

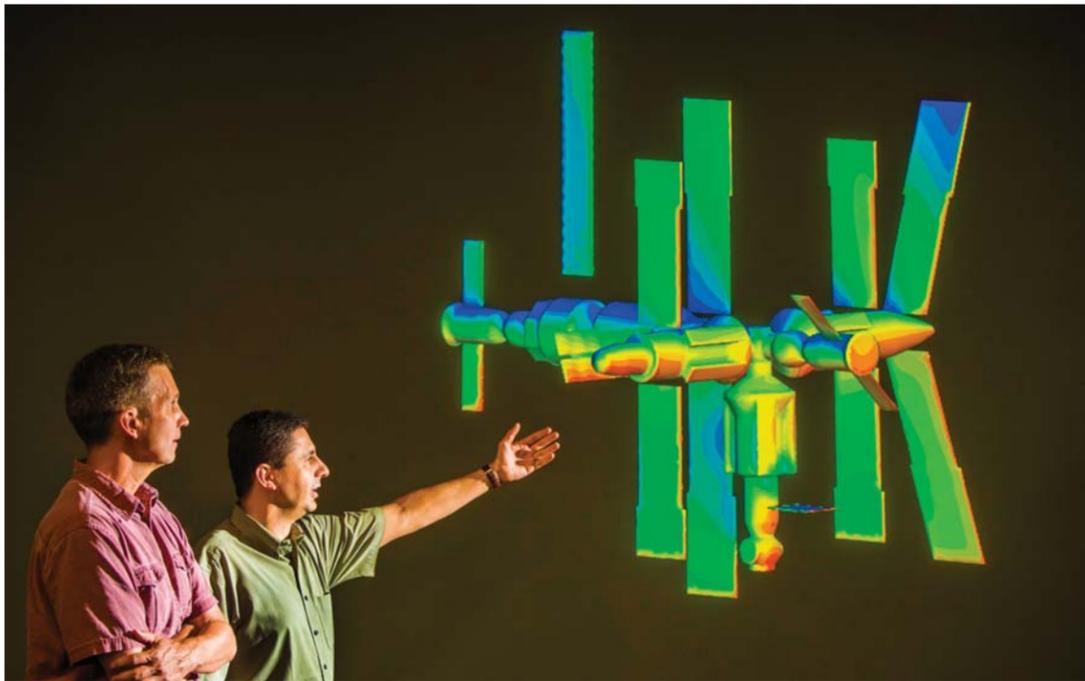


## Managing the nuclear weapons enterprise a huge undertaking

A question-and-answer session with Jerry McDowell, Deputy Laboratories Director and Executive VP for National Security Programs. Read the interview with Jerry on pages 8-9.



# Sandia's parallel DSMC codes yield unprecedented physics, engineering insights



By Sue Major Holmes

When the space shuttle Columbia disintegrated in the first stage of re-entry in 2002, sophisticated computer models were key to determining what happened.

A piece of foam flew off at launch and hit a tile, damaging the leading edge of the shuttle wing and exposing the underlying structure. Temperatures reached thousands of degrees as Columbia plunged toward Earth at 27 times the speed of sound, says Sandia fluid science and engineering researcher Michael Gallis, who used NASA codes and a Sandia DSMC code called Icarus to do accident simulations that proved critical to investigators.

But researchers realized a more sophisticated code would be even more valuable. Now Michael (1513) and computational scientist Steve Plimpton (1444) have created a parallel three-dimensional DSMC code called SPARTA. In July, Sandia released it as open source, available at <http://sparta.sandia.gov/>. In addition, Michael presented results of work using SPARTA at an invited keynote lecture at the 29th annual International Conference on

(Continued on page 5)

MIR PROJECTION — Steve Plimpton (1444), left, and Michael Gallis (1513) look at a projection of a model of the Russian MIR space station, which fell out of orbit several years ago and disintegrated, with the remains ending up at the bottom of the Indian Ocean. Using Sandia's 3-D code SPARTA, the calculation is simulating an instance of the process of de-orbiting. (Photo by Randy Montoya)

## Here's your chance to have a say in safety

... and earn 1,000 HealthMiles

Sandia is conducting a comprehensive survey this month to better understand how Sandians feel about worker safety, to identify strengths and weaknesses, and to gain insights on how the Labs is doing in meeting its goal that "everyone goes home and comes to work as healthy or better than the day before, while protecting the environment."



It's important for everyone to participate in the survey to get the widest possible range of views to help make improvements for a safer workplace, says Div. 4000 VP Mike Hazen.

### Our safety journey

Work done today can affect someone years in the future. Read Rick DeAnda's story on page 13.

People often view safety as something that affects only those who work with heavy equipment or hazardous materials. Although injuries may be more severe in those settings, even office workers need to remain aware. A question about the "safety of the physical facilities in your workplace" may conjure up images of forklifts, but offices have an interest in safety as well, including such things as adequate stairwell lighting, fire extinguishers that work, and cabinets that don't rain supplies on your head when you open them.

DuPont, a leader in safety, is conducting the survey for Sandia — the first such broad look at safety here since 2005. Using DuPont also allows Sandia to benchmark results against other organizations and ensure confidentiality for survey participants.

The 30-question survey should take no longer than 20 minutes. The results will be shared with employees by the end of the year.

Your responses will be kept anonymous. Sandia is ensuring confidentiality by having a third-party administer the survey. Managers will not see any names or verbatim comments that can be linked to any individual.

Employees will receive 1,000 HealthMiles for taking the survey. You'll be directed to a separate website to provide your name for that purpose only.

The survey will begin on Aug. 18 when employees will receive an email with a link.

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Jeff Bingaman, Gen. Robert Kehler on vital policy topics. Pages 10-11.



## A perfect heist

Researchers study successful real-world heists to gain insights about improved physical security. Read the story on page 3.



## Tim's Place

Tim Harris, born with Down Syndrome, dreamed of owning his own restaurant. Did his dream come true? See the story on page 16.

# Things to do, see, learn at Family Day 2014 beginning to take shape for Sept. 20 event

An early list of confirmed activities for Family Day 2014 provides a glimpse of what entertainment, fun, and learning opportunities are in store for the Sept. 20 event.

Core goals for Family Day 2014 are to:

- Provide family and friends with an improved understanding of the Labs' mission;
- Encourage talent retention of the workforce;
- Encourage students to succeed in school and pursue science, technology, engineering, and math (STEM) careers; and
- Promote health in the workforce.

And it's clear the already-planned attractions are sticking to those goals.

"Engineers are Problem Solvers" is the theme of one Div. 5000 activity that will feature computerized puzzles and questions for youngsters to solve and answer.

Div. 9000, which right now tops the list of confirmed activities, is planning to have its Viz Team present 2-D and 3-D scientific visualization demonstrations of the Labs' computational simulations, including the dynamics of fluid flow, which poses critical problems for work done by many Sandia engineers.

The Corporate Archives and History Program Exhibit will provide historical perspective and background about Sandia's nuclear weapons testing initiatives that have occurred over a period of about 60 years.

Members of the Community Involvement organization will be on Hardin Field to inspire the next generation of scientists and engineers with a variety of family-friendly activities.

For example, they will work with some University of New Mexico LOBO-MotorSports team members who will show off their SAE Formula One-style racecar, which the team recently took to an international competition.

Members of Sandia's HBE organization will be at several Hardin Field stations. A few examples:

- Throughout the day, Project Heart Start will provide whole-family-oriented 30-minute compression-only CPR lessons.
- Representatives from the Health Management Clinic will be present to talk about ways to manage conditions like metabolic syndrome, pre-diabetes, high cholesterol, blood pressure, weight, and depression.

Organizations whose members have been thinking about or planning Family Day 2014 activities but haven't gotten around to formally signing up should contact Katrina Wagner (3652) at 844-1810.



## How about becoming a Family Day 2014 volunteer?

Volunteers are needed to work as Family Day 2014 volunteer staff in several capacities. You'll get a free T-shirt commemorating the occasion. Workers are needed for various Hardin Field activities along with providing exhibit support in several areas, serving as safety volunteers, and in other roles to be determined. And you needn't commit to the entire 9 a.m.-3 p.m. Family Day hours. You can specify the time you can work. Contact Patty Zamora (3652) at 844-2146 or go to the Family Day volunteer website at <http://tiny.sandia.gov/u3o0i>.

## That's that

You've heard of STEM, right? All of a sudden (it seems) that word is everywhere. On the off-chance the term is new to you, it stands for science, technology, engineering, and math. You usually see it used in the context of education or workforce composition. Thus, you'll read that we need to get more students interested in STEM; we need a better-trained STEM workforce; we're falling behind in STEM fields compared to the rest of the developed world.

If you say we need to do better in STEM, you'll get no argument from me. What with the ascendancy of Big Data, and the technology-driven revolutions in energy, medicine, transportation, and just about everything else, it's a slam dunk that STEM capabilities are going to play a bigger and bigger role in our lives, our society, our destiny.

So do we need more and better STEM workers? Do we need to be more competitive? Do we need to prime the STEM pipeline? Absolutely. (I won't revisit here the controversy about whether there is currently a STEM worker shortage in the US, a subject I touched on in this space a few weeks ago. Maybe there's a shortage and maybe there isn't — both sides of that argument make a good case — but if we look beyond today, I think it's clear that over time we'll need more STEM capabilities.)

So, STEM, yes! But we need more than STEM; we need *STEAM* — that's science, technology, engineering, *arts*, and math. There is an emerging STEAM movement that originated out of the esteemed Rhode Island School of Design. Its emphasis is on the synergy between technical fields and industrial design, with Apple Computer being the unofficial poster child: Cool, advanced technology combined with cool, advanced design.

I think they're onto something.

If STEM is the hardware of our lives, then the arts — the "a" in STEAM — are the software, the content. MP3 is a great technology, created by very smart STEM people, but it exists only to deliver content created by individuals who wouldn't be able to code a tic tac toe game on a Commodore 64. HDTV? Great technology, but again, it exists to display programming created largely by people who come from the "a" world. We spend much of our non-working lives engaged with the arts, broadly defined — engaged thanks to tools created by STEMsters.

Technology and the arts exist synergistically; always have. Great artists embrace the technology of their age and use it to advance their vision. Imagine if Bach could get his hands on a synthesizer! As it was, he created his greatest works on some pretty high-tech devices of his own time, harpsichords and pipe organs.

We need our musicians and storytellers, our painters and sculptors, our filmmakers, our poets and dancers. We need our artists like we need our engineers and scientists. Together, they make us complete.

John Adams, the second president of the United States, addressed the subject head-on, as was his style. In a letter to his wife, Abigail, he wrote:

*I must study politics and war that my sons may have liberty to study mathematics and philosophy. My sons ought to study mathematics and philosophy, geography, natural history, naval architecture, navigation, commerce, and agriculture, in order to give their children a right to study painting, poetry, music, architecture, statuary, tapestry, and porcelain.*

Adams wrote these words more than two centuries ago. Even then, our visionary Founder understood that it was STEAM — STEM and the arts — that made us a whole people.

About all of this, I do have a concern. Sandia and Lockheed Martin have been commendably proactive in supporting STEM education in our local schools.

As a scientific engineering lab charged with profound responsibilities of a deep technical nature, it's right and proper, essential, that we make sure we're doing everything we can to bring along the next generation of Sandians.

At the national level, though, I think we need to be careful that in championing the importance of STEM, we don't minimize the importance of those other things that give meaning to our lives. We need to be sure that we aren't conveying a message, however subtly, that if you're not in STEM, you're not quite in the big leagues, that if it's not STEM, it's fluff. Everyone has a gift, a purpose, something to contribute, something uniquely their own. We need to encourage STEM and STEAM, science and the arts, because we need the very best that everyone has to give.

See you next time.

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

## Vipin Gupta to give TEDs talk

Vipin Gupta (6124) will present one of 18 TEDxABQ talks scheduled for Saturday, Sept. 6, at the University of New Mexico's Popejoy Hall.

One hundred sixty applications were submitted, all geared toward lifting the popular level of discourse on a variety of topics.

Vipin's six-minute talk will focus on Sandia's novel microscale photovoltaics effort — popularly known as "solar glitter" for the tiny size of the individual photovoltaic cells. The micron-sized particles are formed in semiconductor foundries using the same methods used to mass-produce computer chips and MEMS devices. This produces a more sophisticated product than current methods used to create photovoltaic "bricks" that form the bulk of rooftop and solar-farm collectors.

Tickets, \$65 each, can be ordered online from unmtickets.com and apparently are going fast. The event has sold out in its previous five annual performances in Albuquerque. — Neal Singer



VIPIN GUPTA

## 2014 Retiree Social scheduled for Sept. 4 at Convention Center

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

**When:** Thursday, Sept. 4

**Where:** Albuquerque Convention Center

**Note:** Sandia will also provide park-and-ride service from Calvary Albuquerque

**Time:** 11:30 a.m. – 2:30 p.m.

**RSVP Deadline:** Aug. 11 — Please call (505) 844-1009 or e-mail revigil@sandia.gov

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

## 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.

### Retirees (only):

To notify of changes in address, contact Benefits Dept. 3332, Customer Service, at 505-844-4237, or Mail Stop 1021, Sandia National Laboratories, Albuquerque, NM 87185-1021.

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# Sandia report draws lessons learned from 'perfect heists' for national security

**Sandia** CaliforniaNews

**"There are many insights to be gained from studying high-value heists and related crimes that could be applied to Sandia's work in physical security."**

— Jarret Lafleur (8118)

By Patti Koning

On Feb. 17, 2003, the unthinkable happened at Belgium's Antwerp Diamond Center. Thieves broke into its reputedly impenetrable vault and made off with hundreds of millions of dollars' worth of diamonds, gold, cash, and other valuables.

Through years of meticulous planning, they got past police officers less than 200 feet away, access controls into the building, a combination-and-key-lock vault door, a magnetic seal on the vault door, and motion, infrared, light, and seismic detectors in the vault.

The Antwerp Diamond Center theft and other sophisticated, high-value heists show that motivated criminals can find ways to overcome every obstacle between them and their targets. Can the Energy and Defense departments, responsible for analyzing, designing, and implementing complex systems to protect vital national security assets, learn from security failures in the banking, art, and jewelry worlds?

