

# Center for Integrated Nanotechnology's two-lab groundbreaking has broad international focus

**Joint LANL, Sandia basic research project involves US economy as well as defense**

By Neal Singer

Most groundbreakings are alike, but one that involves breaking ground at two national labs is different.

The groundbreakings for the Center for Integrated Nanotechnologies that took place in rapid succession, first at LANL on Monday afternoon, May 24, and then at Sandia, Tuesday morning, May 25, had the customary feeling of pride and accomplishment that other groundbreakings have had: a major commitment of funds from Washington was verifying the judgment of management and the talent of technical people by creating new facilities for further achievements.

But perhaps because this was one of the first formal large-scale institutional collaborations between the two giant labs since the Cold War, or perhaps because of the worldwide interest in the subject at hand — nanotechnology — there was an unusually outgoing, broad, and even international flavor to the speeches.

Executive VP Joan Woodard, master of ceremonies at the Sandia groundbreaking, said CINT is one of a constellation of five Office of Science centers with a goal "to propel our country from its current position as a minority player in nanotech worldwide to the international leader." (Joan also spoke the day before at Los Alamos.)

Sandia President and Labs Director Paul Robinson, who had returned the night before from an international meeting at Russia's Institute of Automatics — the Russian lab closest to

Sandia in form and function — said, "What they wanted to talk about was CINT."

He said comparisons there were made between the current scramble for supremacy in nanotechnology with the arms race underway 50 years ago. "This race is much preferable," said Paul. "It's a race where everybody can be winners. We'll still be racing to win prizes, but there'll be many prizes over time that'll benefit all humanity."

LANL Acting Deputy Director Carolyn Mangeng, who hosted the earlier ceremony at LANL, said partnerships between the labs were not new and should generate "new solutions in energy, national security, health care, and environmental stewardship." She mentioned LANL's potential contributions in neutron scattering, biology, theory, and magnetic fields.

Raymond Orbach, head of DOE's Office of Science, described the CINT gateway concept, which channels external scientists into working relationships within the two labs, as revolutionary: "Like a cell wall, giving us access to resources behind the fence."

He quoted with some pride a European call to create nanotechnological "poles of excellence" that Orbach felt were modeled on DOE's new centers. "They're behind," he said of the European centers. "We hope they stay behind."

"The economic spin-off, which is what we are after, will give this state the opportunity to lead this nation in economic development," he said. "We wish nothing less."



SEN. PETE DOMENICI was one of several speakers at the Center for Integrated Nanotechnologies (CINT) groundbreaking May 25. The senator, describing himself as a "technology optimist," delivered a rousing talk on a wide range of topics.

(Photo by Randy Montoya)

Jonathan Epstein, speaking for a vacationing Sen. Jeff Bingaman, D-N.M., described a working trip to Asia the senator took with some Sandians. "We came away from that thinking, you need to look out there," he said, because "people [else-

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## Sandia LabNews

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## WIPP celebrates five years of accepting transuranic radioactive waste

**Sandia there all the way as science advisor**

*Editor's Note: On March 26, 1999, the Waste Isolation Pilot Plant (WIPP), 30 miles east of Carlsbad, began accepting transuranic radioactive waste from the research and production of weapons at DOE facilities around the country. In commemoration of this fifth anniversary, Lab News writer Chris Burroughs recently toured the WIPP site with several other Sandians and wrote the following account about her experiences.*

By Chris Burroughs



TRUCK ARRIVAL — A truck carrying TRUPACT containers of transuranic waste arrives at the WIPP site and waits for a security check before it is admitted into the area.

Flat, dry desert land and an occasional land formation punctuate the 30-mile drive from Carlsbad to WIPP. It's oil and gas country, and wells are scattered around the landscape.

Our tour guide, Sandia DMTS Frank Hansen (6820) — who began working on WIPP repository sciences in 1975 — tells us how 225 million years ago, when early dinosaurs roamed the planet, this part of the world was the Permian Ocean. This ancient ocean deposited enormous beds of salt extending over several hundred miles, including the 2,000-foot salt formation where WIPP is located. He points out skeletal structures of a declining potash industry — mines that at one time were the heart of the Carlsbad economy.

WIPP's official boundary is four miles by four miles square around the repository, evidenced by a lack of drill rigs on the property. If not for that, it

would be difficult to tell when you've reached it, as all you see are miles and miles of dry brown desert.

Frank parks the government van in a large parking lot, and we enter a white building that looks much like any Sandia or DOE facility.

Entry into the site is guarded, and we are subject to random search before proceeding. The

first stop is a large viewing room where we watch a safety video about what to expect underground. We are told we have to wear solid, closed-toed shoes and

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## Columbia study review: Sandia shares many practices with NASA

By Chris Burroughs

A Labs review team that studied in detail a NASA report on the Feb. 1, 2003, explosion of the Space Shuttle *Columbia* has concluded that Sandia shares many of the organizational factors that led to the accident.

"The *Columbia* Accident Investigation Board deduced that the management practices at NASA overseeing the space shuttle program were as much a cause of the accident as the foam that struck the left wing," says David Carlson, Director of Surety Assessment Center 12300, who led the Sandia review team. "Although there are important organizational differences, we follow many of these same management practices. In reviewing and discussing this accident, we all recognized ourselves in many respects."

The shuttle launched on Jan. 16, 2003, in what seemed to be a normal takeoff. Unknown was that insulating foam separated from the external tank, breaching the leading edge of the left wing. Upon re-entry the breach allowed superheated air to penetrate the leading edge insulation and progressively melt the aluminum structure of the left wing. This resulted in a weakening of the structure until increasing aerodynamic forces caused loss of control, failure of the wing, and breakup of the orbiter. The accident killed seven crew members.

Executive VP Joan Woodard and VP 2000 John Stichman tasked David to lead the review of the NASA investigation. Starting work on Sept. 1, team members — all senior scientists

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Sandia/Carlsbad plays significant role in life of Waste Isolation Pilot Plant

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Sandia continues to help use solar power to electrify homes on Navajo Reservation

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## What's what

Okay, we're past Memorial Day, the Indianapolis 500 is over, and temperatures are already well into the 90s. The season's first regatta is a sunburned memory and blueberries are showing up in the grocery store.

It's time to pull those Navy blue linen blazers and seersucker dresses out of the back of the closet — and those new espadrilles, ladies. And white bucks, guys — wear 'em if ya got 'em.

It's summertime!

\* \* \*

John Aperans (3128) is tops so far in having the most cards and other things dangling from his badge holder lanyard. He responded to the query in last issue's "What's what" with this list: Sandia ID badge, Respirator Qual Card, SCBA Instruction Card, RCT Qual Card, Confined Space Qual Card, ISMS card, Sandia Vision card, four (4!) cards with department contacts/phone numbers, Escort Responsibilities Card, Ethics Card, rad dosimeter, and snap link with office keys.

