKG., Celestron PowerSeeker 80EQ Refractor, w/motor drive, 21048-OP, w/accessories, photos available, MSRP, $440.60, make offer. Wilkins, 575-347-2222.

SLEEPING BAG, Kelty Little Creek Junior, 26" x 66", +30F holo-fill, nice for kids, $25. Alam, 688-7221.

DINING ROOM TABLE, oak, double pedestal, 4' x 6', 2 16-in. leaves, >8-ft. long, new, $800, will consider offer. Amend, 505-453-4751.

YOUNG AT HEART CHOIR, "Dickens Christmas in Heartsville," food, crafts, & more, Nov. 27-28, Dec. 4-5, Heights Nazarene. Martin, 858-3009.

SKIS, 3 pair, Völkl, high-end: World Cup Pro Stock, piston bindings, never & seldom used, 154-175 cm, mint condition. Wagner, 250-4040.

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 0165 (Dept. 3651)**
- **DELIVER: Bldg. 811 Lobby**
- **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.

FIREPLACE SET, black, wrought iron, 3-pc., small in size, w/stand, log grabber, poker, shovel, $75. Rivers, 505-720-4701.

CHRISTMAS TREE, 7-ft., pre-lit, white lights, very full, photo available, $50. Graham, 238-3549.

DOUBLE RECLINER, La-Z-Boy, full-size, w/fold down table, brown fabric, photo available, $400. Graham, 379-8798.

TRANSPORTATION

'13 ZL1 CAMARO CONVERTIBLE, Blue Ray metallic, 580-hp, 683 miles, will email photos, $48,000 OBO. Espander, 975-0387.

'14 INFINITI Q50 PREMIUM, all power, gray/black interior, navigation, Bose, only 21K miles, $31,995. Solis, 331-8169.

'01 TAURUS SE WAGON, V6, fold-down 3rd row seat, 127K miles, $3,500 OBO. Aidun, 265-4792.

'09 SMART CAR, loaded, white/silver, 1-owner, 43-mpg, 35K miles, $9,800 OBO. Sturgeon, 505-975-6565.

'12 TOYOTA RAV4, V6 sport, 4x4, white, 1-owner, 36,675 miles, private-sale value $19,369, asking $17,000. Strait, 281-7138.

'12 FORD F150, supercrew, King Ranch, 4x4, off-road, Ecoboost, white/gold trim, all options, 53K miles, $37,500. Tapia, 280-8888.

'69 CHEVY NOVA 307, w/350 heads, 450 holly & headers, great original condition, $5,500 OBO. Martin, 280-6924, flm7@q.com.

'03 LINCOLN TOWN CAR, 167K miles, $4,500. Clements, 865-3993.

'06 HONDA CIVIC EX, 4-dr., Galaxy grey, sunroof, tinted, 30/40-mpg, 99K miles, excellent mechanical condition, $7,500. Emery, 505-407-0830.

'11 SUBARU FORESTER, 2.5XT Turbo, blue, AT, blue, new tires, 97K miles, $14,000. Rosen, 771-2960.

RECREATION

'11 SUZUKI GSXR 600, only 3K miles, immaculate condition, $8,500. Ramirez, 505-859-8319.

'09 YAMAHA FZ6 MOTORCYCLE, blue, extra lights, recent full service, + extras, 20K miles, $4,000 OBO. Field, 505-697-9305.

'95 BMW R1100 R, garage-kept, w/tank bag & hard-side saddle bags, ~36K miles, $1,500. London, 505-720-6979.

'05 ALPENLITE 32RL AUGUSTA 5TH WHEEL, 4 season, high end, central vac, 2000-W inverter, $30,000. Cuoco, 280-4310.

BICYCLE, road tires, 26-in., Jamis Trail-X1, slanted crossbar, good as young/small rider's first full-sized bike, $250. Harris, 265-4792.

REAL ESTATE

4-6-BDR. HOME, multi-generational, handicap accessible in-laws suite, pool, completely updated & remodeled, MLS#847935, $500,000. Baczek, 505-450-7895.

