Bonnie Apodaca named Business Ops Div. 10000 VP and Chief Financial Officer

Bonnie Apodaca has been selected as VP of Business Operations Div. 10000 and Chief Financial Officer. Her appointment was effective May 11.

In announcing the appointment last week to members of the workforce, Sandia Deputy Director and Executive VP for Mission Support, Kim Sawyer said of Bonnie, “I am confident that her contributions will move Sandia forward, improve our business efficiencies, and ensure continued excellence in mission support.”

Bonnie brings a range of experience in multiple business areas. For the past four years, she has been director of Business Management Operations Center 10600. Previously, she was director of Supply Chain Management Center 10200. Bonnie’s first position as a director came with her appointment as director of Business Operations Div. 10000 and Chief Financial Officer. Her appointment was effective May 11.

It’s our way of doing business

By Chris Miller

Last month, two Sandia materials handlers inspected a shipment of 15,000-pound load-hogger tie downs—destined to secure high-risk hazardous materials during shipment—and found them to be counterfeit and of questionable quality.

In 2011, Division 6000 determined during a management assurance review that growing issues with procurement and reapplication in the Supply Chain Policy Area were impacting mission work and creating safety hazards. In 2009, a self-assessment in Sandia’s Explosives Technologies Group discovered that the material specifications provided to a vendor and used to fabricate a component was imprecisely worded and could lead to confusion. This assessment grew out of an issue discovered by the quality inspector during the acceptance process.

Each of these issues was discovered and corrected in the course of performing day-to-day job responsibilities. They are just three examples of how members of Sandia’s workforce routinely take steps to verify that work is meeting mission requirements. In today’s vernacular, this process is called “assurance.”

Ensuring optimal Labs performance

During his all-hands meeting with Sandia’s management in October 2011, President and Laboratories Director Paul Hommert described assurance as “the way we do business; it is what we do for ourselves to ensure optimal performance by the Labs.” He further explained that “our performance assurance system is just one piece of Sandia’s overall management system, and central to performance assurance is plan, do, check, act, which provides a rhythm and a framework for assurance implementation.”

Manager Susan Gardner (5342), who assisted Paul during his presentation, used the plan-do-check-act framework to describe how her department delivers and helps maintain 10 radians for a military customer. Those activities, she said, include extensive conversion.

Tales of courage

Students from public and private schools in the Albuquerque area were honored recently as 2012 Thunderbird Award winners for overcoming significant personal challenges on the path to high school graduation. See page 12.
That's that

Taos used to be a hum. Now it has a buzz. A good buzz. Last month, Smithsonian magazine ranked Taos No. 2 in its list of the 20 best small towns to live in, in June, 2012. My magazine cited Taos as one of the top places to retire, a great alternative to Arizona. In fact, Smart Money says New Mexico may very well be “the next Arizona.” (I think that’s supposed to be a good thing.)

After seeing that Smart Money item, I smacked myself for being: a) unaware about Taos in the national media lately, so to confirm that impression, I called Cathy Connally, director of Public Affairs and Tourism for the Town of Taos. I was right, Cathy, who was just as pleasant as she could be, sent me a list as long as my arm of all the media coverage where Taos has gotten some ink one, two, three, or another in just the past few months: Vogue (best mountain towns with culture), National Geographic (World’s 25 best ski towns). USA Today (10 happiest towns in the West and 10 great places to see animals in the wild). And the lists go on: Best honeymoon destination. Best historical towns you’ve never heard of. America’s prettiest towns.

If you’ve been to Taos, probably none of this surprises you. For a lot of us, a trip up to northern New Mexico — including, of course, Taos — is a must-do activity when we have out-of-town visitors. It’s a special place for sure, but I feel an extra-special affection for the town because my son was born there. As he’s grown up and set out on his own, he’s found that everyone he meets, people have heard of Taos. And whenever he mentions it, he’s always been told, “Oh, so your parents were hipsters, right?” Well, no. (Or at least not by the time he was born.) “Actually,” he explains, “my father worked for the chamber of commerce.”

For the record, I directed the Red River Chamber of Commerce in the late 1980s; Taos was the nearest hospital. I remember walking up to the clinic and looking around at the green blankets and seeing folks from a village with a 15-foot long house. My wife was in the backseat and her midwife, Tanya, was driving right behind us. At one point, Tanya flashed her lights and waved for me to stop. When I rolled down the window, she said, “Quit stopping at the stop signs!” Anyway, since then I’ve kept my own list: Best place to have a daughter: Albuquerque. Best place to have a son: Taos. Best place to raise them: New Mexico.

* * *

‘You’ve never heard of the Taos hum?’ it turns out that the same percentage of the adult population in Taos is wave was a very distinctive hum, which has been described as the sound of an idling diesel engine heard from afar. It got to be so pronounced that in 1993 Congress got involved and mandated a team of experts from several Sandia Labs and universities, including, of course, Taos — to investigate. As far as I can tell from a quick bit of web research, the phenomenon seems to be real, but the investigation was never able to definitively identify a cause.

