

# Hard data from a hard place

## Science on Alaska's North Slope

Story and photos by Neal Singer



Mark Ivey (6913) and I are standing on the tundra at an outpost of science at the northernmost point of the North American continent. We are five miles northeast of Barrow, an Alaskan village unreachable by roads, 320 miles north of the Arctic Circle, and one mile south of the Arctic Ocean.

It is late spring, the ice breaking up and the snow melting around us, and Mark — manager for Sandia of DOE's Atmospheric Radiation Measurement (ARM) climate research facility at Barrow — is waiting with me for the automated release of a weather balloon in about two minutes, at 9:31 a.m.

The balloon, to be launched from the balcony of a metal-and-glass test facility about the size of a mobile home, is expected to measure the Arctic atmosphere's temperature, humidity, and wind speeds at a rapid succession of altitudes as it rises. The tests are part of an ongoing effort to depict the structure of the atmosphere (an interesting concept to a layman like me) and the formation and elevation of its clouds. Imprecision in both these areas cause disputes about the accuracy of global climate models, which need the kind of hard data provided by this facility for the most accurate results.

To this end, the launch facility inflates and releases two balloons every day, automatically — one at 9:31 a.m. and another at 9:31 p.m.

"We used to have our Barrow assistants come out here twice a day and fill a balloon with helium and let it go," Mark tells me from the balcony as he checks the canisters used to fill each balloon. "This automated setup is much easier on everyone."

(Continued on page 5)

WE HAVE LIFT-OFF — At DOE's Atmospheric Radiation Measurement (ARM) climate research facility at Barrow, managed by Sandia, an auto-released helium-filled weather balloon floats rapidly up from its cradle as Sandia researcher and station manager Mark Ivey indicates its path. The balloons are released twice a day to gather atmospheric data. (Photo by Neal Singer)



### Health Partner Network cardiac care options

The Sandia Health Partner Network (HPN) includes a variety of cardiac and stroke care facilities, including Lovelace Medical Center, Heart Hospital of New Mexico at Lovelace Medical Center, and the New Mexico Heart Institute. Learn about HPN cardiac care options in a story on page 8.

# Sandia LabNews

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SANDIAN RESEARCHERS Don Kalinich, left rear, Andrew Goldmann, right rear, Jesse Phillips, left front, and Jeffrey Cardoni have used the Sandia-developed MELCOR code to analyze the 2011 Fukushima Daiichi reactor accident. (Photo by Randy Montoya)

## Modeling the Fukushima accident

MELCOR code used to model accidents at Fukushima

By Stephanie Holinka

Following the earthquake and devastating tsunami last year that damaged the nuclear power complex at Fukushima, Japan, Sandia experts were asked to apply the Labs' 30-plus years of experience in modeling severe accidents to help reconstruct what happened there.

Sandia analysts say they hope the recently released "Fukushima Daiichi Accident Study" will assist researchers, operators, and regulators in understanding the accident and guide future efforts to improve reactor safety and responses to severe accidents. The work will also be used to validate the MELCOR code (a system-level severe accident analysis code developed by Sandia to help the NRC inform its decision-making process) and the Fukushima models, and suggest potential future data needs for improvements.

The project is a partnership among Sandia, Idaho, and Oak Ridge national laboratories. DOE and the Nuclear Regulatory Commission sponsored the report and have planned follow-up severe accident analyses.

Sandia began its studies of responses to severe nuclear accidents shortly after

(Continued on page 4)

## Sen. Jeff Bingaman meets with Presidential Early Career Award winner Stan Atcitty



SEN. JEFF BINGAMAN, D-N.M., sits down with Stan Atcitty (6121) to discuss Stan's work on power electronics and his outreach with the Native American community. Stan is one of two Sandians honored by President Barack Obama as recipients of the Presidential Early Career Awards for Scientists and Engineers (PECASE). Daniel Sinars (1648) also received the PECASE for his work on the study of high energy density plasma. According to the White House, the PECASE is the "highest honor bestowed by the US Government on science and engineering professionals in the early stages of their independent research careers." (Photo by Randy Montoya)

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## That's that

I'm a big Olympics fan, but I will admit to a certain prejudice toward those contests that can be timed, weighed, tape-measured, or otherwise resolved via some objective, repeatable methodology. When an Usain Bolt wins the 100-meter dash while looking back over his shoulder, he is unambiguously the fastest man alive. When Michael Phelps wins his 22nd Olympic medal (extraordinary!), he is indisputably the greatest swimmer who ever lived. And when 5-foot-tall, 123-pound North Korean On Yun Chol lifts three times his own body weight, he is clearly one of the strongest men, pound-for-pound, in the world. There's no room for doubt; you put the weights he lifted on the scale and read the results.

But when a diver from one country outscores another diver, or one gymnast defeats another, those results are based on subjective judgments. Oh, sure, the judges are sworn to be as objective as possible, but if the scores were truly objective, based on hard metrics, all the judges' scores would be the same. Indeed, if the scoring process was truly unbiased, you'd only need one judge. Because the scoring is subjective, though, there have been instances over the years of national interests driving judges' decisions; there have even been outright cases of bribery in these "soft" events. So there's sometimes this sense, when the results come in on a gymnastics competition or a figure skating championship, that the best athlete didn't win.

Such was emphatically not the case this year, though, for the American women's gymnastics team. They went out and won their gold the old-fashioned way: They earned it through a remarkable display of sheer talent, mental toughness, and a classic display of grace under pressure. No one watching the competition had the slightest doubt that the best team won. Their performance last week exemplified why I love the Olympics so.

\* \* \*

On the subject of the Summer Games and sport, the most remarkable single athletic feat I've ever seen occurred at the Olympics in Mexico City in 1968. At the time, the world record in the long jump was just over 27 feet. Bob Beamon showed up for the Games on a roll; this was his year. Having already won 22 of the 23 events he'd entered in 1968, the 22-year-old African American student was heavily favored to win the gold. And he did win, but the way he won was extraordinary, astonishing, unbelievable. On his first attempt (you get three) he soared across the pit and made a good landing. A clean jump and obviously a long one. The stadium announcer read off his distance: 8.9 meters. Beamon, as an American, didn't know the metric system. The number didn't immediately mean much to him. When fellow jumper and coach, the legendary Ralph Boston, told Beamon that, with a jump of 29 feet 2.5 inches, he had broken the existing record by almost 2 feet, Beamon collapsed in disbelief. According to a Wikipedia entry, he actually went into cataleptic shock. The photograph of Beamon with his face buried in his hands is one of the iconic images of sport in the 20th century. In this event, where the record is broken an inch or so at a time, 2 feet is preposterous, ridiculous, impossible. Except, it happened. Millions of people around the world saw it. The judges went out and measured it. And measured it again. I actually remember feeling the hairs on the back of my neck prickling when the distance was announced. I still get goosebumps when I watch the video of the jump. His leap, which remained the world record until 1991 and remains the Olympic record to this day, has defied explanation for two generations. Mexico City is at 7,000 feet; maybe the altitude was a factor. Maybe, except all of the other jumpers were bunched right around the expected 26-27-foot range. The wind? There was a breeze, but it was within the parameters allowed by the very conservative body that sets the rules for high jump records. It was a jump that just . . . happened. (By the way, in his subsequent career, Beamon never again leapt as far as 27 feet.)

\* \* \*

Which brings me to this year's Chinese swimmer, Ye Shiwen. You may have heard that the young phenom swam the final 50-meter split of her 400-meter individual medley faster than did American superstar swimmer Ryan Lochte in the men's version of the same event. It's just a reality of today's sports culture that an extraordinary accomplishment such as Ye's immediately raises the dark specter of doping. I don't know what the actual story is here. Personally, I like to believe that Ye's accomplishments in the pool are hers and hers alone, unaided and unaugmented. As I say, I don't know, but I do know this: Based on the example of Bob Beamon's incredible leap into history, I am convinced that we just don't know the limits of what people are truly capable of. Olympians remind us year after year that the edge of the envelope is a moving target: For athletes. For scientists and engineers. For artists. And for writers.

See you next time.

— Bill Murphy (505-845-0845, MS0165, wtmurph@sandia.gov)

## Labs' annual retiree social scheduled for Sept. 5

In 2011 more than 1,500 Sandia retirees and their guests attended the annual Retiree Social. The 2012 event is expected to host even more attendees, as Sandia experienced a record number of retirements in 2010 and again in 2011. More than 650 retirements were processed last year. Due to our increasing retiree population and the increased attendance at the Retiree Social, Sandia pursued several options for securing a venue for this year's event. The Albuquerque Convention Center was selected as the 2012 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. This year's event will include a presentation from senior leadership and presentations from Sandia's Corporate Archives and History Program.

When: Sept. 5

Time: 11:30 a.m.-2:30 p.m.

Where: Albuquerque Convention Center

**Note:** Sandia will also provide a park-and-ride service from Hoffmantown Church

An invitation with event details will be sent to retirees via mail in early August. Information on the California Retiree Social will be announced in a future edition of *Lab News*.

## Sandia tech showcase shines a light on research, business

By Nancy Salem

Sandia's cutting-edge research and technology will be on display at a daylong event that will also spotlight intellectual property and how to do business with the Labs through licensing, partnership agreements, procurement, and economic development programs.

