Annual Assessment Report is culmination of year-long effort

Offers unbiased, informed judgement about safety, security, reliability, and performance of stockpile

Photo by Stephanie Blackwell

Each year, Sandia assesses the safety, reliability, and performance of the nation's nuclear weapons stockpile. Through a series of presentations and discussions, all stockpile weapon systems and relevant component engineering and science and technology organizations report on the safety, reliability, and performance status of each weapon type in the stockpile in the absence of nuclear testing.

As required by law, the Laboratories director sends an annual report of this assessment and related issues to the Secretary of Energy, Secretary of Defense, and the Chairman of the Nuclear Weapons Council.

The directors of Los Alamos and Lawrence Livermore national laboratories and the commander of the United States Strategic Command complete similar reports based on their assessments. The secretaries, in turn, attach each assessment without change and submit a letter to the President under their signatures summarizing their comments, conclusions, and other appropriate information regarding the state of the nation's nuclear deterrent.

* * *

After signing the 2016 assessment report, Jill shared the following thoughts:

As I sign this year's annual assessment report addressing the status of the nation's nuclear weapon stockpile, I take pride in the extraordinary commitment, skill, and focus Sandia brings to this important responsibility. Although the report itself is a snapshot in time, it comes as the culmination of a complex year-long effort involving teams from across Sandia.

The conclusions expressed in the report reflect the most important role of the Laboratories, offering the nation's leadership and policymakers an unbiased and informed judgment about the safety, security, reliability, and performance of the nuclear weapon stockpile.

The nation places great trust in Sandia, a trust we've earned in the course of serving the nation for more than 65 years. We are proud of the confidence our nation places in us, and we come to work every day determined to live up to that trust.

— President and Laboratories Director Jill Hruby

Sandia marks Disability Awareness Month. See page 12.

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Since 1949

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Inside . . .

EMPLOYEE Caring PROGRAM

THROUGH OCT. 21. SEE PAGES 6-7

Defense Secretary Ashton Carter visits Labs

'Nuclear mission the bedrock of American security'

Photos by Norm Johnson

Defense Secretary Ashton Carter and President and Labs Director Jill Hruby pause in front of a bronze statue of the late physicist Willis Whitfield, who invented the modern laminar-flow cleanroom at the Labs in 1962. During a Sept. 27 visit, Carter toured a nuclear weapons display area and the Microsystems & Engineering Sciences Applications (MESA) complex and received briefings about Sandia's mission. Earlier in the day, speaking to Air Force personnel at KAFB, Carter said the "nuclear mission is the bedrock of American security." He also praised Energy Secretary Ernest Moniz and Deputy Energy Secretary Elizabeth Sherwood-Randall for being "spectacular leaders" and added that the nuclear enterprise needs DoD and DOE to continue to "run just like this, these two departments doing our two parts."

US DEFENSE SECRETARY Ashton Carter, left, is joined by Sandia President and Director Jill Hruby and Executive VP Steve Rottler during a tour of the Labs.

That's that

"*E pur si muove* – And yet, it moves." That's the phrase attributed to Galileo Galilei – the father of modern physics – after being forced by the powers that be to recant his claims that the Earth moves around the Sun rather than the other way around.

One imagines Galileo muttering the phrase, knowing full well that he was right, and knowing, I suspect, that history and science, being the quest for truth, would vindicate him.

I got to thinking about Galileo because of the annual rite of fall, the Major League Baseball playoffs, which are upon us. The National Pastime, more than any other team sport, has long appealed to the numbers nerd, the stats freak, in all of us.

You know those old-school baseball statistics – batting average, runs batted in, earned run average? They're all so very passé these days in the stratospheric heights of baseball nerd-dom. Now the hard-core stats nuts get into online flame wars and even, I'd wager, into some outright fisticuffs over which stat is more important, the Value Over Replacement Player number or the Wins Above Replacement rating.

And the debates haven't been limited to the relative merits of increasingly arcane statistics.

For the better part of the 20th century one of the most contentious issues in baseball was whether the curve ball actually, you know, *curves*. Warring camps staked out their positions, with some arguing the pitch was a mere optical illusion. Others, trusting the evidence of their own eyes, were convinced the phenomenon was real and argued accordingly. A compelling piece of their evidence was that many a young prospect, a high school hotshot with his future all ahead of him, fizzled at the Big League level because he couldn't hit this "optical illusion."

Granted, the fight over the real or perceived trajectory of the curve ball wasn't as momentous as Galileo's fight to establish a fundamental astronomical truth, but it *did* heat up the blood of lots of otherwise mild-mannered Rotarians.

The matter seemed to be resolved with some finality when *LIFE* magazine, famed for its photojournalism, published a "proof" that the curve was in fact, an illusion. To which Galileo, were he a switch-hitting shortstop facing off against pitcher Bob Feller, might mutter as he swung and missed the great right-hander's monster curve, "And yet, it moves!"

Curve-baller and American original Dizzy Dean was having none of what *LIFE* was selling. "Stand behind a tree 60 feet away, and I'll whomp you with an optical illusion!" he said at the time through a mouthful of Beech-Nut chaw.

LIFE's expose didn't settle the matter. Several years later, archrival *LOOK* magazine published its own proof, this time demonstrating graphically that the ball *did* curve. And science, not to be left out, got into the act. Ralph Lightfoot, an aeronautical engineer with Sikorsky Aircraft, ran wind tunnel tests that seemingly closed the book on the matter. Under rigorous control and scrutiny, the ball was shown to *actually* curve, just as befuddled batters had been averring since the days of Abner Doubleday. So the issue was done and dusted, right? Not quite.

Here's the final irony: It now seems that both sides were correct. The ball *does* curve, but an optical phenomenon associated with the pitch makes it very difficult for batters to predict where the ball will be when it crosses the plane of the plate. And that wicked pitch – the real part *and* the illusory part – is still the bane of plenty of young prospects caught flailing away at empty air where the ball *should* have been.

More baseball? If the curveball has been the nemesis of batters for decades, the knuckleball has been like Russia's pre-World War II intentions as described by Winston Churchill: A riddle, wrapped in a mystery, inside an enigma.

Knuckleballs, which dance the Macarena on their way to the plate, are almost impossible to hit. As renowned batting coach Charlie Lau once said, "There are two theories on hitting a knuckleball. Unfortunately, neither of them works."

* * *

We're right in the middle of our annual ECP campaign to raise funds for those in need in our community. Things are tough out there; hard times hit the least of us the hardest. When you've been knocked down, it's not always easy to get back on your feet without a helping hand.

Whatever you can find to give this year will make a difference in someone's life, maybe *all* the difference. And that's what we're about here: Making a difference – for the nation and for our community.

See you next time.

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

Round three

Small businesses can apply for clean-energy help

By Nancy Salem

Small Business Vouchers Pilot
U.S. DEPARTMENT OF ENERGY

DOE has launched the third round of its Small Business Vouchers Pilot, which lets companies in the clean-energy sector apply for technical help from Sandia and other DOE labs.

Johanna Wolfson, Technology-to-Market director in the office of Energy Efficiency and Renewable Energy (EERE), announced the launch Oct. 5 at South-by-Southwest Eco in Austin, Texas. The pilot, part of EERE's National Laboratory Impact Initiative, aims to help small businesses bring next-generation clean-energy technologies to the market faster by giving them access to expertise and tools at national labs.

The Small Business Vouchers Pilot began in September 2015. EERE said 76 out of several hundred applicants received funding in the first two rounds. Eleven DOE labs have begun working with the private sector with a combined budget of $14.7 million. Sandia's 12 vouchers from rounds one and two total $2.6 million and include projects in advanced manufacturing, bioenergy, fuel cells, geothermal energy, solar energy, wind, and water power.

Companies can apply to Sandia through the SBV website (www.sbv.org) for $50,000 to $300,000 in vouchers for technical assistance. DOE will select the best business proposals that focus on a specific technical challenge in a competitive process. Successful applicants must provide a 20 percent, in-kind cost share. EERE says it hopes in the third round to increase the number of small businesses collaborating with the DOE national laboratories. Small businesses with little to no experience working with the labs are strongly encouraged to submit requests for assistance.

Juan Torres (8040), chief of operations for Sandia's Energy and Climate programs, says companies can propose collaborative research with a particular scientist, request technical assistance from an engineer, or gain access to such Sandia facilities as the Microsystems Science and Technology Center, the National Solar Thermal Test Facility, or the Battery Abuse Testing Laboratory.

"The program gives companies an array of options to meet their technical challenges," Juan says. "Sandia and the other labs have decades of R&D experience in clean-energy technologies and an incredible amount of knowledge to share with these small businesses."

Last year, DOE chose Sandia as one of five leads in the $20 million pilot, along with the National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory. Sandia was named the lead lab in the sectors of solar energy, wind energy, and geothermal technologies.

Overall, the pilot focuses on helping small businesses develop technologies in the areas of advanced manufacturing, buildings, vehicles, wind, water, bioenergy, fuel cells, geothermal, and solar. To be eligible to apply, businesses must be US-based and -owned with no more than 500 full-time employees worldwide. About $12 million is available for vouchers in rounds three and four.

"This is a tremendous opportunity for small companies," says Jackie Kerby Moore, manager of Technology and Economic Development Dept. 1933. "And it will benefit the nation by building the clean-energy economy. It's a classic win-win."

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* * *

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H_2GO! Zero-emissions hydrogen-powered passenger ferry in San Francisco Bay is possible, says Sandia study

First-of-its-kind vessel can achieve speed with zero emissions

By Patti Koning

AN ARTISTIC RENDERING of the proposed San Francisco Bay Renewable Energy Electric Vessel with Zero Emissions (SF-BREEZE). A Sandia-led study found that a high-speed, hydrogen-fueled passenger ferry is feasible.

Nearly two years ago, Sandia researchers Joe Pratt (8366) and Lennie Klebanoff (8367) set out to answer one not-so-simple question: Is it feasible to build and operate a high-speed passenger ferry solely powered by hydrogen fuel cells? The answer is yes.

The details behind that answer are in a recent report, "Feasibility of the SF-BREEZE: a Zero Emission, Hydrogen Fuel Cell High Speed Passenger Ferry." SF-BREEZE stands for San Francisco Bay Renewable Energy Electric Vessel with Zero Emissions.

"The study found that it is technically possible to build a high-speed, zero-emission hydrogen-powered ferry. We also believe this can be done with full regulatory acceptance," says Joe.

"In the course of the study, we examined more than 10 major issues where feasibility was initially unknown. SF-BREEZE sailed through them all," adds Lennie.

Tom Escher, president of San Francisco's Red and White Fleet, first conceived of the project when he asked if it was possible to do away with emissions altogether on one of his ferries.

"This is a game changer. We can eliminate environmental pollution from ships," he says. "This could have a major impact on every shipyard in the country."

Funded by the Department of Transportation's Maritime Administration and led by Sandia, the feasibility study brought together the American Bureau of Shipping (ABS), the US Coast Guard, naval architect Elliott Bay Design Group, the Port of San Francisco, and dozens of other contributors.

