When seconds count

ER doc, Sandia engineer join forces on stronger trauma shears

By Nancy Salem

Albuquerque physician Scott Forman was on duty in the University of New Mexico Hospital (UNMH) emergency room when the victim of a serious traffic accident was wheeled in. The ER erupted in activity and staff scrambled, frantically looking for trauma shears to remove the patient's clothing. Forman calmly unclipped a pair from his belt and started cutting.

"It was the strangest thing. Everyone just stopped," Forman says. "A paramedic looked across at me, grabbed my hand and said, 'Where did you get those shears?' I said I made them."

A half dozen people in the ER that day in 2008 placed orders for Forman's shears. "I knew then that I needed to go into business," he says.

Forman later teamed with a Sandia engineer to improve his trauma shears design so emergency personnel can more quickly get to the injuries they need to treat.

(Continued on page 4)

MAKING THE CUT — Sandia researcher Mark Reece, right, and Albuquerque emergency room physician Scott Forman examine trauma shears developed for Forman's company, Hé ros, under a New Mexico Small Business Assistance Program project. (Photo by Randy Montoya)

Louis Nogales marks 50 years at Labs

Louis Nogales walked away from a promising management opportunity with Piggly Wiggly to take a job at Sandia. Fifty years later, he's still going strong. Read about his remarkable Sandia career in a story on **page 8.**

Sandia LabNews

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Sandia National Laboratories

Sound management strategies benefit employee pension, health care programs

By Chris Miller

Health care costs nationwide have risen about 22 percent over the past three years. Over the same period, health care costs at Sandia decreased about 5 percent and are only now beginning to rise, but much slower than the national rate.

The number of companies that offer a traditional pension plan to employees continues to decline. As of May 31, 2011, only 30 percent of Fortune 500 companies offered such benefit plans, compared to 47 percent in 2008.

At Sandia, the employee pension and enhanced 401k programs remain strong.

The strength of Sandia's health care and pension programs is due primarily to the recent benefit redesigns and the Laboratories' sound management strategies, which have helped Sandia to control costs for customers and provide more funds to support mission work through infrastructure investment.

Sandia's multipronged management approach for making required pension contributions has included restructuring the benefit design, making judicious

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Inside

Sandia paper is one of prestigious *Applied Physics Letters'* 50 greatest hits

By Neal Singer

A paper published by Sandia researchers in *Applied Physics Letters* in January 1996 has been named one of the 50 most cited papers to appear in that journal in the last 50 years. (See http://apl.aip.org/apl_50th_anniversary.)

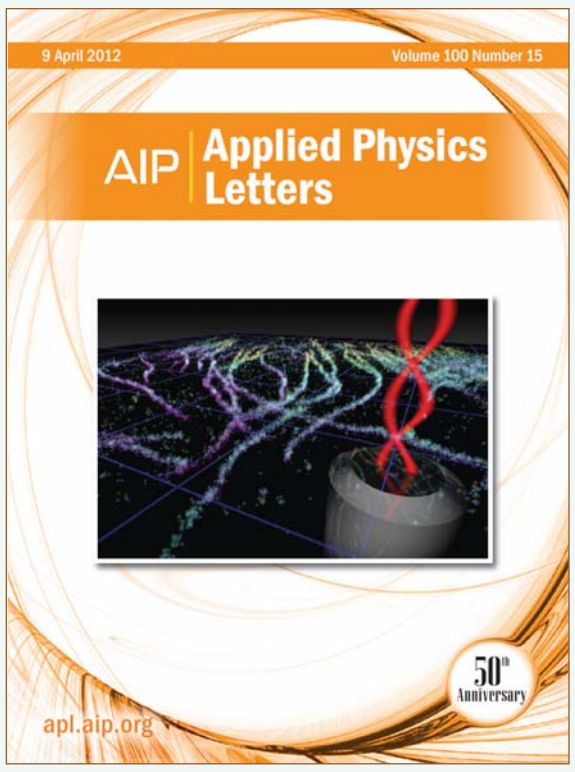
The paper, "Correlation between photoluminescence and oxygen vacancies in ZnO phosphors," shows that if zinc oxide is partially reduced of its oxygen, it will lumenesce in the green (visible) range instead of the invisible ultraviolet range. The finding was important for then-developing flat panel display technology based on low-voltage excitation of luminescence.

Even more interesting detective work by Carol Ashby (1911) — who was acquainted with the work of former Sandians K. Vanheusden, C. H. Seager, W. L. Warren, D. R. Tallant, and J. A. Voigt — found that a second, longer paper by the same authors on the same subject has approximately double the citations of the first piece — 1,902, compared with 887, according to the Web of Science. The paper, "Mechanisms behind green photoluminescence in ZnO phosphor powders," was published five months later in the *Journal of Applied Physics*.

And the hits keep on coming: There were 33 new citations in 2012.

Emails Carol, "Thirty-three citations are more than most physical science papers ever get, even papers that have significant impact in their area. This is a REALLY BIG impact piece of work for SNL."

Dave Tallant (now staff-augmentation in 1822) explains that at the time, researchers worldwide were trying to move from high-voltage to low-voltage excitation of phosphors for phones and display panels. Low-voltage excitation seemed promising, but the only materials that would work were organic and



didn't survive long. "You wanted something rugged," he says.

The *APL* paper opens directly on the problem: "Luminescence of ZnO phosphors has recently regained much interest because of its potential use in new low-voltage fluorescence applications…." And, jumping right into the issue in the second sentence, "Although ZnO luminescence has been the subject of studies for several decades, the centers

(Continued on page 5)

That's that

Have you had the chance to read the "Sid's Corner" column in the April 2 issue of *Porcelain Press*? Written by Sandia Chief Safety Officer Sid Gutierrez, the item reprints in its entirety the brief speech Apollo Flight Director Gene Kranz made to his team in 1967, just days after a spacecraft fire claimed the lives of astronauts Ed White, Roger Chafee, and Gus Grissom. The speech became known as "the Kranz Dictum." Here are a few excerpts:

> Spaceflight will never tolerate carelessness, incapacity, and neglect. Somewhere, somehow, we screwed up. . . . We were too gung-ho about the schedule and we locked out all of the problems we saw each day in our work. Not one of us stood up and said, "Dammit, stop!" . . . We did not do our job. We were rolling the dice, hoping that things would come together by launch day, when in our hearts we knew it would take a miracle. . . .
> From this day forward, Flight Control will be known by two words: "Tough and Competent." Tough means we are forever accountable for what we do or what we fail to do. . . . Competent means we will never take anything for granted. We will never be found short in our knowledge and in our skills. Mission Control will be perfect.
> When you leave this meeting today you will go to your office and the first thing you will do there is to write "Tough and Competent" on your blackboards. It will *never* be erased. Each day when you enter the room these words will remind you of the price paid by Grissom, White, and Chaffee. These words are the price of admission to the ranks of Mission Control.

The entire speech isn't much longer and is worth reading. You can find it in the *Porcelain Press* at http://porcelainpress.sandia.gov/2012/PP_Vol.17_No.7.pdf or, from outside Sandia, at http://en.wikiquote.org/wiki/Eugene_F._Kranz. It's worth checking out in full.

In concluding his own remarks, Sid wrote, "Very few of you who will read this message work for me, so I cannot direct you to write 'Tough and Competent' on the boards in your offices. But let me suggest that each of you who read this do exactly that. And when someone asks you why it is written there, direct them to this message."

* * *

When I was a boy, I was fascinated by those pictures you'd see every year or so on the covers of *Popular Science* or *Popular Mechanics*, the ones depicting a futuristic city with a sky teeming with flying cars, a dream as old as aviation itself. Over the years, visionaries, tinkerers, garage inventors, and serious engineers have been trying to make a practical flying/driving machine, but for various reasons, none of those efforts has panned out. After more than 100 years, it looks like that might be about to change.

Just this month, an American company successfully demonstrated the flight capability of its Terrafugia Transition flying car. The Terrafugia (it means "escape from earth") is, according to the company's website, a two-seat personal aircraft capable of driving on roads and highways, parking in a single-car garage, and flying with unleaded automotive fuel. The company claims the Terrafugia Transition will be available for sale by the end of this year at a mere $279,000.

Meanwhile, a Dutch company has demonstrated the PAL V (the Personal Air-Land Vehicle), a flying car — the "car" is more of a covered, three-wheeled motorcycle — that could be available commercially by 2014. According to the company's website, the Pal V offers the promise of being able to leave home, drive up to a fjord, hop over it, and then drive on to your destination.

Rather than taking the fixed-wing approach used in the Transition, PAL V designers have used an auto-rotating rotor (like an unpowered helicopter rotor) to provide lift, and are getting forward propulsion from a pusher prop-based engine. It's an elegant design and on the "cool" scale it beats the Terrafugia Transition hands down.

Like most neither-fish-nor-fowl efforts, it may be that neither of these vehicles represents the true practical breakthrough promised by those old *PopSci* and *PopMech* stories. Still, regardless of their ultimate success or lack thereof in the marketplace, as engineering accomplishments, both are impressive.

In thinking about these marvelous machines, I'm reminded of that old adage about the talking horse: It's not so much what the horse has to say as that it can say anything at all.

See you next time.

— Bill Murphy (505-845-0845, MS 0165, wtmurph@sandia.gov)

Bruce Hendrickson and Pavel Bochev named 2012 SIAM Fellows

Bruce Hendrickson (1440) and Pavel Bochev (1442) have been named Fellows of the Society for Industrial and Applied Mathematics (SIAM).

Bruce and Pavel were among 35 members selected for Fellow status this year, and are the first Sandians to receive this honor from the 4-year-old fellowship program.

SIAM is the leading international professional society for applied mathematics, with 14,000 members from 85 countries. It is the de facto professional society for computational modeling and simulation.

