ENGINEER OF THE YEAR — Cliff Ho (6337) has been named a 2010 Asian American Engineer of the Year by the Chinese Institute of Engineers–USA. See the story on **page 4.** (Photo by Randy Montoya)

## Women's History Month

In recognition of Women's History Month, Sandia corporate historian Rebecca Ullrich tells the story of several of the pioneering women who worked at the Labs as scientists and engineers in the early years. See the story on **page 12.**


# Sandia LabNews

**Vol. 62, No. 4** **March 12, 2010**

*Managed by Lockheed Martin for the National Nuclear Security Administration*

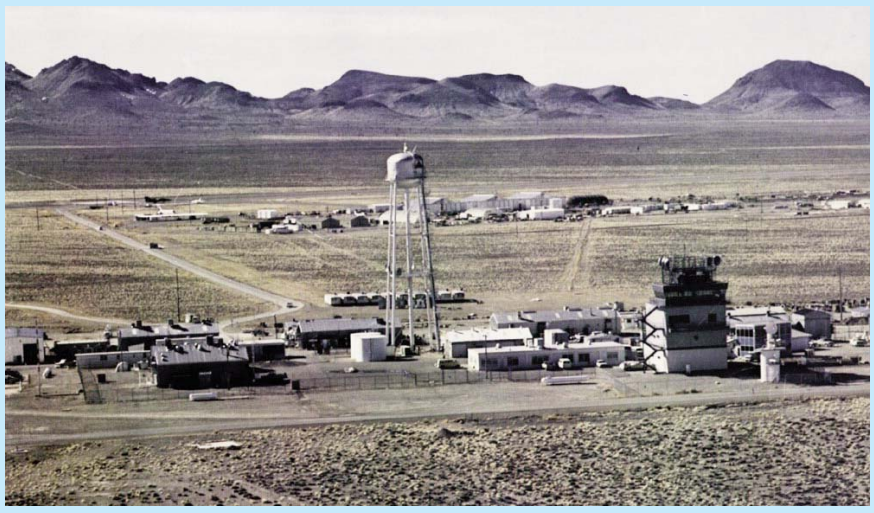
Sandia National Laboratories


### *Inside . . .*



# Tonopah Test Range open for business

## *Nevada site has supported weapons flight testing for more than 50 years*



By Bill Murphy

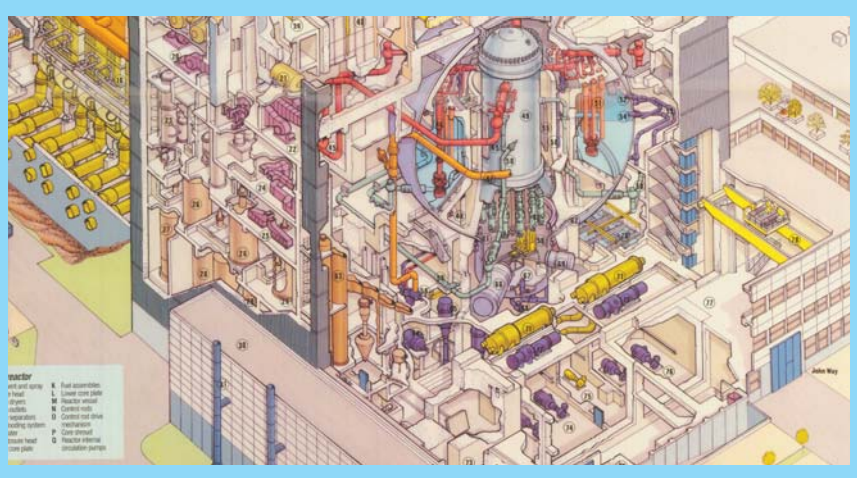
To paraphrase Mark Twain, reports of the demise of Sandia's Tonopah Test Range have been greatly exaggerated.

Given the recurring discussions over the years about retiring the range, it's understandable that some Sandians might think the TTR has entered the history books as part of Sandia's storied past. But that isn't the case. It's still very much a going concern.

Ajoy Moonka, senior manager of the Stockpile Support and Test Group (2910), wants to get out a simple message: Tonopah Test Range is open for business. It's serving the nation's nuclear weapons mission and, through work for others agreements, conducts tests for customers in a number of federal agencies, including Man Portable Air Defense System (ManPADS) tests that help protect American forces in war zones.

*(Continued on page 4)*

# Reactors as art



YOU FIND ART in the most unlikely places. Ron Knief (1382) found it in the pages of *Nuclear Engineering International* magazine, which from the mid-1950s through the early 1990s published poster-sized cutaway illustrations of commercial nuclear reactors from around the world. Ron has made it his avocation to ensure the illustrations survive for future generations of nuclear engineers. Read about Ron's preservation efforts — and see some of the remarkable illustrations — on **pages 6-7.**

# That's that

First off, how 'bout them Lobos? Regardless of how the 2009-2010 season ends for them, this has been a most incredible time for a team that was not expected to be much of a factor in the Mountain West Conference. As I write this, the Lobos have clinched the MWC title, are ranked No. 8 in the weekly AP college basketball poll, and are assured of a bid — and probably a pretty high seed — in the post-season NCAA tournament. You know something really special is going on when folks who never pay the slightest attention to college hoops start talking about the team. We can all draw our own lessons from this remarkable season. But more to the point, we can just enjoy and savor it. Finally, since this is a young team, I wonder if they're going to be like the Ramans? Remember: the Ramans always do things in threes. (A nod here to Arthur C. Clarke.)

* * *

Guess I'm on a sports kick, but I also have to take note of the just-completed Vancouver Olympic Winter Games. A couple of impressions: Snowboarder Shaun White is a superstar. So is Apolo Ohno. And Lindsey Vonn. In fact, all of our US medalists are collectively a pretty impressive bunch. Hey, you don't get to that level of accomplishment without some extraordinary gifts. And I suspect that raw talent barely begins to tell the story. Athletes competing at the Olympic level are the living embodiment of Thomas Edison's observation about genius: It's 1 percent inspiration and 99 percent perspiration.

You know what really impresses me about these games? In competitions that are decided literally by hundredths of a second, the same people keep winning again and again. The same people are always just that blink of an eye better than everyone else.

* * *

Sandia enjoyed a nice twofer the other week in terms of media coverage: *The Wall Street Journal*, which recently overtook *USA Today* as the nation's biggest newspaper (circulation-wise), featured two stories in the same week about Sandia. One was about our battery abuse lab, highlighting the work by Pete Roth and Christopher Orendorff and the folks in Advanced Power Sources R&D Dept. 2546. That story, by the way, featured a large color photo of Pete by Randy Montoya that we ran in the March 28, 2008, *Lab News*. The other story was about the Livermore Valley Open Campus, an innovative collaboration between Lawrence Livermore and Sandia/California where, as the *WSJ* story put it, "both of the city's weapons labs . . . are moving forward on plans to build a campus where government scientists and outside researchers can work together on clean-energy technology." Bob Carling, director of Transportation Energy Center 8300 was quoted to very good effect in the story, saying, "We've been hiding behind the fence for too long."

It's especially gratifying for the folks in my group — Media Relations and Communications Dept. 3651 — and California-based Business Development/Public Relations and Strategic Communications Dept. 8529 when our efforts help garner national media coverage for our researchers.

* * *

Just finished a book called *One Second After*; it's about what happens when some undisclosed enemy sets off one or more nuclear weapons in the upper atmosphere above the US. The blasts generate an electromagnetic pulse, or EMP, that effectively turns off 21st-century American life. I'm no expert, but a bit of online research suggests the basic concepts in the novel are accurate: an EMP of sufficient size would, indeed, play havoc with the nation's infrastructure, with devastating results. The picture the novel paints is pretty alarming, alarming to the extent that I sure hope there are some smart folks — including, of course, Sandians — working on ways to counter this kind of threat.

See you next time.

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

**Medicare Part A & B reminder for current retirees**
**First announced in letter mailed January 2010**

Effective Jan. 1, 2011, Sandia Labs will discontinue the UnitedHealthcare Senior Premier PPO, and plans to offer only Medicare Advantage plans. This change will affect all **Medicare-eligible Sandia retirees, surviving spouses, and long-term disability terminees (and their Medicare-eligible dependents).** The Sandia Health, Benefits, and Employee Services (HBE) group detailed this change in a January 2010 letter sent to all affected individuals.

***You may need to take action to ensure you have uninterrupted coverage.***

**To be eligible for a Sandia Medicare Advantage plan, you must be enrolled in Medicare Part A & B.** If you are already enrolled in Medicare Part A & B, you do not need to take any action. If you are not currently enrolled, you may be able to sign up during the general enrollment period that ends March 31, 2010 (coverage will take effect July 1, 2010).

To learn if you can sign up for Medicare, visit medicare.gov/MedicareEligibility. You may also call the Social Security Administration at 800-772-1213 for more information about Medicare eligibility.

To review the letter HBE mailed in January, visit hbe.sandia.gov and search "retiree letter" or "1781."