2-ACRE LOT, Edgewood, all utilities available, w/natural gas, quiet neighborhood, $50,000. Huppertz, 286-3287.

2 BDR. HOME, 2 baths, newly updated, new appliances/carpet, huge backyard w/access, 446 Apache Loop NW, Rio Rancho, $99,999. Buck, 353-2667.

WANTED

VCR, compatible w/new Samsung widescreen TV, trade for selections from vast library of classical CDs & LPs, books, or cash. Joseph, 822-0536, call only after 7 p.m., audreyzen@msn.com.

SMALL, SINGLE-FAMILY HOME, extended Tri-Valley area (CA), lease starting Dec. 1, 2015-Jan 15, 2016, prefer $2,500/mo., max $2,750. Doak, 530-601-1960.

EXTREMELY CHEAP LIVING SITUATION, quiet, neat, nonsmoker, male, needs cheap place w/bike-accessible route to KAFB. Armstrong, 505-504-5554.

PICCOLO TRUMPET, working, affordable price for AYS student. Gutierrez, 505-332-3099, ask for Carlos or Susan.

MALE ROOMMATE, quiet, nonsmoker, updated, newer, 3-bdr. home, on KAFB, $550/mo. Bonner, 925-324-6995.

WORK WANTED

NEED A NANNY?, can pass background check, kids love me. Perry, 505-917-6708.

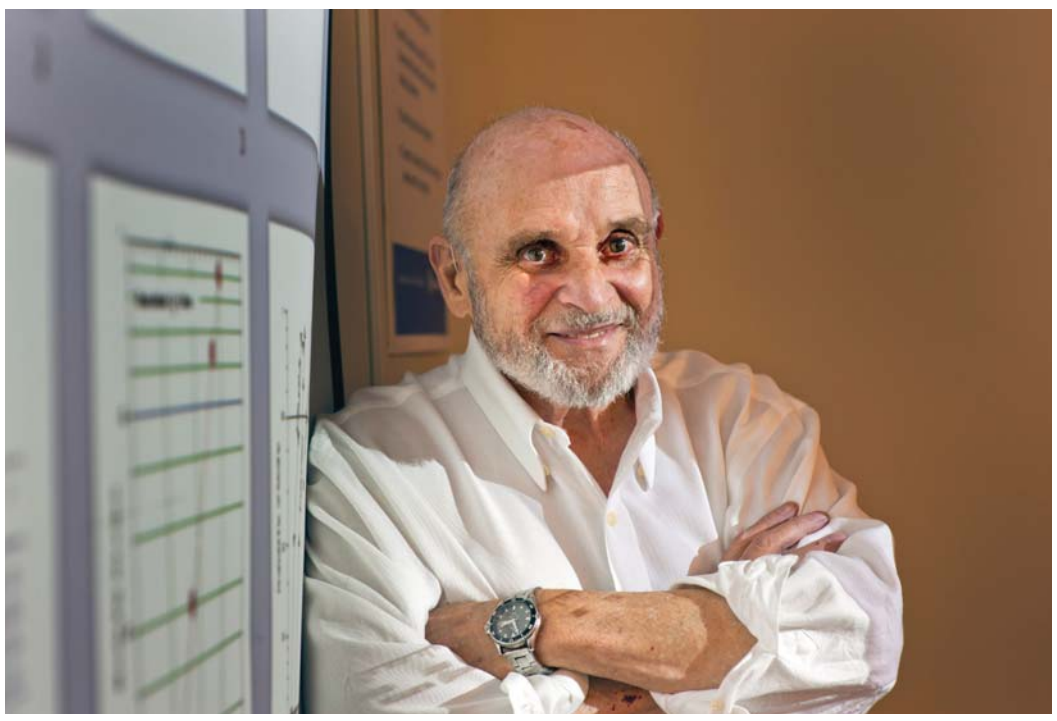
Explosives legend Paul Cooper honored by NYU Polytechnic

By Nancy Salem

Renowned Sandia explosives expert Paul Cooper was named Distinguished Alumnus of the Year by the New York University Polytechnic School of Engineering. "My head is swimming," says Paul, a retiree who continues to consult for the Labs. "I didn't know there was such a thing. It was a real surprise and a big honor."

