

HELLO. GOODBYE.

The privilege of leading the NW mission area

Steve Rottler looks ahead to the challenges and opportunities of his new role as Executive VP



STEVE ROTTLER

Note: On March 6, Steve Rottler, currently VP of California Div. 8000, assumed the role of Deputy Labs Director and Executive VP for National Security Programs. Steve took the helm from Jerry McDowell, who is leaving the Labs after a 35-year career (see story at right). Steve sat down recently with California communicator Patti Koning to talk about his new role and reflect on his experiences in California.

Lab News: What are your thoughts about becoming the deputy director and executive vice president for National Security Programs?

Steve Rottler: I am very flattered to be selected for this position and honored to be part of the nuclear weapons mission area leadership team

once again. I am excited about facing new challenges and opportunities to learn. I also look forward to working in a new role with my colleagues to implement our new mission area framework.

Working in the nuclear weapon mission area is a privilege, in part because of the unique responsibilities for weapon safety, security, and reliability assigned to us. Now is an exciting time to be part of this mission area because of the once-in-a-generation opportunity to modernize the stockpile.

LN: What has changed in the weapons program?

SR: When I last worked in the nuclear weapon mission area, we experienced a capability-focused period known as "Science-Based Stockpile Stewardship," fol-

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Sandia Lab News

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Jerry McDowell looks back on 35-year career at Sandia

Note: Jerry McDowell, a leader in shaping Sandia's future and national security mission, has decided to retire in early July 2015. Today, March 6, after 35 years of service, Jerry will transition his role as Deputy Laboratories Director and Executive VP for National Security Programs to Steve Rottler (see story at left). Jerry recently sat down with his NW communications team, Jennifer Awe and Cathy Ann Connelly (both 3651), to reminisce on his journey at the Labs, his fondest memories, and his plans for the future.

Lab News: After 35 years, and the breadth of your involvement at the labs, what has been one of your favorite experiences, and why?

Jerry McDowell: I came here with a graduate degree in aerospace engineering that tended to be high on individual contributions. Yet, I joined a group at Sandia that expected I would contribute to a team. Sandia was a place where you were expected to continuously learn and grow, and some of my greatest learning experiences were not from fellow PhDs, but from technicians who had come to the laboratories after World War II and had embedded in their spirit this commitment to serve. Titles didn't matter to them. When I look back, I see that having a PhD in engineering didn't mean I really knew what the heck was going on. I've learned so much from so many in teaming environments, particularly with SWERVE (Sandia Winged Energetic Reentry Vehicle Experiment), Defense Systems & Assess-

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JERRY McDOWELL



Marianne Walck is new VP for California Site Div. 8000, lead for Energy and Climate PMU

Sandia names new VPs for Divs. 5000, 8000

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James Peery is new VP of Defense Systems and Assessments Div. 5000, lead for the DS&A PMU.



Arms control research explores solutions for treaty after New START



Multilab team creates Chain of Custody Test Bed to demonstrate arms control technologies

By Heather Clark

Future arms control agreements might require monitoring nondeployed nuclear weapons and counting individual warheads, so when US negotiators begin work on the successor agreement to the New Strategic Arms Reduction Treaty (New START), research by Sandia and other labs could inform them of possible technological solutions.

Sandia, working with National Security Technologies (NSTec), contractor for the Nevada National Security Site (NNSS), developed the Chain of Custody Test Bed at NNSS to support arms control technology experiments and demonstrations. Working with Lawrence Livermore (LLNL) and Pacific Northwest national laboratories (PNNL), Sandia developed systems to track the movements of nuclear warheads

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CHAIN OF CUSTODY TEST BED — Justin Fernandez (5943), left, adjusts an item monitor at Sandia's Chain of Custody Development Test Bed where engineering development work supports eventual arms control technology experiments and demonstrations at NNSS. Mike Coram, center, and Jay Brotz (both 6831) work with a container used to store mock weapons during testing. (Photo by Randy Montoya)



The \$6.5 million lab

Contributions by Sandia employees and retirees to the United Way of Central New Mexico (UWCNM) through the ECP totaled \$6,556,666, up \$491,595 from the previous year. The retiree share was \$851,109. For more information, see the story on page 2.

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A woman of influence

Sandia's Susan Rempe was named to the 2015 class of Albuquerque Business First's Women of Influence for her professional achievements, leadership, and community involvement. Read about Susan's recognition in a story on page 12.



That's that

Categorize this under the heading of "I had no idea." As reported in the Feb. 26 *Albuquerque Journal*, Sandia Computing and Network Services Center 9300 Director John Zepper told an audience at an Albuquerque Economic Forum breakfast that Sandia handles some 1.5 billion cyber incidents every day. Now, some of those incidents are benign and innocuous – for example, if I type in my password incorrectly, that's an incident – but plenty are direct, malicious attacks, specifically designed to penetrate our cyber defenses, and are aimed at both the Labs and Labs personnel. Those attacks demand an active response.

Cyber attacks come from everywhere: lone wolves who just get a kick out of the intellectual challenge; professional hackers whose attacks are intended to provoke a response that they can then study for weak spots; cybercriminals (who often purchase cyber tools created by the professional hackers); cyberterrorists attempting to attack critical infrastructure; industrial spies seeking proprietary information; and even state-sponsored cyber warriors looking for military secrets. They're after everyone and they want everything.

In the movie *Key Largo*, the character played by Humphrey Bogart says to a gangster who is holding people hostage in a tourist hotel: "He knows what he wants, don't you, Rocco?" The gangster, Johnny Rocco, says: "Sure. . ." but then fumbles for words to articulate his desires. Bogart says: "He wants more, don't you, Rocco?" The gangster grins; he's never heard it put quite that way before. "Yeah," he says. "That's it. More. That's right! I want more!" "Will you ever get enough, Rocco?" Bogart says. To which the gangster replies, "Well, I never have. No, I guess I won't."

The malicious hackers of the world are like Johnny Rocco; they want more and they'll never have enough. They keep coming at you.

Every day, Sandia's cyber team sees 10 to 20 new types of cyber aggression they had not seen before, John told his breakfast audience of community and business leaders. "It's real, it's here, and it's here today," he said.

I knew the cyber threat was real, but reading the *Journal* article was an eye-opener: The scale of the cyber challenge we face right here at Sandia is a couple of orders of magnitude bigger than I would have guessed.

Most of the work we do at the Labs is hard, intellectually demanding and profoundly consequential. But is there anything else we do where on a day-to-day basis the imminent threat is so persistent and remorseless and the stakes so high? In the cyber arena, the threat comes at you in real time and must be met, likewise, in real time.

And here's another aspect of this challenge: The story is told that during the worst of the troubles in Northern Ireland in the 1970s and 1980s, the Provisional IRA was targeting British officials and Royals. After one car bomb attempt was foiled by British intelligence, the IRA conceded the tactical defeat but then reminded the British: "You have to succeed every day; we only need to succeed once." The cyber threat is like that. Our team has to win every time.

Ongoing vigilance is essential, but it isn't enough. To succeed, the Labs' cyberdefenders need to be smarter, more agile, better equipped, and better motivated than our adversaries. The fact that we're able to open our doors for business every day is a testimony to the incredible job these folks do for us.

What kind of person does it take to deal with 1.5 billion-incidents-per-day kind of pressure? Intelligent? Sure. But staring down this menace day in and day out, foiling the bad guys' aims, that takes more than smarts; it demands nerves of steel, a big dose of courage, an ability to focus like a laser on whatever is in front of you, to think fast, and then to think two steps ahead. Oh, and they should have excellent typing skills.

We owe our cyber team a lot. Our jobs, among other things.

One final note on this: One of our eight mission areas is to Defend and Dominate in Cyberspace. To that end, our cyber folks are not just keeping us and our critical information secure here at Sandia; they're on the global front lines of this challenge, developing the tools and techniques and knowledge base to protect the entire nation's IT infrastructure. As has been the case for more than 65 years, we're there where the nation needs us the most. In other words, right where we want to be.

See you next time.

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

'The peoples' campaign' Sandians come through again for the United Way

By Nancy Salem

Sandia's 2014 Employee Caring Program (ECP) focused on participation and passed a major threshold. "We wanted to get above 75 percent; that would be a significant accomplishment," says campaign chairman Grant Heffelfinger, director of Physical, Chemical and Nano Sciences Org. 1100.

Sandia went above 75 percent and then some, to 77.3 percent participation, the highest ever. "Now that the dust has settled on the campaign, I'm very happy with the outcome," Grant says. "I was impressed with the engagement and enthusiasm of our campaign team as well as the results, especially the participation."



ALBUQUERQUE READS is a program supported by the United Way of Central New Mexico's Community Fund. There are about 200 children in Albuquerque Reads and more than 500 volunteers.

The Labs set other records as well. Contributions by Sandia employees and retirees to the United Way of Central New Mexico (UWCNM) through the ECP totaled \$6,556,666, up \$491,595 from the previous year. The retiree share was \$851,109.

Employees of five or fewer years increased participation by 6 percent to 69 percent. "Given the growth of the Labs in general, and thus the large number of new employees, seeing their participation go up so much lays a great future for continuing the tradition of the ECP at Sandia," Grant says.