## Recent Patents

*Note: Patents listed here include the names of active and retired Sandians only; former Sandians and non-Sandia inventors are not included. Following the listing for each patent is a patent number, which is searchable at the US Patent and Trademark Office website (www.uspto.gov).*

* * *

Timothy Boyle (1815): Solution Synthesis of Germanium Nanocrystals. Patent No. 7,591,871

Kamlesh Patel (8621), Ken Peterson (1832), and Ron Renzi (8125): High Temperature Flow-Through Device for Rapid Solubilization and Analysis. Patent No. 7,592,139

Jim McElhanon (1821), Blake Simmons (8625), Tom Zifer (8223), Greg Jamison (5918), Kamyar Rahimian (5923), David Wheeler (1714), and Chad Staiger (6338): Thermally Cleavable Surfactants. Patent No. 7,595,349

Jim Brennan (8621), Anup Singh (8621), Daniel Throckmorton (8621), and James Stamps (8229): Portable Modular Detection System. Patent No. 7,602,307

Kevin Dixon (1432) and John Forsythe (1432): Physical Context Management for a Motor Vehicle. Patent No. 7,610,130

Blake Simmons (8625): Surface Engineered Nanoparticles for Improved Surface Enhanced Raman Scattering Applications and Method for Preparing Same. Patent No. 7,608,461

Dawn Skala (8238), Stewart Griffiths (8300), and Peter Yang (8656): Vitreous Carbon Mask Substrate for X-Ray Lithography. Patent No. 7,608367

John Hachman (8223) and Dorrance McLean (8517): Apparatus and Method for Electroforming High Aspect Ratio Micro-Parts. Patent No. 7,608,174

John Brainard (2452): Charge-Pump Voltage Converter. Patent No. 7,612,541

Prabal Nandy (5717): Edge-based Correlation Image Registration for Multispectral Imaging. Patent No. 7,620,269

Robert Moore (6771), Paul Pickard (6770), Edward Parma (6771), Milton Vernon (6771), and Fred Gelbard (5713): Integrated Boiler, Superheater, and Decomposer for Sulphuric Acid Decomposition. Patent No. 7,645,437

James Ramsey (5713), Patrick Finley (6323), and Brad Melton (6325): Determining Position Inside Building via Laser Rangefinder and Handheld Computer. Patent No. 7,646,473

Mark Tucker (6327): Decontamination Formulation with Additive for Enhanced Mold Remediation. Patent No. 7,662,759

Dennis Youchison (1658): Methods for Manufacturing Porous Nuclear Fuel Elements for High-Temperature Gas-Cooled Nuclear Reactors. Patent No. 7,666,463

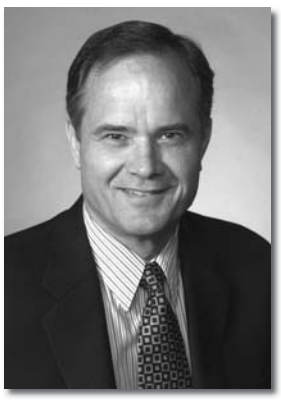
## Retiree deaths

Richard P. McCann (age 86) . . . . . Jan. 18
Ralph H. Plumlee (93) . . . . . Jan. 24
James R. Collier (82) . . . . . Jan. 24
Thomas W. McKinney (87) . . . . . Jan. 26
Herbert V. McNabney (93) . . . . . Jan. 27
Robert E. Moll (87) . . . . . Feb. 1
Myrtle P. Patterson (90) . . . . . Feb. 2
Richard G. Eakes (75) . . . . . Feb. 6
M.J.L. Gallegos (78) . . . . . Feb. 11

# Dennis Siebers selected as an ASME Fellow

By Patti Koning

Dennis Siebers (8362) has been named a Fellow of the American Society of Mechanical Engineers (ASME). The Fellow grade recognizes significant engineering achievements and contributions to the engineering profession. Out of 93,537 total ASME members, there are only 2,956 Fellows.



DENNIS SIEBERS

According to the ASME citation, Dennis was honored for "research at the forefront of developing a new understanding of diesel combustion, which became a key enabler for the industry's achievement of a two order-of-magnitude reduction in diesel pollutant emissions, and simultaneously, higher fuel efficiencies over the last two decades." During this time, he became a leader in the field of engine combustion research, helped grow and lead Sandia's world-renowned engine research program, and worked with DOE to formulate and lead national engine/fuel research programs. Earlier in his career, Dennis developed new heat transfer understanding related to solar-central-receiver power plants and was instrumental in evaluating the Solar One receiver thermal performance.

Since 2002, Dennis has managed the Engine Combustion Department in the Combustion Research Facility (CRF). He received his BS and MSc in mechanical engineering from Purdue University in 1973 and 1975, respectively, and his PhD in mechanical engineering from Stanford University in 1983. He joined Sandia in 1976 and worked under Sandia's Doctoral Study Program while at Stanford.

Under Dennis' leadership, the Engine Combustion Department provides the science base on advanced combustion strategies needed by the US engine industry to develop more efficient, cleaner internal combustion engines for transportation. He also provides technical management support to DOE's engine combustion research programs, including helping DOE create multiyear research plans for advanced engine research and development and to manage university engine combustion research projects.

Dennis plays a key role in the CRF's collaboration with industry, universities, and other national laboratories. He leads a memorandum of understanding between 15 engine and energy companies (Ford, GM, Chrysler, Caterpillar, Cummins, Detroit Diesel, John Deere, GE, Navistar, Mack Truck, ExxonMobil, ConocoPhillips, Shell, Chevron, and BP) and six national laboratories (Lawrence Livermore, Los Alamos, Oak Ridge, Argonne, National Renewable Energy Laboratory, and Sandia) on engine/fuel combustion research that is supporting the development of the next generation of clean, high-efficiency engines for transportation.

He is actively involved in the international combustion research community. Dennis is a Fellow in the Society of Automotive Engineers (SAE), the author or coauthor of more than 80 papers, and the recipient of several annual best paper awards from various organizations: the ASME Melville Medal, the SAE Horning and Arch T. Colwell Awards, the Central States Section of the Combustion Institute best paper award, and the ASME ICE division best paper award. He is on the editorial board for the International Journal of Engine Research, continues to be on the organizing committee of major international conferences on engine research, and has served as the SAE Vice Chair for Combustion on the Fuels and Lubricants Activity.

## Sandia CaliforniaNews

# California selects Livermore Valley's i-GATE as state innovation hub

By Mike Janes

The city of Livermore has moved one step closer toward its goal of establishing the Livermore Valley as a high-tech anchor for the region. Recently California's Business, Transportation and Housing Agency selected the city's i-GATE (Innovation for Green Advanced Transportation Excellence) as an inaugural member of the California iHub demonstration program.

The mission of i-GATE is to maximize the economic impact of green transportation and clean energy technologies through expedited technology transfer, entrepreneurial assistance, collaboration opportunities, academic alliances, and a technology incubator for the development of high-growth green businesses. The city of Livermore is the iHub coordinator and Sandia is the program lead. Partners include Lawrence Livermore National Laboratory (LLNL), two University of California campuses (Davis and Berkeley), Cal State East Bay, Las Positas College, the Livermore Chamber of Commerce, and four nearby cities (Pleasanton, Dublin, San Ramon, and Tracy), among others.

"This represents an exciting opportunity to both advance technology in the transportation arena and to increase our partnerships with the city of Livermore and local businesses," says Rick Stulen, Div. 8000 vice president.

The i-GATE hub will be leveraged by the Livermore Valley Open Campus (LVOC), a joint venture between Sandia and LLNL to promote greater collaboration between the world-class scientists at the labs and their partners in industry and academia. According to Energy Secretary Steven Chu in a press release last year, the LVOC will maximize the return on the nation's investment in nuclear security.

"By leveraging the groundbreaking research of our nuclear security labs through private sector collaborations, we will bring breakthroughs to the market faster and find new solutions to the energy problem," says Chu.

The i-GATE effort is designed to drive the Livermore Valley as the core of an energy research cluster that will rapidly expand to benefit the regional economy and the state of California, create jobs, mitigate climate change, increase energy security, educate the future technical workforce, and form an interlocking innovation web. In addition to the LVOC, the i-GATE plan leverages several current initiatives, including the National Energy Systems Technology (NEST) incubator and the i-GATE Academic Alliance.

The state's iHub program is designed to spur economic recovery and growth by showcasing and supporting California's most promising hubs of innovation. Six applicants were selected, including hubs in Orange County, Sacramento, the Coachella Valley, and San Francisco's North Bay (Sonoma) and Greater Mission Bay regions.

The state is now working to secure seed funding, funding grants, and other resources for the iHub program with entities such as the US Department of Commerce.

**Following is the complete list of confirmed i-GATE partners:**

City of Livermore (iHub Coordinator)
Sandia National Laboratories (i-GATE program lead)
Lawrence Livermore National Laboratory
Joint BioEnergy Institute (DOE)
Scion Group (New Zealand Crown Research Institute)
California Fuel Cell Partnership
East Bay Economic Development Alliance
University of Michigan
University of California, Berkeley, CITRIS (UC Institute for Science & Innovation)
University of California, Davis
California State University, East Bay
Las Positas Community College
Small Business Development Center
NewLine Ventures, LLC
Livermore Chamber of Commerce
City of Pleasanton
City of Dublin
City of Tracy
City of San Ramon
City of West Sacramento
Tri-Valley Business Council
Workforce Incubator
Alameda County One Stop (job training)
Alameda County Workforce Investment
Bridgelux, Inc.

## *Rep. Lipinski visits JBEI, California site*

US REP. DANIEL LIPINSKI, D-Ill., and his senior legislative analyst, John Veysey, met with Div. 8000 VP Rick Stulen, Glenn Kubiak (8600), Blake Simmons (8625), Karen Scott (12122) and Erik Ridley (12122), at the Joint BioEnergy Institute (JBEI) for a briefing and tour. Lipinski and Veysey then came to Sandia to tour the Combustion Research Facility, meet with Rick and Bob Carling (8300) and learn about Sandia's cyber security work and the Center for Cyber Defenders from Len Napolitano (8900). Lipinski has a long-standing relationship with Sandia, which has included visits to Albuquerque and meetings with former VP Les Shephard in Washington, D.C. Lipinski is vice chairman of the House Science and Technology Committee, is chairman of the Subcommittee on Research and Science Education and sits on the Subcommittee on Energy and Environment, the Committee on Transportation and Infrastructure, and the Committee on Small Business. He recently authored the House's cyber security bill (HR 4061). In the photo above, Craig Taatjes (8533) explains the fundamental chemistry of auto emissions to Lipinski.

(Photo by Dino Vournas)

# Cliff Ho named Asian American Engineer of the Year

By Stephanie Hobby

Cliff Ho has made a career out of tackling great challenges at Sandia. A distinguished member of technical staff, Cliff has worked on problems in water treatment and distribution, detection of trace explosives, nuclear waste management, and microchemical sensor systems for environmental monitoring. Now, Cliff is focusing on concentrating solar power and renewable energy technologies. It's a resume impressive enough to garner international attention, and Cliff has done it all in just 17 years.

