Sandia wins four R&D 100 Awards

Sandia researchers — competing in an international pool of universities, corporations and government labs — captured four prestigious R&D 100 Awards in this year’s contest.

_R&D Magazine_ presents the awards each year to researchers who its editors and independent judging panels determine have developed the year’s 100 most outstanding advances in applied technologies. An awards banquet will be held Nov. 1 in Orlando, Fla.

The awards, with their focus on practical impact rather than pure research, reward entrants on their products’ design, development, testing and production. The Chicago Tribune once described the contest as “the Oscars of invention.”

By Jim Danneskiold

Sandians are saving the Labs about $100,000 per month by making smart decisions about airline travel planning and ticket purchasing. Read the story on page 2.

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That’s that

One of the better online publications from around the DOE complex is Fermilab Today, which, as the title suggests, serves up a pretty good snippet in this era of “it’s got to go on a day to day basis.” Fermilab, based in the rural countryside of Batavia, Ill., about 40 miles west of Chicago, focuses on high-energy particle physics. As you can imagine, they do some fascinating work up there. I subbed for Fermilab Today for two or three weeks. First, I like to keep generally informed about what’s going on around DOE’s labs; and second, Fermilab Today is just really well-written. I find it a pleasure to read. The next step is to read it regularly as time permits.

Anyhow, a couple of weeks back, Fermilab Today featured a story about a symposium by Nobel laureate in physics David Gross. As the story described it, Gross “took a large audience in Ramsey Auditorium on a wild ride Tuesday night, explaining connections between the Standard Model and the mystery of the origins of the universe.” Sounds like fun, mind-expanding stuff. A wild ride, indeed.

In a reception following the symposium, Gross said something that caught my attention, because it has a direct bearing on what we do here at the Lab News and in our media relations efforts. As scientists, Gross said, “we have a responsibility to tell the public what we are doing, especially since all of this is just human curiosity.”

It’s clear from the context that Gross was speaking specifically of the work done at Fermilab. But his insight has applicability for us, too. On the face of it, more than just curiosity drives what we do at Sandia; we are tasked to anticipate and solve problems of urgent national concern. But isn’t it, ultimately, curiosity that motivates all of us in our work? We want to know, whether we are scientists or engineers — or writers — what happens next? What happens if I do x, y, or z? Where does that take me? Why did that happen? What does that mean? If we want and expect to find continued support for what we do, we have to communicate what we have found, what it means, and why it matters. It’s my hope that at the Lab News and in our media efforts, we’re helping and making a difference in that communications effort.

As an aside, it’s been my observation that Nobel laureates are unusually good indicators of the quality of their own work. The laureates I’ve heard speak here at Sandia over the years have been great communicators. That’s a skill that has probably served their careers very well.

A quick observation: Whenever you read instructions for assembling some new appliance or gadget at home that use the word “simply,” reach for the aspirin bottle. The next step is going to drive you simply nuts. It might as well say “simply grow another hand and eyes in the back of your head.”

You probably saw where SpaceX, the private space launch business started by PayPal founder Elon Musk, successfully launched its Dragon spacecraft into orbit, hopped up to the International Space Station, and then undocked and headed to mid-ocean splashdown and recovery. This is big, big news for us space buffs. Musk is one of several young (relatively) entrepreneurs who are putting their money where their dreams are. I have no doubt that Musk and like-minded folks — John Carmack, Paul Allen, Richard Branson, and others — aren’t getting into space merely to shuttle supplies to the space station. No way. These guys grew up dreaming about space, and my bet is that they want to get there themselves. All of these individuals got rich by making technology accessible to a large percentage of the world’s population. Over the next few years, as their collective vision really takes shape, we’re going to find that they are doing the same thing with space. They are each doing it their own way, but the end result will be more space access, or more free time, or more than ever. Some of us reading this might even get to the moon ourselves. Sign me up.

See you next time.

— Bill Murphy (505-845-0845, H50165, bmurphy@lanl.gov)

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The Federal Acquisition Regulation (FAR) requires the purchase of the lowest airfare, but Sandia was able to negotiate lower prices through Travelocity. For business travelers, a savings of almost 50 percent would have created a hardship on the Labs. “We understand it’s not always possible to purchase nonrefundable tickets at least 14 days in advance and it doesn’t always make sense to purchase the lowest possible airfare if it creates undue hardship on the employee and Sandia,” says Patricia Taylor, manager of Treasury and Travel Services.

Exceptions allowed

Employees are allowed to purchase airline tickets outside of the lowest airfare requirements as long as their travel meets one of several exceptions. The employee must indicate the exception via automated mechanisms in Travelocity Business and in the Expense Reporting Tool.

A list of the exceptions can be found by clicking a link at the top of Sandia’s Travel and Treasury Services website at http://info.sandia.gov/travel/travelhp.htm. The goal is to increase trip booked at least 14 days in advance from 47 percent in FY11 to 95 percent, and to increase the purchase of nonrefundable airline tickets from 8 percent in FY11 to 95 percent. In FY11, Sandia spent more than $21 million in airfare.

