

New Div. 8000 VP Rick Stulen reflects on opportunities at California site

Sandia Lab News California team members Mike Janes and Patti Koning (both 8529) sat down recently with new California Laboratory Div. 8000 VP Rick Stulen to discuss the state of the California site, the challenges it faces, and the opportunities it has to evolve its competencies to meet a broad range of emerging national-security imperatives. Rick spent nearly 30 years at the California site before leaving for Albuquerque in 2005 to serve as chief technology officer and VP of Sandia's Science and Technology & Research Foundations Div. 1000.

(Editors' note: His 33-year journey from California to New Mexico and back to California led Rick himself to wonder out loud: "Does this make me the 'new old guy,' or the 'old new guy?")

Lab News: How does it feel to be back in California?

Rick Stulen: It feels terrific — pure and simple.

LN: How did your time in New Mexico prepare you to return to California as vice president?

RS: New Mexico was a tremendous learning experience. I had a very large organization with extremely

high-hazard facilities; operational complexities; and terrific science, technology, and engineering activities. One fascinating aspect was the engagement with the state and the New Mexico delegation to Washington.

I had been on the job for less than a month when Tom Bowles, the governor's science advisor, approached me to discuss possible areas of focus for the state's S&T plan. We identified three initiatives: high-performance computing, nanotechnology, and biology. We developed a strong friendship and worked together to get the other institutions in the state appropriately engaged. It was a delightful opportunity to make a difference in the state and develop a network with S&T leaders across New Mexico.

I'd like to do something similar in California. It is going to look different here, but there are ways for us to play significantly in the state. We should be maximizing our connections with the other national labo-

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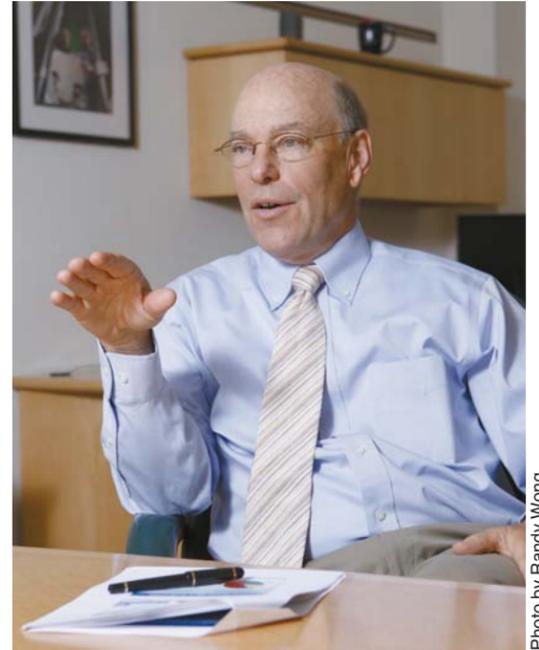


Photo by Randy Wong

Sandia California News



IT'S BECOME an August tradition. For the third year in a row, this special edition of the *Lab News* is dedicated largely to the work being done today at Sandia/California. The issue's guest editors are Mike Janes and Patti Koning (above).
(Photo by Randy Wong)

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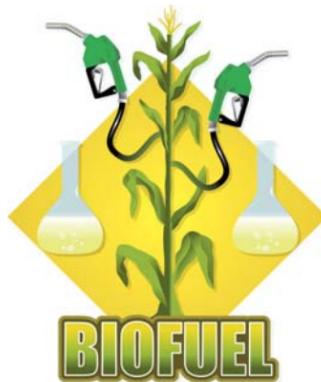


Managed by Lockheed Martin for the National Nuclear Security Administration

JBEI fires 'opening salvo' with paper on deconstruction of switchgrass

Technology breaks down plant wall to access sugars needed for ethanol

By Mike Janes



If a tree falls in the woods and no one is there to hear it, does it make a sound?

One of the more profound (or silly) questions of our time, yes, but Blake Simmons (8625) might rephrase the question as only a biochemist can: If a tree falls in the woods and no technology is in place to uncover

the hidden sugars from within, will it deconstruct and produce clean-burning ethanol all on its own?

The answer, of course, is no, but the question drives home a larger point. "Trees," says Blake, "don't just fall apart at the whim of man. You have to do something to them to get them in the state that you want them to be."

That ideal "state" — at least for biofuels researchers such as Blake and others working at the DOE's Joint BioEnergy Institute (JBEI) in Emeryville, Calif. — would be one in which lignocellulosic biomass (such as trees, switchgrass, and other plants) could be efficiently and affordably processed in a way that will liberate the sugars

needed to produce fuel.

There is a great need to improve the deconstruction of lignocellulosic biomass, says Glenn Kubiak, director of Sandia's Biological and Materials Sciences Center 8600. "Why do we want to convert that biomass into a liquid form of energy?" asks Glenn. "The biomass itself already possesses a large amount of energy, available through combustion, so why invest a large R&D effort to transform, or deconstruct it, into fermentable saccharides?"

In answering those questions, Glenn points out the

"Trees don't just fall apart at the whim of man. You have to do something to them to get them in the state that you want them to be."

— Blake Simmons (8625)

need to convert the biomass into a form of energy that burns more cleanly, and also to convert it to a portable, easily transported and stored liquid fuel, suitable for transportation applications.

Enter Seema Singh (8625), a Sandia biofuels researcher and lead author on a paper that currently appears in the online edition of *Biotechnology and Bioengineering*. Titled "Visualization of Biomass Solubilization and Cellulose

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'One site, two laboratories' plan will identify business synergies between Sandia/California, Lawrence Livermore labs



By Mike Janes

Sandia/California and Lawrence Livermore National Laboratory (LLNL) will soon begin sharing some operational functions, as part of NNSA's Complex Transformation.

"Complex Transformation" refers to NNSA's vision for a smaller, safer, more secure nuclear weapons complex to achieve consolidation and operations efficiency throughout the complex. Often described as "one site, two labs," the Sandia/LLNL effort identified business synergies in areas of facility use, property, and other business functions.

Following the NNSA request, the two labs created a project team to analyze a variety of opera-

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Livermore Valley Open Campus initiative paves the way toward easier access, open collaboration at Sandia/California and LLNL. Story on **page 4**.



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Longing for island time



RENE BIERBAUM with a group of high school teachers on an outing to the island of Bohol in the Philippines. A Peace Corps stint in the islands changed Rene's life. Story on **page 12**.

That's that

By Ron Stoltz

It's hard to share thoughts in the Sandia/California edition of the *Lab News* without saying something about the State of California, as well as the state of California. Many, including the late night comedy shows, have had their laughs lately, especially about the issuing of IOUs and the inability to get anyone here to agree on anything. To close a \$60 billion gap over two budget years is a daunting effort.

Rather than recount the bad choices we've made and the bad luck we've endured, better to provide a look into the future. Astute observer of the California scene and noted scholar on urban development Joel Kotkin sums up the problem as an excess of narcissism. At the same time, he notes: "The best great hope for California's future does not lie with the narcissists of left or right but with the newcomers, largely from abroad. These groups still appreciate the nation of opportunity and aspire to make the California – and American – Dream their own."

It's this sense of opportunity and the extremely open society that attracted me to the state over 30 years ago. The feeling that "almost anything is possible" continues to energize me, my family, and most of the Sandians I work with day to day.

I experience this energy most strongly when I attend the Foreign Nationals Summer Picnic held each year. Having been an FN myself (although I prefer to call us international collaborators) as a postdoc in France, I gravitate to this group and use the picnic both as a chance to view America through other eyes, as well as to get a sense of what is really happening in the rest of the world. Sandia is a richer institution, both in California and New Mexico, by having these international scientists and engineers working alongside us. I hope they remain in the US and if not that they carry back to their home countries the same sense of optimism and opportunity they experience while here.

* * *

Is there an iconic figure that embodies the spirit of Sandia? The US Postal Service has its mail carrier who endures rain, snow, heat, and often gloom of night to complete his/her appointed rounds. We should have a write-in contest for the Sandian who best represents the expertise, daring, and dedication to mission and sets an example for all of us. My own vote is for those who helped engineer and execute the nuclear tests in the 1950s and early 1960s. I'm particularly drawn to the story of the test engineer who drove out to the tower and helped reset the connections when the device didn't fire. The story and the image are both riveting.

* * *

In addition to a write-in contest, we could also have a Sandia Book Club with suggestions for good literary fiction to read and discuss. My neighborhood club has read about three dozen books over the past few years. My top choices are: *All the Names* by Jose Saramago; *Body and Soul*, by Frank Conroy; and *White Tiger*, by Aravind Adiga. Each features a rugged individual who triumphs in an uncertain and chaotic world. Maybe there's a message here??

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Ron Stoltz has been with Sandia since 1976. His early career was in materials R&D and nuclear weapons component design. At mid-career Ron began to focus on outreach and planning at the Labs. He worked as Sandia/California's Government Relations manager for eight years, helped the Homeland Security and Defense and Energy, Resources, and Nonproliferation SMUs develop programs with federal, state, and local agencies, and maintains a network of lab supporters in the government, think tank, Wall Street, and nonprofit communities.



RON STOLTZ



GREG LONG

Employee death

Greg Long got more out of life than most people twice his age

Greg Long (2554) died July 24. He was 42 years old and had been at Sandia eight years.

