Sandia 'RAP artists,' White Sands techs free stuck radiation source

Extraction a Mighty Mouse robot detective story

By Neal Singer

The cylinder was small — the size of a restaurant salt shaker — but it emitted enough gamma rays to kill a person in half a minute. And it was stuck.

Technicians at DoD's White Sands Missile Range Gamma Irradiation Facility ordinarily use pneumatic air to propel the little cylinder from its insulated location to its exposed test position and back again, like drive-up banking facilities use pneumatic tubes to shuttle cylinders between customer and teller. The method had worked satisfactorily for decades.

How the good guys saved the day

Sandia RAP team members and engineers, using a robot affectionately nicknamed "Mighty Mouse," teamed with White Sands personnel to solve problems on the fly, and dislodge an exposed and very dangerous radioactive source. It's the kind of unadorned detective story that *Lab News* writer Neal Singer obviously loves to tell.

But on Oct. 2, after the irradiator finished a test sequence, a switch along the cylinder's path caught in one of its ribbings and would not release. The cylinder, emitting 20 rads/second at a distance of one foot, wouldn't move, says White Sands health physicist Douglas McDonald.

Five hundred rads is considered a lethal dose; half the people receiving it die in 30 days.

Researchers significantly increased pneumatic pressure on the 3-by-1-inch cylinder, but it would not budge.

Warning horns blared. Warning lights flashed. They would do so for almost three weeks.

The facility's primary mission is to irradiate electrical circuit boards to test their survivability under extreme circumstances. But because vehicles are sometimes irradiated as well, emissions intentionally extend beyond the building through a raised overhead door into an already cordoned-off area outside. These emissions were now unceasing.

"We're required to alert staff [24 hours a day], using a visual and audible signal, to the existence of a radiation area," Richard Williams told the *Lab News*.

(Continued on page 5)

BOB ANDERSON demonstrates the capabilities of the robot affectionately known as M2, for Mighty Mouse, as in "Here I come to save the day."(Photo by Randy Montoya)

Border lab a 'go'

The Bi-National Sustainability Lab, whose origins can be traced to Sandia and VP Gerry Yonas's Advanced Concepts Group (Gerry is at right in photo), got an enthusiastic sendoff last week in Santa Teresa, N.M. Story on page 10.

Sandia LabNews

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Sandia National Laboratories

Real-world solutions offered for all-too-real terror threats

Sandia, Lawrence Berkeley experts publish new airport guidelines

By Mike Janes

Airport executives and emergency planners now have a new suite of concrete recommendations on how to boost security at their facilities, thanks to a just-published report developed by researchers from Sandia and Lawrence Berkeley National Laboratory (LBNL).

The tangible, real-world recommendations in the 100-page "Guidelines to Improve Airport Preparedness Against Chemical and Biological Terrorism" is intended to help security managers at airports and other transportation facilities reduce the risk of these types of attacks.

The report makes concrete recommendations on improving security and assessing vulnerable areas, and helps readers understand the nature of chemical and biological attacks. The report has been turned over to Airports Council International (ACI) and the American Association of Airport Executives (AAAE), two large organizations that represent the interests of thousands of airport personnel and facilities in the US and around the world.

The project was an extension of PROACT (Protective and Responsive Options for Airport Counter-Terrorism), a five-year, Sandia-led program most recently supported by the Department of Homeland Security. LBNL became part of the PROACT effort in 2003 and joined forces with Sandia to develop the guidance document.

In addition to the ACI and AAAE's distribution plans, the Transportation Security Administration (TSA) has distributed the document to its own staff at the nation's highest-threat airports, and plans to incorporate portions into its existing document, "Recommended Security Guidelines for Airport Planning, Design, and Construction."

Donna Edwards and Susanna Gordon (both 8114) worked with LBNL colleagues to develop the guide.

"We wanted to offer airport planners a user-

(Continued on page 4)

Sandians' ECP record-setting generosity passes $2.8 million

By Iris Aboytes

"I am blown away by Sandians' generosity this year," says ECP chairman Art Verardo (2990). Here are just a few of the highlights of this year's campaign, as provided by Art.

- Employee participation increased by 8 percent to almost 71 percent
- New hires increased their level of participation by more than 26 percent
- All divisions significantly increased their level of participation (both in percentage of participation and money pledged)
- The three bargaining units increased their level of participation (both in percentage of participation and money pledged)

(Continued on page 4)

Shoes for Kids 2005

Shoes for Kids, a Sandia tradition for 49 years, will again this year fit more than 400 local kids with brand-new shoes, thanks to Sandians' donations and Mervyn's department store. See story and photos on page 12.

Sandia observes Native American Heritage Month; Debby Tewa helps bring PV electric power to Hopi people. Stories on ***page 6.***

DOE's mobile atmospheric lab deploys to Niger to continue ARM program studies. Story on ***page 9.***

What's what

About those messages to single addresses that comprise large groups of people.

Recently, somebody sent a message to everybody in the Integrated Enabling Services Strategic Management Unit (IES SMU), which generated some responses. That seems OK on the surface. Trouble is, in responding, the responders clicked on the "Reply all" button, which sent the response to everyone in IES — in case you aren't aware of the size of IES, it includes roughly 2,800 Sandians (plus contractors) — which inspired many who didn't want the message in the first place to say so. To everyone who got the first message.

PUPPY LOVE

After a furious flurry of these "don't send any more messages to me!" messages, including lots of "ditto" responses, someone with a delightful sense of humor or, perhaps, just a keen sense of opportunity replied-all asking if anybody wanted a puppy.

After more notes — some more polite than others — someone either very curious or having a sense of comedic timing asked: "What kind of puppy?"

It was about then that the multi-response tirades dwindled to a trickle, eliminating the fun of reading them, and I lost interest. Whether a puppy transaction actually occurred, I don't know.

* * *

Meanwhile, the "IES SMU" mention above provides a perfect segue to something all of us working in large beauracracies are familiar (and struggle) with — acronyms and initialisms.

A reporter called recently about SAND Report SAND2002-2019 Acronyms, Initialisms, and Abbreviations. He might be able to get a nice little light-hearted feature out of it, he said.

Some discussion of the value of such a piece to the Labs ensued, producing the following observation from within the Media Relations group:

"At Sandia, sometimes we have a program that sounds like an acronym but isn't. When we refer to such a program, we follow it with the acronym TINA in parentheses. That means 'this is not an acronym.'

"It's AVS, really, — er, I mean, it's all very simple, really. Really."

* * *

Bill Suderman (10334) e-mailed following a *Sandia Daily News* reminder last week that Nov. 21 was the annual Roadrunner Food Bank drive's Take-a-Turkey-to-Work Day, which asks Sandians to bring a frozen turkey to work that day to contribute to the drive.

"If I can get a carpool placard and use those close-up parking spaces, I'll do it in a NY minute," he wrote. "One turkey should last 'til about March this time of year."

Forget it, Bill. NOAA says we're in for a warmer-than-usual winter. Someone would notice.

* * *

Clever people in Labs groups come up with some funny web or e-mail addresses, like the Electrical Safety Committee's http://zap.sandia.gov web address. If you know of others, zap 'em along to me. We'll share 'em.

— *Howard Kercheval (844-7842, MS 0165, hckerch@sandia.gov)*

Sandia LabNews

Sandia National Laboratories

http://www.sandia.gov/LabNews

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LOCKHEED MARTIN

Retiree deaths

Saul Skolnick (age 83) . . . . . August 7
Joe Die Fulmer (95) . . . . . August 8
Janice T. Kowalski (79) . . . . . August 8
Warren Nilchee (95) . . . . . August 10
Frank W. Muller (73). . . . . August 11
Gary O. Miller (66) . . . . . August 13
James M. Winter (78) . . . . . August 18
Donald L. Benoist (77). . . . . August 18
Jack M. Donaworth (70) . . . . . August 28
Frank J. Feery (90) . . . . . October 1
Charles W. Quillen (89). . . . . October 2
Bruno Paoletti (87). . . . . October 2
Margaret I. Key (83) . . . . . October 6
Robert F. Carrell (82) . . . . . October 7
Marcus M. Herrera (83) . . . . . October 8
John A. Fackelman (94) . . . . . October 8
Louis E. Guintard (88) . . . . . October 8
Thomas E. Russell (83). . . . . October 9
J.R. Hollingshead (65) . . . . . October 11
Alexander S. Trujillo (81). . . . . October 11
Fred F. Eichert (84). . . . . October 13
Oscar E. Carter (73) . . . . . October 22

Note: A number of retiree deaths that occurred in September were listed in the Nov. 11 Lab News.

Take Note

Retiring and not seen in *Lab News* pictures: Ronald Coonen (4012), 29 years; Eugene Mutchie (2431-1), 28 years; Gerald Roudabush (10848-2), 30 years.

Mike Desjarlais named an APS Fellow

Work with 'warm, dense plasmas and liquids' cited

Citing his "pioneering work" with warm dense plasmas and liquids, the American Physical Society's Executive Board has elected Mike Desjarlais (1674) a fellow.