"Not long ago, the prospect of pollution-free transportation seemed like science fiction," says Maritime Administration Administrator Paul "Chip" Jaenichen. "Today, through public-private collaboration on projects like SF-BREEZE, we are making progress to turn it into a reality."

Novel boat design

Hydrogen-powered ferries do exist, but most are smaller, slower vessels used for tours on lakes and rivers. The SF-BREEZE study set out to discover whether it is technically feasible to build a large, fast vessel; it could meet maritime regulations; and it could be economically competitive with modes of transportation already available in the San Francisco Bay area.

The group drew up conceptual specifications: a 150-passenger commuter ferry that would travel four 50-mile round-trip routes each day at a top speed of 35 knots (roughly 39 miles per hour) about 60 percent of the time. The ferry could refuel midday, between the morning and afternoon commutes.

"This kind of boat has never been built before," says mechanical engineer Curt Leffers, the project manager for Elliott Bay Design Group. "Hydrogen fuel cells are heavier than diesel engines for a given power output, so achieving the right power-to-weight ratio for the vessel was tricky."

The need for speed drove the design to a slightly longer catamaran. The engineers were able to save weight by consolidating the support equipment for the fuel cells.

To achieve the necessary safety standoffs from the fuel cells, the designers placed fuel cells on the main deck of the vessel in a separate compartment. Leffers explains that this provides physical separation between the fuel cells and passengers.

The project supports Elliott Bay's commitment to the environment. "I'm a big believer in developing environmentally friendly designs," Leffers adds. "This project has been terrific because it's something I really believe in. I think that this proof-of-concept — this boat — can be built, is very important for future projects."

Regulations and economics

ABS issued a conditional Approval in Principal to verify that the conceptual design would comply with applicable regulations and rules and to identify any potential gaps in compliance. Combining their assessment with feedback from the Coast Guard, Sandia found no regulatory showstoppers and concluded that the vessel will be acceptable from a regulatory perspective once a more detailed "ready-to-build" design is generated.

"ABS is proud to have participated in the SF-BREEZE feasibility study and advance the research on unique challenges of designing a high-speed passenger ferry powered solely by hydrogen fuel cells," says ABS Chief Technology Officer Howard Fireman. "The collaboration with Sandia and the project team extends our knowledge base and the potential technology transfer to address the challenge of reducing the environmental footprint."

The hydrogen ferry would cost about twice as much as a comparable diesel ferry with today's prices. Much of that cost is in the fuel cell system.

"Right now, we can't achieve economic parity with a comparable diesel ferry," says Joe. "But this is a question we need to explore further. Is economic parity necessary from the outset? Lessons from the automotive market tell us maybe not."

Vehicle manufacturers have successfully brought fuel cell electric vehicles to market even though those cars are more expensive than comparable internal combustion engine vehicles. Many experts expect mass adoption of fuel cell electric vehicles to bring down prices of hydrogen fuel cells.

Optimization is next step

The next step is to optimize the vessel design. "We need to consider if the parameters we started out with are optimal for the technology that is available today," says Joe.

Working with Red and White Fleet and other stakeholders, Lennie and Joe are now undertaking an optimization study. They will examine the tradeoffs between speed and costs and emissions among other factors.

Red and White Fleet President Escher sees SF-BREEZE as the start of a revolution in marine transportation. "When this boat is launched, it will be a seed. When you add a seed to water, it grows," he says. "This seed could grow into a 40-meter tugboat, a 70-meter supply boat or a 300-meter oceangoing ship trading between the West Coast and Hawaii. And all at zero pollution."

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HyStEP makes stop at Sandia/California

Story by Michael Padilla
Photos by Loren Stacks

The Hydrogen Station Equipment Performance Device (HyStEP) took time out of its busy scheduling commissioning new hydrogen refueling stations to visit Sandia/California for a hardware update. HyStEP, which recently won an Outstanding Partnership Award from the Federal Laboratory Consortium, was developed by Sandia and the National Renewable Energy Laboratory. DOE's Office of Energy Efficiency and Renewable Energy's Fuel Cell Technologies Office funded HyStEP as part of the Hydrogen Fueling Infrastructure Research and Station Technology (H_2FIRST) project. After a few days of maintenance and calibration in Sacramento, HyStEP stopped in Livermore before heading to Redwood City, California, to commission a new hydrogen refueling station. Previously, HyStEP was testing hydrogen refueling stations in Los Angeles and surrounding areas. Joe Pratt (8366, left in photo at lower left) and Terry Johnson (8253, at right in the same photo) shown here, are Sandia's H_2FIRST project leads.

rebooting computing

Sandia explores neural computing to extend Moore's Law

By Mollie Rappe

Computation is stuck in a rut. The integrated circuits that powered the past 50 years of technological revolution are reaching their physical limits.

This has computer scientists scrambling for new ideas: new devices built using novel physics, new ways of organizing units within computers, and even algorithms that use new or existing systems more efficiently. To help coordinate new ideas, Sandia has assisted organizing the Institute of Electrical and Electronics Engineers (IEEE) International Conference on Rebooting Computing held Oct. 17-19 in San Diego.

Researchers from Sandia's Data-driven and Neural Computing Dept. 1462 will present three papers at the conference, highlighting the breadth of potential non-traditional neural computing applications.

"We're taking a stab at the scope of what neural algorithms can do. We're not trying to be exhaustive, but rather we're trying to highlight the kind of space over which algorithms may fall," says Brad Aimone (1462), a computational neuroscientist and co-author of one paper. Historically, neural computing was seen as approximate and fuzzy, he adds; however, Sandia researchers in their papers aim to extend neural algorithms so they include rigor and predictability, which shows they may have a role in high performance scientific computing.

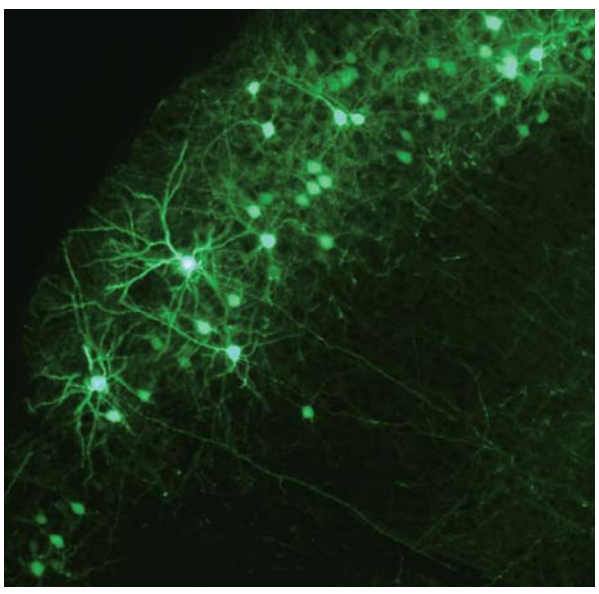
The three papers are titled "Overcoming the Static Learning Bottleneck — the Need for Adaptive Neural Learning" by Craig Vineyard (1462) and Steve Verzi (6132); "Computing with Dynamical Systems" by Fred Rothganger (1462); and "Spiking Network Algorithms for Scientific Computing" by William Severa (1462), Ojas Parekh (1464), Kris Carlson (1462), Conrad James (1714), and Brad Aimone.

Troubles, benefits of continuously learning

The brain is continually learning. "While we do learn in school, our learning doesn't stop when school ends. Instead, our brains are continually adapting through processes such as synaptic modifications. However, most machine-learning algorithms learn once and are done," says Craig, a computer scientist.

Most so-called machine-learning algorithms have a learning phase and a separate testing and operation phase. This is really time-consuming. Ambitious — and challenging — attempts to develop algorithms that learn continuously also run the risk of the algorithm "learning" something that's wrong, Craig says.

His paper argues for continual learning and suggests the use of game theory — the mathematics of logical decisions, such as when to take out the trash and when to hope your roommate will do it for you — to bring precision to the decision of when an algorithm should learn.



SANDIA RESEARCHERS are drawing inspiration from neurons in the brain, such as these green fluorescent protein-labeled neurons in a mouse neocortex, with the aim of developing neuro-inspired computing systems to reboot computing.
(Photo by Frances Chance, courtesy Janelia Farm Research Campus)

What are dynamical systems anyway?

A dynamical system is an equation that describes how things change with time. A simple dynamical system is a function that describes the movement of a grandfather clock's pendulum. "The idea behind using dynamical systems for computation is to build a machine such that its dynamics — which has to do with the structure of the machine or the structure of the math — will lead it to the answer based on feeding it the question," says Fred, a computer scientist.

Both our brains and, in a way, conventional computers are dynamical systems: They find answers just based on the question and how the computers are constructed, Fred says. His paper proposes that if researchers think of a traditional scientific computing problem, matrix decomposition, as a dynamical system, they could solve it rigorously on neuro-inspired systems.

"There's a lot of potential and also a lot of risk in the idea I'm working on," says Fred. If his idea works, "it would provide a point of unification between neural algorithms and traditional numerical algorithms."

Spiking network algorithms

The third paper identifies three hand-crafted algorithms that use the careful arrangement of spiking neuron-like nodes to perform precise computations. In the brain, each neuron is connected to many other neurons and uses spikes of electricity to communicate. William, a mathematician, and his co-authors took inspiration from these aspects of the brain.

An example of these innovative algorithms is a kind of flow estimation called particle image velocimetry. By taking two pictures of dust motes moving through the air and figuring out how far they moved in the time between photos, researchers can determine the speed of the air and any local eddies. This can be done on a conventional computer using fancy math, but William's method uses the massively parallel nature of neurons to calculate all the possible shifts efficiently, he says.

"By carefully designing your networks and the properties of your neurons, you can do exact things," says William. "You can push the envelope of what you can expect a neural network to do."

Whether the future holds neuro-inspired computers in your cellphone that understand phrases like "Show me a cute picture of Fluffy" and "Order my favorite Chinese food," or if neural computers can also work alongside future quantum computers in solving tough math problems quickly, computing needs to be reinvented, and soon, says Brad. By bringing together experts in many different disciplines, he says, the International Conference on Rebooting Computing aims to nurture new ideas and spur this revolution.

Funding for all the projects was provided by Sandia's Laboratory Directed Research and Development office. Two projects also were part of the Hardware Acceleration of Adaptive Neural Algorithms (HAANA) Grand Challenge.

The broader rebooting computing effort

Sandians are among the organizers of the IEEE's Rebooting Computing initiative and the conference. Chief Technology Officer Rob Leland (1000) will give the conference kickoff talk on the history of innovation in computing. Erik DeBenedictis (1425) and Matt Marinella (1768) are members of the conference program committee.

Erik, Sapan Agarwal (8956), Jeanine Cook (1422), and Michael Frank (1425) also are presenting four papers on low-energy logic and memory. Christopher DeRose (1765) and Tony Lentine (1765) are presenting a paper on optical communications.