Sandia and Lockheed Martin travel offices have developed some additional suggestions to save on travel costs. They include the following:

• Book online through Travelocity and save $30 compared to speaking to a Travelagent.
• Minimize one-day trips for a single purpose unless it’s missions-critical work requested by the customer.
• Consider alternative meeting methods that don’t require travel — teleconferencing and teleconferencing.
• Limit the number of employees traveling to the same meeting to only mission-critical attendees.
• Arrange to share ground transportation such as taxis and rental cars when traveling with other employees to the same meeting.
• When selecting a hotel, evaluate the total value to include room rate, meals, taxes, and parking and breakfast costs if applicable.

Lab News Reader Service

The Sandia Lab News is distributed in-house to all Sandia employees and on-site contractors and mailed to all Sandia retirees. It is also mailed to individuals in industry, government, academia, nonprofit organizations, media, and private life who request it.

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To receive the Lab News or to change the address (except retirees), contact Michelle Fleming, Media Relations and Communications Dept. 3651, 505-844-4902, email mfleming@sandia.gov, or Mail Stop 0165, Sandia National Laboratories, Albuquerque, NM 87185-0165.

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Lab News Reader Service is reaping savings for Sandia

Sandians are saving the labs about $100,000 per month by making smart decisions about airline travel planning and ticket purchasing behaviors.

The savings were realized by taking two simple measures: purchasing only nonrefundable airline tickets, and purchasing the tickets at least 14 days in advance. The measures became mandatory March 1.

The savings for the first three months under the new policy — March, April, and May — compared with the same three months in 2011, were $111,902 in March, $90,519 in April, and $99,083 in May, for a total savings of $301,304.

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Cyber research facility opens at Sandia/California

CTRL laboratory offers open yet controlled space for cybersecurity practitioners

By Mike Janes

Sandia/California’s new Cybersecurity Research Laboratory (CTRL) now offers an open yet controlled area for cybersecurity practitioners from the Bay Area and across the country to meet and discuss critical cyber research issues. A grand opening for the facility, which resides on the grounds of the Livermore Valley Open Campus (LVOC) and is part of Sandia’s Cyber Engineering Research Institute (CERI), was held June 12.

During the ribbon-cutting event, Rep. Jerry McNerney (D-Stockton) talked about the growing national issue of cybersecurity and said CTRL will “bring together a tremendous amount of talent and synergy” from Sandia, neighboring Lawrence Livermore National Laboratory, academia, and industry.

Other speakers at the event included executive vice chancellor Ralph Hexter from the University of California-Davis, Livermore Chamber of Commerce president and CEO Dale Kaye, and Sandia’s Div. 8000 VP Rick Stulen and Center 8900 Director Len Napolitano. Following the remarks, guests visited workstations staffed by students from the Center for Cyber Defenders (CCD) and other Sandia researchers, learning about cybersecurity and related project themes such as malware, cell phone tracking, and supply chain security.

“Our potential users in the coming months and years, potentially from collaborators Sandia hasn’t even begun to work with. He also sees the facility as an important contributor to workforce development.

cybersecurity and related work throughout Sandia, along with acting as a Bay Area resource for open work performed at Sandia/New Mexico.

Sandia has a decades-long history in cybersecurity, Jim says, the origins of which lie in the Labs’ nuclear weapons program. Most recently, it has received accolades for its successful Center for Cyber Defenders (CCD) program, which has trained hundreds of college students in cyber defense and has seen many go into private industry and government to tackle cybersecurity issues. This summer’s Sandia/California CCD interns are housed in the CTRL facility.

As a national security laboratory, Sandia needs to remain active in the cybersecurity arena, says Jim, and Sandia/California is well-positioned to offer a facility like CTRL to Silicon Valley interests, federal and local government, and companies from around the country that need it the most. Virtually every company and organization in existence has issues with privacy, supply chains, exfiltration of intellectual property, malware, and communications, so places where scientists, engineers, and cyber analysts can gather openly yet securely have become critical.

“The Bay Area is a hubbed for social media and computer companies of every type, and every product or service being developed today must be reliable and resilient,” Jim says. “Any of it can be attacked by our adversaries, so the more we can facilitate technical discussions with our cybersecurity brethren, the better.”

Access to CTRL, he says, is very flexible, so some non-Sandia personnel could conceivably come for an afternoon or day, stay a week or more, or even have an office set up for long-term use.

In addition to its Center for Cyber Defenders students, the CTRL facility houses a number of Sandia cyber programs funded by multiple sources and is beginning to provide office space for academic and industrial partners. Jim says he envisions even more CTRL users in the coming months and years, potentially from collaborators Sandia hasn’t even begun to work with.
The Weapon Intern Program, it is fair to say, has become an institution, not just at Sandia but within the nuclear security enterprise. Since its inception, almost 300 individuals from the nation’s weapons community — including 37 Sandians — have gone through the program. Through a combination of classroom study taught by active and retired weaponers, site visits, and individual and team projects, weapon interns have honed their skills, broadened their knowledge base, and engaged with fellow colleagues in the nuclear weapons community.

As an important strategic component of the Labs’ nuclear weapons mission, Sandia’s Weapon Intern Program (WIP) has evolved over the years to meet changing mission needs and national policy goals. What began as a two-year program in 1998 eventually became a one-year, one-once course of study and projects. Since the start of 2013, 14th class the WIP has changed its format again to stay aligned with the demands of the Labs’ weapons work.