BRUCE HENDRICKSON

Bruce Hendrickson was recognized for contributions to combinatorial and parallel algorithms in scientific computing. His other research interests include linear algebra and preconditioning, graph theory, and data mining. He brings, he says, "nontraditional mathematical tools to support various aspects of parallel and scientific computing," and has provided leadership to the society.

siam Fellow

PAVEL BOCHEV

Pavel Bochev was recognized for contributions to the numerical solution of partial differential equations. His main research interests are in numerical analysis, applied mathematics, and computational science. He seeks, he says, "how best to translate mathematical models of physical phenomena into discrete computational models that will give accurate and physically consistent answers." He is also editor-in-chief of the SIAM *Journal on Numerical Analysis*.

"I think I speak for both of us when I say that our careers have been richly enhanced by the opportunity to work with so many outstanding peers in Centers 1400, 1500, and elsewhere across the lab," says Bruce. "Although I'm personally gratified by this honor, I'm even more excited about the implicit acknowledgement that Sandia is an outstanding organization in computational science. I am confident that Pavel and I will not be the last SIAM Fellows from Sandia."

Says Pavel, "The vibrant interdisciplinary research ongoing at Sandia has greatly influenced and shaped our careers. And so this honor also recognizes the Labs' success in fostering ties between different scientific and engineering disciplines."

Both men will be honored at the SIAM annual meeting to be held in Minneapolis, Minn., in July.

— Neal Singer

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Artist's concept of a catastrophic asteroid impact with the early Earth. An impact with a 10-km-diameter asteroid would effectively sterilize the planet.
(Illustration by Don Davis, NASA)

Turning the tables on asteroids

By Patti Koning

Sandia CaliforniaNews

Retired astronaut Ed Lu is on a mission to save the world — from asteroids. On March 6, the noted scientist and technologist gave a talk at Sandia about predicting and avoiding asteroid impacts on earth.

"The classic problem when you bring up this subject is 'Are you serious?'" he said. "But the odds are kind of surprising. As a society, we are taking a lot of risk."

Asteroids have shaped the history of life on earth — just ask the dinosaurs. As Lu explained, the impact of the 10-kilometer-wide asteroid that hit the earth 65 million years ago displaced a couple hundred thousand cubic kilometers of molten rock into space. As those rocks reentered the atmosphere over the next few hours, the temperature of the earth rose to about 500 degrees or as Lu put it, "a broiler oven." Almost everything that was not killed by the asteroid impact was destroyed by the ensuing worldwide firestorm, according to current scientific understanding.

"This was a giant control-alt-delete and admittedly, a pretty rare occurrence," he said. "It has only happened about 50 to 100 times in the history of the Earth."

But there are many more small asteroids. A more common occurrence — 5,000 times in the history of the Earth — is a kilometer-wide asteroid that would kick up enough debris to end growing seasons worldwide for a few years. "Civilization as we know it would not exist. I don't know what would happen but it's not a world I'd want to live in," said Lu.

Looking on an even smaller scale, he points out the 1908 Tunguska Event in Siberia. The blast from an asteroid approximately 40 meters across wiped out 2,500 square kilometers, which would encompass the area between San Francisco and San Jose, and is about a hundred-times greater area of devastation than was caused by the Hiroshima atomic bomb. "There is a 50 percent chance in your lifetime that you will see one of those somewhere on Earth," said Lu. "These odds aren't that small."

FORMER astronaut Ed Lu spoke at Sandia on the threat posed by asteroid impact.
(Photo by Randy Wong)

Fighting back

However, he said he believes it is possible to prevent an asteroid from hitting the Earth by changing its velocity and that technology available today is adequate, if essential early warning is provided, to deflect all but the most improbable predicted impact.

"If you do a careful tracking of all asteroids in the solar system, you will know many decades in advance, but that's as long as you bother to go out and look. The current situation is, we are not bothering," he said. "Politics and economics are a big problem. It's clearly a good investment, but the threat is uncertain and far into the future."

In response, Lu and a group of scientists and engineers established the B612 Project [http://b612foundation.org] in 2002. Named for the home asteroid of the hero in Antoine de Saint-Exupery's *The Little Prince*, the private foundation is determined to establish an early warning system and demonstrate a deflection capability before it is needed for an actual impact threat.

B612's proposed early warning system is an infrared space telescope deployed in a Venus-like orbit to map all of the asteroids in the inner solar system of 100 megatons or greater. Both NASA and the National Academy of Sciences recommend this proposal.

The B612 Foundation website states that a deflection system, to be fully successful, must generally have both a robust and a precision deflection capability. Of the three deflection technologies available, two (kinetic impact and nuclear explosion) are robust, but not precise, and one (gravity tractor) is precise but not robust. Given these characteristics and other technical considerations, a deflection will generally comprise at least two missions to meet the need for both a substantial and a precise asteroid orbit change.

Working with Ball Aerospace & Technologies Corp, B612 came up with an estimate of $350 million for a fixed-price contract to develop and deploy the early warning system. That number, said Lu, is within reach through private fundraising.

"At any given time in the United States there are 50 to 100 ongoing philanthropic projects of $300 million to $500 million funded through private donations," he says. He lists several local projects — the California Academy of Sciences at $505 million, the new wing of the San Francisco MOMA at $350 million, and a new building for the Stanford Business School at $350 million.

While the funding may come from alternate means, B612 plans to work very closely with NASA. Lu said that both sides are close to signing a no-fund agreement through which NASA would provide access to the Deep Space Network and other support and in return gain access to all of the data collected.

"Our fundamental belief is that humanity is worth protecting. Each and every day, we are putting 10,000 years of civilization on the line," he said. "If we don't look for asteroids, then frankly what have we built all this space technology for if not to do this? Odds are we aren't going to be hit by an asteroid tomorrow but long term I guarantee we will be hit unless we do something."

Trauma shears

(Continued from page 1)

"Sometimes seconds count. This product will make a difference for the medical community," says Mark Reece (1831) of Sandia's Multiscale Metallurgical Science & Technology group. "It's neat to see something come out of Sandia that will save lives."

Forman is CEO of the Albuquerque startup Héros, formerly known as EMvolution, in addition to being an ER physician. He and Mark joined forces through the New Mexico Small Business Assistance (NMSBA) Program, which pairs entrepreneurs with scientists at Sandia and Los Alamos national laboratories. The state-funded program was established in 2000 by the New Mexico Legislature to help small businesses get technical support from the labs. It has provided $29.8 million in assistance to 1,876 companies in 33 counties. The help is free of charge to the business.

Mark worked with Forman to improve the performance and durability of trauma shears — the go-to tool for responders in the first seconds of a crisis. The shears must cut through a wide range of materials, from denim to leather to Kevlar, to expose wounds for treatment.

Smarter, more durable trauma shears was something Forman had imagined and tinkered with in his garage for years. He has a background in mountaineering and wilderness medicine and was frustrated by the flimsy, disposable construction of typical trauma shears. "They are imprecise and made of cheap, shoddy materials with a blade that dulls quickly," he says. "People just throw them away."

And they get lost. "It's not at all uncommon to have a patient come into the ER and everybody starts looking for their darn trauma shears," Forman says. "They're hard to keep track of. You can't find them."

Forman fitted the handle of his first home-made shears with an integrated carabiner that clips onto a belt. He attached it to a standard manufactured set of trauma shears blades coated with titanium nitrate for a sharper, longer-lasting edge. And he personalized the shears with laser engraving so if they got lost, they'd find their way back.

Forman founded a company in 2008, applied for a patent, and made 1,100 pairs in his spare time while working as a University of New Mexico resident in emergency medicine. "They just caught on from word of mouth," he says. "Most of the EMTs in New Mexico carry some version of my early trauma shears. I started to think this could work."

Trial and error

But Forman needed serious help to produce the top-notch shears he envisioned and believed he could sell in bulk to global customers in military, medical, emergency, and other fields. He met flight paramedic Daniel Barela, who had brought a product to prototype through NMSBA with his company Trinity Medical.

Barela was intrigued by Forman's trauma shears and joined the business. They applied to NMSBA. In December 2010, Forman was directed to Mark — and stopped making shears in his garage.

TRAUMA SHEARS developed under a Small Business Assistance Program project between Sandia and Albuquerque startup Héros, incorporate features and capabilities that have been welcomed by emergency room staff and first reponders. Héros was launched by Albuquerque physician Scott Forman.

"I took Mark our first-generation product and told him we needed help with the material selection for the blades and the blade design so the shears could cut through a more robust set of materials," Forman says.

He handed Mark about 15 materials that emergency personnel typically face, including Kevlar from bullet-proof vests, loose gauze, diapers, fiberglass, and plaster, all with different densities and compositions. He also gave Mark a variety of blades.

"We wanted Mark to determine if there was one blade design that would give the most bang for the buck," Forman says. "And Mark, the genius that he is, did it."

Mark studied the best shears from all over the world, focusing on why some worked better than others and why none worked well on synthetic fibers such as Kevlar, ballistic nylons, and polyethylenes. He tested all the blades on all the materials.

"The failures were very reproducible," Mark says. "I began to see a trend of what worked and why."

He researched the literature on cutting with scissor blades. "I drew in material on everything from hairstylists to fabric manufacturers and tried to assemble a picture of what was going on here," he says. "I got out the microscope and video camera and examined what happens as each blade attempts to cut fabric."

Mark learned how serrations should be made and combined that data with information on dentation of animals such as sharks, whose triangular teeth are powerful shearing machines. He then tested various blade angles on all the materials. Mark machined trial blades and gave Forman reports and prototypes. "We honed in on a design that gives much better cutting capability," Mark says.

He and Forman worked together for about six months. The base-model shears they developed has an ergonomic, ambidextrous handle with an integrated carabiner. The blade length and handle pivot point are engineered to generate considerable torque, so less effort is needed for heavy cutting. The blades are high carbon content surgical stainless steel that can be autoclaved.

"We incorporated a proprietary blade design," Forman says. "Mark is excessively meticulous. He created the pitch of this blade, the troughs between the serrations, the angulations of the serrations and pitch of the other blade — the nonserrated side — to create shears that can cut through everything. It's brilliant."

The shears also have a ripper attachment with a replaceable blade to zip through clothing, a bottle opener for medications, a key for oxygen tanks and a window punch. "It's an all-in-one tool," Forman says. "EMTs suggested some of the features."

A eureka moment

Under NMSBA rules, the program pays for a specific amount of the researcher's time, which is woven into his or her existing work. The business owner keeps rights to any intellectual property generated through the collaboration.