The Chinese Institute of Engineers–USA honored Cliff's achievements by naming him the 2010 Asian American Engineer of the Year. The CIE–USA annually presents the award to outstanding Asian American engineers and scientists who make significant, lasting, and global contributions to the nation.

Past winners include US Secretary of Energy and 1997 Nobel Prize winner in Physics Steven Chu and five other Physics and Chemistry Nobel laureates. "I am elated, happy and honored," Cliff says. "It's a great feeling to receive this award."

*"Sensitivity analyses using these probabilistic models can also be used to prioritize R&D activities on system parameters that have the most impact on these metrics."*

**— Sandia researcher Cliff Ho**

Cliff joined the Labs in 1993 to develop thermal-hydrologic models for the Yucca Mountain Project, and quickly became a lead investigator for the Viability Assessment and Site Recommendation reports that were submitted to Congress and the president. He also led the development of comprehensive performance-assessment models of complex systems ranging from long-term covers for waste isolation to chemical transport through skin.

## Water treatment and solar energy

In 2000, Cliff initiated and led a project to develop microchemical sensors to monitor environmental contaminants in wells, which led to four patents and significant commercial industry interest. Cliff also worked to improve sensor systems and protocols to detect trace explosives for DOE and the Department of Homeland Security. Five years later, he led research in water treatment and distribution security, including UV disinfection and modeling to predict how contaminants would move through the water distribution network.

Cliff turned his attention to solar energy in 2008 and is currently a principal investigator in a group that looks for ways to use concentrating solar power to capture and store solar energy for utility-scale electricity production. Concentrating solar power uses a large array of mirrors to focus sunlight onto a receiver, harnessing the resulting heat to generate electricity using a heat engine. Cliff develops models and analyses that can improve the system's efficiency and performance. For example, the force of gravity and wind can distort the shape of the mirrors, decreasing efficiency and ultimately increasing the cost of electricity. Cliff models those changes to predict and understand impacts of wind and gravity, and then works with industry to design more efficient, cost-effective systems.

CLIFF HO

Cliff is also pioneering the use of probabilistic models to more reliably predict the performance and cost of concentrating solar power systems. Probabilistic models have the advantage of being able to quantify the impact of uncertainties on simulated performance metrics such as energy production and cost.

"The objective is to honor the inherent uncertainty in these complex systems," Cliff says. "We can then provide companies with more confidence and reliability in their models by quantifying the likelihood of achieving specific cost and performance metrics. Sensitivity analyses using these probabilistic models can also be used to prioritize R&D activities on system parameters that have the most impact on these metrics."

Those around him continue to be impressed with Cliff's innovative work and creative approaches to engineering challenges. Ray Finley and Laurence Costin, two of Cliff's managers who have known him since the beginning of his career, wrote in their letter of support, "Cliff is an outstanding scientist and engineer who, over many years, has demonstrated a significant impact on the betterment of society in the true spirit of the engineering profession."

"As witnessed by his list of publications and the broad support he received from the research community for his nomination, Cliff Ho is an outstanding engineer and analyst," says Tom Mancini (6337), Concentrating Solar Power Program Manager. "What isn't immediately apparent in his vitae is that Cliff is an excellent communicator; he is very good at placing boundaries around problems and stating them in such a way as to make them more readily understood."

That ability was a hallmark of Cliff's teaching career at the University of New Mexico. Between 1996 and 2003, Cliff served as an adjunct professor in the Mechanical Engineering and Earth and Planetary Sciences Departments. Students recognized his exemplary skills by voting him the "Outstanding Professor" in 1997.

Cliff took first place in *Discover Magazine's* Future of Energy in 2-Minutes-or-Less video contest with his video that explains how solar energy can supply our three primary energy needs: heating, on-site electricity production, and transportation. You can view Cliff's video, "Solar Energy is H.O.T.," at http://tinyurl.com/5ouyzp. Cliff donated the $5,000 prize to his daughters' elementary school to start a Green Team, which uses activities, events, and programs to promote energy and environmental sustainability.

His love of math, science, and engineering started at a young age, and his father encouraged him to pursue mechanical engineering. "My dad thought it was the broadest of the engineering fields," Cliff says. "I think it continues to appeal to me because of the diversity of projects I have been able to engage in, from waste management to microchemical sensors to water treatment to solar power. I guess my dad was right."

Cliff's parents moved from China to the US in the 1950s, and Cliff was born and raised in Wisconsin. He attended the University of Wisconsin–Madison, where he earned his bachelor's degree in mechanical engineering.

While climbing over a particularly daunting snow drift on his way to class his senior year, Cliff decided he was finished with cold, snowy winters. For graduate school, he headed to the University of California–Berkeley, where he met his wife, Sylvia Saltzstein, and earned his master's and doctorate degrees in mechanical engineering. After graduation, he and Sylvia both accepted jobs at Sandia.

Cliff's life outside of work reflects his dedication to family, community, and education. Today, Cliff and Sylvia are copresidents of their neighborhood association and have served on the board of directors for the daycare their three daughters attended. In his free time, Cliff enjoys tennis, skiing, biking, golfing, and swimming, and he hopes to someday compete in an Ironman Triathlon. He regularly volunteers with Habitat for Humanity and Sandia's Technology Outreach programs, encouraging students to pursue math and science, and to eventually see what Sandia has to offer.

"Receiving this award is a great honor, and I am so pleased to represent Sandia," Cliff says. "I think one of the best things about working here is the diversity and the opportunities that Sandia provides for its engineers. The ability to work on many different yet nationally important programs within the same company is rare and I genuinely appreciate that. It's been wonderful."

# Tonopah Test Range

*(Continued from page 1)*

Tonopah Test Range, established in 1957, occupies 280 square miles tucked in the northwest corner of the 4,687-square-mile Nellis Air Force Range. Currently, 113 personnel are assigned to TTR, including 22 Sandia employees, with the remainder being contractors who provide site support (security, maintenance and operations, medical, fire, rescue, and hazmat response). The nearest town is Tonopah, Nev., which is more than 30 miles from the TTR operations center.

Understandably, Ajoy notes, personnel at TTR sometimes feel like "a neglected cousin," a sentiment that probably isn't helped any by the fact that the range has been on the proposed chopping block many times over the past couple of decades. But a pervasive uncertainty about the TTR's status hasn't deterred staff at the range from keeping their eye on the ball, Ajoy says.

"They are very dedicated to the mission and make the best of rather old equipment, facilities, and infrastructure that exists due to lack of investment for over a decade," he says.

One example of the TTR team's focus and dedication is that the range, working in partnership with Center 4100, completed self assessments, followed by an Independent Verification Review, and received authorization to restart JTA operations with an extensive 90-day effort after operations were stood down following the October 2008 sled track accident. (In the wake of that accident, all Sandia organizations involved with energetic materials work were required to go through a complex and rigorous restart process to ensure operations were being done safely and in accordance with Labs policies and procedures.)

After an extended period of uncertainty about its future, it appears that TTR may be in for a time of relative stability.

## Record of Decision affirms support

In December 2008, NNSA issued a Record of Decision (ROD) affirming support for the test range as part of the complex transformation effort. The ROD calls for a continuation of the flight test activities at TTR, revitalization of some facilities and infrastructure, and possible changes to the footprint and operating model. Additionally, the Obama administration's FY11 congressional budget request — that is, the budget the president submits to Congress — has language specifically addressing TTR. It reads, "Funding in FY2011 also supports the Tonopah Test Range (TTR) in Nevada, providing unique capabilities to air drop nuclear bomb test units. These capabilities allow TTR to support DSW's [Directed Stockpile Work] ability to perform surveillance testing on nuclear bombs and their compatibility with US Air Force bombers and fighters . . . ."

Over the years, Ajoy notes, NNSA and DOE have conducted numerous studies — Ajoy has a PowerPoint chart that lists no less than 12 such studies since 1992 — to determine the feasibility of closing the range. Those studies, Ajoy says, come to strikingly similar conclusions time after time. Among recurring findings: The flight test mission at TTR in support of stockpile surveillance is a vital one, and one that is not likely to go away; TTR infrastructure is old and should be upgraded; the nuclear weapons flight testing mission could be transferred to DoD and performed elsewhere, but for a number of reasons, the programmatic risks (mission priority) and costs to make the transition far outweigh the benefits.

Given the consistency of study results over an extended period of time, the 2008 December NNSA ROD concluded authoritatively that flight testing will remain at TTR.

That's good news for the Labs as work on the B61 Life Extension Program ramps up. The B61 project, if it progresses as planned, will rank among the biggest weapon-related efforts at Sandia in 20 years. That program will likely require a number of developmental flight tests. With the NNSA ROD, there is now no question about where those tests will be conducted.

In speaking about the advantages of keeping the TTR open, Ajoy cites the "wonderful relationship" with the US Air Force at the Nellis Test and Training Range, adding that a new TTR business model may involve Sandia procuring some support services from the USAF when it's mutually advantageous.

The TTR of the future won't look exactly like the TTR of the past, Ajoy says. How could it, when during the height of the Cold War, the range conducted approximately 300 development and surveillance flight tests each year and had five departments with a senior (group) manager. Rather, the TTR of 2010 and beyond, which currently conducts 12 to 15 surveillance flight tests and two WFO test series of four to six weeks' duration, will operate in a new business/operating model. A number of options are being explored, including operating in a "campaign mode," with a core of Sandians assigned full time to keep the range operational, supported by a cadre of others — Sandia employees and contractors — who staff the site during test weeks.

# Looking back at an oceanographer's unlikely career

## *VP Les Shephard retires after almost 30 years at Sandia*

By Stephanie Holinka and Stephanie Hobby

In the mid-1970s, a terrific storm ripped through the Mississippi River Delta, tearing up the coastline and completely destroying any hope of data collection by a small group of dedicated scientists. Although all the instrumentation was demolished and the researchers had to start from square one, it was a turning point in the life of one influential Sandian. If the waters had remained calm that day, Les Shephard might never have made his way to the Labs.

