Three researchers named Sandia Fellows

Labs recognizes career accomplishments, reputations of Ed Cole, Jerry Simmons, John Rowe

By Neal Singer

Sandia researchers Jerry Simmons (1120), Ed Cole (1755), and John Rowe (5550) have been named Sandia Fellows.

That status — stellar at Sandia and nearly as rare as hen's teeth — is reserved for those who are nationally or internationally recognized pioneers in their fields. It is considered a promotion to the highest level of Research and Development staff, equivalent to the level of management immediately below Sandia's vice presidents, says Julia Phillips, vice president and Sandia chief technology officer (7000).

There have been only six previous Fellows in Sandia's history. Of them, Jeff Brinker (1002) alone is still active at Sandia.

"The three new Fellows have histories of sustained and equally distinguished accomplishments in their fields," said Sandia President and Laboratories Director Paul Hommert in announcing the appointments.

Jerry made notable discoveries in the physics that examines electron tunneling — how an electron can turn up where by rights it shouldn't be. He is well-known for linking fundamental scientific understanding with engineering impact, and has demonstrated

(Continued on page 4)

SANDIA researchers, left to right, Jerry Simmons (1120), Ed Cole (1755), and John Rowe (5550) are Sandia's newest Fellows, joining six others who have earned the distinction since it was instituted in 1986. (Photo by Randy Montoya)

ALWAYS SAFE

Engineered Safety

Find out how Geothermal Research Dept. 6916 is using an Engineered Safety model to shift away from a strong reliance on process to assure safety (such as checklists), to one based on safety by design intent. Story on **page 4.**

Sandia LabNews

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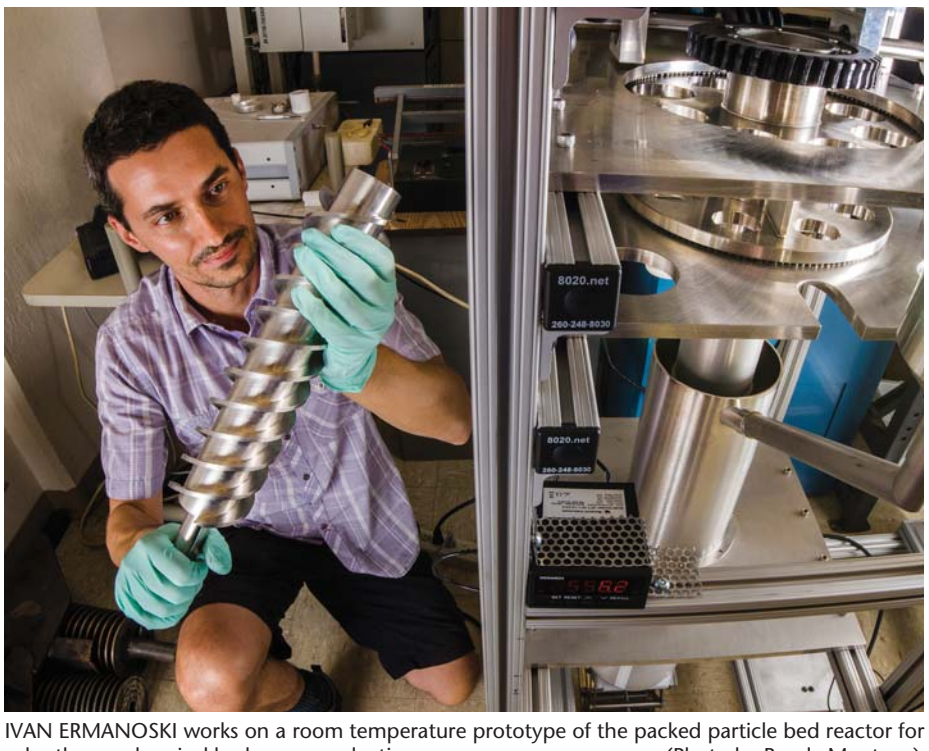
Sandia National Laboratories

Robot Rodeo rocks

Bomb techs and robots take on tough tests in annual competition . . . Pages 6-7

Concentrating on sunshine to advance hydrogen economy



IVAN ERMANOSKI works on a room temperature prototype of the packed particle bed reactor for solar-thermochemical hydrogen production. (Photo by Randy Montoya)

By Holly Larsen

Researchers around the world are pursuing the goal of harnessing the vast amounts of energy available from the sun to address climate change and other impacts of the world's growing dependence on carbon-based fuels. Myriad technologies for capturing and storing the sun's power are maturing — but large-scale commercially viable and economically competitive processes based on these technologies are likely still years away.

Nonetheless, by building on other efforts, notably the findings of Sandia's Sunshine to Petrol (S2P) Grand Challenge Laboratory Directed Research and Development (LDRD) project, a Sandia team of S2P veterans that includes principal investigator Tony McDaniel (8367) and Ivan Ermanoski (6124), has taken significant steps toward an intriguing possibility: creating hydrogen fuel using a two-step thermochemical process powered by the sun. Hydrogen fuel for transportation is widely viewed as an environmentally friendly alternative to gasoline, natural gas, and other carbon-based fossil fuels — especially if the hydrogen can be generated without using fossil fuels in the process.

> *"Using particles as the working fluid enables the high efficiency, mechanical simplicity, scalability, and material and operational flexibility of the Sandia reactor concept."*
> **— Researcher Tony McDaniel**

Broad outline of concept is simple

"If the concept can be validated and scaled up, it could lead to an economically viable means of creating hydrogen from water and sunlight — two very abundant resources," says Tony.

Collaborators from the University of Colorado, Colorado School of Mines, and Bucknell University are also contributing to this project, which is funded by DOE's Fuel Cell Technology Office under the Solar ThermoChemical Hydrogen Production (STCH) program.

The broad outline of the team's concept is fairly simple: use sunlight to split water into hydrogen and oxygen. The concept uses a second-generation version of the Sandia-developed CR5 receiver reactor for converting solar energy into an easily storable form: a chemical fuel, such as hydrogen. The reactor is placed at the top of a tower

(Continued on page 3)

Inside . . .

That's that

On page 1 of this issue, we have a story by our longtime science writer, Neal Singer, about three remarkable individuals, Ed Cole, John Rowe, and Jerry Simmons. They are Sandia's newest Fellows, the highest title — and honor — that can be bestowed on a Labs scientist or engineer. If we hire the best and the brightest — and I know we do — and if the best of the best rise through the technical ranks to earn the prestigious "distinguished" designation on the merits of their work, then our three new Fellows represent the best of the best of the best.

Our recruiting team tells potential new Sandians about the various perks of working at the Labs: The pay is competitive, the benefits package is good, the tools and resources available for researchers are second to none, and — not least — the work is consequential and often of profound importance to the nation and the world. We ain't making sugar water here. The recruiters mention, too, that if you come to Sandia you'll have the chance to work with some of the very best people in your field. People like our new Fellows, that is.

In sports, you'll hear the phrase "franchise player." Think LeBron James for the Miami Heat, Clayton Kershaw for the Los Angeles Dodgers, Robert Griffin III (RG3) for the Washington Redskins. The best of the best of the best. They have a way of making the rest of the team look pretty darned good and while they're at it, they raise the bar for everybody. When the chips are down, when the stakes are high, when the game is on the line, you want to get the ball to these three guys. The same is true of our three Fellows. Congratulations Ed, John, and Jerry.

* * *

Speaking of perks, we have a nice one here at the Labs that's maybe a bit underappreciated, or at least not recognized for the unique benefit it really is.

In any given week, a fascinating and compelling selection of symposia are conducted at the Labs, ranging from the specific and technical to the high-level and strategic. Add to that the impressive suite of career development courses offered by our Corporate Learning and Professional Development (CLPD) team. Are you in nuclear weapons? HR? IT? Management? Communications? Those are just a few examples of the 20-plus "schools" operated by CLPD, with each school offering an evolving range of classes designed to help make you better at your job and bolster your career.

When you toss in the brown bags, conferences, and workshops, the town halls and the web-based learning opportunities, the Tech Library with its strong customer focus to get researchers what they need, you practically have the makings of a Sandia University right here. And that's not something you're going to find at just any workplace.