"As you may know," the letter to Mike from APS board officer Alan Chodos states, "election to Fellowship in [APS] is limited to no more than one half of one percent of the membership. [It is] recognition by your peers of your outstanding contributions to physics."

MIKE DESJARLAIS

His full APS citation, which appears on his fellowship certificate, reads: "For pioneering work on the application of quantum molecular dynamics simulations to the generation of accurate wide-range electrical conductivity models for warm dense plasmas and liquids."

Mike was nominated by the APS Division of Plasma Physics and received his certificate at DPP's annual meeting in Denver last month.

Mike received a PhD from Cornell University in 1986 through the Laboratory of Plasma Studies and immediately joined Sandia's light ion-beam fusion effort centered on PBFA II, now evolved and operated as the Z machine

Mike's early research focused on developing theoretical models of magnetically insulated ion diodes. The work received broad international recognition and ultimately led to his special appointment as a DMTS in 1995.

His current research is primarily in the area of high-energy-density physics, with emphasis on using quantum molecular dynamics to calculate accurate equations of state and transport properties for warm dense matter, the principal motivation being Sandia's inertial confinement fusion and material properties research efforts on the Z machine.

The wide-range conductivity models he has generated for use in advanced modeling codes have become very popular in the high-energy-density physics community.

In 2002 Mike received a Sandia Employee Recognition Award for Individual Technical Excellence citing his work with density functional theory to develop an accurate wide-range conductivity model for aluminum. This led to many new connections within Sandia, spawning several ongoing collaborations with staff in Sandia Centers 1100, 1400, and 8700 on advancing electronic structure methods for use in high-energy-density physics applications.

Mike maintains collaborations with physicists at Los Alamos National Laboratory; the Commissariat à l'Energie Atomique (CEA), France; and the Universität Rostock, Germany. He is an executive committee member of the APS Topical Group on Shock Compression of Condensed Matter, an adjunct research professor with the Institute for Shock Physics at Washington State University, and an associate editor for *Physics of Plasmas.*

Employee death

Paul Sands of Cyber Security Technologies (4312) died Nov. 9. He was 55 years old.

Paul had been at Sandia for more than 16 years. He is survived by his wife Patricia, daughter Lorraine, and son.

Lab News *schedule and deadlines*

One more *Lab News* issue will be published this year, dated Dec. 9. The deadline for submitting classified ads for that issue is noon, Dec. 2.

The first 2006 issue will be published Jan. 4. The deadline for submitting classified ads for that issue will be noon, Tuesday, Dec. 20; a reminder will be published in the Dec. 9 issue.

Combustion science 'essential,' DOE science chief tells Sandians at all-hands meeting at the CRF

By Nancy Garcia

"I'm delighted that 25 years ago somebody had the foresight to recognize that combustion was essential," Ray Orbach, director of DOE's Office of Science, told Sandians at an all-hands meeting at the Combustion Research Facility in late October.

Orbach, in remarks anticipating the CRF's 25th anniversary symposium (held Nov. 17), added that he believes "the most important issue facing our country is energy, period."

It was Orbach's second visit to the CRF, following a full tour he took a few days earlier, shortly after stepping into his new role.

Center 8300 Director Terry Michalske noted that Orbach is known both for his leadership ability and for his excitement about science. "He's responsible for directing and leading a major fraction of the nation's science research resources," Terry said, "with a budget of more than $3.5 billion that covers everything from the dark matter in the universe to the beauty of nanoscience — that's a lot of orders of magnitude."

A wide spectrum of research activities takes place at the CRF, Orbach observed, saying, "You go all the way from the very basic to the very applied, and you do that seamlessly."

In the next 20 years, he said, US energy consumption is expected to go up by one-third, as is oil consumption. Natural gas usage is expected to increase by almost two-thirds, and electricity by 50 percent.

"The search for energy is here," Orbach said, "and if we're not careful, we'll see conflict." With less than 5 percent of the world's population, the US consumes one-fourth of the world's energy but produces only 15 percent of it. Conservation and cleanliness, the kinds of things addressed by energy efficiency and low-emissions research at the CRF, will profoundly affect the energy balance and have an international effect, he said.

Imported oil contributes to the budget deficit, which will choke expansion, Orbach said. To increase efficiency, DOE is looking at alternatives, such as direct solar-to-chemical energy conversion. The budget authorization bill signed at Sandia/New Mexico, he said, "has an emphasis on science and the contribution of science to energy."

He expects the Office of Science to play an ever-broader role and told the audience, "We're all in this together — we're very, very interested in your accomplishments and ideas. . . . All we have left are you and the other DOE labs — you are playing the role of a really fine Bell Lab type of industrial lab and if we don't keep the funding, we'll lose the output we had. . . . We've always been the leader; I don't know what happens when you're second-best. To me, the issue of discovery is first and foremost."

Since he was also slated to give remarks via videolink at the anniversary event itself, Orbach told the audience, "Let's just consider this a pre-celebration."

AN ANIMATED Ray Orbach, head of DOE's Office of Science, shares his passion for science with an audience of Sandians at the Combustion Research Facility. (Photos by Bud Pelletier)

"We've always been the leader; I don't know what happens when you're second-best. To me, the issue of discovery is first and foremost."

'A bit like coming home,' says Len Napolitano on becoming director of Center 8900

By Nancy Garcia

For Len Napolitano, becoming director of Computer Sciences and Information Technologies Center 8900 is a bit like coming home, since his first promotion to management had been to run the scientific computing department, he told the some 250 members of his center at his first all-hands meeting.

Len, most recently senior manager of Biological and Microfluidic Sciences Dept. 8320, said in remarks at the Distributed Information Systems Laboratory that he appreciated interdisciplinary and multidisciplinary problems long before helping to grow a bioscience capability at Sandia.

LEN NAPOLITANO

He has several degrees from MIT — a bachelor of science in humanities and science (with concentrations in American studies and biology); a bachelor of science in art and design; another bachelor of science in civil engineering, and a master of science in civil engineering.

'I saw the place . . .I stayed'

Although he grew up in Albuquerque, Len never thought about working for Sandia until he was on an interview swing along the West Coast in 1979 and stopped in Livermore.

"I came, I saw the place, I loved it, I stayed," he said.

He started at Sandia in the Structural Mechanics Department, analyzing solar central receiver systems. As a Sandian, Len took advanced studies at Stanford University, where he completed an interdisciplinary PhD program, writing a thesis on computer architectures for computational mechanics with advisers from civil engineering, mechanical engineering, electrical engineering, and computer science. After completing his dissertation, he returned to work on the Strategic Defense Initiative, joining a group that was trying to build special-purpose, massively parallel computer hardware for image processing.

His new position appeals to him, he said, because computer science research is changing society. "Information technology is the transforming technology of our time. Everyone's hooked in and wired up," he said.

"We're sitting on the type of technology that should be indistinguishable from magic, and I want people to be amazed at what we do."

Len doesn't expect to make major or immediate changes, since the day-to-day operations are run by the senior managers, Jim Handrock (8960) and Chuck Oien (8940). Jim was acting director in the five months since Ken Washington (4600) moved from director of 8900 to become Sandia's chief information officer.

On the other hand, Len would like to see the center be a learning and developing organization. In the past, he'd filled jobs in different technical areas addressing different national problems. Each one wasn't the same as what he'd done before — but also wasn't the same after he'd done them.

The newly established bioscience capability at Sandia is still growing. "We went from being a lab that didn't do biology to being a lab that does," he said. "We have created evolving technological capabilities in response to an evolving set of threats — Tom Hunter's view of us in leadership in the country is adaptability to changes that we master and apply."

Making a contribution through new accomplishments will be an exciting challenge in the new center, he believes, and told his listeners there is much to be done in the national interest.

Referring to Arthur C. Clarke's "third law," the observation that "any sufficiently advanced technology is indistinguishable from magic," Len said, "We're sitting on the type of technology that should be indistinguishable from magic, and I want people to be amazed at what we do."

Sandia CaliforniaNews

Symposium marks 25th anniversary of the CRF

AN ENERGIZING DISCUSSION – MIT Bayer Professor of Chemical Engineering Greg McRae, who chairs the Combustion Research Facility (CRF) advisory committee, participated in a panel titled "From Here to the Hydrogen Economy: Building an Energy Bridge to the Future" at the 25th anniversary celebration of the CRF, moderated by Energy, Security and Defense Technologies Div. 6000 VP Les Shephard. McRae commented that inventions such as Sandia's energy-conserving white light laser diode (that was presented in a laser-pointer pen as a memento to dignitaries, employees, and media in attendance) are among the imaginative solutions that emerge from the Labs. He went on to call the CRF "one of the true jewels in DOE's crown." For more on the Nov. 17 anniversary symposium see the Dec. 9 issue of the *Lab News*. (Photo by Bud Pelletier)

GREG McRAE

Guidelines

(Continued from page 1)

friendly guide that gives them a clear understanding of chem/bio defense of their facilities and concrete steps they can take to assess and improve their current readiness levels," says Donna, the lead author.