If you weren't counting, that's 15 things. John wondered if he won a prize. I think a neck brace might be nice, or a needle and thread for restoring sheared-off buttons, or maybe a fund to replace silk ties shredded by all that stuff.

Can anybody beat 15?

\* \* \*

It may have been the eyes-are-bigger-than-the-stomach syndrome, or simple fickleness, or maybe a Labs manifestation of the broader culture's demand for instant gratification and almost-as-instant disinterest. But whatever "it" was, the result is the "Your Thoughts, Please" tent has folded — or, more accurately, is folding.

YTP was launched a little more than three years ago — in response to employee and senior management suggestions — as a publication venue for uncensored comment about life and work at Sandia. Such as, in the light of "increasing concern about the attractiveness of Sandia as a place to work . . . if you had a chance to start your career again, would you come to work at Sandia?"

Despite gaining quick attention and participation during its first year or so, the number of responses has been declining steadily, and recent research indicated there is little interest in it.

Guess we'll just have to keep our thoughts to ourselves.

\* \* \*

A funny note from Peter Merkle (16000) pointed out that the website for Sandia's Washington office was illustrated with a photo of St. Peter's Basilica, not the US Capitol. "The Sandia DC office has a picture of the Vatican instead of the US Capitol," he wrote. "Do we take care of their nukes too? Or do they just rely on fire and brimstone?"

Of course, the Vatican doesn't have any nukes, and somebody took care of the website. St. Peter's is gone — replaced by a photo of the entrance to the DC office building.

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

## Sandia ranked No. 1 employer of choice in aerospace/defense industry, survey finds

Sandia ranks first in the nation as an employer of choice in the aerospace/defense industry, according to a survey by *Aviation Week and Space Technology*.

Technological challenge and meaningful work ranks No. 1 in considerations by aerospace/defense professionals when looking at employment opportunities, the survey found. And Sandia ranked first in that technological challenge category. Raytheon, Hamilton Sundstrand, General Atomics, and Northrop Grumman followed.

The results are published in the May 3 *Aviation Week and Space Technology*. To get a better sense of the industry's makeup today — and which companies may be doing the most to attract top engineers and technical people — the magazine conducted a comprehensive survey in partnership with the Aerospace Industries Association.

Respondents considered four broad categories: technological challenge and meaningful work; opportunity for career growth and professional development; job stability; and leadership.

Those surveyed ranked the technological challenge category first, and Sandia qualified as best-in-class in that category on the basis of all the data points, said the magazine. It pointed out that Sandia is operated by Lockheed Martin for the US Department of Energy and that more than three quarters of Sandia's 8,000 employees work directly on R&D or engineering projects.

It said Labs Director and President Paul Robinson "can offer employees sustained funding for R&D projects linked to the hottest projects in energy, visualization, sensors, chip design, and, most fundamentally for Sandia, nuclear weapons — and now, terrorism. Low attrition rates, high percentages of diversity, promotions from within, and a highly technical leadership team add to Sandia's attraction."

"People want to be part of the lab," the magazine quotes Paul as saying. "When you have the really hardest problems, you send them here to be solved. That challenge is what brings people here. Once they get a steady diet of it, it's pretty hard to go anywhere else." Plus, Paul told the magazine, "It's not just a job. It's your country."

"To say I was delighted would be an understatement," Paul told the *Albuquerque Journal*. "The part I'm most proud of was not only were we ranked No. 1 in challenge, but that factor was No. 1 in career choices. It gives me great hope for the next generation of scientists."

In looking at women and minorities in the workforce, *Aviation Week* identified three top companies: Vought Aircraft, Rockwell Collins, and Sandia.

At Sandia, the magazine says the push for diversity goes back decades and it notes that today, of the top 80 slots at the lab, 20 are filled by women, including Joan Woodard, Sandia's executive vice president and deputy director.

— Ken Frazier

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## For the record

The information provided us for the employee death notice for Ann Marie Griego (*Lab News*, May 14) was incomplete.

Ann Marie's survivors include, in addition to her husband, Alex Griego, her mother, Eva Davis, and sister, Janet Davis, both of New Orleans, and father Louis Davis of Los Angeles.

## VP Don Blanton to retire in July



Don Blanton, VP of Human Resources and Protection Division 3000, has announced his retirement effective in July.

Don, who has been vice president since 2001, has been responsible for the Labs' human resources, health services, benefits, environmental safety and health programs, and emergency management programs.

While at Sandia he has led significant organization change initiatives to bring best-in-class HR business practices to the Labs. Some of those prac-

tices include converting the traditional compensation job structure to a broadband approach; a performance management process with line of sight from corporate goals to individual objectives; realigning workforce skills to match changing mission requirements; and streamlining of human resources practices to accommodate commercial software.

Don joined Sandia in 1995 as the Human Resources Director. From 1987 to 1994 he worked in the Lockheed Martin Energy Systems organization in Oak Ridge, Tenn., where he was Director of Human Resources at the Y-12 and K-25 plants. Before then he was Labor Relations Manager at both Y-12 and K-25 and production supervisor in the Oak Ridge Gaseous Diffusion Plant.

"I have really enjoyed being a part of Sandia," Don says. "My greatest joy has been getting to know and work with such a talented, caring group of people."

# Sandia, Lawrence Berkeley unveil new guidelines to help guard airports against chem/bio threats

By Mike Janes

Over the past few years, researchers at Sandia/California have helped improve San Francisco International Airport's (SFO) ability to thwart chemical and biological terrorist threats through the PROACT (Protective and Responsive Options for Airport Counter-Terrorism) program. The next logical step, it seemed, would be to take the expertise and lessons learned from PROACT to assist other airport facilities across the nation, and a newly published report may soon serve that very purpose.

Sandia has collaborated with Lawrence Berkeley National Laboratory (LBNL) to develop Guidelines to Improve Airport Preparedness Against Chemical and Biological Terrorism, a 90-page report to aid airport planners in defending their facilities against chemical and biological attack. Early indications from SFO managers are that the report contains an ideal mix of information and direction, but Sandia has asked other airport managers to review the document to ensure the guidelines are broad enough to relate to a variety of airport designs yet specific enough to serve their individual needs.

Sandia/California's System Studies and Systems Research groups (8112 and 8114) are spearheading the project, with researcher Donna Edwards (8112) and new department manager Susanna Gordon (8114) taking the lead. The Indoor Environment department at LBNL, which enjoys a long and reputable history in airflow and contaminant transport modeling in buildings, contributed significantly to the publication and has previously published its own guidance document for protecting buildings from chem/bio attack.

The Federal Laboratory Consortium recently selected the Lawrence Berkeley/Sandia team to receive its Award for Excellence in Technology Transfer in 2004 for the work package "Minimizing Casualties from a Chem/Bio Attack: Preparation, Training, and Response Resources," which included the airport guidance document as a

core component.