Les was pursuing graduate degrees in oceanography at Texas A&M University with the intention of going into the oil industry. While working on his doctorate, Les decided to take advantage of a research partnership between A&M and Sandia. A team of scientists was evaluating the sea floor off the Mississippi River Delta as a potential site for subseabed disposal of nuclear waste. The goal was to assess the stability of the sea floor and pore pressure. The team had just completed the laborious task of placing and calibrating the monitoring equipment when the sea started to churn.

### 'A pretty good place to come to work'

"We had to evacuate, and the long and short of it was we lost all the instrumentation because of mudslides. We never found it, and Sandia was pretty much unfazed by that. They knew it was just part of doing business, I guess," Les laughs. "I was a student, and I thought, 'Well, this is probably a pretty good place to come to work.'"

So with that experience behind him, Les returned to A&M, fully committed to finding work in the oil industry after graduation. He had nearly forgotten about giving Sandia a resume when he received a call from Rip Anderson, a now-retired Sandian and internationally recognized expert in risk and performance assessment, and former manager of Sandia's Subseabed Programs Department.

"Rip called me out of the blue and asked me to come out here and think about the subseabed disposal program," Les says. "I had never been to New Mexico, and as an oceanographer, I figured one time in your life you ought to visit."

Although Les wasn't sold on the idea of using his doctorate in oceanography to work in the high deserts of New Mexico, Rip took him to the Sandia Crest, and as Les watched the sun go down over the mesa, the idea suddenly didn't seem quite so ridiculous.

"So I said I could seriously consider such a thing. But of all the people, and I've interacted with lots and lots of people, Rip was a tremendous mentor. He was as innovative and creative an individual as anybody I'd ever met," Les says. "So I joined the subseabed disposal group. Most people don't know that Sandia really had a nationally, if not globally, acclaimed group that did ocean modeling. It's not a surprise when you think about who we are and what we do, but ocean modeling is something that was an integral part of understanding the environmental consequences of disposal and high-level waste in the oceans."

The subseabed disposal group stayed together for 13 years, disbanding in 1987 when the Nuclear Waste Policy Amendment designated Yucca Mountain as the sole site for characterization.

"Most Sandians don't know that the systems analysis that developed out of this group became the fundamental basis for the performance assessment process as part of the subseabed program," Les says.

"The modeling of Earth systems in a probabilistic manner with quantifiable uncertainty characterization led to the certification and opening of WIPP in 1998 and also led to the license application for certification of Yucca Mountain in 2008," he adds.

### Yucca Mountain and WIPP

After the subseabed program, Les worked for Yucca Mountain, performing testing at G-tunnel at Nevada Test Site. He was present at the last underground nuclear test at the Nevada Test Site in 1992.

In 1995-1999, Les moved his family to Carlsbad to continue his work on WIPP. "For many reasons, a senior Sandian needed to live in Carlsbad to demonstrate to an uncertain community that WIPP was safe. What also brought me to WIPP was the fact that WIPP was an ocean 250 million years ago. I was just a little late," Les laughs. "But I felt right at home working in salt, and I went from conducting large-scale experiments at sea to large-scale experiments underground."

LES SHEPHARD pays close attention to a discussion about Sandia-developed arsenic water treatment technology during a visit to Jemez Pueblo. (Photo by Randy Montoya)

*"I came out here for a couple of years thinking I'd go back to the oil industry. And like so many people who came before me, I never left."*

**— Les Shephard**

Les counts WIPP as the most successful technical achievement of his career. "We brought together a group of people dedicated to do something that has not yet been replicated," says Les. "WIPP's been operational for 10 years and been recertified twice. It's done all the things it was supposed to do for the country and forms a foundational precedent for the upcoming resurgence in nuclear energy technology."

After WIPP's certification in 1999, Les briefly headed the Computer Sciences group. He then spent some time as Paul Robinson's staff director. Six years ago in March, he became VP of Sandia's Energy, Security & Defense Technology Div. 6000.

### Solving global energy and water issues

"When I came to Sandia, I didn't really know what it was other than when I worked with them in the field, it was a great group of folks to work with. They took on hard problems, and if things didn't go well, they got back in the saddle and did it again. I liked that. There was a spirit around these Labs that I knew about before I came out here," Les says. "I came out here for a couple of years thinking I'd go back to the oil industry. And like so many people who came before me, I never left."

Although Les is retiring from Sandia, you won't find him whiling away his days on the golf course. He is headed to the University of Texas at San Antonio to head up a new Institute for Conventional, Alternative and Renewable Energy (ICARE) to help the university's efforts to solve global energy and water crises. The UTSA position also offers him and his wife of 37 years, Darlene, the chance to be closer to their family and watch their grandchildren grow up.

It's tough for an A&M fan like Les to pull for schools in the University of Texas system, but he says he'll get over it. "It's part of who I am. I'm a diehard Aggie. Having said that, this is really another opportunity of a lifetime." He intends to partner with other Texas institutions — including his alma mater — and Sandia to help develop the next generation of energy experts, who he says will have to deal with difficult problems in energy, climate and issues around nuclear power. "These are hard issues, and where is the leadership of tomorrow going to come from? What better way to leave a legacy than to really focus the next 10 years of my life on that?" Les says.

"Clearly I'm confident this will be the case, but I hope Sandians never lose sight of their commitment to serving the country, never lose sight of the fact that the American public, whether they know it or not, depends so heavily on this institution," Les says. "These areas of energy security and nuclear security are critically, critically important to American's security and future. I hope and expect Sandians to continue to be national and global leaders in that area, and to really step out of their comfort area and lead in a much more visible way and be really present on the global scene in a big, big way."

# Japan's NEDO partners with DOE labs


Japan's New Energy and Industrial Technology Development Organization (NEDO) earlier this month signed agreements with Sandia, Los Alamos National Laboratories, and several New Mexico companies and municipal entities to assist in the creation of two smart grid demonstration projects, one at Mesa Del Sol and a second in Los Alamos County. Sandia will be providing technical expertise for the effort, including planning, modeling and simulation, data analysis, cyber security, and testing of smart grid technologies. DOE has actively encouraged interactions between NEDO and the US in several areas, including smart grid and renewable energy. Among DOE technologies Sandia will be able to test in these demonstration projects are solar energy grid integration systems, energy storage, advanced cyber security R&D, microgrids/advanced controls, and grid-scale modeling and simulation.

Because Japan's in-country smart grid demo and test projects provide unique data for this project, the collaboration allows Sandia to demonstrate and compare Japanese technologies and exchange data with NEDO. Gov. Bill Richardson initiated the New Mexico Green Grid Initiative in 2008 with the goal of becoming the first state with a full green grid. He has also set a goal of becoming the leading state in renewable energy export and becoming the center of the North American solar industry. Prior to signing ceremonies and a media event at the Buffalo Thunder Resort in Pojoaque, N.M., announcing the projects, the NEDO delegation visited Sandia, where NEDO President Takefumi Fukumizu and Sandia President and Labs Director Tom Hunter were able to discuss the importance and potential of NEDO-Sandia collaborations.

(Photo by Randy Montoya)

# REACTOR

## Art worth saving: One Sandian revives decades-old drawings of the world's nuclear reactors

***Story by Stephanie Hobby***

In an age when many publishers and even libraries are tossing hard copies of bulky paper publications in favor of compact digital storage, finding and rescuing rare books, magazines, and posters from almost certain obscurity can be a true labor of love. Ron Knief's (1382) efforts to save more than 100 detailed poster-sized drawings — wall charts — of nuclear reactors is paying off to the benefit of both current and new generations of nuclear engineers.

From the mid 1950s through the early 1990s, *Nuclear Engineering International* printed large, technically accurate images of nuclear reactors from all over the world. These charts were folded and included in select issues of the magazine. A Sandia nuclear engineer and former University of New Mexico professor, Ron understood and relished the educational value of each image. "I could teach you more about a reactor in 10 minutes with one of these than I could by talking to you for several hours using more traditional one-line diagrams and photographs," Ron says. "The three-dimensional cutaway view is something that doesn't exist in the real world, so the charts are very useful."

Ron carefully saved all of the charts he acquired and used them over the years in courses at UNM and Sandia. "As a professor who teaches reactor design, there was no substitute for being able to look at a 3-D rendition. I brought in my charts and had students look at them in groups. One of the unfortunate parts was that you had to almost treat them like gold. Even though the students were always very careful with them, you didn't want to use them up in the process of studying them," Ron says.

While revising his textbook, *Nuclear Engineering: Theory and Technology of Commercial Nuclear Power*, Ron decided to include one of these images that had been so helpful in his own education. "It was almost a sacrilege to take a large chart and put it on a single 6-by-9-inch page in a book as a black and white diagram," Ron says. "But nonetheless, it still allows a reader to learn from it, and have an idea of the value of the actual charts."

A few years ago, he contacted the publisher and received permission to copy and distribute the specific chart electronically. Then, when he sought to do the same with a few more, he was disheartened to learn that even the magazine no longer had them. However, they encouraged him to collect as many as he could. As a nuclear engineer, Ron had worked on or visited several of the plants depicted in the charts, and he knew what he had to do.

Starting with the few dozen charts he had in his own collection, Ron set off to find and locate the remaining ones to fill out the set. He relentlessly queried librarians and colleagues, asking them to sift through their dusty closets and store rooms to track down the decades-old drawings.

In the back of his mind, he knew that he had to work against the clock to find the images before more were abandoned and thrown out. "My feeling was that if I didn't move fairly quickly, I would face the situation of people saying, 'Well, gee, if you'd called yesterday or last week or a month ago, we could have helped.'"

Librarians and friends from Sandia, Pacific Northwest National Laboratory, and the magazine publisher helped him locate a few more, but Ron hit the jackpot when he contacted Idaho National Laboratory. "INL was the mother lode and, in short, they provided almost 60 percent of the 100-plus charts that I've now accounted for," Ron says.