Active, passive measures

Readers can use the information to help determine what kinds of physical or system upgrades are required for their facilities, or whether an outside consultant is needed. The guidance is also intended to help airport personnel deter high-consequence chem/bio attacks through targeted physical security measures and to mitigate the impact of an attack through passive protection (measures that reduce impact even in the absence of response) and active response measures.

Susanna says the nature of a chem/bio threat is far different from conventional attacks and a comprehensive guide is needed to help airports deal with such a threat.

In developing the guide, Sandia drew extensively on knowledge gained from its collaboration with San Francisco International Airport (SFO) under the PROTECT and PROACT programs (both initiated by DOE and continued under the Department of Homeland Security). Insight was also gleaned from Sandia's participation in the DoD's Biological Defense Initiative and guidelines Sandia developed for other sites. Other contributions came from existing guidelines for building protection, including some from the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health, and the US Army Edgewood Chemical Biological Center.

THE SECURITY GUIDELINES developed by Sandia and LBNL were based on many data sets, including information gained from tests at San Francisco International Airport. The smoke dispersal test shown above was conducted several years ago in a new, unoccupied wing of the airport.

In collaboration with SFO, Sandia conducted research over the past few years to understand how agents would spread through an airport. They also studied the effectiveness of HVAC responses, conducting extensive gas and smoke tracer tests at SFO. Together, Sandia and Berkeley created a set of specific prioritized recommendations targeted at improving the preparedness of airports and other facilities with wide-open interconnected spaces against chemical and biological terrorism.

"We understand that no airport will look identical or respond in precisely the same fashion," Donna says. "But the starting point for any facility is the same: gaining a thorough understanding of the specific threats and the characteristics of those threats, which in this case involves chemical and biological agent attack. Only then can you begin to look at plausible responses and facility 'hardening' measures. The ultimate goal, of course, is to protect airport facility users and save lives in the event of a terror attack."

To develop the guide, the researchers worked extensively with airport managers at SFO, who provided insights into their security measures, and strategies for improving security. The Sandia/Berkeley team sent the draft document to reviewers at other airports around the country to ensure that it reflected the best thinking of security managers. Although focused on airports, the document is also relevant to facilities such as train and bus stations and ports.

ECP numbers

(Continued from page 1)

- Temporary employees increased their level of participation by 11 percent
- Total participants increased by more than 700 people (626 regular and 118 temporary employees)
- Overall pledges/contributions (including retiree and Lockheed Martin Cornerstone contributions) total more than $2.8 million (and could go up more)

"Sandians have so much to be proud of — our service to the nation, our commitment to values, our ability to excel," says President and Labs Director Tom Hunter. "Few things say as much about who we really are as our commitment to our community and our support to those in need. Your spirit of giving continues to make a profound difference in many lives and makes us better.

"Few things say as much about who we really are as our commitment to our community and our support to those in need. Your spirit of giving continues to make a profound difference in many lives and makes us better."

Labs Director Tom Hunter

ter. I am impressed by what we do together, but especially proud of our response to our campaign and by each Sandian who chose to share."

"Cochairman Pam Catanach (3652) and I want to thank all of the campaign coordinators for the incredible job you have done to get our message out to your coworkers," says Art. "You gave real meaning to our theme of 'Experiencing Our Tradition of Giving.' We also want to thank members of Large Staff for the support and leadership that you provided during this campaign. Finally, we want to recognize the leadership provided by this year's campaign co-champions, VPs Al Romig and Kim Adams."

"What a great achievement for Sandians," says United Way of Central New Mexico CEO Jack Holmes. "When you consider the significant changes that have taken place this year at the lab, the campaign results are even more magnificent. Everyone stepped up: new hires, those in the tech areas, union members, the steering committee, the reps, and the lab leadership. I'm not sure Sandians realize the tremendous influence they have in the community. Their spirit of volunteerism and caring and their consistency of performance in community involvement is far-reaching. They also are far and away the largest single contributing group to the United Way campaign year after year. Congratulations to everyone."

Never prouder

"I have been a Sandian for 28 years, and I have never been prouder to be a member of this great organization," says Art. "The many less-fortunate members of our community who will benefit from your generosity thank all of you for your efforts during this year's campaign. Thank you [ECP representatives and all contributors] for your incredible efforts. You are amazing."

Juanita Sanchez gets 'real job'

Juanita Sanchez, program manager of the ECP from 1993 to 2005, decided it was time for her to get a "real job."

She is now working with the Trades Apprenticeship Program in Center 2400. Pam Catanach (3652) was this year's ECP program manager and Art Verardo (2990) was chairman.

JUANITA SANCHEZ

"ECP wasn't a real job for me," says Juanita. "It was a passion. It was the noble job of fundraising, which is probably the most misunderstood, yet vital, job we do to help communities provide services to those most vulnerable."

Juanita took over the program in 1993 when the ECP contribution going to United Way of Central New Mexico was $1.76 million. Last year's total was $2.515 million. Neither of these totals include California's LEAP (now SHARE) program.

"Imagine what our community would become without our health and human service agencies funded through ECP," says Juanita. "I sure would not want to live here. Would you?"

When she took over the campaign it was all done on paper. She worked with Payroll to design a totally paperless campaign. She also saw the campaign evolve to include retirees. Her farewell from her passion job to her real job was the following poem.

Experience our tradition of giving

(Dedicated to the 2005 ECP Representatives and Core Team Members)

Children learn when hunger does not slow their fragile minds
The elderly can live in dignity when they are comforted and valued
Teenagers can graduate when they are taught to love themselves
A single mother can provide for her family when we help her
And a father can become a nurturing parent when we support him in his quest
When we are all woven into this communal blanket
Interlacing all the global shades of yarns and threads
We become fuller, cherished, confident, generous, and warmer
We can then continue to link all hands into the journey
As we ask others to experience our tradition of giving.

Robot

(Continued from page 1)

Williams is White Sands' associate director for its Survivability, Vulnerability, and Assessment Directorate.

The facility also had to be staffed around the clock, he said, to warn security personnel and other potential visitors not to enter the area because radiation was present.

Because of these precautions and the lab's layout, there was no danger to staff or the environment. But the approximately 3,000-square-foot test facility was now inoperative.

IMPROVISED solutions to a unique challenge, developed on the fly.

The White Sands team's options, say McDonald and Williams, were expensive, labor-intensive, and time-consuming. No human was strong enough to carry a shield heavy enough to protect him or her. There were robots on the East Coast that might be located and flown in. The facility also had the capability to design, manufacture, transport, and maneuver in a very heavy lead shield on a front-end loader to block and then surround the errant source. Technicians drilling through the shield might send in a rod to free the switch.

But the quickest, simplest option was to work with NNSA's local RAP (Radiological Assistance Program) team, DOE's usual responder-of-choice in assessing and resolving emergency radiological situations.

On Oct. 3, White Sands personnel called Sandia RAP — exactly the right thing to do, says Richard Stump (12345), Sandia RAP leader. "Part of RAP's mission is to help out in jobs like this," he says.

Able to draw upon many Sandia resources, Richard called robotics manager Phil Bennett (6644) and explained the problem.

Phil said his group had a robot that might do the job. The 600-pound, five-foot-long robot, now unofficially known as M2, rolled on treads, could maneuver around obstacles, and had a long, multi-jointed gripper arm. It had the dexterity to reach into awkward places and apply force to drills and screwdrivers. It could remember positions, important in starting with tools at the right height and depth.

But radiation that can kill a human can kill a robot. Phil estimated M2 could withstand intense radiation for only 50 minutes. That might be long enough, perhaps, to free the cylinder.

The plan was to drill through the protective 3/16-inch steel plate covering the switch. By inserting a wire through the drilled hole, the switch — which rotated on a hinge pin, similar to a teeter-totter — could be nudged to change its alignment. A bomb-disposing robot might have been capable of this in simpler circumstances. But this plate was four feet off the floor, three feet away from any vertical position, and sat on a 45-degree angle. The height, depth of extension, and angle were beyond the capabilities of ordinary explosive ordnance disposal robots to drill.

Problems overcome, one after another

But when the call came, M2 was down with a faulty motor control board in its forearm. A call to DOE provided immediate funding to get it working; a replacement part was built and shipped from Agile Manufacturing in Waterloo, Ontario. Manufacturing, shipping, installation, testing, and querying White Sands took two weeks.

"Our people at first wondered what the holdup was," says White Sands' Williams, "and then we saw how well [the Sandia RAP team], with all their questions to us, had prepared."

Because the robot lacked a trigger finger to depress and release a drill control, the Sandia team stalked the aisles of local hardware stores, buying cordless drills and other equipment they modified into remotely operated drills, hooks, and grippers. On tests performed at Sandia by Bob Anderson and Jim Buttz (both 6644) on a mock-up sent north from White Sands, M2 performed perfectly.