Sandia emeritus director Bill Camp wins Seymour Cray Computer Engineering Award

PREVIOUS SEYMOUR CRAY AWARD RECIPIENTS include Gordon Bell, Ken Batcher, John Cocke, Glen Culler, William J. Dally, Monty Denneau, Alan Gara, John L. Hennessy, Peter Kogge, Kenichi Miura, Steven L. Scott, Charles Seitz, Burton J. Smith, Marc Snir, Steven Wallach, Tadashi Watanabe, and Mateo Valero.

Talented computeer also considers post-exascale computing

By Neal Singer

When Bill Camp learned by phone last month that he had won the IEEE's top-of-the-line Seymour Cray Computer Engineering Award, the Sandia emeritus director said that compared with the giants who had won the award in previous years, he felt "like the kid who had snuck into the movie theatre." However, no one else does.

BILL CAMP
(Photo by Randy Montoya)

"This is the top career award in high-performance computing architecture. I'm delighted Bill is receiving this recognition, which is richly deserved," says Rob Leland, Science and Technology vice president (1000).

Bruce Hendrickson, director of the Center for Computing Research (1400), adds, "This is one of the IEEE's most prestigious awards, and is largely based upon Bill's leadership in the development of Red Storm."

The Red Storm supercomputer — specifically cited in the IEEE announcement as a crowning achievement of Bill's "visionary leadership" — saved the bacon of the then-foundering Cray Inc., according to its current president and chief executive officer Pete Ungaro.

"Without Red Storm, I wouldn't be here in front of you today," Ungaro told a Sandia audience in 2012. The machine went on to serve as intellectual stud to successive generations of the best-selling Cray XT supercomputer line, he says.

"Red Storm is arguably the most successful general-purpose supercomputer in high-end computing," says Bill, who achieved support for the vision first proposed by himself and Sandia technical adept Jim Tomkins (retired), who provided much of the detailed design work. "Red Storm is over, but its influence is not."

But there's much more.

In 1998, Bill led development of Sandia's Massively Parallel Computing Research Lab, which pioneered using many processors working in concert to solve large problems in science and engineering. In its first five years, the lab won the inaugural Gordon Bell Prize, several international awards, and eight R&D100 Awards — all for pioneering highly scalable applications, algorithms, and methods as well as scalable systems software and hardware. The researchers working in the lab received more than 30 patents in the technique then becoming known as massively parallel-processing. Their achievment included standing up Sandia's Paragon, the first massively parallel supercomputer to lead the world's bi-annual Top 500 list in computational speed.

Later, as director of NNSA/DOE's Accelerated Strategic Computing Initiative, Bill led development of the world's first teraflop computer, ASCI Red, which led the Top 500 list for an unprecedented three and a half years.

Bill's work frequently demonstrated computation to be a major pillar of science and engineering. He co-founded Sandia's programs in cognitive science and biotechnology. He and several Sandia teams provided computational expertise to Celera Genomics in their successful sequencing of the human genome, and they developed the family of light-weight kernel operating systems — SUNMOS, Cougar, Puma, Catamount, and Kitten — that foreshadowed operating systems in the high-end computing industry. They also created the world's first Linux cluster-based supercomputer, and produced the first tera-scale cluster-based supercomputing environment (CPlant).

Bill has published more than 60 journal articles in physics, materials, engineering, and computing and made keynote presentations at international conferences. He is a Fellow of the American Physical Society, a member of IEEE, and was co-founder and second chairman of the International Union of Pure and Applied Physics' International Commission on Computational Physics. He has served on the editorial boards of several journals and is on the editorial board of Concurrency, a software journal. He holds a doctorate from Cornell in theoretical and computational physics.

Currently a consultant at Sandia and other labs, Bill's recent projects include research on quantum annealing and Ising spin-glass systems as a type of quantum computer, optical interconnects for router-less supercomputing, technical approaches for neuromorphic computing, and intelligent stacked memories for processor-in-memory architectures.

Bill also consults on post-exascale supercomputing ideas beyond CMOS architectures. Exascale requires a degree of computational speed that DOE laboratories are only beginning to attempt.

Asked how he keeps up with so many projects, the retiree says, "I think as well as ever. Just more slowly."

It's just not obvious.

About the prize . . . and Seymour Cray

The Seymour Cray prize, widely regarded in the computer engineering community as the IEEE's top award, consists of a crystal memento, an illuminated certificate, and a $10,000 honorarium, which will be presented to Bill at the SC2016 convention on in Salt Lake City, Utah, on Nov. 15. On Nov. 16 he is scheduled to present an invited talk there.

Seymour Cray enjoyed near-mythical stature for his brilliant innovations that kept his company's supercomputers the fastest in the world for more than a decade. He died in a car wreck in 1997. The memorial award recognizes design, engineering, and intellectual leadership in creating innovative and successful HPC systems.

FRAGMENT TRACKING

SIMULATING FRAGMENTATION — A computer model shows a simulation of explosively driven plate expansion and fragmentation. Researchers at Sandia want to know how pipe bombs and other improvised explosive devices come apart and how much destruction they cause to learn how to mitigate that damage. (Illustration by Org. 1556)

Insights into what happens in explosions

By Sue Major Holmes

A bang and a swirl of dust from detonating 9 pounds of plastic explosive in the desert signaled the beginning of tests that — thanks to advances in high-speed cameras, imaging techniques, and computer modeling — will help Sandia researchers study fragmenting explosives in ways that weren't possible before.

"The details matter," says Mark Anderson (5437), principal investigator on Sandia's fragment tracking project, which began explosive experiments this year. "Explosives are very complex to understand and to use, and they continually keep us humble."

Researchers want to know how pipe bombs and other improvised explosive devices come apart and how much destruction they cause to learn how to mitigate that damage. They'd like to create computer models of explosive phenomena for broader studies since it's impossible to do experiments for every possible situation, says Phillip Reu (1512), team lead for diagnostic development on the three-year study.

The project marries modern cameras, diagnostic technology, and the latest computer algorithms to gather more data. Past techniques and equipment couldn't provide detailed enough experimental data, forcing modelers to make assumptions about how materials failed or where fragments flew.

From a diagnostic standpoint, the dream is to be able to watch an exploding device expand, come apart and become fragments, then see the fragments fly and trace where they are in space and in which directions they go. That understanding could lead to better models and "what if" scenarios.

"We have to understand what creates the environment to mitigate the environment," says researcher Tim Miller (1535), who is developing algorithms to measure the shape and trajectory of explosive fragments.

Modelers, experimentalists exchange data

Modelers and experimentalists work in parallel. "The modelers give us a predicted outcome, which helps the experimentalists set up for the test," Mark says. "Then we take our measurements and feed them back to the modeler. The interchange is extremely powerful because we do better experiments having some modeling insights. And the modelers better see how their code works, and more importantly, where it doesn't work, so they can unravel why that is."

The improvements in diagnostic equipment allow researchers to better measure what goes on in an explosion. "We know that fragments travel at high speed, but we don't really know the aerodynamic drag," Mark says. "When we see the size and shape of the fragment and we see it as it tumbles and rotates, we know the drag changes."

Better instrumentation gives researchers new insights into such characteristics as mass, orientation, length-width ratio, velocity and tumble rate. "Is it one big chunk? Is it a bacon strip, is it a cornflake, is it a sausage link? Maybe it's a steak coming at you," says researcher Steve Attaway (1500). "That's the shape characterization."

High-performance computing has improved the ability to calculate fracturing and fragments. "We're running calculations now that 10 years ago we wouldn't dream of attempting," he says. "That said, every calculation is incomplete in what can be included, so the ability to gain more insight on how to make approximations to better mimic the fracture and fragmentation is important."

How fast a fragment moves and whether it spins make a difference in the damage it inflicts. Simply assuming fragments are one size or behave one way skews the assessment of possible damage and ways to lessen it.

"If you think the average fragment is going to go a half mile, but you get one that's shaped just so and it flies 2 miles, then that's a problem, that begins to illustrate the range safety aspect of fragmenting explosive devices," Steve says. "We're trying to get the best idea we can of that distribution."

Today's high-speed digital cameras take millions of frames per second, speeds that capture enough images to create measurements that feed complex computer models and help validate them. Sandia's tests use two or more cameras to measure 3-D characteristics of fragments shooting through the air.

'Things happen very, very quickly'

Cameras face a highly reflective background so fragments stand out. "These are things that happen very, very quickly so getting enough light and getting your cameras to go at the right time is very difficult to do," Phillip says.

The team also is working to develop high-speed X-ray movies of fragments. X-rays can create images of fragments in the initial stage of an explosion when smoke, flame, and dust obscure what an optical lens can see. A high-speed X-ray movie would help tell the entire life story of a fragment, says researcher Enrico Quintana (1529).

While X-ray movies are not new, taking them at high speed is, he says. The team is developing a way to create continuous X-ray movies, rather than building up a series of images by firing nine Marx generators in rapid sequence as has been developed in the past five years. The team is slowly stepping up the speed, but it will be a giant leap to a movie that acquires hundreds or even thousands of images at rates of up to 1 million frames per second, Enrico says.

There are limits on the team's high-speed camera and its X-ray scintillator, which converts X-ray photons to light photons. While the current setup could achieve nine images at a rate of 250,000 frames per second, the resolution wouldn't be ideal.

"The important numbers to remember are the width of a single pulse from the flash X-ray system, 50 nanoseconds; the fastest shutter speed of the camera, 1 microsecond; and the primary decay time of the scintillator, 4 microseconds," Enrico says. "Doing ultrahigh speed radiography is a matter of balancing the speeds of those three pieces of equipment, and we are limited by the slowest of the three."

While evaluating new ways to protect the very expensive equipment during a detonation, the project successfully demonstrated X-ray movie capability. It provided sequential images from a multihead X-ray system that captured the behavior of fragments in flight, beginning while the fragments were inside the explosive fireball and continuing as the fragments began to rotate in flight.

Lead technologist Mike Bejarano (1535) helps ready everything from cameras to cables and works on post-test data processing. The team is responsible for protecting the expensive tracking system and making sure it triggers when it should and that the delicate measuring system remains stable. "Moving even a tenth of a pixel introduces uncertainty and reduces the fidelity of the measurements," Mike says.

Digital image correlation

Researchers use a technique called digital image correlation to watch how a metal case around an explosive expands and ruptures. They coat the object with a speckled pattern and set high-speed, high-resolution cameras in pairs for stereo photography. The cameras track how the pattern moves as the case explodes, and the stereo pairs show how speckles shift, allowing researchers to measure 3-D displacement fields and see when strains are great enough for metal to fracture. X-rays penetrate the smoke, flame, and dust of the initial blast, capturing data cameras miss.