"We wanted to offer airport planners a user-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 level," says Donna. Readers of the guide, she says, will be armed with the information necessary to determine what kinds of physical or system upgrades are required for their facilities, or whether an outside consultant is needed. The guidance contained in the document is also intended to help airport personnel deter high-consequence chem/bio attacks through targeted physical secu-

a comprehensive guide is needed to instruct airport facilities on how to deal with such a threat.

The guide begins with an overview of the chem/bio threat, including an examination of past incidents, specific chemical and biological agents, and potential scenarios that airport planners should consider. Subsequent chapter themes

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include vulnerability assessments, targeted physical security measures, passive protection measures, and active responses to mitigate the consequences of attack.

In developing the guide, Sandia drew extensively upon knowledge gained from its collaboration with San Francisco International Airport 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 Defense Department's Biological Defense Initiative and from guidelines Sandia developed for other sites. Existing guidelines for building protection by the Center for Disease Control/National Institute for Occupational Safety and Health and the US Army Edgewood Chemical Biological Center also were used.

"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."

Because Sandia's experience working with SFO played such a key role in the lab's development of the document, managers at that facility were offered a "sneak peek" at the guide and asked to offer recommendations and insight. SFO's response, Donna says, was just what she had hoped for: an enthusiastic endorsement.

While acknowledging the urgency of getting the document into the hands of airport planners as soon as possible, Donna says Sandia and LBNL plan a thoughtful rollout of the guide. "We want to gain feedback from the building protection community and a few major airports to ensure we give the best possible advice before sending it to every airport in the country," she says.



Susanna Gordon, left, and Donna Edwards look over the document they helped prepare.

riety 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, who served as the principal investigator during previous stages of PROACT (*Lab News*, May 2, 2003), points out that airports and the Transportation Security Administration (TSA) are already well equipped to deal with explosives and other conventional weapons. But the nature of a chem/bio threat, she says, is far different, and

## Feedback

**Q:** I've recently learned that single-line-item JIT purchases cannot be split over several project/task numbers. Is there a fix for this in the works, or does a work-around exist? It is frustrating and unfair to have to buy something (e.g., a PC) that will support all my projects and bill it to only one task. We can do this with P-cards, why not JIT?

**A:** Unfortunately, the inability to split a JIT purchase of a single item with a quantity of one among several project/tasks is a limitation within the Internet Procurement module of Oracle Purchasing. This limitation has been discussed with Oracle, and Oracle has stated that more robust cost distribution capabilities will be available in the future releases of the software. Oracle was not specific, however, on when we might expect to see this enhancement. Sandia has no plans at this time to customize the existing software to accommodate cost distribution at a more detailed level

than what is currently provided. A work-around to this problem is to place a requisition through Oracle Procurement Application (not Internet Procurement) and have a buyer place the purchase order. This process allows for greater cost distribution alternatives. We apologize for the inconvenience this may cause and look forward, as you do, to getting the software enhancement from Oracle. Thank you again for your concern.  
— Dave Palmer (10200)

**Q:** Why aren't Sandia Directory employee photos visible by default? These photos are an underutilized resource that could help employees recognize people in key positions such as ES&H Coordinators, Computer Security Representatives, Building Owners, etc. At a very minimum, all managers, project leads, and secretaries should be visible.

**A:** As you noted, not all Sandians have their picture posted in the Sandia Directory. The reason for this is that each employee can make a personal decision as to whether or not to display his

or her photo. The current default is not to display the photo to protect employee privacy. Since the IIS organization (9500) owns the Directory database, you can pursue this matter further with them if you wish.  
— Al West (3100)

## For the record California

A second Sandian who is completing the University of New Haven's new master's degree program in National Security was inadvertently omitted from an article about the first graduating class (*Lab News*, May 28). Nellie Ward (9317) began the program in January 2003 and was involved in a recent visit by the administrator, University of New Haven Dean Thomas Johnson, to the New Mexico site. Several other Sandians showed interest in the program, which currently has classes online and at the California site.

# Sandia establishes fire-science CRADA with FM Global

*First objective of R&D agreement is to reduce consequences of fires*

By Michael Padilla

To jointly pursue research and development to reduce the consequences of adverse events such as fires, Fire Science and Technology Dept. 9132 has established a collaborative research and development agreement (CRADA) with FM Global, a large-loss insurance company with a risk management focus.

The umbrella CRADA sets the stage for additional

progress in Engineering Sciences to address high-consequence events.

The CRADA's initial objective is to provide significant technical

advances for the prevention and mitigation of high-consequence fires, says Louis Gritz (9132), Manager of Fire Sciences.

These advances will be accomplished through gaining new, high-quality data for discovery of controlling mechanisms and model validation, and the formulation of new theories to describe fire behavior. In addition the CRADA will focus on development and validation of analytical and numerical fire models to predict fire hazard and mitigation system performance, says Louis.

These advances are expected to provide measurable improvements in fire safety by decreasing fire-related losses of life and property.

FM Global and Sandia's Fire Sciences

*"Both organizations have, or will soon have, new fire test laboratories with differing, but complementary, capabilities."*



FIRE SCIENCE — Louis Gritz explains the Thermal Test Complex before the CRADA signing with FM Global, a large-loss insurance company. (Photo by Bill Doty)

Department have a common objective of preventing or reducing losses due to high-consequence fires.

"Both organizations have, or will soon have, new fire test laboratories with differing, but complementary, capabilities," says Louis.

FM Global has research laboratories that include facilities for small-scale experiments, material flammability characterization, and large open burn rooms with calorimeter vent hoods.

The large burn rooms provide a quiescent

environment for large fire experiments. Sandia has large open fire facilities, small-scale laboratory facilities, and enclosed large-fire facilities with controlled airflow to provide quiescent and cross-wind conditions.

Both Sandia's Fire Sciences Department and FM Global are developing new instrumentation including gauges for measuring heat transfer in very large fires. The organizations are also both developing validated computer models for predicting fire environments. Both organizations share similar objectives, but to date have taken significantly different approaches. Cooperation between the organizations is expected to speed progress to meet the needs of both parties.

Sandia will employ its existing fire diagnostics and facilities, as well as new diagnostics and new facilities included in the Thermal Test Complex (*Lab News*, March 19). Experiments will serve as benchmarks for improving the knowledge of fire physics, validating quality data sets, and developing predictive models of fire behavior.

FM Global is the only large-loss insurance company to base risk decisions on engineering analysis as opposed to actuarial techniques. FM Global recently completed construction of a new \$78 million world-class research and product-testing complex.

Sandia's Fire Science and Technology Department is a multifaceted, multi-customer program. It includes research, development, and application activities throughout the Labs.

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(Continued from page 1)

and senior management — spent some 60 hours each reviewing information.

Their review centered on four themes: risk assessment, adequacy of technical understanding, decision making, and organizational and safety culture.

The end of the Cold war eroded the urgency and sense of NASA's mission, much as it did Sandia's. There were significant budget pressures associated with the space shuttle program. Increasing costs and operational needs caused safety upgrades, in some cases, to be deferred. Also, a firm, Feb. 19, 2003, completion date was established to finish the US portion of the International Space Station, which was probably pushing the envelope, David says.