How about some language fun? I guess I ought to put “fun” in quotes; when you’re in the food business, it’s no fun to get zinged for glaringly bad usage. In the case immediately at hand, former Lab News editor Bruce Hawkins nailed me fair and square. In a page one story last time, the word “miniscale” was used in a sentence talking about a toy to a tiny little hole in the shape of a mouse, or “the Hawk” as he was often called, jumped all over that one. The “correct” spelling, of course, is miniscule. I put “correct” in quotes because the Associated Press says that Hunnicut rioted last month. A lot of Americans found that everyone was expecting miniscale as a legitimate variant of miniscule. But I made my bed with AP and I have to sleep in it. So it was a mistake, but just a little one. A miniscule one, even.

Speaking of mistakes, the daily quotation on our Techweb homepage the other day really resonated with me. It was by the great Irish playwright George Bernard Shaw. “A life spent making mistakes is not only more honorable but more useful than a life spent doing nothing.” By that standard, I have lived a very honorable life, indeed. See you next time. — Bill Murphy (505-845-0845, MF 0165, wtmurphy@sandia.gov)

** Partnership program seeks small-business groups needing technical help **

By Nancy Salem

Ranchers in eastern New Mexico faced a vexing problem. Their cattle were living shorter lives, reproduction rates were down, and some calves weren’t surviving. Ranchers suspected poor water quality from deep underground wells, the area’s primary water supply, was harming livestock.

The ranchers formed a group and applied to the New Mexico Small Business Assistance (NMSBA) Program for technical help. They were paired with Sandia National Laboratories and Los Alamos national laboratories and the state of New Mexico — contractors scientists, engineers, and others with New Mexico small businesses to solve critical challenges and promote economic development.

KENNETH MCKENZIE of McKenzie Land and Livestock was among a group of eastern New Mexico ranchers who asked for New Mexico Small Business Assistance Program help to improve water quality that was harming livestock.

While individual businesses can apply for help throughout the year, group projects are considered once a year. The NMSBA is currently soliciting proposals for 2013 leveraged projects, which are small projects that fill small companies, and matching the funds, so they can receive up to $20,000 in total funding, depending on the number of companies involved and their locations.

The livestock project in Guadalupe and Hidalgo counties was among 10 honored by NMSBA at its annual Innovation Celebration on May 1. It turned out the ranchers — McKenzie Land and Livestock, Singleton Ranches, and Don Thompson Ranch — were right. Tests by Sandia’s Michael Schuhman and Brian Dwyer found an endemic bacterium that was releasing sulfur into the water.

The researchers found partners with expertise in water quality and improvement. Al Bird of Western Environmental Management Group studied the feasibility of installing ozone equipment at one of the 10 RO systems. And Joe Ortie of Sustainable Resources Inc. evaluated solar pumping systems to power RO in remote locations.

The new RO system is at work purifying ranch water. Ranchers expect to see results with this year’s calf crop that production rates were down, and some calves weren’t surviving. One rancher lost 20 head. The ranchers formed a group and applied to the New Mexico Small Business Assistance (NMSBA) Program for technical help. They were paired with Sandia National Laboratories and Los Alamos national laboratories and the state of New Mexico — contractors scientists, engineers, and others with New Mexico small businesses to solve critical challenges and promote economic development.

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Get connected with Sandia Plug

By Patti Koning

Nearly 10,000 people work at Sandia, and, like most large corporations, we are scattered geographically with people in Albuquerque, Livermore, Carlsbad, N.M., Nevada, Washington, D.C., and even a lucky few in Kauai, Hawaii. So outside of the people we see day to day and at formal meetings, how does this massive, diverse workforce share ideas, inspire one another, and ask and answer questions? The same way people across the globe connect — through social media.

Sandia Plug (http://plug.sandia.gov) is a pilot application to discover, rate, and chat about web content within Sandia. Modeled after popular sharing sites like Digg and Reddit, Plug lives on the Sandia Restricted Network (SRN) so users can share content without the risk of inadvertently exposing information to the outside world.

“We originally conceived of Plug as a tool to show current trends of what is important to the laboratory and a place to have informal conversations around topics of interest,” says Tracy Walker (8949). “For example, at an all-hands meeting, only a few voices are heard. Plug allows that discussion to continue online.”

The goal, says Joe Lewis (8944), Sandia’s chief web architect, was to create an internal bookmarking, linking, sharing, commenting, and ranking tool. “Users post links — internal or external — that are of interest to them,” he explains. “Other users can comment on and vote if the link is useful or not, known as ‘Plugging.’ This gives you a nice, clear picture of what people find compelling. As more people begin to use Plug, the results will become more interesting.”

Info doesn’t get buried

One of Plug’s newer features is Questions. Users can submit questions on any topic to the entire Plug community. Users also have the ability to “Plug” both questions and answers, driving the most useful content to the top of the page and keeping it there for as long as users rate it positively.

“We want people to know about Plug so they can start using and start enjoying it. It’s a fun way to share information and a fun way to work.”

