

A small world: Sandia Wounded Warriors discover they were united in battle years ago

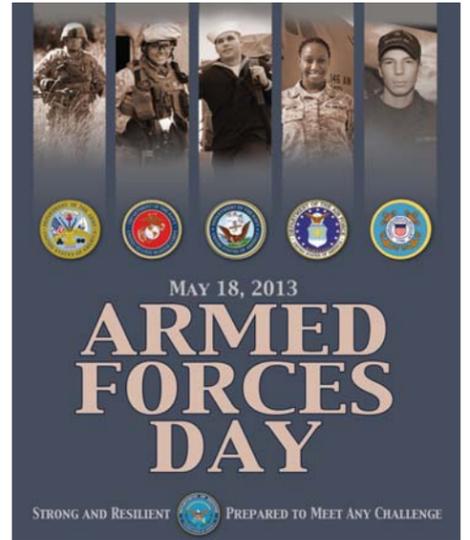


By Nancy Salem

Jason Shelton and John Bailon left a recent Sandia Military Support Committee meeting side by side, sharing stories of combat in Iraq. John (5627) talked about a day in the summer of 2005 when his Marine unit was called to help a small Joint Special Operations team holed up and taking mortar and gunfire in a house next to a school booby-trapped with explosives.

The hair stood up on Jason's neck. "It sounded really familiar," Jason (2998) says. "I asked if the mission involved bombing the building. He said it did. It was crazy. There could not have been two missions involving a Marine unit supporting a Special Operations team at a school at that exact time in Iraq. I was on the team that John's unit came to help."

John says it became clear as he and Jason talked that they were



THIS WEEK is Armed Forces Week, which culminates with Armed Forces Day on Saturday, May 18. The week and day honor members of the nation's five military branches: Army, Navy, Marine Corps, Air Force, and Coast Guard.

(Continued on page 4)

BROTHERS IN ARMS — Jason Shelton (2998), left, and John Bailon (5627) reminisce while walking in terrain at Sandia Labs that reminds them of Iraq. They both fought for the US military in Operation Iraqi Freedom. (Photo by Randy Montoya)

Faces of Sandia

Meet eight newer members of the workforce who chose to join Sandia early in their careers. They come from around the country and bring with them a wide range of skills and interests. The eight are just a few of the many newly minted professionals hired by Sandia each year. See brief profiles, photos on pages 6 and 7.

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NATO group tours Sandia



By Sue Major Holmes

NATO delegates toured Sandia during a three-day visit highlighting the Labs' programs that support extended deterrence to US allies, as well as broader national security programs ranging from homeland security to preventing the proliferation of weapons of mass destruction.

The visitors included more than 50 representatives from 23 European countries, along with officials from the Department of Defense, the NNSA, the State Department.

(Continued on page 5)

Paul Hommert addresses Senate subcommittee regarding status of stockpile work



Photo by Charles Votaw

On May 7, Sandia President and Laboratories Director Paul Hommert testified before the US Senate Armed Services Subcommittee on Strategic Forces along with his counterparts from Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL). Paul and the other lab directors' testimony provided guidance to the subcommittee as it prepares the fiscal year 2014 National Defense Authorization Act. The annual bill provides congressional guidance for national defense programs, including the nation's stockpile. During the hearing, Paul showed senators a Sandia-designed B61-12 component to make the point the Labs is underway with full-scale engineering, design, and testing for the program. Paul also testified the component will be utilized in other key Sandia weapon-related programs. Paul told the Senate panel that Sandia is meeting the B61-12 schedule and milestones, and is on budget in FY2013. He emphasized that stability in funding and planning is key to Sandia's execution of its life extension programs and ALT programs. The subcommittee is chaired by Sen. Mark Udall, D-Colo. In the photo here, Paul, center, is flanked by LANL Director Charles McMillan (on Paul's right) and LLNL Director Parney Albright.

Inside

Rad detection to go... Systems deployed at international ports. See story and photos on page 8.

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That's that

Before I go anywhere else with this column, let me strongly encourage you to read Nancy Salem's story beginning at the top of page 1 about two Sandians brought into the Labs as part of our Wounded Warrior Career Development Program. I don't want to give away too many details here; just please read it; it's the darndest story you'll come across for many a moon.

And not only is the story a compelling human drama in its own right, it also gives you a good sense of the caliber of people we are bringing into the Labs. It reminds us that our veteran employees, including those here as part of the Wounded Warrior program, are an extraordinary asset for us. With their life experiences, so different from what most of us encounter in our daily lives, they give us a perspective and a grounding that serve us well as a national security laboratory. They have seen the world and its threats in ways that, thanks to them, remain largely an abstraction for most of us.

* * *

It happens every spring. That happens to be the title of a silly 1950s baseball movie that I loved as a kid. And it also applies to my annual misadventures with my evaporative cooler.

There I was, a few days ago, bumping my head as I crawled over to the spot in the attic where the duct work from the cooler on the roof interfaces with the duct work from the central heating system. In our house, there's a baffle that you slide into place that opens or blocks the air path from the cooler: closed in winter, open in summer. It's a bit of a nuisance but you only do it twice a year, closing it as winter descends and opening as summer blossoms.

That is, in *theory* you only do it twice a year. In practice, well . . . there I was closing the duct work. Yes, closing it. I had opened it just days before, fooled once again by the false promise of summer. Late April seems to throw us these curve balls that I fall for every year. You get a few 80-degree days in April, the house is getting hot during the day, and the next thing you know, you're on the roof and in the attic, bringing the cooling system on-line. You're pretty pleased with yourself. Yep! Got 'er done early this year!

And then . . . the betrayal. That little foretaste of summer goes away in a gust of wind. Next thing you know, the nighttime temps are down in the 30s again, upper 50s during the day, the house is cold and the furnace is off-line. And try sleeping when the wind is blowing at 60 miles an hour, rocking the hinged baffles on the cooler. Sounds like an alien invasion on the roof. You tough it out for a day or two, figuring the weather's bound to turn around. And it will. It will. But in the meantime, there I am . . . bumping my head in the attic. And I'll be up there again next week, when the temperature's hitting 90 degrees in the shade.

* * *

Some people have their lawyer, their stockbroker, their accountant. As in, "I need to speak to my accountant about that." Or "My stockbroker thinks I ought to sell." My wife and I have our mechanic. As in "Our mechanic says . . ." And usually, what our mechanic says is, "Gonna cost you \$3,000." That seems high. I'd talk to my accountant about the best way to pay the bill . . . if I had an accountant. But I don't. My mechanic does.

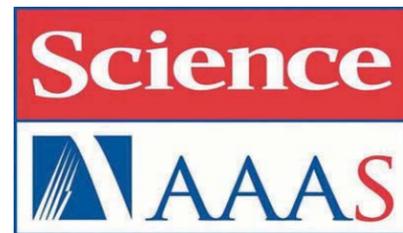
* * *

Did you see the headline the other day: "It's Time to Get Serious About Going to Mars, NASA Says"? NASA administrator Charles Bolden was quoted in the story as saying: "Interest in sending humans to Mars I think has never been higher. We now stand on the precipice of a second opportunity to press forward to what I think is man's destiny - to step onto another planet." The "D" word, destiny. It's a big word, a big assertion but I think it's well-chosen. I think we will go to Mars, we will send human crews to the vast reaches of the solar system and then, who knows? I have always remembered a sentence I first came across back when I was still a teenager. It was written by Russian rocket pioneer Konstantin Tsiolkovsky: "Earth is the cradle of humanity, but one cannot remain in the cradle forever."

See you next time.

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

Science 'Perspective' authored by Sandia researchers



The May 17 issue of *Science* magazine contains a perspective authored by Sandia fellow and UNM professor Jeff Brinker (1002) with Paul Clem (1816) "on work that involves our evaporation-induced self-assembly process conducted by the group with which I collaborate at College de France in Paris," emails Jeff in response to a *Lab News* request for information.

The materials science article, "Quartz on Silicon," opens, "The on-chip integration of piezoelectric quartz would be highly beneficial for chemical sensing and accurate timing circuits.... [Now A.] Carretero-Genevri et al demonstrate the formation of oriented piezoelectrically active alpha-quartz thin films directly on silicon." — Neal Singer

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Congresswoman Lujan Grisham visits Labs



REP. MICHELLE LUJAN GRISHAM, D-N.M., elected in November to represent New Mexico's first congressional district, visited the Labs earlier this month to hear briefings about Sandia's national security work. After receiving a Sandia overview from Sandia President and Labs Director Paul Himmert, Lujan Grisham was briefed on cybersecurity, nuclear weapons mission work, national security technology programs, and tech transfer efforts. In the photo above, Lujan Grisham, second from left, is joined by Sandia Deputy Labs Director and Executive VP for National Security Programs Jerry McDowell, left, Paul Himmert, Deputy Labs Director and Executive VP for Mission Support Kim Sawyer, and NNSA Sandia Field Office Manager Geoff Beausoleil.

(Photo by Randy Montoya)

Assessing the economic potential of advanced biofuels

By Patti Koning

Biofuels hold great promise for the future of transportation energy, but the day that biofuel completely replaces gasoline at the pump is still a long way off. How far off is, at best, an educated guess with many variables at play.

A new study led by Scott Paap (8114) takes a close look at the biochemical production of fatty acid ethyl esters (FAEE), one of several candidate biofuel molecules, and how it measures up against the biochemical production of ethanol. The study is detailed in a paper, "Biochemical production of ethanol and fatty acid ethyl esters from switchgrass: A comparative analysis of environmental and economic performance," published in *Biomass and Bioenergy* in February 2013.

The study found that the biochemical production of ethanol outperforms the biochemical production of FAEE under the current state of technology development in terms of both economic and environmental metrics. However, the study also identified pathways for improving the FAEE process and evaluated the prospects for it matching or exceeding the performance of the ethanol process in the long term.