"We, too, face schedule and budgetary pressures that challenge us to meet our many requirements," David says. "Among those requirements is safety in our designs. Safety is part of performance and not easy to judge. It's one of those things that seem easy to trade off. You can't weigh it, can't see it on the calendar, but it is very real."

He adds that the NASA people, just like Sandia's, have a "can-do attitude."

"This attitude is vital to our success, but it must be judiciously managed. It is essential to understand and manage our risks," Dave says.

Another issue with management was that some did not have a full understanding of technical difficulties associated with *Columbia*. This is not unusual in complex systems such as the space shuttle or in systems like those designed by Sandia.

"However, we must always provide proof

that the design is safe rather than, as in the case of the shuttle engineers, expecting safety professionals to prove to the program management that its system is unsafe," David says.

The NASA engineers found themselves in the unusual position of having to prove that the situation was unsafe.

Sandia is subject to many of the same pitfalls in decision making and communications that contributed to the *Columbia* accident. These include reliance on past experience and technical expertise; communication barriers including a culture of "over-politeness" which

may make it difficult for management to appreciate the depth of engineers' concerns; and potential erosion in our expectations of first-level management for technical leadership, direction, and judgment.

"The lessons from the *Columbia* accident speak to us as managers at Sandia," David says. "However, these are important issues to all of us — not just managers — in conducting our everyday work. Our review heightened our recognition of these issues. They are difficult to resolve but essential to recognize and address if we are to strengthen our safety culture."



GOODBYE, NEW MEXICO. President Ronald Reagan waves farewell as he boards Air Force One at the end of a 1983 visit to Albuquerque. Reagan died Saturday, June 5, at the age of 93 after a 10-year battle with Alzheimer's disease. (Photo by then-presidential press pool photographer Randy Montoya)

# Sandia/Carlsbad plays significant role in life of WIPP

*Editor's Note: Articles on pages 1 and 5-8 offer a glimpse of the work done at the Sandia/Carlsbad site. They are part of an occasional series the Lab News has been publishing about the Labs' remote sites. This set of articles was written by Chris Burroughs, who spent two days in Carlsbad meeting with Sandians there. She also toured the Waste Isolation Pilot Plant (WIPP), for which Sandia serves as the science advisor.*

Three significant events in the life of the Waste Isolation Pilot Plant (WIPP) and in Sandia/Carlsbad's continuing support for the repository took place on March 26.

They included the fifth anniversary of the first receipt of transuranic waste at WIPP; DOE delivery to the Environmental Protection Agency (EPA) of the Compliance Recertification Application (CRA) for WIPP; and EPA approval of the disposal at WIPP of supercompacted transuranic waste from Idaho. Sandia/Carlsbad played key roles in the long processes that led to these milestones.

"Sandia has supported WIPP since its inception in the early 1970s," says Paul Shoemaker, Level II Manager 6820 who manages the Sandia/Carlsbad site. "It was largely through Sandia's efforts in site characterization and performance assessment modeling that DOE received certification from EPA to open the world's first nuclear waste repository to be licensed through a rigorous and transparent regulatory approval process. Our support for WIPP is one of the longest-running projects in Sandia's history. At least four members of the LLT [Labs Leadership Team] were or are intimately associated with WIPP."

He adds that about three years ago Sandia began preparing for the technical analyses required to support recertification of WIPP for another five years of operation. Along the way Sandia staff "successfully coaxed four of the 24 conceptual models used to project the performance of the repository through rigorous peer reviews."

"We continuously improved the EPA-required quality assurance environment within which our field and experimental work and our modeling and analysis efforts are done," he says. "We also assisted our sister laboratory, Los Alamos National Laboratory [LANL], with a complete update of DOE's transuranic waste inventory, and we partnered with the WIPP management and operating contractor, Washington TRU Solutions, to craft the 9,000-plus

page recertification application."

During this time, at DOE's request, Paul served as the Recertification Project Manager among the four WIPP participant organization managers, including Sandia, LANL, Washington TRU Solutions, and Carlsbad Technical Assistance Contractor (CTAC).

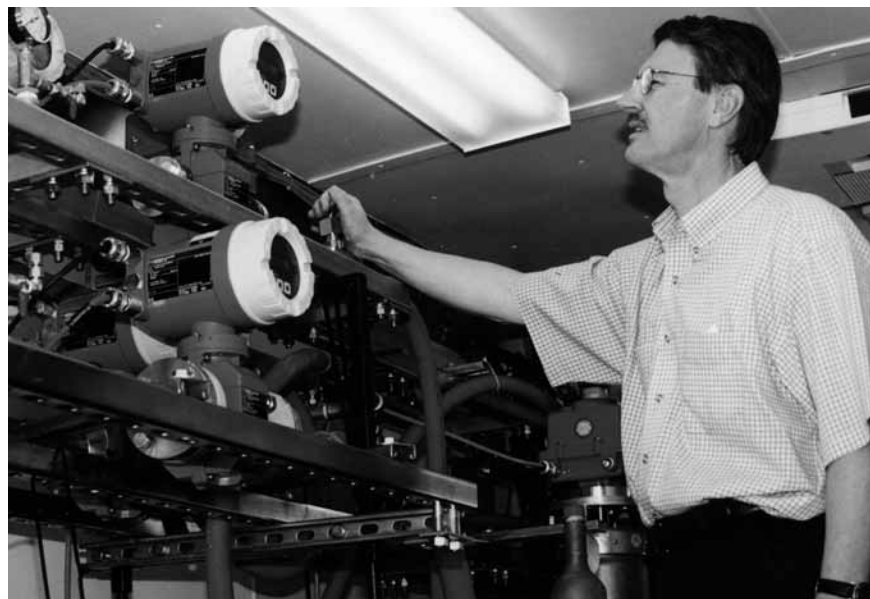
Eighteen months ago Sandia was asked by DOE to participate in the development of a reasoned-argument approach to convincing the EPA that WIPP repository performance would not be adversely affected by the disposal of supercompacted transuranic waste from Idaho.

"Enormous investments had been made by BNFL Environmental Services in constructing a supercompaction facility at INEEL [Idaho Engineering and Environmental Laboratory] to treat alpha low-level mixed waste in lieu of incineration and to prepare it for disposal at WIPP," Paul says. "DOE would experience significant exposure if the EPA refused to allow disposal of this waste form at WIPP."

He adds that the initial stab at securing EPA approval through the "reasoned-argument approach was unsuccessful."

"DOE turned again to Sandia, asking that we make a more rigorous case for supercompacted waste disposal — a case based on complex excursions from our standard approach to WIPP-related performance assessment," Paul says. "By an accident of timing, we were obliged to engage in this work at the same time we were conducting performance assessment calculations and analyzing and documenting results in the CRA."