Sandia systems analyst Jarret Lafleur (8118) set out two years ago to answer that question. "There are many insights to be gained from studying high-value heists and related crimes that could be applied to Sandia's work in physical security," he says. "Our work focuses on securing nuclear materials and other assets. Those kinds of attacks and threats are extremely rare, which is good, but give us very little historical information to draw upon."

## Compiling the crimes

He found there hadn't been a comprehensive study of sophisticated and high-value heists in more than two decades. "When we dug into the details, we found several areas worthy of further study that could inform our approach to physical security," he says. "Two examples are the roles of insiders in successful heists and the ways that redundancy in a security system can affect the behavior of humans in the loop."

Using public information sources, Jarret chose 23 worldwide heists that occurred in the past three decades, notable for the value of assets stolen, innovation, and complexity. The thieves used kidnapping, violence, and the threat of violence, insiders both coerced and willing, and many forms of deception. Other key ingredients were patience, innovation, and meticulous planning.

Notable cases Jarret looked at included the Vastberga Helicopter Heist (Sweden, 2009) in which thieves descended from a helicopter into a cash depot by smashing through a skylight; the Isabella Stewart Gardner Museum Art Heist (United States, 1990) where burglars posed as police officers to deceive and subdue museum guards; and the Securitas Cash Depot Heist (Britain, 2006) that saw robbers abduct the manager, his wife, and their child to force him to let them into the depot and provide key details about its security.

Jarret, working with Luke Purvis (8119), manager of Sandia's National Security Systems Analysis group, and Alex Roesler (5627), manager of the Assurance Tech-



SANDIA RESEARCHERS Alex Roesler, left, Luke Purvis, and Jarret Lafleur, shown here inside a Bank of Italy vault in a historic Livermore building, studied 23 high-value heists that occurred in the last three decades for lessons learned that can be applied to designing complex security systems to protect vital national security assets. (Photo by Dino Vournas)

nologies and Assessments group, compiled the results in a Heist Methods and Characteristics Database. They analyzed the results qualitatively and quantitatively to describe the range and diversity of criminal methods and identify characteristics that are common or uncommon in such high-value heists. The analysis focused on seven areas: defeated security measures and devices; deception methods; timing and target selection; weapons employed; resources and risk acceptance; insiders; and failures and mistakes.

Jarret, Luke, and Alex published the research in a report "The Perfect Heist: Recipes from Around the World" [SAND 2014-1790], which details the 23 crimes, their categorization, and lessons learned. Jarret also presented the "The Perfect Heist" to numerous audiences.

## Deception, patience are common ingredients

While methods and implementation of the heists varied greatly, there were common factors. At least one

form of deception was used in 21 of the heists, ranging from impersonating law enforcement to use of decoy vehicles to concealing surveillance equipment. Insiders — willing, unwitting, and coerced — played a role in the majority of cases. The Antwerp Diamond Center's building manager even provided blueprints to the heist mastermind, thinking he was just another tenant. Jarret continues to delve into the concept of the coerced insider with the help of interns from the Air Force and Naval academies.

"I learned from this study that these thieves have a lot of patience. Most spent months and even years planning. They were very deliberate in how they defeated security measures and those methods were often very low-tech, like using hair spray to disable infrared sensors," says Jarret. "In most of these heists, multiple security measures were defeated."

Another finding is that weapons aren't needed to steal a lot of money. Four of the top five heists, in terms of value, were weaponless.

# Sandia brings home four regional tech transfer awards

By Nancy Salem

Sandia won four regional awards from the Federal Laboratory Consortium (FLC) for its work to develop and commercialize innovative technologies.

The Far West/Mid-Continent Region awards honored:

- New Mexico Small Business Assistance (NMSBA) program as a Notable State and Local Government Collaboration;
- Mantevo software, which recently won an R&D 100 Award, for Excellence in Technology Transfer;
- Nano-Stabilized Enzymatic Membrane for CO<sub>2</sub> Capture as a Notable Technology Development;
- H2FIRST, an effort to build the number of fueling stations for hydrogen cell electric vehicles, as the Outstanding Regional Partnership, involving Sandia and the National Renewable Energy Laboratory, California Fuel Cell Partnership, California Governor's Office of Business and Economic Development, and California Air Resources Board.

"Sandia is proud of our work in technology development, technology transfer, and partnerships," says Jackie Kerby Moore, manager of Technology and Economic Development Dept. 7933 and Sandia's representative to the FLC. "We are truly honored to be recognized, alongside our partners, for our work in these areas."

Here are the four Sandia winners:

## NMSBA: A helping hand to small business

Some 354 small businesses in 29 counties participated last year in NMSBA, a public-private partnership among Sandia, Los Alamos National Laboratory, and the state of New Mexico that connects small business owners with scientists and engineers who provide technical assistance. The program also contracts with the New Mexico Manufacturing Extension Partnership, University of New Mexico Management of Technology program at the Anderson School of Management, Arrowhead Center at New Mexico State University, and New Mexico Tech Department of Management. NMSBA provided \$4.6 million worth of assistance to New Mexico small businesses last year.

"NMSBA has been bringing small businesses together with scientists and engineers from Sandia and Los Alamos national laboratories for 14 years. We are grateful to the principal investigators who work with New Mexico's small businesses," Jackie says. "Together they are implementing innovative ideas and stimulating our state's economy."

NMSBA was created in 2000 by the state legislature to bring national laboratory technology and expertise to small businesses in New Mexico, promoting economic development with an emphasis on rural areas. Since its inception, the program has provided 2,195 small businesses in all 33 New Mexico counties with more than \$39 million worth of research hours and materials.

## Mantevo: Next-generation computing

Mantevo is an integrated collection of small software programs, or miniapps, that model the performance of



full-scale applications yet require code a fraction the size of the full application. They were designed to improve high-performance computing.

The Mantevo project, which grew out of Laboratory Directed Research and Development (LDRD) and won a 2013 R&D 100 award, pioneered the miniapp concept. Mantevo Suite 1.0 is the first integrated collection of full-featured miniapps.

Mantevo provides rapid exploration of the design space for new supercomputers and applications. It speeds research in today's co-design model of collaborative computer development, where designers work together simultaneously on hardware and software. It is a critical tool that impacts business, science, and national security.

Sandia brought the Mantevo miniapps together and made them freely available as an open-source software package. Every major computer vendor and dozens of university research teams use Mantevo to design next generation systems and tools.

The work was done in collaboration with, among others, Los Alamos and Lawrence Livermore national laboratories and Santa Clara-based NVIDIA Corp.

"Things are changing rapidly in the computing industry," says Mike Heroux (1426), co-lead on the project with Richard Barrett (1423). "It is very satisfying that the work is having an impact on the design and development of new computing systems and applications."

## CO<sub>2</sub> Capture: Better way to keep emissions at bay

Electricity-generating plants, especially coal-fired, and other industrial activities that generate CO<sub>2</sub> face new US Environmental Protection Agency regulations limiting emissions.

Nano-stabilized enzymatic membranes for CO<sub>2</sub> capture provide a simple, compact, and more energy-efficient approach to capture than conventional methods. The process removes 90 percent of the CO<sub>2</sub> in emitted gas mixtures and is expected to save the US coal industry alone \$90 billion a year.

Enzymatic membranes also separate CO<sub>2</sub> from gas mixtures faster and more selectively than other membranes. The enzymatic membrane technology uses computational modeling to design and nanofabrication techniques to synthesize membranes with thin, narrow, and airtight liquid layers. By embedding an enzyme that converts CO<sub>2</sub> gas into a more soluble form, the liquid-layered membrane efficiently captures CO<sub>2</sub> from power plant flue gas. The fabrication process can be inexpensively scaled-up. The robust and inex-

pensive enzyme is already used at industrial scales.

The CO<sub>2</sub> capture process evolved from Sandia's LDRD program. Team members included Susan Rempe (8635), Juan Vanegas (8635), and Jeff Brinker (1000).

"With the growing concern about global warming caused by greenhouse gas emissions, there is an immediate and urgent need for efficient CO<sub>2</sub> capture and reuse in other applications such as enhanced oil recovery," Susan says. "It is gratifying to be recognized by the FLC for our Sandia-UNM team's efforts to provide a solution to CO<sub>2</sub> capture that works within the framework of the US coal industry."

## H2FIRST: Places to refuel hydrogen cell electric cars

As hydrogen fuel cell vehicles continue to roll out in increasing numbers, the infrastructure for fueling them must expand as well. A project launched by DOE and led by Sandia and the National Renewable Energy Laboratory (NREL) will work in support of H<sub>2</sub>USA, the public private partnership introduced in 2013 by the Energy Department and industry stakeholders to address the challenge of hydrogen infrastructure.

Established by the DOE's Fuel Cell Technologies Office in the Office of Energy Efficiency and Renewable Energy, the Hydrogen Fueling Infrastructure Research and Station Technology (H2FIRST) project will draw on existing and emerging core capabilities at the national labs to reduce the cost and time of new fueling station construction and improve the stations' availability and reliability. The partners include several agencies from the state of California, widely regarded as the nation's epicenter of zero-emission vehicles.

The goal is to accelerate and support the widespread deployment of hydrogen fuel cell electric vehicles. Toyota recently announced it will begin selling its fuel cell vehicle in 2015. General Motors and Honda have announced plans to jointly develop hydrogen fuel cell cars, and Hyundai will lease its Tucson Fuel Cell hydrogen-powered vehicle in California.

"The success of hydrogen fuel cell electric vehicles largely depends on more stations being available, including in neighborhoods and at work, so drivers can easily refuel," says Daniel Dedrick (8367), hydrogen program manager at Sandia. "With H2FIRST, we're definitely on the road to making that happen more quickly."

## About the Federal Laboratory Consortium

The FLC is a nationwide network of more than 300 members that provides the forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace.

The FLC Awards Program annually recognizes federal laboratories and their industry partners for outstanding technology transfer efforts. Since its establishment in 1984 the FLC has presented awards to nearly 200 federal laboratories; the award is considered one of the most prestigious honors in technology transfer.

# Dan Sinars wins Excellence in Fusion Engineering Award

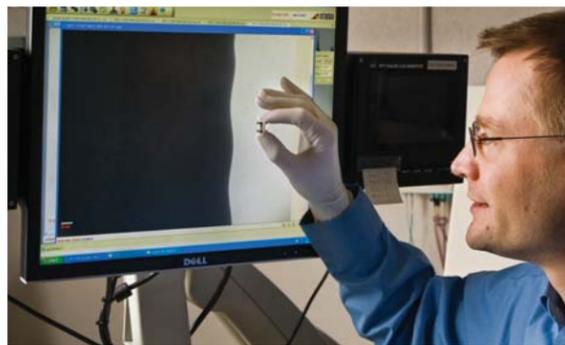
By Neal Singer

Dan Sinars (1680) has been selected to receive Fusion Power Associates' 2014 Excellence in Fusion Engineering Award.

The award is "presented to individuals in the early part of their careers (maximum age 42) who have shown both technical accomplishment and potential for becoming an exceptionally influential leader in the fusion field."

The award recognizes Dan's leadership in "high energy density physics experiments on the Z facility at Sandia, and ... many scientific contributions to understanding wire-array implosions for indirect-drive inertial confinement fusion." The award also recognizes Dan for his contributions in understanding "magnetically driven implosions being studied for the MagLIF approach to inertial confinement fusion for fusion energy applications."

"There is a lot of excitement and interest within the US about Sandia's recent experiments on magnetized-liner inertial fusion [MagLIF] at our Z facility," says Dan. "That work almost certainly contributed to this recognition. Significant laboratory fusion remains a great challenge even after decades of research, yet every year our community continues to make steady



DANIEL SINARS

progress. My success in receiving this award is due in large part to the great mentors and coworkers I have had here at Sandia, to whom I am indebted."

"This is great news and a significant honor," says Duane Dimos, VP of Science and Technology Div. 1000.

The selection was based in part on recommendations and letters of support from Bob McCrory, director of the Laboratory for Laser Energetics at the University of Rochester; Mike Campbell (1200), Keith Matzen (director, Nuclear Weapons S&T Programs 1200), and Mark Herrmann (director, Pulsed Power

Sciences Center 1600).

The award is slated to be presented at the organization's 35th annual meeting in Washington, D.C., in mid-December.

Mark won the same award in 2012; Mike and Keith each won a "Leadership" award 1995 and 2011, respectively, presented to "individuals who have shown outstanding leadership qualities in accelerating the development of fusion."

According to its website, "The purpose of Fusion Power Associates is to ensure the timely development and acceptance of fusion as a socially, environmentally, and economically attractive source of energy." One of its goals is "to foster the use of fusion science and technology in both commercial and government applications, including such areas as energy, space, and national security."

Its board of directors includes representatives from many institutions prominent in fusion research, including Sandia, Los Alamos, Lawrence Livermore, Lawrence Berkeley, Savannah River, and Oak Ridge national labs, the University of Texas at Austin, Princeton Plasma Physics Laboratory, MIT Plasma Science and Fusion Center, US Naval Research Laboratory, Columbia University, General Atomics, Logos Technologies, and more.

# Power of a code

## Bar is raised in procurement reporting

By Nancy Salem

Sandia has changed the way it categorizes purchased goods and services by linking each acquisition to a specific industry code. "This change in our data systems allows Sandia to better describe to our stakeholders, customers, and the general public how we spend our money," says Don Devoti, manager of Small Business Utilization Dept. 10222.

Before the June 30 switch Sandia categorized purchases with an internally generated code. Under the new system each item or service must include a North American Industry Classification System (NAICS) code, the standard used by the federal government to categorize businesses and to collect, analyze, and publish statistical data on the US business economy.

"There's a NAICS code associated with everything a business can do," says Jim Green (10222). "If you make a widget, there's a code. If you build something, if you consult, there's a code."

The NAICS system lets Sandia, which spent roughly \$975 million on goods and services in fiscal year 2013, report more precise data to DOE, Congress, and others. "We can say that for code X we spent X dollars and for code Y, Y dollars," Jim says. "There's a confident database, a foundation. We're using industry standardized codes rather than internally created purchase categories."