Greg worked in Sandia's Explosives Technology Group. "He worked with a team of scientists to develop a novel field in explosive science, referred to as microenergetics," says his manager Leanna Minier (2554). "He was instrumental in developing solid-deposition technologies for the study of energetic material behavior on the microscale. Greg was leading the effort to define the corporate policy on explosive storage to address the issues of explosives becoming aged and sensitive to initiation while in storage. He was the lead member on the Explosives Storage Review Committee.

"Greg helped me understand myself," adds Leanna. "Once he started typing something on his computer that I had stated. When he asked me to restate it, I couldn't remember what I had said. He started laughing and said, 'That is what I like about you. You never think of anything the same way twice, but always in a new way.' Those were words of wisdom to me. He was a kind soul who cared for others."

Alex Tappan (2554) and Greg worked together since Greg started at Sandia. "He was always sharing his jokes," says Alex. "Sometimes the jokes weren't funny, but his laughter was contagious. He loved the academic aspects of his work and took a genuine interest in mentoring students and colleagues. His carefree attitude and kind heart were a pleasure to have in my life."

"Greg had a calming way about him," says Kevin Fleming (2554), "both in his voice and his approach to life, and in interactions with friends and family. I had the privilege of being his officemate. That made it easy and convenient to talk to him. Greg was an avid athlete. Few runners could boast they were in better shape, or faster than Greg. He was proud of being a Big Brothers-type volunteer.

"We had an office ritual. When I'd get a new coffee from Trader Joe's, I would make a pot, and we'd talk about the nuances of the flavor, as if we were some sort of 'coffee sommelier' experts. Greg entertained the notion of going back into academia and becoming a professor."

"Greg had a profound love for chemistry," says Brett Eller (4335). "Seriously, who else has the periodic table of elements posted on their fridge and carries a copy in their wallet? He balanced his work life with an active personal life. He was a great skier and a fast long-distance trail runner. His other passions included playing scrabble with his father, playing with his six nephews, and going to the opera."

Tony King (2666) and Greg came to Sandia at the same time and were officemates for a few years. "Greg wore his accomplishments with great humility," says Tony. "He loved to challenge himself. He was always preparing himself for the next adventure. Greg got more out of life than most people twice his age."

"Greg always had a smile and an interesting story," says Sean Madden. "He could brighten your day even if the surrounding circumstances would not otherwise permit. He had an enviable and contagious love for athletics that could reinvigorate the joys of personal physical accomplishments in anyone."

"Greg would often join us on ski trips to Wolf Creek, Colorado," says Vivian Kammler (1735). "One year when we overfilled the rooms at the cabin, Greg agreed to sleep on a cot provided by the owners. On arrival, however, we realized the dusty mattress would never accommodate his tall frame. He cheerfully took the floor. We cut down his share in lodging, but he eventually came out ahead with the damage he inflicted on the groceries and dinner.

"Greg's house at the foothills had many pictures of his nephews, whom he adored," adds Vivian. "Also proudly displayed was a framed finger painting he had made when he was four years old."

"The last day I talked to him, we were critiquing a new dark roast Mocha Java," says Kevin. "Greg said, 'Hey man, I'm glad they paired you up with me as an office mate.' I figured either he liked getting great fresh-ground coffee, or that my voice wasn't too loud and annoying if we were both on the phone. If his statement went beyond that, I'll take away the notion that along our paths, it's so easy to forget to slow down and enjoy the simple moments that perhaps, reflecting back in time, mean so much. I can only hope that he and his recently deceased mother are reunited and happy."

— Iris Aboytes

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Energy Bowl 2009



SANDIA LABS DIRECTOR Tom Hunter, left, and Kirtland Air Force Base Commander Col. Mike Duvall at the 2009 Energy Bowl awards ceremony. The two agreed to continue the friendly competition to encourage energy conservation. (Photo by Lloyd Wilson)

The 2009 Energy Bowl, the friendly competition between Sandia and Kirtland Air Force Base to see who could reduce electrical energy use (per gross square feet) the most during the months of April, May, and June, is history. And the winner is . . . Well, it was close. In April and May, both Sandia and KAFB actually saw slight increases in electrical energy use over the same periods last year. Sandia's increase was lower, so Sandia won the first two months. In June, both Sandia and KAFB realized year-over-year decreases, with Kirtland showing a greater decrease, so it was the winner for June.



At an August 4 ceremony to announce the overall winner, Labs Director Tom Hunter accepted the energy conservation globe in recognition of Sandia winning two of the three months. Base Commander Col. Mike Duvall good-naturedly accepted the "energy hog" trophy, saying he would put it to good use to motivate his people to do better. Joining Col. Duvall and Tom at the ceremony were NNSA Sandia Site Office Manager Patty Wagner and Deputy Manager Kim Davis, who were enthusiastic supporters of the energy competition.

Col. Duvall said KAFB began to hit its stride later in the competition by engaging individual facility managers in the energy conservation effort. Tom called ideas around energy use a cultural phenomenon, one that can be addressed over time. "That's why the contest is good idea," Tom said, noting that it raises awareness about the issue.

Because two of the three months showed an energy usage increase, Sandia, KAFB, and SSO have decided to extend the competition with the possible future expansion to include other resources.

The Labs' energy conservation team reminds Sandians that to maintain bragging rights in the next phase of the competition, everyone will have to become more aware of their energy footprint, doing things like turning off lights and office equipment at the end of the day.

Technology showcase may be 'defining moment' for mid-school students

Sandia *NewMexicoNews*

By Rachel Kolb

In every engineer's past there is, perhaps, a single defining moment in which science first seemed fascinating and irresistible. For a group of middle school students, that moment may have come at a Junior Leadership Camp on June 16, when Sandia employees presented an interactive exhibit showcasing cutting-edge technologies from the Integrated Technologies and Systems Group.

The camp took place June 14-20 on the New Mexico Military Institute (NMMI) campus in Roswell. "Its intent was to provide junior high school students with the experience of working in teams and individually to learn about the fundamentals of leadership, learning styles, and how to handle themselves in challenging environments," says Molly Glen (5223), who presented the Sandia exhibit to five groups encompassing 105 students and instructors.

Other than the Sandia exhibit, camp activities included leadership exercises, physical fitness training, and problem solving. The camp also conducted more carefree activities like cookouts, swimming, and field trips.

The exhibit, which showcased some technologies from Sandia's C109 Integrated Technologies and Systems Exhibit Room, included unclassified, unlimited release hardware and software developed in support of homeland security, homeland defense, and nonproliferation and assessment. These technologies included the handheld MicroChemLab chemical sensor, the MicroHound™ handheld explosives detector, the Sandia protective arm gauntlet, and a variety of small robots.



MOLLY GLEN discusses Sandia technologies with an attendee at June's Junior Leadership Camp.



THE STUFF THAT DREAMS ARE MADE OF — Molly Glen (5223) tells an audience of middle school students about many ways that science and technology can be applied to solve urgent national problems. The presentation, intended to interest students in math and science careers, came during a Junior Leadership Camp at the New Mexico Military Institute in June.

"To make the exhibit interactive and interesting, we invited the students to handle the numerous hardware items and ask questions about how each of the technologies was developed and how it is used in the real world," Molly says. "We talked about the connection between science and engineering and real-world solutions to problems that we as a nation and as individuals face."

The exhibit, according to Molly, was a popular success, but it wasn't all about fun and games. Molly explains the significance, emphasized by Sandia upper management, of exposing students to science at a young age.

"Both [Center 5200 Director] Dori Ellis and [Executive VP] Joan Woodard think it is important to reach the younger generation coming up through the schools and let them know that science and engineering are fun and exciting careers and also to tell them a bit about the work Sandia does to keep the country safe," she says.



A VISITOR checks out some of the items from Sandia's Integrated Technologies and Systems exhibit room on display at a recent Junior Leadership Camp in Roswell, N.M.

Livermore Valley Open Campus (LVOC) proposal gets green light from NNSA

Initiative will pave the way toward easier access, open collaboration at Sandia/California and LLNL

By Mike Janes

A Livermore Valley Open Campus will maximize the return on our nation's investment in nuclear security. By leveraging the groundbreaking research of our nuclear security labs through private sector collaborations, we will bring breakthroughs to the market faster and find new solutions to the energy problem."

Those words of support came from DOE Secretary Steven Chu in an Aug. 4 news release issued by NNSA. Chu was referring to the Livermore Valley Open Campus (LVOC) concept that is being jointly proposed by Sandia and Lawrence Livermore National Laboratory (LLNL).

In parallel with the news announcement, NNSA Administrator Tom D'Agostino and DOE Under Secretary for Science Steve Koonin signed off on a "mission need concept" document that authorizes Sandia and LLNL to move forward on developing a detailed plan for the LVOC effort. With NNSA authorization in hand, both labs will now create "phase one" of the LVOC, which will include examination of its initial infrastructure, analysis of "brown fielding" (redevelopment of land and/or facilities) needs, and creation of an operating environment to enable open operations.

Led by Sandia's Bob Carling (8300) along with counterparts at LLNL, the Open Campus initiative is conceived as an "enabler" that will provide expanded opportunities for research collaborations between Sandia/California and LLNL and their external partners. As currently envisioned, it will consist of an approximately 50-acre parcel along the eastern edge of the LLNL and Sandia sites along Greenville Road, with LLNL's National Ignition Facility (NIF) and Sandia's Combustion Research Facility (CRF) serving as anchors at each end.