For its latest iteration, the WIP involves six months of intensive classroom work and a five-month special project. This allows for two classes to be offered each year. Nominations for the class beginning in September are being accepted through July 27. Details are available on Sandia’s Internal Techweb at (http://wip.sandia.gov). Given the nuclear weapons workload, a firm decision to hold a second class (starting March 2013) will be made in December 2012 to account for nuclear weapons staffing and budget projections.

More throughput

The motivation for reconfiguring the WIP, says Larry Schoof (2916), is to try to get more throughput in the program. Larry, who recently took the reins as WIP project lead, notes that Sandia is likely to see a significant increase in the volume of nuclear weapons work over the next few years, with several Life Extension Programs and alteration projects in the pipeline that are intended to keep the stockpile viable for the next several decades.

That would expand workload, Larry notes, Sandia has hired a lot of new people. “To help accelerate their learning about the nuclear weapons enterprise, Larry says, “we’ve been asked by Sandia management to essentially double the throughput in the WIP. We are really fine-tuning the curriculum so that doesn’t come at the expense of content, though, Larry says a lot of effort was put into consolidating the curriculum, eliminating redundancies and non-weapon-related material. The consolidation doesn’t come at the expense of content, though, Larry says. “We are really fine-tuning the curriculum so that we can get the same content into that six-month class, room timeframe,“ he says.

Program review drove latest changes

Many of the latest changes to the program came as a result of a WIP review conducted in 2010 at the request of Larry Walker (then Center 2990 director) to a team led by Corey Knapp (then, New Mexico Weapon Systems Center 2100 director). Based on extensive interviews with stakeholders and weapon systems managers, this group generated a blueprint for a redesigned WIP.

The modified, streamlined curriculum hasn’t been all about eliminating content. As a result of the Knapp review, some new material was added to the program, including a course focusing on lessons-learned from the recent Knapp review, some new material was added to the program, including a course focusing on lessons-learned from the recent Policy War College at Maxwell Air Force Base in Alabama, which was not new to the field of nuclear weapons training. He spent two years on temporary assignment at the Air War College at Maxwell Air Force Base in Alabama, where he developed a nuclear weapons curriculum for Air Force personnel. Larry, who retired from the Air Force Reserve in 2005, has been at Sandia 22 years, where his career has focused on modeling and simulation and nuclear weapon safety and surety.

As lead for the Weapon Intern Program, he says his time will be spent recruiting, both internally and externally, to ensure that the WIP classes continue to reflect a broad diversity of viewpoints and experience. “I really want to keep a diverse program because of the tremendous advantages that we get when we have so many different perspectives for class discussion,” he says. Larry says he also intends to continue to tweak the curriculum to keep its focus on current stockpile issues. He also wants to make sure that the program, as it evolves, continues to incorporate a historical perspective, “to link the past to help us solve current and future issues.”

DAN CORDOVA (2541), seen here at the National Museum of Nuclear Science & History, spent a year in the Weapon Intern Program with the Class of 2009. Here’s what he has to say about the experience: “The Weapon Intern Program was one of the best years of my working life. I had been working as a systems engineer on the W76-1 LEP, and the WIP exposed me to the history of the nuclear weapons complex, all of the past and current systems, all the way back to the beginning, to the first nuclear weapon. The WIP gave me a chance to see how the nuclear weapons enterprise works, offered unprecedented access to information about past and current weapon systems, and gave me a perspective as to how Sandia fits into the very big picture. I also know that my experience in the WIP and as a systems engineer were key to my selection into my current job as a technical team leader. I highly encourage anyone at Sandia who is interested to consider participating in the Weapon Intern Program.”

(Photos by Randy Mortoya)

Weapon Intern Program makes its mark

‘One of the best years of my working life’

By Bill Murphy

The Weapon Intern Program, its fair to say, has become an institution, not just at Sandia but within the nuclear security enterprise. Since its inception, almost 300 individuals from the nation’s weapons community — including 37 Sandians — have gone through the program. Through a combination of classroom study taught by active and retired weaponers, site visits, and individual and team projects, weapon interns have honed their skills, broadened their knowledge base, and engaged with fellow colleagues in the nuclear weapons community.

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(Photos by Randy Mortoya)
Sandia wins 4 R&D 100 awards

Sandia’s award winners...

Computer Chip Configuration for Neutron Generators. The ultra-compact neutron generator, dubbed a “neutristor,” is a thousand times smaller than anything on the market today. A three-year Laboratory Directed Research and Development (LDRD) project led by Sandia researcher Juan Elizondo-Decanini (2625) turned away from conventional cylindrical tubes and demonstrated the basic technology necessary for a tiny, mass-produced neutron generator that can be adapted to medical and industrial applications.

“The idea of a computer chip-shaped neutron source — compact, simple, and inexpensive to mass-produce — opens the door for a host of applications,” Juan says. Juan’s vision for the neutron generator of the future is one that uses no tritium and no vacuum and is made in a solid-state package. The technology is ready to be licensed for some commercial applications, but more complex commercial applications could take five to 10 years.