Pam Catanach (3652), the Community Involvement specialist who coordinates ECP activities, says newer employees had a huge impact on the overall campaign. "It shows they understand Sandia's culture of giving," she says.

Community Fund donations rose by \$102,344 to \$1,697,867. The fund supports a range of nonprofit agencies and programs that help people in Bernalillo, Sandoval, Torrance, and Valencia counties.

"We know that when participation is good, the dollars follow," Pam says.

ECP ran Oct. 6-24 and featured a nonprofit agency fair with more than 40 participants, book fairs that raised \$4,371 for the Community Fund, leadership activities, ice cream socials, pizza parties, head shaving, wig wearing, hair coloring, cake baking, and a dunk tank. There were hundreds of presentations throughout the Labs coordinated by 83 ECP representatives who ran campaigns within their centers and divisions. "They are the heart of the campaign," Pam says.

Kim Sawyer, the ECP Management Champion and current UWCNM board chair and former campaign chair, called the 2014 ECP "the peoples' campaign" because Sandians take such pride in its continued success and impact on the community.

Ed Rivera, UWCNM's president and CEO, says Sandia's generosity is an inspiration. Since the ECP was launched in 1957, Sandia has been the single largest supporter of the organization's annual campaign, contributing about \$90 million. "Sandia National Labs and the Employee Caring Program epitomize generosity in support of vital needs in our community," Rivera says. "We deeply value our long partnership and extraordinary engagement with so many donors and volunteers at Sandia. Thanks to the involvement and generous support of Sandia Labs employees, the lives of many children and families throughout our community will be improved."

Randy Woodcock, UWCNM vice president and chief strategic officer, has provided staff support to the Sandia ECP since 1996. "I have often heard Sandians say, 'What gets measured gets done,'" he says. "This past campaign, Grant Heffelfinger, Pam Catanach, and their ECP campaign committee set a goal of growing donations to United Way's Community Fund. Once again, Sandians rose to the challenge. Community Fund giving will be used to improve the lives of tens of thousands of people in need right here in central New Mexico."

Pam summed up the campaign by saying giving is truly part of the Sandia culture, from new hires to retirees.

"Sandians are amazingly generous and recognize the community needs," she says. "They just want to help."



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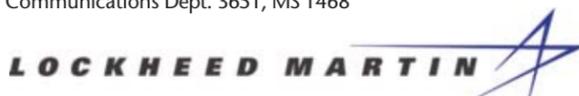
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CRADA with M Squared Lasers looks to reignite gas imaging technology

By Mike Janes

A gas imaging technology developed several years ago at Sandia and designed for use at petroleum refineries and natural gas processing facilities may soon be resurrected thanks to a new business agreement with Scotland-based M Squared Lasers.

Known as active gas imaging due to its reliance on lasers rather than passively emitted infrared radiation from a scene, the technology was developed for the detection, quantification, and monitoring of gaseous leaks.

The method — known at Sandia as backscatter absorption gas imaging (BAGI) — has yet to be fully embraced by US industry due to the US Environmental Protection Agency's (EPA) acceptance of less expensive, laser-less, passive imaging approaches that have emerged in recent years. But Sandia still believes its active technique is superior, and remote sensing scientist Tom Kulp (8128) says M Squared may very well see a market in developing a product line of active imaging devices.

"They could end up funding us to develop a proof of concept for an active gas imaging device, but they're not restricting themselves to gas imaging," Tom says. The company, he says, also has shown an interest in broader imaging applications, such as surface or liquid spill imaging.

Last year, M Squared Lasers was ranked by Deloitte, a UK-based professional services firm, as one of the United Kingdom's 50 fastest growing technology companies.

Two methods of optical imaging

With passive imaging devices, a video camera and filter are directed at the scene being imaged, such as a storage tank at a gas refinery. The system relies on the warmth of the scene relative to the temperature of the gas, and leaks are displayed as either a darker or brighter cloud. However, if imaging takes place under conditions where the gas is near the same temperature as the background scene, a gas image won't appear.

Sandia's system uses an infrared laser for illumination which, by contrast, allows the device to operate independently of ambient conditions. "That's why we prefer the active approach," says Tom. "There's far less uncertainty using active imaging. A laser removes all of the ambiguity."

Companies involved in the gas industry are required to look closely for leaks due to strict EPA regulations on urban smog and greenhouse gases. Years ago, inefficient hand-held "sniffing" devices were the primary method used for identifying leaks, but Sandia research eventually led the EPA to relax earlier restrictions on gas imaging technology. It is now seen as a viable method that is attractive to cost-

conscious industrial users, though a debate remains on which technical approach is best.

EU grant, informal conversations led to CRADA

Tom says the relationship with M Squared Lasers came about after he read about a large grant the company had won from the European Union, which was targeted toward the development of active imaging technology. Sandia strategic alliance specialist Yasmin Dennig (5230) then contacted the company regarding a collaboration in this and other technical areas, and the seeds of an "umbrella" CRADA were sown. M Squared CEO Graeme Malcolm and sales manager Josh Atkinson spent two days at Sandia, hosted by Yasmin and senior manager Andy Boye (1720), exploring other areas of collaboration.

Though the CRADA is loosely defined for now, Tom says it will include a reengagement of the gas industry to assess how well passive imaging is working and how receptive the industry may be to active imaging technology. He says M Squared Lasers will also likely want Sandia's technical help in developing intellectual property around laser technology that can be used to enhance gas imaging.

Sandia California News

Purdue University recognizes Anthony Thornton

The Purdue University College of Engineering has named Anthony Thornton (5220) one of its 2015 Distinguished Engineering Alumni Award recipients. The award is given annually to alumni who have made outstanding contributions that reflect favorably on Purdue University, the engineering profession, or society.

Anthony is in good company, with less than three-fifths of 1 percent of the graduates of all of the Colleges of Engineering at Purdue University receiving the prestigious award.

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"For me, the biggest thrill is that I am now emblazoned on the same plaque as Neil A. Armstrong (1967), the first man on the moon and a Purdue graduate. He was my boyhood idol whom I got to meet in 2004 when I received an Outstanding Aerospace Engineering Award from Purdue."

In naming Anthony a Distinguished Alumni, Purdue University cited "decades of excellence in advancing critical technologies for national defense in vital leadership roles at both Sandia National Laboratories and Lockheed Martin Aeronautics."

Anthony, deputy to the vice president for Technology and Programs, Defense Systems & Assessments Program Office, has served in a variety of posts at Sandia, including leadership roles in Defense Systems and Assessments and in Validation and Qualification Sciences. He also worked at Lockheed Martin as deputy director of Joint Strike Fighter New Initiatives.

He earned his PhD in aeronautics and astronautics from Purdue and also has a master's in engineering from Stanford and a bachelor's in aerospace engineering sciences from the University of Colorado.

"Sandia supported my graduate degrees, and they've given me a great career," he says. "In addition, I got to work at the famed Skunk Works facility, a dream for any aerospace engineer."

In addition to being honored by Purdue in February, that month he delivered the keynote address at Intel's Black History Month award

banquet.

He has served on a number of boards of directors, including the National Museum of Nuclear Science & History and the Albuquerque chapter of MESA (Math, Engineering and Science Achievement). He currently serves on the New Mexico Governor's Mansion Foundation.



PRESENTING THE DISTINGUISHED ENGINEERING ALUMNI AWARD from Purdue University to Sandian Anthony Thornton is Leah H. Jamieson, the John A. Edwardson Dean of Engineering, Ransburg Distinguished Professor of Electrical and Computer Engineering. (Photo courtesy of Purdue University)

Arms control research explores solutions for treaty after New START

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throughout their life cycles for arms control purposes.

In the completed first phase of the project, Sandia developed the test bed backbone of the new monitoring system, worked out the systems engineering, provided the infrastructure to collect the data from sensors, defined interfaces between sensors and computers, and figured out how to store, organize, and display the monitoring data collected, Sandia physicist Sharon DeLand (6831) says.

Last spring, a second project that expands the Chain of Custody Test Bed research, called End to End, was initiated to broaden the research and development to questions of how to validate the entrance of a nuclear warhead into the monitoring system and confirm its eventual dismantlement. Both projects are funded by NNSA.

The projects are giving researchers significant insights. The next generation of laboratory experts is learning to think about this problem in an agile fashion so they can provide insights to policymakers during future negotiations and develop solutions that will make it easier to implement new agreements, says Regina Griego (5537), lead systems engineer for the Chain of Custody project.

Under New START, the US and Russia currently only limit the number of deployed warheads on strategic weapons, but potential future monitoring of nondeployed nuclear weapons would bring new challenges.

Nondeployed warheads are in a dynamic environment throughout their lifecycles — in Department of Defense or Department of Energy storage, in transport, or undergoing maintenance. The Chain of Custody research focused on a systems approach to tracking warheads, says Mary Clare Stoddard, manager of Nuclear Monitoring and Transparency Dept. 6831.