* * *

The news out of Arizona was shocking, hard to believe: 19 members of the Prescott Fire Department Granite Mountain Hotshots killed fighting a blaze that consumed half the houses in the town of Yarnell. The first news was very sketchy and for a time I hoped that maybe somebody had gotten it wrong. In a world of instant communication and 24/7 news cycles, the media operate under constant pressure to put out information before it is fully vetted. We saw that in the coverage of the Boston Marathon attack and I thought that maybe, maybe, they'd gotten it wrong here. These guys were hunkered down somewhere, out of communication, that's all.

But no. The reports were all too true: 19 highly skilled firefighters, the best of the best of the best, were down. Things happened too fast at the face of that fire. Things out of their control. The wind changed direction. The wind. We haven't learned how to do much about that. It does what it will. And so will fire.

If you are going to fight a fire — and that's what these men wanted to do with their lives — you are going to get close to the roaring beast, you are going to stare it down, you are going to beat it back, you are going to put yourself between this almost living thing, this almost malevolent thing, and the lives you are trying to protect. But if the wind changes on you and you are maybe not quite in the best place for your own good . . .

This summer, we're seeing an awful lot of smoke on the horizon, burning our eyes and throats, choking our air. This tragedy in Yarnell reminds us that wherever you see that smoke, there are fire crews in the thick of things, fighting the fire, sometimes fighting for their very lives, trying to bring it under control. For us.

See you next time.

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

Sandia LabNews

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LOCKHEED MARTIN

Attention Sandia retirees . . .

Annual Retiree Social scheduled for Aug. 27

The Albuquerque Convention Center has been selected again as this year's venue for the annual retiree social, as this location has adequate indoor space to allow for gathering of friends, good food, reminiscing, and catching up, all within the same banquet room.

When: Tuesday, Aug. 27
Where: Albuquerque Convention Center
Time: 11:30 a.m.-2:30 p.m.

Note: *Sandia will also provide park-and-ride service from Calvary Albuquerque (New location)*

An invitation with event details will be mailed to retirees in late July. Information on the California Retiree Social will be announced in a future edition of *Lab News*.

Big Brothers Big Sisters launches mentor2.0

Sandia is partnering with Big Brothers Big Sisters of Central New Mexico, South Valley Academy, and Amy Biehl High School on mentor2.0, a new technology-based mentoring program. Mentor2.0 is a curriculum-driven program that provides a whole-school model of mentoring that prepares students at each high school with the skills they need be to successful in college and the job market when they graduate.

"We need help from Sandia's amazing work force and retirees to change 'the news' about New Mexico's youth," says Ted Kreifels, systems quality engineer in Systems Surety Engineering II Dept. 427.

Ted has been a Big Brother for 30 years and a board member at Big Brothers Big Sisters for 14 years. "We must do something different to improve high school graduation rates in New Mexico, and this program has made it easier to get involved and make a difference," he says.

Big Brothers Big Sisters will begin matching freshmen with adult mentors in early fall, but before those students can be matched, the agency must recruit volunteer mentors. Nearly 200 mentors will need to be recruited, interviewed, and background-screened to meet the goal of matching every freshman student at both schools. Volunteers will be expected to email their mentee once a week as part of an accredited class, as well as to attend an in-person event every month at the mentee's school during the school year.

Easy to enroll as a mentor

"The time commitment for mentoring is a big reason more people don't volunteer," says Big Brothers Big Sisters' chief outreach officer Sharon Tenorio. "Mentor2.0 is so easy, even the busiest executive can do it. You can email your 'Little' anytime from anywhere throughout the week, and you can plan for the school-based event months in advance.

Mentor2.0 kicked off at Sandia in Surety Engineering Group 420 through the efforts of senior manager Marcey Hoover.

"In just the past three weeks, 16 volunteers have begun the process of becoming mentor2.0 mentors, including me," Marcey says. "Over the next couple of months, we will complete an in-person interview and receive on-site training before being matched with a freshman at either of the partner schools. We need more people to step up and move the needle on our graduation rates. This is a great opportunity to give back to the community and share some of the privilege that we all enjoy as employees of Sandia."

For more than 100 years, Big Brothers Big Sisters has operated under the belief that each child possesses the inherent ability to succeed and thrive in life. Most children served by Big Brothers Big Sisters are in single-parent and low-income families or in households where a parent is incarcerated. Big Brothers Big Sisters is the nation's largest donor- and volunteer-supported mentoring network. In central New Mexico, Big Brothers Big Sisters serves nearly 1,500 children annually.

"We are excited to be a part of a program that has shown tremendous success in other markets," says Big Brothers Big Sisters of Central New Mexico CEO Angela Reed Padilla. "Mentor2.0 is a program that will help Albuquerque high school students graduate and prepare them to achieve success in life. I've been leading Big Brothers Big Sisters for almost two decades. I'm thrilled to bring mentor2.0 to New Mexico; it's going to be a game-changer in the way we approach education. Many more schools are going to want mentor2.0, and students who receive this class will significantly increase their chances of success.

"I can assure you, as can so many other volunteers, the relationship with your Little Brother or Sister will change your life as well as theirs. Learn how you can positively impact a child's life and volunteer today [at bbbs-cnm.org]."

To learn more about mentor2.0, visit www.bbbs.cnm.org/mentor2.0 or call 505-837-9223.

Retiree deaths

John A. Christopher (age 83) . . . . . Jan. 23
Samuel L. Johnson (91) . . . . . March 21
Clifford F. Hiner (91) . . . . . March 24
Charles L. Becker (91) . . . . . March 24
Jacek Stefan Sivinski (86) . . . . . March 29
Donald C. Spencer (89) . . . . . April 6
Thomas C. Corpe (94) . . . . . April 10
Don William Doak (82) . . . . . April 16
Freddy L. Whitworth (80) . . . . . April 18
Donald L. Summers (80) . . . . . April 23
George H. Johnson (96) . . . . . May 2
Dorothy A. Marklin (82) . . . . . May 4
Ralph F. Jaeger (95) . . . . . May 6
Waylon B. Ferguson (86) . . . . . May 26

Sandia CaliforniaNews

Advancing the hydrogen economy

(Continued from page 1)

centered within a large field of heliostats (flat mirrors that track the sun). Together, the tower and heliostats form a concentrating solar power plant. Such plants — which commonly store solar energy in the form of molten salt that can be used to generate steam, and thus electricity — already exist in many parts of the world, including Spain and the United States.

The reactor being developed by Sandia uses metal-oxide particles sized a few tens of microns in diameter as the working "fluid." The particles are transported between two isolated reaction zones: an upper chamber illuminated and heated by concentrated solar energy and a lower chamber exposed to steam. Using gravity feed and a unique particle elevator concept patented by the team (based on an Olds Elevator™), particles are lifted from the lower to the upper chamber.

Here, concentrated sunlight heats the particles to temperatures as high as 1,600 C, providing sufficient energy to remove oxygen from the oxide particle. The oxygen is continuously pumped away, and the oxygen-reduced particles (designed not to melt or sinter at such high temperatures) flow to the lower chamber.

TONY McDANIEL (8367) carefully adjusts the setting on an optical pyrometer used to measure the temperature of the metal-oxide particles undergoing reduction. Incandescence from the experimental reactor can be seen in the foreground and attests to the extreme temperature used to extract oxygen from the metal-oxide particles. (Photo by Randy Wong)

In the lower chamber, the particles are exposed to water in the form of steam. Strongly attracted to the oxygen-reduced particle, the oxygen breaks away from the water molecule to deposit in the metal oxide, creating hydrogen in the process. The re-oxidized particles are then ready to be elevated to the upper chamber and repeat the cycle. It is expected that these particles will be cycled hundreds of thousands of times before replacement.

Project goes farther

"In part, this concept draws on past work to generate hydrogen by splitting water," says Tony. "But this project goes farther by exploring several novel aspects that hold a lot of promise."

For example, meeting the project goal of developing a process that requires only two steps, as opposed to the numerous steps (up to nine) required for many of the other thermochemical processes under development, will allow for greater process efficiencies. Efficiency is further enhanced by incorporating key features of the earlier Sandia CR5 reactor — such as recuperation of thermal energy, continuous on-sun operation, and direct absorption of sunlight by the working metal-oxide — coupled with new features developed in the second-generation design. The most significant of these is the intrinsic gas and pressure separation between the two chambers made possible by the moving packed bed of particles.