"This is a great example of techno-economic modeling helping to inform and guide research," says Blake Simmons (8630), vice president of the Deconstruction Division at the Joint BioEnergy Institute (JBEI) and a Sandia senior manager. "This is really powerful insight into where we are relative to existing technology and where we need to be in order to fulfill our mission of replacing petroleum as a transportation fuel. Now we have a base scenario and guidelines for what the process needs to be competitive in terms of price and carbon emissions."

The study was part of an Early Career LDRD project, in which Scott developed a process model representing the biochemical production of ethanol and an FAEE from acid- and alkaline-pretreated switchgrass.

"We implemented a flexible, modular process model, and incorporated Monte Carlo analysis to account for the inherent uncertainty in parameter values," he says. "This allowed us to identify the parameters and process steps that drive performance, which in turn provided insight into potential areas for future research. The model is designed to enable comparisons of early stage technologies on a consistent basis within a single framework."

Fermentation efficiency is key

Ethanol has a long history as a transportation fuel. The Ford Model T, one of America's first mass-produced cars, ran on ethanol in addition to gasoline and kerosene. Despite the decades of usage, ethanol still has several significant drawbacks — low energy density, miscibility with water, and corrosivity.

Drop-in biofuels (hydrocarbon fuels substantially similar to petroleum-derived fuels) made from plant-derived sugars have the potential to overcome all three of these drawbacks. However, their immiscibility with water is most relevant to the production process. In simple terms, the water-immiscibility of drop-in biofu-

els results in a spontaneous separation from water in the production process, whereas the separation of ethanol from water requires an extra distillation step.

"This has been touted as an advantage of drop-in biofuels — the potential reduction in the energy requirement of the fuel production process," explains Scott Paap. "However, when I searched the literature, I found that no one had done a direct comparison of the efficiency of the fuel production processes. Our analysis began as an attempt to quantify the potential cost and energy savings of producing water-immiscible biofuels."

The process model showed that miscibility with water doesn't matter all that much within the biorefinery context. "In the overall conversion process, miscibility with water is a small factor. The fermentation of sugars to fuel is so much more efficient with ethanol that any cost or energy penalties associated with distillation are more than offset. You'd expect this, given how much experience we have with ethanol and the relative immaturity of the FAEE fermentation technology," says Scott.

This difference in fermentation efficiency is the primary driver of ethanol's current advantage over FAEE. The study found that ethanol production per metric ton of dry biomass, the yield, is about 2.5 times higher than that of FAEE. The minimum fuel selling price of ethanol is approximately ½ that of FAEE. The amount of electricity and water used in the production of FAEE are significantly higher than in the production of ethanol. Ethanol production greenhouse gas emissions are also substantially lower than those from FAEE production.

The study identified two primary areas for potential FAEE process improvements: increasing the fermentation yield and switching from aerobic to anaerobic fermentation. By improving the fermentation parameters to match ethanol's, the FAEE processes can make up most cost, fuel production, GHG emissions, and water use differences and produce a fuel with a higher energy density than ethanol. Switching to anaerobic fermentation will significantly decrease electricity consumption. However, even if these improvements in the FAEE



DEAN DIBBLE (8237) prepares samples of switchgrass for analysis. (Photo by Randy Wong)

Sandia California News

process can be achieved, the processing advantages from immiscibility with water are at least partially offset by a lower maximum fermentation yield when compared to ethanol.

Results broadly applicable

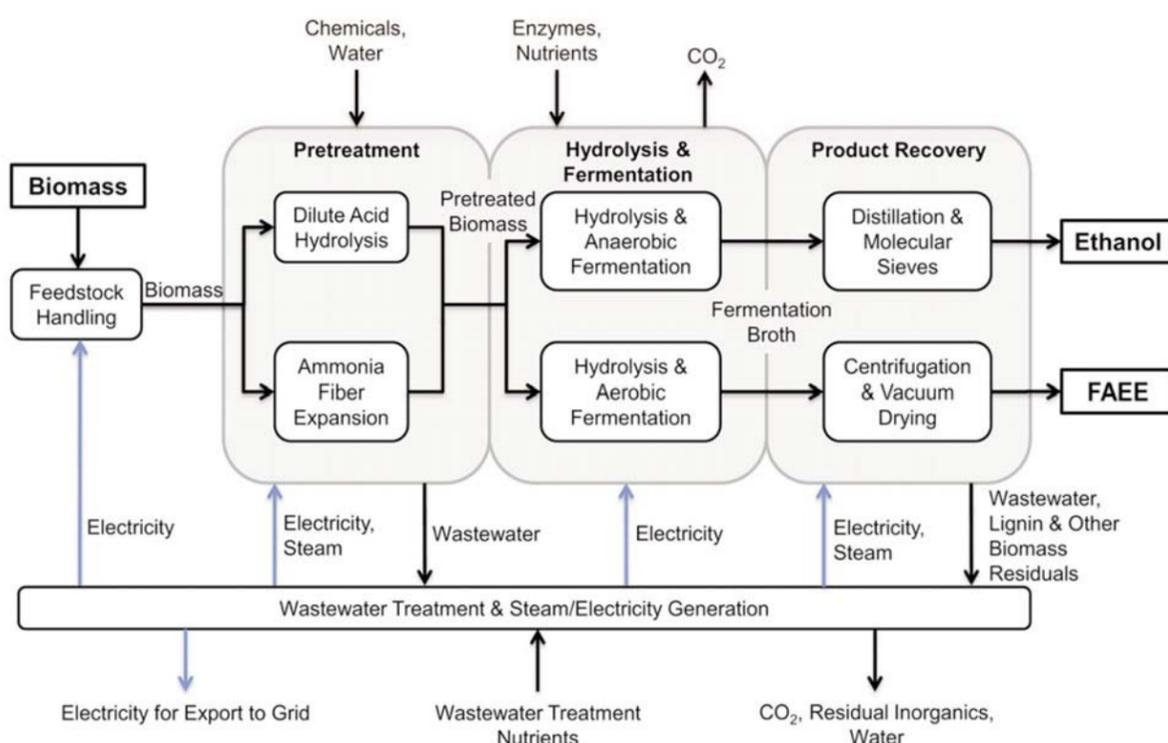
The comparison between the processes to produce ethanol and FAEE is imperfect, says Scott, because ethanol is a gasoline additive/replacement and FAEE is intended for diesel engines. However, the results are broadly applicable to other water-immiscible biofuels, most of which suffer from similarly low maximum theoretical fermentation yields when compared to ethanol.

This point also underscores the need to extend the scope of such comparisons beyond the biorefinery to distributing fuel to end users, and ultimately to combustion in engines. Further study is needed to explore the question of whether potential advantages in infrastructure compatibility and combustion efficiency for advanced biofuels will be sufficient to overcome the apparent process limitations of producing FAEE for fuel via biochemical pathways.

"The process model allows you to take a step back and analyze how a specific technology fits into the bigger picture. When a process is in the early stages of development, any estimates of energy use or greenhouse gas emissions, for example, will have a large degree of uncertainty. So, the model is useful for comparing different options and their relative performance rather than arriving at absolute numbers," says Scott.

Scott applied the same modeling approach to a follow-up project for Lockheed Martin to compare processes to produce biomass-based aviation fuels, completed in October 2012. He is currently conducting cost and energy analyses for an LDRD Grand Challenge on affordable photovoltaics and an LDRD on metal organic frameworks for oxygen purification. His modeling approach is also part of a proposed LDRD analyzing a natural-gas-based process to produce liquid fuels.

"I would like to do this kind of study on all major research projects relative to bioenergy," says Blake. "Economic analysis and experimental work must be considered together. In a research environment, you can't target the right things on a topic with as broad an impact as commercial-scale production of biofuels if you don't have the economic focus."



PROCESS PATHWAYS evaluated in this study for the conversion of cellulosic feedstocks to ethanol and biodiesel (FAEE).

Brothers in arms meet up at Sandia

(Continued from page 1)

within 100 yards of each other during the tense conflict. "It was a weird, strange coincidence," Jason says. "For the next few days we both kept saying, 'I can't believe it.'"

Both John and Jason are in Sandia's Wounded Warrior Career Development Program, which opens specific



JASON SHELTON (2998) on duty in Iraq.

jobs at the Labs to military veterans injured in combat. The program offers training and education, allowing combat-injured veterans to catch up to their peers who entered the civilian workforce instead of the military.

Dog sensed trouble

Jason was an Air Force Combat Controller and part of an elite counterterrorism team that tracked prominent members of al-Qaida, the Taliban, and other militant groups. On that day in Iraq, they were alerted to the possibility of a school being used to hide weapons and fighters. "They use schools, hospitals, and mosques, thinking we won't go there," Jason says. "We were dropped off in the desert and walked into this school."

A K-9 team led the way in the dark of night, testing

special equipment intended to make dog-handling in a combat environment more effective.

"That dog ended up saving everybody's lives," Jason says. "He alerted, and the handler could see that they had booby-trapped the school with trip wires and explosives and built fighting positions in stairwells with extra ammunition. We didn't know how many people were in there waiting for us. It was bad."

The team retreated to a small house next door and called for help. "It was too dangerous to send guys into a situation like that," Jason says. "When things happen at that scale we request a kinetic strike in which the Air Force comes in and destroys the building. It was the middle of the night, so there were no kids around."

The sun started rising as a decision was being made on the strike, not a good sign for Jason and his team, who, for the safety of support aircraft, did not go out in daylight. "We knew if we stayed there much longer we'd have to stay all day and into the next night, and we didn't have provisions," he says. "We couldn't leave because there were enemy troops in the building, and someone had to keep 'eyes-on' the school until a decision could be made whether or not to destroy it."