Of course, the US has domestic systems in place to track its warheads. But when it comes to arms control verification, the procedures covered under the agreement need to provide enough information to convince a treaty partner that the US is abiding by the treaty's terms and vice versa, Sharon says. For identification purposes, this could be somewhat like providing a fingerprint, but not an entire DNA profile.

Test bed intermediary step

To explore ways to monitor warheads through their lifecycles, the Chain of Custody Test Bed was created to demonstrate the technologies and concept of an integrated monitoring system and evaluate US technologies in action, Regina says.

Sandia has a strong history of research and development for on-site inspection technologies, including the radiation detection equipment used for the 1987 Intermediate-Range Nuclear Forces Treaty, START, and New START.

The Chain of Custody and End-to-End programs grew out of research for the Warhead Monitoring Technology Program in the 1990s. That program developed

monitoring concepts for a single weapon type, and then the Chain of Custody project expanded the research to monitor a variety of container configurations throughout more of the weapon lifecycle, says Kevin Seager (5944), an expert in radiation detection for treaty monitoring.

Demonstrating arms control technologies

The test bed consists of a tunnel that houses mock storage and maintenance areas and a second site that contains a mock staging bunker and high bay that simulate stockpile surveillance and life extension activities, Mary Clare says. Small sealed radiation sources were used to trigger some sensors in the testing.

The team installed instruments and stocked the facilities with containers that normally hold nuclear weapons, Regina says.

"These test assets weren't easily found; Sandia and NSTec had to be scavengers," she says. "It was quite a complex venture to collect containers and other equipment representing everything in the active stockpile."

Sandia designed the communications backbone, a data collection and management system. Then Sandia, LLNL, and PNNL tested a variety of monitoring technologies and concepts. The test bed enabled an integrated experiment that included containers fitted with the different labs' monitors moving among the mock facilities while the communications system tracked them, Mary Clare says.

Field test challenges

The field test experiment included baseline inspection activities: monitoring mock warheads during simulated stockpile management operations and transportation. During the four-day experiment, about 4,000 events were recorded, including attaching item monitors, checking items into and out of monitored areas, and transporting the items between locations, Sharon says.

Successful field tests usually uncover problems not anticipated in a laboratory setting, and the Chain of Custody tests were no exception, Mary Clare says.

One challenge that emerged was synchronization of the monitoring systems. Even when times were off by tenths of seconds, it was very difficult to figure out what happened, says Mike Coram (6831), who led the software development team that collected and analyzed the data. The team built in additional synchronization to resolve the issue.



SANDIA WORKED with National Security Technologies, contractor for the Nevada National Security Site, to develop the Chain of Custody Test Bed, which includes the mock storage containers pictured above, to support arms control technology experiments and demonstrations. (Photo by Darwin Morgan/NNSS)

The team also battled temperatures of 120 degrees, snow, rain, and lightning, giving them a chance to expose the technology to realistic environments.

Despite the hurdles, after incorporating what the team learned during a series of technology evaluations, mock inspectors could track mock weapons through multiple facilities and reliably detect simple attempts to divert weapons or tamper with the monitoring system, Sharon says.

Test bed underpins research portfolio

The Chain of Custody project's results became the bedrock for a large piece of NNSA's arms control technology research and development portfolio, Regina says. "I'm really proud of the fact the team pulled together, that we were able to find such a great staff," she says. "Every one of these people was critical."

The Chain of Custody evaluation experiments showed it is possible:

- to monitor and track test objects within facilities and in transit;
- to operate in complex environments like the tunnel; and
- to detect unauthorized opening of containers.

The Chain of Custody project was a team effort, with Regina organizing the test bed development. Test director Justin Fernandez (5943) planned and oversaw the movements of the mock weapons and orchestrated the test scenarios. Justin also designed how to attach the monitors developed at all the labs to the containers so one side could not remove them without the other side knowing.

Jay Brotz (6831) led development of the monitoring devices and equipment. The labs worked within the larger team, developing and demonstrating their tracking technologies, and enabling secure, trusted communications, which provided the basis for overall project evaluation.

The team used Sandia monitoring technologies and commercial motion sensors, door switches, and cameras, and integrated them into the communications interface.

Multilab team created to tackle arms control research

The End-to-End project is now underway as part of a larger NNSA R&D National Center for Nuclear Security program based at the NNSS, says Sandia's deputy program manager Steve Vigil (5751). The End-to-End project broadens the concepts explored in the Chain of Custody project to include the development of technology to monitor during warhead confirmation and dismantlement and new features in the test bed.

In the End-to-End project, the multilab team is developing detection, tracking, and radiation measurement technologies, combining them into systems with integrated data collection and analysis, and exercising them with the various approaches to figure out how they could work together, Mary Clare says.

Los Alamos National Laboratory also joined the End-to-End project and will take part in a large-scale demonstration planned for 2018.

"No one has the right answer; they're all different approaches. Because the labs are peer reviewing each other's ideas, it really strengthens what comes out," Steve says.



THE CHAIN OF CUSTODY TEST BED consists of a tunnel that houses mock storage and maintenance areas and a mock staging bunker and high bay that simulate stockpile surveillance and life extension activities. In the photo here, researchers review preparations at the NNSS tunnel mock maintenance area prior to an experiment. (Photo by Darwin Morgan/NNSS)

Sandia names VPs for Divs. 5000, 8000



(Photo by Randy Montoya)

Marianne Walck named VP of California laboratory Div. 8000 New role includes leadership of Energy and Climate PMU

Marianne Walck has been named VP of Sandia's California laboratory Div. 8000. She replaces Steve Rottler, who became Deputy Director and Executive VP for National Security Programs. Both changes were effective March 6.

In her new role, Marianne will also lead the Energy and Climate Program Management Unit. She is currently the director of Sandia's Geoscience, Climate, and Consequence Effects Center 6900.

"I am pleased to welcome Marianne to Sandia's executive leadership team," said Paul Hommert, Sandia President and Labs Director. "She brings a deep and accomplished background in energy, as well as demonstrated success in leading large organizations. These skills and knowledge make her well-suited to leading both our California organization and our energy programs."

Marianne received her master's and doctorate in geophysics from the California Institute of Technology and her bachelor's in geology and physics from Hope College in Holland, Michigan. She joined Sandia in 1984 and has more than 24 years of leadership experience.

Marianne's research career centered on seismic studies related to subsurface energy sources and research tools for treaty verification. While manager of the Geophysics Department, her staff developed key

technologies to monitor and characterize subsurface processes, including microseismic methods for understanding the direction and extent of subsurface fractures created by hydraulic fracturing.

As senior manager for the Nuclear Energy Safety Technologies Group, Marianne oversaw studies for the Nuclear Regulatory Commission assessing vulnerabilities of nuclear power plants to terrorist attacks and key experiments on the consequences of spent fuel drainage for boiling water reactors. The insights gained in this work were later important in understanding the Fukushima Daiichi nuclear disaster. Her recent responsibilities included the National Infrastructure Simulation and Analysis Center (NISAC), engineering and science support for the Strategic Petroleum Reserve, and research programs on infrastructure resilience and subsurface science and engineering.

Marianne is associate director for the Center for Frontiers of Subsurface Energy Security, a DOE Energy Frontier Research Center that pursues scientific understanding of processes to safely store carbon dioxide and other energy production byproducts.

"I am honored and excited to have the opportunity to lead the diverse activities at Sandia's California laboratory and the Energy and Climate program," Marianne says.

James Peery named Div. 5000 VP Will oversee defense research at Sandia

James Peery has been appointed VP of Defense Systems and Assessments Div. 5000 and will also lead the Defense Systems and Assessments Program Management Unit. In his new roles, James will lead Sandia's longstanding work in this national security area.

James had been director of Sandia's Information Systems Analysis Center 5600 and was responsible for the research and development of new information technologies for national security organizations.

In his new position, he will lead programs to develop and integrate advanced science and technology into a broader range of state-of-the-art systems for DoD and other national security agencies.

James succeeds former VP Jeff Isaacson, who left Sandia in October.

Announcing the appointment last week, Sandia President and Laboratories Director Paul Hommert said James will be responsible "for accelerating the development of innovative systems, sensors, and technologies for the national security community and the warfighter."

James says: "It is truly an honor to be asked to lead an organization that has developed and continues to develop state-of-the-art technology to protect our warfighter and increase US security. The talent and dedication of the staff and management within Defense Systems and Assessments Division is unparalleled."

James, who has a doctorate in nuclear engineering from Texas A&M University, joined Sandia in 1990. During his career, he has been responsible for developing

state-of-the-art, massively parallel computational tools in fields spanning high energy density physics to structural dynamics.

He was a key contributor to the ALEGRA multi-physics code, an extensive set of physics models used for a variety of national security projects, including Z machine experiment designs and armor modeling for the Army.

James managed an award-winning team that developed the Salinas program, which simulates stresses on aircraft carriers, buildings, re-entry vehicles, and certain aspects of the nuclear stockpile. In 2002, the Salinas team won the Gordon Bell Prize from the Association for Computing Machinery, known as the "Superbowl of supercomputing." The program also received an NNSA Award for Excellence.

From 2002-2007, James held several positions at Los Alamos National Laboratory, including hydrodynamic experiments division leader, principal deputy associate director of LANL's nuclear weapons program, and program director of NNSA's Advanced Simulation and Computing Program.