Sandia/Carlsbad staff were completing technical reports in connection with this matter and forwarding them to the EPA the week before EPA approved placement of this waste in WIPP.



AN IMPORTANT ASPECT of Sandia/Carlsbad is the hydrology program, which monitors groundwater near the WIPP site. Here Tom Pfeifle checks out a mobile laboratory that goes into the field to test water wells.

***"Sandia has supported WIPP since its inception in the early 1970s. It was largely through Sandia's efforts in site characterization and performance assessment modeling that DOE received certification from the EPA to open the world's first nuclear waste repository to be licensed through a rigorous and transparent regulatory approval process."***

Paul says that executive management should be "very proud of the overall effort turned in by Sandians and contract associates working on these two WIPP projects" — efforts that required overtime hours for an extended period.

"This was a truly exceptional effort by these folks during the closing stages of the work in mid-March," Paul says. "During that crucial period, staff in Carlsbad were working out of their homes, in borrowed office space in Carlsbad, and in offices in Albuquerque because we were obliged to be away from our Carlsbad offices until a gas well being drilled adjacent to our facilities was brought fully back under control after a blow-out on March 11 [Lab News, April 2]. Sandia's 'can do' attitude was vividly displayed. All those who worked on these tasks throughout did in fact render an 'exceptional service in the national interest.'"

## Some facts about Sandia/Carlsbad

Sandia employees were assigned to live in Carlsbad and support WIPP projects full time as early as 1975. The first Sandia support office in Carlsbad was established in 1976. The first Sandia manager permanently stationed in Carlsbad — Tom Schultheis — came in 1987. In January 1994 the Carlsbad Operations Center came into being with Paul Brewer as its first director. At about that time there were 16 full-time employees and 21 contract associates in Carlsbad.

Currently 60 people are affiliated with Sandia/Carlsbad. They work and reside in the town. Some 38 of these are Sandia employees and 22 are contract associates.

Approximately 90 percent of the funding supporting Sandia/Carlsbad comes from DOE's Carlsbad Field Office (DOE/CBFO) for support of WIPP; the other 10 percent derives from non-WIPP and non-DOE sources. Most of the 60 people support only WIPP; some, however, support non-DOE, non-WIPP customers. None of the Carlsbad-based people reports to work daily at the WIPP site itself. All are based at the Carlsbad office and travel to the WIPP site when needed. This is just the reverse of the pattern that used to apply in the early days of Sandia's time in Carlsbad.

## Compliance Recertification Application represents thousands of hours of work by Sandia/Carlsbad

The WIPP Compliance Recertification Application (CRA) recently submitted by DOE to the US Environmental Protection Agency (EPA) represented thousands of hours of work by Labs employees at Sandia/Carlsbad and elsewhere.

One group that contributed significantly to the CRA is the Sandia/Carlsbad performance assessment (PA) team that had to predict the way the repository may perform over the next 10,000 years.

"Our job is to look at possible scenarios and their uncertainties, and evaluate the future performance of the WIPP repository for 10,000 years into the future," says David Kessel (6821), Manager of Performance Assessment and Decision Analysis Dept. 6821. "We determine what could happen, how likely is it to happen, what are the consequences, and how much confidence you have in your assessments. These results are then compared to allowable limits set by the EPA."

Since the late 1980s, the WIPP performance assessment team has studied a number of potential issues, including volcanic action, earthquakes, and climate changes. They sifted through all of the possibilities and came up with one primary release scenario — radiation release related to oil and gas drilling. Performance assessment has shown that if WIPP is not breached by human activities in the distant future, releases of radioactivity are effectively zero. Release scenarios associated with drilling are an area of significant attention and analysis.

"A rigorous process is used to develop the con-

ceptual basis for these release scenarios," David says. "Each of the 24 conceptual models used in PA must pass a rigorous peer review before the EPA will allow its use in performance assessment."

For the 2004 recertification two conceptual model peer reviews were conducted to approve and confirm changes made to four conceptual models directly related to release mechanisms. "These peer reviews give us and the EPA confidence that we're appropriately modeling the complex processes that are expected to occur in the WIPP over a very long period of time," he says.

The department has its own computing platform to run the performance assessment models used to predict WIPP's performance. The platform has changed considerably over the past several years due to advances in computers and software, although the conceptual models remain largely unchanged. What used to take them many months to model has been reduced to three weeks. Sandia's WIPP computing environment is compliant with rigorous quality assurance requirements.

"We need strict control over our software," David says. "The most effective way to accomplish this is to own the equipment."

The team worked since April 2003 on performance assessment calculations for the recertification documentation. The document went through successive rounds of review and comment in November and December before being submitted to EPA by DOE in March 2004.

## Researchers refine knowledge of waste containment

While researchers expect that the bedded-salt deposit where the Waste Isolation Pilot Plant (WIPP) is located will remain undisturbed for many years in the future, the Environmental Protection Agency (EPA) has mandated that human-intrusion scenarios be factored into evaluations of how the repository will perform over the long term.

"For example," says Donald Wall (6822), an actinide chemist who serves as the laboratory manager of the Carlsbad Programs Group, "brine may enter the repository through future drilling for natural resources such as oil or gas. In such a scenario, brine may then carry radionuclides to the surface. The WIPP design employs an engineered barrier to reduce the likelihood of movement of radionuclides. Controlling their movement is done by controlling the chemical environment within the repository."

Most of the waste comes to the repository in 55-gallon steel drums. When the salt formation creeps closed, the drums will be crushed. The presence of large amounts of iron from the drums will maintain plutonium in the lower +III and +IV oxidation states, which are the most insoluble and immobile. This significantly reduces the mobility of plutonium.

The two radionuclides of greatest concern in repository performance are plutonium and americium.

"Plutonium has the most diverse and complex chemical behavior of all the elements on the periodic table, which along with its useful nuclear properties, makes it one of the most fascinating subjects that a chemist can study," Donald says.

The solubility and mobility of plutonium and americium will also be suppressed by plac-



DONALD WALL, laboratory manager of the Carlsbad Programs Group, says the combination of expertise and Sandia's excellent facilities allows his group to branch into new areas of research.

ing large quantities of magnesium oxide on top of the waste stacks. Magnesium oxide will consume all carbon dioxide, which could be produced in significant quantities by microbial activity in the repository and could increase the solubilities of plutonium and americium. If brine enters the repository, magnesium oxide will consume it and keep the pH of any remaining brine at levels favorable from the standpoint of plutonium and americium solubilities.

Researchers at Sandia/Carlsbad study magnesium oxide to confirm that it will perform as expected.

Anna Snider (6822), magnesium oxide project principal investigator, and Yongliang Xiong (6822), a postdoc, have made "tremendous progress" in investigating the behavior of magnesium oxide, Donald says.

"They have been examining the kinetics and products of the reaction of magnesium oxide

with carbon dioxide and brine," Donald says. "As it turns out, magnesium oxide was an excellent choice for an engineered barrier because it will consume carbon dioxide and control the pH of brines that may enter the repository as well."