Marines take control

John's nearby Marine unit had a Quick Reaction Force (QRF) on standby to help whoever was in trouble in the area. "They had assets we didn't have," Jason says. "With their numbers and tanks they could secure the area better than we could."

Jason's team asked the QRF for help and at the same time began taking mortar and machine gun fire from near the school. "They knew we were there because our team had discovered and destroyed a vehicle-borne improvised explosive device near the school," he says.

The team held on while Marine tanks rolled in and secured the area. "They surrounded the school for us," Jason says. "We were taking fire, we were getting mortared. John and his guys got there and took control. It's nice when people bring tanks. With the Marines there our helicopters could come and get us out."

John says his unit had attached assets, such as jets, choppers, tanks, and plenty of Marines, while Jason worked in a small team. "They needed our help and we all got down there," John says. "It was a



MARINE TANKS ROLL IN to secure the area around an Iraqi school building that had been booby-trapped by militants. A Joint Special Operations team holed up next to the school called for Marine help. Sandians John Bailon (5627) and Jason Shelton (2998) were part of the 2005 operation. (Photo courtesy of Jason Shelton)

dangerous situation."

Jason says the house that sheltered his team didn't provide much protection, especially against mortars. "Having those guys show up was huge," he says. "Our small group was limited on what we could do."

John says the Marines received permission to destroy the building. "It was obviously being used for something other than a school," he says.

The story has a tragic postscript. The Marines left six snipers to watch the school site after the mission ended. They were later ambushed and killed. Five of the bodies were recovered by the Marines, but the sixth was missing. Jason's team went into a nearby city and recovered the body. "We leveraged all our assets to find him and we did. We brought him back to the Marines," Jason says.

Different paths to Sandia

Jason, who joined the Air Force after graduating from high school in Indiana in 1995, left the service in 2007 after doing four combat tours in Iraq and three in Afghanistan. His first deployment was 10 days after 9/11.

He moved to Wyoming with his wife, whom he met in the Air Force, and in 2011 relocated to New Mexico, where he heard about Sandia's Wounded Warrior hiring program from the Veteran's Administration. He went to work in January as a mechanical designer.

"I love it," Jason says. "I do miss the guys I was with in the Air Force, but I wanted to further my education and do something different with my life."

John, a native of Shiprock, enlisted in the Marines in 2001 with his brother Cheston Bailon (5635), who served with him in Iraq and who also is in Sandia's Wounded Warrior program. The brothers studied business at Arizona State University and were deployed to Iraq in March 2005. They returned in October and went on reserve status through 2008. John completed a bachelor's degree in sustainability economics from ASU and in 2010 went to work for Oracle.

He learned about the Wounded Warrior program when Cheston was hired. John started at Sandia in 2012 and works in cybersecurity.

"It was pretty shocking," Jason says of learning that he and John were in the same battle in Iraq. "It's a very small world to know we were that close over there and now we're both working at Sandia and in the Wounded Warrior program."

John says it's amazing that he and Jason were yards apart "in a country thousands of miles away eight years ago."

"To randomly stumble upon it is very interesting and awesome," he says.

The shared experience has brought John and Jason closer. "Things like that always do," Jason says. "It doesn't matter who you were with in the military or how long ago, having the same experience is powerful. You might not see someone for 10 years but run into them again and remember that one night, and you're best friends again."



BACK TO BASE— Jason Shelton's Joint Special Operations team is flown out of the combat zone and back to its base after Marine units arrive at the site of a 2005 conflict in the Iraq War. (Photo courtesy of Jason Shelton)



INTERNATIONAL FRIENDS — More than 50 delegates from 23 NATO member nations spent three days at Sandia last week for a visit that highlighted the United States' commitment to extended deterrence for its allies through life extension programs, as well as broader national security programs. The NATO delegates were accompanied by Andrew Weber, assistant secretary of defense for nuclear, chemical, and biological defense programs (in the red shirt in

the front row in the photo above), and by Elaine Bunn, deputy assistant secretary of defense for nuclear and missile defense policy (to Weber's right). Also joining the delegates were Albuquerque Mayor Richard Berry (to Weber's left), Sandia Labs Director Paul Hommert (to Berry's left) and several Sandia VPs and staff members.

(Photo by Randy Montoya)

NATO visit

(Continued from page 1)

ment, and other US government agencies.

The delegates were accompanied by Andrew Weber, assistant secretary of defense for nuclear, chemical, and biological defense programs, and by Elaine Bunn, deputy assistant secretary of defense for nuclear and missile defense policy.

Sandia President and Laboratories Director Paul Hommert, welcoming the visitors on May 8, presented an overview of the Laboratories' history, from its beginnings in the World War II Manhattan Project to build the first atomic bombs, to a focus on nuclear weapons components manufacturing that gave birth to Sandia as a separate laboratory in 1949. He outlined Sandia's focus on nuclear weapons safety and security through

the 1950s and its subsequent evolution into broader national security research, including energy and a variety of DoD work.

Paul also emphasized that the highly diverse laboratory Sandia has become remains focused on its core responsibility, nuclear weapons life extension programs.

"We are in full gear to execute this mission" with the alliance in mind, Paul said.

The visit aimed at demonstrating the science, engineering, and technology required to implement US policies that support the alliance. The agenda included an overview of national security and nuclear weapons programs at Sandia, Los Alamos, and Lawrence Livermore national laboratories and the NNSA's nuclear weapons enterprise, as well as mission briefings for the Defense Threat Reduction Agency (DTRA) and the Air Force Nuclear Weapons Center on Kirtland Air Force Base.

Sandia officials also demonstrated various capabilities associated with the Labs' pivotal role in life extension programs. The delegates took a windshield tour of Sandia's large-scale experimental test areas, saw demonstrations of nuclear incident response equipment, and viewed exhibits about homeland and global security programs.

DTRA provided briefings on how it supports nuclear surety and inspections, as well as the onsite inspection program activities that support treaty verification activities.

Five members of the delegation participated in a National Security Speakers Series panel moderated by Bunn. The panel addressed US allies' views of extended deterrence, the role of NATO member states in the nuclear deterrent, and arms control negotiations. The session at the Steve Schiff Auditorium drew a standing-room-only crowd of Sandians, which Paul said demonstrated that "our staff understands that if it says 'life extension program,' it's important."

Sandia designs and delivers new, safe, and secure vehicle to transport nuclear material

By Stephanie Hobby

Moving nuclear material is always a delicate operation, and when the Y-12 National Security Complex at Oak Ridge, Tenn., needed to replace the 30-year-old vehicles it had been using to move materials within the site, Y-12 leadership turned to Sandia for its expertise in safe and secure transport.

Y-12 entered into a WFO project with Sandia to design and build two new Special Nuclear Material Vehicles, or SNMVs, to replace the existing models. Remarkably, the Sandia team went from conceptual design to finished product in only 18 months. The project was funded in September 2011, construction started in May 2012, and the first truck was delivered on April 2. The second truck arrived in Tennessee May 8.

"We were especially pleased with how quickly we were able to deliver the trucks, since many of the necessary tasks had never been done before. Due to cost and schedule constraints, we weren't able to develop a complete drawing set or build a prototype before fabrication of the production units," says project manager Marc Ahlen (6623).

The Sandia team used the same basic vault construction as used in other secure transport vehicles. The Sandia team designed a compact 16-foot vault and had it bolted to a heavy-duty truck chassis similar to those already used at Y-12.

Sandia engineers designed a stronger floor structure to accommodate an 8,000-pound cargo capacity as well as loading equipment, such as a forklift, weighing up to 8,000 pounds. The wall structure was strengthened to allow cargo tie-down tracks to be mounted on the front and side walls.

Additionally, the trucks required a few safety modifications, such as preventing high speeds while turning to keep the top-heavy trucks upright. The updated models also offer electronic access control; they require two-person control and have updated security features over the previous models. In addition, the team worked with General Plastics in Tacoma, Wash., to fill the walls with a proprietary polyurethane foam to better protect SNMV cargo from heat and fire.

Once Sandia's modifications were designed and finalized, team members

worked with New Mexico-based MCT Industries to build the units. Sandia had designed, developed, and sustained other secure transport vehicles, and MCT Industries had done the fabrication for some of them, so both teams

knew the previous design well. With such expertise, the project came together quickly. They were able to meet the ambitious deadline and now have the experience needed to quickly build more.

"This project helps support Y-12's mission while upholding high standards of safety and security," Marc says. "This vehicle could also very likely have a place at other sites similar to Y-12, such as Savannah River and Los Alamos national laboratories, where they need to do similar transport within their sites. We've essentially built prototypes with the Y-12 vehicles."

With a working prototype designed, built, and delivered, sites needing a similar vehicle in the future would not have the added engineering expense, so costs for future models would be significantly lower. The design sent to Y-12 cost roughly \$4.5 million for the two vehicles, but Ahlen estimates that the cost could drop considerably for subsequent vehicles. The WFO project was funded by the NNSA through Y-12.



LITTLE BROTHER — A vehicle designed at Sandia to transport special nuclear materials within NNSA's Y-12 site is based on similar, but larger, secure transport vehicles developed at the Labs.

Faces of Sandia

Story by Nancy Salem
Photos by Randy Montoya

Young scientists are well on their way in life

When Sandia President and Laboratories Director Paul Hommert talked to the Albuquerque Economic Forum recently about the state of the Labs, he introduced to the group eight newer members of the workforce who chose to join Sandia early in their careers. They come from around the country and bring with them a wide range of skills and interests. The eight are just a few of the many newly minted professionals hired by Sandia each year. Here they are:

Albuquerque native **Alice Muna** first came to Sandia in 2004 as a high school Science, Technology, and Research, or STAR, intern and continued to work at the Labs through her senior year. She also interned at Cisco Systems in San Jose, Calif., and was a summer research assistant at Stanford University. Alice graduated from Stanford in 2009 with a bachelor's degree in electrical engineering and worked as a cyberanalyst for the federal government in Washington, D.C. She returned home to Albuquerque and Sandia in 2011. She now works in the Labs' Fire Protection and Assurance group and is earning her master's degree in fire protection engineering from CalPoly San Luis Obispo. In her little bit of spare time, Alice enjoys trying new restaurants, reading, and playing with her new puppy.