He returned to Sandia in 2007 as the director of the Computation, Computers, Information, and Mathematics Center, the foundation of Sandia's research and development of high performance computing.

In the past three years, James has been personally committed to supporting Sandia's efforts to hire and provide career development to wounded combat veterans in the Wounded Warrior Career Development Program.



Jerry McDowell

(Continued from page 1)

ments (DS&A), and, now, the Nuclear Weapons (NW) team.

Our efforts have a lasting and enduring impact. I am so lucky to have had a career where I've journeyed 35 years with a community of people who care deeply, who are very bright — they make you better because they challenge you, and they've been kind and generous to me.

LN: *What legacy do you hope you've provided Sandia?*

JMc: Early in my career, I was given an assignment to lead a group of people in an experiment at Sandia's Tonopah Test Range. It was demanding. It had never been done before, and we failed. The first time I ever met a vice president at Sandia was when I appeared before him to explain what had happened. I now realize he knew it was hard. In fact, what he said was, "I think we ought to go try it again." And I'm sitting there thinking, "I'm not sure I want to go try this again." But we did, and 18 months later it failed a second time. But it was ultimately OK. Sandia had asked me to do something very difficult, and taking prudent technical risk was what we were about. The message was, "You didn't do anything dumb. You didn't get anybody hurt. You managed your risk and safety and security well, but the technology just appears to be too difficult at this point, so good try, let's move on to something else."

Fifteen years later, I reconnected with that same VP, then retired, and we talked about the Tonopah experience. At the time, I was VP of DS&A. He said, "it's now your turn to give back to the spirit of encouraging our staff to take good, prudent risks." I was given a lot of grace and encouragement early in my career and I'd like to think that I've given some of that back.

A generational shift

LN: *You've seen a lot of change. In what ways is Sandia different than when you started?*

JMc: There's been a generational shift — not good or bad, just different. During my career I've been the "middle generation." I came to Sandia when I was 27 years old and wound up working with folks who were 10 to 20 years older and had roots back to Sandia of the '50s. So I was between the early legacy, Cold War era and today's dynamic global environment where the US faces many more threats in all phases of national security.

As I moved into management it became clear to me that we needed to change the culture at Sandia so we were still a relevant and exciting place to come and work. It was fine for me to be happy working in a Quonset hut, which I did my first five years here, with a

punch card rolled and stuck into a hole in my office wall so sand wouldn't blow in my ear when the wind came out of the east.

Expectations today are different. Sandia needs to remain contemporary, and so we have seen changes, many for the better.

What hasn't changed is the excitement of coming to work and knowing we're a place where you have the privilege of hearing about an incredibly difficult problem and being asked to help solve it — whether as an engineer who likes to build things, a scientist, or a professional in business, finance, or another discipline.

LN: *What advice would you give new Sandians?*

JMc: Take chances in your career. There have been several times I made a change and went outside my comfort zone. That was liberating because I discovered it wasn't the job that defined me, it was me that defined me. I never planned my career; I took chances and tried different assignments. It kept me fresh and gave me a broader sense of understanding.

Embrace the job you're given. Do the best that you can no matter how small you may think the task is. Have courage to respectfully speak your mind. Don't get too comfortable. Give way to your passion. Have fun. Remember, though, the privilege of working here comes with an extraordinary expectation of doing your duty. This is about serving the nation with the gift you have. To use my favorite line from the movie *Saving Private Ryan*, "Earn this."

LN: *What are some of the things you're proudest of?*

JMc: In 2010, when Paul Hommert became the Labs director, I was not expecting to be called into Paul's office and asked to become the executive vice president and deputy Labs director. The principal job was managing the nuclear weapons program, and I remember asking Paul why he'd ask me to do this? I had no background in NW. Paul indicated that in DS&A I did have a successful track record in an organization that had delivered product successfully, mostly to the Department of Defense. He felt we were about to embark on an era in which product delivery was going

to become the dominant need, and he was right.

Looking back over the last four and a half years as EVP, with the help of an extraordinary group of people in both mission and mission support, today we're successfully managing and on track to deliver three major full-scale engineering developments, and I think it was important for Sandia to show it could do that, and do it effectively. I have had an amazing group of people who helped me, and so the NW community today, of which I am one part, did our job. I'm very proud of that.

The mission will continue

LN: *What are your hopes for Sandia as you retire?*

JMc: Sandia's core purpose is captured in President Harry Truman's iconic letter, "You have an opportunity to render exceptional service in the national interest." However, I believe exceptional service in the national interest, in order to remain relevant, has to be open to the reality that over time those interests change.

I like to think of Sandia as a strategic national security laboratory — strategic because we only work the hardest, most enduring, most compelling problems. NW is one part of the broader national security needs of our nation, and we're in a position to help America figure out the interplay between space, cyber, nuclear, advanced conventional weapons — in essence the overall global strategic balance and the twin threats of proliferation and terrorism in a landscape that's extraordinarily dynamic. At Sandia we can imagine a future that doesn't even exist, and anticipate what the future's going to bring in order to get the US in a position of readiness to respond when the technology fully arrives. That's the focus of a Federally Funded Research & Development Center.

When I retire, this mission will continue on. For me that's incredibly exciting, because I can look back over 35 years and see leaders just keep stepping up. I have a lot of peace knowing there is a tremendous cadre of people waiting for their turn. And I know they will step up. Give them the keys.

LN: *What are you going to do when you retire?*

JMc: I'm on the University of New Mexico Hospital Board of Trustees. It's a very satisfying activity, and I look forward to devoting more time to helping make sure Albuquerque has good medical care. Also, my family allowed me to have this experience at Sandia, as well as a family life. I'm a father and a grandfather. I don't want to deny myself the opportunity for a healthy retirement and I think change is good for the institution. I've had a great career, I've had fun, now I want to go see what other things I can do in the time that I still have ahead of me to hopefully give back to the community in which I live and to the

family which allowed me the privilege of having this experience.



EARLY CAREER — Herman Wenthe, standing, mentors Jerry McDowell in the mid-1980s as he examines data for wind measurement adjustments at Sandia's Kauai Test Facility on the island of Kauai in Hawaii.



JERRY MCDOWELL answers a question during a Nuclear Weapons PMU all-hands meeting.

Colleagues reflect on working with Jerry

A few people who've worked with Jerry over his years at Sandia share their memories:

- **Mike Vahle**, VP of Information Technology Services Div. 9000 & Chief Information Officer
- **Don Rigali**, retired; Don hired Jerry and they worked together for many years
- **Ron Hoskie**, Sr. Facilities Maintenance electrician
- **Bruce Walker**, retired; former VP of Weapons Engineering & Product Realization Div. 2000
- **Sheryl Hingorani**, Sr. Manager, Systems Analysis & Engineering

What's your favorite memory that exemplifies Jerry the person, and the professional?

Mike Vahle — It's always been a pleasure; I look forward to interacting with Jerry. You can learn a lot about someone by watching them perform under stress. Jerry has a calming influence; you always knew he was going to get you off on the right track. He keeps focused on the big picture and relevant principles. He's a living example of what he espouses.

Don Rigali — I typically didn't hire anyone right

out of school, mostly experienced people who could hit the ground running because we were so busy at that time. I heard about Jerry from a Sandian who said he was just a super person and someone to look for. That person didn't have a hiring slot, and I did, so I hired him right away after interviewing him. We didn't want to let him get away from Sandia.

I remember maybe Air Force, Navy, wherever, had a problem with reentry and I'd come up with an idea that might solve that problem. I'd discuss briefly with Jerry and then a few days later, he'd walk into my office with a full briefing that was about 95 percent complete and nearly ready to present. He had a knack for that.

Ron Hoskie — Jerry combines humanness and intelligence. He's genuinely friendly and talks with people about connections. With me, that's music and Bldg. 802. My Native music is always a topic, along with "our building" that I've taken care of for 20 years. He's the same here or outside work. Jerry gives respect.

Bruce Walker — Most of us engineers and scientists focus on examining the technical issues. Jerry offers more of a balance of not only understanding the technical issues but also understanding the personal, cultural, and organizational issues. He pulls in inputs from all involved in an issue and is able to identify other

impacts that would have been missed without his insights and influence.

What is the legacy Jerry leaves Sandia?

Mike Vahle — He was one of the first to recognize the importance of a laboratory that did not only NW work, but served other national needs. I think he became the articulation of the values of those ideas and was always pursuing, refining, and articulating them. He's ended his career in NW, but he started — and lived most of his career — in other parts of the laboratory, and I think because of that he learned the importance and power of the combination of activities.

Bruce Walker — Jerry is always thinking further ahead — more strategically — than anyone else in the room. He thinks: What are the future implications of a decision? How will it be seen by our sponsors or partners? What happens if these other issues occur? In his words, he is "playing chess, not checkers."

Sheryl Hingorani — Jerry's legacy at Sandia, and for the nation, is broad and deep and represents a lifetime of dedication and commitment to national security needs. He also leaves a legacy in the lives of colleagues and coworkers that he touched both professionally and personally. Jerry's spirit of passion, strength, and service will endure.