The first annual Sandia Research & Technology Showcase is Sept. 12 from 9 a.m.-4 p.m. at the Embassy Suites in Albuquerque. The event is free and open to the public.

The showcase will include presentations, panel discussions, posters, and booths. Posters will focus on four broad themes: cyber research, energy security, nano and micro science and technology, and water security. Within each theme, a collection of research projects, technologies, and facilities will be featured, illustrating the range of Sandia's work from early stage research through technology deployment.



Event sponsors

The showcase is targeted to local and regional industry and academic partners. The agenda includes an overview of Sandia research and development by Labs VP of R&D and Chief Technology Officer Steve Rottler. Pete Atherton, senior manager of Industry Partnerships Dept. 1930, will discuss accessing available intellectual property. In a panel discussion moderated by Technology Ventures Corp.'s John Freisinger, several companies that have licensed Sandia technology will talk about achieving business success.

And Jackie Kerby Moore, manager of Technology & Economic Development Dept. 1933, will moderate a panel discussion featuring local businesses that have utilized Sandia's economic development programs, including the Sandia Science & Technology Park and the New Mexico Small Business Assistance Program.

Researchers and business development specialists will be on hand to discuss the showcased technology. And careers and recruiting staff will be available to answer hiring questions.

Sponsors include the city of Albuquerque, Bernalillo County, Sandia National Laboratories, Sandia Science & Technology Park, and Technology Ventures Corp. Online registration is required.

For the agenda, more information, and to register, visit [www.sstp.org/showcase](http://www.sstp.org/showcase).



## Sandia National Laboratories

<http://www.sandia.gov/LabNews>

Albuquerque, New Mexico 87185-0165

Livermore, California 94550-0969

Tonopah, Nevada • Nevada National Security Site

Amarillo, Texas • Carlsbad, New Mexico • Washington, D.C.

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**Bill Murphy**, Editor . . . . . 505/845-0845

**Randy Montoya**, Photographer . . . . . 505/844-5605

**Mike Janes**, California site contact . . . . . 925/294-2447

**Michael Lanigan**, Production . . . . . 505/844-2297

**Contributors:** Michelle Fleming (Ads, Milepost photos, 844-4902),

Neal Singer (845-7078), Patti Koning (925-294-4911), Stephanie Holinka

(284-9227), Darrick Hurst (844-8009), Stephanie Hobby (844-0948),

Heather Clark (844-3511), Sue Holmes (844-6362),

Nancy Salem (844-2739), Jennifer Awe (284-8997),

Tara Camacho-Lopez (284-8894), Jane Zingelman (845-0433),

Jim Danneskiold, manager (844-0587)

**Lab News fax** . . . . . 505/844-0645

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## UNM sponsors national security symposium

The University of New Mexico National Security Studies Program will host its annual symposium Sept. 6-7. The symposium, titled Global Trends in the Next Decades: Challenges to US National Security, will examine how global community trends are shifting and provides a view toward the year 2030. The event will include presentations by, and discussions among, top experts in the national security field. Topics include, among others, the evolution of terrorist activities in the United States; US and South Asian relationships; NATO and its role in shaping world events; cyber trends; and the changing Middle East. Sandia researcher Howard Passell will discuss the New Nexus: Energy, Water, and Environment.

"The symposium will provide a valuable policy consideration component for our students, faculty, and those involved or interested in national security issues," says Frank Gilfeather, director of the National Security Studies Program. For more information on the agenda and speakers, visit <http://nssp.unm.edu/symposium/>, or contact Candace Shirley at 505-277-3223 or [shirleyc@unm.edu](mailto:shirleyc@unm.edu)

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# 'In this building, we are all JBEIans'

## Blake Simmons reflects on five years of JBEI

By Patti Koning

Earlier this year, the Joint BioEnergy Institute (JBEI) successfully completed a renewal process conducted by DOE, and as a result was recommended for renewal through FY17 to advance the development of next-generation biofuels. JBEI was founded in 2007 with \$134 million in funding over a five year period. Sandians were invited to tour the institute this spring at open houses.

"We want everyone to know that Sandia is an integral member of a leading Bay Area scientific partnership that includes other national labs and leading universities," says Ben Wu (8634). "There are researchers and resources here that Sandians can tap into. We plan to make this an annual event."

Laura Carney (8623) attended the open house to get a feel for the research happening at JBEI. "I was very impressed with the facility," she says. "I enjoyed interacting with the staff during the tour. There appear to be many niches at JBEI but also good collaborative work."

JBEI is one of three DOE Bioenergy Research Centers (BRCs). The other two are the DOE BioEnergy Science Center led by Oak Ridge National Laboratory and the DOE Great Lakes Bioenergy Research Center, led by the University of Wisconsin-Madison in close collaboration with Michigan State University in East Lansing.



BLAKE SIMMONS, vice president of deconstruction at JBEI and a senior manager at Sandia, explains how the cohesiveness of JBEI enables better research. (Photo by Dino Vournas)

The JBEI partners are Lawrence Berkeley National Laboratory (LBNL), Lawrence Livermore National Laboratory, Sandia, University of California, Davis, University of California, Berkeley, and the Carnegie Institute for Science located at Stanford. Pacific Northwest National Laboratory will soon become the seventh partner during the renewal phase of the project. JBEI is divided into four divisions: feedstocks, deconstruction, technologies, and fuels synthesis.

JBEI is the only centralized BRC in terms of physical location. "From the proposal stage, we really envisioned this as a facility under one roof," says Blake Simmons (8630), vice president of deconstruction at JBEI and a senior manager at Sandia. "Regardless of your home institution and badge and how you are structured in the workforce, here you are a 'JBEIan,' not a Sandian at an offsite location."

This made an impression on many of the attendees. "It is very refreshing to see how people from different



DOMINIQUE LOQUE, director of cell wall engineering at JBEI (second from left), explains the different plants growing in one of JBEI's greenhouses to Ken Wu (8533), John Dec (8300), Michelle Hekmaty (8656), and Mark Allendorf (8600). (Photo by Dino Vournas)

universities and national labs are working together under the same roof to advance this field and accelerate the commercialization of biofuels," says Karla Reyes (8223).

Of the approximately 190 people working at JBEI year-round (summer brings an influx of some 40 interns), about 30 are from Sandia. "We are the second largest in terms of staffing, with people working in deconstruction and cross-cutting technologies," says Blake. "Sandia brings to the enterprise expertise in advanced imaging, microfluidics, and engineering."

Having the entire JBEI staff together under one roof enables seamless integration through every step of research, from feedstocks to fuels. "When the feedstocks team makes their lignin mutants, they can give it to the deconstruction team to generate sugars, and then they hand it off to the fuel synthesis team to see how it produces fuel," says Blake. "This is very enabling."

An example of this synergy is last year's breakthrough in engineering strains of *Escherichia coli* bacteria capable of digesting switchgrass biomass and synthesizing its sugars into gasoline, diesel, and jet fuel. This work was reported in a paper, "Synthesis of three advanced biofuels from ionic liquid-pretreated switchgrass using engineered *Escherichia coli*," published in the *Proceedings of the National Academy of Science*.

"This was a landmark publication that shows how at JBEI we can fit the pieces together toward this outcome of feedstocks to fuels," says Blake.

### Drawing a bead on the problem

The integration among research groups also helped when the deconstruction team hit a problem with an ionic liquid pretreatment process using reduced temperatures, something they thought would prevent spontaneous degradation.

"Along the way we found that ionic liquids are extremely inhibitory to normal organisms, so we had to develop a better process to separate the ionic liquid

from the organisms," Blake says. "We also developed biocompatible ionic liquids and organisms that tolerate them better. If we were separate, it could have taken years to get to that point but within six months we had drawn a bead on the problem. Solving this really impacted our research program."

Another distinguishing feature of JBEI is the handling of intellectual property (IP). "All partners ceded control of IP to Lawrence Berkeley," says Blake. "This has had an incredible impact on our commercialization effort. Over the four years I've been around, there have been 100 invention disclosures, half of which of have been converted into patent applications, and half of those are already under negotiation to be licensed to industry."

The Sandia visitors toured labs in each of JBEI's four divisions. On the May tour, they also saw the new LBNL Advanced Biofuels Process Demonstration Unit, a new DOE-funded facility that is designed to help expedite the commercialization of advanced next-generation biofuels by providing industry-scale test beds for discoveries made in the laboratory.

## Sandia California News

### Daniel Dedrick receives DOE award for outstanding technical contribution

At the Annual Merit Review and Peer Evaluation meeting in Washington, D.C., in May, the DOE Hydrogen and Fuel Cells Program presented Daniel Dedrick (8367) with a Sub-Program Award for outstanding



DANIEL DEDRICK

technical contribution in Hydrogen Safety, Codes, and Standards. Each year Hydrogen and Fuel Cells presents Program Awards for contributions to the overall efforts of the Program, and Sub-Program Awards to recognize achievements in specific areas.

Daniel directed a team responsible for providing the technical basis for domestic and international codes and standards needed for the safe deployment of hydrogen technologies. He and his team also developed advanced testing methodologies to enable better understanding of accelerated embrittlement and fatigue due to hydrogen's effects on materials. Sandia was key in advancing the scientific understanding and developing and validating the engineering needed to establish a risk-based approach for defining safety distances for bulk gaseous hydrogen storage at fueling stations and other facilities. This risk-based approach was incorporated into the National Fire Protection Agency's Hydrogen Technologies Code.