Easier access, greater collaboration

A more open sector, one with fewer security restrictions, says Bob, will benefit a wide range of energy-related companies, including those that focus on high-performance computing, life sciences, optical sciences, and biotechnology, which is especially important as Sandia continues to focus on transportation energy programs.

"If we wanted to arrange a visit to Sandia/California next week for Toyota's top executives from Tokyo, for example, we simply couldn't make it happen due to the badging processes that are in place," Bob says. Though such processes are clearly necessary for both labs' NNSA missions, Bob says, Sandia and LLNL both are moving in directions that will require more flexibility, particularly when foreign nationals and other uncleared visitors are involved.

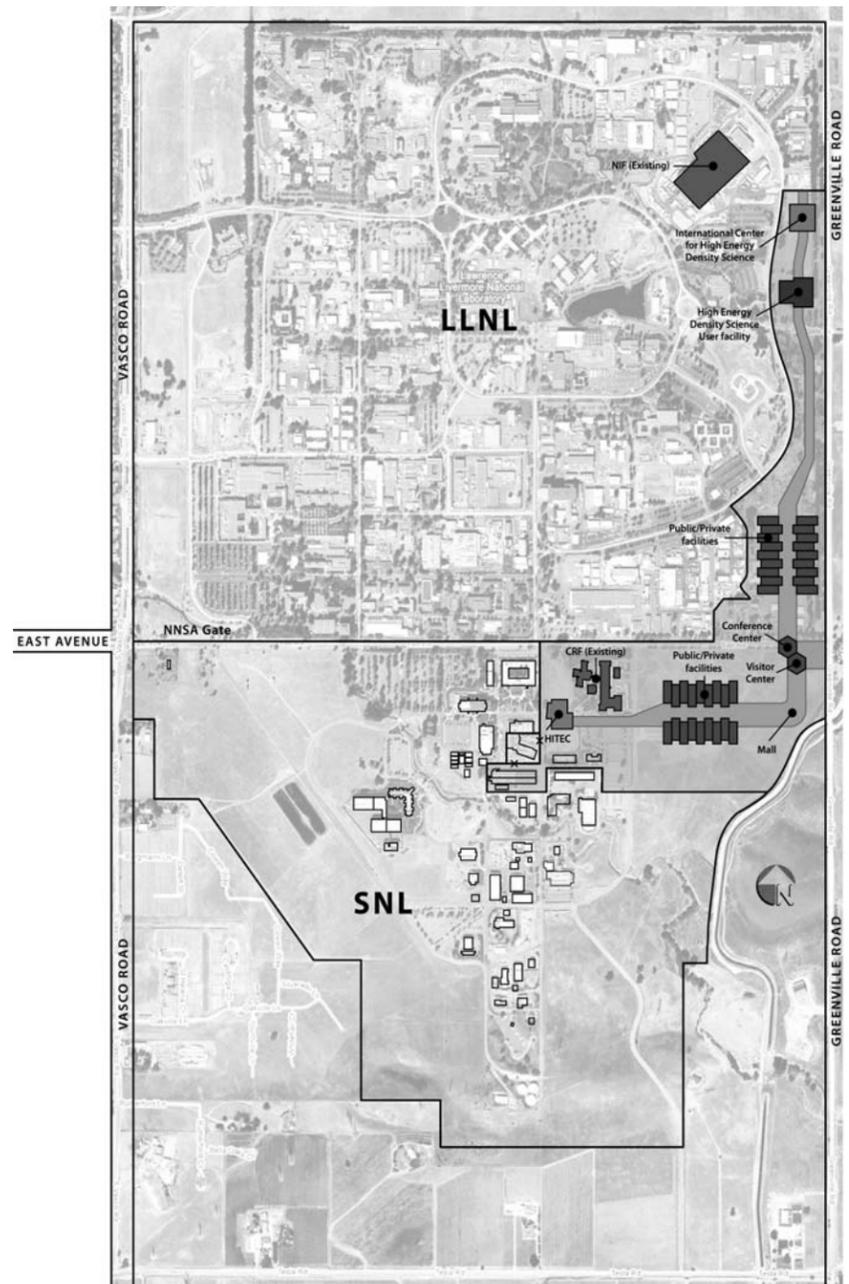
The LVOC proposal is being developed in parallel with Sandia's Hub for Innovation in the Transportation Energy Community (HITEC) program (*Lab News*, March 13, 2009). More effective access to the international science community and greater collaboration with industry, Bob says, are both essential to the advancement of HITEC and will be more easily achieved with a successful open campus.

'Technotourism' and economic impact

A number of other benefits will be derived from a Livermore Valley Open Campus, says Bob, including a potential increase in what he calls "technotourism" and economic development around the Livermore region.

"Nearly 200 scientists from around the world already visit Sandia and LLNL each year, and hundreds more would likely do so if we had an open campus in place," Bob says. "Those researchers might have access to certain facilities for days, weeks, or months at a time, likely stimulating the regional economy when they're here."

The city of Livermore, Bob says, is developing strategies for increasing the technology "footprint" in the area and would like to establish the Livermore



THIS RENDERING SHOWS what the Livermore Valley Open Campus (LVOC) might look like one day. Anchored by LLNL's National Ignition Facility (NIF) and Sandia's Combustion Research Facility (CRF), the LVOC will consist of an approximately 50-acre parcel along the eastern edge of the LLNL and Sandia sites along Greenville Road.

(Rendering by Daniel Strong)

Valley as a high-tech anchor for the region. An open campus, he says, will offer companies a compelling reason to move into the area by providing smoother and more direct access to both labs' facilities, researchers, collaborators, and technologies. Even LLNL and Sandia researchers themselves who are interested in starting spinoff companies of their own might be more inclined to remain in Livermore when an open campus is established.

Other elements of phase one of the LVOC will include evaluating alternatives, obtaining necessary approvals, and executing infrastructure modifications.

One site, two labs

(Continued from page 1)

tional and infrastructure activities for potential joint operations. In keeping with NNSA's goals, each lab will retain its own programmatic missions and maintain clear and distinct corporate identities.

"This plan will increase operational efficiencies between our two labs," says Pat Smith (8500), Sandia/California's site operations director.

Initial opportunities identified

The project team has prioritized potential areas for shared services into three categories ranging from potential "quick wins" to longer-term opportunities. Joint teams from Sandia/California and LLNL then began developing business case analyses (BCAs) for each area.

Sandia/California and LLNL also convened a governance board, whose responsibilities include determin-

ing the target areas that will be implemented. The board consists of senior management from both laboratories.

According to Linda Houston (8530), implementation plans for shared or joint services are being written for the following areas:

- Technical writing and editing
- Graphic design
- Photography
- Video production
- Animation
- High-volume printing
- Custom printing
- Scanning
- Mail services
- Phone switch emergency support
- Bicycle shop operations
- Shipping/receiving/traffic

Leaders for each of these areas will meet with employees at a later date to discuss in detail how these areas will share operations.

"We are not consolidating jobs to save costs," Pat says. "We are sharing operational functions to improve

business efficiencies."

The way the services are shared or consolidated between sites will vary, Linda says. In some situations, both sites will share their capability to accommodate surge capacity. In others, the function would primarily reside at one site, where it has been determined that either Sandia or LLNL alone has the ability to provide the service to both sites.

Under the "one site, two labs" effort, current NNSA prime contracts for Sandia/California and LLNL will remain intact, and each lab will continue to control its own funding for operations — even for those that are provided jointly, Linda says.

There is precedent for sharing some infrastructure services between both labs, Linda says. LLNL currently provides utility services such as power and water, as well as emergency response and East Avenue security access.

The joint operations project is important strategically, Linda says, because it also can pave the way toward increased work for others, including a jointly managed open campus between the two laboratories.

Rick Stulen

(Continued from page 1)

ratories in the state and the incredible university community.

Any national laboratory would kill for a location in California, and we've got one. You couldn't ask for a better place to be. California is a major player in all the new thinking around problems like energy consumption, transportation, immigration, and ports — everything comes together here in a way that can be a tremendous asset and learning opportunity for Sandia's missions.

I'm also interested in developing more management experiences in both locations. My four years in New Mexico were a great learning experience and enabled me to bring different thinking back to California. I will be more intentional in creating temporary assignments so people can get this experience without turning their lives upside down.

I've had a number of profound safety experiences, so I have a lot of passion for the safety culture of the Labs. This site will see energy from me in that area. I plan to spend a couple of hours relating the sled track story — it's very interesting, poignant, and difficult.

Engaging with the state of California

LN: Can you go into more detail about engaging with the state of California?

RS: We'll start with Congress. We've focused on this district and nearby districts, but we need to expand to the whole state. Our state legislators can give us access to the governor's office to get a handle on the problem areas that touch our national-security mission. California is a terrific playground for working on issues associated with national security, particularly homeland security.

LN: How do you see Div. 8000 fitting into Sandia's four main corporate thrust areas of nuclear, energy security, cyber security, and science and technology (S&T)?

RS: We play pretty well in all four. Nuclear weapons will continue to be a core function of this site and a core reason for having this site here. We have a strong partnership with Lawrence Livermore, and we serve as the engineering window into the non-nuclear part of that program. Part of my job is to continue what Paul [Homert] has done in strengthening that relationship and making sure that Sandia remains a trusted partner and developer for the nuclear weapons stockpile at large.