Steve Rottler

(Continued from page 1)

lowed by the first stockpile life extension programs on the W87 and W76 warheads. However, at the time there was little national consensus about the stockpile's future evolution. Frequent funding level changes made following any long-term strategy very challenging.

Today, we sit squarely in a period that can be characterized as "Stockpile Modernization" — multiple simultaneous development programs, unlike anything we have experienced since the 1980s. Further, there now appears to be national consensus about the evolution of the stockpile over the next decade or so. Even with these exciting opportunities to provide exceptional service in the national interest, we face daunting challenges — sustaining our research base and infrastructure, and exploring new ideas in anticipation of future stockpile needs — in an increasingly constrained budgetary environment that challenges us to balance all of these needs.

LN: How has your experience at Sandia prepared you for this role?

SR: My 30-year career at Sandia has been divided equally between research and the nuclear weapon program, plus two years leading our California Laboratory and the Energy and Climate PMU. My various assignments have given me hands-on experience in all nuclear weapon life cycle phases and understanding of how the US nuclear weapon enterprise successfully delivers on its national mission imperative. Lastly, I am fortunate to have well-established relationships across the nuclear weapon enterprise. I look forward to working with these colleagues, inside and outside Sandia, once again.

LN: What have you gained as vice president of Division 8000?

SR: Leading a large, integrated organization at a remote site has been fascinating and very enjoyable. Before coming to California, I had some operational experience and knew some areas of mission support such as human resources. I had not, however, managed all of those mission support functions, technical capabilities, and program execution as an integrated whole to strategically advance the organization. In addition, I have learned more about leadership in a new and very different environment, and have added to my customer and community relations experience.

LN: And as leader of the Energy and Climate Program Management Unit?

SR: Managing the Energy and Climate PMU has been an equally enjoyable and fascinating experience. Because I had not previously led a mission area or PMU, I was the most uncertain about this aspect of my current position. Leading this PMU has been quite different from what I expected, which created a learning opportunity. Moving to this position as we created the mission area framework allowed me to work with other Sandia leaders to refine our strategy development and implementation skills. Though my skills in this area are still maturing, I feel we have progressed considerably over the past two years. I

am excited to now draw on and continue developing these skills in my new role.

My academic training is in nuclear engineering. When I started college, I intended to enter the nuclear power industry upon graduation. The Three Mile Island accident, which happened during my sophomore year, caused me to shift my post-graduation plans, a decision that eventually brought me to Sandia some 30 years ago.

The chance to work in the energy and climate space of national security after spending so many years in nuclear weapon-related science and engineering has been very exciting. Unlike the nuclear weapon stockpile, energy and climate are not "owned" by the federal government. Many factors drive the evolution of energy supply and use and the associated infrastructure. Arguably, some state governments have more influence in this space than the federal government. This makes working in the energy and climate space a complex endeavor, and I love working on complex things. I will greatly miss this work.

A special experience

LN: What have the last two years in California been like?

SR: Serving as the VP of the California Laboratory has been a special experience — truly, a privilege. I was familiar with the site and many of the people, having visited on numerous occasions. But certain aspects of our presence in California are hard to fully grasp unless you live and work here.

Between the New Mexico and California sites, there are more similarities than differences. We are one lab with two main sites that share the same values and commitment to exceptional service in the national interest. The differences derive from the California site being located 1,000 miles away, adjacent to Silicon Valley and in the vibrant Bay Area, with a workforce of only 1,200. Among other characteristics, our California site has a level of intimacy, integration, agility, and strategic focus that is difficult to achieve across the entire New Mexico site. This is neither good nor bad; it is merely a difference



STEVE ROTTLER WATCHES as Chung-Yan Koh (8621) demonstrates SpinDx, a point-of-care diagnostics device that uses centrifugal microfluidics.
(Photo by Randy Wong)

driven by factors unique to location and configuration.

I've also thoroughly enjoyed being part of the local community, which again is quite different from Albuquerque based on size alone. The community has a unity of purpose around nurturing the innovation ecosystem that is quite impressive and more difficult to achieve in Albuquerque.

LN: How has your perspective of the California site changed?

SR: I truly understand and appreciate the value of our California presence. When I moved here two years ago, I felt I understood the value. I did to some extent, but my experience here has deepened my comprehension of the value and clarified my understanding of opportunities we are missing and internal barriers that prevent us from better exploiting our California presence.

Our California presence is a strategic, but still underutilized, asset for the lab. We must all be dedicated to continuously strengthening our use of this asset. In addition, we must view any threat to our California presence as a threat to the lab, not just a Division 8000 issue. The fact that our California site organizations are arranged into a single division is merely an artifact of our organization structure. While those of us here in California feel tremendous responsibility for stewarding this strategic lab asset, everyone at Sandia should feel some stake in assuring the long-term success of our presence here and enthusiasm for exploiting it to maximum advantage for our mission execution. The Livermore Valley Open Campus is but one example of how this can be done.

LN: What will be most important to National Security Programs in the near future?

SR: I am honored to follow my friend and colleague of 25 years, Jerry McDowell, into this role. Jerry has led the NW PMU with distinction for the past five years. We owe him a debt of gratitude for his outstanding leadership at a crucial time. I agree with the priorities he has set for the NW PMU, so you can expect continuity in this transition.

Following on this, three important areas come to mind. First, ensuring the safety, security, and reliability of the existing stockpile.

Second, the incredible workload associated with modernizing the stockpile. We must execute on this. We are succeeding, but this endeavor requires continued focus and attention from everyone involved.

Third, the fragility of our research base and underlying infrastructure concerns me. We no longer invest heavily in R&D for the weapons program as we did in the past. While the overall nuclear weapons budget has grown, R&D has not grown in proportion. This foundation is our future; it's a part of what draws people to Sandia and it's a good entry point for career development. This decreased investment will be a focus of my attention just as it was for Jerry.

Striving for continuous improvement of the work experience

LN: What will be your other priorities?

SR: I intend to stay fully focused on my current responsibilities and remain in California through my last day on March 5. As a result, I have not thought much about my priorities beyond my response to the above question. That said, many areas are of special interest to me — areas that intersect with but transcend the nuclear weapon program. I want to devote some of our leadership team's attention toward diversity and inclusion. Because of its insular nature and some inherent characteristics that create barriers to inclusion, this is a special challenge in the weapon program.

Safety is another priority. As a lab, we have embraced engineered safety. We have made an excellent start, but we have a long way to go in maturing our safety culture.

Finally, workforce and leadership development and continuous improvement of our work environment is critical. Everything we do begins and ends with people. The weapons program always will be somewhat cyclical, with times of heavy workload followed by a narrower program scope and smaller workload. Managing this complexity while assuring the long-term development and retention of talent is a difficult leadership challenge. Further, while Sandians tell us there are many great aspects of our work environment, they also tell us of frustrating and challenging elements. We owe it to our employees to strive for continuous improvement of the Sandia work experience.

LN: Any advice for the new Division 8000 vice president?

SR: The same advice that was given to me by Rick Stulen two years ago when I replaced him in this role: lean back and enjoy yourself, because the California Site, Division 8000, and the EC PMU are an exciting and fun location, organization, and program area in which to work.





THE MECHANICAL SHOCK FACILITY is Sandia's oldest environmental test facility. The construction team added a 6-inch bore gas gun, seen here with researchers Adam Slavin, left, and Patrick Barnes. (Photo by Randy Montoya)

Shake, Rattle, and Roll

New gas gun boosts Labs mechanical test capabilities

By Stephanie Hobby

It sits in the heart of the New Mexico desert, windswept and quiet until a sudden, earth-shattering boom interrupts the tranquility. Sandia's remote areas have long been known for their exciting test capabilities, and with a decade-long, \$100 million renovation wrapped up last spring, the area will often be shaking, rattling and rolling.

Some of Sandia's most well-known tests have been conducted in this remote space, with its powerful and soaring structures. Wired magazine once said that if Sandia is the nation's science playground, Tech Area 3 is its sandbox.

While the tests conducted there are admittedly fun to watch — and it's hard not to get excited about the “shake, rattle, and roll” aspects — the mission couldn't be more serious. The Tech Area 3 facilities are critical to supporting Sandia's ongoing nuclear stockpile modernization work on the B-61-12 and W88 Alt, assessments of current stockpile systems, and test and analysis for broad national security customers. But the test sites were aging. Many were built in the height of the Cold War, and needed to be updated. A 2000 study indicated that to maintain Sandia's test capabilities, new facilities and upgrades were needed. That study prompted the massive Test Capabilities Revitalization (TCR). This series in Lab News takes a closer look at the upgrades.

The Mechanical Shock Facility is Sandia's oldest environmental test facility. It opened its doors in 1946, when Sandia was still known as Z Division. Originally housed in Tech Area 1, it was home to shake tables, a pendulum for mass gravity measurements, and a cold chamber. It was moved to Tech Area 3 in 1956 to better serve Sandia's impact test needs. Almost 70 years later, it opened its doors again with the goal of producing higher quality and higher speed shock tests to validate

high-value components and subsystems.