## Sandian Maynard Holliday receives 2012 President's Volunteer Service Award

Maynard Holliday (8112) has received the 2012 President's Volunteer Service Award [<http://www.presidentialserviceawards.gov/>]. Presented by the Corporation for National and Community Service, the award came with a certificate and a letter from President Barack Obama. Maynard was recognized for his work as a volunteer teacher at Oakland's Elmhurst Community Prep Middle School, where he applies his technical expertise in leading an after-school robotics program through Citizen Schools.



MAYNARD HOLLIDAY

"In my Inaugural Address, I stated that we need a new era of responsibility — a recognition on the part of every American that we have duties to ourselves, our nation,

and the world," wrote President Obama. "These are duties that we do not grudgingly accept, but rather seize gladly, firm in the knowledge that there is nothing so satisfying to the spirit than giving our all to a difficult task."

"Your volunteer service demonstrates the kind of commitment to your community that moves America a step closer to its great promise."

"Although it's a great honor to receive this recognition from the president, ultimately it's not the reason I choose to devote my time to the children of East Oakland," says Maynard. "These children are America's and California's future and need to be motivated at an early age and shown that pursuing careers in math and science can be both cool and fun."

Earlier this year, Maynard was named Volunteer of the Year by Citizen Schools California for his work at Elmhurst. (See the Feb. 10, 2012, issue of *Sandia Lab News*.)

# New Northrop Grumman, GE umbrella CRADAs tap wide range of Sandia expertise

By Nancy Salem

Sandia has signed a pair of cooperative research and development agreements (CRADAs) that could broadly add to the Labs' research into such fields as combustion, defense systems, and nuclear security.

The umbrella CRADAs, which cover multiple projects in a variety of categories, are with Northrop Grumman Information Systems and General Electric Global Research.

"These are strategic agreements envisioning long-term partnerships," says Brooke Garcia (10012), who helped negotiate them.

Sandia has had a standard CRADA, which covers a specific scope of work, with Northrop Grumman Information Systems since 2007. And the Labs has existing CRADAs with the company's Aerospace Systems and Electronic Systems divisions.

"Northrop Grumman is a longtime Sandia partner," Brooke says.

The new Information Systems CRADA is an umbrella covering a wide range of potential research designed to enhance defense systems technologies through collaborative R&D in engineering sciences, modeling and simulation, intelligence systems, and infrastructure and nuclear security, and by evaluating energy and climate factors domestically and abroad. The agreement says the primary goal of the collaboration is to improve national security.

"The collaboration so far has been extremely successful," says Alex Tappan (2554), principal member of Sandia's R&D staff who has done Northrop Grumman project work.

Potential research categories included in the CRADA are engineering sciences for defense systems and technologies; modeling and simulation for defense systems and technology; intelligence systems and assessments; energy, climate and infrastructure security; international, homeland, and nuclear security; and advanced manufacturing and technology maturation.

"Northrop Grumman looks forward to many collaborative opportunities and a



long and productive working relationship with Sandia," says Eric Sepp, a Northrop Grumman program manager.

The GE agreement replaces a decade-old umbrella CRADA that expired last year. "Rather than extend the old one, we took the opportunity to negotiate an updated agreement that supports current missions as well as mutual goals for future innovation," Brooke says.

The agreement states that Sandia and GE will "cooperatively engage in analytical studies, research, and development of a diverse set of energy-related topics with a goal of accelerating the understanding and development of new energy systems required to transition away from a hydrocarbon based economy to carbon-neutral energy sources."

The scope of the partnership encompasses a variety of technical categories including combustion; thermal management; aerodynamics; systems engineering, economic, and life-cycle analyses; computational simulations; energy storage; sensors and optical diagnostics; fossil energy; renewable energy; nuclear energy; and advanced materials.

Sandia supports DOE research and development aimed at moving the US toward a new energy economy, Brooke says. The Labs' goal is to ensure a secure and sustainable energy supply, safe and resilient delivery infrastructure, and clean and efficient use of energy resources.

The agreement says Sandia and GE as partners can leverage the Labs' expertise in systems-based science and engineering with GE's skill in energy systems to accelerate understanding and development of new energy systems. GE brings to the collaboration a business-driven perspective to evaluate the likelihood of success or failure of energy alternatives.

"Sandia's robust and broad-based energy program includes a multitude of innovative research and development programs that can be leveraged in pursuit of the goals of the nation and GE," the agreement says.



## Fukushima

(Continued from page 1)

the Three Mile Island incident in 1979 that radically altered the future of nuclear power in the United States.

To model the Fukushima accidents, Sandia and Oak Ridge staff used the MELCOR code, which models an entire nuclear power plant, from the nuclear fuel rods to the reactor plumbing, the containment building out to the environment, and includes effects of safety systems and operator actions. Based on the state of a power plant just prior to an accident or other event, MELCOR calculates a simulation of the accident's progression.

The Japanese government publicly released information about the design of the reactors and operator actions, which Sandia analysts used to develop input for the MELCOR code for each of the accident scenarios. This became the basis for the Fukushima Daiichi Information Portal, which Idaho National Laboratory developed for the US laboratory team and as an archive for use by future researchers. Existing MELCOR models for similar US reactors were used as templates to develop Fukushima-specific models of the Unit 1, 2, and 3 reactors and spent fuel pool 4.

Randy Gauntt, manager of Severe Accident Analysis Dept. 6232, which develops and implements the MELCOR code, says MELCOR allows researchers to analyze and understand what happens during a severe nuclear plant accident. Such studies support the development of advanced accident management and mitigation strategies, and improvements to reactor designs.

"On the whole, the MELCOR simulations have been found to replicate the observed events," Randy says.

"And the Fukushima events are exactly why we model low-likelihood accident sequences: to help understand the progression of serious accidents and, we hope, aid in preventing them from happening."

Randy thanked the Japanese government for the opportunity to support the global response to the accident, and for Japan's proactive role in sharing data about the accidents. He says Japan's cooperation will advance the international nuclear industry's understanding of what happened and expand its knowledge as the industry moves forward. Randy and his colleagues expressed their deepest sympathies for the Japanese people in this time of great national tragedy, and he says he hopes the modeling and analyses will support recovery activities in Japan.

Sandia serves as NRC's principal contractor for severe reactor accident research and has provided regulatory research support for more than 30 years. Sandia's MELCOR code is used by regulators in more than 27 countries, including the United States and Japan, for computational analysis of severe reactor accident progression and modeling of off-site consequences.

Research analysts will continue to work on the Fukushima accident using their MELCOR models so they can continue learning more about what happened.

## What happened at Fukushima?

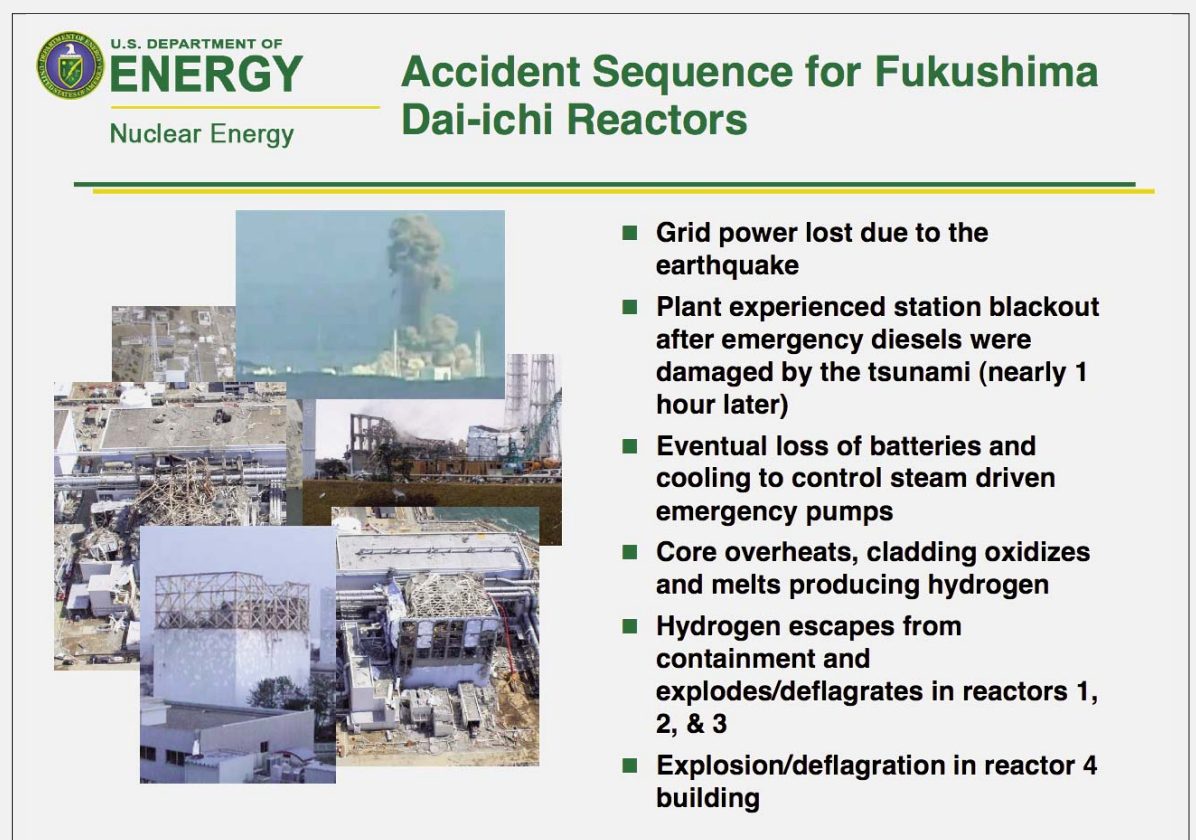


Chart information above from DOE report of June 15, 2011, titled, "DOE Response to Fukushima Dai-ichi Accident"

*Note: The following information is adapted from the introduction to the recently released Fukushima Daiichi Accident Study.*

Japan suffered an immense tragedy as a result of the 2011 Tohoku earthquake and resulting tsunami that caused widespread damage to the infrastructure of the country and more than 20,000 deaths, most from the tsunami.