On Oct. 21, the team — including DOE team leader Gregory Sahd from WIPP, and RAP team members Richard, Phil, Bob, Jim, and Al Horvath (12345) — made the trip to White Sands, where reality — as it often does — proved more complex than the dry run had led the team to expect.

DERRING DO — The Sandia team that deployed to White Sands included, in addition to M2 the robot (third from left), Dan Puetz, Daniel CdeBaca, Bob Anderson, Robb Lee, and Clinton Hobart (all 6644). (Photo by Randy Montoya)

Aided by M2's video camera, Bob steered the robot around two free-standing radiation shields and stopped it at the work site. The robot drilled through the steel plate on target, leaving room for a probe that pressed down the back side of the teeter-totter.

The switch did not budge.

The robot drilled a second hole and applied the probe, with the same negative result.

A third hole, drilled through the switch's hinge pin, failed to dislodge it.

Using a hook, the robot attempted to pull the switch by yanking at two linked wires; the wires came apart. Grasping one of the wires in its pincer, the robot only succeeded in detaching it.

By this time an hour and a half had gone by, and the team was temporarily out of ideas. Phil had estimated that the robot could remain ambulatory in the radiation field for only 50 minutes, and in fact the robot's lower portion was no longer responding to commands.

Wouldn't touch it with a 10-foot pole

The RAP team, working with White Sands personnel, as a precaution against this specific circumstance, had tied a rope to M2 before sending it into the work area. The rope, attached to a RAP team winch 100 feet outside the structure, insured the robot could be hauled out if radiation damaged its drive unit. But radiation shields now blocked a direct haul. M2, powerless, was hemmed in.

The radiation field fanned out like a flashlight beam, strongest at its center and weakest at its edges. Using a ten-foot-long pole and standing at the edge of the field, the team hooked and then tugged at the rope hauling M2. The deflection of the rope's pull slid the robot around a moveable radiation shield without knocking it over. The RAP team's winch then pulled the robot directly out.

Rebooting the robot and performing other maintenance, Bob and Jim found they could reactivate it, and the team finished the day ready to return the next morning.

The new plan was to unscrew six bolts securing the 3/16-inch steel plate that blocked the team's direct access to the switch.

When they returned the next morning, however, the robot again would not start. The problem was traced to a damaged fiber optic line, apparently chewed by one of the numerous rabbits in the area.

HOW DO YOU GET to Carnegie Hall? Practice, man, practice. Here, M2 (Mighty Mouse) practices the complex drilling routine it will follow to free up the stuck radiation source at White Sands.

"The orange fiber optic cable probably looked like a carrot," said Williams of the line transmitting control data to the robot. "Fortunately, White Sands has another facility that uses fiber optic lines, and it was able to repair the cable."

But it was Sunday morning. It took half a day to replace the damaged line.

The time was not wasted. The group, making frequent trips to the local Home Depot and Lowe's, modified its tools. Three screws required Allen wrenches to turn them; the other three screws were single-slotted. The drills needed to turn on in reverse when pushed, yet move slowly enough to engage the screw heads at the start of each effort. The robot could not control the speed via the trigger, since it had only a pincer grip, and accuracy was difficult when trying to insert a turning screwdriver into a single-slot screw head. The team purchased a small, clear acrylic bubble that acted as a see-through guide for Bob to aim the screwdriver head; unfortunately, heat from the radiation source melted the plastic.

So ended the second day.

The third day

A metal guide bought from the hardware store the next morning was opaque, but small enough in diameter to satisfactorily seat the tool on the screw.

By counting revolutions, the team could estimate whether the screw had been rotated enough times to free it from the plate. The team then tried air pressure and hook tools to remove the plate. When neither worked, they steered the robot out of the area and outfitted special tips to the end of its gripper. This time M2 succeeded. A blast of air then blew the entire switch out of the cylinder's pathway, and the radiation source at long last was blown back to its storage position.

Inspection revealed the problem: Forceful early attempts to blow the cylinder back apparently had bent the straight switch into a right angle. Nothing other than plate removal could have freed it.

It was at White Sands that the robot came to be affectionately (and unofficially) dubbed "M2," for the cartoon character Mighty Mouse ("Here I come to save the day").

"It would have been impossible to return the source to storage without removal of that switch," says Richard.

Cleanup extended for another day.

The four-day on-site effort ended the problem, to the exuberance of the RAP team and relief of White Sands personnel.

"The warning lights and horns that could be heard for miles away finally stopped after 21 straight days of annoying personnel at White Sands," says Richard.

Says McDonald, "The facility is being evaluated. We're looking at what happened and considering what we can do to prevent similar incidents in the future."

Says Williams, "The team effort [between White Sands and Sandia RAP] produced a marvelous job."

Lightbringer Debby Tewa provides expert advice about photovoltaic units to people on Indian reservations

Most lived without electricity like Debby did growing up on Hopi Indian reservation

By Chris Burroughs

Debby Tewa (6218) spent her first 10 years living without electricity, water, or a telephone in a three-room stone house in an isolated area of the Hopi Reservation in Arizona.

Today, as a contractor to the Sandia Tribal Energy Program, she provides technical advice about maintaining photovoltaic units to people on Indian reservations who live remotely like she did. For many, it's the first time they've had electricity in their homes.

"I can identify with the people I'm helping," Debby says. "Many live the way I grew up, and I fully appreciate their excitement in having electricity and light at night."

Photovoltaics technology harvests the energy from the sun and converts it into electricity, which is stored in batteries for future use in the home.

DEBBY TEWA with photovoltaic units at Sandia. She is helping Native Americans in remote areas learn how to maintain PV units deployed via DOE grant money. (Photo by Randy Montoya)

As part of Debby's job, she and program director Sandra Begay-Campbell (6218) offer technical advice to tribal governments, which receive DOE Tribal Energy grants. Her work also includes teaching Native Americans how to use and maintain photovoltaic units, supporting project management plans, and helping people network and learn from each other about their photovoltaic systems. In addition, she is enhancing DOE's PV Reliability database with off-grid system information which includes Navajo PV systems' maintenance data.

Debby and Sandra work closely with the Navajo Nation with which Sandia signed a memorandum of understanding in 2000 to encourage further collaboration between the two entities. The Navajo Utility Authority, through DOE funding, has installed photovoltaic units at more than 300 homes on the reservation since 1993.

"There is still a long way to go," Debby says. "It's estimated there are 18,000 families in the Navajo Nation without electricity."

The reason there are so many, she adds, is that many Navajos live at remote sites, like she did as a youth, and it is prohibitively expensive to string electricity lines to those areas. The cost of expanding the gridline is about $27,000 per mile. Many Navajos make do with kerosene, wood, and coal.

Debby lived with her grandmother in the unelectrified house through the fifth grade. Then she moved to Tuba City, Ariz., to live with her parents — they had a telephone, electricity, and water.

After graduating top of her class from Sherman Indian High School in Riverside, Calif., she attended Northern Arizona University (NAU) where she spent two years but didn't earn a degree then. She decided to take the nontraditional path and went to a trade school to become an electrician.

After earning her electrical theory and application certification, she worked briefly as an electrician for the Gila River Indian Reservation south of Phoenix. In 1987 she joined NativeSUN, a Hopi-managed nonprofit organization that installs photovoltaic units at homes in remote areas off the grid.

She spent 11 years there, first as an electrician and later as a program manager, bringing electric light to people who never had it before.

One of the people she helped with her first photovoltaic system was her aunt, who quickly adapted to the new technology.

"She's had her system for 12 years now and just changed the battery for the first time," Debby says. "She's happy with the system."

Debby talked to her customers in their Hopi language and helped them understand what was involved in having a photovoltaic unit.

After 11 years, she went back to school at NAU and earned her BS degree in Applied Indigenous Studies with a minor in Environmental Science. Sandra recruited her as a student intern three years ago to assist her with the tribal energy work.

Her current job has given her some interesting experiences, she says. For example, she's been working with the Ramona Band of Cahuilla Indians in Southern California. They are developing an ecotourism business that brings geologists to learn about the local flora and fauna. They were not hooked up to the electric grid. Debby works with their electrical contractor to set up a hybrid system for their business that consists of a small wind unit, photovoltaic system, and a back-up diesel generator.

She also gives photovoltaic workshops to women, most recently in August at the American Solar Energy Society Conference in Florida. As part of the workshop, the 20 participants installed a photovoltaic unit at an elementary school in Orlando, Fla. Helping with instruction were Sandian Marlene Brown (5733) and Lori Stone of Solar Energy International.

Soon she will be back working with her native Hopi people. The tribe recently received a DOE grant to develop a wind turbine program.

"I'll be offering them technical assistance," she says. "It'll be good helping people at home again."

BBC crew to chronicle Debby Tewa's work

The electrification of homes on the Hopi Reservation — work Debby Tewa did while she worked for NativeSUN — will be featured in a British Broadcasting Corporation (BBC) Science documentary.