— Joe Lewis

“The Q&A utility enables Sandians to submit questions and answer other queries, enriching the collaborative experience,” says Wendy Shaneyfelt (9537). “The expertise and interest areas that emerge from this Q&A content provide a rich data source where skill sets and competencies across the Labs can be discovered.” The Enterprise Analytics Competency project is using this Q&A data to supplement SAND report abstracts and MySite pages to characterize Sandia’s capabilities and knowledge areas.

People are using Plug in ways that the developers didn’t envision. “Some departments are using Plug specifically for their department. They want to share information, but they don’t want everyone swimming in email and they want to be able to retrieve the information in a central location,” says Joe.

Jill Micheau (8539) uses Plug to share notifications of federal funding opportunities. “I find when I send this information by email, it gets buried,” she says. “With Plug, this information is always easy to access.”

Using Plug eliminates the need to write an email — Jill just plugs what she finds and adds relevant tags. She asked all of the managers and business with whom she regularly interacts to subscribe to her Plug or to tags relevant to their programs. “I think it’s working,” she says. “The next step is for this community to add comments if they intend to respond to an opportunity so that others can join.”

Joe says he uses Plug to post links to articles, papers, and websites he thinks are of interest to the general Sandia populace. Craig Hokansons (8944) subscribes to the RSS feeds to get an overall view of what’s going on at Sandia via Plug.

Andrew Scholand (5741) believes collaborative knowledge repositories like Plug are both social and informative. While the informative value, as a repository of work-relevant resources, is fairly self-evident, he sees plenty of social value as well.

“Plug allows a ‘presentation of self’ — a curated collection of resources and responses that advertise ‘here’s who I am and what I’m interested in,’” he says. “The reciprocal of that self-presentation is that users can build up a mental model of clusters of expertise across the organization. In addition, Plug allows individuals to see the collective responses to those socio-technical identities. That acts both as reinforcement for some behaviors and also allows users to self-assess into virtual communities of practice, despite organizational or geographic boundaries.”

The developers are working on several improvements to make Plug more user-friendly and mobile-friendly. Another major goal, says Joe, is to build the user base. “We want people to know about Plug so they can start using and enjoying it. It’s a fun way to share information and a fun way to work,” he says.
Assurance is about mission success.

Assurance performance improvements have always been integrated into Sandia’s work. During Sandia’s early days, the Laboratories focused primarily on ensuring the safety, security, and reliability of weapons in the growing nuclear stockpile, safeguarding sensitive information, and ensuring the safety of the workforce. All of these labs required a painstaking attention to detail and quality seldom before attained. As Sandia expanded its work into other programmatic areas, our commitment to our customers remained the same: to provide exceptional service in the national interest.

Pat’s organization conducted a self-assessment as a way to understand where we are from a maturity perspective — to understand where we are from a maturity perspective and to establish a baseline to measure improvement. Sandia rated itself as “partially meets.” An independent review conducted by an NNSA team in November 2011 confirmed these results.

Sandia’s self-assessment was performed using a five-stage Assurance Maturity Model to evaluate Sandia’s overall assurance system. The five stages in the maturity model are described from lowest to highest levels as:

1) Ad hoc
2) Defined
3) Repeatable
4) Managed
5) Optimized

Sandia continues to make steady progress on its assurance journey, says Pat. The Laboratory Leadership Team is actively engaged in reaching a minimum of Stage 3 maturity, or “repeatable” level, across the Labs this fiscal year. As part of the journey, last year the Assurance Information System (AIS) was deployed for risk purposes and this year, as part of AIS, new tools for assessments and corrective actions purposes will become available.

Quarterly management reviews are evolving as one way to routinely assess program and operations performance, and to identify areas for improvement. Through these reviews, issues can be rated from one manage- ment level up to the next, potentially reaching the Executive Management Review meetings chaired by Paul. The management review process — within the context of the “check” portion of the plan-do-check-act cycle — is one way that Sandia manages mission performance through assessments "to ensure risks and viables are taken through the Lab and it continues to be green."

Corky Cormorran (25565), assigned to managing and assessing the assurance assessment for the Explosives Technologies Group, says the group values internal reviews and assessments, and the ability to learn and improve. They conduct between four and six risk-based assessments each year with an eye on identifying and correcting issues before they become problems. He says the assessment that found an issue with the material specification used to fabricate a component was performed to evaluate processes and to identify improvement opportunities.

"Managers now compete to have their program or activity assessed since they know it will make things better for everyone in the long run," Corky says.

Corky says a lean six sigma reaction would have been to blame the vendor for the issue with the material specification. But closer inspection showed that the process in question was on the vendor and Sandia were in need of improvement. "We could have done things to help the vendor, like provide more specific requirements," Corky says.

A never-ending journey

A common theme stressed by Paul, Pat, Roy, Dave, and Corky is that assurance is a never-ending journey, not an end-state. And, as with many journeys, there is a systematic approach to getting where you want to go. “The environment has changed, the bar has been raised, and it’s up to us to provide credible assurance to our employees, customers, suppliers, and stakeholders,” says Corky. "It’s just the right way of doing business."
Sandia research comes up with unique materials approach to provide temperature-stable circuits

S

Steve Dai (1832) jokes that his approach to creating materials whose properties won’t degenerate when temperatures swing is a lot like cooking — mixing ingredients and firing them together in an oven. Sandia filed a patent last September for a unique approach to an LTCC, ceramic-based, 3-D microelectronics circuits, such as those used in cell phones. The approach compensates for the effects of how something called the temperature coefficient of resonant frequency, which is one critical property of materials aimed at radio and microwave resonator frequency applications. The work was the subject of a two-year Early Career Laboratory Directed Research and Development (LDRD) project that wrapped up in March. The LDRD team focused on developing fundamental understanding of why certain materials behave as they do. That knowledge could help manufacturers design and build better products.