The earthquake resulted in a scram (an emergency reactor shutdown) and a regional loss of electrical power, requiring the Fukushima Daiichi power plants (Units 1, 2, and 3) to start emergency on-site diesel powered generators to maintain cooling at the plants. Unit 4 was defueled at the time for maintenance, and Units 5 and 6 were in a state of cold shutdown for maintenance.

The tsunamis produced by the earthquake flooded buildings, resulting in the loss of emergency diesel-powered AC generators and producing conditions known as Station Blackout (SBO). DC power was also lost at Units 1 and 2. Units 1, 2, and 3 were effectively isolated from the ultimate heat sink (the ocean), and the emergency cooling systems eventu-

ally failed; each of the three units subsequently suffered core damage of varying degrees as a result of loss of water level in the reactor cores.

With no way to reject the decay heat from the reactors, the suppression pools quickly became thermally saturated. This produced pressures in the containment vessels that eventually exceeded their design pressures. Containment venting was attempted. However, due to difficulties in accessing and operating vent valves, venting was either unsuccessful or delayed.

Ultimately, the containment systems leaked, failed, or were intentionally vented, resulting in the release of radioactivity to the reactor buildings and the environment. Combustible gasses produced from the core damage and molten core-concrete interaction accumulated in the Unit 1 and Unit 3 reactor buildings, causing explosions and destruction of portions of the buildings.

Collectively, the accidents likely reflect varying degrees of core/reactor damage and are therefore an invaluable source of information that can validate/confirm the current understanding of severe reactor accidents and provide new insights.

# Doing science at the top of the world

(Continued from page 1)

The time- and location-stamped data — collected every 10 seconds as the balloon soars upward — will be radioed to a receiving antenna at the test facility, and from there electronically to the ARM central Alaskan facility — an unpretentious one-story duplex a few miles away in Barrow. Along with other data collected at the wind-swept, often snowed-in research site, which operates under the aegis of DOE's Office of Science, the information also helps calibrate satellite measurements of Earth's atmosphere, providing reality checks to the remote sensor inputs received from space orbit.

## Calibrating satellite observations

These inputs are electronic zeroes and ones to which human beings assign meanings. Atmospheric measurements secured and analyzed, on the other hand, provide hard data against which satellite observations can be calibrated, improving their accuracy and reducing another possible source of error in climate computer models.



MARK IVEY (6913) points to an X-band precipitation radar on the roof of the Barrow Arctic Research Center in Barrow, Alaska.

I am down on one knee with my camera ready, about 12 feet below the deck where Mark is standing. The balloon should bolt out of its chamber at 5 meters per second — “It pops up and goes pretty fast,” Mark had warned — and there would be no do-overs until 12 hours later if I miss its emergence. I don't think

an evening shot would prove any easier and, because we are leaving early the next morning, a return to the site might prove difficult. So I stay down, the knee of my pants leg soaked in the melting permafrost of late spring (the top layers of permafrost evidently are not so permanently frosted), waiting at a spot I had marked on an earlier walkthrough with a quarter and a white bit of found paper glaringly evident as a marker in the still-brown short tundra grasses. (The paper, I later found out, had arrived on the site with one of Mark's two very capable Inupiat assistants. They help maintain the ARM facility year-round as Mark and guest researchers cycle back and forth from the Lower 48.)

Two metal petals of the machine's business end had opened a few minutes earlier like a huge mechanical rose, indicating its sensors had determined wind speeds to be low enough to make a balloon launch feasible. At 9:31 a.m., the remaining two petals should open, releasing its 3-foot diameter, helium-filled balloon.

A mile or so distant, the white radar domes of the



THEY WENT TO ALASKA — Sandians, from left, Center 1400 Director Rob Leland, Jerry Peace (2721), Div. 8000 VP Rick Stulen, Center 6900 Director Marianne Walck, and ARM facility manager Mark Ivey at a pipeline pumping station on Alaska's North Slope.

US Air Force Point Barrow Long Range Station are watching for planes or missiles on their way over the North Pole, some 1,300 miles to the north. A DOE radar dome and several slender, heavily instrumented towers stand nearby, also managed by Mark, taking moment-by-moment data from a variety of ground- or tower-based sensors on humidity, methane, CO<sub>2</sub>, wind velocity, ground infrared (heat) emissions, and microwave energy from the sky, all transmitted electronically to a computer at ARM's home base. Nearby, sensors in facilities run by NOAA and by the US Geological Survey gather complementary geophysical data that includes precise measurements of the Earth's magnetic field and concentrations of greenhouse gases in the atmosphere.

“People had mentioned to me that they thought our operation would fade away,” Mark had said in his reflective, soft-spoken way. “But because of the quality of the data and its ability to provide information about important topics in a trustworthy way, funding has actually increased. The program could be around for a long time to come.”

## Balancing multiple interests

That is, of course, if Mark and his colleagues can continue balancing the interests of federal and state agencies, the local electric utility, and the native corporation that manages land in and around Barrow. One of Mark's pressing tasks when I visited was to finalize agreements in the community for living quarters and meeting space for the scientists who come from elsewhere to do technical work. This had become particularly urgent because of rumors that a major oil company might soon move ahead with off-shore drilling immediately north of Barrow. Housing, office, and lab space, already scarce in the village, could become even harder to find, causing lease prices to rise dramatically — a big worry in economically challenging times. The uncertainty has sent mixed messages to the electrical co-op about where to install new utility lines needed for the scientific effort.

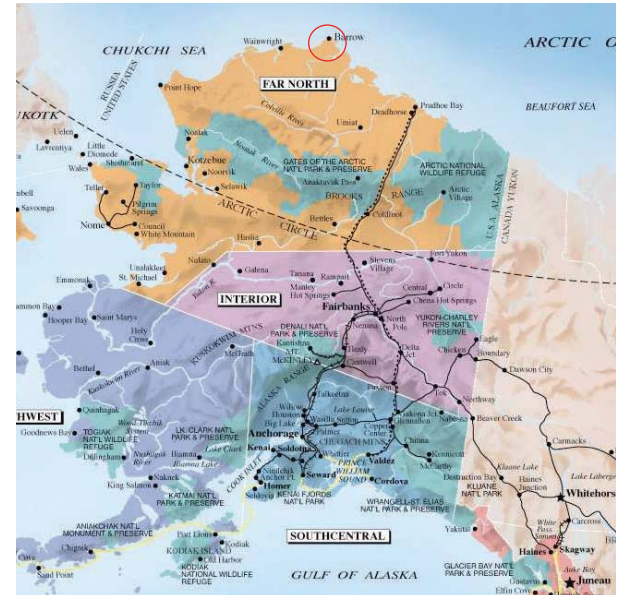
The scope of the human, technical, and regulatory problems facing Mark as ARM representative reminded me of a statement Sandia's president is fond of making: “Sandia doesn't do easy,” Paul Hommert has said, “Sandia does hard.”

That certainly seems the case here.

## The balloon site's data streams

are available electronically to labs and modelers around the world interested in honing their computer simulations with exact ongoing information on the Arctic climate, thought to be a precursor and influencer of the rest of the slower-responding world. Among the reasons for this are the clear window to space for outgoing radiation provided by the very dry atmosphere, and the expansion or contraction of the polar ice sheet. The latter causes large changes in surface sunlight reflectivity and regulates how much solar energy is absorbed by the darker ocean water. In addition, measured trends in the extent of Arctic ice indicate the Arctic will likely be ice-free in summer within the next few decades. At what rate is the far north climate warming, and why? Up here in permafrost land is the data that may help decide these issues.

Among the site's findings to date has been that the Arctic's very cold clouds fill with supercooled liquids rather than ice particles. This difference has a big impact on the amount of heat entering or leaving Earth's surface, says Hans Verlinde, a meteorology professor at Penn State and site scientist for the ARM



AS FAR NORTH AS YOU CAN GET and still be in the US. DOE has maintained its climate research facility on the North Slope of Alaska in Barrow (circled in red, above) since 1997. (Map courtesy of State of Alaska)

program. In the Arctic, where clouds help warm Earth's surface instead of cooling it, they do this more effectively with liquid in the clouds instead of solids, an important clarification for climate models.

## New facilities on tap

Information like this is so desirable that the Office of



INSTRUMENT SHELTERS and new radar are part of the ARM facility near Barrow.