"From what we've seen in the literature thus far, one or more of these attributes is missing from other systems. Yet all are critical to achieving economic viability because of the high capital costs associated with building solar concentrators and the direct tie between efficiency and cost. Using particles as the working fluid enables the high efficiency, mechanical simplicity, scalability, and material and operational flexibility of the Sandia reactor concept," says Tony.

Equally important, the team has identified a novel material chemistry for the metal oxide particles. Researchers to date have focused on two chemistries, ferrite and ceria, the current state of the art. Both ferrite and ceria have issues and, at best, have demonstrated efficiencies of less than a few percent.

"By leveraging Sandia efforts to understand these materials and their limitations, and working closely with a separate Sandia project led by Andrea Ambrosini (6124) that is developing new thermochemical materials, we have identified a different chemistry based on perovskite materials that opens the door to some interesting possibilities," Tony says.

As reported in a recent paper ("Sr- and Mn-doped $LaAlO_{3-\delta}$ for solar thermochemical H_2 and CO production," *Energy and Environmental Science*), the perovskite chemistry produces significantly more hydrogen per reduction/oxidation cycle than ceria while maintaining rapid reaction kinetics, a principal advantage of ceria. In addition, the perovskites can be cycled effectively at temperatures below 1,350 C, as opposed to the 1,500 C minimum temperature required for ceria. Operating at a lower temperature range allows for use of less exotic, and therefore less expensive, materials for constructing the reactor.

In fact, the team believes perovskites have the potential to meet or exceed the 26 percent solar conversion efficiency targeted by the DOE STCH program, whereas it is almost certain that ceria and ferrite chemistries will not. In addition, because perovskites have highly tunable properties and because an overwhelmingly large number of compounds can be formed in the perovskite crystal structure, it's highly likely that a metal-oxide material can be discovered that will efficiently and economically produce hydrogen fuel.

To evaluate and refine their reactor design concept, the project team is building a small (1 kW) engineering test stand. At the moment, the team is testing the particle conveyance and pressure separation concepts at room temperature and plans in the near future to retrofit the stand to test these features simultaneously and at high temperature.

"By studying how this unit operates and doing extensive modeling, we're working to gain a deeper understanding of reactor function and how to create a viable system at a much larger operating scale," says Tony. "In particular, we're looking hard at how the particle elevator works and at how to improve efficiencies." In this endeavor, the STCH program will benefit from work being conducted in Sandia's Materials, Devices, and Energy Technologies Dept. 6124 and supported by an early career LDRD that is examining the complexities of solid-solid heat exchange for particle systems.

Though aware of the work ahead, the team is optimistic about the prospects for their reactor design. "Ultimately, this effort could contribute to a new transportation infrastructure based on hydrogen or enable carbon-neutral, renewable-based synthetic liquid fuels that could be inserted directly into the existing infrastructure. Either way, it could smooth the transition away from fossil fuels," Tony states.

California Energy Commission visits Sandia/California

By Patti Koning

On Tuesday, June 25, Commissioner Janea Scott and Executive Director Rob Oglesby, both of the California Energy Commission (CEC), spent the day at Sandia/California learning about Sandia's comprehensive work in energy programs.

AS PART OF A TOUR of energy research programs, Rob Ogelsby and Janea Scott of the California Energy Commission stopped by one of the Combustion Research Facility's optical engine labs to learn about Sandia's diesel engine research from Jackie O'Connor (8362). (Photo by Randy Wong)

Div. 8000 VP Steve Rottler welcomed the two guests to the Livermore Valley Open Campus (LVOC) with an overview of Sandia, including the history of the organization and the California site. Next, Dawn Manley (8350) shared Sandia's transportation energy programs and how Sandia's analysis capabilities relate to the work of the CEC.

Scott and Oglesby visited an Optical Engine Laboratory in the Combustion Research Facility, where Mark Musculus and Jackie O'Connor (both 8362) discussed their diesel engine research. Next, Daniel Dedrick and Isaac Ekoto (both 8367) explained the unique capabilities of the Hydrogen Combustion Laboratory and how knowledge gained in that lab is informing codes and standards related to hydrogen infrastructure.

The two visitors stopped by the site of the future Hydrogen Fueling Station Demonstration in the LVOC and headed to the Advanced Biosciences Laboratory to learn about advanced integrated renewable liquid and biofuel research and development from Blake Simmons (8630), Mary Tran-Gyamfi (8634), and Weihua Wu (8634).

Following lunch, Charles Hanley (6112) gave an overview of Sandia's history in renewable energy research and development, including solar, wind, water, and geothermal technologies. Robert Hwang (6110) then spoke about Sandia's grid resiliency programs.

The goal of the visit, says government affairs officer Patrick Sullivan (160), was to introduce the CEC to the comprehensive transportation energy portfolio at Sandia's California locations and highlight Sandia's knowledge and research in renewable energy and electric grid resiliency based in New Mexico.

"We hope the energy research capabilities here and the window this site provides to our Joint BioEnergy Institute and New Mexico energy research capabilities can better inform state transportation and energy policy," he says. Sandia has a history of providing knowledge to help inform state policy makers, as both Dawn and Blake have testified before the California Senate Transportation and Housing Committee.

The CEC was created by the California Legislature in 1974 as the state's primary energy policy and planning agency. As it sets state energy policy, the CEC is guided by six principles: forecasting future energy needs; promoting energy efficiency and conservation by setting the state's appliance and building efficiency standards; supporting public interest energy research that advances energy science and technology through research, development, and demonstration programs; developing renewable energy resources and alternative renewable energy technologies for buildings, industry, and transportation; licensing thermal power plants 50 megawatts or larger; and planning for and directing state response to energy emergencies.

Three Fellows

(Continued from page 1)

leadership in helping to advance solid-state lighting, terahertz sources, and detectors and quantum qubits.

Says Jerry, "I'm honored to be recognized and thank colleagues I've worked with over the years. Almost everything I've done has been a team effort with very talented people. As a Fellow I hope to spend more time working with others to explore new ideas, and then build new teams to bring those ideas closer to reality."

Ed is internationally recognized for his widely used work in failure analysis and reliability physics. His pioneering work and leadership in applying failure analysis techniques to the most challenging national security problems has led to methods for finding almost entirely hidden defects.

Says Ed, "I am honored and excited by the Sandia Fellow appointment and the opportunity it affords to work with staff, leadership, and external partners in Sandia's national security mission."

John's expertise and technical leadership in space-based multispectral remote sensing systems have helped shape US capabilities and are widely recognized in national security fields. His deep technical understanding of national sensing and detection systems makes him a highly regarded and sought-after expert in the Department of Defense and intelligence communities.

Says John, "It is a huge honor to be appointed a Sandia Fellow and I look forward to continued collaboration with my colleagues and Labs leadership as we work to address current and future challenges to our national security."

Fellows are chosen from fields that coincide with areas in which Sandia intends to maintain or grow its presence. Fellows are expected to bring the very best science and engineering to Sandia and the US, shape the future of Sandia's science and engineering enterprise, expand the breadth of their influence, mentor others, and maintain extensive professional networks.

Sandia's last promotions to Fellow took place in 2002 and 2003, when Gordon Osbourn (retired), Jeff Brinker, and Jim Gosler (retired) were selected for their pioneering work in strained layer superlattices; sol-gel processing of ceramics and self-assembling nanostructures; and information security, respectively.

The first Fellow appointment was made in 1986.

Jeff Brinker says, "We're planning a meeting in a few weeks to see what we could do together for the improvement of the Labs. Together, the Fellows could work to identify new opportunities and lead initiatives to further increase the quality, visibility, and impact of Sandia science and technology."

John Rowe

John Rowe, lead Senior Engineer in Sandia's Space Mission Program, hired on to Sandia 35 years ago as a technician in a materials testing group. He was grateful for support offered by Sandia management that allowed him to complete his master's degree in computer science from the University of New Mexico. From there, he transferred to the Satellite Systems area and has worked in space- and ground-based sensing systems for most of the last 30 years.