### Where do the dollars go?

Marie Myszkier (10222) says Sandia can "better answer the question, 'How do we spend taxpayer money?' We can more exactly identify what types of goods and services we as a lab are buying and how much we spend with whom. It's the perfect system if you really want to know where the dollars are going."

Another advantage to assigning all purchases a code is the ability to more accurately report the business size and socioeconomic status of the supplier for every product or service purchased. Marie says an important distinction is that a company can be large or small depending on what it's selling. For example, a company — based on revenue and number of employees — can be small when it offers construction but large when it consults.

"That's the kind of specific and accurate data we can collect using the NAICS system," Marie says. "Under the former system if there was a question about the size of a company we always defaulted to large to be conservative in our small business data reporting. By consistently using NAICS codes we get succinct data at the point of sale versus generalized data to determine size and socioeconomic standards. Because we have integrated the codes into our purchasing applications, we have all the information in one place and can create more sophisticated reports."

Marie says another plus is that by looking at suppliers and their NAICS codes, procurement managers can better strategize in purchasing. "It takes acquisition planning to another level by opening doors in the analytics of what we buy," she



GETTING DOWN TO BUSINESS — From left, Don Devoti, Marie Myszkier, and Jim Green (all 10222) were part of the multi-department team that spent six months developing the NAICS system of procurement reporting for Sandia. "This has been a tremendous team effort," Don says. (Photo by Randy Montoya)

says. "We are better able to prepare, plan, and improve."

And the NAICS system allows the Small Business Utilization Department to more accurately track the Laboratories' purchasing goals with small and minority-owned companies. "It shows how strongly committed Sandia is to supporting small business," Don says. "We will have the best data possible to reflect that."

The change means suppliers must register in the federal System for Award Management, or SAM, database, and certify the types of products or services they sell. "You can have one code or you can have 20," Jim says.

The NAICS project began in early January. "This has been a tremendous team effort by business and procurement staff and the IT department," Don says. "It was a wonderful collaboration."

## DSMC

(Continued from page 1)

Rarefied Gas Dynamics.

Three-D codes like SPARTA represent physical reality more accurately than 2-D codes such as Icarus. More accurate simulations mean designers can account for many more details in new spacecraft or satellites. However, there's a price for greater physical realism. "A 3-D simulation is like a series of 2-D ones, sometimes making it thousands of times more demanding," Michael says.

DSMC codes simulate molecules moving and bouncing off each other and objects, just as they do in real gas flows. Underlying statistics determine when and how molecular collisions occur, enabling predictions of energy transfer and chemical reactions. The DSMC approach typically is used to model low-pressure gases. Physical problems where gas is at low pressure are less common than problems with gas at higher pressures.

"Monte Carlo" refers to the randomized way in which collision parameters are chosen for pairs of particles, based on statistical principles. The order in which molecules collide is random, but not the rate or outcome of a large number of collisions, which can be described by well-known mathematical models.

### Sandia recognized DSMC potential early

More than 20 years ago, Tim Bartel (6233) and Steve Plimpton developed Icarus, still considered a workhorse for DSMC applications. Michael and Steve began working on SPARTA about two and a half years ago — doing some of their brainstorming while walking on the Santa Fe Plaza during breaks at an international DSMC workshop Sandia hosts every two years.

"Michael is very, very good with DSMC physics and Steve Plimpton is very, very good at formulating problems so that large parallel machines can solve them. That combination has given us a parallel code with very sound physics that runs quickly," manager Dan Rader (1513) says.

*"It's a win for Sandia because having additional developers expands the capabilities of a code more quickly and we get to use ideas that other people add to it and vice versa."*

— Labs researcher Steve Plimpton (1444)

DSMC, invented in the 1960s by Graeme Bird when he was at the University of Sidney, takes a different approach from most codes that treat gases as a continuum rather than as individual molecules. Continuum codes solve partial differential equations based on such fundamentals as conservation of mass, momentum, and energy. Although it's based on the same physical principles, DSMC's molecular approach lacked formal mathematical proof of its soundness until 1992.

"Until then, people assumed it was kind of an approximate method that could do the job in regimes where continuum methods would clearly fail," Michael says.

Sandia is largely interested in DSMC for two research areas where gas molecules are relatively far apart: re-entry vehicles, including the effects of flight through the outer reaches of the atmosphere, and micro-electrical-mechanical systems (MEMS) that have features at the micron and submicron scale. Examples of MEMS include chemical flow and pressure sensors, accelerometers, and transducers.

Senior manager Steve Kempka (5940), former senior manager in 1510, says the Gallis-Plimpton collaboration also has resulted in DSMC being used to simulate higher-density flows where molecules are relatively close to one another — something he never thought he'd see.

"DSMC will allow simulations free of the assumptions used in many other computational fluid dynamics methods. We hope it will let us explore the physics of turbulent flow in new ways. I believe we will see it being used to simulate re-entry vehicle flight to much greater depths in the atmosphere, with much more accurate

descriptions of the flow," he says. That includes the difficult phenomena of laminar, or streamline, flow transitioning to turbulent flow; ionization of the atmosphere flowing around a re-entry vehicle; and the wearing away of material as a space vehicle races toward Earth.

The chaotic nature of turbulence makes it difficult to investigate, but Michael says being able to use DSMC to study fluid mechanics at a more fundamental level may help to better understand the mechanisms of turbulence.

### Parallel computing has broadened DSMC's uses

Particle methods like DSMC saw relatively limited use in the past, but parallel computing has broadened their applicability.

"We can now look at problems that years ago were unthinkable, or go well into the continuum regime, when we think the relevant physics needs modeling at the molecular level," says Michael.

"Compared to Icarus, SPARTA enables us to resolve finer scales of behavior in low-density fluids and study flows around more complex geometries," Steve Plimpton says. "In its development, we also thought about future, faster computers with novel architectures, trying to design the code to work well both on today's machines and tomorrow's."

With an open-source code, Sandia hopes to collaborate outside the Laboratories to improve the code and enable users to add their own new physics, chemistry, or collision models, Steve Plimpton says.

"It's a win for Sandia because having additional developers expands the capabilities of a code more quickly and we get to use ideas that other people add to it and vice versa," he says. "It also introduces us to users who may discover coding errors or wish to collaborate with us on new applications."

The next frontier is to take advantage of DSMC to model and study flow physics — energy exchange and chemical reactions in colliding molecules — at a more fundamental level than possible with continuum codes, Michael says. "If you're able to study things at that level, you are able to extract models that you can then use in continuum codes to study much bigger problems," he says.

# Sandians played role in climate reports praised by DOE secretary

By Neal Singer

When DOE Secretary Ernest Moniz praised the 3rd US National Climate Assessment (NCA) released on May 6 as “the most comprehensive scientific report to date on US climate change impacts,” he noted that the report was “developed by our nation’s top climate and technical experts — including many from the Energy Department’s national labs.”

The report makes clear, said Moniz, that climate change is affecting every region of the United States and key sectors of the economy.

Sandians played a large role in writing the report. Vince Tidwell (6926) was a lead author of chapter 10, “Energy, Water and Land Use.”

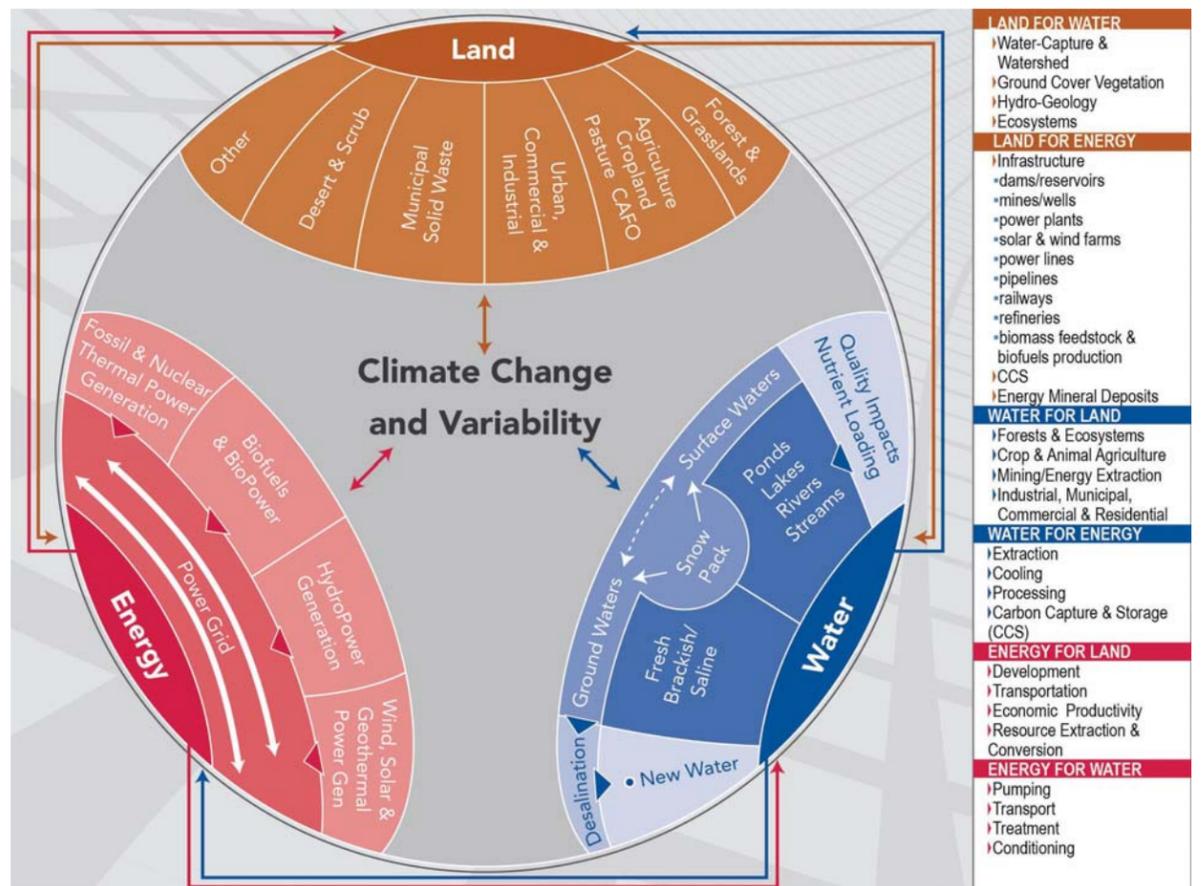
“Vince’s authorship is a big deal,” says Marianne Walck, 6900 director of Geoscience, Climate, and Consequence Effects. “It’s the first time, to my knowledge, that a Sandian has been a listed author on the NCA itself.”

The chapter highlights the interdependence of three key resources — energy, water, and land use — “by crossing the silos that often constrain their analyses,” Vince says.

According to the chapter introduction, “Climate change affects energy, water, and land use as well as the interactions among these sectors. The combination of these factors affects climate change vulnerability as well as adaptation and mitigation options ... Better understanding of the connections between and among energy, water, and land systems can improve our capacity to predict, prepare for, and mitigate climate change.”

There was also praise from on high for other work.

“We received a letter of appreciation — as far as we know, the only letter to any team — from John Holdren (assistant to the president for Science and Technology and director of the White House Office of Science and Technology Policy) for our ‘Infrastructure and Urban Vulnerabilities’ chapter,” says George Backus (0249), who along with Vince, Ron Pate, Tom Lowry (all 6926), and Pablo Garcia (6830) were lead authors on some of the massive NCA Technical Reports summarized to make up the 700-page final assessment.



EVERYTHING’S INTERRELATED — While talk show hosts argue about degrees of possible global warming and mystics say we are all One, climate researchers at Sandia and elsewhere are more practically concerned with understanding how changes in the availability of water, use of land, and various means of energy production affect each other and the climate.

(Image from 2012 DOE report on Climate and Energy-Water-Land System Interactions)

“The Infrastructure and Urban Vulnerabilities group was a large team made up of people from many institutions,” adds Pablo. “Oak Ridge National Lab was the lead organization and did a great job of pulling it together.”

One of the technical reports was later repackaged as

a book: *Climate Change and Infrastructure, Urban Systems, and Vulnerabilities*. George and Pablo were two of the seven lead authors.

Other Sandia staff members noted in the NCA report include Theresa Brown (6924) and Eric Vugrin (6921).

# Sandia is lead architect of Trinity supercomputer

By Neal Singer

There were no computers operating at a teraflop pace — a trillion calculations per second — until Sandia researchers, working with Intel, created the ASCI Red supercomputer in 1997.

Now a single processor of NNSA’s latest supercomputer — the recently announced Trinity — will be two to three times faster than all of ASCI Red’s processors working together, says Trinity’s chief architect Doug Doerfler (1422).

“It also requires the same level of expertise to program a single processor on Trinity as it did to program all of ASCI Red,” emphasizes Doug.

The \$174 million machine will be a joint effort of Sandia and Los Alamos national labs, working through the New Mexico Alliance for Computing at Extreme Scale, as part of NNSA’s Advanced Simulation and Computing (ASC) Program. NNSA signed a contract with Cray Inc. to begin delivering the machine next year.

Trinity will be housed in the Metropolis Computing Center at Los Alamos. Lawrence Livermore National Laboratory and Sandia will share access to it.

“Sandia has the lead architectural position,” says Doug, “because we have established a certain breadth and depth in supercomputer design over the decades.”

In addition to ASCI Red, Sandia’s computational successes include the Sandia-Intel Paragon, the first massively parallel-processor supercomputer to be indisputably the fastest system in the world. It also includes the Sandia-Cray Inc.-designed Red Storm, which served as seed for several new generations of Cray supercomputers in wide use around the world.

“Our biggest deliverable as Trinity lead architect,” says Doug, “is to produce a document that factors in our capabilities and technical needs, as well as those of the other labs, to accurately describe the machine we want to see. That description is what goes out on the street. The computer vendors then propose solutions to make it happen.”