SANDIA RESEARCHER Juan Elizondo-Decanini holds a prototype of a “neutristor,” a new R&D100 Award-winning configuration for neutron generators. (Photo by Randy Montoya)

Microsystems Enabled Photovoltaics (MEPV): Sandia’s Microsystems-enabled photovoltaics, also known as “solar glitter,” combine mature technology and tools currently used in microsystem production with groundbreaking advances in photovoltaic cell design. Sandia researcher Greg Nielson (1719) led the project, in which the cells are created using mature microdesign and microfabrication techniques. The cells are then released into a solution similar to printing ink and “printed” onto a low-cost substrate with embedded contacts and micro lenses for focusing sunlight onto the cells. Each cell can be as small as 14 microns thick and 250 microns wide, reducing material costs while enhancing cell performance by improving carrier collection and potentially achieving higher open circuit voltages. The technology has potential applications in buildings, houses, clothing, portable electronics, vehicles, and other contoured structures.

PROJECT LEAD Greg Nielson holds a solar cell test prototype with a microscale lens array fastened above it that together will help create a concentrated photovoltaic unit. The work won a 2012 R&D 100 Award. (Photo by Randy Montoya)

Preparation of Nucleic Acid Libraries for Ultra-High-Throughput Sequencing with a Digital Microfluidic Hub builds from Sandia’s RapTOR (Rapid Threat Organism Recognition) Grand Challenge. RapTOR rapidly identifies and characterizes unknown pathogens. It is a digital microfluidics “Grand Central Station” that manages and routes samples. “We’re taking advantage of DNA sequencing technology,” says Sandia’s Kamlesh (Ken) Patel (8125).

“Reading the genetic code, the original building blocks, allows you to begin characterizing a pathology at the most basic level,” Ken leads the Automated Molecular Biology (AMB) research to scale down and automate traditional sample preparation methods such as normalization, ligation, digestion, and size-based separation — methods that traditionally require a skilled scientist and take days or even weeks. The hub functions like a train station for samples, shrinking and enlarging samples as necessary and manipulating their speeds. Samples are caged within a microliter-scale droplet that is spatially moved across the Teflon-coated surface of the hub when electrostatic forces are appropriately applied. The hub moves samples from one step to the next with the flexibility to skip or repeat steps on the fly. The hub also manages the size of the sample, extracting the right amount for each process.

TINY BUT GRAND — Ken Patel works on the digital microfluidic hub, the Grand Central Station of RapTOR that manages and routes samples. In addition to winning a 2012 R&D 100 Award, the work earned the Society for Laboratory Automation and Screening’s $10,000 Innovation Award. (Photo by Dino Vournas)

MR. COOL — Sandia’s Jeff Koplow makes an adjustment to an earlier prototype of his Air Bearing Heat Exchanger invention, winner of a 2012 R&D 100 Award. The technology, known as the “Sandia Cooler,” significantly reduces the energy needed to cool the processor chips in data centers and large-scale computing environments. (Photo by Dino Vournas)

“The ‘Sandia Cooler,’” also known as the “Air Bearing Heat Exchanger,” will significantly reduce the energy needed to cool the processor chips in data centers and large-scale computing environments, says Sandia researcher Jeff Koplow (8366). With the Sandia Cooler, heat from a conventional CPU cooler is efficiently transferred across a narrow air gap from a stationary base to a rotating structure. The normally stagnant boundary layer of air enveloping the cooling fins is subjected to a powerful centrifugal pumping effect, causing the boundary layer thickness to be reduced to 10 times thinner than normal. The Sandia Cooler also offers benefits in other applications where thermal management and energy efficiency are important, particularly heating, ventilation, and air-conditioning (HVAC).
Return of the eggbeater

Story by Stephanie Holinka

S andia’s wind energy researchers are re-evaluating vertical axis wind turbines (VAWTs) to help solve some of the unique problems of generating energy from offshore breezes. Though VAWTs have been around since the earliest days of wind energy research at Sandia and otherwise, VAWT architecture could transform offshore wind technology.

The economics of offshore windpower are different from land-based turbines, due to unique installation and operational challenges. VAWTs offer three big advantages that could reduce the cost of wind power in the ocean: fewer moving parts, lower fatigue loads, and simpler technology, reduced machine complexity and fewer failures in very large arrays. A lesser cause of gravity means reduced uplift and smaller foundations in case and even less corrosion. Fewer parts, lower weight loads, and simpler maintenance all lead to reduced maintenance costs.

Elegant in their simplicity

Sandia is conducting the research under a 2008 DOE solicitation for advanced rotor technologies for US offshore windpower generation. The five-year, $4.5 million project began in January of this year.

“VAWTs are elegant in terms of their mechanical simplicity,” says Josh Paquette (6121), one of Sandia’s two principal investigators on the project. “They have few parts because they don’t need a control system to point them toward the blowing wind to generate power.”

These characteristics fit the design constraints for offshore wind—high cost of support structure, the need for simple, reliable devices, and economic scales that demand larger machines than current land-based designs.

Large offshore VAWT blades, in excess of 200 feet long, will need to produce more than blades for onshore wind turbines, but as machines and their foundations get bigger — closer to the 10-20 megawatt (MW) scale — turbines and rotors become a much smaller percentage of the overall system cost for offshore turbines, so other benefits of the VAWT architecture could mean more than offset the increased rotor cost.

Changes remain

However, challenges remain before VAWTs can be used for large-scale offshore power generation.

“Even small VAWT blades are complex, making manufacture difficult. Producing very long VAWT blades demands innovative engineering solutions. Matt Mansfield (6111) says partners Iowa State University and Composites will be exploring new techniques to enable manufacture of geometrically complex VAWT blade shapes at an unprecedented scale, but at acceptable cost,” Paquette adds.