Forman's company, Héros, has a patent pending on the final trauma shears design and is negotiating prototype production, product manufacturing, and distribution. Héros includes Forman and Barela, along with Drew Tulchin, who focuses on business development, and marketing director Mike Sophir.

Mark says he enjoyed working with Forman. "It was very cool," Mark says. "Scott Forman is the real deal. He's enterprising and has good ideas. When he says this is what we need and this is why, you listen."

John Willgohs of the Bernalillo County Fire Department says he had a eureka moment when he first saw Forman's shears. "The ones out there are adequate, but if you have to cut through anything of any substance or thickness, you might as well throw the shears away afterward," he says. "To have something stronger and more beefy, wow, it's fantastic. And the clip, oh my gosh. You're rushing around in the heat of the moment, it's chaotic, and you have to find the shears. When they're clipped to your belt, they're right there. That clip was another eureka moment."

Mike Cavit, an Albuquerque emergency room technician and EMT, says he appreciates that the blades stay sharper longer and can be resharpened. "The clip makes them accessible and the blades stay sharp," he says.

The shears will cost more than typical throwaway models, from $20 to $60 versus $5 to $10. Both Cavit and Willgohs say the extra cost would be well worth it to have better shears.

Forman says he has other ideas for improved emergency equipment and would like to work again with Mark. He plans to reapply to NMSBA. "It's a fantastic program," Forman says. "It's invaluable."

Forman, who finished his residency and joined Presbyterian Hospital in 2010, says the trauma shears have been a labor of love.

"I've learned a lot about business, marketing, customer service, material selection and design, manufacturing, prototyping, intellectual property, acquisition, contract law," he says. "Just about every day somebody comes up and says, 'Aren't you the doc who makes trauma shears?' They have ideas of their own. These are nurses and paramedics and people who know what they're talking about. I want to be able to help get those products to market."

Pitch in

The New Mexico Small Business Assistance Program is reaching out to Sandians to participate. If you know of a New Mexico for-profit small business that could benefit from Sandia's technical expertise, or if you would like to be among the scientists and researchers who help small businesses, contact Genaro Montoya (1933) at 505-284-0625 or gmontoy@sandia.gov or visit the NMSBA website at http://www.NMSBAprogram.org.

New SharePoint site connects volunteers with educational outreach

By Stephanie Hobby

One of the things that drew Ruben Martinez (6634) to a Sandia job about a year ago was the opportunity for greater work-life balance. Volunteering is an important part of his life, and he says he is thrilled to find a career that allows him to continue pursuing that priority.

Since joining Sandia, Ruben has taught two workshops with Expanding Your Horizons, a program geared toward middle school and high school girls to encourage them to pursue math- and science-oriented careers. He spent the day teaching the students about delaying intruders, and did demonstrations by having the students try to install a series of bolts and nuts on a device covered in liquid soap, then again with welding glasses to obscure their vision. "It's hands-on, fun, and challenging. We start off by explaining the big picture, and tell them that we need to keep the bad guy away from the pot of gold. The demonstration is meant to display some of the delay technologies developed here at Sandia. By the end of the session, you could really see the light bulb turn on, and the girls were coming up with all kinds of ways to slow down an intruder," Ruben says.

Community Involvement's Patty Zamora (3652) has developed a new SharePoint site to help connect potential educational volunteers, and specifically new Sandians like Ruben, to projects that match their interests. "We get requests from schools that want employees to present, judge fairs, and share their careers with students," Patty says. "The SharePoint site allows employees to input their expertise, and we can match them to those requests."

Patty's goal is to streamline the process of matching employees with specific skills to volunteer programs to increase the number of employees involved with the department's strategic initiative of education. The SharePoint site also gives volunteers the ability to track their hours and projects.

TWO STUDENTS at this year's Expanding Your Horizons learn about delay techniques by trying to install a series of bolts and nuts on a device covered in liquid soap. Welding glasses are used to obscure their vision.

The website is available for both New Mexico and California volunteers. Volunteers are asked to enter their name, what kind of work they are able to do, what grade level they'd be most comfortable presenting to, and their area of expertise. If you would like to register, or for information, visit (on Sandia's internal web): https://sharepoint.sandia.gov/sites/communityinvolvement/SSB/SitePages/Home.aspx.

Honoring a fallen hero

Kirtland Air Force Base renames M Avenue to Staff Sergeant Travis Griffin

IN A MOVING CEREMONY earlier this month at the Kirtland Air Force Base theater, base officials renamed M Avenue to Griffin Avenue in honor of Staff Sgt. Travis Griffin, who was killed in action in April 2008. Griffin was killed by a roadside bomb while deployed with the 732nd Expeditionary Security Forces Squadron in Baghdad, Iraq. Griffin joined the Air Force in 1999 and Team Kirtland's 377th Security Forces Squadron in September 2003. During his time here, he served as an instructor, responsible for training approximately 550 airmen on security tactics and procedures. Griffin's wife Krista, in photo at left, speaking at the ceremony, said of her husband: "If he were here, he'd say, 'Thanks for the sign, but I was just doing my job,' not because he would be ungrateful, but because of his humility. Whether he knew it or not, that in itself makes him special." In the photo at right, airmen were undeterred by a spring snowstorm as they carried out a 24-hour vigil at the street that now bears Griffin's name. About 200 people attended the ceremony in the theater, including Griffin's mother, Christine Herwick. (Photos by Randy Montoya)

Sandia paper stands test of time

(Continued from page 1)

and mechanisms responsible for many of its luminescence properties are still a matter of controversy."

The big question, says Dave, was "why does the [ZnO] phosphor work, and what do you have to do to get it to work? To optimize its use, you have to understand the mechanism."

In a fully oxygenated zinc oxide lattice, negatively charged oxide ions exactly balance positive zinc ions. Reducing the number of oxygens creates vacancies (holes) in the lattice that attract electrons to maintain charge balance. These electronic rearrangements create lower energy levels and emit green light. "These were good candidates for green panel displays, hot at that time," Dave says.

Using Sandia's wide-ranging expertise — in this case, in electron paramagnetic resonance, optical absorption, and photoluminescence spectroscopy — the researchers could make a seminal finding: "A strong correlation is observed between the green 510 nm emission, the free-carrier concentration, and the density of singly ionized oxygen vacancies in commercial ZnO phosphor powders."

Offering insight into why two papers were written, Carleton Seager (now a contractor in 1123) emails, "The work was of sufficient interest to the community studying phosphors that we felt quick publication was important. This was only possible for papers submitted to journals that rapidly publish letters, like *Applied Physics Letters* and *Physical Review Letters*. Unfortunately the totality of the work could not be compressed to fit in the space dictated by the restricted letter format, so a later publication was also warranted where all the details of the research could be presented. Thus a follow-up, longer paper was prepared for the *Journal of Applied Physics*. So it wasn't really the interest in the first paper that stimulated the second paper, it was the interest in the topic that dictated putting part of the work in the earlier, shorter *APL*."

Other Sandia work with 'enormous impact'

Carl Saeger, an emeritus Sandian from (by definition) the old school, maintains a healthy skeptical perspective on what may be merely a modern fashion: the widely accepted belief that citations are a metric of the importance of a scientific paper, even when it is his group's paper that benefits from that belief.

He emails: "This paper illustrates the fact that the most cited work is not always the work that has the most impact. Other work done by us at Sandia on silicon grain boundary properties and passivation has actually had a fairly enormous technological impact. This work was done in the late 1970s and early 1980s with Dave Ginley (now at NREL) and Gordon Pike (retired). Grain boundaries in polycrystalline silicon solar cells and transistors greatly degrade the properties of these devices. By understanding the electronic properties of these boundaries we were able to develop simple measurement techniques that could be used to probe the density of unwanted electronic states at the boundaries between Si grains. This allowed us to develop and monitor techniques for introducing hydrogen into polycrystalline Si; this element attached itself to the broken Si bonds at these boundaries and eliminated many of the unwanted electronic states.

"How important is this to Si solar cells, most of which are made from polycrystalline Si? In 2010 there were 27 Gwatts (billions of watts) of Si solar cells produced, and this industry is doubling its output every two years. For purposes of reference 1 Gwatt is approximately the output of a nuclear power plant. Our technique improved the efficiency of these cells by 10 percent to 20 percent, according to a paper we published at the time, but more importantly, greatly reduced the statistical spread in cell efficiencies. This allows much tighter control of the output of panels composed of multiple cells.

"A second, and equally important, impact of this work has been in the flat panel display industry. The defacto technology for high resolution TVs and computer monitors is AMLCD, active matrix liquid crystal display. Each colored pixel in these devices uses a polycrystalline silicon transistor to control its on/off state. Without the H passivation step developed at Sandia these transistors have insufficient gain to permit large area (approximately greater than 10 inches) displays. This flat panel TV industry alone has a worldwide volume of roughly $50 billion per year, and this does not include the large market for computer monitors.

"Interestingly, the work on ZnO phosphors (which was funded at Sandia by DARPA) was motivated by the development of FED's, field emission displays. These were supposed to operate like conventional TV cathode ray tubes, but with a much thinner, flatter display tube that operated at low electron energies (1 keV versus 50keV for a typical TV tube). ZnO is attractive because it is the only phosphor that is sufficiently bright at these low electron energies. FEDs turned out to be difficult devices to manufacture, and the development of large area flat panel displays raced ahead and doomed these devices. In fact, large area flat panel display development basically eliminated the mass market cathode ray tube industry and changed the major market for phosphors into those used for fluorescent lighting and white light LEDs. Neither of those two light emitters use ZnO. So our earlier Sandia work really should have quelled any serious interest in ZnO as large volume commercial phosphor. Strange stuff."

"Thirty-three citations are more than most physical science papers ever get, even papers that have significant impact in their area. This is a REALLY BIG impact piece of work for Sandia."

— Carol Ashby (1911)

Asked what led the group to investigate diminishing the ratio of oxygen to zinc, Carl responds, "There were reports in the literature before our work that suggested connections between the Zn/O ratio in this material and the green emission. Since we were interested in this material for display purposes, changing this ratio by heating in either O_2 or H_2 seemed like a sensible way to investigate the luminescence mechanism."