Researcher Huizhen Gao (6822) has also been studying what happens when microbes act on cellulosic material in the waste, such as wood and paper. The main goal is to measure the rate at which microbes produce gas under humid conditions with experiments that more realistically represent WIPP conditions than those carried out previously.

In another research project at Sandia/Carlsbad, Nathalie Wall, a nuclear chemist from Paris, France, is examining the behavior of humic substances under WIPP conditions. When humic acids, which slowly form as organic matter degrades, interact with plutonium, the solubility of the plutonium could increase.

"As a result, the complexation and solubility properties of humic materials are important to understand to accurately describe repository chemical behavior," Donald says.

Also being researched at Sandia/Carlsbad is the chemical behavior of radiolysis products, such as hydrogen peroxide and hypochlorite — both highly oxidizing species that result from the interaction of alpha-particles with chloride-containing brines. The hydrogen peroxide formed is the same chemical in household peroxide. Hypochlorite is the active ingredient in household bleach. Both are very reactive substances. Alpha-particles are high energy particles emitted by plutonium and many other radioactive materials during the course of their radioactive decay.

Donald and Nathalie have been examining the kinetic and thermodynamic controls of formation and decomposition of radiolysis products to determine their impact upon the chemical behavior of plutonium and americium.

### Lab well-equipped

The Sandia/Carlsbad laboratory is well-equipped and unusually tidy.

Donald Wall, laboratory manager, describes the routine, "We place a great deal of emphasis on good ES&H practices, and good housekeeping is an important element in maintaining a safe work environment. We also have excellent facilities and a combination of expertise that allows us to branch out into other areas.

"For example, our past experience in handling radioactive materials. Before coming to Sandia, Nathalie [Wall] and I actually performed experimental work with every actinide from thorium through curium, including plutonium, which is pretty unusual. Our experience allows us to work on a wide variety of issues related to the characterization, control, and disposal of radioactive materials.

### Husband and wife chemists team together

In case you are wondering, the last names of two of the researchers on the WIPP project above is not just a coincidence. Donald and Nathalie Wall, a husband-and-wife team, are the only two actinide/nuclear chemists working at Sandia/Carlsbad on the WIPP project as contract associates.

"We met in front of a liquid scintillation counter in Professor Greg Choppin's lab at Florida State University," Donald recalls. "I did not speak much French at the time, so when I met her I used one of the few sentences that I did know 'Tu est belle comme une pompe à vide [You are beautiful like a vacuum



DONALD WALL



NATHALIE WALL

pump]."

She responded without hesitation, 'Alors, tu est beau comme un camion [You are handsome like a truck]."

## Jesse Roberts studies water flow at Sandia/Carlsbad

Imagine a terrorist wants to poison a water supply. He could put poison in the river that flows to the community reservoir. Initially the water in the reservoir would be contaminated, but, over time, sediment would filter the contamination out.

The sediment, now contaminated and covered by cleaner sediment, is waiting for the next big flood, which would disturb the sediment and send the poison back into the water.

It's something that Jesse Roberts (6822) in the Sandia/Carlsbad Soil and Sediment Transport Lab thinks about a lot. He has several funded projects and a Laboratory Directed Research and Development (LDRD) project to develop capabilities to measure and model sediment and contaminant

transport in surface water systems.

Jesse was initially hired to conduct experiments at WIPP to determine the possibility of buried waste rising to the surface during a drilling intrusion. Now he studies water flow and transport of sediments in places as far away as the New York Harbor and Alaska and as nearby as the Pecos River and the Rio Grande Delta.

Jesse says communities throughout the country have been dealing with issues described here. Only they weren't acts of terrorism. Mostly they involved industrial plants discharging polluting chemicals which attached to sediments in lakes and rivers prior to the regulations established by the Clean Water Act. Now the Environmental Protection Agency is directing that the rivers and

lakes be cleaned up. Depending on water flow, cleanup is done by diverting a river and digging the polluted sediment out or by putting a cap on the sediment in an effort to demobilize the contamination.

Jesse and fellow researcher Rich Jepsen, who started his Sandia career in Carlsbad and now works in Mechanical Environments Dept. 9134, have built and patented two devices to measure the erosion and transport of sediments. Using cores of sediment from rivers, lakes, or oceans, Jesse flows water across the top of the core, applying shear stresses that mimic the hydrodynamic environment in question.

The first device invented was the Adjustable  
(Continued on next page)

# Sandia-sponsored resource center helps with science education in Southeastern New Mexico

Much of the science education in grades kindergarten through seventh in Chaves, Eddy, and Lea counties in New Mexico can be credited to Sandia/Carlsbad.

Ten years ago Paul Brewer, then director of Sandia's Carlsbad Operations Center, suggested a plan to provide age-appropriate science kits to classrooms in the Carlsbad area in an effort to augment science being taught in elementary schools. Eleven school districts joined, and a new program, Southeastern New Mexico Educational Resource Center (SNMERC), was born. Sandia provides office space, computers, copier, and a limited-term employee to revise curriculum and manage the delivery of science kits to the program. Participating school districts pay dues for SNMERC operating expenses.

SNMERC still serves 11 member districts and offers a variety of programs for teachers and students. One of SNMERC's programs, Hands-On Program for Elementary Science (H.O.P.E.S), provides science kits to the schools. These kits are motivational and engaging for students as well as teachers.

"In some cases these kits are the primary science education the students receive," says Carol Streber, a Sandian on loan to the program. "The

*"In some cases these kits are the primary science education the students receive."*

kits all include a teacher manual and a student booklet for each child. Almost all of the materials needed are included in the kit."

There are 22 different types of kits, which are refurbished three times a school year. Annually the program refurbishes more than 1,150 kits that provide hands-on math and science instruction.

Participating school districts are: in Chaves County, Dexter, Hagerman, Roswell, and Lake Arthur; in Eddy County, Artesia, and Loving; in Lea County, Eunice, Hobbs, Jal, Lovington, and Tatum. More than 14,700 students use the kits in the 11 districts. In addition to Carol, other staff members include Kristina Baca, director; Marty Carpenter, who is on loan from the Loving School District; and Juanita Trujillo, head clerk.

Superintendents from the participating school districts sit on the board of directors, along with Paul Shoemaker, Level II Manager of Sandia/Carlsbad, and David Chavez of Washington TRU Solutions, the company that handles day-to-day operations of WIPP.

"Our staff assembles and refurbishes the H.O.P.E.S. kits, picks up and delivers them to the schools in the SNMERC district," Carol says. "It's a labor-intensive work, but we love it." In addition, training is available when new kits are introduced and to teachers new to SNMERC.

Through another SNMERC program, PathFinder, middle and high school students from participating districts engage in career and technical education. They also do job shadowing and get in contact with businesses for jobs.