VAWT blades must also overcome problems with cyclic loading on the drivetrain. Unlike horizontal axis wind turbines (HAWTs), which maintain a steady torque if the wind remains steady, VAWTs have two “pulses” of torque and power for each blade, based on whether the blade is in the upgoing or downgoing part of the motion. This “torque ripple” results in unsteady loading, which can lead to fatigue issues. The project will evaluate new rotor designs that smooth out the amplitude of these torque oscillations without increasing rotor cost significantly.

Because first-generation VAWT development ended decades ago, updated designs must incorporate decades of research and development already built into current VAWT designs. Integrating VAWT research means figuring out the models that will speed up turbine design work. Sandia’s current development effort that will synthesize and enhance existing aerodynamic and structural dynamic codes to create a publicly available aerelastic design tool for VAWTs,” Matt says.

Needed: Aerodynamic braking

Another challenge is brakes. Older VAWT designs didn’t have an aerodynamic braking system, and relied solely on a mechanical braking system that is more difficult to maintain and less reliable than the dynamic brakes used on HAWTs.

“VAWTs need pitchable blades, which stop the turbine within one or two rotations without damage to the turbine and its components,” Paquette explains. Matt says new VAWT designs will need robust aerodynamic braking systems that are reliable and cost-effective, with secondary mechanical brakes like modern-day dynamic brakes. Unlike HAWT brakes, new VAWT brakes won’t have actively pitching blades, which have their own relative maintenance issues.

VAWT technology: A long history at Sandia

In the 1970s and 1980s, when wind energy research was in its infancy, VAWTs were actively developed as windpower generators. Some looked like eggbeaters, others looked like rotating insect antennae.

“VAWTs held their own against HAWTs. But then wind power design and manufacturing became more complex,” Josh says.

VAWTs emerged as the predominant technology for land-based wind over the past 15 years primarily due to advantages in rotor costs at the 1 to 5 megawatt scale,” Josh adds.

In the 1980s, research focused more heavily on offshore VAWTs and V-shaped VAWTs. But the early favorite rotor type was the Darrieus design, the so-called “eggbeater.”

Although strange looking, they had a lot going for them: They were simpler than their horizontal-axis cousins so they tended to be more reliable. For a while, VAWTs held their own against HAWTs. But then wind turbines scaled up.

“HAWTs emerged as the predominant technology for land-based wind over the past 15 years primarily due to advantages in rotor costs at the 1 to 5 megawatt scale,” Josh says.

In the 1980s, research focused more heavily on offshore VAWTs, and many VAWT manufacturers left the business, converting VAWTs to an “also ran” in the wind energy sector.

But the winds of change have blown VAWTs’ way once more.

Sandia is mining the richness of its wind energy history. Researchers who were among the original wind energy engineers are going through decades of Sandia research and computing the lessons learned, as well as identifying some of the key unknowns described at the end of VAWT research at Sandia in the 1990s.

Phase one of the program will take place over two years and will involve creating several concept designs, running those designs through modern modeling software and narrowing those design options down to a single, most-diverse design for offshore turbines. TPI Composites will develop a commercialization plan. The University of Maine will develop floating VAWT concepts, tension-leg platforms, and spar buoys.

In addition to rotor designs, the project will consider different foundation designs. Early candidates are barges, tension-leg platforms, and spar buoys.

The project partners will work on many elements. The University of Maine will develop floating VAWT platforms and composite blades and subscale wind tunnel testing. Iowa State University will develop manufacturing techniques for offshore VAWT blades and subscale wind tunnel testing. TPI Composites will design a proof-of-concept subscale blade and develop a commercialization plan. TU-Delft will work on aerelastic design and optimization tool development and modeling. Texas A&M University will work on aeroelastic design tool development.

Ultimately it’s all about the cost of energy. All these decisions need to lead to a design that’s efficient and economically viable,” Josh says.
Richard M. Garcia charged ahead full-throttle, full of life and love, with a spirit that wouldn’t quit

He was young — way too young — and had only barely started at Sandia. And then he was gone. Richard Michael Garcia was 23 when he died earlier this month. He was a courageous young man, quite literally laughing in the face of an illness, cystic fibrosis, that would ultimately claim his life.

According to an obituary published in the Albuquerque Journal, Richard understood that because of his illness, “he knew his time was precious, so he lived his life like every day was his last. He loved everyone to the fullest and did everything at full throttle.”

It was that indomitable spirit and that laugh, that unforgettable laugh of his, that stick with his colleagues. “Our workday flew by because we were always laughing and making fools of ourselves,” says co-worker Anthony Chavez (4848). “I’m sure the Bldg. 878 residents can vouch for that. Richard was always happy and positive regardless of what he had going on personally. His laugh echoed through the halls and it was the kind of laugh that would make anybody’s day. He left a big impression on my life and I’ll always remember to ‘take it easier’ like Richard did,” Rhonda Rice (4848) remembers that spontaneous sense of joy and good spirits that seemed to follow Richard around. “When I think of him,” she says, “I can see him laughing in front of me. My mind has kept a good memory of a young man ready to smile. He could bring me to tears laughing, because what he said was so hilarious. He was definitely enjoyable to be around.”

Richard (his family called him Michael but to his Sandia colleagues he was always Richard) started working at the Labs in December 2010 as a custodian in Facilities Management. According to his supervisor, Chuck Cawley (4848), Richard thoroughly enjoyed his job at Sandia, “understanding the exceptional service his employment provided to his nation.”