Steve, who spent 14 years with Motorola before joining the Labs in 2009, says Sandia was interested in the market have a temperature coefficient of resonant frequency in a range as wide as that between northern and southern Arizona in the summer and winter. That necessary caution wastes potential bandwidth to various uses — aviation, the military, cell phones. The approach compensates for the effects of how something called the temperature coefficient of resonant frequency, which is one critical property of materials aimed at radio and microwave resonator frequency applications. The work was the subject of a two-year Early Career Laboratory Directed Research and Development (LDRD) project that wrapped up in March. The LDRD team focused on developing fundamental understanding of why certain materials behave as they do. That knowledge could help manufacturers design and build better products.

Steve, who spent 14 years with Motorola before joining the Labs in 2009, says Sandia was interested in the research for its own programs, but the work also has potential commercial applications. He says, however, no exact projects have been pinpointed.

“Steve’s research achieved a near-zero temperature coefficient of resonant frequency,” he says. “We have to demonstrate that it’s practical to analyze what happens when materials with different properties are placed together, and what happens if you change their order in the stacked layers or the dimensions of one material versus another. “We study all these different facets, the placement of materials, the theory, the practice.”

Another advantage: Manufacturers could eliminate additional mechanical and electrical circuits now built into a device to compensate for temperature variations, he says. That would reduce costs.

One basic challenge of the project was choosing different materials that don’t fall apart when co-fired together. Steve says. Glass ceramic materials used are both fragile and rigid, but they’re also very solid with minimal porosity. Researchers experimented with different materials, changing a parameter, adjusting the composition, and seeing what worked compatibly.

“It’s in a sense like cooking, you mix all these things together — it’s cooking. You have these ingredients, certain things you do in certain ways, just making sure it works together. Even the equipment is very similar; we have furnaces, ovens, etc. . . . Each step is very much like making bread or something,” he says. Steve had to consider both physical and chemical compatibility. Physical compatibility means that as materials shrink when they’re fired, they shrink in the same way so they don’t warp or buckle. Chemical compatibility means each material retains its unique properties rather than diffusing into the whole.

Looked at variables to boost performance

The LDRD created a new set of materials to solve the problem of resonant frequency drift but also developed “more of an understanding of why this works this way,” Steve says. “Why select material A and not B, what’s the rationale? Once you have A in place, what’s the behavior when you make a formula definition, a composition change, do little things?”

Researchers looked at variables to boost performance. For example, the functional material within the composite carries the electrical signal, he says. Sandia researchers experimented with placing that material in different areas within the composite until they came up with what worked best and understood why.

“That’s really important, the why,” Steve says. The team also constructed a computational model to analyze what happens when materials with different properties are placed together, and what happens if you change their order in the stacked layers or the dimensions of one material versus another. “We study all these different facets, the placement of materials, the theory, the practice.”

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More than 1,100 people turned out for Sandia/California’s Friends and Family Day on Saturday, April 28. Only about one-quarter of that total were members of the workforce; the rest were spouses, children (even one two-day-old infant), siblings, parents, and friends.

“I want to thank all of the guests who attended Family Day,” says Div. 8000 VP Rick Stulen. “The sacrifices they make allow staff the creativity and flexibility to solve some of our nation’s toughest problems. We know we can be difficult when we’re close to a breakthrough but we really couldn’t serve our country and achieve our national security mission without their support.”

Family Day was an opportunity for many friends and family members to see their loved ones’ workspaces and gain some insight into how they spend their workdays. “I enjoyed seeing the young children watching in amazement as their moms and dads described what they did in their labs and offices across the site,” says Robert Mariano (8005), deputy to Rick and executive champion of Family Day.

“One image burned into my heart is of all the families walking from the parking lot to join the Family Day celebration. I saw many moms and dads walking with young children in their arms and their older children walking hand in hand,” he adds. “I’m especially proud that we were able to include foreign nationals in this very special day.” Both Robert and Rick volunteered as escorts for non-US citizens and their guests.

The site was filled with engaging activities, including family science exploration, a martial arts demonstration by Aaron Cummings, cyclone fitness classes, the FBI Crime Scene Truck and a fingerprinting demonstration, and a workshop on Scratch, a programming language aimed at children.

Attendees toured the optical engine lab, scanned probe microscopy lab, and hydrogen effects on materials lab and discovered “a million computers in a box”— lightweight and low-memory virtual machines as well as scalable management software to emulate large-scale networks and computers.

On display was a new discovery made recently at Sandia — survival supplies for nuclear fallout preparedness. Recent core drilling for new networks uncovered the supplies, which had been sealed for 50 years in a fallout shelter below Bldg. 912. The display was accompanied by radio and music spots of the time.