In terms of energy, clearly the Combustion Research Facility (CRF), Livermore Valley Open Campus (LVOC), and the Hub for Innovation in the Transportation Energy Community (HITEC) all position this site to play a key role for Sandia. If you walk in the halls of the Office of Science, it is clear that the CRF is viewed as one of the crown jewels of the DOE laboratories.

As for cyber, Len [Napolitano] has taken the point on that. I'm not as educated in this area as I should be, but California is where we started the Center for Cyber Defenders. Cyber is important for the country, and Tom Hunter has a lot of passion for this area. Our presence in California can help us connect with industry players in the cyber arena.

S&T has several dimensions. One is making sure our S&T enterprise is healthy. We are an S&T laboratory; it



PASSING THE BATON — Rick Stulen (left) and Paul Homert share the stage during a town hall meeting that marked the transition of the California VP job from Paul to Rick. Paul recently became Executive VP in charge of the Labs' weapons program. (Photo by Randy Wong)

is our engine. We apply S&T to mission areas and they feed back into S&T — saying, "Here are areas we need you to get smart on." So one challenge is keeping our science and engineering strong.

I also think the national laboratories have a role in national workforce development in S&T. We need to open up the Labs to foster more student internships as part of graduate and undergraduate education. The CRF, again, is a great example. Students immediately get linked up with problems that impact industry. They have a great educational experience and leave primed to enter the marketplace with an understanding of good science and its application. That's a theme I want to push here: helping Sandia prototype this model of workforce educational development.

Losing our edge?

LN: Do you have ideas for overcoming the intellectual horsepower deficiency you identified as a result of overseeing the Laboratory Directed Research and Development (LDRD) program?

RS: I may be paranoid, but I'm concerned we may be losing our edge in innovating and bringing forth new, exciting science. This is not just my opinion alone — I've heard similar concerns from managers and scientists within the LDRD program. In the Grand Challenge program this year, nine ideas came forward in the final selection process, and only one survived. We should be doing better and will need to look at both the process and also the ways in which we stimulate innovation.

We need to ensure that our managers are setting the bar high and encouraging creativity from our staff. An important ingredient is connection to the outside. New ideas don't come from sitting alone in your office and telling yourself, "I've got to think of a new idea today."

New ideas come by reading and connecting with other people at your own institution, cross-disciplinary, and with outside universities and industry.

To incentivize and encourage more external connections, we've built a university component into the LDRD program. Each Grand Challenge requires a university piece — funding for a professor and a student at a top-ranked school pertinent to the project. Secondly, we are pushing on intellectual property in Grand Challenges. The review process now looks at what intellectual property has been created and how it can be used as a way to connect with industry. It's trite, but discoveries really do happen at the interfaces.

LN: How are you developing your vision for the California site?

RS: I've been away for four years, and the site is a different place. I'm curious how many new staff members we've had since I left — I'm guessing about 20 percent [according to HR, Rick's guess is correct]. To get reacquainted, I'm sitting down one-on-one with the directors to learn about their concerns, worries, and the opportunities they see. I'll follow up with a director off-site meeting to discuss where we are and collectively brainstorm opportunity areas. For example, what do we mean when we say the site is a window to California, and what should we be doing differently?

At the annual off-site with directors and senior managers, we can put some of these ideas on the table to throw rocks at and debate. I don't see a huge departure from where Paul has positioned the site. He broadened our work in energy and ensured a robust nuclear weapons program. The site has gone through some tough times, but Paul really took on those challenges. So I come into this role with a lot of confidence.

Weapons work, LVOC, and hiring

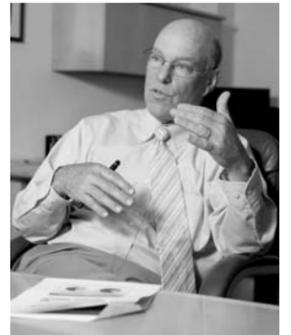
LN: You've alluded to a number of challenges that we will need to take on. Does one or two stand out in your mind?

RS: Continuing the course in nuclear weapons and ensuring the gas transfer mission are significant challenges. The Livermore Valley Open Campus is another, but a positive one. A huge amount of work remains to make it a reality. Hiring has always been a challenge because of the cost of living and competition. If we don't get hiring right, we don't have a future. So hiring is vitally important.

LN: In terms of strategic partnerships, are there examples of specific programs, customers, organizations, or industry that you think will help us in the future in terms of alliances or partnerships?

RS: We need to determine how to position the

"New ideas don't come from sitting alone in your office and telling yourself, 'I've got to think of a new idea today.' New ideas come by reading and connecting with other people at your own institution, cross-disciplinary, and with outside universities and industry."



MR. VICE PRESIDENT — New California Laboratory Div. 8000 VP Rick Stulen sits down in his office for an interview with *Lab News* writers Mike Janes and Patti Koning. During the discussion, Rick shared ideas about his vision for the California site. (Photo by Randy Wong)

LVOC. I'd like to have an energy focus. Clearly, the automotive and transportation sectors are stakes in the ground that differentiate this site, so some of our partnerships have to be in the transportation sector. We've had a phenomenal run with GM, and I expect that to continue. GM has emerged from bankruptcy and looks like a pretty strong company.

I've also begun thinking about university connections. It would be terrific to have a university presence here, like University of California, Davis, with Teller Tech [at LLNL]. I'd like to entice a UC school to be a part of the LVOC, but that's a difficult proposition right now because of the financial strain on our university system. Las Positas is another great opportunity.

And what about cyber? We are in the land of the Googles, the Suns, and the Intels. Building on the California presence — there are wonderful opportunities for collaboration here.

A journey of discovery

LN: Do you have any thoughts about our main partnership with Lawrence Livermore?

RS: LLNL will continue to be a major partner. I will work to further connect Sandia to the NIF [National Ignition Facility] community. Over the past four years, I've been responsible for pulse power, Z machine, and high-energy-density physics. We're already doing work in this area with LLNL, but we can step up for a larger engagement. For the next four to five years, NIF will be on a huge journey of discovery, and we should be part of that. And the feeling is mutual — they are very interested in tapping into our talent as well.

LN: On a personal level, what are you looking forward to now that you are back in California?

RS: I'm an avid road biker. I won't be riding with the "peloton," but I'll be chasing them. I'll also ride my bike into work from time to time.

LN: Conversely, what will you miss about Albuquerque?

RS: Over the past four years, I have fallen in love with New Mexico. The culture, people, the art scene, and diversity are all pretty special. And I'll definitely miss the roasting green chiles. The good news is I will be traveling between the sites quite often.

JBEI

(Continued from page 1)

Regeneration During Ionic Liquid Pretreatment of Switchgrass," the article establishes JBEI's footprint on the use of ionic liquid pretreatment technologies.

Breaking down cell walls

Ionic liquids are those that essentially contain only ions (atoms or molecules where the total number of electrons are unequal to the total number of protons, giving it a net positive or negative electrical charge). The many distinctive qualities of ionic liquids, which allow them to act as acids, bases, or ligands, make them ideal for use in organic chemistry, electrochemistry, catalysis, physical chemistry, and engineering.

The work reflected in the paper, Blake says, demonstrates that advanced imaging can successfully be used to understand the mechanisms of ionic liquid pretreatment. "Most important," adds Seema, "it will enable further discoveries and improvements down the road as to how the first principles of this pretreatment technique work, and how the ionic liquid interacts with biomass."

Current biomass pretreatment technologies, largely derived from the pulp and paper industry, involve dilute acid, ammonia fiber expansion, and hot water. All of the commercial entities involved in lignocellulosic biofuels (the noncorn, nonfood variety) are employing some variant of those technologies, says Blake, in an effort to break down the cell wall of the biomass plant, liberating the sugar-rich (and hence much sought-after) polysaccharides. Enzymes then are used to access the sugars, which are hydrolyzed into glucose and xylose — the feedstocks that go into the biofuel fermentation process.

The ionic liquid pretreatment process that Seema and her colleagues examined focused on its efficiency in processing switchgrass. According to a study by researchers



SANDIA RESEARCHERS Seema Singh and Blake Simmons coauthored a paper that establishes the Joint BioEnergy Institute's (JBEI) footprint on the use of ionic liquid pretreatment technologies. The work demonstrates that advanced imaging can successfully be used to understand the mechanisms of ionic liquid pretreatment. (Photo by Randy Wong)

at the University of Nebraska-Lincoln, switchgrass grown for biofuel production produced 540 percent more energy than needed to grow, harvest, and process it into cellulosic ethanol, making it a very attractive feedstock.

"The pretreatment process we looked at was remarkable in its ability to solubilize the plant cell wall," says Seema. "Instead of increasing the surface of the cell wall or just realigning or readjusting it, the ionic liquid process completely transforms the plant cell wall into polymeric form."

Floating in ionic liquid

Essentially, that means the three main elements of the biomass — the cellulose, hemicellulose, and lignin — are broken apart and floating in the ionic liquid, which makes those elements (once water or another

antisolvent is added) much easier to access. The all-important polysaccharides can then be recovered.

This process, Seema says, demonstrates an exciting new method for converting polysaccharides into sugars in a way that is much more efficient in terms of both yield and time. Other researchers around the world are also examining ionic liquid pretreatment technologies, says Blake, but those efforts are primarily focused on processing microcrystalline cellulose derived from wood pulp. The JBEI research is the first to examine switchgrass and its interactions with ionic liquids to such an extensive degree, as well as the use of advanced imaging to help understand the mechanisms involved.