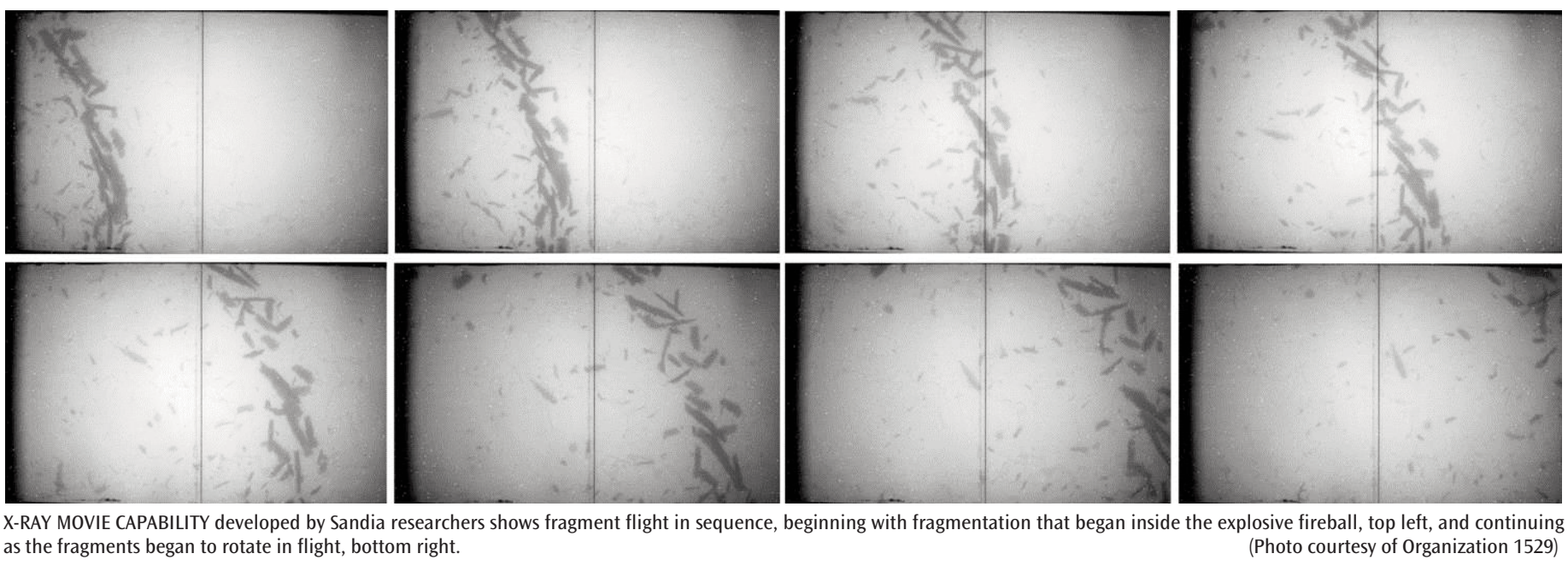
The project uses image-processing algorithm techniques developed by Dan Guildenbecher (1512) to help eliminate noise that interferes with accurate measurements.

Noise is defined broadly. "You've got things like shock waves, you've got dust that's getting kicked up, you're operating cameras at very fast rates and so they are inherently noisy. As a result, you've got noise that comes in with lots of different false signals that could show up in your measurement. We have a lot of different noise, and we have to be able to figure out where we're measuring actual particles," Dan says.

Traditionally, explosive experiments placed layers of plywood or other material around a device to catch fragments — called soft catch — then removed the fragments for study. However, there was little or no diagnostics to evaluate fragments during flight. Researcher Jason Wilke (6626) says current experiments use high-speed photography and imaging techniques to determine fragment size and location during the explosion; researchers then dig the corresponding fragments from the soft catch for study.

Phillip added, "What are you validating [the model] against, fragments that run into something or fragments that are floating in the air before they run into something? We'd like them in the air before they run into something because that's how they'll be coming at the things we care about."

The team plans three to four test series a year, each with several explosions. "It's better to run some tests, think about what went right, what went wrong, what we need to change, then come back in a few months and set up another test," he says.



X-RAY MOVIE CAPABILITY developed by Sandia researchers shows fragment flight in sequence, beginning with fragmentation that began inside the explosive fireball, top left, and continuing as the fragments began to rotate in flight, bottom right. (Photo courtesy of Organization 1529)

YOUNG LEADERS SOCIETY member Ben Yee shares the wonders of science with kids at a recent event at the Explora science museum in Albuquerque. (Photo by Randy Montoya)

'Our duty to help others'

United Way Affinity Group members encourage Sandians to help

By Manette Newbold Fisher

EMPLOYEE Caring PROGRAM

2016 CAMPAIGN RUNS THROUGH OCT. 21
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The way Angela Rivas (9531) feels about United Way is written all over her face and emails. She ends sentences with smiley face emoticons and, in person, she'll enthusiastically explain why she wants everyone to get involved.

It's no surprise that someone who volunteers for four affinity groups would want to spread the United Way fever, and those who talk to her long enough might catch the bug, too.

Angela, a communication and project management specialist, volunteers with Women in Philanthropy (WIP), Young Leaders Society (YLS), Hispano Philanthropic Society (HPS), and Guys Give. On average, she meets with each group monthly and serves on the stewardship committees for WIP and YLS.

The United Way provides several ways for members of the community to get involved, whether it's donating money, organizing a workplace event, or volunteering. Affinity groups provide opportunities for networking, events, fundraising, and grant allocation — all revolving around specific issues.

"I think what's unique about United Way is there are so many ways to give," Angela says. "Whether it's being in an affinity group or volunteering on the Community Fund allocation panel or a number of things. There are so many opportunities. Plus, they have the whole Center for Nonprofit Excellence that gives you volunteer opportunities with all the different organizations. You can be as involved as you want to, but you should definitely get involved."

Angela grew up in Albuquerque and says her family and friends used some of the resources United Way provides. Knowing what it's like on the receiving end is one of the reasons she gives her time and resources now, she says.

"I'm in a position now where I can give. I can give my time and I can give my financial resources," she says, adding she recognizes that at any time she could need services again. "I think that's something people often forget … You could lose your house in a fire or need emergency services and that counts, and that's under the umbrella."

Resonating Issues

There are six local affinity groups associated with United Way of Central New Mexico, and each has a different purpose. For Senior Manager Jesus Ontiveros (10590), it was children and education that drew him to HPS.

He says the primary focus of the group is to contribute funds to organizations that support middle schools. STEM-related activities, mentoring, and awarding grants are main focuses of the group. Jesus and others in HPS are working with Polk Middle School students in the South Valley. Members of HPS offer brown bag lunches, speakers, field trips, and presentations to teenagers who may not see themselves graduating from high school or college.

"We really try to focus on making sure we're engaging them and not just up there talking. That's really a major concern," Jesus says. "One of the things that really helps us in that direction is having bilingual mentors. I think it makes a difference if you can conduct your lunch time session in Spanish or at least be able to speak to them in Spanish for a portion of the class."

Angela, who plans to volunteer with HPS' Polk Middle School program, also volunteers with YLS' mentoring program at Del Norte High School. She says many of the youth she works with don't see a clear path to their future, and these programs aim to help.

A first-generation college student, Angela said it can be hard when kids don't have "great shining examples" of what they can achieve. Through volunteering, she wants to help them dream.

Angela says those who want to get involved with affinity groups can find the one that suits them best. Each committee group has a different mix of what they do, but they all have opportunities for service, opportunities for networking, and even opportunities for agency visits, she says.

Locally run, locally focused

Physicist Ben Yee (1118) became a YLS member when he moved to New Mexico from Michigan. He saw it as a way to network in an active group. He helped with an outdoor beautification project at Crossroads for Women's Hope House and mentored teenagers at Del Norte High School. He also participated in Gift of Giving, an event at Explora last week that enabled the public to learn about local philanthropy.

"What I really like about the United Way is it's locally run, locally organized, and it's locally focused," Ben says. "Even though it's a national group, it's sort of like a franchise. It's all local members. They are the ones who decide where the funding goes, what the funding priorities are, what kind of projects they want to support."

Instead of focusing on individual programs, United Way is more interested in what set of programs help a particular issue, Ben says.

United Way volunteers have the opportunity to read proposals and listen to presentations from various agencies seeking funding. For the last two years, Angela read several domestic violence proposals that receive grants through WIP, and Jesus, the council chair for HPS, read proposals that benefit students. Learning about central New Mexico's issues can be overwhelming, but Angela and Jesus both say they see what United Way and the affinity groups can do.

"The community at large needs a lot of help, and when you discover all the needs out there, it's really almost overwhelming. But there are many different aspects of the community that individuals can get involved in, and many ways to give back," Jesus says. "I think most of us in HPS feel like we've been blessed with so much that it's our duty to help others have some of the same blessings that we had, and see themselves getting and leading successful lives here in Albuquerque, or wherever they might go."

For more information on United Way affinity groups, visit www.uwcnm.org/you-can-help/join-group.

There's an Affinity Group for you

YOUNG LEADERS SOCIETY: This group, made up of members age 45 and younger, works to educate and encourage youth in central New Mexico. YLS organizes service projects around the community, and many members are involved in its Del Norte High School mentoring program. YLS awarded seven program grants this year.

WOMEN IN PHILANTHROPY: This group strives to give women a greater voice with education and encouragement. WIP focuses on self-sufficiency for women and helps victims of domestic violence. The group often arranges agency visits and speaking events. WIP also runs its own mentoring program for women. WIP awarded four grants this year.

GUYS GIVE'S FIRST PROJECT was to donate sporting goods equipment to the Boys and Girls Clubs of Central New Mexico. See more about Guys Give on the next page. (Photo by Randy Montoya

HISPANO PHILANTHROPIC SOCIETY: The Hispano Philanthropic Society strives to recognize Hispanic leadership, and encourages all Hispanics to become contributors to the community. It also focuses on helping at-risk youth with mentoring and field trips. The group recently awarded grants to the New Mexico Jazz Workshop and the Native American Community Academy; both organizations work with youth in the state.

GUYS GIVE: The newest of United Way's affinity groups, Guys Give is a group of men coming together for philanthropy. The group meets monthly and recently completed its first project: donating sporting goods equipment to the Boys and Girls Clubs of Central New Mexico.

TOCQUEVILLE SOCIETY: This is an active group with more than 500 members who annually donate $10,000 or more. Sandians represent more than 100 of the members.

LOYAL CONTRIBUTORS: This group is made up of donors who have been giving to any United Way branch for 10 years or more. There is no minimum contribution amount to be a loyal donor. There are more than 10,000 Loyal Contributors in central New Mexico.

Service and suds

GUYS GIVE AFFINITY GROUP COMBINES PHILANTHROPY, FELLOWSHIP

By Manette Newbold Fisher

It wasn't technically happy hour, but it was that time of day, and as the sun streamed its late afternoon glow on Marble Brewery's rooftop, a couple of dozen guys gathered for pints and lively talk about philanthropy. And even if the beers weren't on a two-hour special, it seemed like happy hour anyway.

The crowd has been meeting for several months at various breweries around town to network and discuss how to create positive change in Albuquerque. The group, officially called Guys Give, is one of United Way's affinity groups that connects locals with opportunities to give their time and financial resources to the community.