In 2011, Mechanical Shock announced completion of a new TCR-funded actuator that can produce up to 1.5 million pounds of thrust and generate super-powerful shock pulses.

A lot of advantages

The TCR project also delivered a new 60-foot-long gas gun, which can fire smaller components down a 6-inch diameter bore at blazingly fast speeds. The projectile is then in free flight for about 14 feet, where it smashes into a massive target 4 feet by 4 feet, backed with aluminum honeycomb and slabs of stabilizing concrete. A laser system at the muzzle measures the velocity of the projectile as it exits the barrel.

“This large-bore gun offers a lot of advantages. We can observe free flight instead of shooting into a containment vessel, shoot really large targets, run tests with fragmentation, and we can capture all of it on high-speed video with support from Photometrics (1535),” says mechanical engineer Patrick Barnes (1534), who is part of the team that conducts the tests done at the facility.

Additionally, the gun is able to shoot one projectile toward another, creating a shock similar to those offered at the actuators, without either projectile exiting the barrel. “This was designed at Sandia, and we wanted to be able to provide our customers with a variety of test capabilities,” Patrick says. “We designed the target to have tunable sections so we can easily create hard or soft targets depending on test requirements. The projectiles can also be varied from hard steel to something soft like Douglas fir or even water slugs shot at high speed.”

The fire chamber has a piston inside that operators can move back and forth hydraulically, so operators can adjust the amount of nitrogen gas needed to shoot.

The chamber volume varies, giving operators very high resolution.

“With all the variability we offer, we needed to fully understand every aspect of this gun for safety and performance reasons,” says test director Adam Slavin (1534). That meant understanding what projectiles will do before the test actually occurs. Traditionally, gun operators shoot projectiles and then develop curves and calibration codes. “This is a national lab. We're not going to do that. We enlisted the help of a fluid mechanics expert to help us develop a code that we use to understand what will happen with each projectile's velocity as it moves down the barrel,” Adam adds.

The overhauled Mechanical Shock Facility offers unprecedented testing for customers. “Mechanical Shock has had actuators since its inception. With the new actuators and the addition of the gas gun, we have extraordinary test capabilities under one roof, with one group of people working here,” Adam says. “We have more tools to provide customers with a suite of shock tests in one place, and we can help them tailor tests to meet their needs.”

Adam and Patrick estimate that turnaround time from inception to test and data is about one month, depending on the complexity of the test. The team helps customers design fixtures needed to hold the object to be tested on the gun while also planning tests to ensure safety and high-quality data. They estimate that with the new systems, they'll be able to do several shots a day for the duration of the tests. “We have a great team that's really dedicated to producing high-fidelity data for our customers and doing really good quality, repeatable tests,” says Patrick. “We're very proud of the fact that we're providing data to support validation of computational models which predict the performance of critical components.”



A FAMILY AFFAIR — In the ¡Explora! Ingeniería program, families worked together to solve challenges designed by ¡Explora! educator Andres Barrera Guerrero (not pictured). In other photos on this page students experience a variety of hands-on — and foot-on — activities designed to introduce them to STEM fields.

'The Jedi of education'



Bringing STEM to bilingual children

By Valerie Larkin
Photos by Randy Montoya

Before he took an entrepreneurial separation from MEMS Technologies Dept. 1719 in February, Jose Luis Cruz-Campa was an active member of Sandia's volunteer community.

Having a father who was an electrical engineer sparked Jose Luis's interest in science, technology, engineering, and math (STEM) when he was a child. Recognizing the importance of that early influence, Jose Luis frequently shares his time, enthusiasm, and expertise with local kids in the hope that they will pursue STEM studies and careers.

Jose Luis's latest volunteer activity involved introducing children in grades four through eight to STEM concepts in a series of workshops conducted in Spanish.

Sandia sponsored Explora Ingeniería (Explore Engineering), a pilot program launched last fall, in collaboration with the ¡Explora! Science Center and Children's Museum and the nonprofit organization Partnership for Community Action (PCA).

"The best part of the program, for me, was not only teaching the kids about science, but teaching them science in

Spanish. I feel I am helping the students as a role model and showing them careers they might not be exposed to otherwise," says Jose Luis, who recently won the Outstanding Engineer Award from the Region 6 Southwest Area chapter of the Institute of Electrical and Electronics Engineers.

A new adventure each week

With the guidance of Jose Luis and Andres Barrera Guerrero, an ¡Explora! educator and facilitator, the students explored topics such as kinetic and potential energy, electromagnetics, chemistry, and structural engineering in weekly sessions at the Alamosa Community Center in southwest Albuquerque. Many of the kids' parents attended the workshops too.

"Sometimes it makes more sense for a student who speaks Spanish at home to also hear about something cool in Spanish. For Spanish speakers, it's like you are one person when you speak English, and that's the school world. And you speak Spanish when you are at home, and that's family. It's like two different worlds, and then when

you mix them, academics is family too. That's the way I feel it, and that's why it was important for me," Jose Luis says.

Each session featured a different theme and a hands-on activity to reinforce the lesson. When the students learned

about structural engineering, for example, they built structures from Popsicle sticks and experimented with various building profiles and environmental conditions, such as a vibration table to simulate an earthquake and a powerful fan to simulate a hurricane. The students also learned how elementary machines make work easier, constructed simple motors and then tested modifications for increased output, and manipulated gears to calculate the ratios governing transfer of power in a machine.

Jose Luis helped conduct the workshops, leading the children and their parents through the activities designed by Barrera Guerrero. Instead of teaching the concepts through lectures, the two opted for an inquiry-based format, asking the children questions and prompting them to think about alternative approaches to the activities instead of immediately providing solutions when they encountered challenges.

"At ¡Explora!, we teach science in a different way; we let the kids make their own discoveries. We are the Jedi of education," says Barrera Guerrero.

Family involvement

PCA, which offers programs to strengthen New Mexico families through education, and health and economic opportunity, selected the children for Explora Ingeniería from families that participate in PCA's advocacy programs.

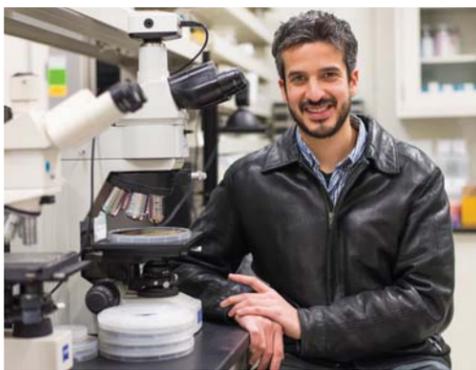
Mayra Acevedo, PCA operations manager, says, "This program has truly benefitted the kids and their families. They keep coming back and learning new concepts, taking them home, and continuing the learning at home. These parents are engaged, and this is a healthy way to introduce science and to build family relationships."

More than a STEM program

In addition to providing experiences designed to build the kids' interest and competence in STEM, Explora Ingeniería also carried a meaningful message.

Jose Luis and Barrera Guerrero would wrap up each week's workshop with a discussion of characteristics that lead to academic and professional success, with the aim of motivating kids to set goals and cultivate the traits — such as resilience, perseverance, and dedication — that will help them achieve those goals.

To teach the kids about perseverance, for example, they used examples the kids could relate to. "When you play video games, how many times do you have to play them to win? It's the same with science, with your job, and with school — perseverance guarantees you succeed. You should know that within you, you can get it done," Jose Luis says.



JOSE LUIS CRUZ-CAMPA has helped introduce bilingual kids to STEM fields through an Explora Science Center program.



Hydraulic fracturing is safe road to energy independence, National Security speaker says



JAMES CLAD

By Neal Singer

In a talk sensitive to many aspects of today's energy markets, James Clad varied between statistical analyses and personal experience to explain his vision of the past, present, and future of hydraulic fracturing, better known as fracking. He found the future bright.

The talk, presented on Feb. 10 at the Steve Schiff Auditorium as part of Sandia's National Security Speaker Series, was titled, "The World Politics of a Changing Energy Landscape."

Clad, a consultant for energy and investment firms, is senior adviser at the Center for Naval Analyses and at Jane's Defence and Cambridge Energy Research Associates. He served as US deputy assistant secretary of defense for Asia from 2002 to 2010 and as senior counselor at the Overseas Private Investment Corporation and the Agency for International Development.

Making no bones about it, he called the award-winning documentary "Gasland," famous for showing a Pennsylvania family lighting their drinking water in an area of heavy fracking, "a really good propaganda movie." He said that local books about the area dating

from the late 18th and early 19th centuries described "how you could light [a nearby] lake," and that local people spoke about schoolchildren decades earlier who would "set fire to the lake each July 4th." His implication was that locals apparently knew that a free-floating methane already existed in the area's groundwater.

Clad described taking a trip to the heart of fracking country — or "environmentalist ground zero," as he put it — where, because of negative national media publicity, "we expected to find haunted houses and bare trees." The situation as reported had deteriorated so badly, in fact, that progressive-minded people from Manhattan had travelled to "ground zero" in January, 2013 to "distribute bottled water to perplexed farmers," Clad said.