The *Biotechnology and Bioengineering* paper outlines the use of autofluorescence of the switchgrass cell wall to track the dissolution of ionic liquid pretreatment and the efficiency of that product to directly observe the fractionation between the polysaccharides and the lignin. This knowledge can now be used to inform a full computational modeling effort.

"This is the kind of thing that Sandia does particularly well," says Blake. Essentially, he says, the

research team created a new technique for interrogating something at very high resolution (plant biomass) interacting with something else (ionic liquids), and determining the nature and extent of that interaction, which in turn enables further discoveries based on that new knowledge.

Several other JBEI papers on biomass pretreatment are in development, addressing woody biomass, corn stover, and other agricultural residue. But as the first research project on this topic to come out of the JBEI effort, Blake and Seema are clearly proud of the work they've helped produce.

"This is the first significant step in biomass pretreatment for us and is indicative of what is sure to be an exciting, challenging, and productive period of scientific discovery by researchers at JBEI," says Blake.

New computational labs building to enhance growing CRF theory and modeling work

By Mike Janes

"Combustion," senior manager Andy McLroy (8350) reminds us, "will almost certainly be part of our energy future for decades to come."

So it should come as no surprise to anyone that the DOE's Office of Science (SC) and Office of Energy Efficiency and Renewable Energy (EERE) are cofunding a new, \$5 million building at the Combustion Research Facility (CRF) that will enhance the computational and modeling efforts that are such an important part of the CRF's work portfolio.

The new 9,000-square-foot computational laboratories building, says 8300 and 8600 mission partner Neal Fornaciari, will offer offices, visualization equipment, collaboration space, and a large room to house high-performance computing clusters. It is slated to begin construction in or around March 2010, with move-ins scheduled to occur by August of that year.

"Both SC and EERE view predictive modeling as a key enabler for industry," says Andy.

The facility, a General Plant Project (GPP) building, will support the work of staff members like Jackie Chen and Joe Oefelein (both 8351), each of whom perform high-fidelity numerical simulations and build and test models that require highly intensive computational capabilities. The new building is also viewed as essential to the advancement of HITEC, the Hub for Innovation in the Transportation Energy Community (*Lab News*, March 13, 2009).

A newly established Energy Frontier Research Center, "Combustion Science: From Fundamentals to Multi-Scale Predictive Models for 21st Century Transportation Fuels," addresses many of the multi-scale predictive modeling challenges outlined in a report that came out of an Office of Science workshop cochaired by Andy. The Center involves several Sandians from the CRF, including Jim Miller, Nils Hansen, (both 8353) and Jackie. The new building will be a key resource for this effort.



Artist's rendering of CRF complex (right) with proposed Computational Laboratories Building (left).

(Drawing by Daniel Strong)

Predictive modeling work continues to grow at the CRF, Neal says, and the space in Bldg. 905 where it currently takes place is crowded and unsatisfactory. "The new building will allow researchers to collaborate much more effectively and will provide the high-end visualization tools necessary for this kind of work," he says. The only comparable collaboration equipment at Sandia/California is located in the Distributed Information Systems Laboratory (DISL), which is located in the limited area. Most of the CRF's work, Neal points out, is done on the open network and includes interactions with international collaborators.

Dawn Manley (8114), previously the manager of Reacting Flow Research Dept. 8351, authored the original proposal to SC and EERE to secure the facility's funding.

"The new facility will enable interdisciplinary collaboration between the combustion scientists and computer scientists needed to address the daunting challenge of understanding combustion," says Dawn. "The building will provide a focal point to further attract leading researchers to develop the methodologies needed to perform and analyze high-fidelity simulations of reacting flows and chemical systems. It will enable wider access to these massive data sets, expand our collaborator base, and enable even greater ties between experimental and computational programs at the CRF and beyond."

Chuck Mueller earns prestigious Horning Award for paper on diesel combustion



CHUCK MUELLER

Sandia's Chuck Mueller (8362) has been selected to receive the 2008 Harry L. Horning Memorial Award for his work on the paper, "Early Direct-Injection, Low-Temperature Combustion of Diesel Fuel in an Optical Engine Utilizing a 15-Hole, Dual-Row, Narrow-Included-Angle Nozzle." Since Sandia's Combustion Research Facility (CRF) opened its doors in 1981, CRF researchers have captured the award seven times, which is more than any other institution.

The Horning award annually recognizes the author(s) of the best paper relating to the better mutual adaptation of fuels and internal combustion engines presented at a meeting of the Society of Automotive Engineers (SAE) or any of its sections during any calendar year. The award preserves the memory of the dedication of SAE's 1925 president, Harry L. Horning, to the pursuit of improved mutual adaptability of engines and fuels. It serves as a motivation for others to follow in his footsteps. The award was established in 1938.

Chuck coauthored the diesel combustion paper with colleagues from Caterpillar, the world's largest maker of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines. The paper elucidates mechanisms by which liquid-fuel films can be formed within the combustion chamber and how the subsequent vaporization and/or ignition of the films can affect engine-out emissions.

Since Sandia's Combustion Research Facility (CRF) opened its doors in 1981, CRF researchers have captured the award seven times, more than any other institution.

Complexity research offers new design methods to strengthen cyber security

By Mike Janes

Computer viruses, spam, and computer hacking are so common that keeping computers and networks safe from attack is a billion-dollar industry.

But if some Sandia researchers successfully change the way software is written, the antivirus industry will become obsolete. By “embracing” the complexity that characterizes computer systems, the new software will render computers much safer from cyber attacks.

A complex issue

A Laboratory Directed Research and Development (LDRD) study guided by Jackson Mayo (8963) and Rob Armstrong (8961) is applying complex-system theory to cyber security. The mathematical properties of complex systems, Jackson says, are vexing for programmers since writing perfect, bug-free software is generally futile.

But Jackson and his colleagues have a novel approach to cyber security. Instead of fighting computer complexity, they advocate embracing and structuring a computer’s complex features to create an excruciatingly thorny problem that is virtually impossible for cyber attackers to solve.

“One way to describe a complex system is something, such as a computer, that can perform arbitrarily complicated calculations,” Jackson explains. “The behavior of a single transistor out of millions can change a calculation’s results.”

Rob likens complex systems to biological organisms.

“Complex systems, whether cyber or biological, are constructed or evolve to solve problems,” he says. Networked computers have been engineered to best participate in the information economy, he says, and living organisms have evolved to solve the problem of survival.

The same complexity required for problem-solving leaves complex systems susceptible to attack. There is no methodology, Rob notes, that can guarantee the absence of vulnerabilities in complex hardware or software; this is an implication of a mathematical theorem known as Turing undecidability. However, an attacker needs to find only one vulnerability to compromise a system. This “asymmetry” of cyber warfare is compounded because identical copies of hardware and software are used across the Internet. Thus, a single vulnerability can lead to a massive shutdown since all copies can be attacked in the same way.

According to Jackson, software developers can exploit complexity to confuse and deter potential attackers. “What we advocate is developing software and systems that are extremely complex but more difficult to attack than simple systems.”

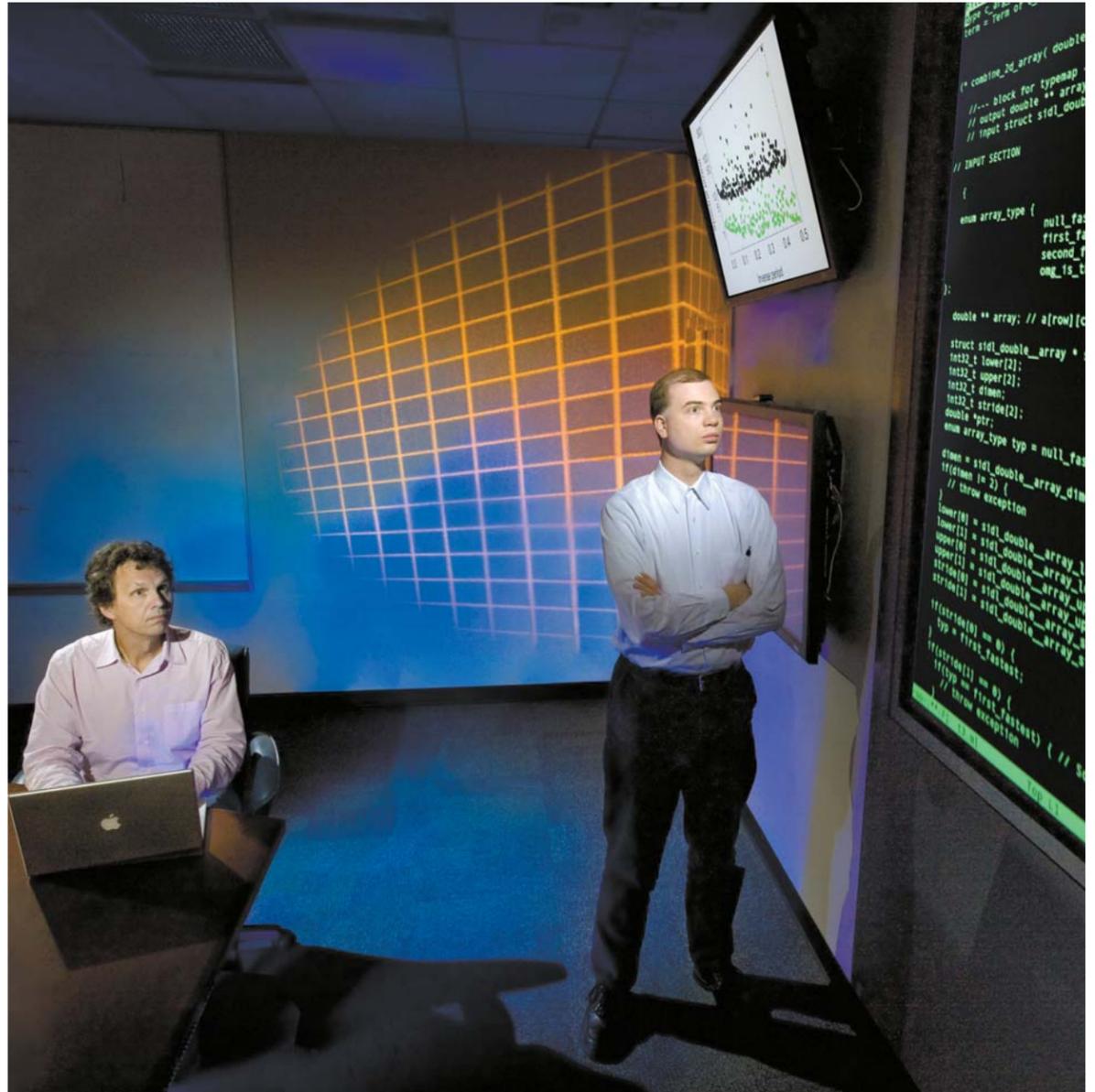
Complex systems, Jackson explains, contain many elements with seemingly chaotic interactions. These interactions produce “emergent behaviors” that impact the whole system. So one key to preventing virus and spam replication is understanding and modeling these emergent behaviors.