JOHN ROWE

"These fields are critically important for our national security interests, environmental monitoring, and possibly for analyzing climate changes," he says.

Of particular importance to John has been development of methods to exploit the growing flood of data provided by satellites, and concomitantly, help design at a high level the characteristics of the sensing systems.

John and his colleagues have pioneered the use of space-based multispectral systems that provide information by analyzing an area or target of interest through use of multiple frequencies of light. More recently, he has focused on persistent sensing systems — "devices that sense what you want, where you want, whenever you want," is all he says on that subject.

For the last several years, John has spent a good part of his time directing or contributing to major studies for space-based systems for the Labs and government customers. He has also supported multiagency studies that "are shaping the future of our space sensing capabilities," he says.

The gravitas of being selected a Fellow, he says, "is a recognition by the institution of the importance of this area of work and of our intent to increase our engagement in this area." He believes it will provide him opportunities to more broadly engage with other elements of Sandia, including senior technical personnel and Labs leadership, to better position the Labs to face national security challenges.

"We could do a better job by interacting with other programs and capabilities across the Labs, such as with cyber, integrated military systems, and others. There are potential ties with all these communities that are not being leveraged to their fullest. My new position may

(Continued on next page)

Snapshot: Engineered Safety in Practice

Engineered Safety and Sandia's Geothermal Research Department

By Cathy Ann Connelly

Note: This is second in a series of article snapshots about Engineered Safety in practice at Sandia. These summaries focus on how groups are using this model for work planning and control to shift away from a strong reliance on process to assure safety (such as checklists), to one based on safety by design intent in which assurance of safe operation comes from critical thinking in the design and the operation aspects of the system. New activity level work is now conducted under the Engineered Safety 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. Natalie Carter (4135) consults Labs-wide to provide guidance concerning the revised work planning and control framework and how to implement it as part of the Engineered Safety implementation team.

The team is co-led by Charles Barbour, director of Physical, Chemical, and Nano Sciences Center, and Sid Gutierrez, director of Radiation Protection, Waste Management, ES&H Center 4100, and Sandia's chief of safety. Natalie's message is, "Call me with any type of Engineered Safety question. I can directly help and get specific about what you require." The Engineered Safety Repository (ESR), (http://tiny.sandia.gov/zy5zb), is also now available online — a repository for Division Implementation Plans, decision documents, and safety cases.

Background basics — Sandia's Geothermal Research Dept. 6916 works on technology aimed at reducing the costs and risks associated with drilling in harsh, very severe subterranean environments. The aim is to significantly expand the nation's energy options for uses such as the generation of electricity. Sandia's primary focus has been on the development of improved drilling and completion technologies such as diagnostics while drilling, high-temperature electronics, advanced drill bit technologies, and wellbore integrity technologies to reduce and mitigate problems associated with loss of circulation. Dept. 6916's activity-level work is completed in the laboratory as well as through field testing of often heavy, bulky, potentially dangerous equipment.

Focus: Approach? Who was involved? — Several department projects, starting with early Engineered Safety pilot projects, have incorporated the Engineered Safety guidelines during planning and execution, purposefully involving experts from outside the immediate group to provide an engaged, fairly broad audience, says department manager Doug Blankenship. "Our approach involved many meetings and lots of rock throwing at what people were doing. Issues of single points of failure were identified and addressed in a robust way," he says.

SANDIA'S GEOTHERMAL RESEARCH DEPARTMENT, which develops improved drilling technologies for geothermal applications, is incorporating Engineered Safety guidelines during planning and execution of its work. (Photo by Randy Montoya)

What issues were solved? — One of the first projects to fall under the auspices of Engineered Safety was the installation and use of the dynamometer test station, (DTS) which is used to test motor torque output for high-temperature motors being developed in the department. As Doug explains, "We were testing downhole motor assemblies for drilling. Braking torque is part of one test to measure how much power is being output by the device — so a motor is connected to a flywheel on the dynamometer. We want to make sure if we have something stick in the system — a sudden stop of the system — we will not be sending material around the laboratory. The flywheel is an area of danger — it's a big piece of metal — and we don't want other things happening because it doesn't act right."

Doug says the flywheel sits on a rather complicated assembly, and the group wanted in this particular safety scenario to engineer a way for the flywheel to disengage from the drive rotor if the power levels exceeded a certain amount at a certain rate. They needed a way for the flywheel to disengage without harm to the rest of the system.

"We thought about that purposefully, and found that — rather than attaching the flywheel with metallic fasteners — appropriate-size nylon screws would shear at the power and stress levels needed to prevent any damage to the system from the flywheel," he says.

The main issues addressed included:

- Defining unacceptable outcomes and eliminating conditions that can lead to accidents
- Engineered controls to prevent over-torqueing the dynamometer (shear bolts on drive shaft)
- Locating equipment to prevent injuring/trapping personnel in the event of an accident
- More formal system definition than had previously been used
- Inclusive discussions with both technicians and staff regarding potential safety issues
- Independent assessment of the system that found shortcomings in securing equipment and hoses

Another project that incorporated Engineered Safety guidelines into planning and execution was the Auto Indexer Testing. The auto indexer is a high temperature motor being developed for use with percussive hammers. It is being tested at the Geothermal Test Range in Tech Area III. Issues addressed included:

- Defining unacceptable outcomes
- Ergonomic improvements (installed hoist to move heavy equipment)
- Ability to use break-out tongs using the hoist
- Minimizing tool movement and transport

Collaboration with the Pulsed Power group to support its Engineered Safety initiatives for a joint project included:

- Engineered Safety documentation and compliance
- Providing supporting documentation and analysis to show design margin

Benefits of Engineered Safety — Doug says the planning wasn't entirely different from what they do anyway, except that it was so explicit. The purposeful engagement in the safety design process — in an open and transparent forum — involved a broader audience than had previously been the case. "It has created more awareness of overall safety for many people in the department, including technologists, and that's a good thing," he says.

Engineer Jiann Su agrees, "The implementation of Engineered Safety has become a mindset rather than a process." He says the department is now more cognizant of potential failure modes and tries to address them early on without focusing simply on checklist compliance — there is more of an emphasis on a system view, involving independent assessment. "The principal investigator works with those involved in activity-level work to assess the safety concerns in the project. Engineering analysis and controls are an integral part of the overall project planning, and unacceptable outcomes are defined," he says. After planning is complete, an independent assessment of the system and process is made. And, manager approval is still required before work is allowed to proceed. He says, "Having an independent, impartial review of the system has been extremely beneficial in capturing potential weaknesses as well as possible safety concerns. There has also been more open dialogue regarding concerns among personnel involved in the activities."

Three Fellows

(Continued from page 1)

offer opportunities to help knit these together."

Jerry Simmons


JERRY SIMMONS

When Jerry Simmons was elected a Fellow of the American Physical Society in 2002, he was cited for experiments on the physics of low-temperature electron tunneling in never-before-seen double quantum-well transistor structures. But the Princeton electrical engineering PhD (whose adviser was 1998 physics Nobel laureate Dan Tsui) found himself as fascinated in creating his research program as in the work itself. "What was exciting was building the team that could grow quantum layers of semiconductor materials with very high purity and atomic layer precision, process them into nanoelectronic devices, and perform delicate electrical measurements at low temperatures," he says. "I hired a lot of people that work in that area; now Sandia has a world-leading program in quantum electronics."

The American Association for the Advancement of Science cited Jerry for his research and leadership in semiconductor lighting (AAAS Fellow, 2008). But again, he says, "Solid state lighting at Sandia has been a real team effort. My contribution was in having a vision." When his solid-state-lighting team was selected for an Laboratory Directed Research and Development Grand Challenge, he set about helping to raise the technology's visibility.

"When we started, solid state lighting was less efficient than incandescent bulbs. We advised Senator Bingaman's office of potentially enormous energy savings; he ended up authoring a national Next-Generation Lighting Initiative, which started a DOE research program on solid state lighting, which funded research and product development throughout the US."

The national push added to understanding of III-V LEDs [light-emitting devices that use compounds involving gallium and nitrogen rather than silicon], enabled more accurately controlled crystal growth, and showed industry how to save on costs. "Now LED lights are on the market," Jerry says.