Jim Laros (1422), lead on the power management effort to make Trinity more energy-efficient, describes

Doug’s role with a little more color: “There are a large number of subject-matter experts that Doug leads. They specialize in interconnects, processors, memory, system software, and file-systems, to name a few. They are tens of people representing hundreds of people from the Trilabs complex, most of whom are incredibly stubborn and opinionated, just like I am. At the end of the day, Doug has to funnel this huge amount of input into a requirements document that will result in the procurement of a Ferrari and not a minivan.”

Trinity will have eight times the capability of Cielo, NNSA’s current choice for running its largest-scale stockpile-stewardship simulations.

“If it could be built today with a snap of the fingers, Trinity probably would be the fastest machine on Earth,” says Ken Alvin (1220), senior manager for Sandia of the ASC program. The machine is expected to achieve peak speeds of 30 to 50 petaflops.

However, Ken says, speed is less a factor than capability. “If we can do a three-dimensional problem in the same amount of time as a two-D, or reduce my solve time from a week to three days — if I can do more work in the same amount of time, the machine is not necessarily faster, it’s more capable. That’s important.”

“It’ll be a big opportunity,” says David Womble (1540), senior manager for computational simulation. “This amount of computing power gives us new ways to think about engineering. We’ll be able to better optimize designs, and make uncertainties and margin calculations an intrinsic part of the engineering. We’ll also do a better job of capturing the physics, including fracture and failure aspects.”

The challenge to Sandia, he says, is that significant advances in Trinity’s architecture require rewriting codes to make optimum use of the machine. “More available parallelism in the computer is forcing us to rethink the algorithms we have,” David says. “Left as is, our programs would run, but not efficiently. To take full advantage of this opportunity, we will do a lot of work on our codes and algorithms.”

Trinity’s approximately 19,000 processors are only a step toward the ultimate goal: an exascale computer — capable of a billion trillion operations a second — that,

in reasonable amounts of time, will run the increasingly complex simulations that ensures the US nuclear stockpile remains safe, secure, and effective.

Such computer simulations allow the United States to continue its moratorium, self-imposed 22 years ago, on exploding nuclear weapons to test them. Simulations make that possible, reducing health, environmental, and political risks, as well as the economic costs, of real-world testing.

“We have the responsibility for stockpile stewardship,” says Jim. “We’re still refining our modeling and simulation capability to be more accurate and more encompassing.”

Jim leads the effort to turn the computer into a smart user of power, analogous to the response of a smart home that turns power off when not needed in a room. In Jim’s case, he’s interested in designing a way to shut down power and thereby save energy whenever a node is inoperative, even for microseconds.

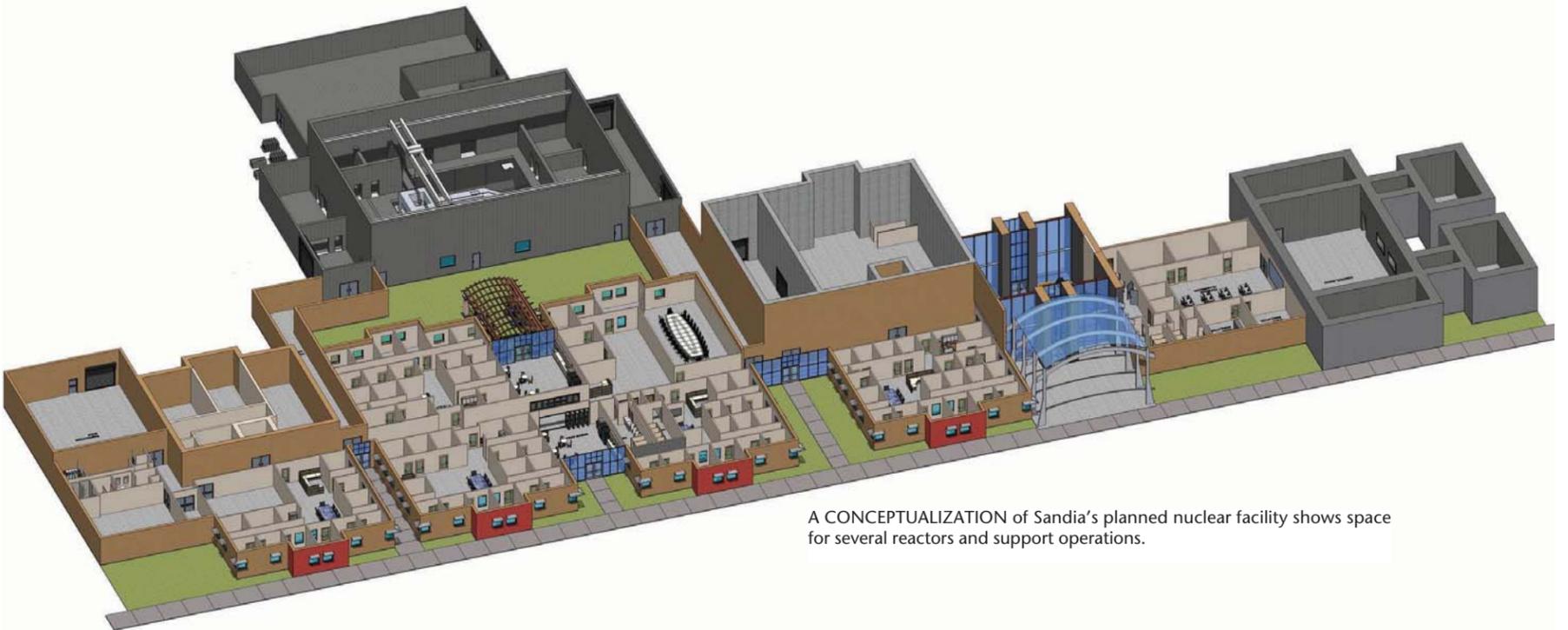
“The machine is going to be eight times faster than Cielo but already will only use three times more energy — about nine megawatts — due to improvements in technology,” he says. “We hope to improve Trinity further so that it uses no more energy than Cielo.”

Another important advance for the machine will be the euphoniously named “burst buffer” concept, which aims to provide instant memory access through installation of the equivalent of flash drives throughout the machine’s memory. The buffer will allow computing to continue despite demands on memory reserves.

“This LANL concept adds an extra layer of memory to improve the efficiency of writing large amounts of data to remote storage,” says Bruce Hendrickson (1420), senior manager of extreme-scale computing. “Really high-power machines generate incredible amounts of data. How do you get it out to disk? Historically, we’d pause our computation and write it out; now, we’ll let the computation continue while the information is copied from the burst buffer.”

Trinity will rely on Intel’s extremely sophisticated Knights Landing chip as well as the more conventional Haswell chip, which will aid applications in the transition from Cielo to Trinity.

# Home sweet home



A CONCEPTUALIZATION of Sandia's planned nuclear facility shows space for several reactors and support operations.

## A lodging upgrade in the cards for hard-working nuclear reactors

By Nancy Salem

### *New design improves safety, reliability, and efficiency of operations*

Sandia Labs has a nuclear research reactor that can do physics handsprings. The ACRR, or Annular Core Research Reactor, produces neutron beams that enable complex, cutting-edge irradiation experiments. "We have world-class capability," says nuclear engineer Lonnie Martin (1381).

What ACRR doesn't have is a home befitting its venerable status. The building that houses the reactor has, shall we say, been around a while. "It's old," Lonnie says. But not forever. On the drawing board is a plan and design for a new campus to house ACRR and the smaller

Sandia Pulsed Reactor/Critical Experiments (SPR/CX) reactor a stone's throw from the existing site. "We will completely replace, recover, and return to green grass the old systems that are out there now," Lonnie says.

The new facility will be more robust and better able to withstand natural phenomena, says Matt Burger, senior manager of Nuclear Facilities and Applied Technologies Dept. 1380. "The new design improves safety, reliability, and efficiency of operations," he says.

And there will be room to expand the physics. "There will be a significant improvement in beam-line capabilities," Lonnie says. "We can take a beam of neutrons from the reactor and run them into a space where a researcher can use neutrons and gamma radiation to conduct experimental activities. Our current ability to do that is limited."

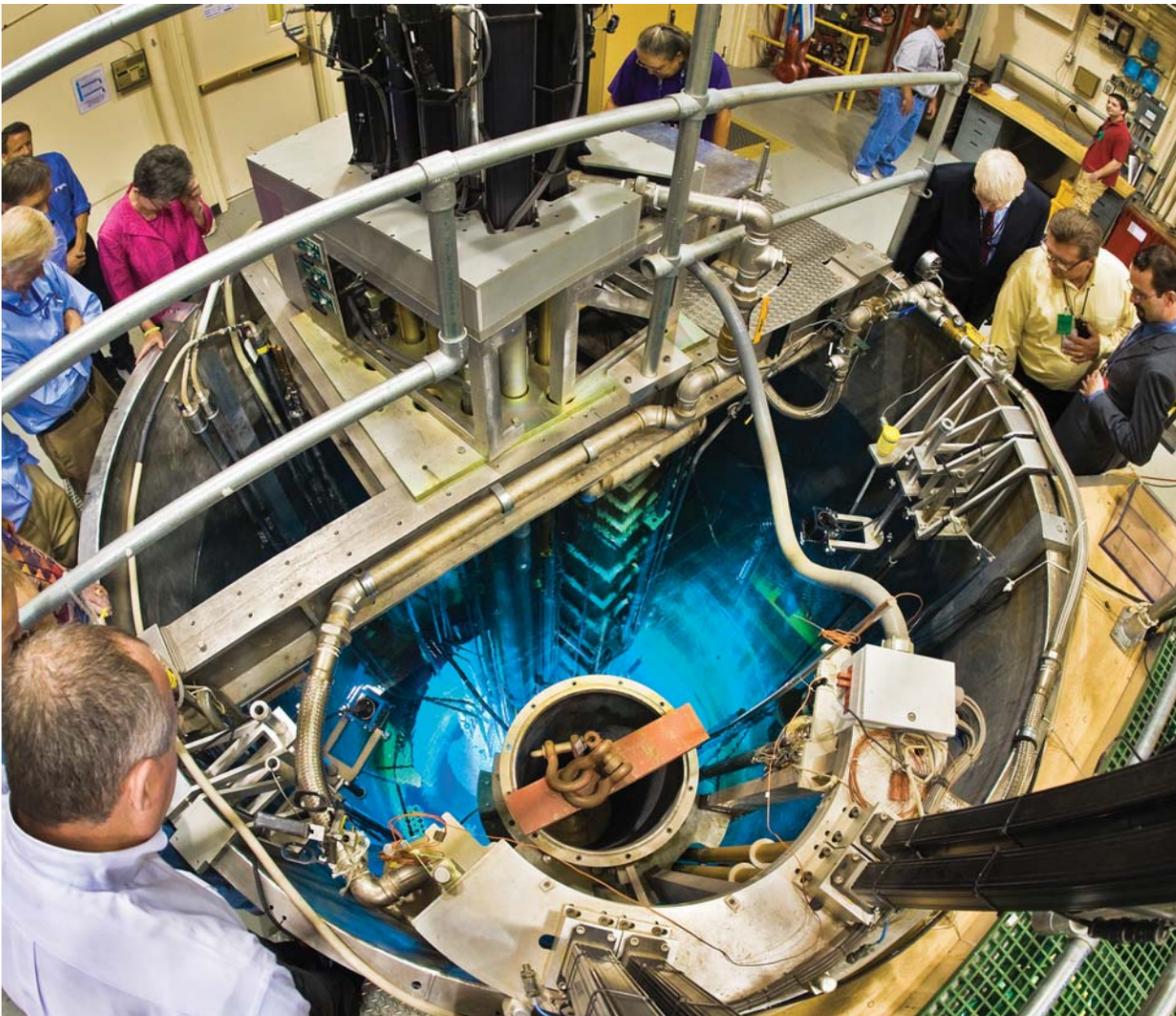
The campus will have three primary functions: train engineers throughout the labs in preventing nuclear materials accidents, test the effects of radiation on materials and electronics, and basic research and development into nuclear technologies.

"Radiation effects testing has been our meat and potatoes. We do experiments on advanced nuclear fuels, space reactor technology, satellite components, and weapon systems," Lonnie says. "These are high-level functions."

He says there is a plan to develop new radiation diagnostic detectors that more accurately measure energy levels. "This would lead to safer nuclear fuels and improved testing of stockpile components, better and cheaper electronics, better communications, and better nuclear medicine," Lonnie says.

The central feature of the new facility will be an above-ground nuclear island including the tank and experimental systems. The current reactor is built around a big hole in the ground with fuel at the bottom. "We'll take the fuel out of that tank and build a whole new facility with the tank above ground. The same fuel will move to the new facility," Lonnie says. "The reactor and tank will be encased in concrete at the ground level. There will be beam ports around the exterior to access radiation fields inside the reactor."

A more detailed conceptual design is due in 2020, and the new facility, with space for several reactors, could be up and running by 2028. "Everyone is excited about the opportunity to design a new facility with unique capabilities," Matt says. "This will increase our state-of-the-art ability to provide nuclear technology that really is exceptional in service to the nation."



PLANNING AHEAD — After decades as Sandia's workhouse reactor for cutting-edge irradiation experiments, the Annular Core Research Reactor will be getting a new home. The new campus, still several years away, will house the ACRR and the smaller Sandia Pulsed Reactor/Critical Experiments (SPR/CX) reactor. A more detailed conceptual design is due by 2020, and the new facility, with space to house several research reactors, could be up and running by 2028. In the photo here, onlookers gather to watch the ACRR's 10,000 test shot in 2011. (Photo by Randy Montoya)

# Managing the nuclear weapons enterprise a huge undertaking

*A question-and-answer session with Jerry L. McDowell, Deputy Laboratories Director and Executive Vice President for National Security Programs*

*“Sandia is on-cost and on-schedule with our three nuclear weapon modernization programs. That is critical to the Laboratories. But these programs can’t be the only focus. Sandia also needs to look ahead and focus on long-term capabilities and exploratory work that is the foundation of everything we do. Given that, we are working to shift the paradigm — shift to engage with leaders throughout the nuclear weapons enterprise to focus on what comes next, including revolutionary rather than evolutionary strategies and approaches. Sandia is a partner in planning in new ways for our national security future.”*

— Jerry L. McDowell, Deputy Laboratories Director and Executive VP for National Security Programs

Jerry McDowell is entering his fourth year as Sandia’s Deputy Laboratories Director and Executive Vice President for National Security Programs. Jerry and his Center 200 team, headed by Director Rick Fellerhoff, are in charge of the Nuclear Weapons (NW) Mission Area strategy as well as the NW Program Management Unit (PMU), responsible for efficient implementation of the overall NW program.