Jackson and Rob have many concepts for relating software to the broader complexity field, including analogies to phase transitions and biochemical networks. But one approach they consider promising performs an “end run” around the overwhelming complexity of software, by exploiting an ensemble of many similar systems to make stronger statements than they could about any one member.

Robustness and RAID

A key tenet in Jackson and Rob’s work is “robustness,” the concept that compromise of a single component should not trigger complete system failure. An ensemble of replicas doing the same job in tandem is one generic way to achieve robustness. But multiple computers running identical software will encounter the same bugs and produce the same faulty or even dangerous output.

A possible solution, Jackson says, is to achieve “robustness through diversity in software” by writing



IT'S COMPLEX — Rob Armstrong (8961), left, and Jackson Mayo (8963) lead a Laboratory Directed Research and Development study to apply complex-system theory to cyber security. (Photo by Randy Wong)

different software versions so that there are few or no bugs in common. In operation, the same input is fed to each of them and the outputs are compared to identify and eliminate compromised versions. “This is the leading approach we have in mind for achieving robustness in software systems,” he says.

Exponential increases in effort required

The potential benefits are great, Jackson and Rob say, because the effort required for a hacker to infiltrate such an ensemble grows exponentially with the number of software versions. “The hacker essentially has to look for a very tiny point in space where everything magically fails at once, and that’s very hard to do,” says Jackson. A key advantage of diversity, he notes, is that it offers protection even if the attacker knows exactly how the system is constructed.

The approach has challenges, Jackson acknowledges, since replicating software programs requires extra time and resources, and it’s difficult to know how many versions are needed. But he says replication can be achieved through automatically generated software versions, which are already available in some computer languages or even genetic-programming techniques that work like biological mutations, making multiple but very slight modifications to create new, random software variants.

An extended form of the concept, “in-depth robustness,” is derived from redundant array of independent disk (RAID) theory — using distributed redundancy to achieve computing efficiency. In-

“Complexity is the problem, but it’s also the solution. By studying complexity, we will be ahead of the curve.”

— Jackson Mayo

depth robustness can be created in software by partially overlapping calculations and distributing multiple cross-checks within a program.

Jackson and Rob say that current virus- and spam-fighting efforts have failed to confront the essential complexity of computer systems — specifically, the reality that complex systems cannot be “reductively” analyzed. In other words, simply averaging individual behaviors will not accurately describe the overall behavior. But by using what they call a “renormalization” technique, the team can identify natural units that interact within the system; this is one way to achieve a realistic picture of emergent behaviors.

For example, says Jackson, a computer with many transistors on a chip may show natural divisions. “So there’s one little cluster here that acts as a unit and does a lot of things inside itself but only occasionally interacts with others, and then you have another cluster and another.” Those clusters, he says, can each be modeled at a higher level. As long as the model retains enough complexity, it will eventually reproduce the behaviors of interest.

In the simplest terms, Jackson and Rob’s work uses complexity and emergent-behavior theory to make computer systems exceptionally difficult to attack successfully.

“We’re taking a very high-risk — but potentially very high-payoff — approach,” says Jackson. “While the work might not be something we can translate into a practical application and sell to Microsoft right now, we know there’s a problem in computing that isn’t being addressed. Complexity is the problem, but it’s also the solution. By studying complexity, we will be ahead of the curve.”

Got pics?

Project team looks to archive historical Sandia photos for quick-and-easy access

By Mike Janes

As Sandia celebrates 60 years of existence, one can only imagine the number of old photographs from throughout the decades, scattered in various places, that tell the Labs' story. While many historical photos have been archived, still more, particularly those from the California site, reside in offices, homes, and personal archives, unscanned and unavailable for broad Sandia use.

But if a current project led by web developer Norm Zablocki (8944) and graphic designer Ken Ball (8531) unfolds as expected, that will all change one day soon.

Norm, largely driven by her and her graphic arts/web development colleagues' ongoing image needs, has initiated a project that aims to unearth every Sandia-related photograph taken prior to 1980, scan each one electronically, and place them in an easy-to-access archive. Already, Norm and her colleagues have uncovered more than 2,000 photos that weren't previously known about or accessible.

"Quite frankly, we've wasted a lot of time over the years hunting down image files," says Norm. Adding to the problem is the fact that even electronic files are typically stored in wide variety of media, including CDs, DVDs, Jaz files, Adlan folders, and so on.

The project will be part of CSandia, the relatively new online collection of Sandia-related, unclassified, high-resolution digital images that resides in Web File-Share. CSandia allows users to search for historic and contemporary photographs, artwork, *Lab News* images, PowerPoint presentations, templates, logos, and videos, but the latest enhancement will result in far more available images and a more user-friendly interface.

Sandia managers and staff, Ken says, constantly need photos for various presentations, program reviews, retirement celebrations, internal and external publications, and other projects. "The goal is to put all of this content into a repository where everyone has quick and easy access," he says. Those who need photos will simply be required to enter one or more key words or other known details on the type of image they're looking for, such as the year it was taken, the activity it represents, or the staff member depicted. The software will then search through the archive and come back with available images.

While the project is funded for the current fiscal year, Norm says she hopes it can be continued into the future to add even more (post-1980) images into the archive.

Staff members are encouraged to send in Sandia photos taken before 1980 that can be included in the archive. (A website, accessible via the Div. 8000 internal homepage, describes the step-by-step process for doing so.) Submitters are asked to provide as much detail about each photo as possible, such as origination date, proper names, or key words associated with the Sandia program or activity featured in the photo.

To contribute to the historical image project, visit <http://info.sandia.gov/historicalphotos>.



George McCarthy, left, William Little, and Frank Thomas calibrate test equipment at Sandia/California (c. 1950s).



At Sandia/New Mexico, George Landry established the Labs' medical department in 1950. The department maintained this ambulance for emergency services. Arthur Chacon was the driver, and Bernice Beeson is the nurse.



New drafting quarters in 1959 were in the east wing in Bldg. 912 (upstairs). The sections in the big, open room included mechanical and electrical drafting, plus the tool and gauge section. The sections were originally scattered in quarters in LLNL and in the 916 warehouse building before 912 was completed.



The "Mosquito Abatement Team" ran test failures on weapons systems at Rocky Flats in the summer of 1963. From left to right: Jim Muir, Gordon Vangundia, Bill Morehouse, Bob Milby, and Elwood Ingledue.



An overview of the model machine shop in 1969.



Inventor Harvey Pouliot and the variable displacement engine. In 1976, Sandia designed, built, and tested the engine that, according to computer projections, would have averaged 40 percent better gas mileage than a conventional engine of equal performance.



The B83 was the first megaton-class bomb to be specifically designed for laydown against hard, irregular targets. From left to right: Don Starkey, Jim Wright, Kurt Franklin, and Jerry Hunting with the B83 in 1980.

Sandia in the blood

By Patti Koning

Growing up, Shirley Johnson (8522) knew what was expected of her: that she become an engineer and work at Sandia. She was raised in Albuquerque and her father, Cecil Tucker, worked as an engineer at Sandia. He retired in 1997 after a 38-year career.

"Initially, I wound up doing the opposite of what he wanted, both in my career and where I worked," she says. "But somehow I came full circle, and here I am at Sandia."

Shirley studied accounting in college and moved to Colorado for her first job. When she moved to California, her career zigzagged to software consulting and then training. Even though engineering was out of the question, her father did not give up on Sandia.

"He told me about Sandia's California site and sug-

gested I look for a job there," she recalls. "So I looked on the website and there was one HR position that was a perfect fit. My dad was absolutely thrilled, but he still asks me every day when I am moving back to New Mexico."