As a Fellow, Jerry says he will look for science and technology ideas that meet several pressing needs of Sandia mission areas. He's now particularly interested in wide band gap power electronics, a smart technology that more efficiently converts electricity from one voltage to another. Advances in the technology would mean that any device using electricity would need less cooling, as well as lower weight, volume, complexity, and therefore expense. Such work could aid Army front lines, Navy magnetic catapult launches, airplanes, electric cars, telephones, televisions, power company electrical transformers, photovoltaics, and more.

"A Fellow has more freedom and time to build new technology programs," says Jerry. "What gets me excited is coming up with new ideas and turning them into reality."

Ed Cole

Ed Cole takes pride that his three daughters — now in their 20s — love going for week-long vacations each year with their mom and dad to the Outer Banks of North Carolina. That's the state in which Ed achieved his bachelor's, master's, and doctorate in solid-state physics. In his doctoral work at the University of North Carolina at Chapel Hill, he used non-destructive, low-energy electron beam techniques to analyze integrated circuits. This made it only a small jump for him to join Sandia's Failure Analysis Department in 1987, where he has improved and devised new nondestructive investigatory techniques to determine the presence and locality of nanometer-sized circuit failures in chips with hundreds of millions of circuits, trivializing any comparison to finding needles in haystacks.

Ramifications of these investigations impact today's technologies and change future products, he says, in both the military and commercial world. His work has helped determine reliability risks for components that haven't failed yet, and found "soft" defects of components that limit the performance of devices that otherwise would operate better.


ED COLE

Among his tools are electron and laser beam probes, the latter for optical and heating purposes. In one technique, he originated serially heating "floors" of vertically connected layers 0.2 microns thick with a tight beam to see if expanding the interconnects improves their performance; the result locates the flaw.

Two teams led by Ed have won R&D 100 awards in failure analysis. He has served on the executive and management committees of a variety of conferences and on the editorial board of several journals.

He has been a major contributor to the development of scanning electron and optical and microscopy techniques as well as light emission and atomic force microscopy applications. His 11 patents have been cited by more than 60 other patents and have generated approximately $1.6 million in royalties for Sandia.

Despite security limitations over much of the last decade — "I straddle two worlds," he says — he is the author of more than 25 journal articles and conference presentations in the area of integrated circuit reliability and failure analysis that collectively have been cited nearly 150 times in the international technical literature, and have won numerous "best" and "outstanding" paper awards. In November 2012 at the International Symposium on Testing and Failure Analysis, about 20 percent of the conference was based on techniques developed at Sandia and its industry partners to localize defects in integrated circuits.

As a Fellow, Ed expects to stay hands-on "but not to the extent I've been doing," he says. "As Fellow, your impact and sphere of influence are expected to grow and I will be pursuing this. If someone told me an IBM Fellow was coming, I would hold an expectation about that person's knowledge and influence. I expect the same to be true of the Sandia Fellows."

Sandia Fellows have made their mark

By Neal Singer


GUS SIMMONS

The title of Sandia Fellow is not a prize won but rather a position obtained, says Sandia VP Julia Phillips. Its rank is similar to that of director. It is awarded to those who have achieved national or international acclaim for their work.

Predecessors of the current appointees are Gus Simmons, Walt Herrmann, Wendell Weart, Gordon Osbourn, Jim Gosler, and Jeff Brinker. Until this week's appointments, Jeff was the sole remaining active Sandia Fellow.

The Fellow status was established in 1986 under then-Sandia President Irwin Welber. The intent, unchanged today, was to recognize a very limited number of technical staff who demonstrated pioneering contributions of exceptional breadth, depth, and creativity over the long term that impacted the technical mission of the Labs.


JIM GOSLER

Cryptographer Gus Simmons and Walt Herrmann, an expert in shock physics, were the first Fellows appointed. The title at that time was "Senior Fellow."

Irwin indicated that Gus would pursue four activities — continued research in nuclear weapons command and control, identify and catalyze new initiatives for Sandia, help with recruiting, and work with younger Sandia researchers (similar to the role of a university professor with students).

Walt was also appointed a Fellow. Because of the nature of his work, very little was published about his appointment at that time.

With Wendell Weart's appointment in 1997, the title changed to Sandia Fellow. Like the previously appointed Fellows, Wendell was expected to keep performing in his specialty area, serve as senior science advisor in Div. 6000, and also serve as a role model and mentor to younger Sandians.


WENDELL WEART

Gordon Osbourn, appointed in 2002, was the first Sandia Fellow to be appointed while an active researcher — the previous three had all been in management for several years prior to their appointments. Gordon, who had made an international stir with his work in strained-layer superlattices, was still mid-career. He was, like the others, expected to continue working in his areas of expertise, with little change in job responsibility except for outreach efforts and advising Large Staff.

At the time of Gordon's appointment, the *Lab News* summarized the responsibilities of Fellows:

"The obligations of Sandia Fellows are to demonstrate a continued and expanding high profile in the scientific community that brings respect to both the Sandia Fellow and Sandia; to lead Sandia in new technical directions; to mentor Sandia staff; to provide advice and consultation across Sandia on technical matters and special assignments of a technical nature; and to participate in Leadership Forums, Spring Mangers' Conferences, Directors' Quarterly Meetings, and so on. Furthermore, Sandia Fellows are expected to earn their salaries, as do all other members of the technical staff; i.e., they are not paid from overhead except for time spent in the types of meetings mentioned above and in other activities not related to technical projects."


JEFF BRINKER

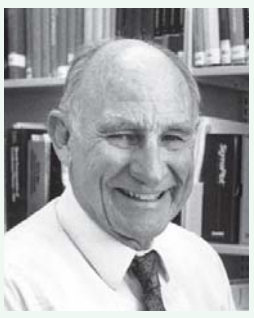
Requirements were described nearly identically in 2003, when Jim Gosler and Jeff Brinker were appointed Sandia Fellows. It was reiterated at that point that there is no regular scheduling of Fellow appointments, that there is no set number required or preferred, and that there is no set time for nominations.


GORDON OSBOURN

Wendell, at one time referred to as "the Sultan of Salt," developed an international reputation for advancing the scientific basis for geologic disposal of nuclear waste in salt beds. His focus changed from milliseconds to millennia when he moved from studying radioactivity in the fractions of seconds following a nuclear detonation, to leading the Waste Isolation Pilot Plant in Carlsbad, N.M., intended to contain radioactive material for thousands of years. He served as educator to elected representatives and the public about the process.

Jim is a widely recognized expert in areas of information security that are generally classified as "dark" areas.

Jeff is an internationally recognized expert in materials science, particularly in the area of sol-gel processing of ceramics and self-assembling nanostructures. Jeff, jointly employed as a Distinguished Professor at the University of New Mexico, is also a member of the National Academy of Engineering. He has trained or mentored a succession of Sandia staff members. Most recently, his team, working with the UNM Cancer Center, has developed engineered nanoparticles for targeted drug delivery that could be adapted for applications in both cancer and biodefense.


WALT HERRMANN

Gordon, a member of the National Academy of Engineering, stood against the beliefs of his era when he showed that layers of semiconductor materials with different-sized atomic lattices could strongly bond rather than fall apart. The so-called strained-layer superlattices he helped fabricate were essential in the development of highly efficient lasers. His later work used simulated protein self-assembly in an effort to design more error-free computer programs.

ROBOT RODEO

Story by Stephanie Hobby • Photos by Randy Montoya

It's a nightmare scenario: a dark arcade, lit only by the flashing lights of the game machines, resounding with the noisy clanging of bells and zinging of the pinball machines. Bomb techs are on the scene after being told of a potential explosive hidden somewhere in the arcade. Disconnecting the machines is not an option; techs have been told that would trigger the bomb. But the teams have an advantage. They are using a robot to search the vacated arcade, and team members intently watch a screen from a safe distance, directing the robot's every move in their quest to find and defuse the explosive device.

Fortunately, this situation is simulated, and no one is in any real danger. The teams came to Sandia for the five-day, annual Western National Robot Rodeo and Capability Exercise. The program, run by Sandia and Los Alamos National Laboratory, helps train bomb squads to use robots to put danger at a distance. This year, nine teams from across the country came to test their skills during the 10-event competition.