Every year SNMERC has a professional development meeting in Ruidoso where speakers talk about key educational issues and administrators participate in workshops.

With the arrival of Marty last year, SNMERC added another program to assist districts with the integration of technology. The web-based system offers online professional development and master's-level courses to teachers. The purpose of the virtual alliance is to design and deliver courses to high school and middle school students. SNMERC partnered with the College of the Southwest and the Regional Education Technology Assistance Program based out of New Mexico State University (NMSU). The College of the Southwest is providing the platform to host



CAROL STREBER, left, and Juanita Trujillo of the Southeastern New Mexico Educational Resource Center put science kits in bins ready to go to schools.



SCIENCE KITS that go to schools include a teacher manual and a student booklet for each child. Almost all of the materials needed are included in the kit.

master's-level courses, and NMSU Distance Learning has made available master's-level credit hours.

Called the Southeastern New Mexico Alliance for Distance Education, it provides professional development via the Internet. SNMADE has involved 22 teachers from the 12 districts and seven postsecondary instructors, who take master's courses online. Participants are being professionally developed as online learners, online course developers, and online instructors.

"Sandia, through supporting SNMERC, has done so much for education in our part of New Mexico. It's made a difference to teachers and students alike," Carol says.

## Jesse Roberts

*(Continued from preceding page)*

Shear Stress Erosion and Transport flume (ASSET flume) that mimics the hydrodynamics found in a river system and erodes sediments at all ranges of flow conditions, even simulating storm conditions. Because river flow is generally unidirectional, a single-speed pump and three-way valve system controls the flow conditions within this device.

The second device, the Sediment Erosion Actuated by Wave Oscillations and Linear Flow flume (SEAWOLF flume), mimics the environment at the bottom of an ocean or large lake. In these environments waves generate an oscillatory flow across the sediment bed and interact with the unidirectional long shore current. To achieve this flow condition within the SEAWOLF flume, pistons are used to drive the oscillatory flow and are superimposed on a unidirectional flow created by a head difference set-up by a uniquely designed reservoir system.

In conjunction with computer simulations that determine water flow in rivers, oceans and lakes these devices help determine the mobility and fate of sediments and associated contaminants.

"The ASSET flume system consists of a series of traps," Jesse says. "Eroded sediment traveling



JESSE ROBERTS with one of the devices he built that measures erosion and transport of sediments.

on the bottom of the channel, as bedload, will fall into the traps, and sediment traveling in suspension will bypass the traps."

He adds that conventional modeling predicts that fine-grained cohesive sediments will erode and transport entirely in suspension since the individual particles are so small. Observation has demonstrated that this is often incorrect as cohesive sediments erode in aggregates or chunks that often tumble along the bottom as bedload.

The mechanism of transport will greatly

affect how far downstream the sediment can travel. For example, suspended sediments have the potential of traveling hundreds of miles while bedload material will likely travel significantly shorter distances. The ASSET flume allows us to define this quantitatively. This way we can determine how far downstream the sediment will travel.

This technology was developed from grants received primarily from the Army Corps of Engineers Waterways Experiment Station in Vicksburg, Miss. Both the Army Corps of Engineers and the Environmental Protection Agency have sought Sandia's assistance on sediment and contaminant transport issues using these newly developed devices.

Another of Jesse's projects was with the Carlsbad Irrigation District. He helped study water needs of wildlife and agriculture along the Pecos River in lean water years. One species of particular concern was the Pecos Bluntnose Shiner Minnow. Water managers wanted to know how much water in depth and velocity is needed to allow the fish to survive and thrive. Jesse's been doing similar studies on the Silvery Minnow in the Rio Grande.

He has also studied the Rio Grande delta mouth where there is not enough water flow to move sediment into the Gulf of Mexico, causing sediment to build a dam and flood the Mexico side of the gulf.

# WIPP visit

(Continued from page 1)

a miner's hard hat equipped with a light so we can see (and be seen) in the semi-dark. Following the safety briefing, we are cleared to go to the waste handling building where waste is received, inspected, and moved to a shaft for transfer underground. We learn that as many as 20 trucks carrying waste arrive each week — more than 2,500 waste shipments have been received in the last five years. WIPP has already received 19,000 cubic meters of waste. The waste comes from DOE facilities around the country, with 10,000 cubic meters alone from Rocky Flats in Colorado.

Outside the waste handling building are stored empty stainless steel TRUPACT containers, 8 feet in diameter and 10 feet high, that arrive on flatbed trucks. Each TRUPACT holds up to 14 of the 55-gallon drums carrying waste.

As we enter the building Frank tells us that the waste in the drums is called "transuranic" waste resulting from the production of nuclear weapons. The displayed waste looks like ordinary items found at any industrial site:

tools, gloves, and protective suits. Transuranic refers to the "heaviness" of the element. Elements with an atomic number greater than that of uranium (92) are considered transuranic. "Trans" means "beyond," so transuranic can be thought of as "beyond uranium."

The waste forms vary: The display drums exhibit conventional lab debris, such as tools and gloves, bagged in plastic. Other waste packages look substantially different.

The waste handling building is bustling with activity. Waste handlers are preparing the 55-gallon drums for their journey underground. A rope keeps us far away from the containers for safety reasons, but we watch as the workers unload the drums of waste from the TRUPACT-II transuranic waste transport containers. The waste is transported in a seven-pack arrangement, in which seven barrels are bound together with sturdy plastic wrap and transported to the underground the same way.

I wanted to know how they get underground, and Frank says a huge elevator takes them down. It's the same elevator that transports large equipment, like trucks and excavation machinery. The larger equipment is transported in pieces and reassembled underground.

Seeing this major facility topside and knowing what lies beneath, I marveled at what it took to make WIPP a reality.

"WIPP was a long time coming," Frank says. "Planning started in the early 1970s after the Atomic Energy Commission's proposition for a 'Salt Vault' near Lyons, Kan., was unsuccessful. The Carlsbad city fathers proposed the option to place the nuclear waste repository near Carlsbad, and initially the proposal was to use potash mines. Sandia was engaged early on as the science advisor."



TRANSURANIC WASTE in seven packs and standard waste boxes are stacked three high and topped with a super sack of magnesium oxide.



TOUR GUIDE FRANK HANSEN (6820), who began working on WIPP repository sciences in 1975, shows a large crystal of halite to Rebecca Jaramillo-Contreras (6800).

As the scientific advisor for the WIPP, Sandia conducted the performance assessment for the initial compliance certification application and just recently completed another performance assessment for the re-certification application, which is required by regulation every five years or at the demand of the Environmental Protection Agency.

Next we get ready to make the trip 2,150 feet down inside the earth.

We go to a cloaking room where we are given the miner's hardhat with a light and a belt containing a battery for the light and a "self rescuer" that converts carbon monoxide to carbon dioxide in the event of a fire.

We're also each handed a brass coin with a number on it to place in our pockets. We learn that this is an accountability technique. In case of a mine fire, a person could be identified by the brass coin carried in his pocket.