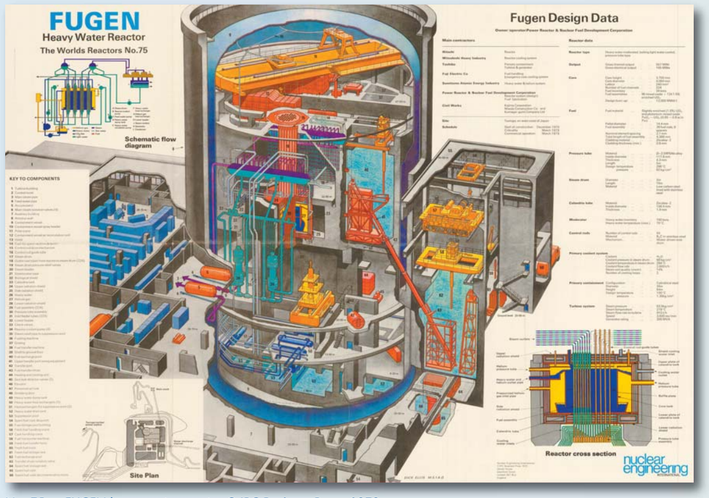
With the complete collection — electronically — now in hand, Ron is working with UNM's Centennial Engineering Library to preserve the charts. With the publisher's blessing, Ron and UNM are posting moderate-resolution files on the library's website free of charge. The resolution gives students and others nice-looking charts on 11-by-17-inch paper. The publisher retains the rights to reproduce larger, laminated charts available for a fee.

So far, eight charts are available online. But Ron has provided the entire set to UNM and Sandia. The UNM library is working diligently to complete the upload, and will also provide an archive for Ron's hardcopy charts.

"As eager as I am for the educational community to have the charts, I think that a lot of staff from Sandia and elsewhere will really benefit too," Ron says. "For example, a recent INL email said: 'The files weren't in my computer more than a minute before we were using them in our Human Factors Simulations Lab to orient test subjects.'"

"I've been so fortunate to work with some really, really great people who have been enthusiastic and supportive of this project from the beginning. It's wonderful to see it come together like this," Ron says.


NUCLEAR ENGINEER RON KNIEF has collected more than 100 wall charts from *Nuclear Engineering International*, each depicting a different nuclear reactor in detail. (Photo by Randy Montoya)



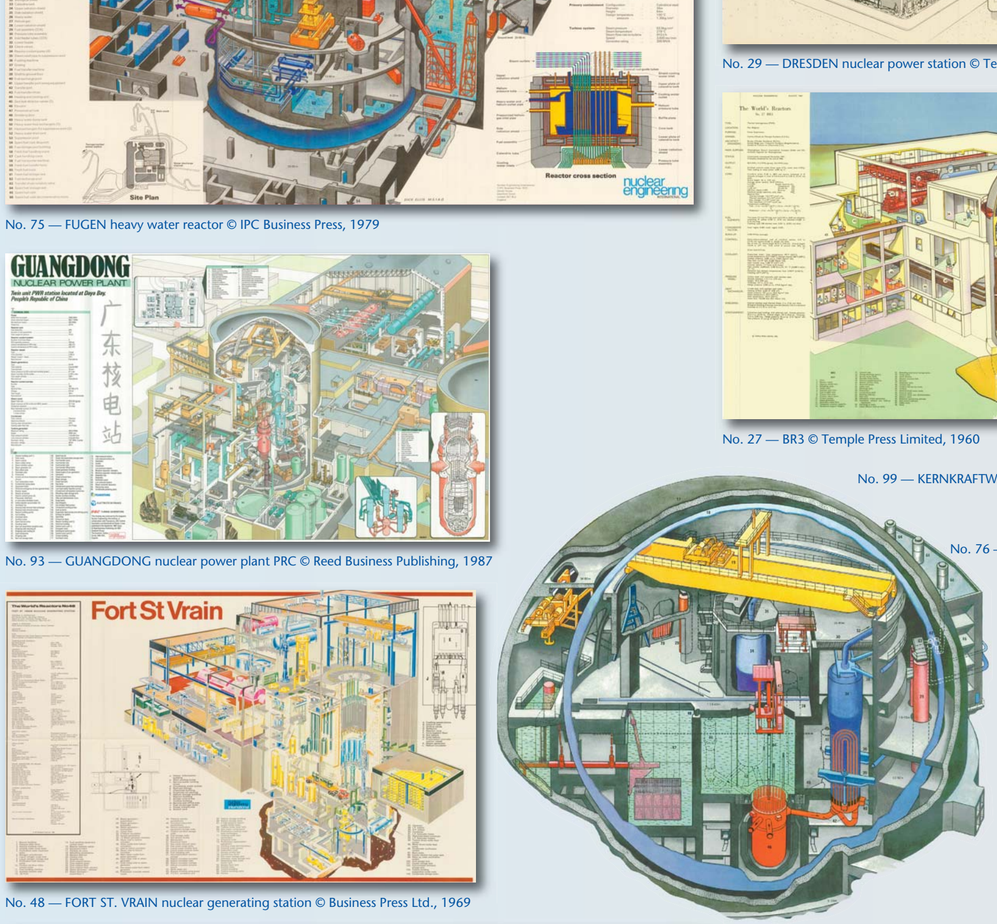

No. 75 — FUGEN heavy water reactor © IPC Business Press, 1979




No. 93 — GUANGDONG nuclear power plant PRC © Reed Business Publishing, 1987



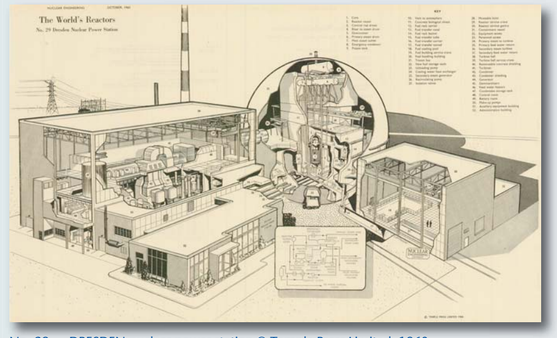

No. 48 — FORT ST. VRAIN nuclear generating station © Business Press Ltd., 1969



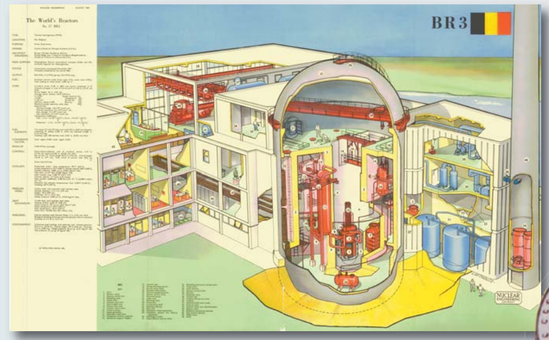

No. 99 — KERNKRAFTWERK KRUMMEL © Reed Business Publishing, 1993



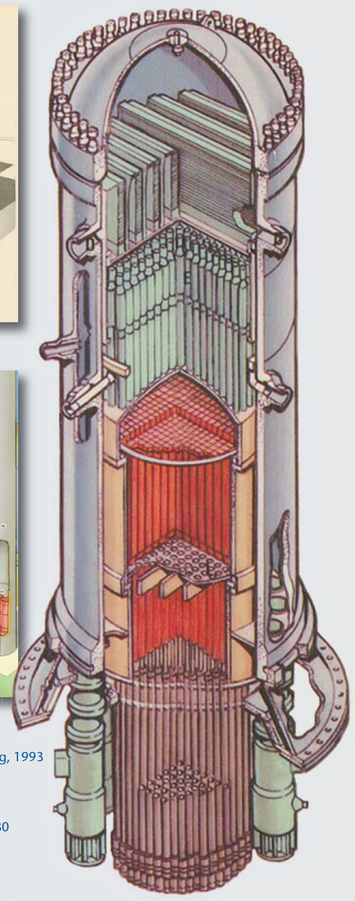
No. 76 — GOSGEN © IPC Business Press Ltd., 1980



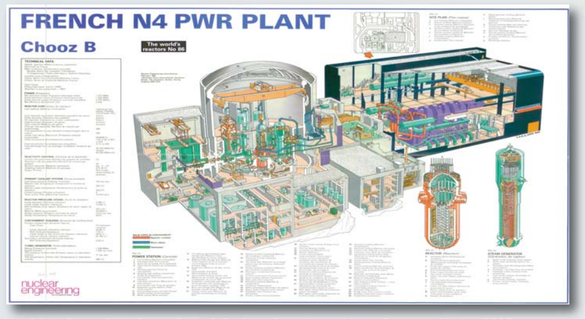

No. 29 — DRESDEN nuclear power station © Temple Press Limited, 1960



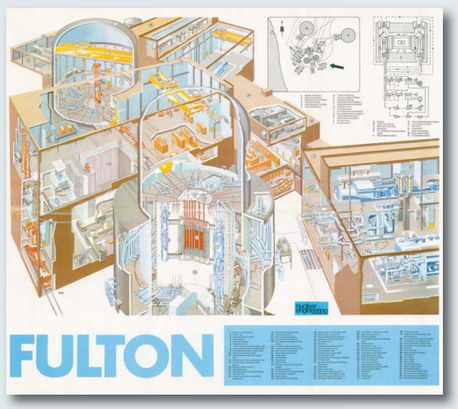

No. 27 — BR3 © Temple Press Limited, 1960



No. 99 — KERNKRAFTWERK KRUMMEL © Reed Business Publishing, 1993




No. 86 — Chooz B N4 Power Plant © Business Press International Quadrant House, 1985




No. 64 — FULTON © IPC Business Press Ltd., 1974


No. 61 — CAORSO ENEL IV © IPC Business Press Ltd., 1973

*Plant the seed*

# Sandia's Site-Wide Environmental Impact data will impact operations for a decade

By Stephanie Holinka

BURROWING OWLS in Sandia's "outback." (Photo by Enrico Quintana)

The SWEIS Source Document Project (comprising members of Sandia's Environmental Planning Dept. 4131 and Environmental Programs Dept. 4133) will collect data from around the Labs during FY10 and FY11, asking members of the workforce to look into Sandia's future and think about what types of work will be done in their facilities over the next 10 years or so.