Asked to explain the large number of ongoing citations, Carl writes, "Apparently the mechanism for the green emission is still somewhat unsettled. It is interesting that in 2002 a paper was published indicating that the electron paramagnetic resonance line that we used in our paper to describe the O vacancy concentration is not really due to O vacancies, but to two other defects, one of which, interstitial H, would be expected to cycle up and down with our gas treatment cycles. Our identification of this resonance relied on earlier papers, so this misidentification was not attributable to us. I did find a recent paper that seems to support our contention that O vacancies cause the green emission, so our paper may have reached the correct conclusion despite this unintentional error!"

What I found at Reutilization:
DC current comparator potentiometer

EDITOR'S NOTE: *This is one of an occasional series of articles about machines, instruments, 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 Reutilization — and it has an asset number that might be traceable — contact Sue Holmes at Media Relations & Communications, 505-844-6362*

By Sue Major Holmes

When you need a set voltage for a project, it's important that's exactly what you get.

Enter the comparator potentiometer, model 9930, a big brown box of an instrument with a line of dials in one section and rows of insulated pure copper binding posts in volts ranging from 0.15 V to 1500 V in another section. Now retired to the asphalt floor of Tent 5 at Sandia's Reutilization and Disposition, the instrument, manufactured in 1979, was a workhorse at the Primary Standards Laboratory (PSL) for decades.

RECALLING THE WORK — Technologist Jim Novak (2542) peers over copper binding posts on a comparator potentiometer now at Reutilization and Disposition. Instruments like this one were used for decades at the DOE Primary Standards Laboratory, which is operated by Sandia. (Photo by Randy Montoya)

Technologist Jim Novak (2542) remembers it well. He and his colleagues used such instruments from the mid-60s to just a few years ago to calibrate resistors and voltage sources.

The DOE Primary Standards Laboratory, which is operated by Sandia, develops precision measurement standards, provides calibrations and technical support, and performs technical surveys and measurement audits. The lab, whose history stretches back to the early 1950s, does everything from electrical, physical, dimensional, and thermodynamic calibrations for organizations at Sandia to certifying reference standards for Pantex, Y-12, and other DOE sites. The National Institute of Standards and Technology (NIST) has reference standards for just about anything you can think of measuring, and Sandia's calibrations are traceable to those standards.

ATTENTION TO DETAIL — Marlin Kraft, who worked at Sandia from the early 1980s until 2001, operates a comparator potentiometer at the Primary Standards Laboratory. An automated version has replaced the old instrument.

Calibration is crucial because it affects the quality of data, says Harold Parks (2542), who has been with the PSL for eight years and worked with the instrument a few times before it was replaced by an automated version.

"If you make a measurement for a research project or for something production-related, if it's not calibrated, that number is meaningless because you can't relate it back to another measurement on the specifications or in the literature," he says. "If you need to know it's 3 volts, if it's not calibrated, you don't know if it's 3 volts or not."

Jim, who has spent 30 years in metrology at Sandia, NASA, and the military, says the comparator potentiometer could calibrate to uncertainties "in the neighborhood of 10 to 20 parts per billion, a very small uncertainty."

The measuring business requires attention to detail and a lot of patience.

"Usually when you're trying to take a precision measurement, speed doesn't count," Jim says.

An operator sat in front of the machine for hours at a time, twisting dials and projecting a light beam onto a linear scale ranging from minus 10 to plus 10 or from minus 12 to plus 12. Adjusting the dials to maintain balance at zero at the center would lead to the correct calibration.

"It would take you seven, eight hours manually of turning knobs and taking measurements and writing everything down," Jim recalls. "Now the computer just kind of does it. You set it up, run the computer, walk away, come back six, seven hours later and the data's there. Plus, I would spend maybe 30 minutes to take one reading. In that 30 minutes the computerized system can take 100 readings."

The newer automated instruments also are safer to operate for high voltages.

Still, Jim and Harold agree automation isn't magnitudes better at performing calibrations than the comparator potentiometer.

"Actually, those things were pretty darn good," Harold says.

Sandia's Reutilization Department donates more than 1350 computers to New Mexico schools

By Stephanie Hobby

When laptop and desktop computers no longer supported by Computer Support Units (CSUs) are replaced, they are sent to Sandia's Reutilization Department. This year, the department turned around and processed 1,358 computers to donate to 25 New Mexico public and private schools and community-based educational organizations.

"Our department takes great pride in helping support students in New Mexico," says Diana Goold (10264), manager of Reutilization and Disposition. "This program provides computers to schools that would have otherwise gone without. It's very rewarding for the members of this department to participate in such an event that impacts the lives of children in our community."

The K-12 Donation Program was reinstated in 2011. The new process is much more streamlined, wherein the clerks and stock keepers do all of the processing work prior to the event, so all the schools need to do is bring in trucks, load them up, and leave. On April 2, representatives from 25 New Mexican educational institutions came to Sandia to pick up equipment.

"It used to take a full day for the schools to come in, go through the process, and collect the equipment that they need," says Jan Wallner (102641), who spearheaded efforts to reinstate the program. "Now that we've streamlined the pickup process, it took about two hours, and the time and costs associated with this are far outweighed by the benefits." She adds that providing surplus computers and other equipment is an example of good stewardship of taxpayer resource and is a good community investment.

The computers are distributed without hard drives, so there are no cyber security risks, and all equipment, including keyboards, mice, and monitors, receive an ES&H and radiological review prior to being distributed.

Schools interested in the program start by contacting Cindy Padilla (10264-1) in Reutilization to get more information about eligibility and how to apply. Currently, the program is run on an annual basis to allow time to collect enough computers.

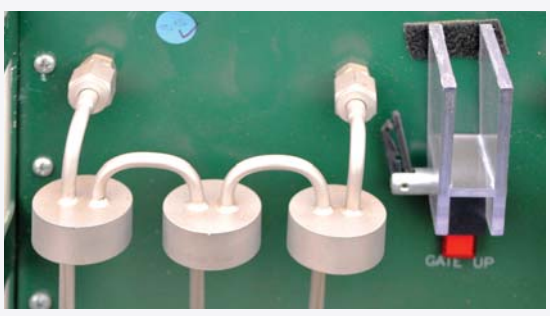
"We're really proud of this program," Cindy says. "This donation provides computers to students all over the state, and that's very rewarding."

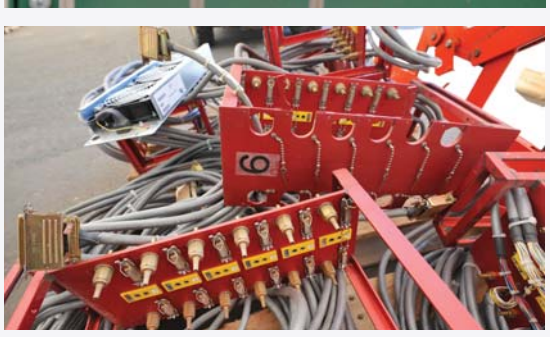
TWENTY FIVE SCHOOLS from New Mexico benefitted from the Reutilization Department's computer giveaway on Monday, April 2. (Photo by Randy Montoya)

What I *saw* at Reutilization

Photos by Randy Montoya

"The world is so full of a number of things/I think we should all be as happy as kings." So wrote the poet Robert Louis Stevenson in "A Child's Garden of Verses." He clearly wasn't thinking about Sandia's Reutilization facility, but he might as well have been. Reutilization, or ReApp, as many people still call it, is so full of a number of things that when *Lab News* photographer Randy Montoya took a turn around the place recently, he found a virtual history of Sandia and its work. These were the machines, the instruments, and the tools that helped advance the Labs' mission work for decades. Even today, a Reutilization "shopper" may find that one-of-a-kind device that is just the thing needed for a new project. And that makes him or her feel as happy as a king.





For Louis Nogales, 50 years of exceptional service . . . and he's not through yet

A LIFE IN FULL — Louis Nogales, who joined Sandia in 1962, recently celebrated his 50th anniversary at the Labs. Louis started in the mailroom; for the past 22 years he has been the building manager and ES&H coordinator for Bldg. 820. He says the idea of retirement has not entered into his thinking. (Photo by Randy Montoya)

The names roll by now, like the years, echoes from the past.

Dozens of names, from colleagues in the mailroom decades ago, to directors and vice presidents. As Louis Nogales reflects on his 50 years at Sandia, it is the people, even more than the work, that act as mileposts along a long and winding road.

Nick Tranoski. Cliff Gilbert. Pete Toma. Jack Westbrook. Paul Brannan. Ron Syler. Ric Breckman. Tom Sellers. Orval Jones. James McKenzie. John Sandoval. Lyle Kruse. Johnny Padilla. Robert Sierra. Neil Hartwigsen. And more. Many more. Each name evokes a memory: of camaraderie, of accomplishment, of a life well-spent in exceptional service to the Laboratories and the nation. And underpinning it all, providing the foundation and anchor, are family and community: Husband. Father. Son. Brother. Friend. A life in service. A life complete.

Louis, who came to Sandia in 1962 as a mailroom clerk, has enjoyed a varied career that has touched upon many areas of Sandia's mission work. For the past 22 years, he has been the building manager and ES&H coordinator for Bldg. 820. While a wide range of important work has been done in the building over the years, it has long been the home of much of Sandia's hands-on work on DOE's Secure Ground Transport program. Louis' main responsibilities in Bldg. 820 are to enforce all ES&H regulations for building tenants and outside users, making sure their training is up to date and certifying they are qualified to operate the crane, Genie lifts, forklifts, and machine tools. He also provides technical and administrative support for the electrical and mechanical engineers related to their projects.

Piggly Wiggly or Sandia?

Louis almost didn't end up at Sandia. As a student at Albuquerque High School in the 1950s, he started working full time at Piggly Wiggly as a box boy. After graduation, he stayed with the grocery chain, working his way up to assistant manager.