Shirley says that for the first few months on the job, she had to suppress a giggle every time she saw the Sandia Thunderbird. "It was such a huge part of my childhood growing up," she explains.

After being her father's guest at countless Family Days, Shirley got to turn the tables when she brought Cecil as her guest to the Employee Recognition Awards ceremony last month.

Ironically, Shirley's brother Wesley did become an engineer and he lives in Albuquerque — but he works at Kirtland Air Force Base. So her father realized his dream, split between his two children.



SHIRLEY JOHNSON and her father, Sandia retiree Cecil Tucker, prepare for the 2009 Employee Recognition Night. Shirley was the team representative for the Sandia/California Complex Transformation Future Studies Team. Cecil was her guest.

No brakes on Sandia/California networks

By Patti Koning

Faster than a speeding bullet . . . more powerful than a locomotive . . . Look at your desktop: It's not a bird, it's not a plane, it's the network!

The network at Sandia/California may not be able to leap tall buildings with a single bound, but its strength is still pretty impressive.

"There is more bandwidth available to the desktop here than any other place in the country," says Len Napolitano, director of Computer Sciences and Information Systems Center 8900. "Whether you are a computational physicist or office manager, that's pretty exciting."

In January, the California site became the fourth node on the Distributed Computing network, or DisCom. Logistically, that means Sandia no longer connects to the outside world through Lawrence Livermore National Laboratory (LLNL) but stands on its own. Before the change, DisCom was a triangle with LLNL, Sandia/New Mexico, and Los Alamos National Laboratory in the corners; now, with Sandia/California, it's a trapezoid.

Geometry aside, what this really means is speed, capacity, and robustness. Users at the California site have a direct high-capacity/high-speed connection capability to Sandia/New Mexico, other DOE and NNSA sites, and anywhere else in the world. "This means that working with partners in Singapore, for example, is no different than with a coworker down the hall," says Chuck Oien (8940). "The network is more robust, so dropouts will disappear or be so quick users typically won't notice."

The new network represents a 20-fold increase in bandwidth over the legacy network, 45 million bits per second to a billion bits per second. The higher bandwidth was immediately visible in videoconferences, virtually eliminating cutouts and improving picture quality.

About 18 months ago, Brian Maxwell, manager of Communications and Network Systems Dept. 8949, assembled a team to work on getting Sandia/California a seat at the DisCom table.



Quest Communications, the provider of the site's wide-area network, installed about \$1.2 million worth of telecommunications equipment. The site paid about \$350,000 toward the equipment cost.

"We realized there are some important things we wanted to do as a company between the California and New Mexico sites," says Rich Gay (8949), the chief architect of the site node. "Having our own node allows us to perform high-speed work

site-to-site with Albuquerque and the other two labs. For the entire network, it creates a diverse path that eliminates a single point of failure."

Putting Sandia/California on DisCom creates a diverse network path that benefits everyone on the network. Previously, DOE connectivity went through Sunnyvale, Calif., creating a single point of failure.

"In addition, the western labs are backing up the southwestern labs, giving each design lab automated failover," adds Rich.



DISCOM
— Current route
- - - Additional route

The change also eliminated the legacy network that tied together the two Sandia sites. "The old connection would fill up and we'd have to throttle back traffic. Now we have higher bandwidth and better cost per bandwidth," explains Brian. "This enables disaster recovery between the two sites. Backups can be run overnight or even in real time, giving us strong data storage and recovery capabilities."

Another benefit of the new node is something the organizers never envisioned: the ability to create an independent network for the proposed Livermore Valley Open Campus (LVOC). "We were working on this long before open campus was a defined idea, but the timing is really fortuitous," says Brian. "We can guarantee to NNSA that we can provide a network that is completely independent of both our network and Lawrence Livermore's. Eventual users of open campus would get a high-bandwidth, robust network at a reasonable cost."

Jim Handrock takes the reins of California weapons center

Says reorganization will make center more agile

By Mike Janes

In late June, Jim Handrock was named the new director of California Weapons Systems Engineering Center 8200. Though challenges await him, Jim says the strengths of the Center — coupled with a recent reorganization — will support an effective transition.

"The near-term challenge will be realizing the vision of the California site reorganization, which is to more effectively integrate the site's science and technology activities into our nuclear weapons program," says Jim.

The job will be supported by the fact that the Labs' weapons-related sci-



JIM HANDROCK

ence and modeling/simulation activities are embedded into the same center as core nuclear weapons work.

"Since all of these programs now reside in the same organization, it allows us to be more agile in terms of moving, combining, or changing programs," Jim says. He adds that, as part of the reorganization, the Joint Test Assembly (JTA) and telemetry activities were moved to Center 8100 due to their synergistic capabilities base with homeland security and defense (HS&D) efforts. But he and 8100 Director Jill Hruby have talked at length about making sure the activities remain integrated with those in 8200 and ensuring that the systems engineering function in Center 8100 is closely coupled with the needs of the Labs' nuclear weapons program.

Longer term, Jim says much of his center's direction will depend on the upcoming Nuclear Posture Review, due out at the end of the calendar year. That, he says, will provide more insight into the current administration's thinking about the future and size of the weapons complex and the number and types of weapons that will remain.

"This will drive the nature of work we do," says Jim.

Jim acknowledges the disappointment surrounding the recent congressional move to put the gas transfer system (GTS) design agency consolidation decision on hold (pending further review), but says he will support it as well as other direction coming from NNSA. Jim says he still believes "we're the right lab to do the GTS work for the complex, and it remains one of Sandia's core nuclear weapon products. We'll continue to do GTS work in the same excellent manner that we always have."

Prior to being named director of 8200, Jim was on special assignment in Washington, D.C., where he served as deputy science advisor to Gen. Robert Smolen, previously the deputy administrator for Defense Programs at NNSA's NA-10. Jim's involvement in Sandia's weapons activities spans some 20 years and includes assignments in gas transfer systems, structural analysis, reliability, electrical modeling and simulation, and scientific computing. Most recently, he served as a deputy director for Directed Stockpile Programs and senior manager of Stockpile Systems and Gas Transfer Systems. He also spent a year as the deputy to former Div. 8000 VP Mim John.

Surety team demonstrates security upgrade concept for weapons in SGT

By Mike Janes

A cross-laboratory team made up of engineers from Centers 8200, 6400, and 2100 recently completed a demonstration of a security upgrade concept for weapons in the SafeGuards Transporter (SGT) environment known as the Integrated Security Solutions (ISS) system.

Paul Yoon (8229), whose department handled the systems integration component of the project, says a demonstration took place in Albuquerque in early June. The project took nine months to complete.

The demonstration consisted of an air-delivered weapon trainer, which was placed inside a test vehicle that resembles an actual SafeGuards Transporter. The transportation attachment device (TAD) was then placed on board the weapon and interfaced with the SGT system.

"The project proved to be a really effective and seamless collaboration with the three centers," says Paul. He says the demonstration project, which con-

tained several new electronics and mechanical modules designed and developed for the SGT and TAD, actually looks like a deployment-ready production unit.

The next step will be to mature those new technologies to enable the initiation of full-scale engineering development in the near future. But the successful demonstration, Paul says, was an important first step in the process.

Sandia has been working on various aspects of the ISS system for roughly five years; ISS work on the SGT began for this air-delivered system in October 2008.



A Safeguards Transporter

Mileposts

New Mexico photos by Michelle Fleming



Brandon Ahrens
30 5915



Mike Coltrin
30 1126

Recent Retirees



Thomas Mayer
20 6316



Ed Tooley
15 4855



Clifton Drumm
25 1341



Aaron Hillhouse
25 2113



Douglas Hodge
25 2996



Michael Moran
25 1111



Cathy Nowlen
25 5919



Christopher Hogg
20 5526



Hue-Su Hwang
20 4131



Scott Klenke
20 2138



Dan Rondeau
20 5430



Thomas Tarman
20 5632



Brenda Townsend
20 2917



Emily Mitchell
15 5632



David Olson
15 6751



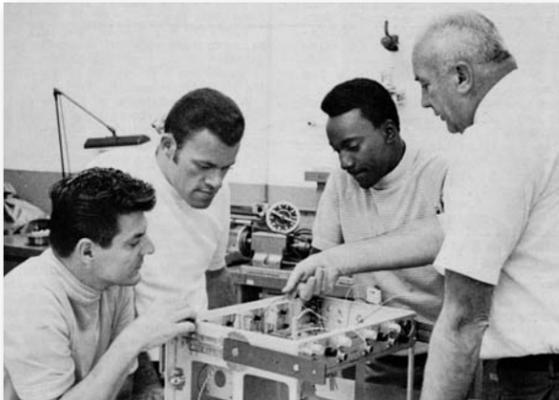
Heidi Ruffner
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Sandia CaliforniaNews



50 years ago — Livermore Laboratory has rearranged its parking lot with an emphasis on pedestrian safety and easier entrance and exit. The parking lot capacity will be 620 cars and is expected to be completed in late August.