The project will interview Level 1 managers and staff members Labs-wide to provide information on current and future operations (i.e., site-wide, corporate, hazardous materials, noise-producing events, facility changes, water use, electricity use, etc.). They will use the collected data to produce more than 30 documents related to the Labs' future, including descriptions of the types of work planned over the next 10 years.

DOE will take these documents and use them to develop Sandia's new Site-Wide Environmental Impact Statement (SWEIS), the master document that sets the environmental boundaries in which the Labs operates. The data collection is part of the required environmental management process.

The National Environmental Policy Act of 1969 (NEPA) is a set of federal policies that document and categorize the environmental impact of every activity at a site. All Sandia activities are documented and evaluated under the NEPA process.

"NEPA helps people make decisions about work activities based on the environmental consequences of that activity," says Stephanie Salinas of Environmental Planning Dept. 4131. "The NEPA process also ensures that the information collected about impacts is freely available before actions are taken."

Sandia's most recent site-wide environmental impact statement was generated in 1999, when the work profile looked considerably different from what is done now.

"As the nature of Sandia's work has changed," says project manager Joe Bonaguidi (4133), "the [1999] NEPA statements are increasingly out of date."

In addition, regulations for things like storm water, oil storage tanks, and greenhouse gas emissions have changed. "There are also external changes that affect operations," Joe says, "such as the Mesa del Sol development, new neighborhood encroachment, and new DOE requirements.

"The new survey will also update operational changes at Sandia. New facilities such as Red Storm, CINT, and MESA place increased demands on resources and personnel; they were not covered in the 1999 SWEIS."

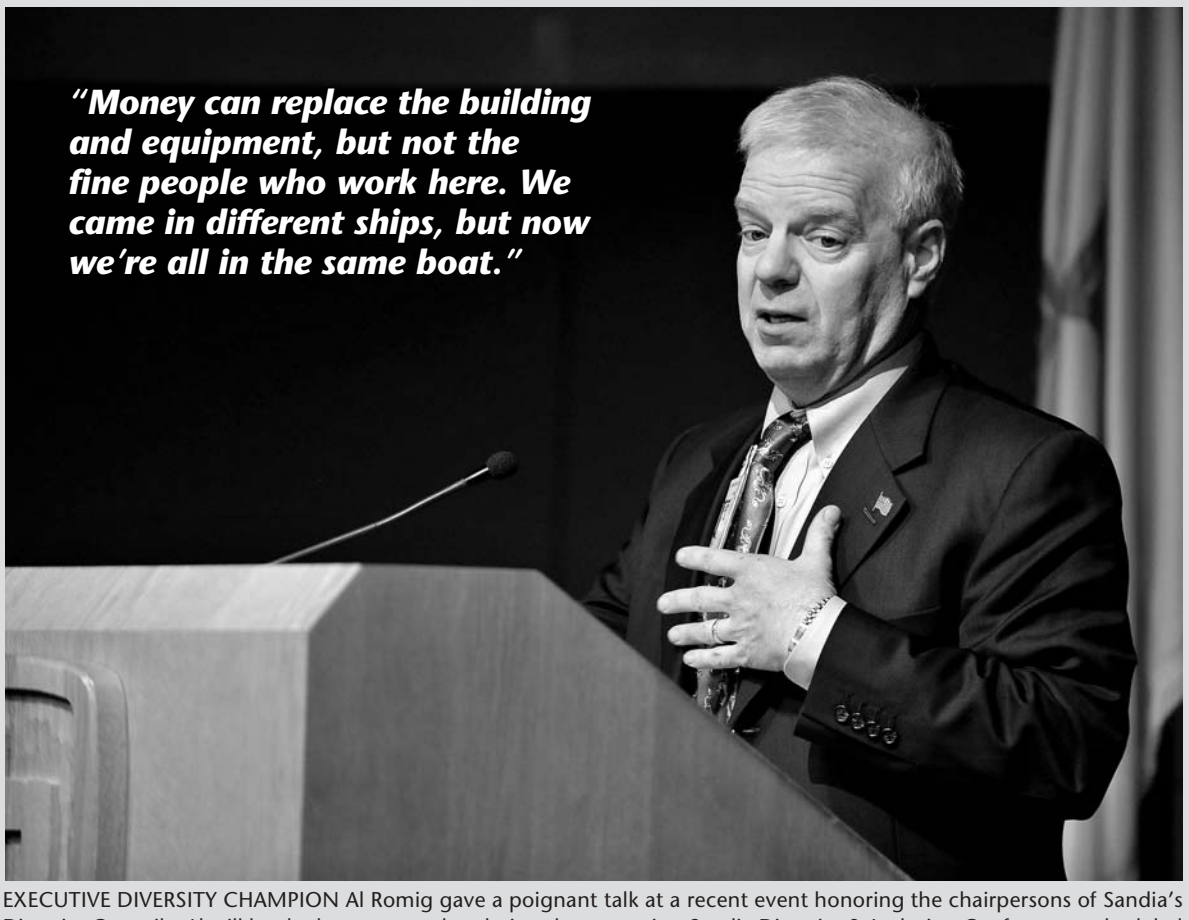
"We're hoping, to align our site's NEPA coverage with the DOE National Security Enterprise. We're going to look at facilities' operational limits to assure that they are appropriate for our facilities. If it looks like we'll be performing more tests than we have documented in the past, we have to make those changes."

The NEPA team does 1,200 to 1,500 NEPA reviews a year for new project proposals. About 90 of those reviews are sent to the NNSA Sandia Site Office for approval. The new site-wide document could speed up that process. "If we can cover projects with existing NEPA documentation," Joe says "we don't have to seek additional approval, which saves time and money."

"The ultimate goal," says Stephanie, "is to show that we're protecting the public. We need to help the Labs make informed decisions about the environment and about Sandia's future."

Sandia's NEPA website: http://info.sandia.gov/esh/nepa.

# Diversity is all of us, says Al Romig




EXECUTIVE DIVERSITY CHAMPION Al Romig gave a poignant talk at a recent event honoring the chairpersons of Sandia's Diversity Councils. Al will be the keynote speaker during the upcoming Sandia Diversity & Inclusion Conference, scheduled for April 5. More details to come in the *Sandia Daily News* and *Lab News.* (Photo by Randy Montoya)

*Employee death*

# 'Who's your daddy?' was one of Ira Sandoval's favorite questions

Ira Sandoval (4847) died Feb. 11. He was 51 years old and had been at Sandia more than 30 years.

IRA SANDOVAL

"When the Facilities craft and maintenance workers started off their days, it usually included a trip to the Facilities warehouse," recalls his supervisor Pam Mincey (4847). "Ira would greet them with a smile, joke, or a tease. One of his favorite questions was 'Who's your daddy?' when scanning parts into a supervisor's name. That told him which bar code to use.

"He could troubleshoot problems and help the administrative staff resolve inventory issues. Ira made things better and more efficient at the warehouse. He was a leader among his peers. He was very conscientious and caring. He was a warm and caring person and was really involved in making the operation run smoothly."

"Ira was a family man," says his sister Laura Latoma (4242). "He spent his time with his wife, children, and grandchildren. He was so proud of his two grandchildren and often went to his grandson's baseball and basketball games. Ira enjoyed sports, whether it be watching, playing, or coaching.

"Ira was very respected at San Felipe Pueblo. Tribal leaders often looked to his wisdom for help. He never refused."

For Jennifer Standridge (4847), Ira was more than a coworker, he was a friend. "I enjoyed coming to work," she says. "He would make me laugh as we joked all day. He was the go-to person in the warehouse.

*"We talked about fixing an old pickup truck and how I would help him pull the engine out. We never got around to doing it."*

"Ira was a devoted and proud family man. Every evening he would come into the office and tell me 'let's go,' and I would respond 'ok, boss,' and we would walk out together. It is little things like that I miss. My life was richer from knowing and working with Ira."

Ira was both a friend and a mentor to Hijinio Sanchez (4847). "He was here when I came to the warehouse about 10 years ago," says Hijinio. "We became each other's good friend and sounding board. He loved sports and his family. He made sure all the needs of his family got done. Bills got paid and appointments were kept. He not only took care of his immediate family's needs, but those of his parents.

"We talked about fixing an old pickup truck and how I would help him pull the engine out. We never got around to doing it.

"One day as he was out walking, Ira saw a lady slip; before he could help her, he slipped. Neither of them was hurt. He would laugh about how he fell down. Ira loved life."

"Ira was very mild-mannered with a great disposition," says Rich Roybal (4842). "There wasn't anybody who didn't like Ira. I met him years ago when our sons were on the same basketball team. We always talked about family and sports. We all loved him very much."

"If you were having a hard day, Ira would find a way to put a smile on your face," says Pam. "He made our days pleasant and fun while getting the job done. The Facilities family will really miss him."

"When I visited Ira in the hospital and met his parents, his parents told me that to Ira I was his friend, to them I was his family," says Hijinio. "Ira was my family at work." — *Iris Aboytes*

# H1N1 will almost certainly reemerge, so get vaccinated

## *Dr. Rick Sauerman says don't be lulled into complacency by current ebb in flu cases*

By Dr. Rick Sauerman, MD,
Site Occupational Medicine Director

The peak of the epidemiologic curve for the H1N1 virus has passed. Currently low levels of Influenza-like Illness (ILI) are being reported both nationally and within the state of New Mexico. Typically, now, is when we start to see seasonal influenza. However, there has been neither a dramatic rise in the seasonal flu nor a rise in Sandia's sickness absence levels due to cold or flu.