“Judging by the smiles on everyone’s faces throughout the day, the event was a huge success. That is due, in part, to the efforts of many people who helped organize the event, led lab tours, and gave demonstrations,” says Stephanie Beasley (8521), Sandia/California community relations officer and Family Day project manager. “Family Day demonstrated the caliber of Sandia’s capabilities and our diverse mission.”

Special thanks to the Family Day Committee and everyone who helped make the event a resounding success: Herman Armijo (8516), Dennis Baker (8511), Stephanie Beasley (8521), Nick Charnichko (8511), Jamie McLeod (8511), Morgan Edwinson (6527), Laurie Farren (85151-1), Carol James (8511), Barbara Larson (8516), Jessica Matte (8522), Dorrance McLean (8537), John Paulson (21), Lisa Corcoran (8533), and Robert Mariano (8005).
Justin Fritz, guest of Joseph Sloss (8353), tries on an FBI bulletproof vest.

Kevin Young (8961) and his wife, Michelle, check out one engine among the many in the Combustion Research Facility.

Aron Cummings (8656) and Nate Gleason (8101), on ground, give a thrilling martial arts demonstration.

Nes Pinar, wife of Ali Pinar (8954), shows their son Eren how to skewer a balloon without popping it, one of the family science exploration activities.

Ray Friddle (8252), holding his two-year-old daughter, Lily, explains microscopic cantilevers used for Atomic Force Microscopy.

In the hydrogen effects on materials lab, Heather Jackson (8252) explains how scientists measure the fracture toughness of metals (resistance to cracking) when they are exposed to hydrogen gas, such as for containing or transporting high-pressure gas.

Rick Stulen (8000) and his grandchildren, Grace and Lucas, enjoy the day.

Tom Felter (8252) strolls with guests as they enjoy the spring weather while attending Friends and Family Day.

Ken Lee (8252) gives a demonstration on hydrogen effects on materials.

Alf Morales (8131) and his family peruse the activities offered on Friends and Family Day.
A Sandia modeling study contradicts a long-standing belief among geologists that pore sizes and chemical compositions are uniform throughout a given strata. Work better understanding the spatial variation of pore sizes and their spatial patterns in horizontal slices of sedimentary rock is essential to fully utilize underground oil reservoirs and water aquifers. It would also aid in evaluating potential carbon storage sites, and in assessing isolation of nuclear waste disposal, and reveal important information about Earth’s geological changes.

The work may help trounce an earlier belief held by geologists that each layer of sedimentary rock, deposited over eons, is more or less homogenous in porosity and composition. Thus a single core sample obtained from a given depth was thought to chemically represent its layer. But Budd’s findings showed that horizontal variations within a sedimentary rock layer could be quite significant — in some cases, as large as vertical variations. This would affect not only the amount of fluid stored or percolating through a rock but the amount of pressure needed to shoot Liquids to Earth’s surface. But no one knew why these variations occurred and at what magnitude. The problem has always been, says Budd, how to extend horizontally the knowledge gained from vertical bore holes that may be 1,300 feet apart.

To date, the model developed by Yifeng is not large enough in scope to derive equations meaningful to an entire reservoir — a process called upscaling. Still, he says, “Part of the predicted heterogeneity can be captured by a high-performance computer model, for example, using very fine spatial grids. Another way to capture this variability is to use statistical analysis.”

Could overturn long-held models

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The remarkable thing is that the model predictions match very well with many seemingly uncorrelated observations. The model predictions not only match the observed porosity patterns, but also match very well with chemical and isotopic signatures. This is the power of mathematical modeling, Yifeng says.

## Could overturn long-held models

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Yifeng is lead author of a paper published recently in Nature Communications that offers new insights into pore size and distribution in horizontal slices of sedimentary rock. (Photo by Randy Montoya)

Yifeng Wang Examines a sedimentary outcrop in Tijeras Canyon. Yifeng is lead author of a paper published recently in Nature Communications that offers new insights into pore size and distribution in horizontal slices of sedimentary rock. (Photo by Randy Montoya)

## What I found at Reutilization: RF amplifier

By Sue Major Holmes

**Note:** This is one of an occasional series of articles about machine dismantlement, and equipment now at Reutilization and Disposition that have been part of Sandia’s history. If you see something intriguing you’d like to know about at Realization — and it has an asset number that might be traceable — contact Sue Holmes at Media Relations & Communications, 505-844-6362.

Leonard Martinez (1653) peers through a missing vent at the large twist-lock connector on an RF amplifier now at Reutilization and Disposition. Such machines have been used at Sandia since the 1970s in electromagnetic environment tests — this particular one at the Electromagnetic Environment Simulator (EMES).

The machine was sent to Reutilization last July. At that time, Leonard verified the capacitors had bleeder electronics inside to malfunction. Inside the pulse modulator are two sets of 15 capacitors, each labeled in red — as is the outside of the machine — “High Voltage.”