Science has allocated additional funding during the next two years through its Biological Environmental Research (BER) arm to build new facilities and buy equipment for another ARM site. Also to be managed by Sandia, it will be constructed 166 miles away at Oliktok Point, a spit of land that borders directly on the Arctic Ocean. The property is owned by the Air Force, which has been required by federal mandate to reduce its landholdings in Alaska. Part of its station may be transferred to other federal agencies, the state of Alaska, or a native corporation. The idea from the scientists comprising the Barrow ARM group is to install a ground station of four prefabricated buildings and stock it with Doppler and high-spectral-resolution lidars, radar, and radiometers, along with meteorological equipment and other sensors. More important, an abandoned Air Force hangar a hundred yards away would shelter DOE unmanned aerial vehicles (UAVs) expected to fly through air space almost empty of civilian or military traffic from the Point to the North Pole, about 1,400 miles away, for additional atmospheric data collection. The UAVs would be operated by DOE with university partners.

“Routine measurements of the Arctic atmosphere would be very valuable in understanding it,” Mark says, “and the ground station would be helpful in understanding cloud processes. But UAVs and balloons are ways to get at atmospheric structure that currently are poorly represented in our models.”

Oliktok Point has another advantage: It's on a major north-south road (the “haul road” used by ice

(Continued on page next page)



SUMMERTIME, AND THE LIVIN' IS EASY— A caribou munches on June vegetation on the peninsula bordering Prudhoe Bay.



ONE OF THE GIANT OIL processing plants bordering Prudhoe Bay. Although fewer than 2,200 people live in the region permanently, several thousand transient workers support the area's oil fields.

## Looking at clouds from both sides now

*(Continued from preceding page)*

truckers on a popular reality TV show) that ends in the assorted collection of workaday buildings known as Deadhorse, an entrance point to Prudhoe Bay oil rigs. In fact, the flat peninsula that ends at Oliktok Point is eerily dotted with enormous facilities built every few miles by oil companies. The companies require personnel and heavy equipment brought in year-round to process oil to put into pipelines that send the precious fluid south.

### Food delivery by barge

Though Barrow is a real community rather than the expanded truck-stop facilities that comprise Deadhorse, one of its limitations is that equipment, materials, fuel, and food arrive by barge from Seattle only once a year, though smaller items can be flown in.

The existence of the Oliktok research station depends on Mark's ability to get the Air Force, the Federal Aviation Administration, the Inupiat, federal and state land offices, and the oil companies of the Prudhoe peninsula to agree. He needs power lines and building leases from the native corporation that oversees Barrow, site licenses from government organizations, Air Force permissions, and oil company concurrence for access to the road system in Prudhoe Bay. Finally, the land may have been polluted by previous users; if ARM purchases it, or just takes it over with the Air Force's blessings, who is responsible for cleanup?

"What do you do when you clean up one year and next year something else leaks out?" says engineer Jerry Peace (2127), a member of the North Slope team at Sandia. "Residual pollution requires ongoing inspections."

"It was enlightening to see the complicated maze that must be negotiated to create the new Oliktok Point site and UAV capability," says Center 6900 Director Marianne Walck, who has made the trip north as part

of a Sandia delegation that includes Division 8000 VP Rick Stulen and Center 1400 Director Rob Leland. Marianne adds that "Rick, Rob, and I are working on ideas on how to find funding so we can increase the scientific impact from our activities there."

How does Mark, an electrical engineer by training, develop these negotiating, managerial, and leadership skills? It seems to an observer, after spending a few days on site, that Mark's endless negotiations resemble someone climbing up a sandstone cliff, the sand falling

**The full-time Sandia North Slope team** consists of Valerie Sparks (10669), Jeff Zirzow, Fred Hesel, and new member Dan Lucero (all 6913). Jerry Peace, Darin Desilets (6913), and Joe Hardesty (6823) lend their talents part-time to work with the new mobile facility. "We are fortunate that they can make time to help us," says Mark Ivey.

In Barrow, the Inupiat Corporation's Walter Brower, Jimmy Ivanoff, and Jimmy's son Josh Ivanoff help run the ARM facility. In Atqasuk, a small village south of Barrow, an ARM facility there investigating sea ice and precipitation is headed by Inupiat contractor and town mayor Doug Whiteman.

The North Slope Borough (itself bigger than 39 of the 50 US states) and the town of Barrow which is its seat "are not only terrific hosts," says Mark Ivey, researcher and station manager, "but they actively support science in the area through things like the Barrow Environmental Observatory and the Barrow Arctic Research Center." The huge borough's population is less than 10,000 people.

Last but not far from least, says Mark, "The whole enterprise owes a lot of thanks to the Office of Science's Biological and Environmental Research team."

away as he tries to climb. But Mark, who speaks slowly and has the endearing quality of pausing after anyone addresses him to make sure he understands the point, shrugs and smiles. "I'm a lucky participant and partner in science," he says quietly. "I am also part of a great team of people. This work would be impossible without them."

### Low-key approach successful

Thus far, his continuous low-key negotiations have been successful in moving the work forward at Barrow and Oliktok Point.

"The work on the North Slope is producing uniquely important measurements that will enable vast improvements in today's evolving climate models," Rick says. "There will be increased confidence in model accuracy in predicting the actions of nature. My reason for taking this trip was to get a first-hand look at the operational conditions for Sandians working in Barrow and eventually Oliktok Point and to gain a better understanding of the strategic importance of our work in this remote location. I came away impressed."

He also was impressed by the petroleum industry. "I was really taken by the enormous oil industry infrastructure in Prudhoe Bay and the Alaska pipeline that provides for something like 15 percent of US petroleum — quite an engineering feat!"

Rob says, "What stood out for me most — in addition to the vastness, the remoteness, and the fascinating mix of subcultures that has developed out of that isolation — is the enormity of the scientific opportunity in the Arctic. Researchers believe that the effects of climate change are amplified substantially in the Arctic, and yet comparatively little is known about the specifics. By combining the data coming from our ARM program with satellite data and the proposed UAV data with the new generation of high-resolution climate models we are developing, it should be possible to

*(Continued on next page)*

## Life in a land of light and darkness



There is an old song about "that lucky old sun [who] has nothing to do, but roll around Heaven all day." At Barrow, for six months the sun rubs in its ability to loiter around by never leaving the sky. Don't think children's stories about Eskimos in fur parkas in the Land of the Midnight Sun. Think of working till 5 p.m., eating dinner, then answering email and making further calculations, knowing it will be dark by the time you're through and sorry not to see a bit of the late sunset. But when you close your laptop and look outside at 10 pm, it is as light as day. The brightness is disconcerting yet somehow relieving, because you feel that after all, you have plenty of time left before dark. Your mind knows you still have to get up at, say, 7 a.m., but you work on a little longer because it's oddly comforting that the Earth's source of light and heat has said, in effect, "Worry not. I will be here for you all night." At 2 in the morning, it is still broad daylight outside your window. There are no visual cues to sleep. Only the will to use blackout shades enables a visitor to rest.

This situation of six months of sun alternating with six months of darkness creates unique opportunities and difficulties in collecting radiance information

from water molecules — otherwise known as the brightness of the sky at microwave frequencies. Microwaves reveal details of cloud structure and formation, an important component of the Arctic science enterprise. To turn the 24-hour sunlit days into an advantage, a sensor station is being installed by ARM directly at isolated Barrow Point on the Arctic Ocean. The idea is to analyze ocean breezes unpolluted by land emissions. Though impractically far from powerlines, the station should be useful for the six months between March and October because its observations will be powered by solar panels fed by the 24-hour sun.

"There is a solar resource out there," says Mark Ivey, researcher and station manager. "Some people are surprised to learn that solar is used extensively in Alaska for remote instrumentation. The resource is, of course, more seasonally dependent than in the lower 48."

For this reason, another difficulty: Mark has created a list of instruments that must be removed early in the polar night, typically the beginning of October, and reinstalled in late March.



JIMMY IVANOFF left, and WALTER BROWER tend the office area of the Barrow ARM duplex. The pair keep the office stocked and help transmit electronic data to researchers around the world.



UTILITY CORRIDOR AT BARROW, set high above the ground for the former Naval Arctic Research Lab, now provides service to ARM and other parts of Barrow. Utilities are routed above ground for easy access and are heated in winter. The ground is frozen too solid for winter access to buried lines.

## North slope

(Continued from preceding page)



AUTHOR NEAL SINGER, camera in hand, on an ice flow in the shallows of the Arctic Ocean. (Photo by Mark Ivey)

greatly advance our understanding of what is really happening there.

"Add to the mix that it is clear that there are a host of critical national security issues at stake in the arctic — new shipping routes, new access to resources, new operational demands on the military to name a few — and you get a sense of the significance of the opportunity. We are just now developing our ability to work across that entire spectrum, and of course we need to do that in close partnership with many other agencies and institutions, but the prospect of Sandia being centrally engaged in addressing the arctic challenge is just tremendously exciting to me."

One underutilized factor that could help advance Sandia's Arctic research are the facilities and personnel at the University of Alaska at Fairbanks, where the Sandia visitors spent most of their first day listening to technical presentations featuring the capabilities of that institution.