"Our goal is to provide an unmatched caliber of training. We want them to experience a variety of situations so they can be prepared when they're called upon to handle a dangerous situation," says Jake Deuel (6532), coordinator of the Robot Rodeo. "Year after year, we hear how much the participants gain from this experience, and many say it is among the most valuable training they've ever had."

This year, participants were asked to address a potentially dangerous backpack that had been thrown over a security fence, got tangled in wires, and was suspended in the air; remove a suspicious object from the trunk of a car without opening the trunk; and search a pedestrian walkway, bring medical supplies to the trapped and injured, and search for additional devices after the structure collapsed.

This year, Rodeo coordinators added an off-site scenario, taking participants to the bustling main branch of the US Post Office in Albuquerque. There, teams had to sort through packages in moving carts to find one that contained a potential explosive as well as work another scenario in an overhead gallery, operating in near pitch-black conditions.

Also new this year was a gruesome scene: Explosives had been detonated already, and bomb techs had to shift gears from defusing bombs to working with first responders while facing horrific carnage. Actors in convincing makeup added to the realism, and techs were keenly aware that something else could quickly go wrong.

"We always want to provide a variety of scenarios, and we never repeat from year to year," Jake says. "I think that's why so many teams return to compete again."

While the nature of the work is serious and participants are there primarily to train, the Rodeo inevitably becomes a lively competition. This year, the Kirtland Air Force Base Explosive Ordinance Disposal team took top honors while the Albuquerque Police Department and the New Jersey State Police took second and third. Other competitors included the Riverside County Sheriff's Office from California, Dona Ana County Sheriff's Office, Los Alamos Police Department, New Mexico State Police, Farmington Police Department, and members of the 62nd EOD Company from Ft. Carson, Colo.

The Robot Rodeo is free of charge for participants and allows up to 10 different teams to practice scenarios where a robot can be a life-saving tool. This is the seventh annual event, and Sandia hosts the competition every other year.

THE NEW JERSEY STATE POLICE remove a suspicious backpack from a tractor trailer during one of the 10 scenarios during the Robot Rodeo.

A ROBOT SEARCHES for a potential explosive device at a noisy arcade set up by the Robot Rodeo coordinators.

ALTHOUGH THE ROBOT RODEO is a lively competition, the mission is serious: to train bomb techs to use robots to "put danger at a distance."

DONA ANA COUNTY Sheriff's Office staff negotiate three robots during a field operations exercise.

THE ROBOT RODEO aims to provide law enforcement and military personnel with experience using a variety of robots.

ADDING TO THE REALISM were actors who played the role of bomb victims. In one scenario, a bomb had already detonated, and bomb techs had to quickly adapt to serve as first responders while securing the scene.

TEMPERATURES in excess of 100° F added to the challenges during the Robot Rodeo.

SWiFT — the DOE/Sandia Scaled Wind Farm Technology facility commissioned in Lubbock, Texas

Story by Stephanie Holinka • Photos by Lloyd Wilson

DOE, Sandia, and Texas Tech University hosted the commissioning of the DOE/Sandia Scaled Wind Farm Technology (SWiFT) facility on Tuesday, July 9, at the Reese Technology Center in Lubbock, Texas.

The event featured speakers from DOE's Wind Program, Vestas Wind Systems, Sandia, and Texas Tech University.

Speakers discussed the importance of increasing performance to reduce the cost of wind power. In addition, speakers addressed the SWiFT facility's objectives of reducing power losses and damage caused by turbine-turbine interaction, enhancing energy capture and damage-mitigation potential of advanced rotors, and improving the validity of aerodynamic, aero-elastic, and aero-acoustic simulations used to develop innovative technologies.

The SWiFT is the first public facility of its kind to use multiple wind turbines to measure how wind turbines interact with one another in a wind farm.

In a news release announcing the commissioning of the new facility, Assistant Secretary for Energy Efficiency and Renewable Energy David Danielson said, "The Energy Department's wind testing facilities, including the Scaled Wind Farm Technology site in Texas, support the continued growth of our nation's clean energy economy while helping to speed the deployment of next generation energy technologies and bring more clean, affordable, renewable power to American homes and businesses."

Jon White of Wind Energy Technologies Dept. 6121, technical lead for the project, says this is the first moderate-scale facility — allowing up to 10 wind turbines — specifically designed for the investigation, testing, and development of technology for wind plants.

"Some estimates show that 10 to 40 percent of wind energy production and revenue is lost due to complex wind plant interaction," he says.

Jon says the three-year process of bringing SWiFT online has been rewarding and challenging.

"It has been a phenomenal experience to work with a diverse team to complete the often underappreciated process of turbine construction. We also had a 1980s-era, smaller turbine rebuilt to perform analogously to a much larger machine," Jon says

The project was designed and built from the ground up.

"The project was a complete green-field construction so there was tremendous complexity in scheduling and managing all of the agreements and contracts to ensure access to the facility, verify there wouldn't be an adverse environmental impact, procure the equipment, and contract numerous specialized labor resources. We succeeded primarily because we have a dedicated and competent team and a steadfast DOE customer," Jon says.

Researchers have begun planning the site's first research projects.

Jon says the two primary research projects for the next year will be testing and evaluating Sandia's new National Rotor Testbed Project and collecting baseline data for turbine-turbine interaction that can be used by the international community to improve wind plant performance.

The National Rotor Testbed Project will provide a public, open-source complete rotor design that the wind energy community can work on collaboratively to bring the best technology to market as rapidly and cost-efficiently as possible, Jon says.

SWiFT will host both open-source and proprietary research as the result of a partnership among Sandia, Vestas, Texas Tech University's National Wind Institute at Reese Technology Center, and Group NIRE, a renewable energy development company.

Funding for the work comes from DOE's Office of Energy Efficiency and Renewable Energy.

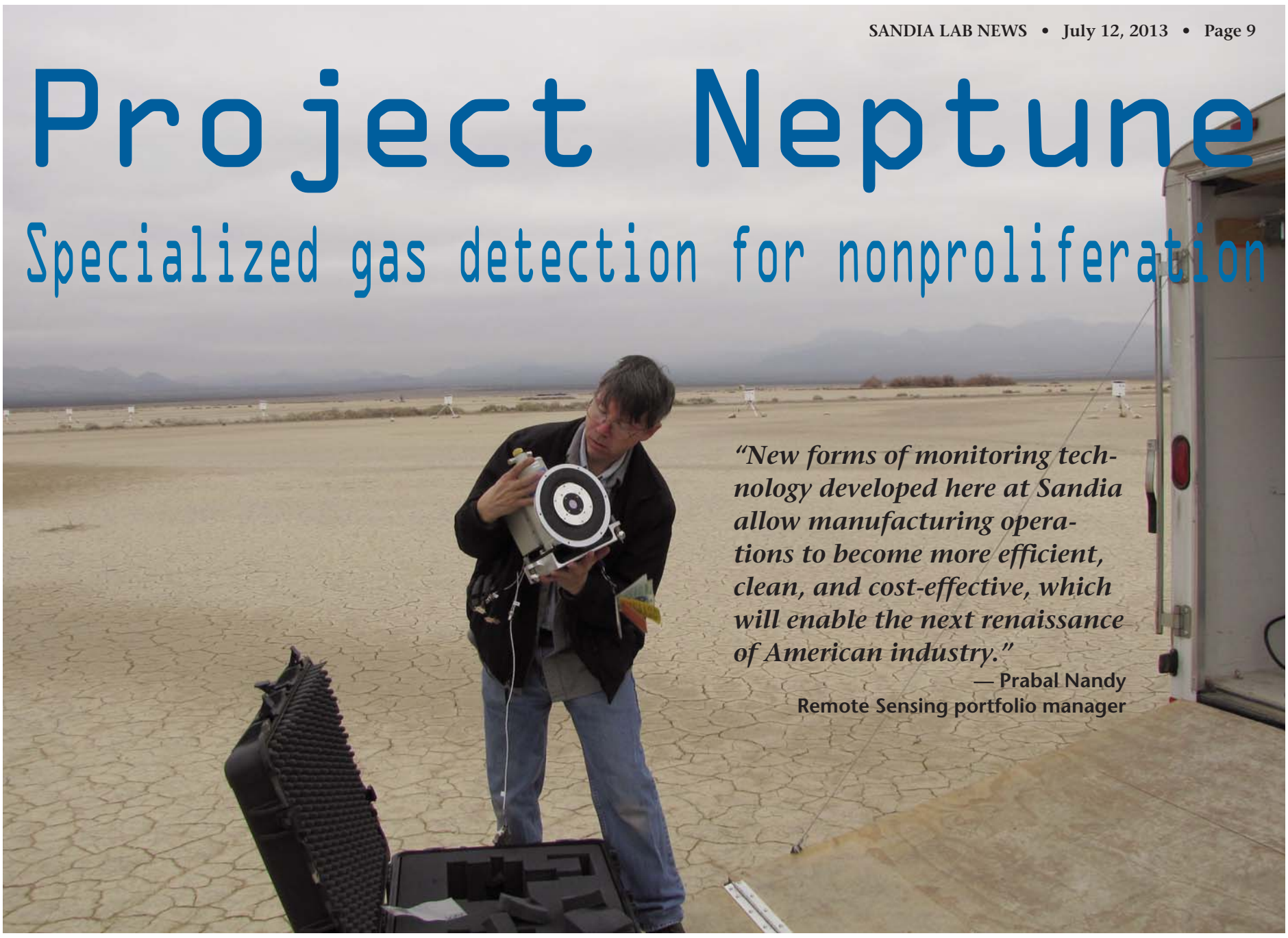
For more information on SWiFT, see previous news releases or visit the SWiFT website.