Paul received the award from the president of the school's Alumni Association at a luncheon last month on the NYU campus in New York City's Washington Square. Five of Paul's 1958 classmates attended the ceremony, which recognized his career achievements. "It was fantastic," Paul says. "We had all stayed in touch. One of them came from Switzerland."

Paul is a Brooklyn, New York, native and chemical engineering graduate of Brooklyn Polytechnic Institute, which operated as NYU Polytechnic from 2008 to 2014. It then merged with NYU to become the NYU Polytechnic School of Engineering.



PAUL COOPER BUILT A GLOBAL REPUTATION as an explosives engineer and passed his knowledge to hundreds of Sandians in courses he taught for more than 35 years. His career was recognized by the New York University Polytechnic School of Engineering, which named him Distinguished Alumnus of the Year. (Photo by Randy Montoya)

Paul joined Sandia in 1964 after working in explosives at the Illinois Institute of Technology's Armor Research Foundation. He worked in explosive components at Sandia until 1977 when he was recruited by the Underground Nuclear Testing arming and firing group, where he stayed until he retired in January 1997. His work focused on the design of explosive systems.

Paul built a global reputation. In 1979, he joined the national Nuclear Emergency Search Team, NEST. "If the FBI or somebody got a lead there was a clandestine or homemade atom bomb somewhere, NEST had to locate and disarm it," says Paul, a NEST member until the mid-1990s when its work transitioned to the military.

Paul was involved in the investigations of the 1989 USS *Iowa* gun turret explosion that killed 47 crewmen; the 1992 Branch Davidian compound siege and fire in Waco, Texas, that killed 75 people; the 1995 bombing of the federal building in downtown Oklahoma City that killed 168; and the 1996 explosion of TWA Flight 800 over Long Island, New York, that killed all 230 people on board.

IAEA inspection team

In October 1991, following Operation Desert Storm, Paul was named to a United Nations/International Atomic Energy Agency inspection team sent to Iraq to look for evidence of weapons of mass destruction. He did other accident and criminal investigative work for outside agencies, particularly the FBI.

And Paul taught explosives safety and technology to about 1,000 people at Sandia over 35 years. He taught hundreds more at private and government facilities nationwide, including the US Army's Aberdeen Proving Ground in Maryland and Schlumberger in Houston, Texas, the world's largest oilfield services provider. Paul taught his final class at Sandia on May 24, 2012.

He describes his career with humility. "Along the way, wonderful things happened," he says. "I was just in the right place at the right time."

Give them 20!

Sandia salutes veterans with crowd-sourced exercise event

Great partication prompts Lockheed Martin donation of $20,000 to Veterans Heading Home organization

SANDIA SALUTES VETERANS – The Labs honored veterans in a creative new way this year. For each participant who dedicated 20 jumping jacks, push-ups, or sit-ups to a veteran on Nov. 3, Lockheed Martin donated $50 to Veterans Heading Home, a program that helps homeless veterans find permanent housing. Hundreds of Sandians participated in Sandia Salutes Veterans events at the New Mexico, California, and Washington, D.C., sites, and the charity received a check for $20,000. (Photo by Randy Montoya)

Sandians step up for Make a Difference Day

MAKE A DIFFERENCE DAY – Six Albuquerque agencies benefitted from the efforts of nearly 200 Sandians who volunteered Oct. 23 and 24 as part of national Make a Difference Day. Volunteers completed projects at the National Museum of Nuclear Science and History, Roadrunner Food Bank, Galloping Grace Youth Ranch, Ronald McDonald House Charities of New Mexico, and Explora Science Center and Children's Museum. For the first time, Sandia's involvement in Make a Difference Day included a collection drive. Organized by Christians in the Workplace, the drive collected 4,085 personal care items that were donated to the Albuquerque Rescue Mission. (Photos by Patty Zamora)