As Jerry Peace — whose master's degree in geophysics from the University of Alaska (U of A) in 1979 included being treed by a grizzly when he went looking for mineral deposits in the brush on an industry-sponsored summer project — says, "The U of A's Geophysical Institute, established by Congress in 1946, studies a spectrum of geophysical processes ranging from the

center of the earth to the center of the sun. It has infrastructure in place and an international reputation for studying the physical environment of the Arctic. Partnering with them could be useful in furthering our state and national needs."

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**The balloon-launch station** is a robotic marvel. Twenty-four balloons at a time can be stacked on a conveyor belt. A half-hour before lift-off, the lead balloon is automatically chambered and inflated by the helium-filled canisters.

But by 9:36 a.m., no balloon has emerged. "Something's wrong," says Mark, and we travel in the project's Suburban the few miles back to the one-story building housing the project's headquarters. There, Jimmy Ivanoff, hired as a technical aide from the Inupiat native corporation that runs Barrow, looks at the automatically collected data in the duplex's office and erupts, "Damn, that thing has worked without a flaw for months. On the day we have a visitor, it fails!"

A balloon apparently was not loaded in the morning's chamber casing. The chamber's sensors, detecting the absence, prevented the structure from opening and essentially shooting a blank.

"Fortunately, experts from the vendor are on their way here," Mark said. "At least once or twice a year we bring someone here from there to check it out."

I remember what Mark told me before we left: "It's Alaska. Expect delays and keep your sense of humor."

I have one more chance to photograph the rising balloon before leaving early the next morning. Because it's late spring in Alaska, I realize the sun won't set tonight. I look at Jimmy poker-faced and say, "As long as you can fix the problem before nightfall, we can try again."

He looks at me, as does the Inupiat station manager Walter Brower, to see if I am kidding. "I guess I can," Jimmy says finally, "seeing as how it won't be dark for weeks." We all laugh.

That evening, promptly at 9:31 — my last photo opportunity before leaving Alaska — the balloon takes off like a sprinter into the atmosphere. I have to estimate when to press the shutter button, because I find it takes almost two seconds for my camera to agree to snap a highly pixelated shot. I get the shot, but with the balloon not quite fully airborne.

Nothing about any of this seems easy.



BIG PLACE IN A BIG SPACE — Jerry Peace, left, and Mark Ivey offer size perspective to an abandoned Air Force hangar only a few hundred yards from the Arctic Ocean at Oliktok Point. Mark is negotiating with a private company in Deadhorse, located at the beginning of the peninsula, for a hangar fall-back if complexities make use of the Air Force hangar too difficult.

## The simple bear necessities, Alaska style

Polar bears complicate data collection. Many decades ago, when the Inupiat lived in sod homes cut from tundra, with whale bones across the wall tops serving as support for tundra roofs, they were sometimes hunted by polar bears for food.

There are an estimated 20,000 polar bears in the Arctic worldwide, and they are excellent predators. Says Walter, "When they hunt you, they are always downwind, and they are very hard to see."

For this reason, and because an adult bear can stand 8 feet tall and weigh a thousand pounds, Walter Brower rebuffed the idea proposed by US administrators some years ago that as escort he could protect himself by carrying a large spray can of Bear Off, touted as a repellent and containing capsicum (the irritant in green chile). It would be, he was told, a more humane and less prone-to-accident bear guard.

But Walter, an Inupiat native, prefers — he's very frank about this — a shotgun. He says, "I'm not putting my life on the line, maybe spraying into the wind."

He has his wish. Because of the hazard from bears — serious carnivores capable of hunting humans — DOE has permitted guides accompanying researchers the extraordinary measure of carrying single-barrel pump-action shotguns with six-shot clips.

But the weapons don't arrive with the fabled simplicity of the Old West, with every man his rifle and the law a hundred miles away.

The first Sandia policy is avoidance. When an agency notifies Walter that bears

have been seen in the research area, he calls scientists in the field back to the duplex base. They may have to wait a day or two — or even three — before resuming their work. Because of Sandia's caution, no guide in the program has ever had to shoot a bear. But someday it might be necessary. So there is the training.

Walter (and anyone else certified to handle a shotgun on site) has to be flown to Fairbanks, 500 miles away, to be trained because soft lead bullets are considered an environmental hazard and Barrow has no cleanup facilities.

He must be able to place five shots in a one-foot square target pulled toward him by a pickup truck approaching at 25 miles an hour, approximately the speed of an on-rushing bear. (This is roughly the speed of the world's fastest human sprinters.)

"It's hard," says Walter, "but a lot harder when it's an actual bear."

Sandia procedures are that the bullets must be discarded every two years to be certain the gunpowder is fresh, and shotguns professionally checked and refurbished every year by a certified armorer at Sandia. Walter likes these precautions because, he says, "I don't like the idea of a gun jamming when a polar bear rushes me." He maintains a register with times and dates of everyone who has ever been assigned a shotgun.

Says VP Rick Stulen, "The training and safety preparation for staff working at these locations is excellent, beyond what I was expecting."



INUPIAT CORP. employee Walter Brower holds a shotgun used for polar bear and wildlife defense.

# Sandia Health Partner Network Cardiac Care offers quality and choice for participants

The Sandia Health Partner Network (HPN) is an additional network option provided to Sandians enrolled in Sandia Total Health Blue Cross Blue Shield of New Mexico (BCBSNM). The Sandia HPN includes Lovelace Health System, along with the physician group ABQ Health Partners, and approximately 250 additional independent community physicians.

## Are you enrolled in Sandia Total Health UHC?

Your provider may also be a part of the Sandia Health Partner Network. Visit [www.SandiaHPN.com](http://www.SandiaHPN.com) and click Provider Search. Switching to Sandia Total Health BCBSNM could potentially save you a lot of money in 2013.

The Sandia Health Plans Team will publish articles in the *Lab News* throughout the next few months highlighting different vendors participating in the HPN. This first article focuses on the cardiac and stroke care facilities that are a part of the HPN — Lovelace Medical Center, Heart Hospital of New Mexico at Lovelace Medical Center, and the New Mexico Heart Institute.

## Heart Hospital of New Mexico at Lovelace Medical Center

The Heart Hospital of New Mexico at Lovelace Medical Center is an Accredited Chest Pain Center by the Society of Chest Pain Centers. Heart Hospital's Chest Pain Center has also received full Cycle II accreditation with PCI from the Society of Chest Pain Centers. To receive the accreditation, the Heart Hospital's Chest Pain Center had to demonstrate expertise in a number of areas, including: assessing, diagnosing and treating patients quickly; effectively treating patients with low risk for acute coronary syndrome and no assignable cause for their symptoms; and continually seeking to improve processes and procedures.

Purchased by Lovelace Health System in 2011, the Heart Hospital of New Mexico at Lovelace Medical Center offers a broad range of cardiac services, from wellness programs, clinical dieticians, and diagnostic testing to cardiovascular surgery and rehabilitation

after a heart attack. Its cardiologists, cardiothoracic surgeons, vascular surgeons, and interventional radiologists offer treatment options for all types of heart and vascular conditions.

The Heart Hospital of New Mexico uses advanced surgical technology and comprehensive diagnostics, including 24/7 catheterization labs and vascular coverage. Its physicians focus on precise diagnosis, medical management and endovascular treatment to reduce the number of amputations in New Mexico. It also offers electrophysiology labs, dedicated cardiovascular operating rooms and outpatient rehabilitation programs.

For more information, please visit <http://www.lovelace.com/hearthospital>.

## Lovelace Medical Center

Lovelace Medical Center has received the Joint Commission's Gold Seal of Approval for certification as a Primary Stroke Center. Lovelace Medical Center has also received the American Heart Association/American Stroke Association's Get With The Guidelines® Stroke Gold Plus Quality Achievement Award. This award recognizes Lovelace Medical Center's commitment and success in implementing a higher standard of stroke care by ensuring that stroke patients receive treatment according to nationally accepted standards and recommendations.

Lovelace Medical Center offers a 12-bed dedicated stroke unit with 24/7 neurology and neurosurgery coverage. Its stroke team consists of neurologists, with spe-

## Meds-to-Beds Program

Lovelace Pharmacy delivers medications to Sandia patients at their bedside before they are released from Lovelace Medical Center, Heart Hospital of New Mexico at Lovelace Medical Center or Lovelace Rehabilitation Hospital. Lovelace Outpatient Pharmacy staff meets you at your bedside to go over medications before you are discharged. This way, you do not need to stop at a pharmacy on your way home to fill a prescription and are able to start your medication as soon as you get home without interruption.

cial training in stroke diagnosis and treatment, Emergency Department physicians, registered nurses, respiratory therapists and Emergency Department staff.

## New Mexico Heart Institute

The New Mexico Heart Institute (NMHI) has received accreditation by the ICACTL (International Commission for the Accreditation of Computed Tomography Laboratories) and the ICAEL (Intersocietal Commission for the Accreditation of Echocardiography Laboratories). NMHI has also been granted accreditation in the area of Adult Stress and Adult Transthoracic by the ICAEL (Intersocietal Commission for the Accreditation of Echocardiography Laboratories).

NMHI practices state-of-the-art medicine by employing the latest cardiovascular imaging and fully integrated interventional, cardio-thoracic, and vascular surgical service approaches. NMHI's services, a number of which are conducted in conjunction with the Heart Hospital of New Mexico, located next door, address a full-range of preventive, diagnostic, treatment, surgical, and rehabilitation needs.