The PMU activity includes anticipating, managing, and reporting about the myriad elements that come together to operationalize “Mission,” including coordination with Mission Support and the other Mission Areas core to NW work. It is a complex undertaking with an intricate, multi-dimensional matrix of people, capabilities, costs, schedules, facilities, planning, and future budgets — all simultaneously carrying near-, mid- and long-term significance for Sandia and the nation’s security.

“The Sandia NW Triangle” helps explain/simplify the enormous responsibility for overseeing the largest NW programs in decades at Sandia (see box at top right) while not losing sight of the need to balance that activity with Sandia’s other mission imperatives. So, how does Sandia’s NW Mission Area and PMU team accomplish this in our financially and otherwise constrained and ever-changing environment? Certainly they focus on a wide variety of activities and responsibilities. One key element we explore in this Q&A with Jerry is —

**What does the team do when they travel to Washington, D.C.?**

**Jerry McDowell:** Part of our responsibility is to communicate to decision-makers — whether our National Nuclear Security Administration (NNSA) partners, Department of Defense (DoD) customers, members of Congress, or their staff — about the work done here at Sandia on behalf of national security.

It’s a very rewarding thing to do. When my staff and I meet with sponsors and customers we’re seeking better two-way understanding; and when, at their invitation, we meet with Congress, it’s about clarifying for them what can be a daunting, complex, technical world.

Most of the congressional staff and members we interact with are not trained in technical disciplines. They’re doctors, lawyers, and accountants, not engineers, scientists, or technologists. When we visit we’re well prepared concerning our programs’ obligations and what we need to fulfill those obligations. We arrange to discuss, at a very high level, the scope and status of our program.

Sandia has a great Government Relations staff that helps facilitate all of this and frankly, you could spend day after day after day on Capitol Hill trying to explain the nuances of nuclear weapons and still have more to impart. Consequently, this is not a challenge met in a day, a week, or a month. It’s a sustained activity of communications



consistency and relationship-building that has to endure, remain focused, adapt as new individuals take positions of leadership, and build over a long period of time.

In addition to proactively communicating, it is critical we spend a lot of time listening. Talking is one thing, but our team often learns more when we just listen and observe. When we do that, we come away with a better understanding of their pressures and what we can do to help them support us.

**What are the “hot topics” in Washington today as they relate to Sandia’s mission work?**

**JM:** Managing the nuclear weapons enterprise is a huge undertaking. There are differences of opinion, there are differences of roles and responsibilities, and we have to be sensitive to all.

The hot topic for us right now among the military services includes, “are you getting our products at a price we can afford?” Any way we can meet their requirements for less cost is appealing. We are in a period of time where there’s a great appreciation for the need to modernize the stockpile. They see Sandia, the rest of the enterprise, and the NNSA as a community of people who deliver an effective weapon.

*“Now is a time of extraordinary opportunity to re-communicate, to find a lexicon for talking about nuclear weapons that’s germane to a generation of people for whom its legacy is a fading memory — and in a global environment that demands new directions and adaptation.”*

Inside the NNSA it’s a different orientation. They care deeply about the product, but they also have a long-term view of the stewardship responsibility with the Laboratories: that we need to deliver what the military needs, but we want to do so in a way that preserves the long-term health of the enterprise. They are concerned about our core attributes as a Federally Funded Research and Development Center (FFRDC) — assuring staff excellence, long-term relationships, objectivity, and independence, advancement of science, technology, and engineering, and execution of work at a reasonable cost.

Congressional staffers tend to ask for an understanding of the combination of short- and long-term considerations — a balance between cost and requirements — more information about context. They ask, “Why? Is there a different way to do it? We don’t really understand why gadget A needs to fit gadget B — can you explain?”

**What is the state of knowledge in Washington, outside the Pentagon and NNSA, about our nuclear deterrent?**

**JM:** It’s an interesting question because you could say, what’s the state of knowledge anywhere? My view is that nuclear weapons don’t dominate today’s national conversation about security, which does not diminish their deterrence role but does change the discussion.

It’s important to note that a considerable number of people in the Pentagon, NNSA, and Congress are of an age that their personal involvement in and understanding of Cold War nuclear issues is pretty slim. Many came of age around the time the Cold War was ending.

Another challenge is that Sandia, as a community of scientists and engineers, is a very strong IQ community, but we must balance that strength with building our EQ — our emotional intelligence. In our mid- and senior-level leadership community we need to nurture and develop this ability to empathize with, understand, and build relationships with the stakeholders involved in nuclear weapons. It is a challenge we’re entirely capable of meeting.

**What are some of the difficult Washington meetings?**

**JM:** Sometimes Sandia finds itself in the middle of disagreements between the NNSA and military, and political forces on Capitol Hill. That is not a negative thing. I think one of the strengths of our democracy is a diversity of views and opinions so you have a healthy, informed debate on all issues, but the stakes involved in our nuclear deterrence are so profound ... I think one of the most difficult challenges for Sandia is to maintain our own conviction about what we think is right. We stay true to our independent and objective, science-based perspectives, while working constructively to bring parties together for a common purpose centered on clarity about our work and what it takes to get that work done.

**What’s an example of a successful meeting?**

**JM:** Fundamentally, the path to success is not having the best idea, but rather having trusting relationships with people where you find a shared point of view. And, the key word there is relationships. This position is best served by a continuity of presence, a consistent message, a simple message. It is imperative for Sandians who visit D.C. to stay focused on a consistent, simple message. Boil it down, and then stick to it and repeat it.

When visiting someone on Capitol Hill, I’m astounded by the incredible pace and fast tempo of life for them — it is a frenetic hub of activity. It’s an interesting challenge to brief them in their setting where we perhaps get 20 minutes to articulate our position to a staffer who has squeezed us into a day that’s 14-plus hours long. Our 20 minutes is somewhere between the price of wheat in Europe, the cost of gas in Oregon, or pick your favorite topic. It is a sound-bite setting.

It is also enormously important to develop these relationships by inviting people to come visit us here at the Laboratories. We host upwards of 150 VIP executive visits a year. Most visitors leave with an enormous sense of respect for what we do. And why wouldn’t they? As important as D.C. is as a center of power for the executive and the legislative branches, it’s a place about ideas and concepts and laws and regulations. Here at Sandia, we’re about doing the work. And we do it with enthusiasm and commitment, which translates into the basic message that we’re passionate about serving our country. That sense of patriotism shows through.

**What are the key NW messages we’re delivering to Washington?**

**JM:** Many of the new messages we’re conveying concern the future.

Certainly job one for us is to deliver on our commitments, which basically means delivering a product on time, on budget, meeting performance requirements, all in an operationally effective way — safe, secure, quality products. That’s job one, deliver on our commitments.

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Job two is to make sure job one doesn't exhaust us. We say we must make sure that in pursuit of meeting near-term schedules, we aren't deflected from preparing for the future. And preparing for the future means continuous improvement in the way we do our business. There's always a better, improved way to do design, qualification, production, surveillance — pick your dimension of our NW program. Lately we've called that shifting the paradigm as a new generation of Sandians enter the workforce and help bring new ideas forward on how we can do our work in a more cost-effective and productive manner.

We also continue to find the balance between short-term needs and long-term health, which is particularly important in this business. If we don't do that, we'll become more contractor-like and less partner-like in our relationships.

In our relationship with the NNSA, we must continue to restore, broaden and reinforce our special role as their FFRDC partner. There is a quality in being a member of the Sandia community that is more than just being an employee at a contractor facility. At their best Sandians who stay here long-term and find fulfillment in their work share a collective purpose that's bigger than each of us. In the case of nuclear weapons, it's about being a part of the deterrent of the United States. It protects us. It's a fundamental security issue. I think Sandia at its best is a community of people who have a common sense of purpose and who are nurtured by their sponsor. And that term is used deliberately — nurtured by — there is an appreciation by the NNSA that Sandia exists to do the technical work, but also is an organization that must be nurtured in anticipation of what will be needed in the future.

*"I'm very optimistic about the future. I have a fundamental belief that Sandia's call for exceptional service in the national interest isn't hollow, but something that actually has become an important part of our culture. Sandia exposes people to a wonderful set of responsibilities, great fulfillment, and a high national purpose. You put all that together and it's a great place to work."*

Jerry McDowell, Deputy Laboratories Director and Executive VP for National Security Programs during a tour, staff presentations, and discussions with Sandia Materials Science Center 1800 in March 2014 that were a prelude to a Java with Jerry. Javas with Jerry are a series of informal, off-the-record sessions during which Sandia NW-related staff and Jerry schedule time together to have a two-way, unscripted dialogue and explore areas of interest and concern, improving communication and building relationships.

## Nuclear Weapons Program Scope

- **Maintain the current U.S. nuclear weapons stockpile**
  - Annual Assessment, Surveillance, LLCE's, SFI's
- **Sustain the stockpile into the future**
  - LEP's, Alt's, tech maturation
- **Steward the long-term vitality of our capabilities, infrastructure and operations**
  - Persistent commitment to multi-disciplinary staff, state-of-the-art labs, equipment, facilities and safe/secure/quality/affordable operations



## Sandia's Nuclear Weapons Mission

Sandia's Nuclear Weapons (NW) Mission is to ensure the nation's stockpile is safe, secure, and effective; that it meets military requirements and is logistically sustainable; and that it always works when needed and authorized, and never works when not authorized.

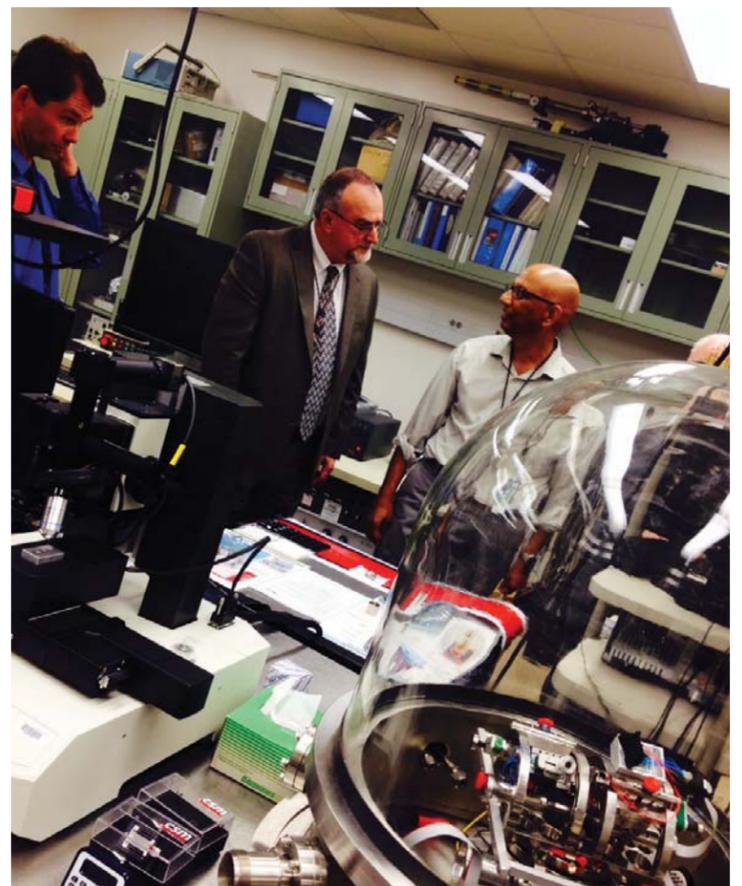
Sandia's NW Mission is the driver for more than 50 percent of the Laboratories' overall \$2.5 billion annual budget. It has complex synergies with the majority of Sandia's broad work, including that which is critical to Sandia's foundation and overall health. It includes science-based engineering, in which fundamental science, computer models, and unique experimental facilities come together to enable researchers to understand, predict, and verify weapon systems performance. Nuclear weapons must survive extremely complex and often harsh environments. They must remain dormant for up to 30 years, yet be immediately available when on high alert-readiness levels. These challenges require systems engineering supported by deep science along with demonstrated

product delivery.

Sandia's NW Mission has three imperatives that represent the three balanced sides of a triangle:

- 1) Maintain the US stockpile through surveillance and the exchange of weapon components that have limited life;
- 2) Sustain the stockpile into the future through life extension programs and alterations; and
- 3) Steward and advance the required engineering and science capabilities, operations and infrastructure to ensure the long-term vitality of the mission.

Sandia is responsible for all non-nuclear components of the nuclear explosive package. In essence, Sandia "weaponizes" the US nuclear deterrent. Currently, the Laboratories leads three nuclear weapons stockpile modernization programs that are in full-scale engineering development — the largest programs at Sandia in decades. They are the B61 Life Extension Program, the W88 Alteration 370, and the Mk21 Fuze Replacement.



# Former US Sen. Jeff Bingaman looks at past, present US energy policies

By Sue Major Holmes

**“What we really need in my view is agreement on what we’re trying to achieve with our energy policies, and then we need policies at the federal, state, and local levels to try to achieve some of those objectives.”**

— Former US Sen. Jeff Bingaman

Solar panels on the White House make a handy illustration of the ebb and flow of Washington’s focus on energy policy. During the energy crisis of the 1970s, President Jimmy Carter put the panels on; during an era of stabilizing gas prices, President Ronald Reagan took them off. Now, under President Barack Obama, they’re back.

Former Sen. Jeff Bingaman cited the on-again, off-again solar panels during a Sandia National Security Speaker Series talk July 22 on the “Evolution of US Energy Policy.” Bingaman, who served in the Senate from 1982 until retiring in 2013, headed the Senate Energy and Natural Resources Committee from 2001-2002 and 2007-2013. He played a major role in passing the 2005 Energy Policy Act and was lead sponsor of the 2007 Energy Independence and Security Act.

His half-hour talk outlined past and current energy policy, lessons that should have been learned, policy options, and where policy is headed.