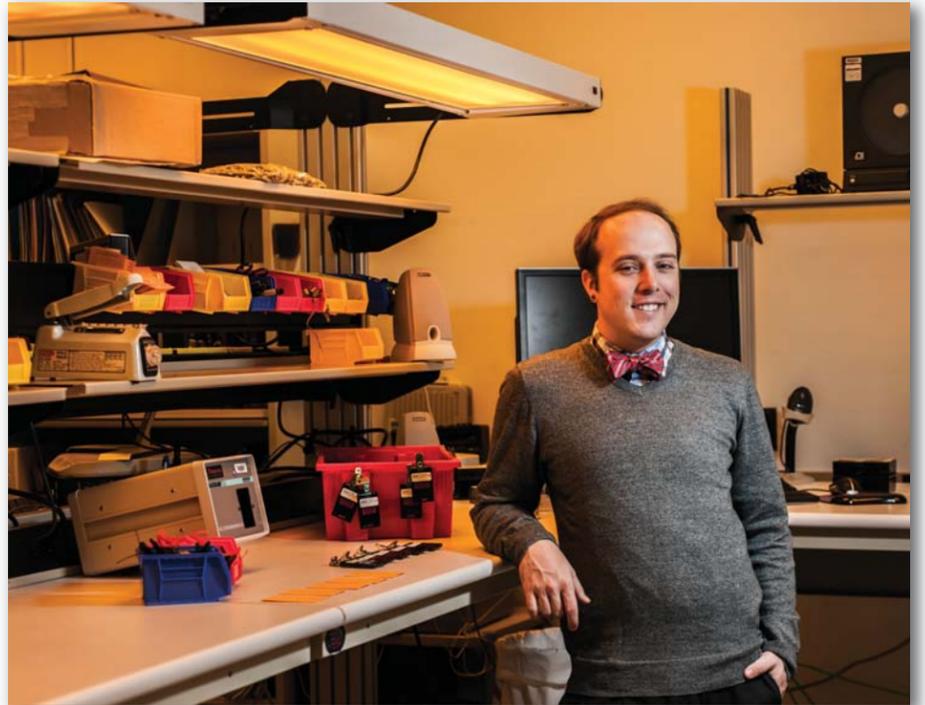


ALICE MUNA (4879)

Matthew Denman grew up in a military family and lived in cities around the world, from Langley, Va., to Ramstein, Germany, and Okinawa, Japan. He earned a bachelor's degree from the University of Florida in 2007 and a doctorate from MIT in 2011, both in nuclear engineering. He joined Sandia two years ago in the Risk and Reliability group, where he led a multilaboratory review of safety and licensing gaps for the Sodium Fast Reactor and helped rewrite a Nuclear Regulatory Commission document on low-level radioactive waste disposal. Matt is now doing research into risk assessment methodologies. In his free time he likes to travel the world to sample local food and drink.

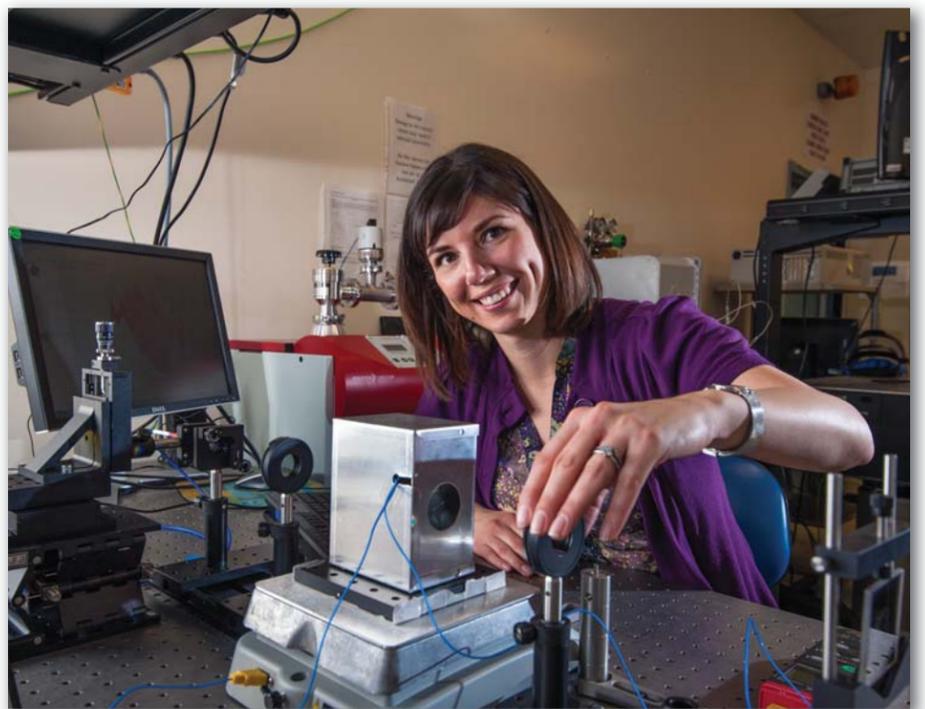


MATTHEW DENMAN (6231)



NATHAN ELLIOTT (4121)

Nathan Elliott is an Albuquerque native who served in the US Navy. He worked for several years on naval reactors, leading to a job in Sandia's Radiation Protection Department. While at Sandia he earned a bachelor's degree from New Jersey's Thomas Edison State University and a master's from the University of New Mexico, both in nuclear engineering. He works in the Radiation Protection Dosimetry Program. Nathan is the father of twins and managed while working and studying, both full time, to maintain an active role in the comic book community, for which he frequently travels to national conventions.



JULIA CRAVEN JONES (5717)

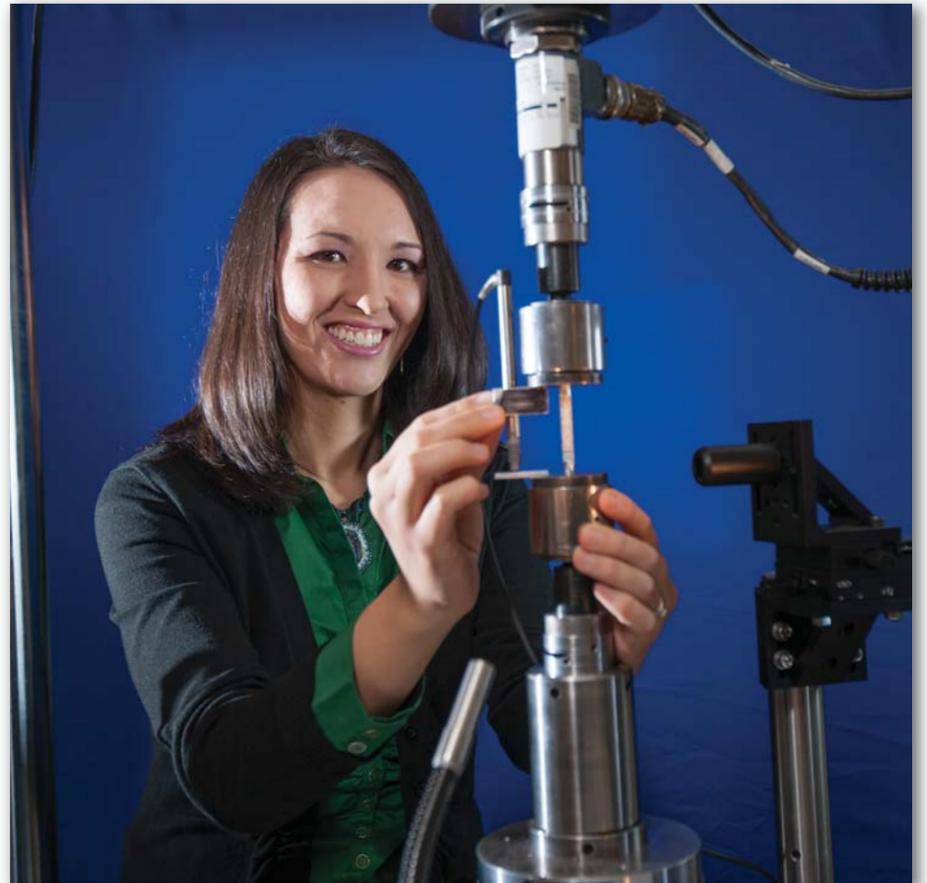
Julia Craven Jones is from Red Bluff, Calif. She got her first taste of scientific research and development as a high school intern at Sandia in 2001. Julia completed her bachelor's degree in physics at San Diego State University in 2006 and her master's and doctorate in optical sciences at the University of Arizona in 2008 and 2011. Her dissertation research, funded by the NNSA, focused on the development of a novel infrared imaging device. Julia interned at Los Alamos National Laboratory in 2004 and the Air Force Research Laboratory in 2007. She joined Sandia after grad school and is principal investigator on two technical projects. She was recently named an evaluator for the Comprehensive Nuclear-Test-Ban Treaty Organization. Julia is a volunteer at the National Museum of Nuclear Science and History and in her free time enjoys cross-country skiing and hiking with her dogs.