On Nov. 30 Debby is scheduled to escort a BBC Science film crew to a remote Hopi village where homes are using electricity from photovoltaic units.

The next day the crew is also scheduled to shoot video of six Stirling Energy Systems solar engine units currently being demonstrated at the Sandia-operated National Solar Thermal Test Facility.

Sandia, KAFB honor Native American heritage

Photo by Patricia Garcia-Brown

Sandia's American Indian Outreach Committee and the 377th ABW at Kirtland Air Force Base joined to promote this year's Native American Heritage Month, focusing on the theme Native Americans: Yesterday, Today — A culture with much more to explore. This year's activities included: a 5K Fun Run/Relay and Health Fair; a powwow social which also included a native foods cook-off and an arts and crafts event; a luncheon/traditional clothing day, with a keynote address by Gov. Everett Chavez, Santo Domingo Pueblo, and Native people dressed in traditional clothing at each table ready to share the significance of the attire; and a special invitation to Jemez Pueblo's Feast Day. During the luncheon event, held at the Mountain View Club, individuals in traditional garb visited from table to table explaining their clothing.

Sandia's AIOC was established in 1979 to increase the number of American Indian employees at the Labs, and to encourage American Indian students to continue their education and to pursue advanced degrees, with an emphasis in science and engineering, while maintaining their cultural values. AIOC also facilitates programs and activities that address the spiritual and cultural needs of American Indians.

In the photo, Mary Montoya (10244, Isleta Pueblo, left) is dressed in a traditional Isleta woman's wedding dress; Alejandro Uentille (Navajo) is garbed in a Warrior Northern Traditional Dance outfit; Val Uentille (Navajo) wears a Grass Dance outfit; Debra Leitka (10244, Seminole) demonstrates a traditional Seminole woman's dress, and the young man in front is Alijah Uentille (Navajo), wearing a Fancy Dance outfit.

Tech art display in Bldg. 802 highlights pre-CAD visualization

Above: Leo Ortiz, Conceptual Rocket Cutaway, circa 1960s. Right: Artist James "Jim" Walston looks at his pen and ink drawings of Presidents Harry S. Truman and Bill Clinton. Jim's portrait of President Truman is the definitive one for most Sandians. The photo of Jim is by Randy Montoya.

In the age before engineers conceived and designed their creations using sophisticated 3-D software, technical artists helped visualize the profoundly complex devices developed at Sandia. With the advent of computers, the age of pen and ink, acrylics, charcoal, colored pencils, and oils may be past. Or is it? Sometimes, the line between tech art and fine art is a fine one indeed, and artists, technical or otherwise, will continue to help Sandians visualize their world for the foreseeable future.

The technical art seen on this page is part of a larger collection on display in the south hallway of the third floor in Bldg. 802.

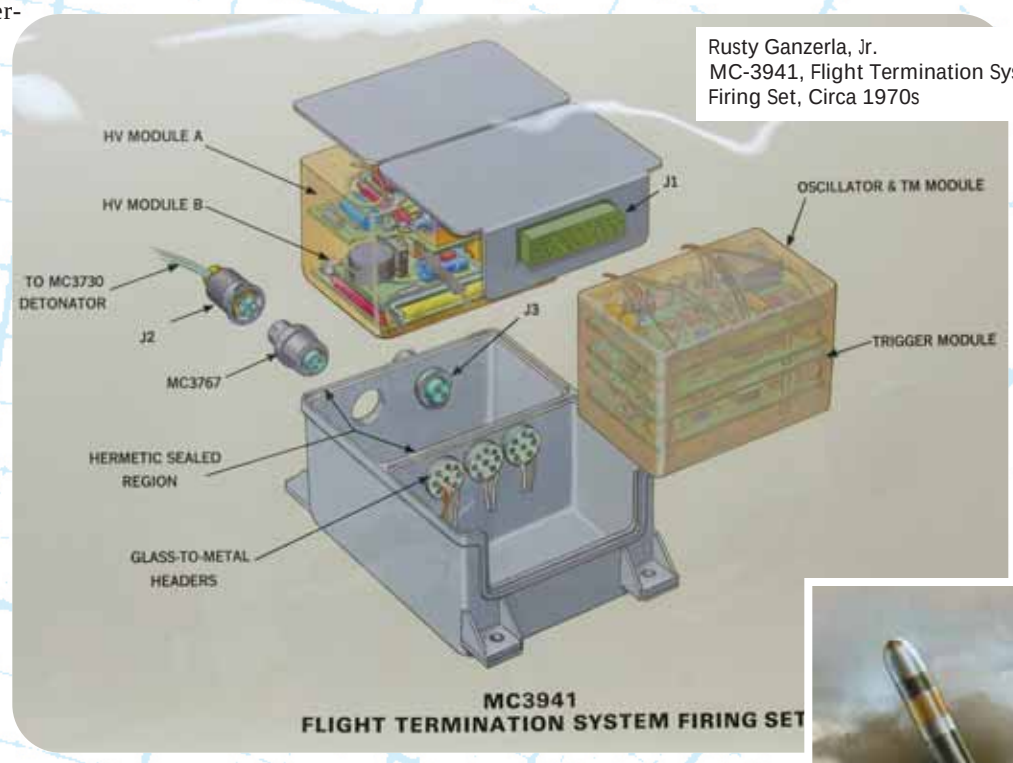
The artists whose works are on display were feted at a special reception in early November.

The exhibit was organized by Mike Clough (3651) and Myra O'Canna (4532).

The artists

The work of 11 Sandia technical artists is on display in the third-floor south hallway of Bldg. 802. The artists are:

- Buzz Babcock
- Leo Ortiz
- Lee Cunningham
- George Marks
- Rusty Ganzerla, Jr.
- Ray Lamb
- Jim Walston
- Jerry Gorman
- Joe Mickey
- George Dooley
- Dick Strome