A few of the men brought sporting goods equipment with them that night to support Guys Give's first project for the Boys and Girls Clubs of Central New Mexico. Technical Security Systems Dept. 4226 Manager Greg Hughes brought kids' golf clubs and says he's been a big advocate of United Way and Sandia's Employee Caring Program (ECP) for 31 years.

EMPLOYEE Caring PROGRAM

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Streamlined Acquisitions Dept. 10246 Manager James Burt, who was also at the Guys Give monthly meet-up, donated soccer balls and basketballs at Sandia during the Guys Give sporting goods drive that ran through September. He'd been a coach for AYSO and was happy to find a new home for dust collectors in his garage. As a child, Burt benefitted from the Boys and Girls Clubs, so donating old sporting goods equipment to the organization hit close to home.

"I kind of grew up with them and thought that was a good match for [Guys Give]," James says. "I have a lot of memories. I learned how to play foosball at the Boys and Girls Club. They took us on field trips. It was cool to have a place to go in the summer. They definitely kept us busy."

All donations for the Boys and Girls Clubs were dropped off in early October. News of the drive, backed by Community Involvement, spread through word-of-mouth, and big 44-gallon garbage cans were placed in a few buildings as collection points.

Agile Procurement Dept. 10247 Manager Jac Pier, one of the leaders for Guys Give, says collecting sporting goods seemed to fit with the affinity group's identity, and was a good first step outside of meeting at breweries.

"I want this group to say, 'Look, we did this. We're not just getting together to grab beers once a month,'" Jac says.

How Guys Give began

Pioneered by Ron Eppes, Community Engagement Manager at Intel, and former Sandian Pam Catanach, Guys Give's goal is to bring men together who may not feel like they fit in other affinity groups, but who are interested in service and humanitarian work.

Over the last several months, Jac arranged monthly meet-ups at breweries around the city. While the name of the group is Guys Give, women are welcome to join, too. In fact, Angela Rivas, who works in Collaborative Information Environments (9531), volunteered for the sporting goods drive.

The evening Guys Give met at Marble, members listened to a United Way presentation about Mission: Graduate, which brings educators, employers, and educational support providers together with the goal of increasing central New Mexico's graduation rates by 60,000 by 2020.

THE PAYOFF FOR GUYS GIVE is seeing kids skipping with joy as a collection of sporting goods is delivered to a Boys and Girls Club facility. (Photo by Randy Montoya)

Eppes also worked with Marble and $1 for every beer purchased by a Guys Give member that night was donated to United Way.

"It's been several years since I threatened to start a group called Men Drinking Beer for Philanthropy," Eppes said that night with a pint in one hand. "The concept survived, but the name was changed.

"We talk a lot about our career road maps and where you want to go. As you're talking about where you want your career to grow, maybe you should also be thinking about how you want to impact the community to grow as well."

The future of Guys Give

Adrian Carver, development officer at United Way, works directly with Guys Give and says the group is reaching the stage where deeper talks about community impact can take place.

"United Way is developing our community impact agenda, so what we're going to do is to be directly aligned with the community impact agenda of the United Way, so we can demonstrate measurable results on the issues that this group of guys care about," Carver says.

Early in the evening, while some of the Guys Give members took a tour of Marble, a group formed inside before moving to the roof. Larry Strickland of United Way said he'd been coming to the meet-ups and watching the number of attendees grow.

"It's kind of clear they're getting there," he says. "Right now, it's like, 'This is something!'"

Guys Give is about creating a way for men to be more intentional about giving to their community, Strickland says. To do that, they will work with United Way on issues that can be affected, and figure out ways to pay for impactful projects.

"I just had a long discussion with a guy and he said in his family, women were the generous ones," Strickland says. "And so he said, 'This is encouraging to me because I'm more involved.'"

Strickland works as the director of donor impact at United Way and for years has seen where funding comes from.

"The data has said for many, many years that women give because they're involved. Men give, and this is a generalization, men give because … another man in their business or somebody in the community that they hold in a high regard [asked them]. That's how organizations raise money. Let's have men to go ask men if they can do this."

Want to join?

For more information or to become a member of Guys Give, contact Jac Pier at japier@sandia.gov, or sign up during this year's ECP campaign which lasts through Oct. 21. Those interested outside of Sandia can contact Adrian N. Caver at adrian.carver@uwcnm.org.

Breaking Bad Habits

Wellness Expo creates chain reaction for preventive screenings

HR & COMMUNICATIONS DIV. Div. 3000 VP Melonie Parker, talking with a community provider group during the 2016 Wellness Expo. (Photo by Lonnie Anderson)

By Sharron L. Harris

More than 1,000 free health screenings were administered at the second annual Health and Wellness Expo sponsored by HBE's Health Plans Team (3512) at Embassy Suites in Albuquerque.

The Expo featured onsite biometric screening appointments with real-time results by Sandia's health plan vendors and exhibits from various local providers and organizations. Screenings for employees, spouses, and dependents included oral cancer, hearing, mammograms, skin cancer, pulmonary, spinal, and more.

According to Blue Cross Blue Shield of New Mexico (BCBSNM) and UnitedHealthcare (UHC), 52 percent of spouses and 64 percent of employees covered by Sandia Total Health in 2015 did not complete preventive care screenings appropriate for their age and gender. Preventive care includes services like a physical exam, cholesterol screening, metabolic profile, and diabetes screening. Sandia Total Health covers a wide range of preventive care services at 100 percent with no deductible to meet, as long as you visit an in-network provider.

A family affair

Thirty-six vendors participated in the Expo, offering walk-up screenings and personalized educational opportunities. Representatives from ABQ Health Partners, Lovelace, and Presbyterian were onsite to help attendees find a Primary Care Physician (PCP) and schedule an appointment. Crystal Mountain Institute, a new vendor at this year's event, provided kinesio tapings and more than 100 relaxing chair massages. Sandia Employee Recreation Program (SERP) and Preventive Health also participated.

The Expo was a family affair with plenty of activities for the kids, including a scavenger hunt with prizes and a very competitive cake walk. Special guest appearances were made by various mascots, including Orbit from the Isotopes, Blue Bear from BCBSNM, and Marshall Molar from Delta Dental. Albuquerque Fire Department showed off one of its firetrucks and several attendees brought stuffed toys for AFD's teddy bear drive, which helps children affected by house fires.

Juperi Johnson (3641) shared her experience as a new employee attending with her family, "Admittedly, I attended so I could meet other new employees; however, I quickly realized this was an event for my entire family to learn about Sandia as well as learn valuable information regarding different aspects of health. This was definitely an educational yet fun-filled morning. I'm glad we attended."

Michial (Mac) McDuffie (3653-1) attended the event with his wife. It was her second year and she liked that she could get all her screenings in one day, in one place, without the dreaded doctor's office wait. "[My wife] felt like she got really good information," Mac says. "The nurse on video chat was very personable and provided motivation and direction for overall health. She really felt like she was able to do all the things she would otherwise put off because of the time. We will definitely attend every year."

According to the Centers for Disease Control and Prevention (CDC), only 66.8 percent of women 40 and older in the US had a mammogram in the past two years. Sandia Total Health covers the cost of a mammogram on a recurring basis for eligible plan participants. Assured Imaging participated as a vendor in the event and provided mammograms in its mobile unit.

Angela Ortiz (10626) shared her personal experience. "It is so convenient to have [the mobile unit] on location. After arriving for an appointment, the sign-in and procedure didn't take much time and the staff was very pleasant. Afterwards, there was a very nice perk of chocolates and a rose for each patient — what a nice touch/gesture for a procedure that some will avoid. I encourage others [to get screened] when I have the opportunity. My maternal grandmother had breast cancer and I think this is an important procedure to be proactive about to stay healthy."

The Health & Wellness Expo is a part of the Health Plans team's ongoing efforts to educate, motivate, and empower employees and their families to make better healthcare decisions by becoming better healthcare consumers.

Human Resources & Communications Div. 3000 VP Melonie Parker, who attended the Expo, says, "This was an outstanding event and very well attended by our employees and their dependents. Ensuring that the whole family is healthy is essential to our employees having successful health outcomes."

For more information on free annual preventive screenings, assistance finding a doctor, or to learn more about upcoming events, go to **hbe.sandia.gov.**

Wave of the future

Wave energy researchers dive deep to advance clean energy source

Surf break, Oceanside, California. (Photo by Randy Montoya)

By Rebecca Brock

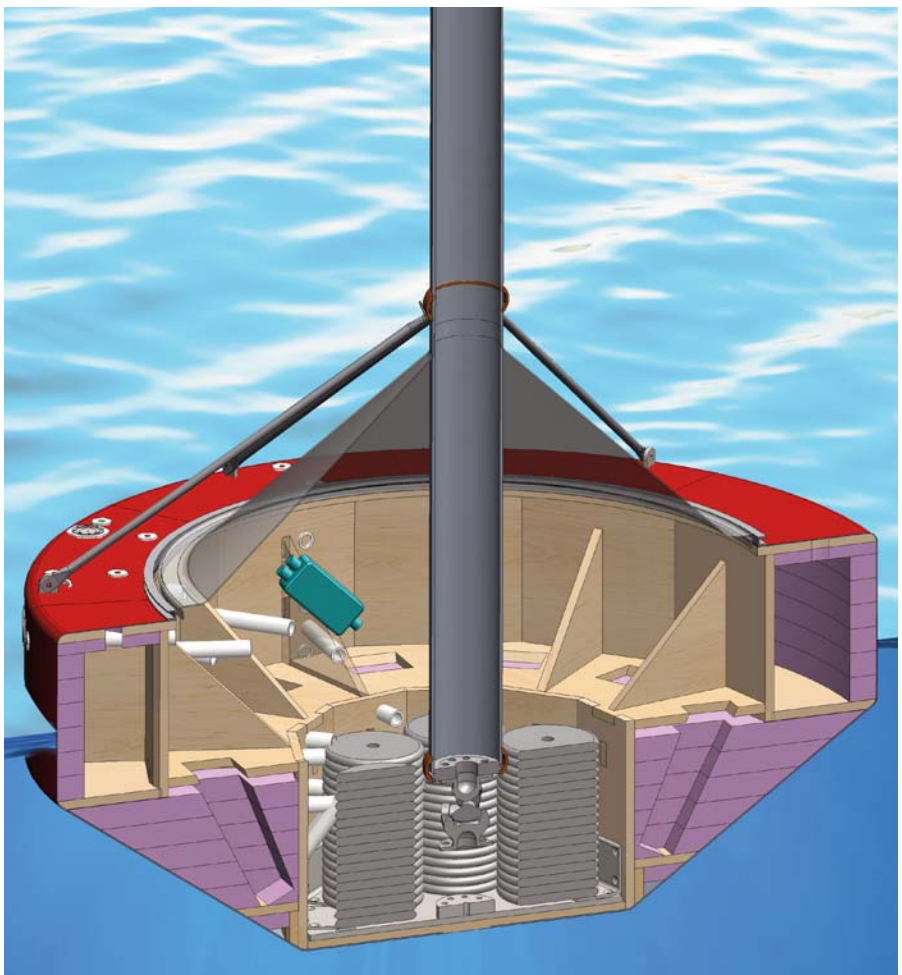
One of the biggest untapped clean energy sources on the planet — wave energy — could one day power millions of homes across the US. But more than a century after the first tests of the power of ocean waves, it is still one of the hardest energy sources to capture.