## NMHI providers include:

### Cardiology

Fundador Adajar, MD  
Gretchen Bailey, PA-C  
Mark Bieniarz, MD  
Mihaela Bujoi, MD  
Michael Carpenter, PA-C  
Brendan J. Cavanaugh, MD  
Elicia Crespín, PA-C  
Diana Darabant, CNP  
Howard Diaz, PA-C  
Ross Downey, MD, MS  
Robert E. Federici, MD  
Mary Frankis, MD, PhD  
Charles Kim, MD  
Geoffrey A. Kunz, MD  
Erica Lopez, PA-C  
William Mansfield, MD, MPH  
Sean Mazer, MD, FHRS  
Robert C. Orchard, MD  
Mel Peralta, MD  
Donna Pham, PA-C, MPAS  
Anita Ralstin RN, MS, CNS, CNP  
Barry Ramo, MD  
Adam Ronan, MD  
Seema Sabu, PA-C  
Sharon Schaaf, DNP  
Karen Sopko, MD  
Brad Stamm, MD  
Kimber M. Stout, MD  
Jay Tiongson, MD  
Geri Vigil-Bartels, CNP  
Chris Wyndham, MD  
Howard S. Zeman, MD  
Mark Zolnick, MD

### Surgery

Brian Castlemain, MD  
Richard L. Gerety, MD  
Steve Henao, MD  
Paul Levy, MD

For more information, please visit [www.nmhi.com](http://www.nmhi.com).

## Sandia HPN Provider Lookup

In addition to all of the providers in the New Mexico Heart Institute, the Sandia HPN also includes five doctors from ABQ Health Partners. Those doctors are:

- Michelle Khoo, MD, FACC, FHRS
- Christina Lopez, MD
- Pedro Ortiz, MD
- Robert Taylor, MD
- Dirk Denier Vandergon, MD, FACC, FSCAI

For more information about the Sandia Health Partner Network, including a link to a HPN Provider Search, please visit [hbe.sandia.gov](http://hbe.sandia.gov).

All NM employees and spouses

# HBE SUMMER HEALTH FAIR

Saturday, August 11, 2012

9:00 a.m. - 1:00 p.m.

Embassy Suites Albuquerque

1000 Woodward Pl NE; Albuquerque, NM 87102



FEATURED SPEAKER 11:00-11:45 A.M.

## DR. BARRY RAMO, M.D.

Dr. Ramo will discuss healthcare consumerism, including finding a good doctor and being a smart patient. And stay for information about Sandia's new Health Partner Network (HPN).

Come early as seating is limited!

Also, FREE HPN services for all:  
Body Fat / BMI testing • Heel Scans to detect Osteoporosis • And more



You and your spouse can each earn **500** Virgin HealthMiles for attending the Health Fair and an additional **1000** Virgin HealthMiles for attending Dr. Ramo's speech.



## Making a house a home Sandia volunteers complete 12th Habitat for Humanity project



Photo by Patty Zamora

More than 350 Sandia employees and other members of the workforce, retirees, and their families pitched in to build the 12th Sandia/Lockheed Martin Habitat for Humanity home in Albuquerque. HR and Communications Div. 3000 VP Pamela Hansen Hargan was on hand at the home dedication on Saturday, July 28, to congratulate the new homeowners. In the photo at left, Pam looks on as Jerome Ndabiorere, Fredance Nibakizaon, and their three children cut the ribbon, making the house a home.

Jerome and Fredance were originally from Burundi, but were forced out by war while they were still children. The two met in a Rwandan refugee camp. Their first home was made of plastic sheeting.

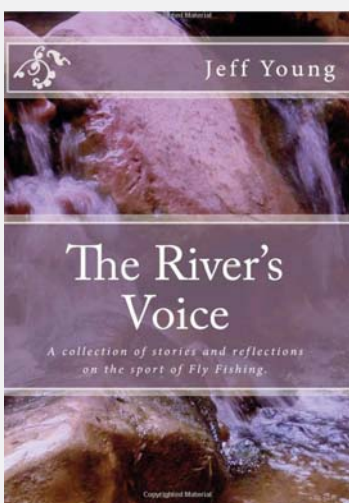
"Life was very, very difficult back then," Jerome says.

The family moved to the US five years ago, and has been living in an apartment since then. Jerome and Fredance have worked in a hotel for the entire time, and their efforts have been focused on making sure their children have hope for a better future. Gisele is now in college, studying to be a nurse and pursuing her goal of helping people. Jean Claude is in high school, and is a soccer star with dreams of pursuing a professional soccer career in Europe. Blaise, who is in middle school, likes working with computers and playing soccer for AYSO.

Sandia's Community Involvement organization staff helped to coordinate the construction and the recruitment of volunteers.



## The River's Voice speaks to Sandian Jeff Young



He has become Sandia's bard of the high mountain pass, the rushing river, the bugling elk at the break of day. Last year, Jeff Young self-published *Faith of an Outdoorsman*, a devotional work that connected his love for the outdoors with his religious faith and how, for him, the two reinforce each other. This summer, Jeff has

published another collection of his stories — this time of a more secular nature — about his favorite pastime, fly-fishing. The book, *The River's Voice*, explores Jeff's 20 years of fishing the quality waters of New Mexico and southern Colorado.

Recently, Jeff spoke briefly with the *Lab News* about his new book, which is available at Amazon.com and other online sources.

**Lab News:** What in particular, besides the fact that it's just fun, appeals to you about fly-fishing?

**Jeff Young:** Fly-fishing allows you to block out the distractions of life. It's almost like being caught in another world. I call it "living on mountain time." I also love the scenic places trout water takes you.

**LN:** How would you describe the perfect day of fishing?

**JY:** I'd have to say if I had to describe it, it would consist of a hike deep into a remote canyon along a trout stream, one with complete solitude. Then, fishing until dark after landing 50+ trout. Doesn't matter how big, but just the fact you had the water all to yourself on a warm, sunny day with a walk out of the canyon by moonlight.

**LN:** Does your family share your passion for the outdoors?

**JY:** Yes. My entire family loves the outdoors. Patti is a hiker, wildlife lover, and runner, while my boys love

hunting, trail running, and the shooting sports. But really, it's a lifestyle that revolves around everything outdoors. My older son, Canyon, recently ran La Luz with me for the first time. It was embarrassing for me after he had to wait 45 minutes at the top for me!

**LN:** How can one disconnect from the wired world and connect with the natural world?

**JY:** Good question. I don't own a cell phone. For me, they are a huge distraction from connecting with the outdoors and building relationships, and they create unnecessary stress. Author Richard Louv discusses this in depth, in his book, *Last Child in the Woods*. He directly links the lack of interaction with nature in today's wired generation with some very disturbing trends including: rises in obesity, attention disorders, and depression. I am definitely not an expert on this subject, but my advice would be just to take an evening walk without your phone. Go on an overnight camping trip without any technology. It really does work and I believe inspires innovation and creativity.

**LN:** Why are you self-publishing these books?

**JY:** My primary motivation is to leave an heirloom for my family. A secondary motivation is to hopefully inspire others to enjoy the outdoors.



## Giving big!

Annual school supplies drive nets more than 20,000 items



HR & COMMUNICATIONS Div. 3000 VP Pamela Hansen Hargan with some of the items collected at this year's school supplies drive. (Photo by Randy Montoya)

Pamela Hansen Hargan, VP of HR and Communications Div. 3000, Community Involvement Dept. 3652, and Sandia Laboratory Federal Credit Union would like to thank everyone who contributed to the 2012 school supply drive. More than 20,000 items have been collected and transported to Albuquerque Public Schools. The supplies will be distributed to students in need. The annual drive gives many children the tools they need to succeed.

A special thanks is extended to Lily Jimenez (102611) and her mail carrier team and David Veitch (Org 102621) and his transportation services team. They picked up, transported and helped with the delivery of the donations.



# TRUTHS AND CONSEQUENCES (FORMERLY ETHICS IN ACTION)

## CASE #11

**Based on Real Cases and Outcomes.** The purpose of this article is to provide an opportunity for employees to learn and better understand our values and policies in action. Many Sandia employees want to know that management, Ethics, and Corporate Investigations take their concerns seriously and action is taken on reports of inappropriate or unethical business conduct. **Truths and Consequences** will highlight Sandia's Ethics and Corporate Investigations cases, and outline the responsive action taken by Sandia.

### CASE ISSUE: MISUSE OF CORPORATE TRAVEL CARDS AND P-CARDS

#### **Background:**

Sandia requires the use of a Corporate Travel Card for business-related travel, and a P-Card to obtain certain other non-JIT items. Each applicant signs an agreement to abide by the policies for usage of these cards. P-Card users also have an annual training requirement.

#### **Facts:**

Corporate Investigations has recently completed a number of investigations on the improper use of Corporate Travel Cards and P-Cards. Several variations of misuse were substantiated.