And all kidding around and joking aside, Richard took his job seriously. Says Rhonda, “He was a hard worker and shared his ideas on good cleaning techniques that he had already picked up. I will miss him.”

During his all-too-short time at the Labs, Chuck says, Richard “earned the respect, admiration, and love of his fellow employees by contributing to Sandia’s mission with dedication, delightfulness, and diligence as a custodian.”

Though it must not have been easy for him, Richard was always ready to step in where he was needed the most, notably as a participant in Operation Deep Freeze in February 2011, volunteering to work as a snow removal team member. Chuck remembers Richard as one who never complained about work and was always willing to work outside of his normal work schedule. “Richard Michael Garcia was simply the best of the best,” Chuck says.

An appreciation of the human spirit

Colleague Roy Cusco (4848) saw Richard as an inspiration. “He was the true definition of a warrior,” Roy says. “He was in constant battle with his body, always having to dig deep to do what he loved, to enjoy every day of life to the fullest. Almost always he would win. Richard was a kind, sincere, honest, person, who would give me a renewed appreciation of the human spirit.”

Maggie Chavez (4848), a colleague on the Bldg. 880 custodial team, recalls Richard as a role model for other custodial workers. “He was such a good person,” she says. “He was always willing to help out others on the team with extra duties.” Noel Jaramillo (4848) couldn’t agree more. “Richard was a hard worker, a go-getter, and did anything to brighten up the mood and make you laugh. He was a true, genuine guy.”

While Richard had been ill for some time, he didn’t wear his illness on his sleeve. “You just didn’t know how sick he was; he didn’t share the details of his illness,” says friend and colleague Katie Serna (4848). “I only knew he lived a good life and enjoyed many outdoor activities daily, or as his health allowed. He had a great sense of humor and a laugh I won’t forget. I never saw him get mad or frustrated. He took everything in stride. He will be missed very much. In the few months I worked with him we grew close as friends, working daily side by side. He was a very nice young man.”

If it is his laughter and his spirit that his colleagues remember, it is his death at a young age that tears at their hearts. “It doesn’t seem right to have someone so young taken from our presence at such a young age,” Rhonda says. “When I heard the news I felt as though a piece of my heart was taken from me.”

Katie sums up a sentiment shared by everyone who worked with Richard. “We need more people like him. I will miss you, Richard.”

More than 200 students interns came out for the Student Intern Program (SIP) Welcome Event, a picnic at Ted Hobbs Park at the corner of Innovation Parkway and Gibson Boulevard. In addition to fun and games like volleyball (photo at left), the event provided students a chance to network with other interns, managers, and mentors, while learning about some organizations and community groups that welcome student involvement. The picnic was just the first of several SIP events and activities planned over the summer for Sandia interns.

Coming up on July 2 is the SIP Career Expo, to be held in Bldg. 858EL from 8:30 a.m.-5 p.m. The expo will inform interns about career opportunities at Sandia in their field of study. Students will register to attend by discipline tracks. Representatives from discipline-specific recruiting teams and intern institutes will present overviews of the research conducted at Sandia.

Also coming up are, on Thursday July 12, a resume writing workshop, and on Thursday, July 19, an interview workshop. Both activities will be at the IPOC facility 11:15 a.m.-12:30 p.m. The SIP Symposium on Wednesday, Aug. 2, at the Steve Schiff Auditorium, 8 a.m.-1 p.m., provides Sandia student interns the opportunity to create a poster detailing their accomplishments during their internship. All student interns, as well as all Sandia employees and contractors, are encouraged to attend the entire event.

Student Intern Program picnic launches summer of activities

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Richard M. Garcia, left, poses for a team photo with colleagues from Sandia’s custodial program. Richard died earlier this month at age 23 after a long illness. He came to Sandia in December 2010, touching many lives during his short time at the Labs.
**NMSBA named Manufacturing Advocate of the Year**

By Nancy Salem

The New Mexico Small Business Assistance (NMSBA) is a public-private partnership among Sandia, Los Alamos, the NM MEP, and the state of New Mexico that connects small business owners with scientists and engineers who give their companies technical assistance. The program provided $4.6 million worth of help last year.

The MEP award recognized the program’s “commitment to the business growth and transformation of US-based manufacturing through work in the manufacturing sector.” The NMSBA was specifically cited for its significant impact in helping new product innovation among New Mexico small businesses and contributing to state economic growth.

“The NMSBA Program truly appreciates this national recognition and we really want to thank all the principal investigators at Sandia, Los Alamos, and NM MEP for providing their skills and expertise to help small businesses throughout the state,” says Jackie Kerby Moore, director of Sandia’s Technology and Economic Development Dept. 1933.

The award was presented last month at the 2012 Manufacturing Innovation conference in Orlando, Fla. The Manufacturing Innovation 2012 awards committee received more than 75 nominations highlighting work in manufacturing throughout the country. Ten awards were given.

Through the NMSBA, small businesses with technical challenges can seek assistance from laboratory scientists or engineers for projects that require testing, design consultation, or access to special equipment or facilities.

The NMSBA has provided 1,876 small businesses with nearly $30 million in technical assistance. The program has helped create or retain more than 2,300 jobs at an average salary of $38,000, increase small companies’ revenues by $107.6 million, and decrease their operating costs by $63.6 million. These companies in turn invested $35 million in other New Mexico small businesses and received $41 million in new funding and financing.