Now, engineers at Sandia are conducting the largest model-scale wave energy testing of its kind to improve the performance of wave-energy converters (WECs). The project is taking place at the US Navy's Maneuvering and Sea Keeping facility at the Carderock Division in Bethesda, Maryland, one of the largest wave tanks in the world at 360 feet long and 240 feet wide and able to hold 12 million gallons of water.

Sandia project leads Ryan Coe and Giorgio Bacelli (both 6122) spend long days in the dark wave tank, where minimal lighting reduces the growth of algae in the water. They are collecting data from their numerical modeling and experimental research to benefit wave energy technology with improved methodologies, strategic control systems design, and testing practices for wave energy converters.

Tackling challenges of harsh environments

"Our goal is to improve the economic viability of these devices," says Ryan. "To do so, we are working out ways to control the WEC's generator to increase the amount of power it absorbs. At the same time, we are looking at how to reduce the loads and stresses on these devices in harsh conditions to ultimately lengthen a WEC's lifespan in the water."



As the waves move it up and down, a wave energy converter can generate clean and renewable energy. The power from the device is transmitted to shore via an undersea cable for the US electrical grid.

CATCH A WAVE — Sandia researchers Ryan Coe and Giorgio Bacelli (both 6122) are collecting data at the US Navy's Maneuvering and Sea Keeping facility in Bethesda, Maryland, to optimize wave energy converter testing.

Ryan says numerous initial studies estimate that improving control of the WECs' generators can dramatically increase energy absorption by as much as 300 percent. Transitioning these simplified studies to more realistic large-scale devices is the challenge at hand.

To control the dynamics for better, faster results in the wave tank, Ryan and Giorgio are using modeling and control methods that have been successful in other industries, such as in the aerospace industry.

More informaton in a fraction of the time

"The systems we used have been around for a while, but strangely enough they had never been applied to wave energy converters," Giorgio says. "So far, we know the techniques we are using are more efficient and cost-effective than existing methods. We are getting more information in a fraction of the time."

Now that Sandia has completed the first round of analyses in the water, Ryan says the goal is to process all the collected data to develop a new, enhanced model that will make sure the next test yields even more valuable results.

"Make no mistake, these are extremely complex machines," Giorgio says. "They have to be fine-tuned continuously because ocean waves are constantly changing. With this setup at the Navy's facility, we have a unique opportunity to study the problems and quantify the effects. We want to help the industry by offering solutions to the challenges the wave energy world is facing."

Sandia's continuing wave energy project, Advanced WEC Dynamics and Controls, kicked off in 2013 and is funded by DOE's Office of Energy Efficiency and Renewable Energy.

Innovations from Sandia's Water Power Technologies Program advance the nation's energy security by making renewable energy more economically feasible, says Ryan. Contributions include WEC-Sim, an open source code for modelling the performance of wave energy converters, extreme-conditions modeling, and tidal and turbine modeling. Sandia researchers serve as advisers and judges for DOE's Wave Energy Prize competition.

Sandia tests nuclear battery safety for Mars 2020 mission

By Mollie Rappe

Mars is really cold; at night it can get down to -130° F. The rover for the Mars 2020 mission, like *Curiosity* and other Mars rovers before it, needs a way to stay warm and continue exploring the Red Planet, even without sunlight.

Radioisotope thermoelectric generators, or RTGs, convert the heat produced by natural decay of radioactive materials such as plutonium-238 into electricity. The heat keeps the rover warm enough that its electronics and moving parts don't freeze, and the electricity produced runs vital scientific instruments. RTGs have been used on space probes such as *Pioneer 10* and *11*, *Voyager 1* and *2*, *Cassini*, and *New Horizons*; the Apollo lunar experimental modules; and the *Curiosity* rover.

In the unlikely event of an accident during the launch of the Mars 2020 rover, the fuel from the RTG has the potential to break through multiple layers of containment and be released. That's where Dan Clayton (6223), a chemical engineer at Sandia, and his team come in.

Working for DOE, they are assessing the potential risk of possible accidents for the Mars 2020 mission. Using state-of-the-art computer programs, they test what would happen to the RTG if the rocket were to explode on the ground or in mid-air.

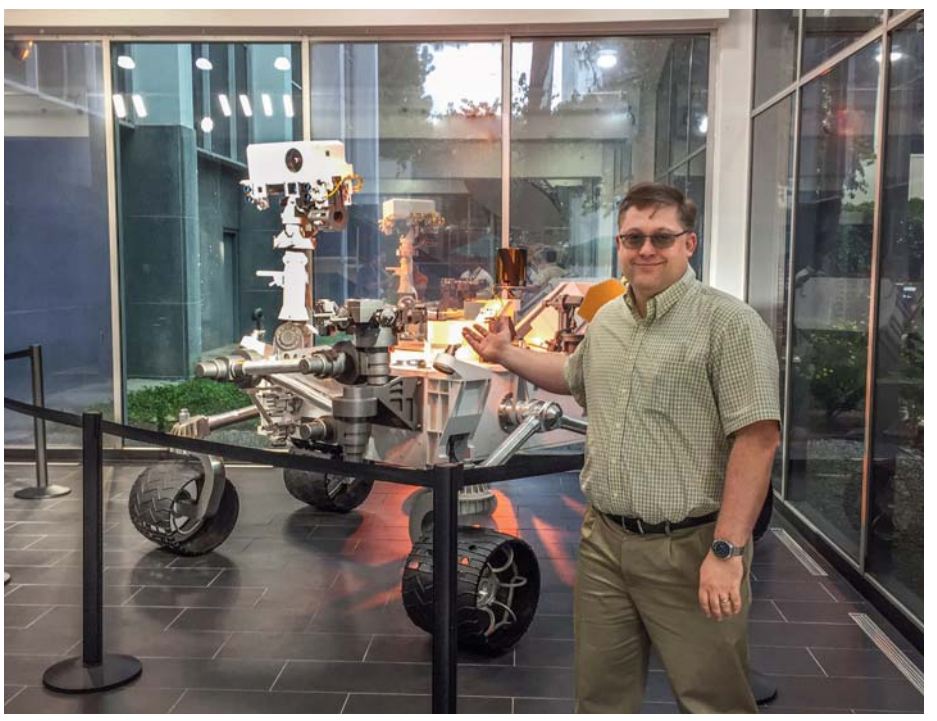
Rugged protection put to the test

RTGs are designed to minimize any possible release of radioactivity. Modern RTGs use plutonium-238 in an insoluble, ceramic form. Each pellet of plutonium is encased in a strong, non-reactive metal — iridium. These metal-wrapped pellets are then encased in layers of carbon fiber to protect them from physical impacts and the heat of launch area fires or reentry.

Dan's team puts the rugged, multi-layer containment system to the test by running mechanistic-based computer models on advanced supercomputers, validated with experimental data.

"We try to validate every aspect of our models with the data we have. But it's hard to convince anyone to blow up a rocket," says Dan. Even without blowing up an actual rocket costing upwards of $100 million, the team has access to large amounts of data from smaller-scale tests.

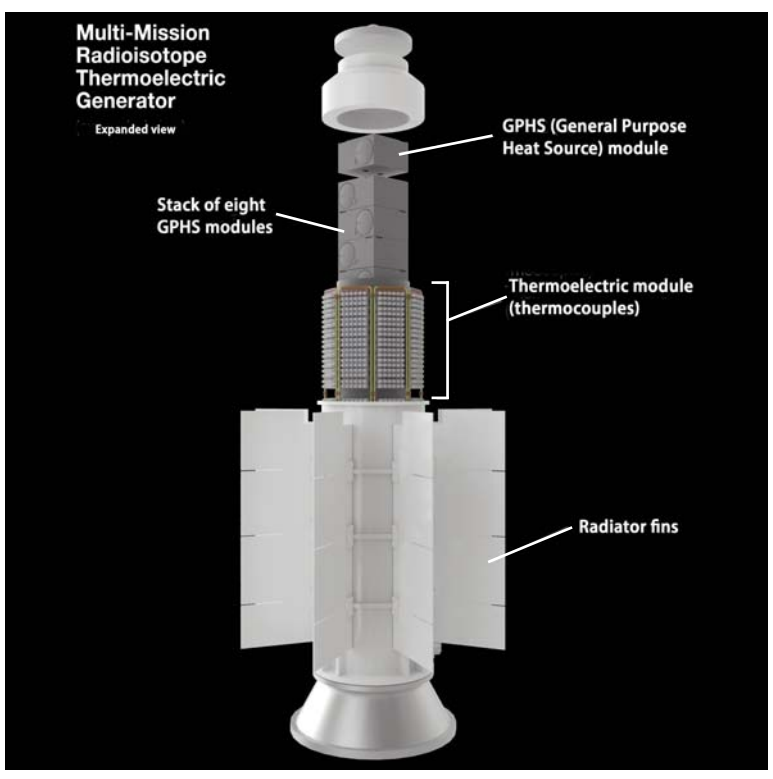
Data from solid propellant fire tests conducted at Sandia's Thermal Test Complex and the Johns Hopkins University Applied Physics Laboratory (APL) are used to validate the computer models of extreme heat from burning rocket fuel.



CHEMICAL ENGINEER Dan Clayton poses with a full-scale model of the Mars Curiosity rover at the Jet Propulsion Laboratory. Dan and his team assess the potential risks of accidents involving the Mars 2020 rover's radioisotope thermoelectric generator battery. (Courtesy Dan Clayton)

The results from impact tests at Los Alamos National Laboratory (LANL) and early tests at Sandia's Rocket Sled Track are compared to the damage the models predicted from the rocket plummeting to the ground.

The durability and ductility of the iridium metal that encases the plutonium is tested at Oak Ridge National Laboratory (ORNL) and Sandia's Engineering Science Center.



LABELED PULL-APART VIEW showing the major components of the Multi-Mission Radioisotope Thermoelectric Generator. (Image credit: NASA)

Even data from accidents are put to good use

But not all of the data Dan's team uses come from experiments. "We don't plan on getting accident data, but when an accident happens, we use that to validate our damage models too," says Dan.

For example, in 2014 an International Space Station-bound rocket exploded just seconds after liftoff at NASA's Wallops Flight Facility. In the days after — while others were involved in mitigating the environmental impact and determining the cause of the accident — Dan and his team headed to launch site at Chincoteague Island, Virginia. They analyzed the damage and compared it to what they calculated for a similar event. Specifically, they validated their fireball models and their smoke plume models. None of the data from the accident invalidated previous safety analyses, says Dan, and it reduced the overall uncertainty of their models.