CHRIS JENKINS (5629)

Chris Jenkins was born and raised in Peoria, Ill. He earned a bachelor's degree from the University of Illinois and a doctorate from the University of Wisconsin, both in computer engineering. His research focused on accelerating algorithms in modern high-performance microprocessors. Chris did internships in information technology and mining truck radar research. He spent time in Taiwan with the National Science Foundation's East Asia and Pacific summer institutes. Chris joined Sandia in early 2012 and is studying new ways to design computer systems to mitigate malware damage. His technical interests include computer architecture, low-level software and firmware, mobile computing platforms, and security analysis. Outside work he practices Spanish and Mandarin Chinese, salsa and bachata dancing, cooking, and auto mechanics.

Sharlotte Kramer was born in Albuquerque on Kirtland Air Force Base, a stone's throw from where she now works at Sandia. The child of an Air Force officer, she lived in several places in the United States and abroad. Sharlotte earned a bachelor's degree in aerospace engineering in 2004 from the University of Virginia. She received a master's in aeronautics in 2005 and a doctorate in aeronautics with an applied physics minor in 2009 from the California Institute of Technology. She was an intern at Booz Allen Hamilton, SAIC, and Lockheed Martin, and a postdoc research associate at the University of Illinois Urbana-Champaign. Sharlotte returned to Albuquerque in 2011 to join Sandia's Structural Mechanics Laboratory. Her expertise is in experimental solid mechanics. Sharlotte volunteers as a worship music leader at her church and enjoys travelling, baking, jewelry making, and spending time with friends and family.



SHARLOTTE KRAMER (1528)

Sandia National Laboratories

Danielle Sedillo-Cafferty was born in Albuquerque and raised in Los Alamos. She earned a bachelor's degree in business administration with a concentration in international management from the University of New Mexico, and spent time in Japan to reinforce her studies. She worked in human resources for Fidelity Investments in Albuquerque then returned to UNM to get an MBA in management of information systems with the cyber focus of information assurance. While in school Danielle interned with Sandia's Intellectual Property group as a systems analyst for patents and licensing. She was hired as a full-time staff member of the Collaborative Information Environments group where she now works as an information systems analyst developing SharePoint solutions. Danielle has the travel bug and also enjoys reading and hiking with her dogs.



DANIELLE SEDILLO-CAFFERTY (9531)



RUSSELL GAYLE (6134)

Russell Gayle, a Texas native, earned bachelor's degrees in mathematics and computer science from the University of Texas at Austin in 2003. He moved on to graduate school at the University of North Carolina at Chapel Hill and a master's in 2006 and a doctorate in 2010, both in computer science. His research focused on robotics and computer graphics and simulation. Russell's first exposure to Sandia was as a fellow in the DOE High Performance Computational Fellowship program. He worked in Chicago at the high-frequency trading company Optiver in computing performance and later in big data analytics at Google. Sandia drew him back, and he joined the Interactive Systems, Simulations, and Analysis group. He does projects in areas from data sciences to gaming technologies and says his work at Sandia has been a fun ride. Russell enjoys running, tennis, racquetball, and bouldering, and spending time with his wife and 1-year-old baby.



PORT AUTHORITY— Three primary Mobile Radiation Detection and Identification System (MRDIS) units form a virtual tunnel at the port of Salah, in Oman.

Radiation detection to go

MRDIS technology deployed at international ports

By Stephanie Holinka
Photos by Greg Stihel

In late March, a Sandia team traveled to the Port of Salah, Oman, to conclude the acceptance testing of the Mobile Radiation Detection and Identification System (MRDIS), a technology intended to make it more difficult to sneak illicit radiological materials into a country.

Typical radiation detectors are fixed-in-place at port entrances and exits, so they aren't able to scan transshipment containers, says Greg Stihel of Systems & Mission Assurance Dept. 6813. This makes transshipment an enticing option for those who might want to bring radioactive substances into a country for terrorist activities like making dirty bombs, he says.

"In 2006 or so, NNSA recognized the need to also scan cargo that is taken off a ship and, in a short period of time, put on a second ship," Greg says.

Greg says port security is a huge international concern, but that port operators and shippers are also concerned about time delays, because they negatively impact their bottom line.

"If the system creates time delays, that costs shippers and port operators money, and the detectors won't get used," Greg says.

Based on the need to scan transshipped containers quickly, Sandia engineers developed the idea for MRDIS. Under direction by the National Nuclear Security Administration's (NNSA) Second Line of Defense

Program they set about making it happen.

Two MRDIS prototypes were developed around 2006, and were field tested in Oman. Engineers worked with port operators to refine the MRDIS based on its performance.

After the prototypes proved their worth, 12 MRDIS devices were ordered, which represents a tremendous investment in the idea, Greg says. Two years later, the first production unit of the second-generation MRDIS was complete.

Engineers then created a detailed set of requirements for subsequent production models, allowing the project to move forward quickly.

The work was done in partnership with Pacific Northwest National Laboratory (PNNL), and with Cincinnati firm DRS Technologies.

Not like driving a tractor trailer

To date, eight MRDIS units have been deployed worldwide. The first set of four went to Panama in November 2012. The four in Oman arrived last summer and, after some delays, completed the final acceptance testing in late March.

Greg says driving MRDIS "feels strange because it's so big, and because the operator sits sideways, facing the trucks going through the center. The MRDIS is big enough for a truck carrying shipping containers to pass through, so it's not like driving just a tractor trailer truck."



NEARLY 90 PERCENT of goods travel by shipping container, making them an enticing target.

Nonproliferation and Cooperative Threat Reduction Center 6800 Director Rodney Wilson was able to observe field testing and drive the MRDIS during an SLD visit to Oman in late March.

"It is not as intuitive as you think. Imagine being in the back seat of your car, on passenger side, facing in, and trying to drive the car using joy sticks to turn and go forward and back, all while staring at a computer screen. Oh, and you are also 15 feet off the ground," Rodney says.

James Schol of Global Security Systems & Technology Dept. 6814 says MRDIS can be moved to active quays, and then containers can pass through the MRDIS on the way to another vessel in the port.

Greg says each MRDIS can work independently or as part of a team, depending on the port's needs. Each MRDIS can also feed data into a central system, or collect data on its own. The ports in Oman and Panama are using three MRDIS units as primary scanners, with a fourth MRDIS including more detailed detection equipment serving as a secondary scanner.

Use at 'pinch points'

In addition to port facilities, the team says that MRDIS could also be used at airports and will be next year. MRDIS-like platforms could be used at any location with "pinch points" that traffic passes through.

The work was funded by NNSA's International Material Protection & Cooperation Office under the Second Line of Defense Program, which installs radiation detection equipment at land border crossings, airports, seaports, and international checkpoints all over the world.

Team members estimated that cumulatively they spent almost a full year in Oman.

Greg says working in Oman for long period of time wasn't a hardship. "Oman is interesting. It's traditional but also it's pretty and friendly and comfortable."

Nearly 90 percent of imported and exported goods worldwide travel by shipping container. Approximately 500 million 20-foot-equivalent units (a maritime shipping unit of measure) transit the globe annually through the maritime system.

Two more MRDIS' are slated to be deployed at international airport sometime next year.



DRIVER'S ED — Driving MRDIS is no piece of cake; the driver is sideways, 15 feet up, and each front wheel operates independently.

'Hero culture' of 'get it done at all costs' compromises safety

By Cathy Ann Connelly

Ease up on the hero culture of "deliver at all costs." Acknowledge and better manage stress and other factors that contribute to human error. Don't ignore or reward "getting lucky" if a behavior is intentionally reckless. Everyone should walk the talk — from line through upper management. Help your colleagues implement Sandia's consequence-based, systems approach to safety known as Engineered Safety. Repeat.

These are a few of the messages that are part of Sandia's safety journey as the Labs strives to mature its safety culture, says Sid Gutierrez, Director and Chief of Safety (4100), and co-lead of the Engineered Safety Implementation Team with Charles Barbour, Director, Research & Development Science & Engineering (1000).

"A big step is shifting safety thinking and behavior from predominantly a 'checklist' approach to the critical thinking required for Engineered Safety," Sid says.

And a recent NNSA and Sandia joint comprehensive review of factors affecting our safety culture also calls for changes in our collective behavior.

Completed in February by Sandia and the DOE/NNSA Sandia Field Office (SFO), the *Final Review Report: Integrated Safety Management Implementation Utilizing Safety Culture Factors at Sandia National Laboratories and NNSA Sandia Field Office* points to solid progress along the safety journey in some respects, but also identifies ingrained cultural issues that must be addressed, Sid says.

"It is unique in its partnered approach and its focus on trying to identify a current benchmark of the specific challenges still facing Sandia and the Sandia Field Office (SFO) regarding improvement of our safety culture," says Geoffrey L. Beausoleil, SFO manager.

Last month the Sandia division VPs held Engineered Safety roll-out meetings with their management teams. They were supported by the Engineered Safety Implementation Team, which developed resources including a mentor program, videos of successful pilot programs, and a repository for the three management decisions and the safety case — integral parts of Engineered Safety. The Executive Safety Council approved June 1 as the date when all new activity-level work must be conducted under the new procedures and policies, which may be found in Integrated Laboratory Management System (ILMS) under Environmental Safety & Health for ESH100.1WPC.1 Plan and Control Work (<http://tiny.sandia.gov/nvq4q>).

Sid explains that for many organizations at Sandia, the Engineered Safety model simply emphasizes and expands what they are already doing for activity-level work. However, for others, the changes will be more significant. "And change is always hard. But part of our cultural journey is to constantly learn and always get better," says Sid.

Sandia Field Office/Sandia Joint Safety Report

Following are highlights from the joint report, including an overview of the safety culture challenges self-identified by Sandia and the SFO. The 49-page report is online on Sandia's internal web at <http://tiny.sandia.gov/f2yvr>.