**Graph500 adds measurement of supercomputing performance**

By Sue Major Holmes

Supercomputing performance is getting a new measurement with the Graph500 executive committee’s announcement of specifications for a more representative way to rate the large-scale data analytics at the heart of high-performance computing.

An international team that includes Sandia announced the single-source standard by specification to assess computing performance last week at the International Supercomputing Conference in Hamburg, Germany.

The latest benchmark “highlights the importance of new systems that can find the proverbial needle in the haystack of data,” says Graph500 executive committee member David Bader, a professor in the School of Computational Science and Engineering and executive director of High-Performance Computing at the Georgia Institute of Technology.

The specification will measure the closest distance between two things, says Sandia researcher Richard Murphy (1422), who heads the executive committee. For example, it would seek the smallest number of people between two people chosen randomly in the professional network links, and finding the freest friend of a friend links between them, he says.

Graph500 already gauges two computational techniques, called kernels: a large graph that links huge numbers of participants and a parallel search of that graph. The first two kernels were relatively easy problems; this third one is harder, Richard says. Once it’s been tested, the next kernel will be harder still, he says.

The rankings are oriented toward enormous graph-based data problems, a core part of most analytics workloads. Graph500 rates machines on their ability to solve complex problems that have seemingly infinite numbers of components, rather than ranking machines on how fast they solve those problems.

A $270 billion market

Big data problems represent a $270 billion market and are increasingly important for businesses such as Google, Facebook, and LinkedIn, Richard says.

Large data problems are especially important in cybersecurity, medical informatics, data enrichment, social networks, andsymbolic networks. Last year, the Obama administration announced a push to develop better big data systems.

Problems that require enormously complex graphs include correlating medical records of millions of patients, analyzing ever-growing numbers of electronically related participants in social media, and dealing with symbolic networks, such as tracking tens of thousands of shipping containers of goods roaming the world’s oceans.

Medical-related data alone could potentially over-write staff hours valued at up to $200,000 per calendar year, Richard says.

Graph500’s steering committee is made up of more than 30 international experts in high-performance computing who work on what benchmarks supercomputers should use and meet in the future. The executive committee, which implements changes in the benchmark, includes Sandia, Argonne National Laboratory, Georgia Institute of Technology, and Lawrence Berkeley.

Bader says emerging applications in healthcare informatics, social network analysis, web science, and internet anomalies are topics for future rankings, Richard says.

“With these capabilities, a machine on the top of this list may analyze huge quantities of data to provide better and more personalized health care decisions, improve weather and climate predictions, improve our cybersecurity, and better integrate our online social networks with our personal lives,” Bader says.

**Graph500 Top 20, June 2012**

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Rudy Sedillo (1527) doesn’t miss Sandia’s old salt fog chamber, not even a little bit. He says the chamber that replaced it can perform a lot more tests and is far easier to operate.

The old chamber, now sitting on the asphalt outside a tent at Reutilization and Disposition, was used for just what its name hints at — it blanketed materials and components in a salt fog, similar to an ocean-front environment, to test their resistance to corrosion.

The salt fog chamber is a squat grayish-beige box with a triangular plastic lid that looks a little fogged up itself. On the outside of the lid is a sign, “NaCl. (Table salt). Not harmful.” A notice on the side of the machine warns that the chamber must be operated by authorized personnel only.

Rudy says the chamber worked this way: Operators put together a combination of salt and de-ionized water in an external tank, and used air pressure to force the mixture through an atomizer as a spray, which turned into a fog in the slightly heated chamber.

Researchers subjected their test items to salty fog long enough to see corrosion.

Such environmental tests derive from mil standards — DoD test protocols for equipment — and the auto industry, which needed to find out how metals and paint held up to various types of corrosion, Rudy says. Here at Sandia, researchers from groups all over the Labs used the salt fog chamber to test different types of metals, plastics, fiberglass products, and glass, as well as entire components, he says.

“We even tested some cards in there one time, a special type of card which resembled a credit card but was used for security purposes,” Rudy says.

Operators mixed the salt and water in an external tank, and had to check the temperature inside the chamber via a thermometer on the side of the chamber.

Rudy, who has been in the Program & Test Integration organization for about eight years, estimates the chamber dates from the 1980s. Sandia replaced it a little over a year ago.

Rudy’s enthusiastic about the modern chamber.

“It’s cyclic; it can go from one environment to the next. You can have salt spray, humidity, rain, or you can go back to a dry environment,” he says. “The old salt fog chamber went straight to a salt fog and that’s what you had.”

The new chamber has a data acquisition system and an integrated solution tank that still has to be mixed manually. It also has a modern control system instead of the rheostats operators once used to turn up the voltage to heat up the old salt fog chamber.

Compared to the replacement, Rudy says, the salt fog chamber was “much more of an antique.”

“It was effective for the one thing it did do, which was a salt fog,” he says. “It was old, but functional.”

What I found at Reutilization: Salt fog chamber
Paul Cooper

(Continued from page 12)

was a pivotal team and a critical turning point. It was a fantastic time to be there.

A year and a half later, the Branch Davidson

was an important milestone.