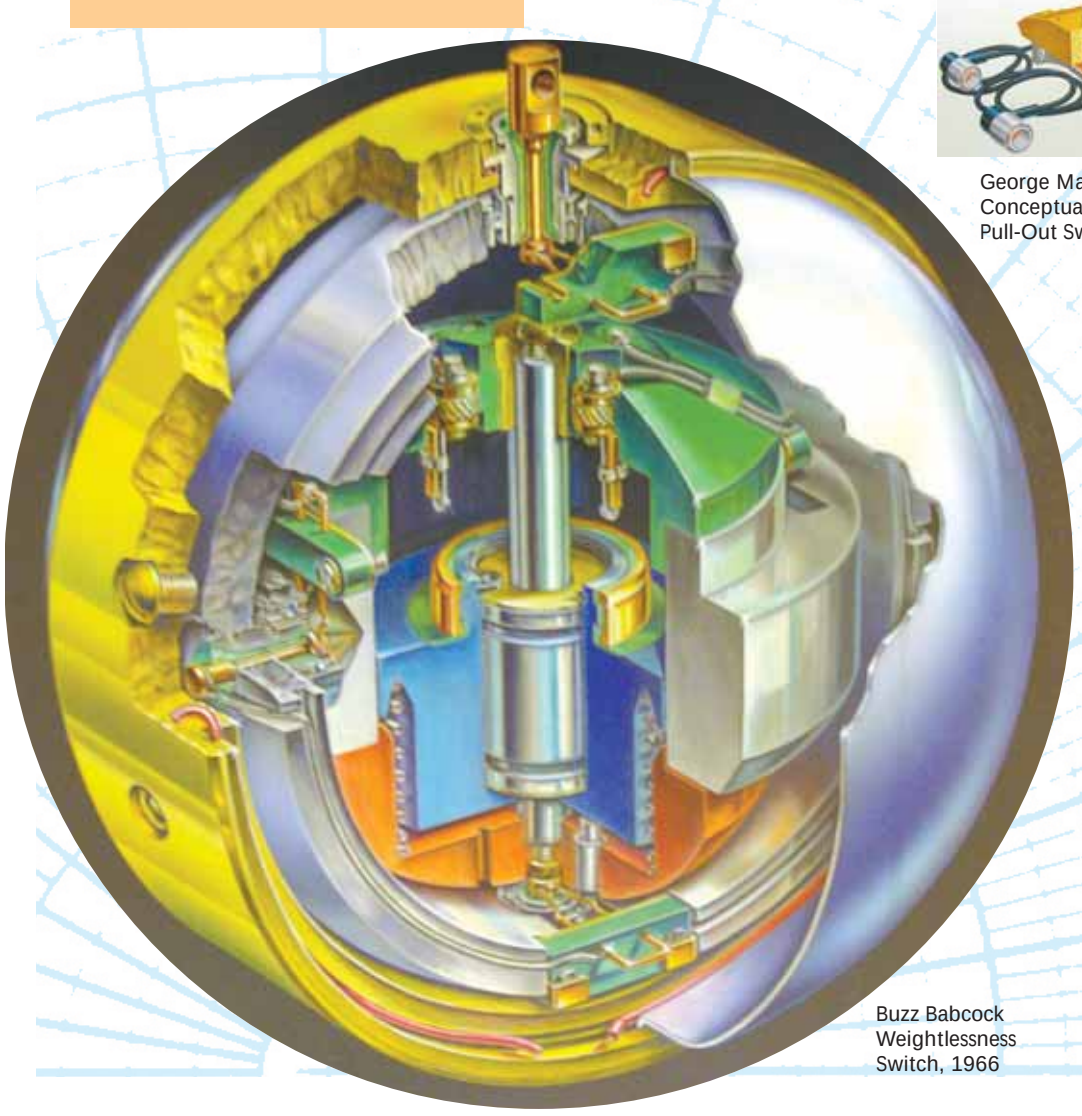


Rusty Ganzerla, Jr.
MC-3941, Flight Termination System Firing Set, Circa 1970s

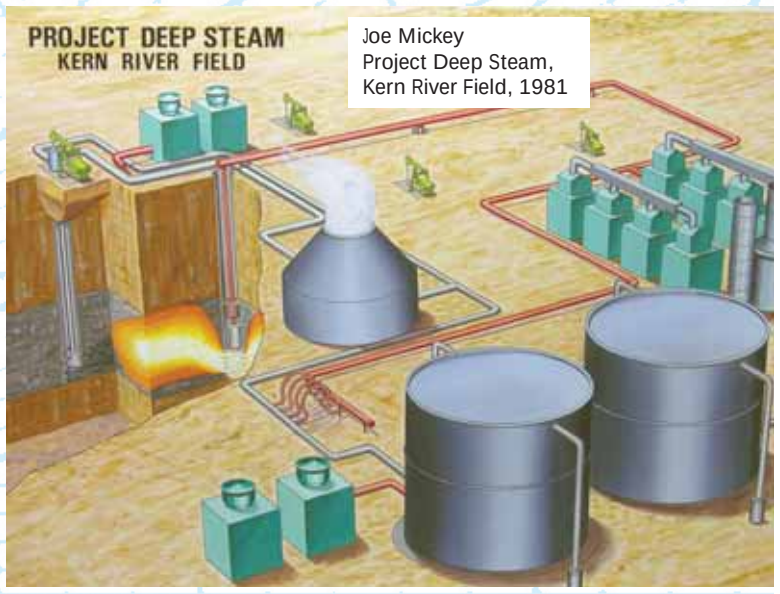
Leo Ortiz, Conceptual Component, Circa 1960s

George Marks
Conceptual Design
Pull-Out Switch, 1966

Jerry Gorman
Trident II Launch Sequence, 1987



Buzz Babcock
Weightlessness Switch, 1966



Joe Mickey
Project Deep Steam, Kern River Field, 1981

Sandia office pros get 'can-do' advice from speaker Suzie Humphreys

Sandia's office assistants attended the New Mexico Office Professionals' Conference at the Albuquerque Renaissance Suites last week. The assistants could choose to attend one of two days, Nov. 8 or 9. The event was hosted and organized by the Office Professionals' Quality Council (OPQC).

OPQC conference attendees await keynote speaker.

The annual conference consists of educational breakout sessions, a luncheon and a motivational speaker. This year's speaker, Suzie Humphreys, focused on passion and endeavor in the workplace and in life. She shared her "can do" attitude with humor while telling about her experiences in jobs ranging from secretary, to singer in a Las Vegas show, to television talk show host. Her advice caused a hunger for ambition, and a hunger for lunch, which took place next.

Following the luncheon, participants chose from breakout sessions including: "Passion for fashion — how to dress correctly in the work force," assertiveness management, exercise classes, and self-defense training from the Albuquerque Police Department.

The OPQC conference, which dates back to 1979, is a day away from the office to promote the well-being of mind, body, and soul. The conference is a "thank-you" for assistants; something nice, said Polly Gutierrez (245), a member of the 2005 OPQC Conference Committee.

Other conference committee members are Marsh Burfeindt (1130), Rosalinda Davis (1769), Suzanne Friggens (6950), Sandra Maestas (3815), Denise Richard-Franco (1128) and Jean Totten (10730). *— Erin Gardner*

OPQC mission is continuous improvement

The mission of the OPQC is to provide a base for continuous improvement in the office-professional environment and promote communication and teamwork among office professionals, staff and management by sharing ideas, issues and solutions. The Council comprises three officers and five teams. Officers include Jeana Brosseau, Chair (3555); Beverly Manuelito, Vice Chair/Treasurer (5916); and Mercedes Herrera, Information Officer (10030). The five teams are: Mentor Team, Work Processes Team, Community Outreach Team, Educational Outreach Team, and Conference Team. Chrissy Garcia (11000) serves as this year's Executive Assistant Advisor; Marcia Vogele (3600) is this year's OPQC Advisor; and Marlene Johnson (3555), Team Lead for Secretarial Services, also participates each year as an Advisor. For more information on the OPQC, visit the web site at: www-irn.sandia.gov/pubs/ opqc/opqcmain.htm.

Q&A addresses issues regarding UT System tuition benefit

The Oct. 28 *Lab News* featured a front-page article outlining a new employee benefit for Sandians: Under an agreement with the University of Texas System, which has developed an increasingly close relationship with Sandia and Lockheed Martin, Labs employees, their spouses, and dependent children qualify for in-state tuition rates at the schools in the UT system. If Lockheed Martin wins the bid to manage Los Alamos National Laboratory, LANL employees will receive the same benefit.

Since the publication of that article, a number of Sandians, retirees, and contractors have raised questions about various aspects of the benefit, specifically seeking clarification of eligibility requirements.

The UT System has developed answers to questions on these issues, which are printed here. Regarding the most pressing question — are retirees, employees of Sandia contractors, and their families eligible for the benefit? — the answer is no. (The full explanation is addressed in question 5 below.)

Frequently Asked Questions

1. Does the State of Texas provide a college tuition benefit to Sandia employees and their families as a result of the science and technology development agreement between the two entities?

Yes. Texas Education Code §65.45(d) authorizes The University of Texas System Board of Regents to charge tuition and fees at the rate charged to Texas residents to non-resident employees of entities with which the UT System enters an agreement regarding science and technology development, including an agreement to manage a national laboratory engaged in such an endeavor. The statute states that a person employed by the entity with whom the system enters an agreement, and that person's spouse or child may pay the in-state rate when enrolled at a University of Texas System institution.

2. When is the in-state tuition rate under a science and technology development agreement available?

It is available when the UT System enters into an agreement pursuant to Texas Education Code §65.45 to the extent that the agreement authorizes the benefit. The benefit was available to Sandia employees and eligible family members effective Sept. 1, 2005.

3. What institutions are a part of the University of Texas System?

UT at Arlington; UT at Austin; UT at Brownsville; UT at Dallas; UT at El Paso; UT-Pan American; UT of the Permian Basin; UT at San Antonio; UT at Tyler; UT at Southwestern Medical Center at Dallas; UT Medical Branch at Galveston; UT Health Science Center at Houston; UT Health Science Center at San Antonio; UT M.D. Anderson Cancer Center; UT Health Center at Tyler.

4. In order for a child to qualify, must the child be a dependent of the employee?

Yes. A dependent child is a child eligible to be claimed as a dependent of a parent for purposes of determining the parent's tax liability under the Internal Revenue Code of 1986. A parent is a natural or adoptive parent, managing or possessory conservator or legal guardian of a child.

5. Are the employees of Sandia contractors or retirees of Sandia eligible for the in-state tuition rate based on this agreement?

No. The Texas statute states that a person employed by the entity with whom the system enters an agreement under Texas Education Code §65.45(d), and that person's spouse or child may pay the in-state rate. The statute does not provide UT System institutions with the authority to charge employees of Sandia contractors or retirees of Sandia who are not Texas residents the in-state tuition rate.

6. Will an individual who receives the Texas in-state tuition rate be eligible for that rate during his/her entire enrollment at a UT System institution even if the Sandia employee terminates employment?

No. The tuition benefit under the agreement terminates upon termination of employment with Sandia. Documents of eligibility will be required of enrolled students prior to the census date at the beginning of each semester in which the student enrolls in a UT System institution. The "census date" is the date in an academic term for which an institution is required to certify a person's enrollment in the institution to the Texas Higher Education Coordinating Board for funding purposes.

7. Will an individual who receives the Texas in-state tuition rate under this agreement be classified as a Texas resident?

No. The individual will be classified as a non-resident eligible to pay the in-state tuition rate.

8. Does the State of Texas have other laws besides Texas Education Code §65.45(d) that authorize non-residents of Texas to pay the in-state tuition rate?