The Report's two objectives are: "To begin creating cultural awareness and developing cultural literacy within SFO and Sandia as to how organizational culture influ-

ALWAYS SAFE

ences the safety of operations," and "to provide initial insights into employee and management perceptions about key organizational behaviors that may influence how Sandia conducts complicated mission activities while performing work safely."

Six positive safety culture themes:

There has been a "definite positive shift in line management ownership of safety over the past several years," including:

- Evidence that management at all levels is actively communicating the importance of safety.
- Line management owns and takes responsibility for safety.
- Workers enjoy autonomy and work/life balance resulting in employee satisfaction.
- Employees feel empowered to stop work [based on safety concerns] and [in the review] discussed several examples of when they had successfully done so.
- Evidence that peers are respected and appreciated; accountability for each other's safety and ability to have "crucial conversations."
- Strong pride in work; that it is important, valued. Strong passion for mission and desire to "do the right thing."

Safety culture opportunities for improvement:

For Sandia: It appears management only gets involved when something goes wrong and tends to overreact to events or issues. This inhibits reporting of low-level concerns and limits incentives to build a true learning culture.

Due to a disconnect between management and staff perceptions of what happens (intent vs. perception), staff sees most behaviors "penalized," whether errors or violations. While management views the statement, "Failure to follow the procedure could result in disciplinary action," as a method of instilling safety accountability, staff views it as, "disciplinary action will occur if employees make a mistake."

SFO and Sandia: Operational processes and associated paperwork are cumbersome, overly complex, and inhibit staff success. Processes seem oriented to compliance without regard for staff expertise. Responses to events add paperwork or training without considering impacts on safety or productivity.

Sandia: Schedules seem unrealistic and driven by customer expectations, paired with a lab culture steeped in a "can do" attitude that expects to work long hours under high pressure (Sandia Hero Culture). While laudable, this cultural orientation sets the stage for vulnerable situations where safety or quality could be compromised.

Sandia: Although some organizations report a good

partnership with ES&H, others say there is not always effective and consistent integration of ES&H into operations. One reason given includes the line not contacting ES&H at all or not early enough in the process to be effective. Another is that ES&H subject matter experts (SMEs), when they are called, are either perceived to be compliance cops or behave in that manner, which means they do not or cannot participate as work planning team partners to help solve safety problems. Where ES&H coordinators were integrated as part of line organizations, these issues appeared to be overcome and the ES&H coordinators were "perceived as working very well in meeting line organization [safety] needs."

Sandia: A perceived caste system makes some employees feel disenfranchised. Examples include Sandian vs. contractor, staff vs. technologist, and mission vs. support. Recent changes in the Laboratories' compensation system (Total Comp) may have magnified these distinctions.

Sandia: As data from the study is reviewed, more opportunities to improve may emerge. Sandia is not a homogeneous organization; rather it is a "collection of diverse, distinct subcultures interconnected in some cases only through linkages of labels and compensation systems." The report continues, "Understanding the diversity of the subcultures is important, as is ensuring that the subcultures can collaboratively work to accomplish missions in a safe, sustainable manner."

Other report elements include: identification that Sandia teams have differing perceptions of risk, use different methods to identify and communicate risk, and lack clarity in who is authorized to accept risk, which may result in indecision, schedule delays, conflict or risk aversion. And for the SFO, there is confusion over expectations for oversight versus collaboration; relative immaturity of the governance concept; a sense of being in a reactive mode (both SFO and Sandia management); and competing or shifting stakeholder expectations.

Both Sid and Geoff indicate that a majority of these issues are not new revelations for Sandia or the SFO, but they have never before been so clearly and concisely identified — and at a time when these factors seem the final obstacles between us and our realization of a whole new level of safety culture.

"These are factors that we are now actively addressing," says Geoff. "They're difficult — long term — but we've started the journey. We've identified the obstacles and we're dealing with them."

"Making sure safety is a natural, daily priority for the way we do our work at Sandia — line through management. That's the priority," says Sid. "We need to address these issues and walk the talk to move to the next level along our safety journey."

As the report concludes, "Finally, the review team strongly recommends that both SFO and Sandia use the results of this review to catalyze a major step forward in addressing safety culture-related weaknesses within both organizations. By leveraging such an approach, coupled with what the data suggests is a dedicated workforce and management team, both SFO and Sandia have an opportunity to achieve a new level of safety culture that could be both an inspiration and a model for the rest of the DOE complex."

Major climate forcer is CO₂, lively invited speaker asserts

By Neal Singer

Another star from the climate-change firmament dropped down to Sandia's Steve Schiff Auditorium on May 1 to give his take on the scientific issue of whether the planet is significantly warming and if so, what is responsible. The speaker — Penn State geosciences professor Richard Alley — was the most animated presenter to date in Sandia's Climate Change and National Security Speakers Series.

"Your brother-in-law says, 'C'mon, climate always changes,'" Alley opened colloquially. "But we're going to walk through 4.6 billion years and at the end of that walkthrough, we're going to see that humans are changing things in ways that matter."

Perhaps Alley's appearance more resembled a three-dimensional sphere entering a two-dimensional world. The National Academy of Sciences member and American Geophysical Union Fellow used a wider geohistorical viewpoint than usually brought to bear to argue that carbon dioxide was indeed, he said, the active factor forcing climate change. Its decline in the atmosphere over millennia caused time periods known as "snowball earth" — continents of ice and snow — because Earth's atmosphere could not retain enough heat. When ascendant, too much airborne CO₂ so overly warmed the earth that the fossil record for eons shows large animals living only at Earth's poles. Alley



RICHARD ALLEY

offered geological proof of both assertions, using the ratio of carbon 12 (lighter, found in plants) and carbon 13 (in rocks) in a variety of geological ages to determine whether life was present or not at periods of high or low CO₂. He also mentioned CO₂ evidence quarried from ice cores in Greenland believed to go back 800,000 years.

Going back billions of years to Earth's very early eons, he said, "The sun was known to be dimmer at first, so the earth should have been frozen solid. Geology is screaming at us that there was a greenhouse effect that long ago."

The process probably happened like this, he said: Volcanoes ejected CO₂ and rocks. Ordinarily, the two do chemistry in what's called rock weathering, a process that pulls CO₂ out of the air to create calcium carbonate. "When it's really hot, chemistry happens faster, for the same reason a Bunsen burner used in a chemistry lab hastens a reaction." Lessening the CO₂ blanket allows the planet to cool.

But if it's cold, as in early Earth, the chemistry would slow. The volcanoes kept putting CO₂ into the air — "one one-hundredth of what we put into the air today, but over a half million years." The CO₂ stays airborne, slowly intensifies, and Earth warms. "So we have a thermostat."

The thing to keep in mind, Alley said, was that "The total energy reaching Earth almost exactly equals the energy leaving Earth, but mostly short waves arrive and

long waves leave." The short waves pass through clouds and CO₂ to strike the Earth; the long waves coming out can be detained. As Alley put it, "stuff from the sun goes right through the atmosphere, longer waves interact when leaving. It's really that simple."

Alley dismissed water vapor's effect in warming as secondary: In the air, it forms clouds, which rain and then the sky is clear again. Even though the water vapor is doing work in blocking heat emissions, it's CO₂ that's the big player because it controls the temperature that sets the amount of moisture the air can carry. "CO₂ creates an atmospheric divot, that's really all you need. What we see over billions of years is that story playing out over and over again."

Is it possible that the thermostat could depress too far, cooling the Earth before CO₂ could warm it? "The answer is yes, there's evidence of glaciers at sea level" further south than the arctic.

At the other extreme, "If we keep burning fossil fuels for another couple hundred years, we could make it so hot that no human will live in the tropics," he said.

Other climate players like hydrogen sulfide, changes in the sun's output, and Earth's wobble all were examined briefly and disposed of: their effects had little to do with relatively rapid changes in Earth's climate occurring in our lifetimes, Alley said.

Alley mentioned that much work on understanding climate and measuring its change were initiated or sponsored by the US military.

The Climate Change and National Security Speakers Series is sponsored by Sandia's Energy Climate and Infrastructure Security SMU and led by Rob Leland, director of Computing Research (1400).

Mileposts

New Mexico photos
by Michelle Fleming



Grant Bloom
35 412



Gwen Drake
35 810



Michael Garcia
35 5964



Patrick Knight
35 6634



Gary Randall
35 2133



Rod Stanopiewicz
35 5419



John Williams
35 5740



Larry Bacon
30 5443



Bill Davidson
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Steven Greene
30 2667



Rex Kay
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15 96



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15 6533

CRADA opens new doors for Sandia and Boeing

By Nancy Salem

A new umbrella Cooperative Research & Development Agreement (CRADA) expands Sandia's partnership with the Boeing Company into a wide variety of technical areas.

Sandia has had an umbrella CRADA with Boeing Commercial Airplanes since 2002 that focuses on Boeing's private-sector work. The new umbrella CRADA is with Boeing Research & Technology, encompassing the company's government-funded work.

"This is a major breakthrough," says Vic Weiss (10012), CRADA specialist and team lead, who helped negotiate the five-year agreement. "For a number of years, Sandia and Boeing have been searching for a way to enable both parties to collaboratively work together on Boeing's government-funded R&D projects. This new umbrella CRADA with Boeing Research & Technology is the result of that long search. We at Sandia are very excited about the new opportunities that this new and expanded partnership helps bring about with our longtime strategic CRADA partner Boeing."

Boeing is the world's leading aerospace company and the largest manufacturer of commercial jetliners and military aircraft. The company also designs and manufactures rotorcraft, electronic and defense systems, missiles, satellites, launch vehicles, and advanced information and com-

munication systems.