Luckily the 2014 rocket accident didn't result in any injuries and didn't contain any nuclear material.

"Accident rates in this industry are relatively high — 2 to 3 percent — which is why this work is so important," says Ken Sorenson (6223), manager of Sandia's risk assessment team. "We're not guaranteeing that there cannot be a radiological consequence as a result of a potential launch accident. What we do is estimate potential radiological consequences from postulated accidents. Then it's up to the decision makers to determine if that level of risk is acceptable."

Dan's team has just begun the multiyear process of assessing the risks of various possible accidents for the Mars 2020 mission. "The results of the assessment are used to identify the main sources of risk, allowing us to reduce the overall risk of the mission before launch," says Dan.

The safety assessment will be reviewed by the Environmental Protection Agency, Department of Defense, NASA, and many others. Eventually the assessment will be submitted to the Office of the President for launch approval.

Technical experts across Sandia will collaborate on the risk assessment with LANL; ORNL; APL; NASA's Jet Propulsion Laboratory and Kennedy Space Center; and the University of Dayton Research Institute.

Ken says, "The breadth of science required for this risk assessment is really well-suited to Sandia's toolbox because we have technical experts in experimental fields and we have technical experts in running and developing codes. This capability set, coupled with world-class experts from organizations across the US, brings together a team that really allows us to address this problem from beginning to end."

Want to be part of the Mars Experience?

SANDIA VOLUNTEERS are needed to staff three events at APS schools Oct. 24-27. Paid time off is available with TRC280. Contact Katrina Wagner at 505-844-1810 for more information.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong


Bob Barton Jr.
40 10246


Clifford Sharp
40 5357


Evan Ashcraft
30 10520


Carol Harrison
30 2223


Lorraine Mendoza
30 10615


Tania Carson
25 5551


Benita Montano
25 5554


Mary Abt
20 5012


David Noble
20 1516


Veronica Garcia
15 4853


Johnny Giere
15 423


Michael Hapka
15 9534


Tom Schonborg
15 5522


Ann Speed
15 1462


Michael Strickland
15 5624

Recent Retirees


David Bullington
40 2665

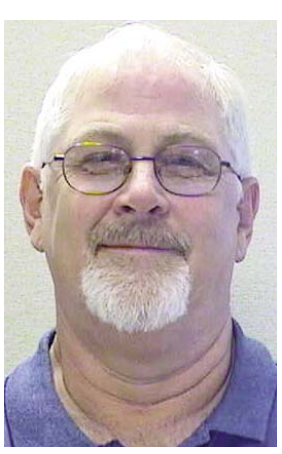

Jeff Romine
40 2666


Barry Hess
35 9520


Jerome Rejent
34 1831


David Jones
31 2953

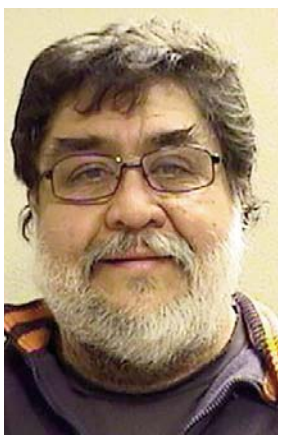

Eric Schindwolf
30 5420


Larry Young
26 5422


Donna Young
18 5300


Marcos Sanchez
20 1753


Vincent Abeyta
15 2992


Mark Duran
15 10262


Sean Hearne
15 1132


Amy Rein
15 9537


Tom Rice
15 6626

2017 Open Enrollment coming soon

Open Enrollment is your annual opportunity to review and update your benefit elections.

- Active Employees: Oct. 31-Nov. 17
- PreMedicare Retirees: Oct. 15-Nov. 18
- Medicare Retirees: Oct. 15-Dec. 7

HBE

Find out more at hbe.sandia.gov.

SANDIA CLASSIFIED ADS

There will be no Classified Ads in the October 28 Lab News.

MISCELLANEOUS

NAVAJO RUGS, various sizes, some old, some brand new; Kachina dolls, various prices & sizes, contact for photos & sizes. Owens, 505-235-8671, padillaowens@q.com.

CORNER DESK & CHAIR, $200; Dell Inspiron mini, $60. Glover, 505-440-0823.

RECLINER, Ekornes Stressless, w/foot stool, Cordovan leather, dark wood trim & base, swivel, lumbar support, $700. Wells, 505-292-0179.

UPRIGHT FREEZER, Frigidaire, 14-cu. ft., working, clean, $200. Moyer, 505-944-5060.

LOBO BASKETBALL 2016-17 SEASON TICKETS, 2, center court, aisle, ~10 rows up, $1,100/both. Harvey, 242-1619, mah0mdk@aol.com.

BABY ITEMS: Pottery Barn crib, w/toddler bedrail, mahogany, $200; Mama & Papas highchair, green, $35; Baby Bjorn playpen, $65. Carroll, 505-401-4377.

FALL DOOR WREATHS, handcrafted, fall colors, call or text for more info, small $23, medium $35, large $75. Gutierrez, 505-410-4541.

GENERATORS, 2, Kipor gensets, 2K watts each, kit to connect together, rolling storage bags, fuel containers, couple of hrs. on each, $1,300/all. Kercheval, 505-266-5833.

CRAFT FAIR, benefits Manzano band boosters, Nov. 19, 9 a.m.-3 p.m., https://manzanohighschoolband.shutterfly.com/holidaycraftfair, $35/space. Alam, 688-7221.

UTILITY TRAILER, Bigtex 30SA, single-axle, 5' x 8', w/tailgate ramp, excellent condition, extras, $750 OBO. Stinebaugh, 505-275-3170.

HOCKEY GOAL, regulation size, good shape, $20 OBO. Kelly, 293-2475.

MR. COFFEE CAPPUCCINO MACHINE, brand new in box, $30. Reeder, 553-4786.

ARMOIRE & HUTCH, dark charry, $550/both. Hennessey, 505-269-6243.

FURNITURE: large hutch, $400; dresser w/mirror, $125; Victorian chairs, $100 ea.; armoire, $100; grandfather clock, $150. Lioce, 238-8279.

MATTRESS TOPPER & COVER, Beautyrest, 4-in. thick gel foam, textured, queen, $50. Witt, 991-1878.

GELDING, 12 yrs. old, buckskin, gorgeous, 15.2 hands, registered AQHA/ABRA, ropes/sorts, ranch & mounted shooting, experienced rider, $10,000. Rivers, 720-4701.

JAZZ FANS, hear guitarist Michael Anthony, Fabulous Felines 10th anniversary celebration, http://www.fabulousfelines.org. Stubblefield, 263-3468.

MULTI-SPORT WATCH, Garmin Forerunner 735XT in frost, 2 mos. used, like new, costs $450 new, asking $350. Cooper, 505-322-8700.

CORNER AQUARIUM, bow-front, 70-gal., w/stand, good condition, $125 OBO. Hammond, 823-9619, dave7300@msn.com.

AUDIO SYSTEMS, 5-speaker Audio Source surround sound, wall/floor mount, subwoofer, 2 39-in. base speakers, Sony receiver, Blu-ray, more, $350 OBO. Hagerman, 505-401-1402.

CLIMBING HELMET, 2016 blue Petzl Elios, size 2, used once for caving, like new, $40 OBO. Beckett, 801-709-4639.

LADDER, Werner MT13, aluminum, telescoping, multi-position, lightly used, 300-lb. capacity, $99 new, asking $60. Dai, 505-990-9116, ask for Steve.

ANTHROCART WORKSTATION, black, w/multiple adjustable shelves, 60-in. wide, paid $1,200, asking $250. Cocain, 281-2282.

BICYCLE RACK, Yakima KingPin 2, hitch mount, fold down, w/cradles & straps, $100 OBO. Rosul, 900-3678.

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 1468 (Dept. 3651)**
- **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

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.

STEREO, 3 CD/2 cassette, Phillips, circa 2001, in box, not used in 5 yrs., comes w/remote & manual, nearly new condition, $50. Mann, 505-604-4236, ask for Brandon.

WOMEN'S JEANS, size 8, ~30 pair; size 8/10 suits; name brand classy shirts, w/price tags. Anderson, 505-903-0911.

LAPTOP, Acer Notebook, Aspire One D255, Windows 7 starter, 1 GB memory, 10.1 screen, $50. Hall, 280-4344.

DINING TABLE, solid oak, w/6 chairs, 2 leaves, excellent condition, can deliver, $850 OBO. Struve, 505-292-2665.

FURNITURE: kitchen hutch, $250; entertainment center, great condition, $175. Paul, 505-294-5113, after 7 p.m.

TRANSPORTATION

'14 TOYOTA 4 RUNNER LTD, silver, 43K miles, like new, $35,000. Thayer, 480-208-7731.

'10 TOYOTA PRIUS, leather seats, navigation system, moon roof, silver, perfectly maintained, 62K miles, $10,000. March, 323-6784.

'12 SUBARU IMPREZA i5D, sport premium wagon, AWD, AT, heated seats, 2-tone paint, 34-39-mpg, 171K highway miles, Pirelli tires, superb condition, $7,000. Dwyer, 505-249-6935.

'09 COROLLA LS, dark grey, original owner, new tires, well maintained, 125K highway miles, $6,000 OBO. Beerwinkle, 405-929-0400.

'01 HUMMER H1, hard top wagon, white, black interior, 107K miles, $47,500. Merewether, 505-250-7350.

'13 DODGE JOURNEY CREW, 3.6L V6, 6-spd., AT, AC, heated seats & steering, UConnect, back-up camera, keyless, red pearl, 25K miles, $15,000. Meister, 232-4700.

'07 FORD RANGER, 4L, V6, 4WD, blue, 125K miles, 70K new rebuilt engine, $8,200. Kokos, 350-6372.

JEEP, very old, & 2 Corvettes, various conditions. Clark, 505-298-8254.

'05 FOCUS HATCHBACK, standard transmission, great shape, $3,000. Fitzpatrick, 505-507-3422.

'00 CADILLAC ELDORADO, V8, 300-hp, leather interior, 98K miles, good tires. $4,700. Torres, 505-228-5011.

'07 HYUNDAI SONATA, 4-dr., dark metallic blue, 67K miles, immaculate, $6,200; '05 Impala, 4-dr., maroon, 105K miles, nice, $5,200. Marchi, 291-9681.

RECREATION

'03 FLEETWOOD TIOGA 26-Q RV, sleeps 6, 27K miles, excellent condition, $17,500 OBO. Ortiz, 505-917-7372.

'07 SEARAY 185 SPORT BOW RIDER BOAT, 40 hrs. on original 4.3L Mercury/Mercruiser engine, text of info/photos, $14,000. Hielo, 505-804-9032.

'05 BMW K1200LT, loaded, 48K service w/new clutch, many upgrades & accessories, auto centerstand, $4,975. Sokol, 415-378-9333.