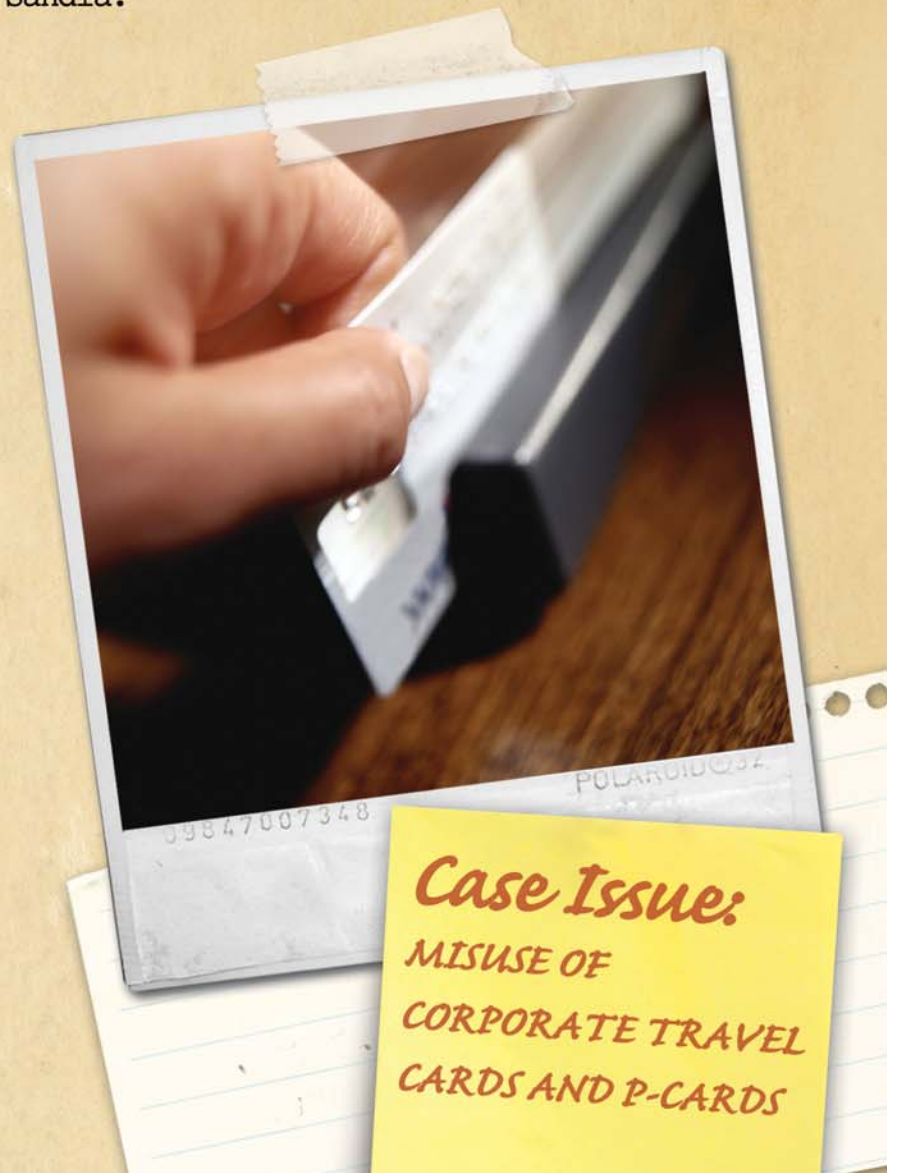
#### **Investigations found that:**

- Two employees continually used the Corporate Travel card to pay for lunches and other personal purchases, while not on travel, and were late paying their bills.
- An employee used a P-Card for substantial personal purchases, and then was not able to pay the bills.
- A frequent traveler kept very poor records and had not paid the Travel Card charges in full for so long that a complete reconciliation was almost impossible. Hundreds of dollars in past due fees were accumulated and thousands were owed to Sandia for expenses that had already been reimbursed.

#### **Resolution/Discipline:**

Based on the severity of the violations and facts of these four cases:

- One employee received a written reprimand.
- An employee was suspended for 2 weeks without pay.
- Two employees were terminated. Sandia seeks repayment of funds. Misuse is referred to the DOE IG for further evaluation for potential criminal charges.



*Case Issue:  
MISUSE OF  
CORPORATE TRAVEL  
CARDS AND P-CARDS*

#### **Applicable Policies:**

Employees violated the following:

- Corporate Procedure: FIN100.1.TNT.9 Use the Corporate Travel Card:** Ensure that use of the Corporate Travel Card (CTC) is for your own Sandia business-related travel or Individual Small Value Purchases (ISVP) expenditures; review transaction activity monthly and report any discrepancies to U.S. Bank immediately; and, pay the Corporate Travel Card in full each month.
- Corporate Procedure: SCM100.2.6 Fulfill P-Card Responsibilities:** Comply with all rules & requirements within the P-Card policies.



Sandia National Laboratories

**CASE  
CLOSED**

# 'A good start': George Clark marks 50 years at Sandia

**Labs veteran came on board in 1962 at the very height of Cold War**

By Bill Murphy

When a colleague heard that George Clark was celebrating his 50th year at Sandia, he said "That's a good start." A good start, indeed.

When George (2627) hired on at Sandia in 1962, the Cold War was at a fever pitch. The Bomb — and in people's minds it was very much a capitalized concept — was perhaps the defining reality of the era. For a young mechanical engineering graduate from Lehigh University, the idea of working at Sandia, working on nuclear weapons to counter the Soviet menace, "was the coolest thing in the world."

"Here was something," George says, "I could be doing to help keep the world from getting into another world war. And I thought that would be really, really neat work."

After interviewing for jobs "literally all over the country," George chose to come to Sandia. "I interviewed from the east to the West Coast, from border to border. Sandia didn't make the highest job offer, but the combination of the education benefit [Sandia paid him to earn a master's degree], the climate here, the vacation package, and the nature of the work was hard to pass up."

In his first job at the Labs, George worked on the barometric fuzes used on some of the weapons in the stockpile; when calibrated for local conditions those fuzes would detonate a bomb at a specified altitude. He found the work interesting and rewarding.

In the early 1960s, he recalls, "we were much, much more focused on nuclear weapons than we are now. It was a very different ballgame because we were in the Cold War with the Russians and the objective was to keep us from being destroyed. That was a tremendous incentive to really stay on your toes and keep turning out nuclear weapons. It was all driven by the fact that we were worried, we were scared that something bad was going to happen. There was a conviction — no question about it — that what we did at Sandia every day was keeping the Soviet Union at bay."

## Core work of the Labs

Part of Sandia's folklore is that when you come to the Labs and stay for a while, you have the opportunity to have lots of "careers," moving to different jobs in sometimes very different fields. That hasn't been George's experience, though. Through his 50 years, he has stayed in weapons; in fact, he has stayed in fuzing, becoming, eventually, Sandia's "Mr. Impact Fuze." Part



NOT READY TO SLOW DOWN YET — George Clark (2627), who came to Sandia from Lehigh University in 1962 right before the Cuban Missile Crisis kicked the Cold War into high gear, has spent a satisfying and rewarding career in the Labs' weapons program. He says he's enjoying himself too much at work to retire. (Photo by Randy Montoya)

of his decision to stay pretty much where he started, he says, is based on the simple fact that he enjoys the work, even after half a century. But he frankly acknowledges an element of self-preservation, too.

"Over the years we have gone through a number of layoffs and I figured that weapons, as the core work of the Labs, was the area that was least likely to have issues."

Interestingly, over most of the past 50 years — and especially the past 30 or so — George was essentially a one-man shop. He had a big influence during much of that time for the design of impact fuzes in the stockpile. "It remained that way until maybe five or six years ago," George says, "when my bosses realized that [I wasn't likely to be around forever] and they started to get people to help me. Right now I have four other people who are working with me; I am mentoring

them, if you will."

As George looks back over his life and career, he is untroubled by thoughts that he should have chosen a different path.

"Family has always been first and foremost for me and I wouldn't change a thing there. And as far as my work is concerned, I've always thought Sandia was a perfect match for my characteristics and personality. I've never had any second thoughts about that at all."

Indeed, he has been very grateful for the rewards of his work: "I have figured it probably cost me — total — to go to college about \$10,000," George says. "And I look at the return on investment for that \$10,000 and it is absolutely phenomenal. It just blows my mind when people say, 'Well, what's the point of college?' I point this out to them; the pay-back is just unbelievable."

## Truman lecturer discusses intersection of nanotechnology and the environment

With the growing importance of nanotechnology, there have also come accompanying concerns from some quarters about the safety of the technology as it interacts with human beings and the environment.

In the latest Harry S. Truman Distinguished Lecture Series Seminar, Dr. Andre Nel, professor of medicine and chief/founder of the Division on NanoMedicine at UCLA, addressed the issue in his presentation, "Safe Implementation of Nanotechnology in Humans and the Environment."

After being introduced by Sandia Div. 1000 VP and Chief Technology Officer Steve Rottler, Nel discussed the implementation of high-throughput discovery approaches and describe their utility for the safety assessment of commercial nanomaterials. He also addressed the improvement of therapeutic nanoparticles, described how the use of combinatorial nanomaterial libraries and a high-throughput screening approach could be implemented to promote nano safety in the environment and humans. His seminar described how in silico data transformation and development of quantitative structure-activity relationships can speed up the rate of discovery and modeling at the nano-bio interface.

The President Harry S. Truman Distinguished Lectures foster the exchange of information on the intersections of national defense, technology, economic, and social policies, and illuminate the scientific, political, social, and economic conditions and consequences of the global economy. (Photo by Randy Montoya)