“The truth is, we have a lot of energy policies,” Bingaman said. “What we really need in my view is agreement on what we’re trying to achieve with our energy policies, and then we need policies at the federal, state, and local levels to try to achieve some of those objectives.”

During three decades in the Senate, Bingaman concluded that national-level attention to energy and energy policy is directly related to the price of gas at the pump. He identified two periods of sustained interest in energy policy, coinciding with high gas prices — the first from 1973-1980 and the second beginning in 2002.

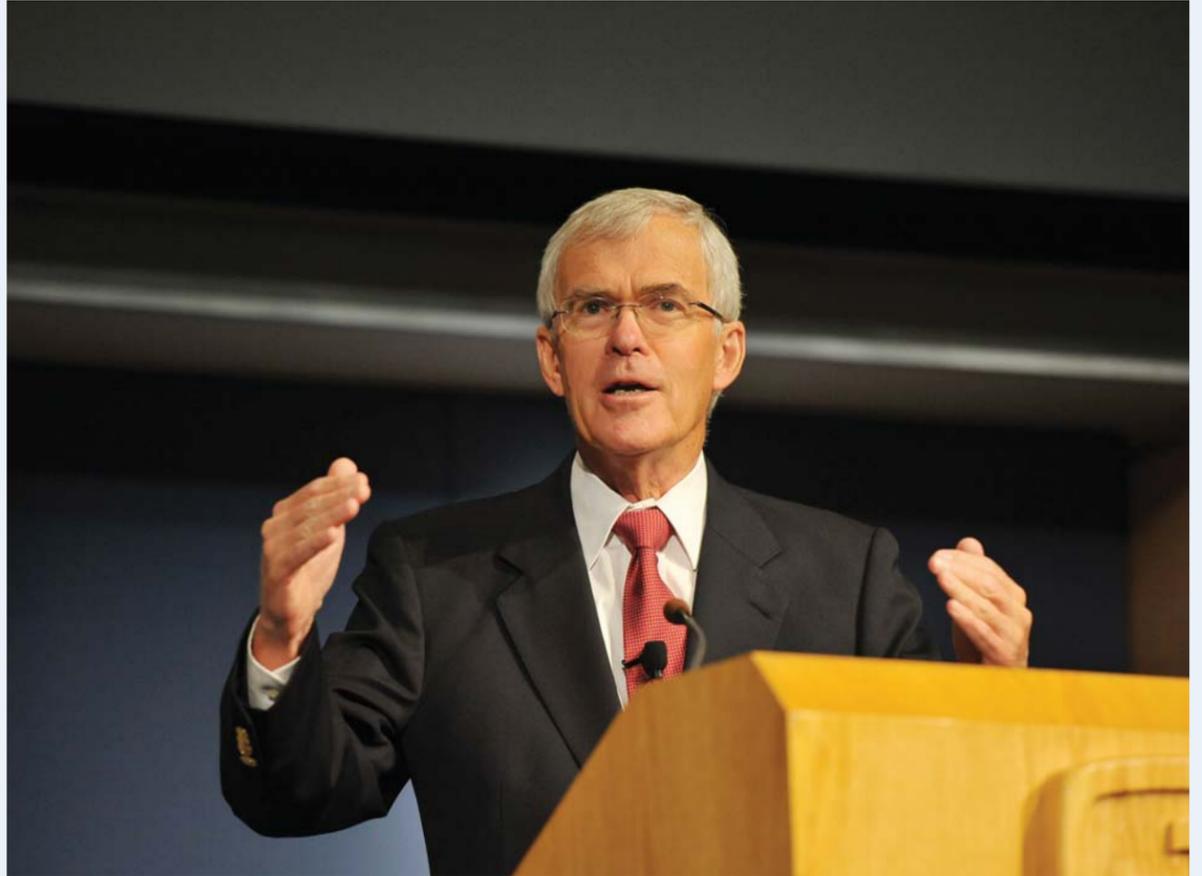
## US focused on energy policy in periods of high gas prices

The first, marked by gas crises in 1973 and 1979, focused attention on oil supply, how to keep prices from going up too much, and dependence on foreign sources. In response, the US helped form the International Energy Agency (IEA), started the Strategic Petroleum Reserve, enacted the Energy Policy and Conservation Act and Corporate Average Fuel Economy standards, increased energy research funding sevenfold, created the DOE and the National Renewable Energy Laboratory, and passed a law requiring utilities to buy renewable energy.

Then came the 1980s, a period of relatively cheap oil and gas. Energy became a backburner issue, symbolized by solar panels disappearing from the White House, Bingaman said.

The nation focused on energy again when gas prices began rising in 2002. Congress passed the Energy Policy Act to increase oil supply and encourage conservation and the Energy Independence and Security Act, which among other things raised the vehicle miles-per-gallon standard. Congress also passed the stimulus act, which Bingaman said many consider the largest energy bill in history because it put money into projects authorized earlier. In addition, the Environmental Protection Agency issued rules to control greenhouse gas emissions from coal-fired power plants.

In the 1973-1979 period, energy policies and envi-



FORMER SEN. JEFF BINGAMAN addresses Sandians during a recent National Security Speaker Series presentation. Bingaman says the nation must “muster the political will” to establish an effective energy policy. (Photo by Randy Montoya)



ronmental policies were separate. Now, Bingaman argued, they’ve come together because of concern over supply and prices and increased awareness of the effect of energy policy on climate change.

“There are many in Congress who disagree with that, there are many who argue we should make energy policy without regard to its effect on the climate,” he said. “I think that’s a profound disagreement that we need to get over.”

Energy production and use have risen dramatically worldwide, especially in recent decades, he said. Fossil fuel dominates, partly because of the shale gas and shale oil revolution. The IEA projects continuing increases in greenhouse gases through 2035, largely from emerging economies, Bingaman said.

## Energy devoted to power production, transportation

Most energy goes into power generation, where coal-fired and natural gas plants are increasing, and transportation, which overwhelmingly depends on gas-burning internal combustion engines. Less than a half percent of vehicles on the road today are zero-emission, Bingaman said.

He outlined lessons from past energy policy:

- Washington needs sustained attention on energy and climate change.
- Policies must reflect the best understanding of the science.
- Energy policy must include supply, price, and independence, plus the effect on climate.
- An election campaign is a terrible thing to waste, because it’s an opportunity to educate the public and candidates. “We need to use campaigns to have a serious national discussion” aimed at some consensus on energy and climate control issues.
- There needs to be strong government policy over power generation to reduce greenhouse emissions and strong, innovative transportation policies to promote the manufacture and use of low-cost, low-emission vehicles for an emerging middle class worldwide.

## Policy options not politically easy

Bingaman also listed three categories of policy options, none of them easy politically. The easiest, rela-

tively, would be policies to increase energy efficiency “because oftentimes you can make a case that you can save more by moving to more efficient use of energy,” he said. Second would be policies to improve performance and reduce the cost of lower-emission energy sources. Bingaman said it’s not easy to agree to put money into the necessary research and development, but that’s easier than the third option: reflecting the full cost of energy in its price. That could mean setting a price on carbon emissions, cap-and-trade policies, or what Bingaman advocated in the Senate, establishing a clean energy standard that would assess additional cost for sources that emit substantial greenhouse gases.

While there’s general agreement the world’s population and gross domestic product are increasing and demand for energy is rising, there’s disagreement over the degree that higher energy use will increase greenhouse gases in coming decades.

## Mustering the political will

Two charts illustrated the point. One from Exxon-Mobil showed energy-related emissions increasing, particularly in the Asia-Pacific region, until about 2030, raising worldwide temperatures by 4-6 degrees Centigrade. The other chart, from a United Nations report by the Sustainable Development Solutions Network, called for deep decarbonization pathways by 2050 to prevent temperatures from rising more than 2 degrees.

“It’s not clear to me how we muster the political will to get from where ExxonMobil says we are headed to where the report to the United Nations this last week says we need to be headed,” Bingaman said. It would require agreement to make greenhouse gas emissions a higher priority in energy policy; substantial progress in energy efficiency; improving performance and lowering the cost of less-emitting forms of energy; and reflecting the full cost of energy in its price, he said.

**“... there are many who argue we should make energy policy without regard to its effect on the climate.”**



# Nuclear weapons have enduring role in US national security, says retired STRATCOM commander

**“The nation has a love/hate relationship with nuclear weapons. Like many love/hate relationships, the parties involved tend to represent two different ends of the spectrum.”**

— Retired Air Force Gen. Robert Kehler

RETIRED US AIR FORCE Gen. Robert Kehler takes a question from the audience during his recent National Security Speaker Series talk on The Enduring Role of Nuclear Weapons in US National Security.  
(Photo by Randy Montoya)

By Bill Murphy

The nation has a love/hate relationship with nuclear weapons, said retired Air Force Gen. Robert Kehler during a recent National Security Speaker Series presentation at Sandia. “Like many love/hate relationships,” he said, “the parties involved tend to represent two different ends of the spectrum.”

Kehler, who commanded US Strategic Command from 2011-2013 and previously commanded US Space Command, spoke to a nearly full house at the Steve Schiff Auditorium (and videolinked to California) about the enduring role of nuclear weapons in US national security. Kehler made clear at the outset that as a retired officer, the views he expressed were strictly his own.

“Those at one end of the spectrum,” Kehler said, “believe that nuclear weapons are the problem.” In their view, he said, the nation should do everything it can to significantly reduce or get rid of these weapons as fast as possible. These individuals see the nuclear weapon arsenal as a Cold War relic, he said, and think “we should defer major investment because nuclear weapons are on their way out.”

At the other end of the spectrum, Kehler said, are those who believe nuclear weapons solve the problem of national security. In this view, he said, the US stockpile is too small, needs to be modernized, preferably with new weapons suited to today’s needs. At this end of the spectrum, Kehler said, individuals see the world as an incredibly dangerous place, one in which significant investment in nuclear weapons and the supporting infrastructure is needed to keep the nation secure.

“Like many issues today, we seem to be paralyzed at the two ends of this discussion,” he said.

“Budgets are declining,” he said, “and we are locked in endless debate while our weapons, delivery platforms, and nuclear command and control systems continue to age. I’ve been asked before on the Hill if the systems are aging and what I would say is ‘No, they are aged.’ We’re beyond aging; we are into aged and certainly we need some serious attention.”

While the stockpile ages, he said, some of the nation’s most experienced and serious national security policymakers have proposed eliminating nuclear

weapons, some saying we need to do so sooner rather than later.

## A world without nuclear weapons?

Kehler cited President Barack Obama’s widely reported policy speech delivered in Prague in 2009, when he said, “Today, I state clearly and with conviction America’s commitment to seek peace and security of a world without nuclear weapons.”

“Now, what often gets lost in the conversation,” Kehler added, is that in that same speech the president stated, “As long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary and guarantee that defense to our allies.”

Kehler said the elimination of nuclear weapons is a worthy goal, one that he supports and one the US should pursue. However, he said, “absent some dramatic change in the international geopolitical environment, nuclear weapons will continue to have an enduring role in US national security as far as I can see into the future. But not a Cold War role; a 21st century role.”

In today’s complex threat environment, Kehler said, the concepts of deterrence and assurance did not disappear at the end of the Cold War.

“But those concepts must now address a broader array of strategic attacks from actors with widely different capabilities and widely different motivations,” he said.

“Strategic attack could come to us through space, through cyberspace, it could involve traditional or non-traditional weapons, but a nuclear attack on the US or our allies, however low the probability, remains absolutely the worst-case scenario.” To answer these threats, he said, the nation has a wide array of deterrence tools that can and must be brought to bear each day.

And among those tools, nuclear weapons, because of their unique combination of destructive power and lingering effects, remain central to the nation’s deterrence strategies as the ultimate guarantor of our security and that of our allies, Kehler said. “Nuclear

weapons remain first and foremost war-preventing weapons and we use them every day.”

Even as nuclear weapons play a more circumscribed role in the 21st century, as described in the 2010 Nuclear Posture Review, it remains essential to ensure the safety, security, and effectiveness of the nuclear deterrent, Kehler said. As stockpile numbers decline, he added, the value of each weapon increases. “That means there’s a premium on the reliability of each weapon,” he said.

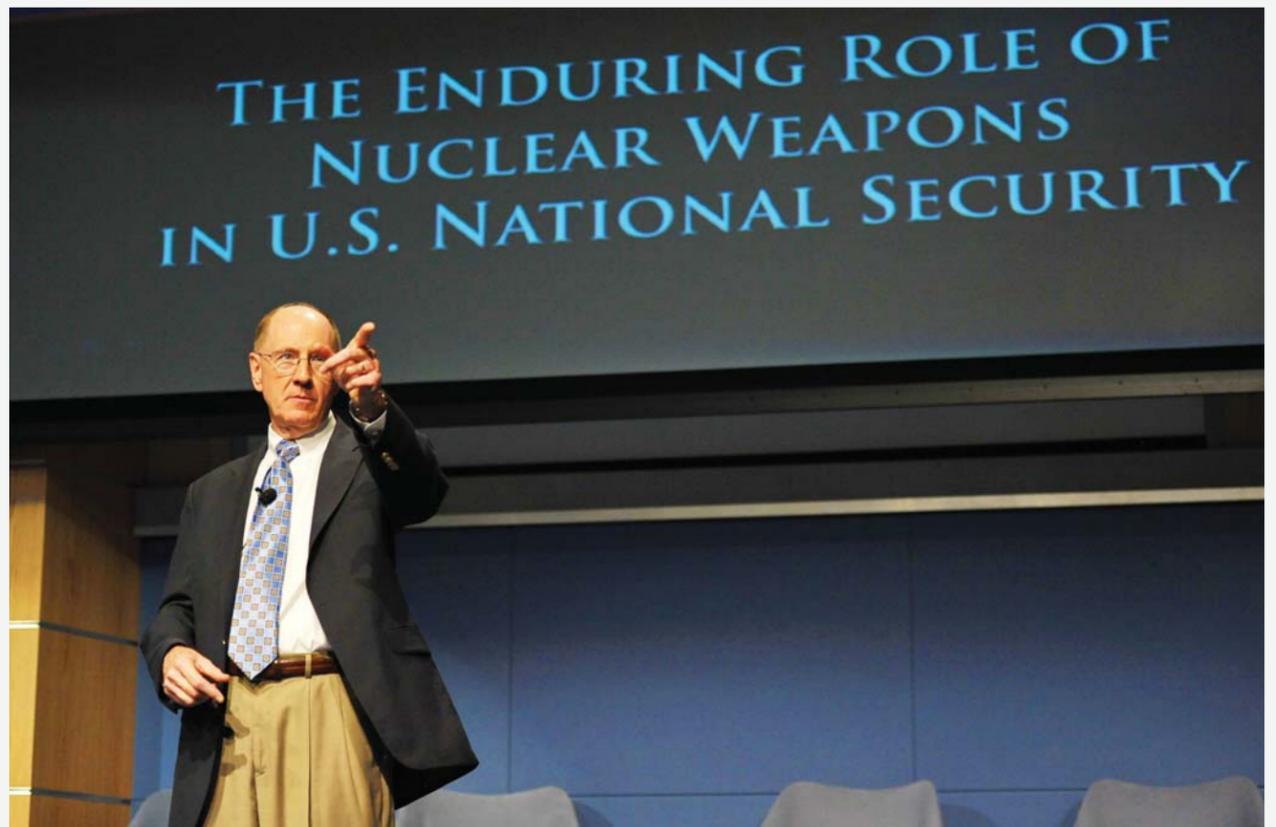
## What do we do between now and then?