"Boeing has been working with Sandia National Laboratories for many years in various areas of advanced technology development using internal development funding," says John Kuhn, a Boeing project lead. "With the creation of this new CRADA, Boeing Research & Technology and Sandia can now cooperate on externally funded projects, such as our current task for the Defense Threat Reduction Agency (DTRA)."



Umbrella CRADAs have a broad scope covering multiple projects in a variety of categories. The new agreement authorizes projects in materials and process science; modeling and simulation; sensors, tags, and associated electronics; microsystems science, technology and components, logistics and supply chain management tools; intelligent systems and robotics; manufacturing technologies; test techniques and facilities; pulsed power; and safety.

"Sandia and Boeing each have technologies, processes,

and unique facilities that can benefit each other," Vic says. "Sandia technologies cross a wide technical spectrum and are applicable to Boeing in its space, missile, and aircraft research."

The first project, funded in part by DTRA, is studying aerosol-based decontamination of airplanes. The goal is to test, evaluate, and develop a prototype decontamination system.

"Under this task we are developing new innovative decontamination delivery and application approaches for decontamination of chemical and biological warfare agents," Kuhn says. "By using the skills and experience available in both organizations we are able to provide the customer better value for their research investments. I have worked with many people at Sandia and have always found them to be bright and motivated people with some amazing technology."

Vic credits both DOE and DTRA with promoting the umbrella CRADA and the first Project Task Statement (PTS). "Without DOE's and DTRA's help this umbrella CRADA with Boeing Research & Technology, and the first PTS may never have happened," he says.

Veronica Lopez (8532), who provided project support, says the umbrella CRADA takes the partnership into exciting new areas. "This is a great collaboration between Sandia and Boeing," she says.

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

MISCELLANEOUS

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YARD SALE & ADOPTION EVENT, Long Leash on Life, Montgomery/Eubank, 5/19, 10 a.m.-3 p.m. Garcia, 977-5889.

COMPUTER/HOBBY ARMOIRE, solid oak, 2 doors, many shelves & drawers, excellent condition, \$250 OBO. Hussong, 332-3523.

SUBWOOFER AUDIO SYSTEM, Polk Audio, excellent condition, \$30. Holmes, 873-5255.

LCD-TV, Samsung, 60-in., 240-MHz, Klipsch surround sound speakers, receiver, purchased 1 yr. ago, \$3,995 OBO. Ulibarri, 417-1154.

WROUGHT-IRON RAILING, decorative & painted, ~20-ft., you haul, free. Drotning, 821-9598.

SMOKER GRILL, good condition, \$30. Willis, 505-304-5034.

BREAST PUMP, dual, Medela Pump In Style Advanced. w/shoulder bag & travel kit, \$75. Eller, 417-4390.

UPRIGHT GRAND PIANO, 1903 Adam Schaaf, needs restoring to play, you move, \$200. Frazer, 881-9278.

DRUM SET, 1 yr. old, Battle series by Gammon Percussion, Sabian high hats, \$250. Reece, 897-3001.

REEL-TO-REEL prerecorded stereo tapes, 40+, mostly 60's pop, movie soundtracks, some classical & folk, free. Homicz, 505-294-1676.

PRO-FORM AB GLIDER SPORT, \$50. Cotinola, 385-7770.

UPRIGHT PIANO, Baldwin Hamilton, oak, w/bench, beautiful tone, \$800 OBO. Vigil, 828-0667.

YOUTH SWIM TEAM, starting at KAFB Aquatic Center, 5/16-7/20, all instructional levels, dolphins-swimteam.net. Gaylord, 610-1369, ask for Ed.

LED-LCD TV, Sansui, 24-in., 7 mos. old, \$155; BMX bike, Expert Kuwahara, great condition, \$110. Brewster, 238-4704, ask for Julie.

EDGER, Craftsman, 3.5-hp, perfect, paid \$250, asking \$30; Toro mower, 5-hp, not starting, free. Kerschen, 821-2848.

HAND TRUCK, w/2 sturdy wheels, weight capacity up to 300-lbs., \$10. Sirwinski, 881-2032.

WOOD STOVE, Napoleon, pedestal, black, cast iron door w/glass, brass accents, medium size, \$900 OBO. Rivers, 720-4701.

PILATES MACHINE, Balanced Body Personal Reformer, not to be confused w/light duty Aero Pilates performer, <http://albuquerque.craigslist.org/spo/3744461347.html>, \$375. Green, 505-281-4533.

LADDER, 18-ft., aluminum, extension, like new, \$50. Marchi, 265-6211.

DRESSER, student-size, oak, 5 drawers, 44"W x 18"D x 28"H, w/attached mirror, 42"H x 27"W, excellent condition, \$40. Philbin, 828-2414.

CHILDREN'S SWING SET, Flexible Flyer brand, bought in '07, lightly used, \$75 OBO. Chary, 573-9019.

MOVING BOXES, 30+, small, med. & large, good condition, \$10; wood shelves w/tracks & brackets, \$50. Garza, 505-400-8525.

DVD PLAYER, Sony DVPSR500H HD-MI, w/remotes, barely used, \$25; OEM carpet floor mats, for '08 Toyota Tacoma, gray, \$30. Hennessey, 915-241-8634.

FLAT SCREEN CRT TV, Sony, 32-in., \$40; Toshiba CRT TV, 32-in.; great for game rooms. Wimpy, 822-0223.

CROSS BARS & ROOF RACK, Thule, fits Honda Odyssey, \$50. Olewine, 505-797-0189.

BUMPER POOL TABLE, rectangular, new felt, \$130. Sanchez, 897-4514.

ESTATE SALE, May 23-25, 9 a.m.-2 p.m., 4612 Haines NE. Mondragon, 268-6938 or 977-0414.

LOVESEAT RECLINER, La-Z-Boy, tan, good condition, moving & can't take it, free. Caledon, 414-0322.

HOME GYM, Hoist, exercise machine, full body workout, immaculate condition, very safe, must see. de la Fe, 974-8670.

DINING ROOM SET, whitewash, oak, Southwestern design, w/leaf, & 4 mauve leather chairs, \$100; 3 Southwestern design bar stools, \$45. Garcia, 280-5815.

NEIGHBORHOOD YARD SALE, Four Hills, Sat. June 1, 8 a.m., treasures galore, maps at entrance. Owen, 293-0913.

COMPUTER DESK & LATERAL FILE, w/hutch, distressed French Country-style, very good condition. Leach, 821-9124.

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.

TRANSPORTATION

'07 PORSCHE CAYMAN S, 6-spd., silver, 44.8K miles, certified at 38K miles, \$30,000. Murata, 228-6901.

'96 FORD BRONCO, Eddie Bauer, 4x4, AT, white, w/lock out hubs, 132K miles, very nice, \$6,500. Campbell, 505-294-6000.

'09 NISSAN 370Z NISMO, 350-hp, V6, red, 10.5K miles, excellent condition, \$30,995 OBO. Osuna, 505-363-4124.

'06 MAZDA MIATA, Grand Touring, gray, 38K miles, outstanding condition, \$15,000. Walker, 717-2945.

'96 911 TURBO, dark blue, well maintained, bigger turbos/intake, chipped, racing suspension, exhaust, 62.5K miles, \$58,000. Shelton, 998-9014.

'08 HONDA CRV, EXL, AWD, 5-spd., AT, w/navigation, 33K miles, \$20,000 OBO. Rimbart, 505-797-4533.

'99 FORD RANGER, 4x4, 6-cyl., 5-spd., BF Goodrich tires, titanium alloy wheels, 92K miles, runs great, \$7,500 OBO. Flores, 505-922-5298.

'04 LEXUS GX470, 3rd row, tow pkg. maintenance records, 100K extended warranty, 80K miles, \$2,000-KBB, \$19,500. King, 505-250-4426.

'77 FORD F100, 302 V8, 3-spd., new front end, short bed, 56K miles, straight, clean, solid, \$5,000. Gluth, 505-291-8622.

'01 ACURA MDX SUV, 4WD, w/navigation pkg., green/gray, 110K miles, good condition, \$5,500. Howter, 850-6691.

'97 BUICK LASABRE, white, new tires, fuel pump, transmission, 80K miles, excellent condition, runs great. Bailey, 505-382-3292.

'06 F150 FLARESIDE FX4, AT, supercab, gray, shell, leather, running boards, 81K miles, \$18,225 OBO. Romero, 505-307-9389.

RECREATION

'72 SLEEK CRAFT BOAT, 23-ft., cubby w/2 loveseats, bar, seats 6, 454 in-board, currently winterized, \$3,200. Fromm-Lewis, 620-0926.

'07 KEYSTONE TRAVEL TRAILER, 26-ft., loaded, excellent condition, \$14,750. Avila, 903-0551.

'06 DRZ400S, \$3,100. Astars GP-R jacket, \$275; more info/photos at <http://smu.gs/10FIAX5>. Yazzie, 449-8086.

REAL ESTATE

25 ACRES, Tijeras, \$200,000; 2.34 acres, commercial, Edgewood, \$200,000; financing available, owner/broker. Dotson, 505-850-2939.

10 ACRES, east of Sedillo, near old Rt. 66, utilities available, excellent horse property, great views, \$10,000/acre. Ashby, 281-1573.

MANUFACTURED HOME, East Mountains, 2,000-sq. ft., easy 20-min. commute, call to see. Petty, 307-9393, ask for Chad.

4-BDR. HOME, 2,700-sq. ft., NE, well maintained, beautiful yard, good schools, owner will finance, \$225,000. Mozley, 884-3453.

3-BDR. HOME, 2 baths, on 5 acres, 2,350-sq. ft., East Mountains, passive solar, remodeled master bath, large open space design, \$289,000. Ochs, 366-4780.

WANTED

SOMEONE TO REFINISH FURNITURE, redwood lawn furniture, classic 70's chairs, tables & chaises need sanding, staining & sealing. Wilson, 235-5069.