At one point, Piggly Wiggly, knowing a hard, smart worker when they saw one, offered Louis his own store in Belen. Louis declined the offer, choosing instead to pursue an opportunity to work at Sandia. Coming in the door at the Labs, he took a substantial pay cut, so to augment his income, he continued to work at Piggly Wiggly for another year, holding down two full-time jobs to support his growing family.

Louis had applied for a janitorial job. It turned out the Labs wasn't hiring custodians, but the interviewing manager liked Louis's attitude and work ethic and got him on board in the mailroom, where Louis worked for a couple of years before moving into the reproduction center as a camera operator, making copies of technical drawings for mission-related projects. In a trend that would come to characterize his entire career at Sandia, Louis advanced through the ranks at the repro center, ultimately becoming a chief camera operator.

In the late 1960s, Sandia was doing computer-related data analysis for the military in support of the Vietnam War. Louis in 1968 jumped at the opportunity to work in the Labs' computer center, where he stayed for eight years, working the graveyard shift.

"It was a good job," Louis recalls. "All of us there got to be real close in those eight years. We were really all like family." As he remembers those days from 40 years ago, Louis becomes pensive. "Last year, the last two guys I worked with retired. I'm the only one left from the old crew now."

The graveyard shift suited Louis to a tee: In those days, he was coaching his sons in Little League, and his night shift hours were ideal for that role. He also started playing softball for a Sandia team, where he made many lifelong friends.

By the late 1970s, Louis was working in the data reduction center, breaking down data from test flights at the Tonopah Test Range for analysis by the test engineers. Later, he worked with Tom Sellers and Orval Jones (who later became Sandia Executive VP) doing simulation runs to model hypothetical nuclear reactor failures.

As his career progressed, Louis earned an associate's degree in information systems, which led to a promotion (again) and a job providing computer graphics support for several key Sandia mission-related projects.

Meeting the Tiger Team challenge . . . and a wake-up call

In 1990, DOE initiated a Tiger Team process to examine, address, and rectify ES&H and security issues at the national laboratories. In preparation for the Tiger Team audit at Sandia, Labs management recognized that Bldg. 820 could be considered a potential problem area. Louis took on the job as building manager, ensuring that the facility was whipped into shape and that the processes in place were safe, secure, and environmentally responsible. While the Tiger Team ultimately highlighted various issues at Sandia, Bldg. 820 came through with flying colors. Louis has been at the facility ever since.

In 1987, Louis says he had "a wake-up call" — doctors discovered five arterial blockages that required a quadruple-bypass heart operation. "After that, I changed a little bit of the way I did things, and everything's been good since then," he says.

As he enters his 51st year at the Labs, Louis says the "R" word — retirement — hasn't entered into his thinking, even as he has watched two generations of colleagues come and go. If he has any regrets, they are related to the inevitable march of time. "Most of my old friends have left. Some have retired. Some have passed away. I miss them every day."

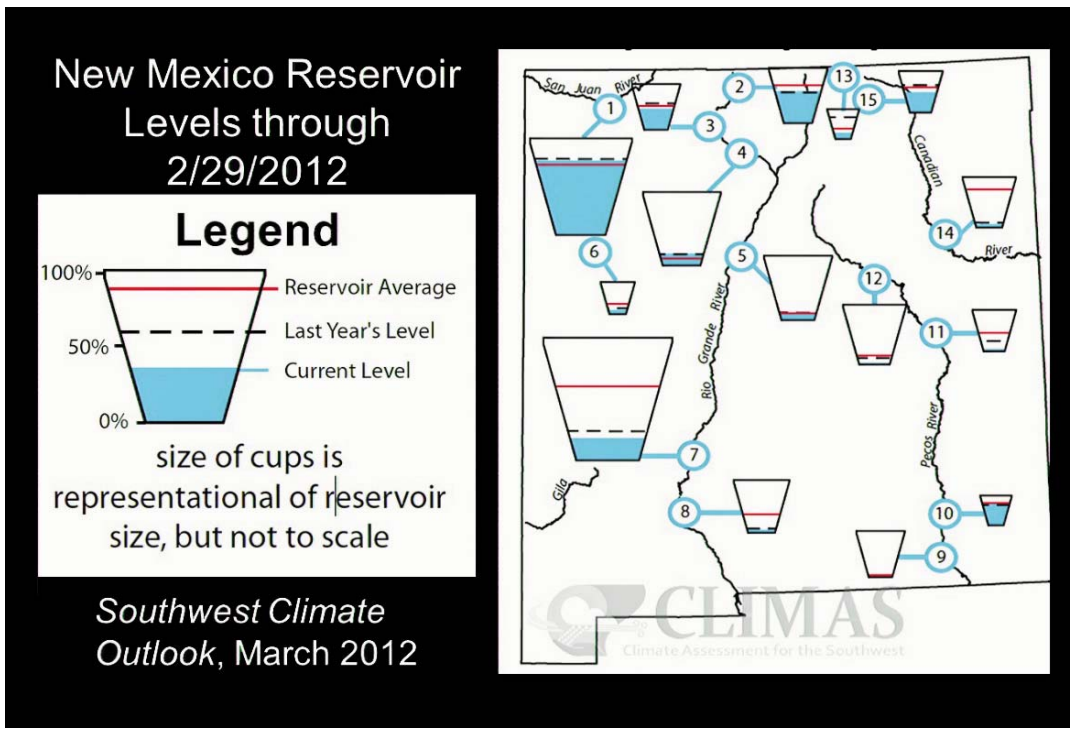
About his Sandia career, though, Louis has an eternally upbeat attitude.

"I've been fortunate to have had good supervisors all along the way," he says. "Sometimes, I may have disagreed with a decision or an order from a boss, but later on, you find there was a good reason for what they did.

"Everything is always changing here; there's always been a real good variety of things going on. I think as long as the job is interesting, I'll stay. As of now, I have no plans to retire."

Speaker: Climate change accelerating Southwest desertification

By Neal Singer



DRINK UP! LAST WATER FOR NEXT FIFTY YEARS? It's hard to believe that we're living in drought conditions, given the state's recent snowfalls and rain, but figures in this chart presented by Arizona professor Jonathan Overpeck show the water levels of New Mexico's reservoirs in general to be declining.

Jonathan Overpeck, professor of Atmospheric Sciences and of Geosciences at the University of Arizona, brought a friendly smile, wonderful graphics, and a Cassandra-like message as an invited speaker to Sandia's ongoing Climate Change and National Security Speaker Series.

Speaking at CNSAC on April 11 on "Climate Change and the Aridification of the North American Southwest and Beyond," the coordinating lead author for the Nobel Prize-winning UN Intergovernmental Panel on Climate Change (fourth assessment) placed water glass images at key water-storage locations in the American Southwest to show how full the reservoirs were, are, and can be expected to be.

Many glasses were more than half-empty, with computer simulations predicting the situation to worsen.

However, Overpeck liked being in the Southwest, he said cheerfully, "where drought is real and people are aware of the problem."

Major problem is drought

He continued with a long list of disturbing statistics. "It's hard to beat what was in the news in 2011 for getting peoples' attention on climate change," he said. He mentioned unprecedented heat waves, with a number of days above 110 degrees in Phoenix and reaching 108 in New Jersey; major floods, a record tornado season estimated by National Oceanic and Atmospheric Administration (NOAA) to have caused $53 billion in damages, an unusually wet and destructive tropical storm, and the biggest wildfires ever in New Mexico and Arizona.

"The temperature record for March was big news," he said: 8.6 degrees above the 20th century average for that month.

But the major problem for the Southwest, he said, is drought. Water managers are used to dry years with occasional wet years interspersed, he said. "How would you adapt to a 51-year drought?" as apparently faced the Anasazi a thousand years ago, he asked.

Even now, most reservoirs are below average in water storage, he said. Furthermore, the Southwest river systems are over-allocated. Finally, the warmer the weather, the greater the possibility of drought, and the weather is getting warmer.

"More greenhouse gases," he said, "mean less snow, drier soils, less later winter snow and rain, less water in rivers, combined with more flooding and more frequent and severe droughts.

"The mega-drought risk is substantial."

In a change of pace late in his talk, a ripple of audience laughter greeted his innocently put, "Is the news all bad?"

He felt that "the climate challenge also includes opportunities."

These include a "no-regrets adaptation" to heat and drought, more efficient renewable energy technology, climate change mitigation that would mean cleaner air and improved health, and new technologies to secure supplies of clean water.

In a dig at conventional power sources, he said, "It's depressing to sit at Four Corners and look at Shiprock. Sometimes you can hardly see the thing, the air there is so nasty."

Just conserving resources isn't enough, he concluded. "We can't conserve our way out of this problem."

Overpeck has authored more than 130 published papers in climate and environmental sciences.

The climate talks, which present speakers of a variety of outlooks, are sponsored by the ECIS SMU Climate Security Program. Rob Leland (director 1400 Computing Research) arranges the series.

Pension , health care

(Continued from page 1)

investment strategies, and implementing process efficiencies, which have resulted in funds that can be reinvested in critical obligations, such as the pension.

Sandia's new consumer-driven health plan, in which employees take a more active role in maintaining their health, has helped to hold down annual premiums for health care. The plan includes the Virgin HealthMiles program, which encourages employees to monitor their activity as a means of developing active lifestyles and staying healthy.

Sandia President and Laboratories Director Paul Hommert says rising pension and health care costs are significant challenges that Sandia has managed effectively.

"I personally felt we had an imperative to act to ensure that we continued to execute our national security mission and remained a viable laboratory," Paul says. "We have been effective in setting forth a strategy that is ensuring the solvency of our pension, providing employees and retirees with quality affordable health care, while ensuring the viability of this Laboratory."

Pension

In 2010, Paul spoke to employees about the need to ensure the solvency of Sandia's pension plans in the face of unprecedented financial challenges, due in part to constrained federal budgets, market uncertainties, and rising health care costs. He outlined a strategy that included restructuring the benefit design and cutting overhead.

To date, those strategies have been successful.

"We had predicted the Laboratories would need to contribute about $1 billion over the next six years to get the plan fully funded. That need has been reduced to just over $800 million, primarily because of the benefit redesign and sound management practices," Paul says.