Paul also called upon the state of Oklahoma to look at technical evidence in the trials of Timothy

McVeigh and Terry Nichols in the April 19, 1995

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Paul Cooper first stood in front of a Sandia class in 1977. His topic was explosives safety and his goal was to make it pop, but not literally. He wanted to grab the students’ attention and hold it. Paul was a natural. He taught with expertise, humor, and an eye for irreverence. “If I wasn’t an engineer, I would have been a comedian or actor,” Paul says. “I feel like a performer in front of the group.”

He held the stage for 35 years, teaching nearly 1,000 Sandians everything they needed to know about blowing things up. His classes filled fast and his reputation grew, both as a teacher and an internationally recognized explosives engineer. “Paul is an acknowledged expert in the explosives community with over three decades of extraordinary achievement. He also has taught explosives courses to hundreds of Sandians starting that time,” says David Reese, director of Integrated Military Systems Center 5400. “We owe a great debt of gratitude to individuals like Paul Cooper who not only excel in their chosen professional field but also put forward the time and effort to pass along their skills and knowledge to others who will follow in their footsteps.”

Paul taught his final class offered by the Corporate Learning and Professional Development (CLPD) organization on May 24. Students stood around and friends stopped by for a slice of pizza and to witness the end of an era at Sandia. “We are very sad to see him go,” says Belinda Holley, manager of Technical and Compliance Training Dept. 3521. “He has had a sustained commitment not only to teaching but shaping the explosives training program and supporting education at Sandia. He is a rarity when it comes to that level of dedication and passion.”

Paul’s explosives safety course spawned four more courses, all focused on technology, Chemistry and Thermochimistry of Explosives; Shock and Detonation; Initiation Theories and Design of Initiation; and Scaling, Engineering Design, and Applications of Explosives. “We felt people would be much safer if they understood the materials and processes they were working with,” he says. “We went deeper into the engineering part.”

Paul says the classes took on a life of their own because of the scarcity of formal explosives training in the US. Paul himself learned explosives from “what I read, what I did, who I talked to, and from experience.”

A colleague Jerry Stofleth (5434) says the only thing Paul despaired about was that the students only learned about explosives and didn’t know how to use them. “I showed that propellant pellets, when hit, can crack and throw burning pieces, and set off an explosion.”

Come to Albuquerque

Paul is a native of Brooklyn, N.Y., and a 1958 chemical engineering graduate of the Brooklyn Polytechnic Institute, where he studied under rocket-engine expert Paul Torda. He followed his mentor to Chicago for a job when Torda was named director of research at the Illinois Institute of Technology’s Armor Research Foundation. “When I got there I looked at all the different places I could work,” Paul says. “There was an explosives department. I was like a little kid. Here was a place where they pay you to go out and blow stuff up. That’s how I officially got into the explosives business.”

A colleague was recruited to Sandia in 1964 and said Paul’s message: Come to Albuquerque. I have a place for you. “The minute I stepped off the plane I didn’t care what the offer was, I’d take it,” Paul says. He worked in explosive components until 1977 when he was recruited by the Underground Nuclear Testing arming and firing group, where he stayed until he retired in January 1997. His work focused on the design of explosive systems. “It’s not all bombs,” he says. “There are lots of things we do with explosives.”

In 1979, Paul joined the national Nuclear Emergency Search Team, NEST, an atomic bomb squad of sorts. “If the FBI or somebody got a lead there was a clandestine or homemade atom bomb somewhere, NEST had to locate and disarm it,” Paul says. “It was very exciting.”

Paul was a NEST member until the mid-1990s when its work transitioned to the military.

Explosives legend Paul Cooper hangs up his teaching hat

Paul enjoys more than teaching is engineering. “His passion in life is to know more, not just explosives, but every discipline of engineering, and not just engineering, but for nature and humanity as well,” Jerry says.

Paul’s professional career is a stuff of legend. He built a global reputation, searching for nuclear weapons in Iraq and investigating disasters ranging from the explosion of a gun turret on the USS Iowa in 1989 to the crash of TWA Flight 800 over New York in 1996.

Paul describes his Sandia career with typical humility. “Along the way, wonderful things happened,” he says. “I was just in the right place at the right time.”

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An ENERGETIC CAREER — Paul Cooper built a global reputation as an explosives engineer and passed his knowledge to hundreds of Sandians in courses he taught for more than 30 years. “It was fun,” Paul says. “And I’m proud of what I accomplished.”

Photo by Randy Montoya

AN EXPLOSIVES DREAM TEAM — The No. 2 turret of the USS Iowa exploded on April 19, 1989, killing 47 members of the turret crew. The left gun of turret one in the background is fully elevated as its crew tries to clear a misfire that occurred earlier by trying to coax the powder bags to slide backwards against the primer. (Photo courtesy of DefenseImagery, by Lt. Thomas Jarrell)

Paul was among those testifying. The Navy reopened the investigation after Sandia concluded the explosion was likely caused by an accidental overram of powder bags into the gun’s breech. The Navy said the cause of the explosion could not be determined and closed the investigation, but drew accusations against the dead crew member. Both reports remain in the record.

In October 1991, following Operation Desert Storm, Paul was named to a United Nations/IAEA inspection team sent to Iraq to look for evidence of weapons of mass destruction. “In early October the Iraqis denied having a nuclear program,” Paul says. “When we left at the end of October, they declared officially they had a nuclear program. It

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