'14 HARLEY-DAVIDSON XL1200C, ghost silver, windshield, bags, <4K miles, awesome bike, $10,500. Griffith, 850-0634.

REAL ESTATE

3-BDR. HOME, 1-3/4 baths, 1,862 sq. ft., 2-car garage, shed, fruit trees, available now, near Comanche/Morris, $218,000. Erikson, 505-332-4997.

4-BDR. HOME, 2 baths, 1,777-sq. ft., new AC, furnace, tankless water heater & stucco, great Sandia views, MLS# 873831, $185,000. Ramos, 505-440-5476.

3-BDR. HOME, 2 baths, 3-car garage/shop, 2,545-sq. ft., Four Hills, on 40+ acres open space, city & mountain views, upgrades. Brooks, 505-362-1828.

3/4-BDR. HOME, great yard, Sandia school district, 7 mins. from Eubank, 1517 Altez NE, MLS#867074, $140,000. Reynolds, 505-884-0020, ask for Janie.

WANTED

ROOMMATE, 4-bdr. home, Menaul/Juan Tabo, pets allowed w/approval, $450/mo., utilities, cable, internet included. OMahony, 505-382-4179.

GOOD HOME, female cat, black, fixed, healthy, full shots, friendly, baby is allergic. Munson, 203-988-3218.

LOG SPLITTER, motor or engine powered; #4 fly rod, short length. Menicucci, 505-235-8501.

Kirk Graham

(Continued from page 12)

Kirk knew he was going to have to make adjustments at home. "My accident affected my whole family to one degree or another," he says. With the help of his family — his wife, three daughters, sons-in-law, and his five grandchildren — his house was reconfigured so that he could easily move around in his wheelchair without bumping or smashing into anything.

Voluntarily self-identifying

Kirk also knew that adjustments needed to be made at work and that he needed accommodations to be successful at his job. His manager, Lorraine Sena-Rondeau (2719), immediately reached out to the Equal Employment Opportunity (EEO)/Affirmative Action (AA) organization. Kirk filled out a form to self-identify as a person with a disability and submitted it electronically in the Sandia system. Tammy Sanchez-Godin (3011), the Sandia job accommodation specialist (JAS) says, "Voluntarily self-identifying is a good thing — it's how things change. Sandia supports and encourages employees to self-identify. The process of self-identification is really simple and easy. It is confidential, and is not reported to your manager or anyone else."

Kirk, Lorraine, EEO & AA, and Facilities worked as a team to reconfigure his work area. Tammy says, "I consult with Sandia Medical to clarify medical restrictions and act as a liaison between management and all on-roll employees to help them participate in discussions to identify reasonable accommodations that will allow employees to perform their jobs."

Kirk's office was completely reconfigured to remove any obstacles.

"Sandia has done a tremendous job setting up reasonable accommodations for me," he says, noting that he has plenty of room to move around his office in his wheelchair, has a sit-stand desk, and Americans with Disabilities Act-accessible doors, both inside and outside the facility, for him. He is also able to drive his wheelchair-accessible, full-sized pickup truck or his classic 1968 El Camino on site and park right next to his office.

Those accommodations have helped him succeed and remain a key contributor at the Labs — he became a Principal Technologist in 2015.

The person in the wheelchair

Lorraine says, "Kirk has consistently demonstrated an amazing work ethic. He doesn't let his disability get in the way of doing his job. He comes to work every day, is very dedicated and hardworking, and doesn't ask for any special treatment. He expects to carry his portion of the workload for whatever project he is working on." His co-workers feel the same way. "Kirk is a hard worker and a very positive person. He is very appreciative of what Sandia has done for him," says one colleague.

Kirk has taken the concept of reconfiguring to a whole new level. With the help of his family, Kirk built an accessible home in the East Mountains. It took a few years to design, create, and build, its completion marking the culmination of a life-long dream to build his own home.

Kirk knows and understands that when people see him, they immediately see his wheelchair and view him as an individual with a disability. He says, "People only see the wheelchair and do not know the person in the wheelchair."

His grandchildren have opened his eyes in this respect. Kirk says, "It is awesome to see how aware my family and my grandchildren are of the special needs of a handicapped person — seating at a movie theater, table height at a restaurant, and especially handicapped parking. They all see the difficulty that I have and remember it."

Kirk can't get back on his Harley . . . yet. But he can still work with his hands and have a normal life.

"My life is good, I get to work on classic cars — it just takes more time and some help — and I get to play with my grandchildren," he says. "Life cannot get much better than that."

I chose a different path

Becky Krauss shares her story of an Invisible Chronic Illness

By Becky Krauss, Director, Communications Center 3600

BECKY KRAUSS, director of Communications Center 3600, lives with relapsing, remitting multiple sclerosis. "Having the support of people who understand that even though you look fine you might not feel fine is a great source of strength," Becky says. (Photo by Randy Montoya)

I have an Invisible Chronic Illness. To an unknowing observer, I appear healthy and, dare I use the word, "normal." But on the inside, at any given time, I might be feeling numbness or tingling in my hands or feet, intense fatigue, dizziness, or, my most common symptom, an intolerance of heat. In a hot, stuffy room, I can feel like my whole nervous system is shutting down.

In 1998, I was diagnosed with relapsing remitting multiple sclerosis. It was devastating and scary, especially when my first doctor recommended I quit my job. I chose a different path.

I was a Sandia lawyer, a wife, a mom. Why would I bench myself? Instead, I had to accept my new self and learn how to live with my new reality.

First, medication. While that involves injecting myself three nights a week (it's better than it used to be — when it was every night!), my medicine has significantly reduced my symptoms.

Second, understand my new limitations. When I was first diagnosed, I took a class offered by the National Multiple Sclerosis Society to learn about MS, get tips, and develop coping strategies. One teacher gave an analogy that made a huge impact on me. For those suffering with chronic fatigue, he said having MS is like having one box of matches per day. Each matchstick is a unit of energy. When you use up your matches, you can't replenish until the next day. People without MS can grab extra matchboxes each day — with a little rejuvenation, they can reenergize. But because people with MS can't do that, they really have to plan how they will use their matches during the day, how soon their matchbox will be empty, and what they will do when the matches are gone.

I have taken that advice to heart and try my best to preplan my day: What will my schedule be? (will it be an exhausting day?); what will I wear? (can I wear my favorite pair of high heels or will that sap my energy?); will I be in a place where it will be too hot for me? (I know where every thermostat is in every conference room and office I frequent. For those of you who feel like you're in a meat locker when meeting with me, now you know why. I apologize to you for your shivering, but I need the cold air!)

Third, surround myself with support. I made the decision early on that while I would not publicize my illness, I would not keep it a secret. Did I worry whether telling people I have MS would hurt my career? Yes, but I decided it was a chance I had to take. Coping with invisible symptoms is hard enough. Having the support of people who understand that even though you look fine you might not feel fine is a great source of strength.

I think I can speak for most people with ICIs that we don't want people watching us, waiting to see some sign of how we are feeling so they can help. I may feel pins and needles inside my body from time to time, but I don't want my family or friends to be on pins and needles waiting to see if one of my symptoms is going to flare up. Of course it is OK to ask me how I am feeling. That is a sign of caring, not overbearing. But on the whole, I know that it is up to me to ask for help.

I know that might sound contradictory. I know it might be difficult to understand how someone like me wants to be treated. My advice — ask. If someone you care about is willing to tell you she has an ICI, then chances are good you can have a deeper conversation about how she wants to be supported.

I have never had cause to regret telling people. My family gives me comfort and strength. My friends keep me optimistic. My managers have accommodated me and never underestimated my abilities. My co-workers give me confidence that if I ever need help in a meeting, on a trip, even in the parking lot, I will get it.

Deciding whether to tell others about an Invisible Chronic Illness is a very personal decision. For me, having people know has been a source of strength and comfort. I'm glad I am not alone, even when others are shivering in the cold next to me. Hot coffee is on me!

The road taken: Kirk Graham forges a new life after accident

By Stan Mathews

KIRK GRAHAM knew that after a disabling motorcycle accident he had a choice: He could either start living and take control of his disability, or let it take control of him. Kirk chose to take control of his disability right from the start. He has praised Sandia for the extent to which it has made accommodations in the workplace to enable him to succeed. (Photo by Randy Montoya)

On Sept. 13, 2007, Kirk Graham's life changed forever while riding his motorcycle on the curvy Highway 60 near Mountainair, New Mexico. His only memory is that the road turned and he didn't.

As a result of the accident, Kirk spent several months in the hospital recuperating and getting used to a new normal: life in a wheelchair, paralyzed from the waist down. He wondered how he was going to get back to work at Sandia, where he had worked as a product quality technologist since 2004.

October is Disability Awareness Month, which celebrates the valuable contributions individuals with disabilities make in the workforce and highlights the importance of diversity in the workplace. To reflect the important role disability plays in workforce diversity, the US Department of Labor's Office of Disability Employment Policy (you can visit this site at: https://www.dol.gov/odep/) has made #InclusionWorks the theme of this year's National Disability Employment Awareness Month.

October is National Disability Employment Awareness Month.

At Sandia, employees with both visible and invisible disabilities make key contributions in organizations across the Labs every day.

Kirk Graham (2719-1) has a visible disability, but he has never let that slow him down. Even at the hospital, as he came to grips with his disability, Kirk knew that he had a choice: He could either start living and take control of his disability, or let it take control of him. Kirk chose to take control of his disability right from the start.

To help Kirk and his family adjust emotionally and mentally to his new situation, the hospital offered a special class that showed everyone how to cope and deal with disabilities.

"It was a very different kind of class," says Kirk, adding that, "I had been going to a Bible fellowship since the 1990s; the individuals in the fellowship, my family, and my love for God is what got me through my accident and the tough times."

Kirk's newfound spirituality and this class changed his perception of being an individual with a disability and helped him overcome depression, a common challenge of those recovering from serious injuries.

(Continued on page 11)

Join the Sandia Disability Awareness Committee

For Disability Awareness Month, take a moment to expand your knowledge about the important events in disability employment history and to embrace the benefits diversity brings to your workplace. Join the Sandia Disability Awareness Committee (DAC), or visit its SharePoint site at http://tiny.sandia.gov/qexn9 on Sandia's internal Web. The DAC is open to all on-roll employees who share a common goal to increase disability awareness, educate, and provide helpful resources. There are employees with invisible and visible disabilities who work each day to accomplish Sandia's shared mission. Recognize the difficult challenges they face on a daily basis. You can talk to management about any possible reasonable accommodations you may need related to a medical condition, or contact Tammy Sanchez-Godin, Sandia's Job Accommodation Specialist, for further guidance. It takes courage, commitment, and partnership to overcome barriers. Sandia is committed under the Americans with Disabilities Act to ensure that qualified individuals with disabilities have the same employment rights and privileges in employment and makes diligent efforts to reasonably accommodate.
For a timeline on disability employment history visit:
https://www.dol.gov/featured/ada/.