Yet, he said, "We came across many new microbreweries in these same counties." Not everyone believed, apparently, that local water was toxic from fracking.

Apprehension about methane leaks and water contamination are reasonable, he granted, but "many agreements have been reached between [oil and gas] producers and environmentalists without the contentious shouting matches often seen on news shows."

On one of his speaking visits, in Tulsa, Oklahoma, Clad met a nationally eminent seismologist who said that claims that fracking stimulated earthquakes were "a lot of nonsense." Clad, agreeing, said fracking was actually an old technology. In the 19th century, "miners had even used nitroglycerin to open seams and fracture the oil-bearing shale." Modern hydraulic fracturing was developed in the late 1940s.

Also in Tulsa, Clad heard a major drilling services company's CEO describe his firm's engineers taking just 20 days to drill nearly 30 horizontal producing wells each to a depth of a kilometer or more.

"That's a pretty amazing demonstration of industry innovation and wellhead efficiency," Clad said.

Not only did this indicate "a resilient industry," he said, "it also means that simple deterministic thinking about the impact of lower prices may not be accurate. The Saudis think if they maintain supply and prices go down, most shale producers will be driven to the wall. I don't think it's going to work out that way."

It doesn't help the national debate that the public conflates fracking with the oil and gas industry's major accidents and oil spills. "The overall public mindset seems to sponsor a kind of Luddite attitude against new technologies," he said. Luddites resisted the mechanization of factories in early industrial Britain.

But fracking now seems to be evolving as a less water-intensive technology, he said, and the dominant motif of the industry is increased efficiency, which

works against waste because drilling time is reduced and recovery enhanced.

"Maybe the genius of our country's energy independence and resilience comes from local drillers making small advances, rather than from top-down legislation," he said.

The peculiarities of land and leasing law in US states may be one reason why other shale-bearing countries aren't racing ahead in the same way as North America, Clad said. "In America, owners usually have subsurface rights." These conditions are absent in other countries, he said, "where a single state-dominated attitude prevails, often with rigid restrictions." America's plethora of jurisdictions leaves producers and owners room to negotiate, he felt.

Another positive outlook for fracked natural gas comes from the reduced demand for coal. Because of environmental problems, he said, coal use is steeply declining in the US. "Even in China, you can't count on coal holding its place," he said, accompanying the statement with slides of appalling air pollution in Chinese cities. In the 1970s, "Japan and South Korea decided they didn't want to breathe air like that. Their move to import LNG (liquid natural gas) cleared the air, involving long-term commitments to financing and planning" — a prospect that could lead to cooperative arrangements with the Chinese involving exported American LNG in the future, Clad said.

The overall energy picture is complex, Clad concluded, citing President Obama's comment that natural gas derived from fracking should be seen as "a bridge-fuel to renewables." Meanwhile, adjustment to the 50 percent drop in the price of oil has had "profound [geopolitical] effects throughout world's economies and the energy infrastructure." Venezuela's economy is expected to shrink by 7 percent or more during 2015, he said, while political upheaval seems inevitable in major supply countries like Nigeria and Angola. Iranians and Russians must reckon with huge reductions of revenue supporting the underpinnings of their political aims — a trend favoring American goals. Still, the current price drop has already impacted US oil drilling activity, with the three largest US drilling services companies announcing a total of more than 18,000 layoffs, Clad said. More cuts may come. Nevertheless, he said a resilient fracking industry should be able to make money even from sharply reduced prices, which he considered a temporary phenomenon.

He closed by predicting that American energy production would "retain the gains of the so-called 'fracking revolution.'"

(Photo by Randy Montoya)

Righting the ship

As part of Community Involvement Dept. 3652's Skills-Based Volunteer Program, Sandia millwrights and painters volunteered more than 30 hours each to help ready USS *James K. Polk's* conning tower, or sub sail, for visitors to enjoy in the 9-acre outdoor exhibition area, Heritage Park, at the National Museum of Nuclear Science & History.

The sail, which measures 30 feet high by nine feet wide and weighs 53 tons, was acquired by the museum in 1999. It required some structural work and a rugged paint job before it was ready for public display.

The USS *James K. Polk* was commissioned as SSBN 645 in 1966, and was later converted into an attack submarine and re-designated SSN 645. It served for 33 years. A dedication ceremony is planned in 2016 to acknowledge the legacy of the ship and its crews.

Pictured are: Sandia millwright and painter volunteers Jeff Butler (48432), Jesus Vazquez (48431), Robert Martinez (48432), Leroy Marquez (48432), and Michael Baca (48432). Not pictured are Rosalio Silva (48432), and Jeff Bibbey (48431).

(Photo by Randy Montoya)



Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

SIRIUS XM RADIO, portable unit, w/all indoor & outdoor antennas, \$75 OBO. Bonzon, 828-1066.

KITCHEN CHAIRS, 5, autumn wood, padded seat & back, \$50 ea. or \$200/all. Bickel, 822-0951.

SLEEPER SOFA, La-Z-Boy, red, new, \$200, TEMA black-tinted glass office desk w/shelf, \$150. Griffin, 822-0318.

HITCH/RECEIVER, Class III, for Chevy pickup 1500/2500, \$150 OBO. Barreras, 246-8285.

ANSWERING SYSTEM, w/caller ID, VTech CS6429-5, 5 handsets, \$50. Brandt, 505-400-6643.

MOVING: LG washer/dryer, warranted 4 months, \$995; sofa, dual recliner, leather, \$650; many other items, far NE Heights. Chavez, 505-999-7929.

JUNIORS CLOTHING: shorts, skirts, tops, jeans, size 6 pumps, 6.5 sandals, dresses, BeBe, Old Navy, Guess, Hollister etc., call or text for more info. Velasquez, 610-3672.

BABY GRAND PIANO, w/bench, Young-Chang, white, smoke-free, regularly tuned/played, reduced, must sell, \$3,100 OBO. Santos, 269-3461, call or text.

MICROWAVE, new, under counter, GE Profile, 12"H x 24"W x 12"D, stainless steel, 800-W, \$300 new, asking \$250. Moreno, 238-0494.

CHILDREN'S BDR. FURNITURE, quality, armoire/dresser, night stand, light-colored wood, blue drawers, paid \$1,000 new, asking \$250. Mulville, 459-6790.

DESK, w/removable hutch, includes matching chair, white, like new, text for photos, \$200 OBO. Lohkamp, 505-554-5199.

PERSONAL PRINTER INK CARTRIDGE, Canon 40, PG-40, black, brand new, \$10. Kovarik, 897-2188.

LADDER, 20-ft., Little Giant, w/step, \$175 OBO. Ayers, 505-349-1793.

BABY BOOMER TOYS, liquidating collection, photos at samstoy-box.com, buy one or all. Cancilla, 505-228-9640, call evenings, text daytime.

DIGITAL IMAGE COPIER, Ham-macher Schlemmer, convert slides & negatives to digital files, almost new, \$75. McKay, 294-2935.

HEDGEHOG, female, 8 mos. old, mostly cream-colored, w/cage, exercise wheel, water bottle, food bowls, bedding, \$240 OBO. Marchi, 220-0180.

PEDOMETERS, 2, GO ZONE, brand new, bought as part of Virgin Pulse health, \$20/both. Drayer, 401-7872.

TIMESHARE, Puerto Vallarta, many amenities, June 13-20, sleeps 4, photos, \$900. Cunningham, 286-1924.

VACUUM, Kirby, rug shampooer, used only 3 times, w/owner's manual & CD, extra bags, retail \$1,700, asking \$1,350 OBO. Weber, 231-1583.

CARGO NET, fits all Acura MDX & RDX models, \$10. Eller, 417-4390.

TRANSPORTATION

'70 VW BEETLE, red, rebuilt engine, new headliner, seat covers, carpet, switches, brakes, black chrome powder coat, newly painted, \$5,000. Flores, 681-7081.

How to submit classified ads
DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:
 • EMAIL: Michelle Fleming (classads@sandia.gov)
 • FAX: 844-0645
 • MAIL: MS 1468 (Dept. 3651)
 • INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

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

'92 CLASSIC MAZDA MIATA MX5, new soft top, paint, runs great, very clean, \$2,500. Brown, 463-5563, ask for Harold.

'14 ACURA RDX, AWD, white, garaged, 4K miles, condition perfect, \$32,200. Garrison, 292-8973.

'00 TOYOTA 4RUNNER, 2WD, 4-cyl., silver, new tires, clean, 165K miles, good condition, \$5,200. Weed, 822-1871.

'03 INFINITI M45, V8, 340-hp, 96.5K miles, good condition, some bumper scrapes etc., \$7,500 OBO. Chandross, 377-6516.

'07 INFINITI FX35, pearl white, leather, back-up camera, premium wheels, great, must sell, 102K miles, \$13,900. Baca, 505-301-7807.

'63 CADILLAC SEDAN DE VILLE, white/red leather interior, lots of options, runs & drives nicely, 98.8K miles, \$8,500. Campbell, 294-6000.

RECREATION

BICYCLE, REI Novara, men's, Shimano, light usage, \$395 new, asking \$180. Schmitt, 856-1280.