The boxy machine also has a large blue commercial twist-lock connector so it can’t be unplugged by accident. The plug is more than oversize. It’s as large as a fist and heavy enough to make holding it up for a photograph a chore. The black AC power cord it’s connected to, now coiled around a galvanized metal vent at the top of the machine that was used to exhaust heat generated by the amplifier, is slightly thicker than a garden hose.

“Just this plugs into the wall, this is AC power,” Leonard explains to an audience who can clearly see that the plug would never fit into regular a household wall plug.

When Sandia’s Electromagnetic Effects Department upgraded its amplifier suite several years ago, EMES received a more modern amplifier with a higher power level, and the model PM1001 became obsolete.

“So this system here generated or amplified the RF input signal to a power level of 2,000 watts, compared to the newer amplifier’s power level of up to 5,000 watts,” Leonard says.

The machine was sent to Reutilization last July. At that time, Leonard verified the capacitors had bleeder resistors installed across their leads — standard practice to prevent any voltage from building up on them and possibly posing a personnel safety hazard. Leonard pats the machine on its pallet at Reutilization. “We kept this for a while as a spare until we felt comfortable with the new system.”

By Neal Singer

A Sandia modeling study contradicts a long-standing belief among geologists that pore sizes and chemical compositions are uniform throughout a given strata. Work better understanding the spatial variation of pore sizes and their spatial patterns in horizontal slices of sedimentary rock is essential to fully utilize underground oil reservoirs and water aquifers. It would also aid in evaluating potential carbon storage sites, and in assessing isolation of nuclear waste disposal.

“I think our paper for the first time provides a reasonable explanation for the origin of disparate patterns,” says Yifeng Wang (6222). “We also found we could predict the variations in pores as well as the heterogeneity of a reservoir.”

The analysis, published Feb. 21 in Nature Communications, was able to match the field observations published in 2006 by second author David Budd, professor of geological science at the University of Colorado at Boulder.

“At the 2010 annual meeting of the Geochemical Society, at a session chaired and assembled by Yifeng,” says Budd, “he recognized that the data I showed could be explained by stress-induced chemical waves. He subsequently developed the nomenclature, toolkit to test his idea. Then we used the 2006 data set to demonstrate the correspondence between his model’s outcomes and the field data.

A chemical wave in this context relies upon mineral dissolution and precipitation, powered by geologic stress, to penetrate material, just as an ocean wave powered by the moon’s gravitational pull rides up on a beach. Ocean waves shift sand; chemical waves act to modify the spatial distribution of rock porosity.

As Yifeng puts it, a chemical wave is “like water rippling. The concentration of a chemical species varies periodically in space (a standing wave) or sometimes such variations propagate through space (a travelling wave).

“The one unique property of these chemical waves is that no one had thought to look for chemical waves in strata. This one occurred on the scale of meters to tens of meters and propagated between a hundred to a thousand years.” Chemical waves are usually observed on much smaller scales in laboratories.

Using the chemical wave concept and well-understood equations for material stresses, Yifeng formulated a mathematical model.

Yifeng Wang Examines a sedimentary outcrop in Tijeras Canyon. Yifeng is lead author of a paper published recently in Nature Communications that offers new insights into pore size and distribution in horizontal slices of sedimentary rock. (Photo by Randy Montoya)
Strategic Target System (STARS), and the Tactical Mis-
Energetic Reentry Vehicle Experiment (SWERVE), the 
from a foundation of work on projects from as long as 
David says. 
conventional military response time significantly, 
flight was launched from Sandia’s Kauai Test Facility. 
The test 
opment for the glide body was the responsibility of the 
USASMDC/ARSTRAT. Thermal protection system devel-
ment's Prompt Global Strike Program.
flight tests conducted as part of the Defense Depart-
tem; and the first time a glide vehicle flew at hyper-
Dynetics Corp.) were used to stabilize a US missile sys-
fins (designed by Sandia and Huntsville, Ala.-based 
edge of the Earth's atmosphere; the first time eight grid 
low-altitude, long-range horizontal flight path at the 
the first time a Sandia-developed booster had flown a 
vehicle's condition as it reached certain milestones. 
jected digital animation driven by the actual data coming 
the test in Kauai. Eric Schindwolf, deputy director of 
control needed to prevent the missile from tumbling,” 
Eric says.

A flight of many firsts
About 50 Sandia employees, including Defense Sys-
tems & Assessments Div. 5000 VP Jeff Isaacson, viewed 
the test in Kauai. Eric Schindwolf, deputy director of 
Stoke and Aerospace Systems 5420, says large screens pro-
jected digital animation driven by the actual data coming from 
the AHW in real-time along with displays of the 
vehicle's condition as it reached certain milestones.

The historic flight had many firsts, David says. It was 
the first time a Sandia-developed booster had flown a 
low-altitude, long-range horizontal flight path at the 
edge of the Earth's atmosphere; the first time eight grid 
fins (designed by Sandia and Huntsville, Ala.-based 
Dynetics Corp.) were used to stabilize a US missile sys-

At a team celebration after the mission, Jeff told the 
attendees, “This success could not have been achieved 
without exceptional teamwork, which was evident to 
anyone in the Launch Operations Building that night.” 
Sandia President and Labs Director Paul Hommert, 
who says he couldn’t have been more proud to be a 
Sandian as he listened to the test from Washington, 
D.C., wrote: “Once again today our Laboratory ren-
dered exceptional service in the national interest. For 
your dedication, excellence, and professionalism thank 
you and congratulations!”