CERAMIC TILE, Saltillo Rojo, 13" x 13". Kral, 298-6699.

HANDYMAN & YARD CARE, for rented home in the Foothills, while owners are away. Sullivan, 505-293-3344.

EXERCISE TANK, that was advertised, if still available. Hadady, 944-6660.

WHEELCHAIR, good condition, non-motorized. Greenholt, 294-5286.

WORK WANTED

SUMMER NANNY, in Albuquerque area, responsible college student, available May-Aug. Williams, 414-3485, ask for Katherine.

Recycle the Lab News

The Sandia Lab News is printed on 75 percent recycled content paper. Please recycle them in the yellow mixed paper bins.



Japanese councilor journeys to end furor over Sandia Z tests

By Neal Singer

Yasuyuki Kaneko left his wife and two small children at the end of April to fly from the northern Japanese city of Sapporo, population 2 million, to Albuquerque. He stayed overnight at a small hotel a few blocks from the airport. The next morning, Kaneko — a Sapporo city councilor — took the final step of his mission when he was escorted into the building housing Sandia's Z machine, viewed by the overwhelming majority of his elected colleagues as the heart of darkness.

Z — the most powerful laboratory producer of X-rays on Earth — regularly interrogates plutonium to study the fissile material's properties. The large accelerator has done this eight times in the last three years. The US government's view is that tests of a few grams of plutonium are ecologically responsible, safe, and politically more advisable than exploding much larger amounts of the same material in an atomic weapon.

But each firing is widely reported in Japan, Kaneko says, and the reports motivate councilors in hundreds of Japanese cities to write letters of protest to President Obama. The Hiroshima Peace Memorial Museum resets its "Peace Watch Tower" clock to zero after each Z shot. The reset indicates the amount of time since the last global nuclear weapons test.

However, Kaneko doubts the danger widely perceived by his countrymen.

"I've read your website," he told the *Lab News*, "and I'm convinced the experiments are not dangerous."

But millions of Japanese "think it's a big explosion [when Z fires]," he said. "So I have come here to see why you do your experiment with all my eyes."

He came alone because no one else wanted to come. Of his city's 68 council members, he said, only three opposed sending letters to the American president. The other two dissenters, several decades older than the 42-



CENTER 1600 DIRECTOR Keith Matzen explains some of the intricacies of Sandia's Z machine to visitor Yasuyuki Kaneko.

year-old Kaneko, were reluctant to undertake the lengthy journey.

Pulsed Power Sciences Center 1600 Director Keith Matzen, asked by NNSA to host the hour-long tour, answered Kaneko's question of how much plutonium was involved in a Z test shot by pulling a nickel from his pocket. "The amount of plutonium is less than the size of this coin," he said.

Kaneko, who has no science background (he majored in college in economics and law), had no trouble understanding the coin comparison. He said later, "The amount [fired] is much smaller than I expected. It is not dangerous because I can touch the container of the facility. Also, they do experiments there every day [so it's not a bomb site.]"

Given that his position on Z was already favorable, would his first-hand report be greeted by skepticism at home?

"The truth is most powerful to convince someone," Kaneko said.

JUNE 11, 12 & 13

SANDIA'S LEARNING EXPO

2013

Call For Nominations: Sandia Lifelong Learner Awards

Calling all Sandians to submit entries for the Sandia Lifelong Learner Awards.

As part of Sandia's Learning Expo 2013, CL&PD will be recognizing and showcasing Sandians for their pursuit of and commitment to lifelong learning.

Submission Categories: Sandia Lifelong Learner Award
Sandia Leader in Lifelong Learning Award

Deadline: May 31, 2013

Starting June 11, a list of awardees will be posted on the Learning Expo website. Sandia Lifelong Learner Award Certificates will be presented at an awards ceremony on June 26, 2:30pm at the T-Bird cafeteria.

for more info, go to learningexpo.sandia.gov

Corporate Learning & Professional Development
Chart your course University Programs

Mileposts on the path to sustainability

Environmental Management System honors four with awards of excellence

By Katrina Wagner

Sandia President and Labs Director Paul Hommert welcomed members of the workforce who excel at conserving natural resources, recycling, and minimizing waste at Sandia during the Environmental Management System Excellence Awards ceremony on April 25. Sandia honored four projects across the Labs with awards of excellence for their efforts in managing risks, reducing Sandia's environmental footprint, and being good stewards of the environment.

"We received nine excellent nominations this year, most from people who don't have 'environmental' in their job title, demonstrating that Sandians care about how their work impacts the planet," says Stephanie Salinas (4143), EMS coordinator. "The nominations we received this year range from administrative assistants who are passionate about recycling and inspire their departments to participate to teams of people committed to finding ways to reduce emissions of sulfur hexafluoride at their operations."

The nominated projects, she adds, save Sandia money and resources. In total, the nine nominations resulted in 2,000 pounds of solid waste being recycled and about \$25,000 costs savings annually.

The 2013 Excellence Award recipients are:

• Energy-efficient lighting systems in the Bldgs. 810 and 825 auditoriums

Creative Services Dept. 3653 used Integrated Enabling Services funding and recovery monies from its service center to update the lighting in the Bldg. 810 and Bldg. 825 auditoriums. Both auditoriums are now equipped with modern energy-efficient lighting systems. The new lighting in the Bldg. 810 auditorium equates to 79.2 percent energy savings and, in the Bldg. 825 auditorium, a 35.2 percent energy savings. The return on investment is significant and provides cost savings to Sandia.

• Bldg. 753 — Taking occupancy sensing to a new level

Occupancy sensor lighting control projects have



been implemented in buildings around Sandia to save energy. These projects have significantly reduced building energy consumption because lights automatically switch off after occupants leave their offices. Lights remain off until occupants return to their offices and turn the lights on. The Bldg. 753 occupancy sensor project was a first of its kind at Sandia and takes occupancy sensor controls to a new level by shutting off lights as well as closing air-flow dampers in unoccupied offices. Results have shown the building's overall electrical consumption has been reduced up to 36 percent during summer months.

• Center 2700 pilots glass

bottle recycling

Waste glass that was previously being disposed via

the hazardous waste management facility in a mixed industrial solid waste stream is now being segregated for recycling.

Both Center 2700 and the Labs are saving money on supplies and disposal, while creating a new corporately available recycle stream to meet federal waste diversion requirements.

• Sulfur hexafluoride reductions at Saturn and HERMES III

The Saturn/HERMES III team has committed to finding ways to reduce emissions of sulfur hexafluoride (SF₆) at its operations.

SF₆ has the highest global warming potential of all identified greenhouse gases, and as a result, SF₆ management and reductions are called out specifically in DOE's Strategic Sustainability Performance Plan and Sandia's Site Sustainability Plan.

The Saturn/HERMES III team has taken a comprehensive approach by identifying and researching the most effective and appropriate solutions including operational procedures, equipment updates/changes, and gas substitutions.



POLLUTION PREVENTION team member Matthew Kuhl (4144) collects bottles for Sandia's new glass recycling initiative. The large containers here are located in the south parking lot of Bldg. 878 and the east alley of Bldg. 870. (Photo by Randy Montoya)

High-achieving Sandia physicist leaves technical yet personal memoir

By Neal Singer

The swan song of retiring Sandia physicist Tom Sanford is contained in SAND document 2013-2481, "History of HERMES III Diode to Z-Pinch Breakthrough and Beyond."

The achievement-oriented physicist was mentored by two Nobel laureates and went on to share the 2005 Hannes Alfvén Prize of the European Physical Society "for the remarkable achievements of the multi-filament Z-pinch development of recent years."

In his memoir, he discusses the process by which he helped fashion significant improvements at the Z and HERMES III accelerators. He credits his successes to relentless attempts to coordinate theory and experiment in attacking the problems of science.

At HERMES, for example, his effort to use a diode to create the required radiation field gave him migraine headaches when the generated beam — theoretically perfect — kept pinching.

"Subsequently," he writes, "I found out that the crate containing the large heavy graphite target being used had been left out in the rain before being installed. The crate had leaked and the graphite likely contained moisture. This could easily explain why the beam pinched. The incident beam would have heated any moisture, creating ions."

A Sherlock Holmes-like solution, but unfortunately heating the graphite to drive out moisture failed to solve the problem. So the HERMES team (all credited by Tom) tried other changes, like replacing the surface of the target with a new foil, to no effect. Finally, a technician found electrical burn marks on an obscure tantalum shield that had not been secured. "The shield was removed and the beam immediately snapped into the calculated position and my migraine disappeared," Tom writes.

Changing the course of fusion research at Sandia

At Z, the breakthrough generally credited to him (and implemented by many Sandians, all credited) is that a z-pinch could be stabilized through use of an orderly forest of tiny wires through which huge currents are passed. In the space of a year, the innovation — which created a huge magnetic field that smashed ionized metal particles together, releasing X-rays — tripled the power output of first the Saturn accelerator, where the innovation was first employed, and then Z, which was already the world's largest producer of laboratory X-rays.

The huge increase changed the course of fusion research at Sandia from the use of ion beams to that of z-pinches, making Z a candidate to achieve peacetime fusion power — an outcome still considered possible by researchers working on the machine now. The increased power output also made Z a more effective materials tester.

Not reluctant to reveal that even successful people sometimes fail, Tom writes that to his chagrin, he had to buy pulsed-power director Keith Matzen a double-decker ice cream cone when Keith won a bet on the output that would result from increasing the mass of Z's wire target. Tom's history of moving without restrictions from project to project at the Laboratories, he says, "illustrates how Sandia provides opportunities."



HE'S Z MAN — Sandia physicist Tom Sanford at Sandia's Z machine.

(Photo by Bill Doty)