'99 SPORTSMAN 5TH WHEEL RV, w/2 slide-outs, brand new tires, sleeps 8, w/bunkhouse that sleeps 3. Spinello, 505-350-9453, ask for Jim.

TRAVEL TRAILER, 23-ft., hybrid, 1 slide out, sleeps 7, very light, 1,950-lb. (dry), \$7,500. Babb, 505-228-5225.

KID'S MOUNTAIN BIKES, 2, 24-in., 5-spd., suspension from Performance bike, excellent condition, new tubes, \$50. Jones, 294-9416.

REAL ESTATE

2-BDR. HOME, 2 baths, 1,108-sq. ft., SW Albuquerque, gated community, 1.5 miles from freeway, \$118,000. Hidalgo, 269-7795.

3-BDR. HOME, 3 baths, 1,753-sq. ft., 7 mins. from KAFB, 2016 Mountaineer RD SE, FSBO, \$247,500. Scott, 505-301-6554.

3-BDR. HOME, 1-3/4 baths, 1,400-sq. ft., w/400-sq. ft., detached studio, Ridgecrest SE, KLWerner Assoc., MLS#832328, \$250,000. McGrath, 450-5724.

3-BDR. HOME, 2 baths, 1,200-sq. ft. near Rust Medical Center on Unser & McMahon, MLS#834203, \$150,000. Brown, 450-6619.

WANTED

BOARD GAMES: Wayne's World & Hotels; small yellow bricks w/'Gallup' imprinted on them. Rosales, 688-3610.

HOST FAMILY, open your heart to an international high school exchange student, host w/AFS. Hiebert-Dodd, 296-1158.

RELIABLE BABYSITTER, 9-mo. old baby girl, needed on part-time basis, 6-20 hrs./wk. Murrieta, 520-249-6176.

INEXPENSIVE VEHICLE, for young adult, dependable transportation. Brewster, 238-4704, ask for Julie.

GOLFERS, Sandia Women's Golf Assoc., accepting registration for 2015 league play, www.swga.sandia.gov. Kitsch, 280-7331.

MOVING BOXES, wardrobe, small, medium, large, liquid, will pick up if local. Bauck, 366-8669.



Mileposts

New Mexico photos by Michelle Fleming



Brad Godfrey 35 151



Carlos Quintana 35 9344

Recent Retirees



Richard Kottenstette 36 6824



Bruce Bainbridge 33 2952



David Hendrick 30 4870



Robert Pierce 25 5332



Lynne Felix 20 10629



Tran Nhu Lai 20 2728



Dorothy McCoy 25 5900



Bill Arnold 20 6224



Nancy Irwin 20 5524



Nancy Linarez-Royce 20 2214



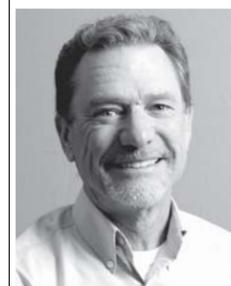
Victoria Getts 15 2669



James Hochrein 15 1852



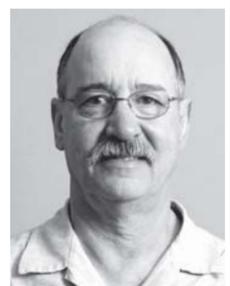
Lisa Kreiner 15 5349



Chris Miller 20 3651



Julia Phillips 19 1900



David Wiederholt 15 1747

Nanobiologist joins ranks of state's most influential women

By Nancy Salem

Sandia's Susan Rempe was named to the 2015 class of Albuquerque Business First's Women of Influence for her professional achievements, leadership, and community involvement. "I'm excited about the award because it's unusual for a scientist to be recognized as influential in the business world," Susan (8635) says.

She is one of 30 honorees chosen from 450 nominees, and will receive the award at a gala March 12 at the Hyatt Regency in downtown Albuquerque.

Susan is a nanobiologist whose field is molecular modeling, and she has worked on three major projects at Sandia. One is a technology that helps regulate carbon dioxide emissions from electricity-generating plants and other industrial activities. Her team's nano-stabilized enzymatic membranes for CO₂ capture provide a simple, more energy-efficient approach than conventional methods. The work won a national Federal Laboratory Consortium (FLC) award.

Susan also helped develop biomimetic membranes, a revolutionary advance in the field of membrane technology for water filtration. The biomimetic membrane is inspired by the way the human body filters water and is designed for water purification using reverse osmosis, which removes impurities with applied pressure powered by electrical energy. Biomimetic membranes can increase access to clean water by dramatically reducing energy use and costs. The technology received R&D 100 and FLC awards.

And Susan has worked with the MD Anderson Cancer Center in Houston on a problem involving an enzyme used to treat childhood leukemia that causes serious side effects. Susan's team showed how to control the side effects by eliminating a side-reaction catalyzed by the enzyme. Susan and her colleagues are studying ways to use the enzyme in different cancer treatments.

"Susan collaborates with top experimental scientists on important problems so that her models and predictions can be tested and refined," says Eric Ackerman, manager of Nanobiology Dept. 8635, who nominated Susan for the award. "When her part of a multidisciplinary project is successful, her models save the experimentalists years of work and hopefully lead to revolutionary breakthroughs."

A thumbs down to medicine

Susan grew up in northwest Montana with an early love of science. As a high school senior she used ultraviolet spectroscopy to assess the water quality in Flathead Lake near her home. She graduated first in her class of about 500 students. "I thought I would become a doctor or a veterinarian," she says. "I was curious about all kinds of things."

She attended Columbia University in New York City as a pre-med, majoring in German literature and history. After college she married, started a family, and decided medicine wasn't for her. She went back to school and earned a bachelor's degree in chemistry from the University of Montana and a master's and doctorate in physical chemistry from the University of Washington. "Physical chemistry explained all my questions in the world," she says.

She planned to become a high school chemistry teacher until she ran into Sandia's Jim Martin (1114), who was recruiting at Washington. "He told me Sandia is about science and solving fundamental problems,



INFLUENTIAL — Susan Rempe (8635) has worked on Sandia teams that have won R&D 100 and Federal Laboratory Consortium awards. "Susan has made important contributions to diverse fields," says her manager, Eric Ackerman.

and about national security," she says. "I could do what I wanted science-wise. He said I could find colleagues with any expertise I needed. It sounded like a place I would like to work."



Research with a purpose

Susan started at the Labs in September 2001 and a few years later was among the first to join the newly formed biosciences center. "This organization suits my interest in fundamental science and fundamental biological chemistry and materials," she says. "There's an applied end, a purpose for the research."

Susan has published extensively in scientific journals and was invited for the prestigious Wilsmore Fellowship at the University of Melbourne, Australia. She is an adjunct professor of biology at the University of New Mexico. She has been invited to speak internationally at scientific meetings including Gordon Conferences and Telluride Workshops and to organize scientific conferences. She is a treasurer/secretary of a sub-group of the Biophysical Society.

Susan does white-water kayaking and back-country telemark skiing in her spare time, and is an accomplished pianist who has performed with the Symphony Orchestra of Albuquerque. She also volunteers in the community with such organizations as the Girl Scouts of America and at science fairs.

Susan says employers and female employees should take steps to bring more women into leadership roles. "Female leadership should be a top priority," she says. "And the criteria for success and promotion must be based on specific measurable accomplishments."



Sandia Women's Action Network

SWAN celebrates Women's History Month

By Valerie Larkin

The Sandia Women's Action Network (SWAN) offers various professional development and recognition opportunities, helping women excel in their current positions, advance their careers, and build and maintain their professional networks. SWAN also partners with the Sandia Women's Committee at Sandia/California on activities of mutual interest.

"SWAN focuses on engaging the network of women at Sandia to help them succeed," says SWAN co-chair Amy Tapia (3652).

During March, all members of the workforce are invited to attend a series of events to commemorate Women's History Month.

"Women's History Month provides us a special opportunity to recognize the extraordinary contributions women have made to national security and to Sandia's success," says Lori Parrott (6924), SWAN co-chair.

• Professor Abigail Stewart presentation: On Monday, March 2, Professor Abigail Stewart presented "Creating an Inclusive Culture at Work: Steps Toward Institutional Change." Stewart is the Sandra Schwartz

Tangri Distinguished University Professor of Psychology at the University of Michigan (UM) and director of the UM ADVANCE Program, which works to improve the UM environment through recruitment, retention, departmental climate, and leadership. Her remarks addressed the effects of unconscious bias on hiring, performance evaluations, retention, and promotion of underrepresented groups, and the institutional changes she implemented at UM that have had a positive effect on its culture. Stewart's presentation is available in the corporate streaming library.

• Diversity Cinema: On Wednesday, March 18, 11:30 a.m.-12:30 p.m. in the Bldg. 810 CNSAC auditorium, Diversity Cinema will present "Makers: Women in Business," a collection of stories about women — past and present — who have excelled in business.

• Women's Leadership Panel: On Wednesday, March 25, 12-1 p.m. in Bldg. 858EL, Rm. 2000, a panel of Sandia leaders will engage in a lively and candid discussion about the paths they have taken to leadership positions at Sandia, the challenges they faced, and their most meaningful achievements.