DR. RICK SAUERMAN, MD

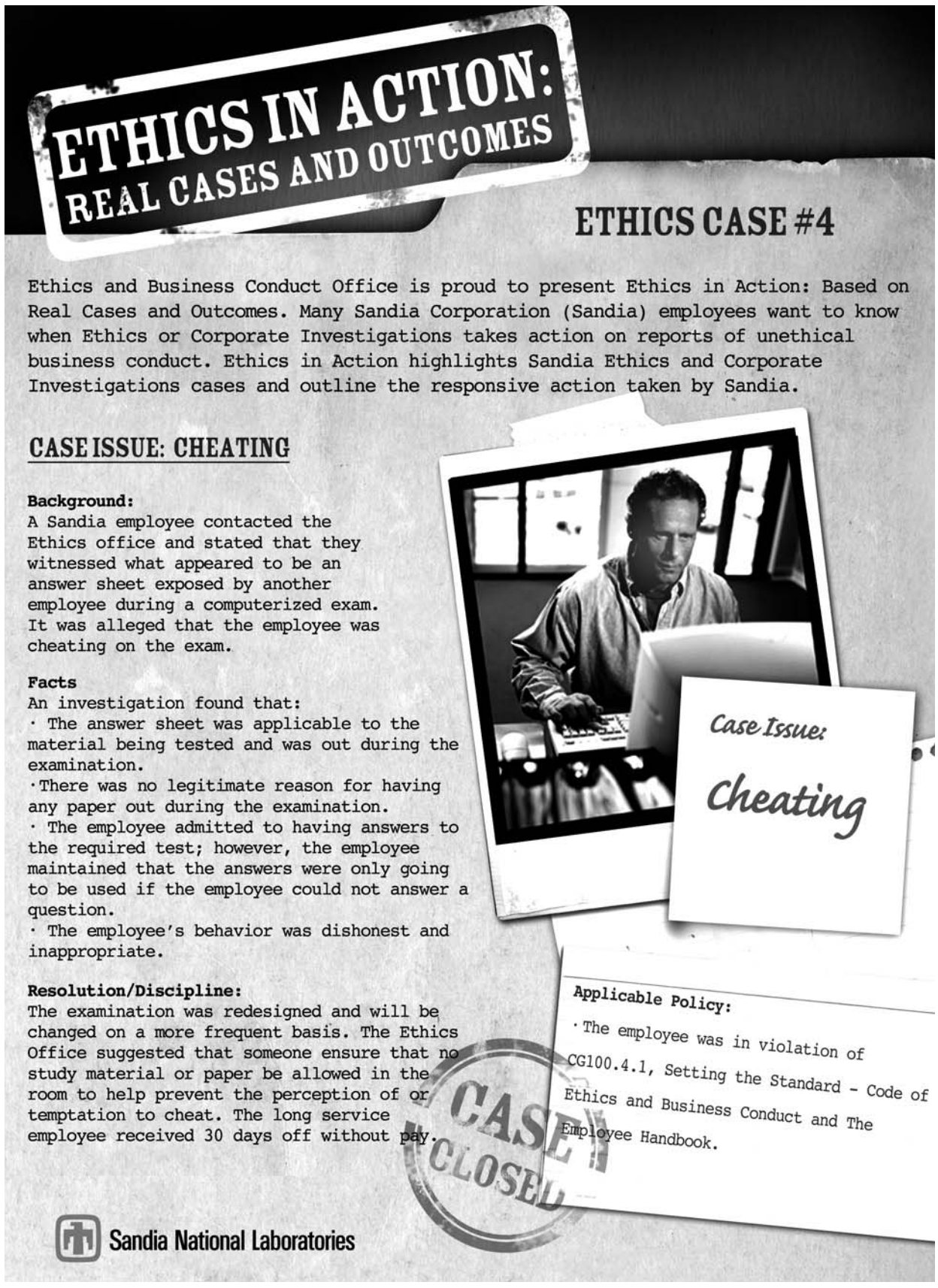
HBE doctors are often asked by our patients about getting the H1N1 vaccination. One question I'm asked, "It looks like H1N1 is ebbing away, so should I bother with a vaccination?" My answer is yes, if you haven't already had the H1N1 shot, you should get one. Although the H1N1 virus is on the decline, it can and will likely reemerge.

Sometimes, I hear, "I'm pretty sure I had the H1N1 . . . so should I get vaccinated?" My answer is again, yes. In the first place, it's not feasible to check everybody's blood to see if they have had the H1N1 infection. It is quite possible that an individual may have had an upper respiratory tract infection with similar symptoms and is therefore still susceptible to the virus. Susceptibility to infectious disease often boils down to whether the host (you and me) has experienced in the past something akin to the infectious disease that is presently circulating. For H1N1, those with relative immunologic naiveté, individuals younger than age 24, were more at risk for complications because their immune systems did not recognize the viral threat like the immune systems of those of us in the more mature age strata.

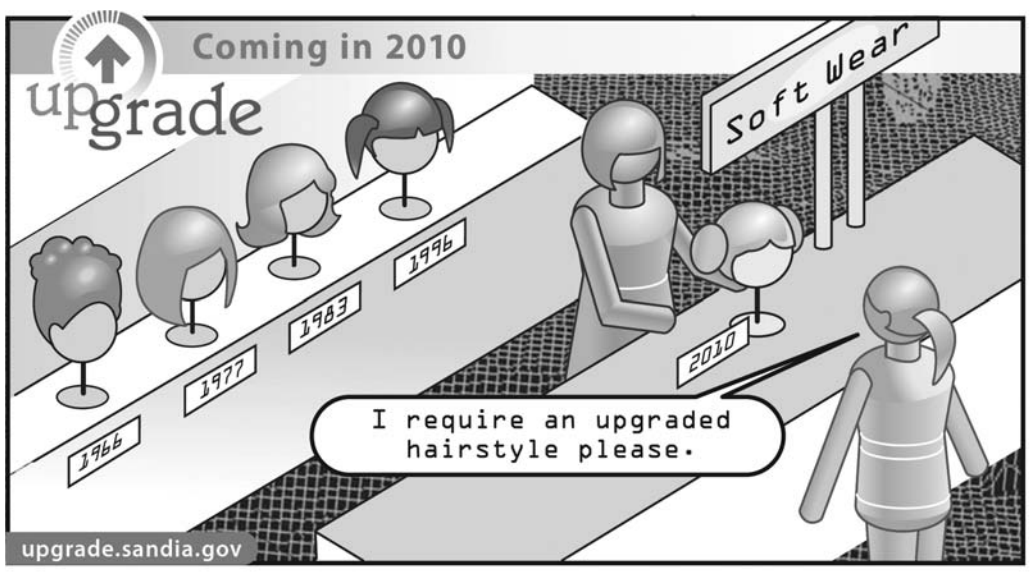
The importance of a robust immune system cannot be emphasized enough. The best way to bolster immunity, besides getting an infection, is to maintain good health habits through the year. Eat right, get enough sleep, exercise, and get vaccinated. For sure, even if you catch a cold or flu virus, your efforts to maintain good health will bolster your immune system's ability to fight it and help prevent complications. If the virus mutates just a bit, causing it to circulate again and perhaps become a bit more virulent the next time around, it may well be that a vaccination this year could give your immune system an edge and help it to clinically attenuate a future infection.

At Sandia, HBE did not receive the amount of H1N1 vaccine we requested to offer the shot to all of our employees. Sandia did get a small allotment that was given to our high-risk patients in the Disease Management Clinic and our health care workers.

Now, H1N1 is readily available to all who want it, regardless of risk stratification. You can get an H1N1 shot in the community, at your neighborhood drugstores, through your primary care provider, and your health care plan. So, take good care of yourself now and through the flu season and get an H1N1 shot this week.




HBE




## Nobel laureate Murray Gell-Mann to speak at National Museum of Nuclear Science and History

MURRAY GELL-MANN

Nobel laureate Murray Gell-Mann will be presented the National Award of Nuclear Science and History at the National Museum of Nuclear Science & History's Einstein Society Gala at the Sheraton Uptown Hotel Saturday, March 20. Gell-Mann was awarded the Nobel Prize for Physics in 1969. The museum award recognizes his many contributions to the theory of fundamental particles, including the existence of quarks, the tiny subparticles from which just about everything is made. In his distinguished career he worked alongside many other legendary figures of nuclear science and history, including Albert Einstein, J. Robert Oppenheimer, Enrico Fermi, and Richard Feynman, among others. Ticket cost is $125. For more information, contact the museum at 245-2137, extension 110, or go to the museum website at http://www.nuclearmuseum.org/.

# Mileposts

*New Mexico photos by Michelle Fleming*


Jerry Adams
30 2996


Vicki Malone
30 10507

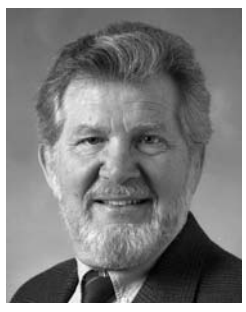

Mike Orrell
30 5413


Carlos Quintana
30 9342


Mike Rouse
30 9542


John Zich
30 1830


Jim Beals
25 4826


Stanley Fraley
25 5900


J. Greg Hughes
25 5764


Tony Perlinski
25 5335


Frank Peter
25 425


Laurence Brown
20 12125


Beth Dick
20 10620


Duane Dimos
20 1500


Greg Madrid
20 6453

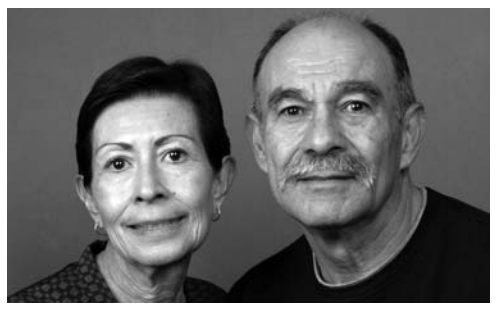

Harry Moffat
20 1516


Robert Pierce
20 5355


Lynne Adams
15 10221

## Recent Retirees


K. Wayne Shirley
40 9343


Gloria Atencio
17 3552

Chuck Atencio
27 4825

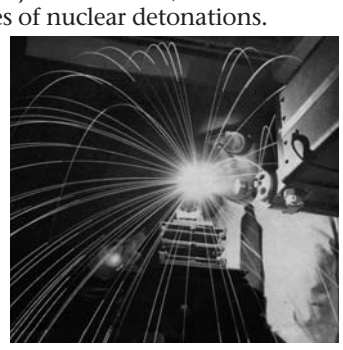

Joe Baxter
15 2733


Stephen Evans
15 2701


Larry Kincaid
15 5932


**50 years ago . . .** "Project Cowboy" Over — Sandians played a large part in "Project Cowboy," **a series of high-explosive tests to study seismic effects** recently conducted in a salt mine near Winnfield, La. Personnel from both Sandia and Livermore laboratories participated. Data gathered from the tests will aid in determining the effectiveness of the proposed Geneva system of detection of underground nuclear explosions as part of an international nuclear test ban treaty. Bill Long (8123), Livermore Laboratory, at the request of the Lawrence Radiation Laboratory, accompanied a team from that laboratory on **a pre-operational site survey of the Chariot Site** near Cape Thompson on the northwestern coast of Alaska. The site is being considered for an excavation experiment using nuclear explosives. It is part of Project Plowshare, the name given to the peaceful uses of nuclear detonations.