Yes. There are various Texas laws that authorize Texas institutions to charge the in-state tuition rate to non-Texas residents. A summary of these laws can be found on the Texas Higher Education Coordinating Board web site at: http://www.collegefortexans.com/cfbin/tofa.cfm?Kind=W

9. Who can assist me with questions regarding residency, tuition, and financial aid?

The following is contact information for individuals at the nine UT System academic institutions who will be able to assist with such questions: http://www.utsystem.edu/news/tuition/Questions.htm

The following provides links to the UT System health institution colleges and schools: http://www.utsystem.edu/hea/HealthColleges.htm

KAFB access — spouse pass update

Due to the high volume of spouse passes that have been requested by Sandia employees, Kirtland Air Force Base (KAFB) now requires a minimum of two business days to process new requests.

To initiate the process, submit a completed Security Forces Management Information System (SFMIS) form to the Bldg. 800 receptionist two days before obtaining the spouse pass (contact the Badge Office Receptionist for information on how to get the form).

The form will be processed and forwarded to the KAFB Consolidated Support Building (CSB, Bldg. 20245) on Fourth Street southwest of the fire station at the corner of Wyoming and F Avenue. Two business days after submitting the SFMIS form, the spouse must be present at the CSB or the Gibson or Truman gates to have his/her photograph taken. The pass is valid for one year from the date of issue.

The CSB telephone number is 846-6429 and hours of operation are Monday-Friday, 8:30 a.m.-4 p.m. (The CSB office is closed the third Thursday of every month.) The KAFB spouse pass allows access to the base only and not to any Sandia-controlled premises. Visitors to Sandia must have official business and be properly badged through the Sandia Badge Office.

The new spouse pass requirement is part of an effort by the US Air Force to exert more control over access to bases.

The familiar hand-written base passes — including those issued to spouses or family members in 2004 and 2005 — will no longer be accepted as authorized credentials admitting access to Kirtland AFB.

The following summary, provided by the Badge Office, offers more information about the new requirement.

Q: Why has Sandia stopped issuing picture identification for spouses to use as entry onto KAFB? The passes from the military are only good for one year.

A: The commanding officer of Kirtland AFB is in the process of implementing a more stringent process for controlling unescorted access onto the base. In the past, some 85 different credentials would allow holders to gain access to the base. That situation created numerous inconsistencies, as well as potential vulnerabilities to all personnel on the base. With the new SFMIS process in place, the number of authorized credentials has significantly decreased.

All US Air Force bases have implemented the SFMIS database pass for all visitors and/or personnel who do not possess authorized government credentials. Additionally, the Air Force has determined that non-permanent residents will be issued an SFMIS pass up to only one year at a time.

Examples of permanent base residents are military members and their families, government employees/contractors, and resident tenants such as Sandia employees, contractors, and consultants.

Additional security measures will be implemented in the near future, including background checks for selected personnel. Those checks will be conducted at the discretion of the Air Force.

* * *

For additional information on base access and visiting Sandia, refer to the Badge Office's external web site at: http://www.sandia.gov/about/locations/newmexico/index.html. Specific questions may be directed to Gabriel Pacheco at 284-5977 or Rubyann Sanchez at 284-3958.

DOE Atmospheric Radiation Measurement program mobile facility moves to Niger for year-long stay

Sandia researcher Mark Ivey spends a week setting up climate monitoring equipment

By Chris Burroughs

After a six-month stint taking cloud and aerosol measurements at Point Reyes National Seashore on the California coast, the ARM Mobile Facility moved to Niamey, Niger, in October for a year's deployment there.

Going along to help set up the climate monitoring equipment was Sandia engineer Mark Ivey, who spent a week in the West African country.

ARM — for Atmospheric Radiation Measurement — is the largest global change research program supported by DOE. It was created in 1989 as part of the Global Change Research Program to help resolve scientific uncertainties related to global change, focusing on the role of clouds. ARM has three permanent research sites around the globe, plus the mobile facility that recently was deployed to Niger.

"This is the mobile unit's second deployment," Mark says. "For the next year, the ARM Mobile Facility [AMF] will be measuring cloud properties, solar and thermal radiation, and meteorological conditions at the surface."

He adds that a multinational experiment is investigating how mineral dust from the Sahara and biomass burning play a role in the West African monsoon and the climate in general. The belief is that these aerosols, as well as deep tropical convection in the sub-Saharan wet season, have a big impact on climate in that region, and possibly well beyond Africa.

"This experiment will help us better understand how solar and thermal radiation are transferred in the atmosphere when deep convection and aerosols are present," Mark says.

While the mobile unit will be taking climate measurements on the ground, a European satellite positioned over the Sahara will be taking them from the sky. The combined measurements will provide the first well-sampled, direct estimates of changes of solar and thermal radiation across the atmosphere. The mobile unit will also be used to study the impact of clouds, aerosol, and water vapor on the surface.

Niger is one of the hottest countries in the world, with heat so intense that it often causes rain to evaporate before it hits the ground. Mark calls the Sahara "the biggest dust aerosol generator on the planet."

ARM MOBILE FACILITY equipment being unloaded at Niamey airport in Niger. (Photos courtesy of Mark Ivey)

MARK IVEY, right, and colleagues from Niger discuss the deployment of ARM's Mobile Facility near Niger's capital city, Niamey.

Teams from the participating organizations will be spending time at the research site on a rotating basis. An Australian couple will be there for more than a year to take care of the equipment and work with local meteorological observers.

Mark, a member of the first rotation team, arrived in Niamey, Niger's capital, on Oct. 11, three days after a chartered 747 jumbo jet carrying the equipment landed at the airport. The AMF equipment includes seven containers, each 8 feet tall, 8 feet wide, between 12-20 feet long, and weighing 5,000-10,000 pounds. One extra container with equipment will arrive in January. A separate container for batteries and other types of potentially hazardous materials was shipped from California to Niger, taking 12 weeks to get there by sea.

The mobile unit has its own power generation, communication system, and state-of-the-art climate measurement instrumentation.

Mark worked closely with colleagues at Los Alamos National Laboratory in planning the Niger deployment. His involvement in the ARM Program dates back to the late 1990s when he led a team at Sandia that designed, built, and integrated ARCS — Atmospheric Radiation and Cloud Stations. The ARCS systems are still used at the Tropical Western Pacific ARM sites, and two ARCS vans were included in the AMF deployment in Niger.

Among Mark's responsibilities as part of the first working team at the Niger sites was the on-site electrical engineering expertise required to install and operate the mobile facility. The US Embassy in Niamey assisted with obtaining the formal procurement contracts required for local communications, utility, and meteorological support services.

The players: national laboratories, universities, and more

The Atmospheric Radiation Measurement (ARM) Mobile Unit is part of the African Monsoon Multidisciplinary Analysis (AMMA) research program that is scheduled to be in Niger for seven years. However, the ARM unit will be there only one year to support a DOE-funded experiment called RADAGAST, short for Radiative Atmospheric Divergence using the ARM Mobile Facility, Geostationary Earth Radiation Budget instrument data, and AMMA stations. The principal investigator for RADAGAST is Anthony Slingo from the University of Reading in the UK. The ARM team includes science colleagues from DOE national laboratories — Sandia, Los Alamos, Pacific Northwest (PNNL), Argonne, and Brookhaven; the Australian Bureau of Meteorology; and several other countries. PNNL initially designed and built the mobile unit, then turned the completed unit over to LANL for deployment. Sandia is handling engineering issues related to operations. The ARM program is funded through DOE's Office of Science.

And now there's this musk ox . . .

Is northern Alaska getting warmer? Through actual long-term measurements taken at climate-monitoring stations in the Barrow area and stories told by area natives, it appears it is.

Once every two to three months, Mark Ivey and his colleagues Bernie Zak and Jeff Zirzow (all 6214) go to the ARM permanent site at Barrow, Alaska — the northernmost town in the US — to check on measurements, make sure everything is operating properly, and participate in field experiments on the North Slope.

Over the years they have come to know some residents of Barrow, a town of 4,500 people, mostly Inupiat Eskimos.

The ARM site has a large instrumentation shelter with state-of the-art atmospheric measurement equipment. It has been operating since 1997 — not long enough to extract a temperature trend from the "noise," but other stations in the area, including the Climate Monitoring and Diagnostics Laboratory operated by National Oceanic and Atmopheric Administration (NOAA), have been measuring local temperatures for decades, with existing records for Barrow reaching back to 1901.

Image courtesy of Fla. Center for Instructional Technology

The latest analysis from the NOAA Barrow facility shows an increase in the daily average temperature of +0.1 C per year from 1977 to 2004, or + 2.7 C overall.

Reported increases in seasonal averages are higher, with the rise in springtime average temperatures measured at +3.8 C over roughly the same period.

Inupiat elders in the Barrow area are convinced of the change. They've noticed, says Mark, that the nesting patterns of migratory birds and ice-related seasonal territories of mammals, including polar bears and Bowhead whales, have changed dramatically in the last decade. The ice that freezes fast to the Barrow shoreline in winter forms later than it used to and can't be trusted in springtime during whaling season. That change has already made a difference in the timing of the yearly supply barge from Seattle. Recently it's been two weeks earlier as compared to the historical norm.

And then there is the musk ox that recently started hanging around the ARM facility near Barrow. Although there are many caribou and polar bears, no one remembers seeing a musk ox so far north before.