Eric shared the general scope of Sandia's work on the 
AHW. The technical challenges that faced Sandia were 
aerodynamic stability, aerodynamic heating, and con-
trol of the missile and glide vehicle, he says. 
Typically, boosters fly missiles to heights of millions of 
feet above Earth, but the AHW flew only to a peak of 
hundreds of thousands of feet above the Earth's surface, 
before descending to a lower altitude for the remainder 
of the flight. The modified STARS booster, which was 
about 40 feet long and 54 inches in diameter, powered 
maneuvers that had been done before, Eric says.

The lower a missile flies in the atmosphere, the more 
it tends to tumble end over end, he says, so Sandia 
helped develop the eight grid fins to improve stability, 
which had never been used before on a US missile. 
Eric says Sandia’s researchers did not want to risk 
having the fins interact with the missile exhaust near 
the ground, so four opened right after clearing the 
launch tower and four more deployed when the first 
stage burned out nearly 60 seconds later.

“They provided the margins of aerostability and 
control needed to prevent the missile from tumbling,” 
Eric says.

‘String of pearls’
Because the 2,485-mile (4,000-kilometer) flight from 
Kauai to the Army’s Reagan Test Site on the Kwajalein 
Atoll was so low, the curvature of the Earth prevented 
continuous monitoring from the takeoff and landing 
sites alone, he says.

Space, air, sea, and ground platforms collected vehi-
cle performance data during all phases of the flight, 
according to a Pentagon news release. The Sandia 
booster and glide vehicle transmitted data to this net-
work, called the “string of pearls,” Eric says. 
Sandia also led the design and development of the 
glide vehicle, including improved navigation, guidance, 
and control technologies and teaming with AMRDEC 
to use advanced thermal protection materials to protect 
it on the long flight in the atmosphere.

Sandia researchers also successfully designed and 
tested the Flight Termination System for the AHW. 
This system protects public safety by destroying the 
vehicle if it should fly off-course during a test flight, he says.

The test's objective was to collect data on the tech-
ologies and test range performance for long-range 
atmospheric flight. The mission emphasized aerody-
namics; navigation, guidance, and control; and ther-
mal-protection technologies, according to the Pentagon 
news release.

Eric says Sandia employees are analyzing the data from 
the test flight, which will be used by DoD to model and 
develop future hypersonic boost-glide capabilities.

“This was only a very first demonstration,” Eric says. 
“This is not a weapon by any stretch of the imagination. 
There’s quite a bit of work that needs to be done.”

David says the information gathered also will be 
used to validate Sandia’s computational models so they 
can be used with more confidence in the future.

David had nothing but praise for the people who 
spent nights, weekends, and many long hours working 
at KTI and the Labs.

“All the credit for the success of this effort goes to 
the team and its tremendous commitment and dedica-
tion that produced these extraordinary accomplish-
ments that enhance our country’s national security,” 
he says.
Researcher John Dillinger explains the Sandia-developed hexagonal actuator controller, which automates the repetitive process of opening and closing doors on cargo containers during tests of security systems. The system was one of several related technologies on display during the recent Cargo Security Demonstrations at the Defense Threat Reduction Agency’s Technical Evaluation Assessment Monitor Site at Sandia. The technologies are intended for securing shipments bound for the US that originate in Canada or Mexico.

The demonstration was part of the Department of Homeland Security’s Secure Transit Corridors (STC) program, developed in partnership with US Customs and Border Protection (CBP) and private industry.

The STC system uses an electronic chain of custody (ECoC) device to secure the doors of trucks and rail cars, instead of the bolt seals currently in use. The reusable ECoC records its route using GPS as well as monitoring and recording door openings. Data will be securely transmitted through an integrated system for analysis during the year-long demonstration, tracking methods on how cross-border shipping may be expedited through new technology.

(Photo by Randy Montoya)
Welcome to the Logistics Communications Network

Digital signage brings info straight to the workplace

By Jeff Young (10265)

It’s June 2011, and my senior manager, Roy Fitzgerald asks me if I am interested in working on a new project. Of course, when your senior asks you to do something, the word “no” should never be in your vocabulary. So as expected, I was happy to work on it. The next thing I know, I’m on a flight to Los Angeles to attend a training session on the cutting edge technology of digital signage.

If you are still drawing a blank, digital signage (also known as the fifth screen) is a form of electronic display that can show television programming, menus, information, advertising, and other forms of communication. Embraced by marketers and retailers, it can found in a wide variety of public and private environments.

Although we have all types of technology to communicate, digital signage goes where no other technology has gone. It can be seen in airports showing arrival and departure times, fast food restaurants as menus, billboards along freeways, and inside retail stores promoting products.

The idea behind digital signage in the corporate realm is to fit a need for communications in areas where employees can’t be reached. In Logistics, a large number of our employees work in shops, warehouses, and receiving docks. Digital signage allows communication in the area where they work. We expect digital signage will become a part of their work through integration.