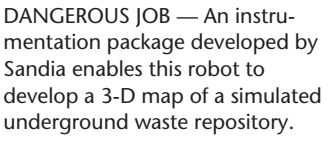
**40 years ago . . . A new carbon dioxide laser is the basis of a new materials research program.** The laser produces a steady 250 watts of infrared radiation that can be focused onto an area smaller than a square millimeter. When the laser is focused on refractory ceramic-type materials, they melt or vaporize. This suggests a new way to form nuclear fuels, permits studies of crystallization from supercooled melts, casts light on the origin of meteorites and the moon, and will soon be used to determine thermal properties of materials at very high temperatures. **A novel test facility capable of simulating impact conditions** for a vehicle dropping at a rate of 800 feet per second has been designed and is now being used by the Coyote Test Field Division 7343. Called the Aerial Cable Site, the facility makes use of a couple of mountains, a mile or two of cable, some bent steel pipe, a short single rail rocket sled — and considerable imagination. The cable facility combines the knowledge of the precise location of impact so that cameras or other recording equipment can be trained on the target and velocities matching those of a unit dropped from high altitudes.


A spray of molten droplets produced when spinning rod of alumina ceramic is melted by infrared energy from a carbon dioxide laser.

**30 years ago . . . Tests on a three-million-watt (thermal) solar receiver panel have been successfully completed** at Sandia's Central Receiver Test Facility (the Power Tower). The 3-by-41-ft. panel, consisting of 70 parallel tubes made of high-strength steel alloy, was illuminated with 2.7 megawatts of thermal energy from the facility's 222 heliostats. Water circulated through the tubes was converted to steam at 960°F and 1,500 psi by heat from sunlight focused upon 10 aim points along the length of the panel. **Two experimental drag bits, fitted with man-made polycrystalline diamond cutters,** are showing significant improvements in drilling rates over conventional roller cone and natural diamond bits. The bits were tested by Sandia in a geothermal well in northern New Mexico.


HOT STUFF — A solar panel glows under impact of 2.7 megawatts of thermal energy.

**20 years ago . . .** "Dependable workers, but not too bright." That could describe some types of industrial "workers" today — not human workers, but industrial robots used on automotive assembly lines and in other mass-production situations. **A new generation of "smart" robots is being developed**, however, and Sandia has become a leader. "This new generation of robots will have tremendous potential," says Pat Eicher, manager of Computer Sciences Dept. 1410. These machines will have the 'ability' to program themselves to do different tasks, react autonomously to unexpected conditions, and eliminate the need to risk human lives in dangerous environments."


DANGEROUS JOB — An instrumentation package developed by Sandia enables this robot to develop a 3-D map of a simulated underground waste repository.

**10 years ago . . . A "smart scalpel" mechanism intended to detect the presence of cancer cells** as a surgeon cuts away a tumor obscured by blood, muscle, and fat has been developed in prototype by Sandia scientists. The dime-sized device, called a biological microcavity laser, should help surgeons more accurately cut away malignant growths while minimizing the amount of healthy tissue removed. In effect, the patented device would tell the surgeon when to stop cutting. **The Multispectral Thermal Imager (MTI), the product of Sandia's first full satellite development program,** was successfully placed into orbit early Sunday morning, March 12, by a Taurus rocket launched from Vandenberg Air Force Base, Calif. By Monday morning, March 13, operators in Sandia's ground control station had reported that the satellite appeared to be in good working order after four passes over Albuquerque.


TIME-EXPOSURE PHOTOGRAPH of MTI being blasted into the night sky. (Photo by Diana Helgesen, 1541-9)

# WOMEN'S HISTORY MONTH

## Early women scientists and engineers at Sandia were heroic, brave, determined

***By Rebecca Ullrich, Sandia Corporate Historian***

*Women's History Month had its start in 1978 as Women's History Week in Sonoma County, Calif. A 1981 joint Congressional resolution declared the week, including March 8 (International Women's Day), Women's History Week. The week was expanded to a month in 1987.*

March is Women's History Month, in which we celebrate International Women's Day (March 8) — acknowledging working women's achievements all over the world — and focus on women's contributions to history and their changing roles in culture over time. In this issue, we pay tribute to a few of the remarkable women who were pioneers in technical work at the Labs.

BETTY CARRELL, hired in 1959, was Sandia/California's first female engineer.

The early decades of the Cold War created new options for women with technical training and degrees. Government-sponsored research increasingly relied on hiring qualified scientists in the post-World War II period. Like other government-funded research and development facilities at the time, Sandia could not hire talented engineers and scientists fast enough as the Korean War began and the nuclear weapons complex expanded its facilities and productivity. Although American industry and universities showed a decided preference for hiring men, the arena of government research proved more open-minded out of necessity.

In 1952, approximately 22 percent of Sandia employees were women, the majority of whom were secretaries, library workers, data reduction clerks, clerical workers, and technical assistants. In the 1950s, these were considered traditionally female careers, but at Sandia, a secretary could find herself the only woman supporting a testing organization in Tech Area 3, Salton Sea, or later, Tonopah Test Range. Data reduction work involved deploying mathematical skills on data from environmental and developmental tests of nuclear weapon designs.

A handful of women turned up as staff members in technical positions at Sandia in the 1950s, and they appear as flashes — leaving to raise families, sometimes returning later for long careers. The majority were mathematicians, with a few chemists and physicists among them. Although Sandia was predominantly an engineering lab at the time, female engineers were rare. This is not surprising as the pipeline was thin — just 0.3 percent of bachelor's degrees in engineering went to women between 1950 and 1959. Frequently the sole woman in their science, math, or engineering classes, graduating with one or two other women in their fields, they pursued their interests actively and with determination.

KATHERYN LAWSON, a PhD scientist, was hired in materials research, conducting spectroscopic studies analyzing the molecular structure of irradiated materials. Katheryn was hired by Sandia in 1958.

BETTY BRAKE, hired by Sandia in 1955, was promoted to MTS in 1959. She worked with component designers to establish test parameters and programmed the thermalog computer to run the tests.

**Mary Jo Vaughn** started at Sandia in 1949 with a BS in mechanical engineering from UNM, where she received special permission from the dean of women to wear slacks to an aerodynamics class so she could climb on top of the wind tunnel test section to collect data. When her supervisor, George Hansche, discovered she had wind tunnel experience, she was promoted to staff member, given a raise, and assigned to travel to various wind tunnels around the country to test Sandia designs. Asked if she had been encouraged to enter the engineering field, she replied, "I hadn't been discouraged."

**Dorris Tendall**, who also traveled to wind tunnels in support of Sandia design testing, started at Sandia in 1952 with an MS in physics from Iowa State University. Her master's thesis was published by the Atomic Energy Commission and she worked in aeronautics research before coming to Sandia. Once here, she conducted model studies of weapons effects and eventually segued into seismic studies of nuclear tests, serving as project scientist for the Sandia Nevada Test Site Seismic Net in 1964, where she garnered respect for her work. She continued in test effects work until she retired in 1979.

DORRIS TENDALL conducted model studies of weapons effects and eventually segued into seismic studies of nuclear tests. Doris started with Sandia in 1952.

After her husband died, **Betty Brake** moved to Albuquerque to be near her mother. She had four children to support and, "in 1955 nobody had heard of child care." She had a BS in chemistry from the University of Chicago (one of two women chemists in her class) and was promoted to MTS in 1959, having demonstrated expertise in heat transfer studies. She worked with component designers to establish test parameters and programmed the thermalog computer to run the tests. She continued in fluid mechanics and heat transfer long after the thermalog was gone, became involved in the early New Mexico Network for Women in Science and Engineering in the 1980s, and retired in 1985.

**Katheryn Lawson** is an exemplar of the determination sometimes required of these pioneers. An African-American woman with a PhD in physical chemistry from the University of New Mexico, Katheryn was hired by Sandia in 1958 — two years before four African-American college students sat down at a segregated lunch counter at Woolworth's in Greensboro, N.C., kicking the modern civil rights movement into high gear among America's youth. She was hired as part of Sandia's push to bring in more PhD scientists to advance weapon designs; like most of them, she was in materials research, conducting spectroscopic studies analyzing the molecular structure of irradiated materials.

**Diane Holdridge**, who later worked with Jim Davis in factoring large numbers using an early Cray computer (they successfully factored the 69-digit Mersenne number in 1983), forged her own path early. In college, she replaced two classes on her advisor-assigned schedule with algebra and piano lessons, and "from then on I just went without an advisor." She studied secondary education, "because I didn't know this job existed." She learned to program at Sandia, developing her skills as the machines evolved. She retired from Sandia in 1990.

Opportunities for women in both management and technical staff positions have increased over time, the way paved in part by women like these who grasped barely visible prospects in the Labs' early years. Progress was eventual, if not quick. **Betty Carrell**, hired in 1959, was the first female engineer at Sandia/California. Fifteen years later, in the wake of the 1960s press for equal rights and the growth of the women's movement, as well as economic pressures driving women into the workforce in ever greater numbers, **Joan Woodard** was one of only three female members of the technical staff at Sandia/California when she hired in. Ultimately, Joan became Sandia's second female VP and first female executive vice president.

MARY JO VAUGHN started at Sandia in 1949 with a BS in mechanical engineering from UNM. Having wind tunnel experience, she was promoted to staff member, given a raise, and assigned to travel to various wind tunnels around the country to test Sandia designs.