“What do we do now if we are going to need these weapons for the foreseeable future? A world without nuclear weapons is a policy goal. What do we do between now and then? When is ‘then’? What world conditions need to exist for us to get to a world without nuclear weapons? And what do we do with these compelling issues with the aged systems that we have today?”

The path forward, he suggested, was laid out in that 2010 Nuclear Posture Review. “It said we need to invest to sustain a safe, secure, and effective nuclear deterrent, including weapons, platforms, and the associated command and control and communications. It said that we need to invest in a modern physical infrastructure. It said we need to invest in a highly capable workforce, while at the same time working to reduce overall numbers and the overall types of weapons, while raising the attention on nuclear terrorism and proliferation.

“So the budget is obviously the major issue in all of this,” Kehler said. “But I believe that this is less about budget and more about priority. I think we have the money we need to get the job done. And you [Sandia employees] need to help, by staying on schedule, and remaining within budget, and being accurate with your cost estimates.” The biggest challenge to mission success is lack of stability in the funding stream. “You can help have stability in budgets by having stability in cost estimates.

“The more stability we have the more likely it is that we’re going to deliver things on time and within cost.”



# Sandia pioneers smart and sustainable institutions

By Stephanie Holinka

Usually when Sandia scientists and engineers model something, they do it for an external customer who needs to solve a problem. But now researchers and facilities managers are working together to use Sandia's science and engineering expertise to reduce operational cost through institutional energy consumption.

After Sandia established an ambitious goal of reducing energy consumption by 25 percent by the year 2020, Jack Mizner (4853) in the Facilities organization turned to Labs researchers Howard Passell (6926), Daniel Villa (6926), Will Peplinski (6926), and Len Malczynski (2243), to help figure out ways to trim Sandia's energy appetite without sacrificing its mission.

The collaboration between researchers and Facilities is unusual. Begun under Rick Stulen's tenure, Energy and Climate (EC) Program Management Unit and Div. 8000 VP Steve Rottler and Infrastructure Operations Division 4000 VP Mike Hazen are teaming up to make energy conservation part of the Sandia culture.

As leader of the Secure and Sustainable Energy Future Mission Area, Steve intends to use the Labs as a testbed for new energy conservation technologies and operations rules. As one way of formalizing this collaboration, Steve has appointed Facilities Management and Operations Center 4800 Director David Darling as a member of the EC leadership team.

## A complex problem

"We've decided to take a tip from the cyberspace playbook and build into our strategy the stewardship of our own facilities," Steve says, referring to Sandia's efforts to apply its cybersecurity R&D to securing Sandia's own IT resources.

"Jack and Howard brought this proposal to me, as the first initiative for our focus on bringing sustainability into the mission area," Steve says.

It's a complex problem.

"How do you transform existing institutional infrastructure to lower the energy footprint when you have hundreds of buildings across two sites and hundreds of square miles? How do you go about doing it in a cohesive, thoughtful, and highly efficient way? This is the problem Sandia is facing," Jack says.

To better understand and evaluate its energy use, Sandia created its Institutional Transformation (IX) model, which builds on eQUEST, a DOE building modeling environment that allows users to model one building at a time, in 3-D, from the building-wide heating, ventilation, and air conditioning (HVAC) system down to individual offices, thermostats, and electrical outlets.

Sandia researchers worked with eQUEST expert Marlin Addison, a professor at Arizona State University, and Matt Schaffer and Robert Conley from Bridgers and Paxton Consulting Engineers Inc. in Albuquerque, to put together a model that looked at building infrastructure across the institution.

"IX integrates energy conservation effects across many buildings, using many conservation methods and renewable energy options, over many years. This allows planners to experiment with many different strategies across the entire institution and over time. It allows them to select the strategies that save the most energy, and then demonstrate their effectiveness and tradeoffs to Sandia leadership and the workforce," says Howard, research project lead.

Sandia's IX model is based on detailed models of 114 Sandia buildings in New Mexico and California larger than 10,000 square feet, which consume more than 90 percent of the Labs' energy.

## A sophisticated planning tool

"IX allows planners to experiment with energy conservation measures such as adding cool roofs or replacing old HVAC systems. It also models operations conservation methods such as changing the temperatures in buildings, and changing the ramp-up and -down times of HVAC systems," Jack says.

A planner also can simulate power production using various combinations of solar energy technologies at 18 sites in New Mexico.

The IX project is in its third year and will complete phase one next month. But Jack and his staff, including Gerry Gallegos (4853) and Doug Vetter (4143), have already used the model to map a strategy for meeting Sandia's goals.

"With help from the model, we have already reduced our energy use by more than 9 percent in less than three years, and saved over \$2 million," Jack says.



WHILE SOME LABS FACILITIES remain lit at night to accommodate mission work, Facilities and Sandia research organizations are partnering to conserve energy by turning off the lights and reducing the heating/cooling energy demands at night wherever possible to meet ambitious smart sustainability goals. (Photo by Randy Montoya)

The energy reductions came from improving central heating and cooling plant efficiency and building operations, installing vacancy and occupancy sensors that control lighting and HVAC operations, and performing better energy audits, Jack says.

## Smart, sustainable institutions

Using the IX model, Jack and his team have identified additional energy conservation and operational measures that will help Sandia meet its energy reduction goals. These measures include the use of higher-efficiency lighting, heat exchangers, improved central plant efficiencies, digital control systems for buildings, and operational changes.

"Some buildings that now are fully heated or cooled 24/7 will ramp down at night so buildings could be a little warmer in the summer and a little cooler in the winter," Jack says.

"Big institutions all over the world will need to reduce their energy footprints," Howard says. "IX gives us and Facilities a tool to help figure out how to do it in a smart and effective way. We already have smart phones, and we're talking about getting smart grids. This work is about creating smart and sustainable institutions."

Future efforts on the IX model will be aimed at integrating costs of different conservation strategies, and at simulating institutional strategies and tradeoffs for water conservation and for transportation energy reduction options on and off campus.

## Cool roofs

The application of cool roofs — roofs with extra insulation and white surfaces for reflecting sunlight — offer a great example of the way the IX model is informing facilities planning at Sandia.

"Remember when there was talk about putting cool roofs on all buildings? It turns out that cool roofs work for some types of buildings in some climates, but not for others," Howard Passell says.

According to the IX model, cool roofs would reduce energy consumption in about a quarter of Sandia's buildings, increase it in about a quarter of buildings, and about half would experience no change. The differences are in the energy consumption characteristics of the building.

"Load-dominated buildings such as data centers produce a lot of heat, and they need to release that heat, particularly in a hotter climate like ours. If you put a cool roof on that building, it comes with added roof insulation that traps the heat inside, increasing energy costs for cooling," Howard says.

Contrast that with skin-dominated buildings, for which the interior temperature is more strongly affected by the outdoor temperature. Cool roofs could be advantageous for them.

"The IX model allowed us to assess the impact that cool roofs could have across the Labs, and it became clear that there would be little benefit if we put them on most of the buildings," Howard says.

## Where the continental US ends



IN NORTHERNMOST AMERICA — Sandia VP Steve Rottler (8000), right, VP Jill Hruby (6000), and VP Julia Phillips (7000), along with Marianne Walck (6900), far left, Erik Webb (6910), and Amy Halloran (6913), in Barrow, Alaska, the northernmost point of the continental US, the week of July 7. At the University of Alaska-Fairbanks, they examined methods (sponsored by LDRD) of measuring permafrost, and discussed further opportunities for collaboration. They also toured a permafrost tunnel built by the Corps of Engineers at Fox and Sandia's climate measurement instrumentation at the Atmospheric Radiation Measurement (ARM) Mobile Facility 3 at Oliktok Point. They finished with a tour of the ARM facility in Barrow, where Sandia collects data to determine the impact that clouds have on solar radiation. Mark Ivey, Sandia's ARM program manager, coordinated the tour and provided technical background for work done by Sandia for each ARM site.

## Sandia's Safety Journey . . .



RICK DeANDA

# Lesson: Work done today can affect someone years in the future

By Kim Bustamante

"We're going to get through this," Rick DeAnda heard his wife, Norma, tell him as the ambulance doors closed on March 20, 2013, the day his ankle was shattered in a work-related accident.

An air conditioning unit he was servicing that day had not been properly secured sometime in the past and fell, and Rick (4843) had to jump 5 to 6 feet off a ladder to avoid being crushed between the unit and a forklift stationed to remove it. His ankle splintered and his foot essentially internally separated from his leg.

Rick underwent initial surgery, and two weeks later doctors put in two plates and 13 screws to piece together the broken bones. Last September, his doctor prescribed an air cast so he could begin putting weight on the foot. But Rick had pain, and new X-rays showed a plate was bent. He underwent surgery to replace it, add more screws, and graft cells from his femur to the bone. After Thanksgiving, he noticed tingling on his calf. It turned out to be a third-degree burn caused by a splint, which had to be removed surgically.

Then in July, doctors discovered two of the screws implanted in his ankle had broken. He's back to crutches and a walking boot on his foot and likely faces more surgery.

Rick's recuperation provided lots of time with his family, but he was pretty much confined to his couch. He says people went out of their way to open doors, ensure

he had the most comfortable chair, or prepare his plate, gestures he appreciated but felt awkward accepting. Outings required considerable planning and preparation.

Losing some independence has been his biggest challenge. He says it was tough not to become depressed and feel less valuable when he had to accept so much help. He had always done home repairs, but now has to hire others to fix and maintain things. He enjoys hunting and fishing, but worries he won't be able to navigate the terrain on foot or fly fish in a rocky-bottomed, fast-moving river.

Rick's doctor has warned him arthritis in the injured joint is almost a certainty, and he knows that aging will make managing his injury and mobility even more challenging.

The accident also affected his family. Norma (9548) had to become a nurse and chauffeur in addition to being a mother and working at Sandia. His 11-year-old daughter had a perfect honor roll record, but had to let things slip a little that semester so she could spend time with her father at the hospital and help out more at home. Rick says he regrets she had to grow up a little faster than she should have because of his accident.

"If my story can keep even one person from having to go through this, it's worth telling," says Rick, who wants to spread the message that work you do today might touch someone years from now.

## STAR students



SANDIA'S STAR HIGH SCHOOL SUMMER INTERNSHIP PROGRAM, coordinated by Community Involvement Dept. 3652, was created to encourage local students entering their last year in high school to pursue careers in science, technology, engineering, and math (STEM) and to foster excellence in those fields. The program enables students to gain real-world mentoring experience with a scientist at Sandia. This year, 18 STAR students completed the eight-week program.

In the photos here, Jason Andersen (6532) explains an intrusion detection system at Sandia's Sensor Test and Evaluation Center (STEC) to STAR students James Donnelly and Stephanie Brink (above). The testing was one highlight of the eight-week STAR program at STEC. In addition to the STEC tour, STAR students also visited the Robotic Vehicle Range (RVR) where they learned about navigation and implemented a working miniature four-wheel-drive robot. (Photos by Rachel Baros)



## Manhattan Project artifacts on display at the National Museum of Nuclear Science & History



Seventy years ago, as World War II raged across the globe, a remarkable collection of men and women were brought together at a remote location — a boys' school called Los Alamos Ranch School — to work on an ultrasecret project whose goal was to create a weapon that could win the war in one blow. Their story, told many times in many media, is now the subject of a TV series called *Manhattan* being broadcast on cable network WGN America.

Reviews of the program have praised the authentic look and feel of the series, but viewers hungering for more detail will find the National

Museum of Nuclear Science & History an intriguing place to gain new insights into Los Alamos during WWII and see actual artifacts from this pivotal time in history.

Among its many Manhattan-era items, the museum houses such historical treasures as the 1942 Packard Custom Limousine (below), also known as "Oppenheimer's Limo," which was the selected mode of transportation for scientists working on the Manhattan Project and transporting dignitaries from the railway station in Lamy, N.M., to Los Alamos. The Trinity Flag (above), a 48-star American flag that flew over Trinity Base Camp on July 16, 1945, is also on display.