Sundown

Under construction

Project Neptune

Specialized gas detection for nonproliferation



"New forms of monitoring technology developed here at Sandia allow manufacturing operations to become more efficient, clean, and cost-effective, which will enable the next renaissance of American industry."

— Prabal Nandy
Remote Sensing portfolio manager

NEPTUNE TEST — Todd Embree (5717) inspects one of the Neptune sensor's two liquid-nitrogen-cooled cameras before field installation. Neptune underwent field testing in Nevada in December. (Photo by David Karelitz)

By Sue Major Holmes

Trying to sniff out traces of hard-to-detect gases can be like trying to hear a whisper at the other end of a very large, very crowded, very noisy room.

Sandia's Project Neptune aims to design a system capable of sensing, from among the loud signals of a lot of gases, the weak signals from specific gases that are signs of nuclear proliferation. The researchers believe their gas correlation technique will prove ideal for a simple, inexpensive sensor to monitor those few illusive gases.

"The hope is to detect gas early so there's evidence before a nation gets too far along in a proliferation program," says manager Jeff Mercier (5717), Neptune's principal investigator.

With about one photon out of every million coming from the signal the Neptune sensor is seeking, "it's a very, very hard problem," he says.

The goal is an imaging technique that could be used in airborne- or space-based systems, says Steve Vigil (5717), project team lead. The three-year project wrapped up in October but researchers continue to analyze data from a Dec. 17-20 test of the prototype Neptune gas correlation imaging system.

Field test gathers data

The test at the Nevada National Security Site piggybacked on a larger, separate test. The field test was calibrated, "so we knew where they were releasing things, what they were releasing, and when they were releasing it," Steve says.

While the sensor and software worked well, the test conditions were different from those the instrument was designed for. The team planned to capture an image of something about the size of a meter from half a kilometer away, but ended up trying to image something that was only about a centimeter in size, Steve says.

Neptune was funded under the Nuclear Fuel Cycle Remote Sensing portfolio of NNSA's Office of Proliferation Detection. A small Albuquerque business, CIC Photonics, which designs and produces analytical and industrial instrumentation and sampling systems, worked with Sandia to design and build Neptune's gas cells and did calibrated measurements of the cells.

Gas cells are the key. Sandia's instrument contains two, each weighing around 20 pounds, in a stainless steel box about 3 feet square by 16 inches high. A beam splitter separates sunlight coming in the sensor's window into two paths — one going to a cell filled with the gas sought and the second to a cell with a different gas.

Researchers are not saying what gases they want to detect, but Jeff says operators can identify whether the gas they're looking for is present by comparing signals on the two paths.

New twist on old technology

He calls the work "a newer, more capable twist on a proven scientific concept."

Gas correlation technology has been around for decades, but modern focal plane arrays, optical design, computer codes, and new materials made it practical for an imaging system, says Remote Sensing Portfolio manager Prabal Nandy (5717).

The team uses sunlight to calibrate the instrument, which must operate in the daytime since it measures absorption of specific wavelengths of sunlight.

The basement Opto-Mechanical Research Lab where the prototype was built and tested is equipped with a periscope-type mirror system called a heliostat. A 40-inch sun-tracking mirror mounted on a post outside the building directs sunlight down a concrete-lined shaft, and a mirror at the bottom of the shaft directs the sunlight into the lab.

Neptune detects signals in infrared rather than visual colors humans can see. An operator watches for indications of the selected gas on a computer screen that displays a processed image from the sensitive focal plane arrays.

Take, for example, emissions from a smokestack.

"If our gas is not coming out of the smokestack, we just see the smokestack. If our gas comes out, it looks like steam," Steve says. An operator also can gauge gas concentration, he says.

Neptune differs from other detection systems

Greenhouse gas monitoring uses similar technology, the researchers say. Steve says Neptune is different because it's ultimately aimed at detecting certain gases with a space-based system, "and that's not something that's commonly done."

Jeff says technologies that detect more common gases are not sensitive enough for the gases the team wants to find.

The portable prototype operates from Mission Science and Analysis Dept. 5717's Mobile Remote Sensing Laboratory, a 16-foot-long trailer modified for field testing operations. The front two-thirds houses a computer room; the back third houses remote sensing instruments the department deploys, including Neptune. Operators simply lower the 8-foot-high rear trailer door to use the sensor.

Since gas correlation can detect extremely low gas concentrations, Prabal also suggests it could fill an important niche: finding suspected leaks in large industrial facilities. Inspection teams could easily use an imaging gas correlation sensor since it has no moving mechanical parts, operates like a video camera, doesn't require costly computer post-processing, and is compact enough to be driven around a factory in a truck. It's designed to locate where specific gases originate, even if they're not present all the time, Prabal says.

A new way of monitoring

That could change how the nation thinks about monitoring, Prabal says. Instead of single-point measurements taken with expensive sensors deployed after someone suspects a problem, continuous monitoring could find leaks early, he says.

"Why not have 24/7 monitoring when the data is simple to interpret? You don't have to wait years for health effects or environmental damage before the source of a leak or release is known," he says. "Catching leaks in real time means that we can move away from a mode of punishing industry for accidents after the damage is done, and instead work with them to catch issues before they become problems. This means less damage to the environment, more efficient and profitable operations for the company, and a healthier environment for all.

"New forms of monitoring technology developed here at Sandia allow manufacturing operations to become more efficient, clean, and cost-effective, which will enable the next renaissance of American industry."

Sandia can take on such complex problems because of its ability to turn ideas into prototypes — in this case, from a scientific concept to a field demonstration in three years, Prabal says.

"That's what we bring to the table that's unique," he says. "The niche is not just in gas correlation, but in things that have never been done, ideas that have never been looked at this way, applications that have never used this technology."