Before 2010, Sandia had not been required to contribute to the pension fund for more than 24 years because the assets covered the costs of the benefits. However, the pension plan became underfunded due to market volatility and the payout of pension benefits. In addition, new federal funding regulations under the Pension Protection Act increased the size of mandatory pension contributions that Sandia was required to make.

Jane Farris (10520), senior manager of the Pension Fund & Savings Plan organization, says Sandia has applied a two-pronged strategy consisting of the benefit redesign to control future costs and the strategic management of pension investments in a clear, structured way for the long term.

The benefit redesign, implemented Jan. 1, 2012, is designed to reduce the rate of liability growth and reduce future pension costs. The redesign changes the high three-year average calculation to what's called a modified career average benefit.

Employees who began their employment at Sandia after Dec. 31, 2008, no longer receive the defined pension plan. Instead, they receive an enhanced 401(k) savings plan, and currently nearly a quarter of Sandia's workforce participates solely in that savings plan.

Jane says managing the pension plan includes making contributions to ensure its future solvency and adjusting Sandia's investment strategy in such a way that assets will be expected to increase when liabilities rise.

"We structured our investments to align with current and future obligations," she says.

Health care

Until 2009 when Sandia redesigned the health care benefit, health care costs at Sandia were trending upward. Nationally, health care costs were increasing about 7 percent a year and were expected to stay at that rate for the foreseeable future, according to actuarial forecasts by HR consulting firm Aon Hewitt.

Sandia's costs were estimated to increase from $133 million in 2011 to $249 million in 2020, an 87 percent increase. Given budget forecasts, those costs appeared to be unsustainable for Sandia. The solution came in redesigning the benefit plan to save costs while ensuring both active employees and retirees still had access to affordable quality health care.

As with the pension, the strategies have been successful in currently holding down costs. Sandia's health care costs declined from $119 million in FY09 to $117 million in FY10 and $113 million in FY11. The costs dropped despite an increase in the number of employees on the plan, from 8,744 in FY09 to 9,914 in FY11.

Rob Nelson, acting director of Health, Benefits and Employee Services Center 3300, says Sandia's costs should begin to level off this year, adding that they will gradually increase again, but at a much slower rate than before.

"Some of the savings are directly related to changes in the plan design. However, also affecting costs are the fact that employees are actively involved in managing their wellness," Rob says. "For example employees can enroll in a number of wellness activities where they can earn additional dollars that can be applied to their healthcare costs."

Sandia's new consumer-driven health plan engages employees and retirees to think like consumers in managing their own health care. Employees and retirees are encouraged to be cost-conscious when making choices about the services they receive, and they are encouraged to participate in health management and wellness programs.

"If we influence and affect behaviors now, employees should be seeing the benefits of those healthy lifestyles for years to come and it ultimately helps to keep health care costs down," Rob says.

Helping the mission

Because DOE does not provide Sandia with additional funds to cover the costs of pension or health care, keeping those costs down has a direct and beneficial impact on Sandia's mission. Those funds must come out of the Laboratories' operations budget, so reducing costs means additional dollars can go for infrastructure investment to support mission work.

To help offset the rising costs of the pension and health care, Sandia could have resorted to increasing the cost to its customers by charging a higher fringe rate. However, that would have threatened existing mission work and Sandia's ability to develop new programs.

"It was essential for us to sustain the viability of this Laboratory, which is so essential to our national security," Paul says. "The nation expects that of us, the nation needs that of us, and therefore we must manage this Laboratory effectively and efficiently. And that ultimately creates a better environment for all of us to do our work."

Vestas to install research wind turbine at Sandia's Lubbock test facility

By Stephanie Holinka

The initial phase of Sandia's Scaled Wind Farm Technology facility (SWIFT), currently being constructed in partnership with Texas Tech University in Lubbock, will be a little bigger than originally planned. Leading wind turbine manufacturer Vestas will add its own 300-kilowatt, V27 research turbine to the two Sandia V27 research turbines.

The Labs worked with Vestas to develop the new three-turbine site plan, uniquely tailored to study turbine-to-turbine interactions. Sandia and Vestas will conduct collaborative research with all three turbines, although each turbine can also be used separately with minimal interaction.

"The Lubbock site benefits from high wind resource and low turbulence, which is ideal for research," says Jon White (6121), project manager and researcher in Sandia's Wind Energy Technologies group. "Wind at the site comes predominately from the south, making it easy to set up the turbine array for research on turbine-to-turbine interactions."

Vestas, the world's leading supplier of wind turbines, partnered with Sandia and added its turbine to "create a technology accelerator that allows Vestas to bring innovations to market rapidly and cost-effectively," says Anurag Gupta, director of rotor systems at Vestas Technology R&D in Houston.

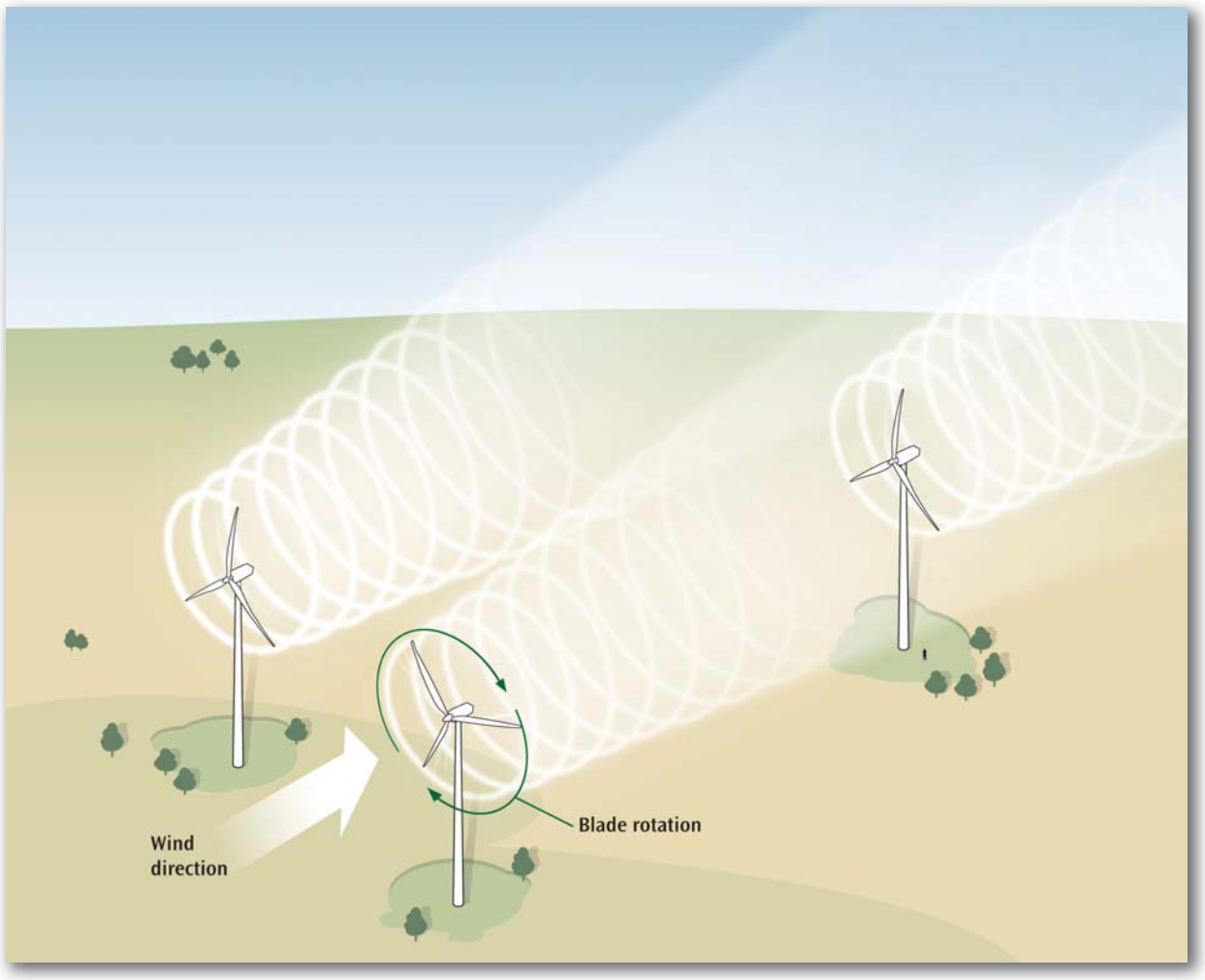
"The SWIFT concept reflects a shared emphasis among the partners on lowering the cost of wind energy by maximizing the output of a wind power plant rather than a single turbine," Gupta says.

The site will use V27 turbines, which are smaller than full, industrial-sized turbines.

"The V27 turbines are the smallest turbines that retain significant characteristics to the study of larger-scale machines," says Jon. "Having smaller turbines makes them easier to reconfigure, repair, and maintain. The cost differences mean researchers can do earlier-stage, higher-risk research at SWIFT and turn tests around much more quickly, allowing them to pursue a more robust annual research agenda."

Creating a new facility from the ground up also allows detailed characterization of the site and the turbine components before installation and testing. This gives researchers higher confidence in the accuracy of the wind turbine models they create based on research at the site.

Studies at the site will investigate turbine-to-turbine interactions and innovative rotor technologies. Other areas for investigation include aero-acoustics and structural health monitoring of turbines using embedded sensor systems. Researchers will also continue work on Sandia's structural mechanical adaptive rotor technology (SMART) program.



ARTISTS RENDERING of the SWIFT concept that emphasizes lowering the cost of wind energy by maximizing the output of a wind power plant rather than a single turbine. (Rendering by Chris Brigman)

"Most wind turbine rotors today are passive structures. Sandia's SMART rotors have active surfaces similar to airplane wings, with actuators that change their shape, allowing for greater control and flexibility," Jon says.

The site eventually might expand to include nine or more wind turbines, which would allow researchers to further examine how individual turbines and entire wind farms can become better "citizens of the grid" and how to be more productive and collaborative.

Jon says the team hopes to have the SWIFT facility operational by October.

A flexible memorandum of understanding (MOU), signed by all four partners — Sandia, Vestas, Texas Tech University Wind Science and Engineering (WISE) Center at Reese Technology Center, and Group NIRE, a renewable energy development company — allows use of the site for collaborative and proprietary research, depending on research needs.