The National Museum of Nuclear Science & History at 601 Eubank SE in Albuquerque is open seven days a week from 9 a.m.-5 p.m. Special group tour rates are



# Mileposts

New Mexico photos by Michelle Fleming



Vance Behr  
35 5440



Mike Coltrin  
35 1121



Edward Archibeque  
30 10261



Doug Clark  
30 421



Aaron Hillhouse  
30 2242



Doug Hodge  
30 2993



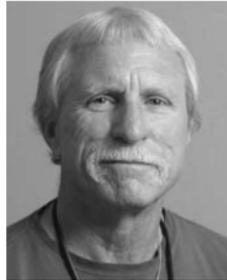
Glenn Machin  
30 9312



Cathy Nowlen  
30 5954



John Pott  
30 1555



Randy Rembold  
30 5752



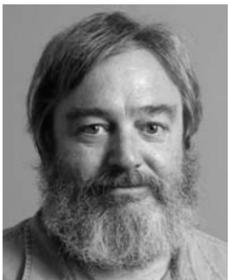
Greg Sjaardema  
30 1543



Dan Vortolomei  
30 2997



Greg Hebner  
25 5950



Chris Hogg  
25 5562



Deanna Jaramillo  
25 1657



Scott Klenke  
25 1557



Anne Moats  
25 5523



Steve Plimpton  
25 1444



Edward Sanchez  
25 2224



Thomas Tarman  
25 5643



Brenda Townsend  
25 2917



Tim Wisely  
25 2994



Chris Applett  
20 2546



John Campisi  
20 857



Sid Gutierrez  
20 4100



Emily Mitchell  
20 5964



Ganesan Nagasubramanian  
20 2545



James Peery  
20 5600



Mark Rodriguez  
20 1819



Heidi Ruffner  
20 5349



Richard Sarfaty  
20 2214



Cathy Sleeter  
20 4229



Jim Stevens  
20 1747



Nelson Bell  
15 1816



Steve Bova  
15 1541



Jerry Clark  
15 6623



Bill Erikson  
15 1516



Annie Garcia  
15 101



Karen Jo Klar  
15 6500



Frank Love  
15 2953



Tony Maokhamphiou  
15 5526



Denise Padilla  
15 6133



Allen Roach  
15 2735



Tamara Rodriguez  
15 2215



Beverly Rudys  
15 1350



Don Susan  
15 1831



Lisa Walla  
15 2734



Pamala Katherine Thullen  
15 4255

**Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads**

**MISCELLANEOUS**

STANDUP CONSOLE RADIO, antique, 1930s, wood cabinet, not working, could be rehabbed, \$50 OBO. Geer, 505-265-2094.

LIVING ROOM SET, 3-pc., Ashley, loveseat, recliner, sofa, excellent condition, \$800/all. Valdez, 280-6579.

BRASS LAMP, \$20; rustic chandelier, \$75. Ramos, 972-951-0290, ask for Phillip.

SPIN SHOES, for spin class, Cannondale, worn twice, size 8.5, photos available, \$250 OBO; Vision Fitness treadmill, paid \$1,200, asking \$200. Gonzales, 450-4391.

TRAINING CRATE, wire w/plastic liner, portable, \$75 OBO. Whitehead, 505-400-4656, ask for Laura.

GRAPHING CALCULATOR, TI-84 Plus, silver edition, \$50. Ashby, 281-1573.

SECTIONAL, brown & tan, great condition, no stains, \$635. Willis, 505-206-9108, ask for Bekka.

TIMESHARE, Crown Point Condos, Ruidoso, NM. Sept. 19-26, 2-bdr., just bring food, beautiful views/accommodations, \$545/wk. Shirey, 505-281-9455.

TIMESHARE, Crown Point Condos, Ruidoso, 2-bdr., \$1,680 includes title transfer fees/annual fee, \$528, 47,000 points available. Tapia, 806-206-0238.

BASS, Peavey Foundation w/accessories, \$250; Peavey TNT100 amp, 16-in. speaker, \$100/both; \$300 negotiable. Carey, 505-238-3675.

CUSTOM BARBIE DOLLHOUSE, 3 floors, wired electrical, \$200; custom Barbie horse barn, \$50; both excellent condition. Eckstein, 505-681-0736.

PORTABLE REFRIGERATED AIR CONDITIONERS, 8,000-Btu, Commercial Cool, \$200; 5,000-Btu, Electrolux, \$200. Meinelt, 350-3255.

MOVING BOXES, 60-in., Sony WEGA TV, \$100; mission-style armoire, coffee table, \$50 ea. OBO. Martin, 828-1247.

TAMA DRUM SET, 5-pc., w/Zildjians, \$700; Gibraltar rack, 5-pc. add-on, additions, \$1,850/all. Lindsay, 330-607-4769.

STOCK RIMS, fit '14 Subaru Forester, 17x7, <100 miles, \$255 OBO. Aragon, 235-3043, call or text.

JET TABLE SAW, \$400; BowFlex tension strengthening machine, \$200; antique chair, \$75; Cabela's screen room, \$50. Reams, 254-4949.

SONY TV, SXRD KDS R60XB1, w/Sony stand & DVD player, \$300. Hennessey, 505-269-6243.

RASPBERRY PI, model-B, new, unused, \$40. Garcia, 505-720-2566.

FULL SCUBA GEAR, tanks/suits/respirators/weights, etc., >\$5,000, asking \$2,500. Williams, 505-379-8994, ask for Karl.

DRUMS, Gretsch Catalina ClubMod, red/black, w/double bass pedal, cymbals, & stands, \$500; will sell components separately. Rudolphi, 217-898-8893.

GOLDFISH, up to 6-8-in., fancy & plain, free; computer desk w/hutch & drawer, 47" x 26" x 55", \$50. Shirley, 505-715-3255.

3-CD CHANGER, Sony, model MHC-BX6AV, receiver, 2 speakers, \$150; North Pole stadium seats, new, unused, w/blanket, \$20 ea. Drebing, 293-3335.

TWIN BEDS, 2, \$50 ea.; king-size headboard, \$25. Mozley, 884-3453.

UPRIGHT PIANO, w/matching bench, moving & must sell, \$300. Condit, 604-9899.

TIMESHARE, 1 wk., Wyndham, available anywhere, \$1,000/wk., \$200/night; Schwinn 12-spd. bicycle, w/rack, \$40. Garcia, 280-5815.

BANJO, Deering Maple Blossom, 5-string, w/case, excellent, no head or fret wear, \$1,800 OBO. Sturgeon, 505-975-6565.

BEDROOM SET, 2 bunk beds, more, \$500; solid oak Windsor chairs, 4, \$400; washer/dryer, \$250/set; solid maple table, w/6 chairs, \$450; 4 Jeep tires & rims, \$300; outdoor metal table w/6 chairs, \$150. Bruton, 505-463-8380, ask for Vivian.

TREADMILL, 60" x 22", fold-up deck, speed to 12-mph, incline up to 12 degrees, stops sporadically, free. Pechewlys, 505-463-6737, call or text.

ROUTER, Belkin, Wi-Fi, dual band, model N600DB, supports g& n standards, \$30. Stuart, 505-265-7315.

**TRANSPORTATION**

'73 FORD F350 ONE TON, w/9-1/2 ft. Mitchell camper, 9,400-lb axles, 4-spd., 95,879 miles, \$4,500. Gibson, 505-898-3529.

'10 CHRYSLER 300 TOURING, AT, 3.5 V6, silver, 63K miles, 85% tread on tires, \$13,800. Zamora, 505-450-2208.

**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 printed on a first-come basis.

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

'03 FORD FOCUS SVT, 197K miles, newer tires, brakes, clutch, maintenance records, etc., \$1,500. Metzger, 299-0908.

'07 BMW 525i, tan interior, dark green, new tires, 86K miles, good condition, \$12,000 OBO. McConkey, 505-463-6409.

'03 TOYOTA TUNDRA SR5, 4x4, V8, tow pkg., new Michelins, new rear window, 150K miles, excellent, \$8,499. George, 505-440-0606.

'05 BUICK LESABRE, custom, grey, runs great, new condition, good tires, 26K miles, \$7,800. Duvall, 881-4406.

'12 DODGE CHALLENGER, 3.6L V6, power everything, CD, MP3, keyless entry, Bluetooth, nonsmoker, 4,600 miles, \$21,000. Stanopiewicz, 286-2889.

'94 TOYOTA 4RUNNER, 4x4, 192K miles, good condition, very reliable, great daily driver, or off-road, \$5,000 OBO. Wolfgang, 414-1483.

'99 DODGE DAKOTA, extended cab, silver, custom bed cover, 87K miles, \$5,700. Martinez, 452-6137.

'68 BRONCO, restored, \$13,000; '99 Dodge Cummins, low miles, \$15,000; downhill bike, like new, Commenal Supreme, \$1,250. Horton, 280-4202.

'99 INFINITY i30, fully loaded, black, 149K miles, runs but needs some work, \$1,500. Kramer, 821-4893.

**RECREATION**

GIRL'S TREK BIKE, age 4-6, pink, always garaged, like new, DVD and Float capability, retails \$200, asking \$100. Czuchlewski, 359-8241.

'04 SUZUKI VL800 INTRUDER VOLUSIA, black, 805 cc, Cobra pipes, removable back rest, 2 helmets & more, 8,850 miles, \$2,200. Adams, 459-7719, ask for Donald.

'86 Harley FXSTC Softail, has removable leather bags, runs well, 42K miles, \$6,500 OBO. Romero, 307-9389.

'07 CAN-AM OUTLANDER MAX 400 ATV, low miles, excellent condition, garage kept, 4x4, electric winch, \$5,000. Shelland, 980-2357.

'09 POLARIS FOUR-WHEELER, Sportsman 500 H.O., no miles, garage kept, new condition, \$6,500 OBO. Green, 803-7228.

**REAL ESTATE**

5 ACRES, commercial zoned. Aragon, 888-3473.

2-BDR. HOME, 2 baths, 1,884-sq. ft., 3 acres, great horse property, water rights included, MLS#810384, \$325,000. Ordonez, 604-7345.

3-BDR. TOWNHOUSE, 2-1/2 baths, 2-car garage, 1,929-sq. ft., remodeled, finished basement, NE Heights, MLS#809010, \$135,000 + \$257 HOA. Sondreal, 505-379-0690.

3-BDR. PUEBLO HOME, 2-baths, 2,300+-sq. ft., Peralta, .80 acre, fenced, 25 mins. to base, quiet, RV hookups, MLS#810274, \$259,600. Warner, 505-507-3460.

3-BDR. HOME, 2-1/2 baths, 1,565-sq. ft., 2-car garage, NE Heights, Tramway & Candelaria, built in 2002, \$180,000. Walker, 918-244-3898.

1.1 ACRES, mountain property, near Regina, NM, w/private lake, breathtaking views, water onsite, \$26,500 OBO. Morgan, 792-7883.

4-BDR. HOME FOR RENT, 2 baths, Sandia Park, pets considered, partially furnished, http://tinyurl.com/31sandia, going on assignment for Sandia, \$1,200/mo. Dennis, 505-926-1014.

3-BDR. HOME, 1-3/4 baths, 1,600-sq. ft., <5 min. to base, 624 California SE, \$149,500. Sanchez, 505-514-9231, after 5 p.m.

4-BDR. HOME, 3 baths, 3-car garage, 1-story, 3,399-sq. ft., in-law suite, separate office bldg., .89 acre fenced/gated, MLS#812515. Tyler, 264-9586, ask for Kate.

**Recent Retirees**




Linda Hall 27 4848 30 2133

**Cycle Sandia off to a rolling start**



Cycle Sandia is the new Sandia/New Mexico bike maintenance and procurement program designed to promote eco-friendly, efficient, and safe transportation around the Labs. Routes Rentals of Albuquerque has been signed on as the vendor, providing maintenance, bikes, and accessories for Labs use. The contact was negotiated by Judy Jojola (10241), supported by Ralph Wrons (4144), Pam Witt (5640), and Amber Romero. Under the terms of the contract, Sandians may also purchase bicycles and equipment for personal use.

In the photo at left Josh Arnold of Routes Rental, left, is joined by Judy, Patrick Allen of Routes Rental, Pam, Ralph, and Heather Wess, also of Routes Rentals.

Below, Tim MacAlpine (9517) test-rides one of the new bicycles on the day of the Cycle Sandia roll-out celebration last month. (Photos by Randy Montoya)



# Local restaurateur Tim Harris to speak at Sandia about overcoming life challenges



ALBUQUERQUE ENTREPRENEUR and restaurateur Tim Harris, who was born with Down Syndrome, fulfilled a long-time dream in 2010 when he opened his own restaurant, Tim's Place.

Harris will speak at Sandia on Aug. 14 about overcoming life challenges. His talk is sponsored by Sandia's Disability Awareness Committee. (Photo by Randy Montoya)

By Valerie Larkin

Anyone who has visited Tim's Place in Albuquerque's Northeast Heights has likely enjoyed the warm atmosphere as much as the food. And anyone who has ordered a Tim Hug from the menu knows the welcoming ambience comes from Tim Harris, the restaurant's gregarious founder. The Hug Counter on the wall at Tim's Place shows that Harris

has given more than 40,000 hugs to diners since the restaurant opened in 2010.

On Thursday, Aug. 14, Sandia will welcome Harris to the Steve Schiff Auditorium from 11:30 a.m.-12:30 p.m. In a presentation hosted by the Disability Awareness Committee, Harris, who was born with Down syndrome, will speak about overcoming life challenges and realizing his dream of owning a restaurant.

Harris says his dream began when he was a teenager and worked as a host at a local restaurant. After he graduated from Eldorado High School, he studied food service, office skills, and restaurant hosting at Eastern New

Mexico University. "First it was a dream, and then it became a passion. Food is awesome, but the people are what are important to me," he says.

In addition to being a successful restaurant owner, Harris is an accomplished athlete, having participated in the Special Olympics in basketball, poly hockey, volleyball, golf, and track and field. He has won more gold medals than Michael Phelps, and many are on display at Tim's Place. "I'm proof that anything is possible," Harris says.

The presentation is open to all members of the workforce and reservations are not needed to attend.



**CIO SERVICES EXPO**  
IT Innovation in Support of Sandia's Mission

**MONDAY, AUGUST 18, 2014**  
**10:00 AM – 2:00 PM**  
**STEVE SCHIFF AUDITORIUM**

Join us to learn about the latest IT technology and services at Sandia.

- Keynote presentation from CIO Mike Vahle
- Short presentations on topics from around IT
- Exhibits in Steve Schiff lobby on various IT services

VISIT [cioexpo.sandia.gov](http://cioexpo.sandia.gov) for a full schedule, presentation video stream links, and list of exhibitors.





YOU CAN ORDER a Tim Hug from the menu at Tim's Place. So far, restaurant proprietor Tim Harris has given out more than 40,000 hugs since 2010, according to a digital ticker on the wall. (Photo by Randy Montoya)