Mileposts

New Mexico photos by Michelle Fleming
California photos by Dino Vournas


Richard Kottenstette
35 6823


Art Pontau
35 8360


Allyn Anderson
30 5946


Gregory Mann
30 5338

Recent Retiree

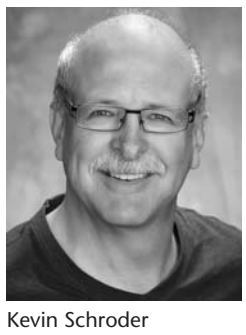

Joan Tallant
27 10656


Jeannette Moore
30 425


Diane Peebles
30 1526


Debbie Post
30 421


Ed Russick
30 1833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Marlene Elizabeth Uribe
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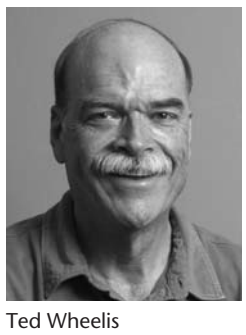
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Greg Wickstrom
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Tom Zarick
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David Denning
25 5737


Lisa Garcia
25 2662


James Heise
25 5747


Daniel Kettleborough
25 2726


Mark Mitchell
25 8949


Jeff Rienstra
25 5719


Sharon Del Prete
20 10621


Chris Forsythe
20 431


Cliff Ho
20 6123


Kurt Kunzler
20 2144


Lawrence Anderson
15 2956


Kelly Chavez
15 10657


Doug Ghormley
15 5636


Gary Grest
15 1131


Owen Henderson
15 2665


Wilbur Johnson
15 2144


Brian Mileshosky
15 5333


Alex Tappan
15 2554


Donna Young
15 5300

Sandia dedicates 13th Habitat for Humanity house; Irv and Lois Hall honored for visionary support

Employees, contractors, retirees, and their family members celebrated the completion of Sandia's 13th Habitat for Humanity House at the dedication ceremony on Saturday, June 29, at the build site, 6424 Trujillo Rd. SW. This year, Sandia partnered with a single mother, Zulema Hernandez, and her two sons, Joshua and Jonathan, to make their dream of owning a home a reality. In the photo at left, Neal DeLange, site supervisor for the Greater Albuquerque Habitat for Humanity, presents the family with the keys to their new home.

The house is a three-bedroom, two bathroom, LEED-certified construction, and Sandia and Lockheed Martin Corp. contributed $37,500, or about one-half the cost of materials. Contributions covering the remaining costs were generously donated by the Sandia Laboratory Federal Credit Union, Sandia employees, and Sandia retirees, also known as the SWAT (Special Work Assignment Team). More than 350 Sandia volunteers participated in every stage of the construction process.

In another Habitat development of special interest to Sandia, on Saturday, June 29, the Greater Albuquerque Habitat for Humanity established the Irv and Lois Hall Legacy Society in honor of Sandia retiree Irv Hall and his wife (pictured at right). The Society honored Irv and Lois as visionaries who have worked tirelessly for the good of Habitat partner families who wish to fulfill their dreams of owning a home of their own.

— Stephanie Hobby

Thinking small

A family crisis uncovers precise approach to solving problems

By Nancy Salem

There are times when emotions tangle with reason. For Thomas Hanson and his family, such a time came when his grandfather was fighting to stay alive.

"Everyone had a different perspective on how things were going and what needed to be done," Thomas (2613) says. "Everyone had different ideas on what the doctors meant and who was right. We all approached things from different angles, and emotions were running high."

Thomas was surprised at his response. When doctors talked in circles, he cut through the jargon and got answers. When overwhelmed by the situation, he found essential information in a mountain of words.

"My grandfather taught me that you can do anything you put your mind to."

— Thomas Hanson

"I would think, 'What are the doctors really trying to tell us? What does this mean?' I could hear the little details in what they were saying rather than get lost in my emotions," he says. "I listened in a critical manner.

"My work in the Nuclear Weapons group changed the way I think and deal with problems. I could see that. I realized it through the crisis with my grandfather. Working on technical issues changes the way a person thinks. It's fast-paced and you have to pick up on the details. You hold onto the technical part."

A difficult diagnosis

The story began on Christmas Eve of 2012 when 86-year-old Joe Rel fell in the driveway of his Las Cruces home at the end of an evening walk. Rel couldn't stand up, so he crawled into the house where his wife helped him into a chair. He had no mobility on his left side and feared he'd had a stroke.

"At the hospital the doctors found he had lymphoma and swelling on the brain that took away left-side mobility," Thomas says. "They started treating him right away."

The next few months were difficult as Rel did two rounds of chemotherapy and developed numerous infections. "He fought it the whole time," Thomas says. "His goal was to be out and about. It was tough for him to be lying in a bed in the hospital. He had some dark days when all he wanted was to go home. His family stayed close at hand to support and fight with him."

Rel had grown up on a farm in Las Cruces during the Depression. He joined the Navy at age 17 at the start of World War II and enlisted in the Army when his Navy tour ended. "He was a strong patriot," Thomas says.

Rel returned to Las Cruces and went to work for White Sands Missile Range as a mechanic, rising to head of the motor pool. "My grandfather taught me that you can do anything you put your mind to," Thomas says. "He didn't have a college degree. He had a very basic education but ended up being in charge of all the heavy equipment at White Sands."

Rel retired about 25 years ago and went back to his farming roots. He worked about 30 pecan trees in the Mesilla Valley and spent time with his two children, 10 grandchildren, and six great-grandchildren.

THOMAS HANSON (2613) takes a close look at materials in a Sandia lab. His work on the tiny parts of a stronglink has taught him to tackle a problem at its smallest point.
(Photo by Randy Montoya)

Kid in a candy store

Thomas earned bachelor's and master's degrees in mechanical engineering from New Mexico State University. He worked for five years at a NASA facility outside Las Cruces designing and building test systems for shuttle components.

LIKE GRANDFATHER, LIKE GRANDSON — Thomas Hanson (2613) and his grandfather Joe Rel shared a love of engineering. "He had a good life," Thomas says.
(Photo courtesy of Thomas Hanson)

He was hired at Sandia three years ago. "It had always been a dream of mine to be a Sandian," says Thomas, who works on stronglink design in Integrated Surety Mechanisms in the Nuclear Weapons organization.

"I'm like a kid in a candy store," Thomas says. "It's a perfect fit for my skills and interests."

The stronglink is to a nuclear weapon what the safety is to a gun. It keeps the weapon from firing by providing electrical isolation of the detonation system if an abnormal, or unplanned, environment or situation occurs. "No matter what happens, this is the first line of defense against the weapon going off," Thomas says. "It has to be able to withstand a plane crash, being buried in ice, started on fire, and struck by lightning all at the same time. The job is to preclude or isolate unintended energy that's capable of initiating the weapon's detonators. It's an energy barrier."

A stronglink is a small but complex metal box with unique parts. Thomas is on a team that does design, development, and troubleshooting so the component works and evolves. "It's very challenging but very fun," he says. "We take the prototype design and make it robust to all the necessary environments."

Thomas says working with something as small and complicated as a stronglink has taught him to shrink a problem to the simplest point possible and solve it from there. "You train yourself to take a box full of challenges and think about it at the small levels," he says. "Instead of getting overwhelmed by all the pieces, we focus on the little parts of the stronglink and make sure they work properly together. In the end the entire system works. When you solve the simple problems the big ones end up resolved."

He also learned that tough problems call for planning and teamwork. "Do you have a challenge? What's your plan to get through? Without a plan you're just wandering," Thomas says. "And you can't do it on your own. It takes a team. When you meet someone who thinks from an alternate point of view it might drive you a little crazy, but the best solutions come from different feedback and perspectives."

The final weeks

As Rel lay frustrated in the hospital, Thomas suggested that the family develop a plan to get him home by the end of February. "That helped his demeanor," Thomas says. "He had a goal to work toward and hope about what was ahead. Having a plan to work on really encouraged him."

The family brought him home and cared for him. "It was a huge responsibility for us. He's in our hands. We're his caretakers," Thomas says.

One day Rel was having trouble breathing and his wife panicked. Thomas remembered a conversation he'd had weeks before with ambulance techs who turned up Rel's oxygen when he was stressed during a transport. "In talking to them it made sense to adjust oxygen based on what the body needs," Thomas says.

Thomas got word to his grandmother to turn up Rel's oxygen. "Within a minute he was OK," Thomas says. "Critical thinking simplifies difficult situations. You pay attention to what people say and find places to apply it later. In every conversation I have at work I ask myself what I need to get out of it, what is my takeaway. It gives me perspective and direction. You have to grab onto the really important details."

Rel passed away at home in early March surrounded by his family. "He put up a fight," Thomas says. "It was a long process. He went from being fully mobile and self-sufficient to being unable to walk. He had a good life and wanted to keep living."

Thomas says he was glad he could help his family care for their grandfather by bringing clarity to some of the complicated issues and tough decisions they faced. "We were all tested," he says. "We learned ultimately that there's strength in having a good working group. We pooled our perspectives and in the end did the right things."