ARM facilities

The DOE Atmospheric Radiation Measurement (ARM) Program established permanent instrumented research sites at three locales around the world for studying cloud formation processes and their influence on climate. Recently designated as "user facilities" by DOE, the ARM Climate Research Facility is now available to visiting scientists for experimentation.

The three regional sites include the Southern Great Plains site near the Oklahoma/Kansas border; the Tropical Western Pacific locale consisting of sites at Darwin, Australia; Manus Island, Papua New Guinea, and Nauru Island; and the North Slope of Alaska sites at Barrow and Atqasuk.

There is no fee for scientists using the facilities or data. However, to qualify for ARM funding for any incremental costs associated with an experiment, they must submit proposals to the ACRF Science Board, which reviews the proposals based on scientific merit and the feasibility and costs associated with using the facility. The board then provides recommendations to DOE for a final decision.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Bud Pellitier

Victor Baca
30 2553

Rita Marie Baca
30 10223

John Emerson
35 2453

Steven Johnston
30 2956

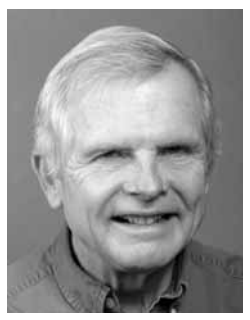
Eunice Young
25 5532

Charles Egbom
20 2666

Recent Retirees

Larry Grube
39 2990

Lyle Kruse
34 6957



Bob Poole
27 2452

Jerome Hands
26 10800

C. Douglas Foldie
24 2714

Larry Claussen
23 6223

Yvonne Oglesby
16 5051

Bi-National Lab opens shop, hopes to create 'necklace of labs' along Mexican border

Dream of Sandia's ACG takes on flesh, though somewhat altered

By Neal Singer

After four years of preparation, and under different management than originally intended, the Bi-National Sustainability Laboratory (BNSL) announced itself ready for business in a 4,000 square-foot-facility in Santa Teresa, N.M. The lab, a short ride east from El Paso and a few miles from the Mexican border, is a collaboration initiated and championed by Sandia's Advanced Concept Group, and financially supported by the US, Mexico, and the State of New Mexico.

The two-hour opening ceremony on Nov. 18 was attended by approximately 125 people.

The point of the fledgling enterprise is to change the US-Mexican border from a political trouble spot to a necklace of research centers stretching from the Gulf Coast to the Pacific. Success would be defined by the number of research ideas its personnel could morph into functioning, profit-making companies, with better paying jobs on both sides of the border the hoped-for result.

Projects of current interest include microelectromechanical systems (MEMS), advanced materials for petroleum processing, and environmental and water technologies.

The US and Mexico contributed initial funding of $400,000 each, and the State of New Mexico, $100,000. Ten states on both sides of the border have expressed interest in taking part in the project, as have US and Mexican national laboratories, research universities and centers, and businesses.

GERRY YONAS addresses session announcing the opening of the Bi-National Sustainability Laboratory at Santa Teresa, N.M.

Though representatives from many high Mexican and US political offices were among the attendees, the person most often praised was Sandia Vice President Gerry Yonas (7000), who conceived the idea of the project and fought for its existence after visiting Colonias, a slum adjacent to Juarez. It stunned him, he told the *Lab News*, that right across the border from the US, across (so to speak) a mere line in the sand, thousands of families live without running water, sewer lines, adequate housing, food, electricity, and clothing. Children have continual diarrhea from drinking polluted water.

"It was inconceivable," he said, "to have our neighbors just a few hundred miles to our south living in such deplorable conditions right across the border from our security and wealth."

He worried that the obvious disparities would result in even worse public health, law enforcement, and social ills that would eventually drift northward.

He wondered as he drove back north if the situation could be changed dramatically through creation of a shared lab, essentially on the border, where Mexican and US scientists, engineers, economic developers, and lawyers could work together on mutual problems and mutual opportunities to create peace, freedom, and prosperity through technology.

Rick Homans, Secretary of New Mexico's Economic Development Department and the celebration's first speaker, acknowledged Gerry as "the father of this baby, the visionary, the individual who originally had the idea that there was unfinished business from NAFTA, and that we have the ability to turn a huge challenge into a huge opportunity. Today takes us from a concept on paper to a project housed in a building — a huge step forward."

A spokesperson for the Mexican National Council of Science and Technology said in Spanish that "people around the world are interested in copying this model; even though we have only just started, it is a dream shared. It's like we are on the field in a stadium and they are looking at us from many parts of the stadium, from many parts of the world. We hope this will change the way borders are looked at."

Among those attending from Sandia were president of BNSL's board Jessica Turnley (7000), BNSL steering committee member Gary Jones (10113), and Vipin Gupta (6218), a member of Sandia's border group involved in solar and water projects.

The BNSL was envisioned initially by Gerry as occupying a large building — "a shining laboratory on a hill," or at least, on the border — in which Mexican and US researchers would work on the knotty problems that might one day cause enmity between neighbors. Solutions would include more efficient use of water, better border crossing sensors and arrangements, research into areas of joint interest like crop development in arid regions, and a central location where Mexican and US researchers could share cultures.

Current management, under the direction of Paul Maxwell, former vice president of research at the University of Texas at El Paso, envisions a string of small research centers that the BNSL would help fund, provide training and cross-border legal and patent expertise, some laboratory space, and bring together researchers in government, universities, and private industry to create marketable goods that will bring to life the somewhat desolate border region.

In both versions, the BNSL is expected to provide business planning, mentoring, incubation, marketing techniques, and aid in morphing technological ideas into developed products.

"Gerry Yonas picked Santa Teresa as the right spot for the BNSL," said Maxwell at another meeting later that day. "He was right. We envision ourselves as an engine of research excellence for sustained economic development [east and west along] the US-Mexico border.

"To cross the Valley of Death [the journey an idea must take between conception and emergence as a business product], businesses need new technical ideas — but they don't have them; academics have ideas but don't know how to cross [from the other side of] the Valley. BNSL will help," he said, crediting the picturesque Old Testament expression to Gerry, who credited to Gary Jones.

Gary spoke briefly on the difficulties in making binational investors comfortable with patents that do not have both US and Mexican originators, because of different rights the two countries assign to patent holders.

Gerry suggested biomems as a possible area of BNSL interest but otherwise spoke very briefly. He described himself as "a card-carrying physicist and dreamer," and compared the BSNL's task to sherpas who accompany tourist mountain climbers to the top of Mt. Everest, over and over without recognition.

"The BSNL's activities will require steady, careful, sherpa mountain climbing," he said.

SHOES FOR KIDS

Sandia's 'Christmas Story' is retold as it has been for 49 years

Most of you have read Sandia's Christmas Story. Forty-nine years ago the gift exchange between two scientists at Sandia took a different turn. Instead of exchanging gifts or cards, they bought shiny new shoes for needy children.

Over the years, word spread and the Christmas program escalated to the department level. By 1995, a division of 800 employees donated nearly $5,000 for new shoes. That year, Lockheed Martin/Sandia adopted the program as a corporate-sponsored project. Since 1999 each year has seen a new high in donations.

Last year employees and retirees donated more than $22,000, which translates to about 500 children getting new shoes. Over the last 49 years, Sandians have provided shoes to about 10,000 children in our community. The children are selected by their teachers.

At a recent fitting, little boys pretending to be Kobe Bryant jumped high in their new basketball shoes. One boy, his own sneakers two sizes too big, found a pair of shoes that were just his size. He selected shoes that "look good on me." He talked about loving to run without shoes. He said he runs faster that way. Asked if the rocks hurt his feet, he responded, "I don't feel them."

One little girl had a hard time trying to decide if she should get boots or sneakers. She decided she would go with the sneakers. She said she would get boots next time.

Fittings began Nov. 8 and continue to Feb. 14. This year school buses will bring 25 children from 20 schools to fittings at Mervyns at Coronado Center. Fittings are held on most Tuesdays and Thursdays. If you are interested in helping fit shoes, contact Patty Zamora (3652) at 844-2146 or at pgzamor@sandia.gov.

Donations for Shoes for Kids Fund can be made at the Sandia Laboratory Federal Credit Union Acct. #223180, P.O. Box 23040, Albuquerque, NM 87192-1040, or call 293-0500 to make a transfer online: 223180-90-01, shoes.

The account remains open throughout the year.

Story by Iris Aboytes
Photos by Randy Montoya

"Our Hearts Warm Kids Feet"

Center 3500 "Socks for Kids"

Please join us in supporting the "Shoes for Kids" by donating socks for children in:

- *Kindergarten through fifth grade*
- *Any children's size (ages 5-10)*
- *Any color/design for girls and boys*

You may leave your sock donation with any 3500 assistant or hang your socks on "The Wall of Socks" in Bldg. 800S / Rm 1080.
'Tis the season – Happy Holidays!
Thank you!
– Center 3500 Assistants

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