40 years ago — The bond graph approach to the modeling of engineering systems is a recent concept based on power flow instead of signal interactions. This concept will be discussed by Professor Ronald Rosenberg at the Sandia Laboratories Livermore Colloquium on August 12. With the recent approval by the Alameda/Contra Costa Counties Joint Apprenticeship Committee, the electronic technician apprenticeship program at Sandia Laboratories Livermore has become



NEW CAREERS — Russ Richards, supervisor of Electronic Fabrication Section 8223-3, explains a fabrication method and the quality requirements to (left to right) James Reitz, James Nickerson, and Everitt Davis (all 8223), apprentices selected for the first class in Sandia Laboratories Livermore electronic technician apprenticeship program.

officially certified by the state of California. The program provides training for young men who wish to become journeymen electronic technicians. (1969.1 photo) "Probably the most significant single thing that's happened at Sandia Livermore during the last year," said VP Tom Cook (8000), "is that we have expanded the base of our capabilities into fields of



VP TOM COOK, Div. 8000, reviews the events of the past year with employees at Sandia Laboratories Livermore. The most significant trend has been toward the expansion of Livermore's base of capabilities in applied research and technological fields.

applied research which have potentially broad implications. A good deal of our research will be in fields that are relevant to, but not necessarily limited to, use and application in the military business. We at Sandia intend to develop capabilities that will allow us to contribute in a broader way to the advancement of science and technology."

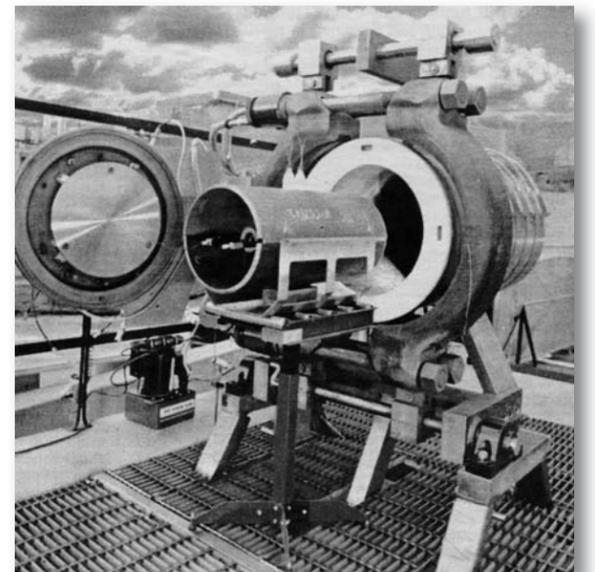
30 years ago — How expensive is the electrical energy produced by a solar central receiver plant? And what design for major subsystems is best in the long run? The answers to these questions depend on many complex and interrelated trade-offs among performance levels and costs of the subsystems of such a plant, especially its heliostats, the most expensive components in the system. DELSOL ("of the sun") is a new computer code that helps answer the question.



DELSOL developers Mim Fish and Ted Dellin.

Built on Ted Dellin's (8451) earlier research and developed by Mim Fish (8326) and Ted since then, DELSOL allows solar designers to optimize the system design (tower, receiver, heliostat field), estimate performance levels, and calculate the costs of energy produced. "The bottom line," says Mim, "is the system's energy cost expressed in cents per kilowatt hour."

20 years ago — Designers of today's high-tech weapons try to augment or replace human operators with computer systems whenever possible. But it's been hard to make a computer that recognizes targets with the speed, accuracy, and reliability that's required. Now, Sandia researchers at Livermore have taken a step forward in solving this problem by developing a prototype of an on-board target recognition computer. Dubbed STARLOC (Sandia Target Location Computer), the prototype grew from an idea originated about two years earlier by Leonard Napolitano and Don Sweeney (both 8435). Their concept is based on earlier research by George Schils (8435) and Don in 1984-86 on optical processing of lock-and-tumbler filter algorithms for automatic target recognition.



EXPLOSIVE DESTRUCTION SYSTEM is shown with the fragment suppression system ready to place in the containment chamber. The system is mounted on a specially designed trailer for transportation.

10 years ago — Sandians have created a mobile device called the Explosive Destruction System (EDS) that's both reliable and reusable to destroy deteriorated and potentially unstable chemical munitions. The EDS is a sealed unit, which offers a safe and effective alternative to open detonation of some recovered munitions. The system is designed to safely detonate chemical munitions and neutralize the chemical agents inside a sealed steel chamber. Specifically, the reusable EDS is equipped with a steel fragment shield that absorbs the impact from exploding parts of the munition and allows the system to withstand hundreds of detonations.

Longing for island time

Rene Bierbaum returns from the Peace Corps

By Patti Koning

Rene Bierbaum (8205) says it took her about a month to stop living by her watch and calendar after arriving in the Philippines. By the time she returned home last December, she found it even harder to readjust to a life in which things happen according to schedule, not just common will.

"It took some time to be flexible and understand that things would just start at the right time. Someone would decide to have a party and I'd be asking what time I should arrive. The host would say, 'Just come, just come.' Sure enough, when the magic moment arrived there would be a mysterious aggregation of people," she recalls.

In March 2006, Rene and her husband Neal set out on the adventure of a lifetime,

becoming Peace Corps volunteers in the Philippines. "Volunteering in a developing country was something we had talked about for a long time," says Rene. "In the early 1990s, we passed up an opportunity to go to Africa and regretted it. By late 2004, events were such that we really wanted to do something positive on behalf of America in another part of the world."

As mid-career professionals and a married couple, Rene and Neal were atypical Peace Corps applicants. Currently, only 6 percent of all volunteers are married and the average age is 27, with only 5 percent over age 50.

They weren't concerned about the location of their assignment, just that their skills would be put to good use. Rene is an engineer with Reliability and Electrical Systems and Neal is an IT consultant. What they got was a perfect match — a rural high school on the brink of starting to use IT.

Compostela is a small farming village about an hour from Cebu City. The school had DSL and about 20

computers with limited capabilities. The teachers, principal, and guidance officer performed a few basic administrative tasks on the computers and a handful of third- and fourth-year IT majors received hands-on training. For the rest of the students, computer education meant looking at pictures of a computer in a textbook.

Rene and Neal focused their efforts on building up the computer infrastructure and expanding the use of IT as a teaching tool. Fortunately, former Sandian Mary Jewett happened to be in the Philippines at the same time and through her husband Jeff's employer, Safeway, was able to arrange a donation of 30 laptops.

"The education department superintendent responsible for about 200 high schools in the region had been pushing IT education, so the teachers all had some baseline computer knowledge," says Rene. "I was able to jump in immediately with administrative aids, like Excel templates for grades and a student information database in Access developed by another Peace Corps volunteer, and computer-based curriculum."



THE 90 NEW COMPUTERS that Rene acquired through the World Computer Exchange.

Rene even picked up a few tricks that she's putting to use at Sandia. As she was learning to use a pivot table in Excel to slice and dice data, Rene found herself thinking about how well it would work with reliability tools.

Before Rene and Neal's arrival, a corporation had donated a small computer lab to the school. Neal wrote a proposal to the school's version of a parent-teacher association to install wireless and purchase memory to



THE COMPOSTELA HIGH SCHOOL library, just after the new computers were installed.

create a centralized campus server. The proposal was modest by American standards — just \$300 — but in the Philippines teachers earn about \$200 a month. "The PTCA agreed to fund it in November of our first year," says Rene. "This was really exciting because we knew the school community was committed to this project."

Neal eventually installed four small computer labs on the campus connected by wireless and set up two computers in each faculty department office. A Linux thin client approach enabled him to maximize the



COMPOSTELA HIGH SCHOOL students at "Math Monday," a bingo fund-raiser. The competition for the grand prize of a 50 kilogram sack of rice was intense. (Photos courtesy of Rene and Neal Bierbaum)

computational resources, giving obsolete computers the same capabilities as the most powerful computer.

Rene and Merlin Lorenzana, the head of the school's science department, wrote a proposal through the Peace Corps to acquire 90 computers from the World Computer Exchange. The delivery was complicated and slow for many reasons, including an attempted military coup.

"Bizarre things kept happening," says Rene. "We received the computers in February 2008 and we were supposed to leave that June. I am deeply grateful that my management here at Sandia agreed to a six-month extension so we could complete the work we had begun."

By the time they left in December, Rene and Neal felt like they had accomplished their goals. One of their biggest thrills was seeing even first-year students doing Internet searches in the school library. The frustrating part, says Rene, is that they didn't have a chance to expand the work to other schools in the area.



A SAD GOODBYE — Rene and Neal with the department heads and several teachers at Cebu airport as they began their journey back to the United States.

Lorenzana began pursuing a master's degree about midway through the Bierbaums' Peace Corp stint. She conducted a study at the high school on teaching with IT tools versus traditional methods that showed that IT was more effective at improving test scores. She passed her oral defense on their last day in the Philippines.

"In March she received her degree," says Rene. "That gave me a sense of closure."

They may be back in the US now, but their thoughts are often still with the Philippines. For Neal, it's more than his thoughts — he can still log into the main server at school.

They've already planned a visit back to Compostela in October, on a working vacation that they timed to coincide with teachers' in-service training. After they retire, Rene envisions spending several months of each year in the Philippines.

"We were so enriched by the people we were around, their generosity and joy in their lives," she says. "It's never too late to think about the Peace Corps. They are actively recruiting people over the age of 50. Putting your life on hold seems intimidating, but it wasn't as hard as you think and the rewards were really incredible."

SANDIA SAFETY SQUAD



Improve Process: Feedback and improvement is an integral step for the ongoing safety, effectiveness, and efficiency of the Work Planning and Control (WP&C) process.