Logistics has 11 devices strategically placed throughout its operations, all controlled from a central location. The technology streams content to monitors at each of the locations. Monitors are located in breakrooms, warehouses, and other places where they are likely to be viewed by Logistics employees. The devices are loaded with "projects" that consist of a variety of videos, news and weather feeds, metrics presentations, safety information, motivational material, and urgent messages. Each project is created using a radio-type format and the program schedule for the project is displayed at the beginning of each day.

One unique characteristic of the Logistics digital signage is the use of a safety status indicator. We review the latest data showing recordable injuries for our center. Based on that review, our status indicates RED or GREEN, informing Logistics employees of any recordable injuries in the last 30 days.

Recently, digital signage went Labs-wide as the Logistics Communications Network. With the help of Steve Wenrich (8947) of Corporate Web Design and Wendy Shelton (10691) of Communications, we are now able to stream one of the devices to the entire Laboratory. Although content development for the customers is still in its infancy, customers will likely find instructions for how to do business with Logistics, live news and weather feeds, and be able to view various safety and motivational videos. It’s also possible that customers will be able to view images of items available in Reapplication, vehicles and carts available from the loan pool, and have access to metrics data in Logistics.

Other applications of the Logistics Communication Network are likely.

Although the Logistics Communications Network is in the early stages of development, we expect that applications for the fifth screen to be limited only by imagination.

If you have questions or comments about the Logistics Communications Network, feel free to contact me at jtyoung@sandia.gov. To view the Logistics Communications Network stream on your desktop, see the Logistics Operations Homepage. Click on the "Logistics Communications Network" link at the lower right of the screen and follow instructions.
Katy Flaming and Nick Hines are typical high school seniors. They have good friends. They love sports. They’re active and engaged in the community. They dream about the future.

But Katy and Nick are different, too. They’ve had more than their fair share of dark days. Katy has been homeless on and off since age 13. Nick and his twin brother were born two months prematurely, and a lack of oxygen for Nick resulted in cerebral palsy.

But they persevered and are graduating this month, Katy from Belen High School and Nick from Sandia High School. Katy is headed to the University of New Mexico and Nick to the University of Northwestern Ohio with smiles on their faces and help from Sandia and Lockheed Martin. They are among the 2012 Thunderbird Award winners who received $1,500 in recognition of their exceptional ability to overcome significant personal challenges on the path to high school graduation.

“Each of you is a hero,” Jerry McDowell, deputy Labs director and executive VP for National Security Programs, told the 21 honorees at the 18th annual awards ceremony earlier this month. As a Thunderbird winner, you exemplify the triumph of the human spirit over adversity. Each of you has something special that enabled you to overcome the obstacles in your lives. For others who find themselves in tough situations, each of you is a role model.”

‘An inspiration to every person here’

No one in the audience was untouched by the stories of courage. There was Michael, abandoned by his parents shortly after birth and raised by his grandmother. Yalda fled Afghanistan with her mother and siblings when her father was taken prisoner by the Taliban. He remains missing. Celina overcame heart surgery and severe bullying. Michael is a cancer survivor. Jamie excelled while battling cystic fibrosis. Adela was a target of violence. Luis has been in and out of foster care and attended six different high schools.

“You are an inspiration to every person here,” Jerry told the honorees. Each of the students is headed to college with a career goal. Majors range from music to engineering — Katy Flaming

Every penny of the money is so helpful. When an opportunity like this comes along the benefit is immeasurable. I can’t thank Sandia and Lockheed Martin enough.” — Katy Flaming

grandfather is legendary Albuquerque Academy basketball coach Vince Cordova. Nick hasn’t let cerebral palsy, or 13 surgeries, keep him from doing the things he loves. “I don’t look at myself as limited,” he says. “I have to work harder at everything. But if anyone else can do it, so can I.”

He says his condition sometimes gets him down. “But I never use it as an excuse not to be able to accomplish something,” he says. “There are people much worse off than I am. I have an excellent family support system, and great people have come into my life.”

‘Proud to invest’ in exceptional students

Katy, Nick, and the other recipients all said they are excited about college and grateful to Sandia and Lockheed Martin for the Thunderbird Award.

“I visited my school a couple of weeks ago and was like a kid in a candy store,” Nick says. “I’ll live on campus, and the award will help immensely.” Katy says she will be responsible for making ends meet while at UNM. “Every penny of the money is so helpful,” she says. “When an opportunity like this comes along the benefit is immeasurable. I can’t thank Sandia and Lockheed Martin enough.”

Jerry says Sandia is proud to invest in the educational future of these “exceptional young men and women.”

“We wish you the greatest success in your lives,” he said.

Tales of courage
Sandia award helps students who conquered adversity

By Nancy Salem

SANDIA VP JERRY MCDOWELL, center, stands with the winners of the 2012 Thunderbird Award recognizing students who overcame hardship on the road to a high school diploma. "Each of you is a hero," Jerry told the young honorees.

SANDIA LAB NEWS • May 18, 2012 • Page 12