DOE's Wind and Water Power Program is funding Sandia's work.

Vestas has research and development offices in Texas, Massachusetts, and Colorado that work with the company's technology centers in Asia and Europe to improve existing wind turbines and develop the wind power systems of the future. Since 1979, Vestas has supplied more than 46,000 wind turbines in 69 countries and employs more than 3,000 people in the United States in technology research, manufacturing, sales, and service.

A break for Bocce

Photos by Randy Montoya

Justin Johnson (9546), in cap in photos below, and Aaron Blackwell (10656) have found a fun way to spend their lunch hour — a friendly game of bocce ball on the lush lawn in front of Bldg. 800. According to Justin, the two started playing about two weeks ago as a way to get outdoors and enjoy the fresh air. Although it's a friendly competition, the two *do* keep score: As the photos below may suggest, Justin won the match photographed here, but in their running score, both have won their share of games. "I hope people realize they can come outdoors and do something fun and unwind a little bit before they get back to the grind," Justin says.

Sandia Classified Ads

MISCELLANEOUS

IN-GROUND POOL COVER REEL, w/straps, manual, 17-ft. inside measurement, excellent condition, $50. Crouch, text to 400-9143.

LAMP, extension goose-neck, $15; lamp, floor model, 3 lights, aluminum color, $25; printer, 895cxi Desk Jet, never used, $75. Lewis, 323-7268.

COUCH & RECLINING ROCKER, brown leather, couch reclines on both ends, excellent condition, $1,000/both. Lee, 720-5994.

HIGHBOY, Ethan Allen, classic American, maple, $850; other EA maple furniture, photos available. Stoffels, 917-8488.

MOVING BOXES, 60, Lowe's, all sizes, slightly used, $50. Wallace, 256-1643.

SCANNERS, RadioShack: Pro-197, Pro-2055, Pro-97; amateur (ham) & shortwave radios, prices vary. Leong, 505-480-5364.

COFFEE MAKER, Cuisinart, 12-cup, $65; wine glass rail, under-counter rack, oak, holds 10-12 long-stem, $25. Willmas, 281-9124, evening, ask for Jack.

DUMBBELLS, 30-lb., 2, $40 ea.; Olympic bench press & weights, $150. Jenkins, 883-7617.

STATIONARY BIKE, used, $75 OBO; Rascal 230 scooter, $200 OBO. Chambers, 292-1427, ask for Carol.

ELECTRIC GUITAR CASE, coffin case BB120, 44" x 14-1/2" x 3", black w/red velvet interior, well-made, like new, $25. Caskey, 298-6428.

STEERING WHEEL, Momo, full, red & black leather, made in Italy, rare, w/hub, like new, $135. Tafoya Porras, 898-4459.

TIMESHARE, Steamboat Springs CO, sleeps 6, June 16-June 23, $550/wk. Buck, 353-2667.

LOVESEATS & CHAIR, matching, $195; wood furniture: dining table, w/4 chairs, $139; coffee table, $25; bar, $189; china cabinet, $199; corner desk, $85. Behar, 821-9299 or 980-8002.

INVERSION GRAVITY TABLE, Teeter Hang Ups, minimally used, $175; recumbent bike, minimally used, $200/offer. Steel, 298-3815.

PIANO, 1937 Gulbransen baby grand, completely rebuilt & refinished, inside & out, appraised $5,000, asking $4,000. Cox, 299-5212.

MEN'S SHOES, Nike Bape Star, brand new, sizes 9.5 & 11, yellow, 11 & 11.5 green, $35. Sandoval, 238-8998.

AIR COMPRESSOR, Campbell Hausfeld, model FP2028, 1-gal., oil-free pancake, w/regulator, $30. Monson, 298-1924.

FUNDRAISER, Giovanni String Quartet, benefits Legacy Academy Fine Arts, Friday, April 27, 7 p.m., Legacy Church, call for more info. Pacheco, 923-3659.

GOLF CLUBS, full set, Wilson, bag, balls, shoes, $80. Gray, 265-6211.

JACKET, XL, Armored, black/yellow/white; large full-face helmet, same colors, excellent condition, $200/both OBO. Fonseca, 232-7091.

RIMS, set, for Dodge pickup, 8-lug, 16-in., $200; tires, 3, Pirelli 245R35, like new, 20-in., $600/all. Garcia, 280-5815,

CAMPER SHELL, white, fits Ford Ranger, short bed, $500 OBO. Sanchez, 400-4205.

SINGLE BED, Tempurpedic Advanced Ergo system, w/mattress & remote, briefly used, $800/both, $600 separately. Meisenheimer, 250-9998.

WEIGHT BENCH, Olympic, 300-lbs., good condition, $299. de la Fe, 974-8670.

TRANSPORTATION

'99 DODGE RAM 1500, 4x4, 5.9L, V8, AT, extended cab, short bed, silver, very clean, 150K miles, $6,000 OBO. Cleland, 505-281-2228.

'72 JEEP COMMANDO, 360 AMC engine, AT, PS, PB, removable hardtop, restored/rebuilt, $6,000. Bentz, 505-857-0728.

'06 FORD ESCAPE LIMITED, 4x4, V6, black, premium sound, sunroof, 97K miles, great shape, $10,000 OBO. Guldan, 505-553-5567.

'02 BMW Z3-3.01, 5-spd., 225-hp, pewter, black leather, best Z3 made, 72K miles, runs perfectly, $12,500. Archuleta, 822-0002.

'06 LEXUS RX330, 2WD, leather, navigation, backup camera, more, 100K miles, great condition, $13,500. Garcia, 899-3064.

'06 MAZDA 6S, V6, AT, heated leather, sunroof, 6-disc/XM radio/iPod, new tires, 67K miles, $11,800. Quarles, 434-260-1649.

'03 SILVERADO 2500 HD, utility truck, gas, white, 195K miles, $8,000. Romero, 505-306-8815.

'02 SUBARU FORESTER L, 5-spd., white, garaged, service records, only 80K miles, great condition, $6,750. Mead, 256-8415.

'06 MAZDA 6S, 5-spd., 3.0L, FWD, sport pkg., red, like new, 42K miles, $11,250. Ritterbush, 298-0802.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:

- **EMAIL: Michelle Fleming (classads@sandia.gov)**
- **FAX: 844-0645**
- **MAIL: MS 0165 (Dept. 3651)**
- **DELIVER: Bldg. 811 Lobby**
- **INTERNAL WEB: On internal web homepage, click on News Center, then on *Lab News* link, and then on the very top of *Lab News* homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.**

Ad rules

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

'02 LINCOLN CONTINENTAL, all power, new brakes, rotors, tires, alignment, garaged, 98K miles, excellent condition, $5,000. Benson, 884-5059.

'08 ZAP XEBRA ELECTRIC CAR, 3-wheeled, commuter car, 10-15 mile radius, never buy gas again. Garcia, 505-294-1442.

'08 DODGE DAKOTA, 4x4, crew cab, tow pkg., bed cover, many extras, 49K miles. Bozone, 505-242-8295.

RECREATIONAL

BICYCLE, Surly long haul trucker, LHT, excellent condition, must see, $900 OBO. Burnett, 505-974-5653.

'07 HONDA SHADOW AERO 750, windshield, sissy bar, saddle bags, T-bag, black & tan, excellent condition, photos available, $3,900. Vernon, 892-6571.

YOUTH MOUNTAIN BIKE, Raleigh Mountain Scout, 24-in. wheels, aluminum frame, front suspension, $150. Nelson, 856-5505.

'07 GULFSTREAM AMERILITE, model 25BH, 2 new batteries, 2 propane tanks, new faucets, water valves, sleeps 8, ready for camping, $13,500 OBO. Barreras, 504-8671.

'77 MORGAN SAILBOAT, 37-ft., Out Island sloop, details at http://sailing-texas.com/201101/smorgan37101.html. Kercheval, 505-266-5833.

'06 HARLEY-DAVIDSON SOFTAIL, dealer serviced, great gas mileage, fuel-injected, performance pipes, excellent condition, $9,000. Valdez, 505-699-9522.

'09 180RX BOAT, 21 hrs., w/all safety equipment, too many extras to list, excellent condition, $13,500. Mulville, 459-6790.

PRO-CRAFT 180 FISH/SKI BOAT, 150 Mercury Black Max, brand new, never in water, garage kept. Green, 898-3791 or 803-7228.

'09 HARLEY-DAVIDSON ROAD GLIDE, FLTR, beautiful stock condition, tour pack & lowers, 6.5K miles, $17,900 OBO. Castillo, 269-1705.

'84 HONDA 125 XL, street legal, garage kept, 2.4K miles, starts & runs perfectly, $950. Schofield, 660-5898.

KEYSTONE OUTBACK, 27-ft., travel trailer, AC, heat, shower/tub, microwave, stove, oven, sleeps 6, great condition, $10,600 OBO. Teraji, 271-8195.

REAL ESTATE

3-BDR. CUSTOM HOME, 2,476-sq. ft., open, light, patio, stainless appliances, access to National Forest, Tijeras, $449,000. Logan-Condon, 505-281-1724, ask for Art.

2-BDR. TOWNHOUSE, 2 bath, 1,500-sq. ft., NE Heights, brick floors, owner financing available, $159,700. Siebenthal, 505-797-8764.

LOT, 1 acre, North Albuquerque Acres, w/well, $229,000. Benson, 856-1602, donnabenson55@comcast.net.

3-BDR. HOME, 1-3/4 baths, 1,140-sq. ft., Belen, $85,000. Padilla, 864-7077.

3-BDR. HOME, 1,700-sq. ft., Juan Tabo/Menaul, Robeson built, expanded living room, new roof, furnace, $170,000. Sobolik, 292-3959.

4-BDR. CUSTOM HOME, 2,890-sq. ft., 1 story, huge lot, RV gate, high-end remodel, Four Hills, $369,000. Kelly, 480-540-8900.

LAND FOR SALE, Bosque Farms, .97 acre, taxes $528/yr., $83,000 OBO. McGrath, 265-7905.

3-BDR. HOME, 1-3/4 baths, 2,260-sq. ft., large lot, cul-de-sac, fruit trees, renovations, 260-sq. ft. sunroom, NE Comanche/Juan Tabo, FSBO, $197,500 OBO. Torrez, 505-489-1478.

WANTED

ROOMMATE, fully furnished, 3-bdr., 3 baths, private bath & refrigerator, Rio Rancho, $550/mo., utilities included. Simpson, 505-440-9903.

CASSETTE PLAYER, capable of dubbing, age does not matter. Chorley, 296-1454.

ROOMMATE, gated, 5 min. from Eubank gate, shared bathroom, washer/dryer, access to community gym, $550/mo. + utilities. Henry, 505-263-3211.

P90X WORKOUT DVDS. Jenkins, 883-7617.

HOUSEKEEPER, Ventana Ranch, must provide references. Carrasco, 505-803-3831.

iPAD DONATIONS, 4, for use w/autistic students to facilitate communication & engagement. Tapia, 250-1111.

GOOD HOME, loving family, German Shepherd, 7 yrs. old, good w/kids & dogs, housebroken. Tadros, 908-7473.

ROOMMATE, 4-bdr. home, furnished, NE Heights, washer/dryer, cable, WiFi, large yard, pool table, $650/mo. includes utilities. Marcon, 505-401-4058.

ROOMMATE, male/female, quiet professional, 50+, no pets, outside smoker OK, $500/mo., some utilities paid. Mooney, 505-797-0452.

WORK WANTED

TWO 15-YR. OLDS LOOKING FOR WORK: first, babysitting, responsible; second, summer tutoring, English & math, junior high & 9th grade only. Andrews, 255-8330.

SHARE-A-RIDE

VANPOOL, looking for riders, full or part time, Bosque Farms, Peralta and Los Lunas. Burford, 916-0405.

Mileposts

New Mexico *photos by Michelle Fleming*
California *photos by Randy Wong*

Alice Ann Vandevender
35 10615

Lawrence Arellano
30 9538

James Aubert
30 1822

Joanna Baczek
30 10222

Antoinette Lucero
30 851

Wendy Amai
25 6532

Eric Detlefs
25 2541

Brad Mickelsen
25 2141

Ted Parson
25 1719

Edward Bujewski
20 2714

Richard Garcia
20 10665

Michael Strosinski
20 6811

Delilah Armijo
15 10242

Matthew Brito
15 4821

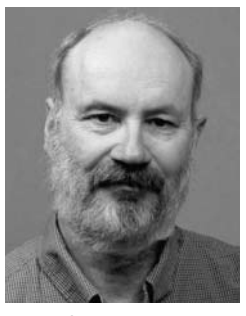
Marlene Brown
15 422

Dennis Kuchar
15 2613

David Melgaard
15 5563

Gary Rivera
15 6634

Elizabeth Ruiz
15 3554



Roger Suppona
15 9317

Wounded Warrior

Cheston Bailon's path to Sandia passed through Iraq

By Nancy Salem

A smile often crossed Cheston Bailon's face as he sat poised for combat in the deserts of Iraq. His fellow Marines thought he was crazy.

"What's wrong with this guy?" Cheston (5635) laughs, recalling those moments. "He's smiling in Iraq."

Cheston's smile came from memories of home, of growing up in Shiprock on the Navajo Reservation with his brother John. "We lived a rough life without many privileges," he says. "But there was love. We worked in the corn fields with my dad in 100-degree heat. It was life for us. It prepared us to endure some of the hardships we would face in Iraq."

CHESTON BAILON on patrol in Iraq in 2005 . . . and at Sandia today. (Photo by Randy Montoya)

Cheston, 27, and John, 13 months older, were inseparable. "My story begins with my brother," Cheston says. "I don't know a day without John. He's been with me every step of the way."

Their journey took the brothers, both Marines, to side-by-side duty in the Iraq War. They made it home in 2005, finished college, and went to work for Oracle Corp. in Virginia.

Cheston recently took the big step of leaving Oracle, and John, to take a position at Sandia. He is the first hire under the Labs' Wounded Warrior Career Program, which offers a variety of work options to combat-injured veterans.

"I chose Sandia because I wanted to do more," says Cheston, who prefers to keep the nature of his injuries private. "Its mentality appealed to me. And the welcome has been incredible. It feels like a big hug."

Sense of responsibility

Cheston lived most of his life on the Navajo Reservation. His father, Francisco Bailon, a native of Santo Domingo Pueblo, retired this month from a long career as a Los Alamos National Laboratory machinist. His mother, Fannie Bailon, a Navajo, mixed work with being a stay-at-home mom while raising her four children, Cheston, John, Jodene, and Jessica. Francisco commuted from Shiprock to Los Alamos, and sometimes moved the family back and forth so he could be close to them.

"My dad never sat us down and said how to be a man. He taught by example," Cheston says. "We faced challenges and hardships and developed perseverance. Our mom gave us the nurturing side, to take care of people and empathize. It was a good combination. John and I were both motivated to develop ourselves."

Cheston and John did a year of high school at the New Mexico Military Institute in Roswell. "I contemplated the idea of joining the military," Cheston says. "I thought about it a long time. Looking back, I didn't have one good reason — I had several."

His motivation revolved around responsibility. He wanted to be the person who stepped up so someone else didn't have to. "I was young and able-bodied. I didn't have a family depending on me," he says. "Send me."

Cheston enlisted in the US Marine Corps Reserves before graduating from Shiprock High in 2002. John, who had completed a semester at Arizona State University, decided on the heels of 9/11 to join him.

Fannie Bailon was reluctant to let both her boys go. "I told them I strongly disagreed. I was upset," she says. "But it's also important to support your children's dreams. I just stepped aside."

Francisco Bailon says he and Fannie had to face their faith and trust that their boys would be safe. Cheston convinced his parents that he and John were in good hands. "I never felt afraid for my safety," Cheston says. "I believe in the Native American ways. I always knew I'd be taken care of."

Cheston and John did boot camp together and were placed on reserve status in March 2003. Cheston enrolled at San Juan College and later joined John at ASU studying business.

On Jan. 4, 2005, the brothers were activated for duty in Iraq. Cheston and John, both lance corporals, were deployed with the 3rd Battalion, 25th Marine Regiment as infantrymen.

"We were in one of the most engaged units since Vietnam," Cheston says. "We saw a lot of combat."

Their battalion lost 48 Marines and sailors.

"I was losing my mind," Fannie Bailon says. "I tried not to watch the news reports. My faith was really tested."

Cheston spent six months in Iraq and John seven. "John and I built an even stronger bond," Cheston says. "Our band of brothers relationship was amplified because we really are brothers. We talked a lot about religion and the purpose of life. It helped us develop who we are."

The brothers were welcomed home to Shiprock with a traditional Native American ceremony to "shed the armor and take away the warrior mindset," Cheston says.

They re-enrolled in business courses at ASU and were discharged from the military in 2008. Cheston graduated in May 2010 with a bachelor's degree in marketing. John earned a degree in sustainability.

Hire a Wounded Warrior

James Peery, director of Information Systems Analysis Center Dept. 5600 and Wounded Warrior's executive champion, says the program is actively looking for managers who want to hire a veteran with combat-related injuries. Two, Cheston Bailon (5635) and Sean Christopher (98), have joined Sandia so far and a couple more hires are in the pipeline.

Each Wounded Warrior hire gets a senior executive mentor, a technical mentor, and a veteran mentor to help with the transition. The program is seeking combat-experienced veterans, especially those who were wounded in action, to be mentors for new Wounded Warrior hires. If you are interested and want to learn more about being a mentor for the program, please contact H.E. Walter (5642) at 284-4853 or James Benson (99) at 284-4856.

Cheston's manager, Curtis Johnson (5635), says the Labs should benefit from the unique energy, talents, and experience of wounded veterans and from drawing Sandians from nontraditional educational and experience backgrounds.

A perfect fit

Cheston says his sense of responsibility did not end with his tour in Iraq. "After my service, I looked for other stages or platforms to continue my necessary responsibility to enrich my community," he says.

At ASU the Bailons were accepted into the second class of scholars of the Pat Tillman Foundation, named after the ASU graduate, National Football League player, and soldier who was killed by friendly fire in Afghanistan.

"Pat lived life to the fullest. He was engulfed in learning," Cheston says. "The foundation carries on Pat's legacy by helping people become leaders."

Working with a foundation mentor, Cheston and John developed a project to increase school retention rates for Native American students and ran the New York City Marathon on their behalf, raising $4,240 each.

They heard about the Wounded Warrior program in an email from the Marine Corps while eating a mound of pasta after the race. They applied and were hired by Oracle, a Sandia partner in Wounded Warrior.

In July 2011, Cheston was invited to Sandia. "I was blown away by the work being done here," he says. "It was a perfect fit for me."

Sandia later offered a job and Cheston accepted, but the decision to leave John wasn't easy. "We talked long and hard and decided that, maybe, if we have different experiences we can bring more to the conversation," Cheston says. "We challenge each other to be better people."

Cheston started work in February as a cybersecurity technologist in Analytics and Cryptography. His manager, Curtis Johnson (5635), says his group has military customers and works on problems relevant to deployed personnel.

"Our admiration for the servicemen and women we work with made the Wounded Warrior program attractive to us," Curtis says. "We are eager to do our part to help military personnel transition to productive civilian careers, and we're excited to see how Cheston's unique skills and experience benefit our team over time."

James Peery, director of Information Systems Analysis Center 5600 and Wounded Warrior's executive champion, says Sandia will continue to hire through the program. "These men and women who have served honorably in our military and come back with sustained injuries have conviction," he says. "They will run through a wall to get the job done. I have no doubt they will be incredibly successful at Sandia."

James says Cheston is someone who will run through the wall. "He takes on initiative," James says. "He won't let anything get in his way."

Perhaps the best description of Cheston comes from his parents, Francisco and Fannie Bailon, speaking together. "We are really proud of Cheston, of the way he thinks, talks, and walks his journey in life, and how his plan is well written out and what his goals are. His determination is totally amazing."