We walk to an elevator shaft just south of great mounds of salt piled several hundred feet away. The salt has been dug up from more than 2,000 feet below, making way for rooms to store the waste that's coming.

Six of us pile into a yellow metal-meshed elevator, which was the first shaft completed in 1982. We're "cozy," and I have to hold my camera and purse close to my body. Then we start the descent.

The elevator makes a kind of whinnying noise as it proceeds downward. At about 1,000 feet the sound changes, becoming dampened as the elevator goes from a lined shaft to the unlined salt section. Our ears pop for the first time.

As we exit the elevator in a large hallway that serves as a road, the first thing we see is a sign that says, "Welcome to the WIPP underground. You have just entered an environment committed to safety." It reminds all of us — as did the brass coin we received above — that this could be a dangerous place if proper ES&H procedures aren't followed.

It's eerie to think this underground roadway, slightly smaller in width than streets above ground, was once all salt — even though we know the walls are salt, the ceiling is salt, and the floor is salt. It's even more eerie to realize that in a few decades it will be all salt again. The salt is constantly creeping inward in all areas of the repository.

But of course we know that the fact the salt closes in is a primary reason the WIPP site was chosen for the waste repository. In a relatively short period of time the waste will be totally encapsulated by the salt.

We notice that at this entry point the walls are covered by a mesh netting, much like we see in roads going through mountains in New Mexico. And for the same reason — to keep chunks of salt (in the mountains, rocks) from falling on workers.

We see by dim orange-like lighting, scattered industrial lights hanging from the ceiling. We can see but are grateful for the additional lights on our hardhats.

At the shaft entrance underground we feel fresh air blowing in. As we continue our trip in the underground tunnels, the air follows us. Frank says the entire underground facility is well ventilated. "The ventilation system," he notes "is designed with a 'negative pressure' gradient such that all air flow has a preferential path toward the disposal area and then out the exhaust shaft."

We all hop on a small open cart and drive through the salt tunnels. Every time we turn a cor-

ner our driver, Ron Parsons (6820), who serves as facility manager and facility security officer at Sandia/Carlsbad, honks the horn to let people in other vehicles who may be approaching the same point from the other direction know that we are there. Ron pulls a cord and we go through a rubber-flapped steel door. We enter a small area, and Ron pulls another cord, opening another door. These air locks are part of the sophisticated ventilation system that ensures that any radionuclide contaminant would pass "downstream" through a high efficiency filter system.

Off we go down another corridor. We stop outside a panel, which we learn comprises seven rooms where waste barrels are stored. We can't get too close, but we can see the 55-gallon barrels. The room is the length of a football field, 33 feet wide and 13 feet high. One panel is already filled with waste. The second, where we are, is half filled. A third panel is currently being excavated. Eventually eight such panels will be excavated and filled with waste, then the entry drifts equivalent to two more panels will be filled, and then WIPP will be sealed and the waste left safely underground.

Each panel holds up to approximately 1,500 seven packs of 55-gallon drums arranged in a hexagonal configuration. Placed on top of the drums are huge white bags of magnesium oxide that keep the pH levels high, if brine should ever infiltrate the repository. The magnesium oxide was selected because of a regulatory requirement to provide an engineered barrier in addition to the natural barrier (salt).

We drive through another tunnel and Ron stops the truck. We all jump out. At this site we dislodge some large single crystals of halite, which look like giant diamonds. We each put our salt in plastic bags given to us above to carry home as souvenirs. I couldn't help it and had to lick one of my fingers. Sure enough, I tasted salt.

We get back in the truck and move on, stopping in front of another room. This, Frank says, is the panel that is completely filled and closed off. The entrance is blocked by a substantial wall of concrete block.

We return to the elevator shaft where we started and see (and hear) huge dump trucks rumbling through, carrying tons of salt recently mined from a panel.

We go back up to the surface, but the adventure isn't quite over. After we turn in our brass coins, hard hats, and belts, we see several flatbed trucks



SAFETY FIRST — Tour participants stand next to a sign that shows WIPP's commitment to safety. It reminds everyone the repository could be a dangerous place if proper ES&H procedures aren't followed.

carrying TRUPACT containers lined up and ready to drop off their shipments at the waste handling building. All the trucks have to be checked out by security guards before they can enter the area. I fall behind the group, because I'm taking pictures. Suddenly everyone started shouting for me to come. I hurried over and saw what they saw. One of the trucks was carrying a demonstration TRUPACT that allowed us to view the multiple elements of the shipping container through a window. And indeed, I saw tools, gloves, and protective suits.

The waste being disposed at WIPP is only a small amount of the radioactive waste existing in this country.

The tour is over, and we return to Carlsbad, following the four-lane highway the waste-laden trucks travel to WIPP. I wonder what will this land be like in 10,000 years. Will anyone know that WIPP exists?



# Sandia continues to help electrify homes on Navajo Reservation

By Chris Burroughs

An initiative to electrify households on the Navajo Reservation continues with the help of Sandian Sandra Begay-Campbell (6214).

Last year DOE, through a congressional act signed into law in 2001, awarded the Navajo Tribal Utility Authority (NTUA) \$1.2 million to purchase 63 photovoltaic/wind hybrid power systems for Navajo families living in remote areas of the Navajo Reservation where it is not feasible to build power line extensions.

Sandra, a member of the Navajo Nation, has been serving as a technical advisor to the NTUA as the utility company installs the units and shows people how to use and maintain them.

This is part of a continuing effort that began in 1993 when the NTUA purchased several 220-watt photovoltaic units using a grant from the Western Area Power Authority, a part of DOE. That was followed in 1999 with installation of 200 640-watt photovoltaic units and 44 880-watt photovoltaic/wind hybrid units in 2002. Solar power is now a part of NTUA's portfolio of service to the Navajo Nation.

Sandra, together with several others from Sandia and New Mexico State University's Southwest Technology Development Institute (SWTDI), partnered with NTUA's solar program to develop a set of specifications for NTUA's procurement of photovoltaic hybrid systems. Contracts were awarded to two companies that built the systems (in 2002 and 2003) — both using equipment supplied by SunWize. She also works with the NTUA coordinator, Larry Ahasteen, answering questions and finding resources.

Sandra and partners at SWTDI trained most of the NTUA's solar program staff, including elec-

tricians, engineers, and customer service technicians. Other assistance included monitoring performance/operations of photovoltaic systems in the field and conducting performance tests on a test NTUA 640-watt system at Sandia. The Labs recently supported NTUA's solar program team and the hybrid system contractors to train the electricians and customer service representatives on the new hybrid systems. Currently, the newest 880-watt hybrid systems are being tested

to optimize the systems' performance.

Navajo customers pay for the maintenance and service of the photovoltaic systems from NTUA and are charged through their utility bill.

Sandra feels she is providing a major service to her people and other Native American people.

"Of the 500,000 people who are part of the Navajo Nation, it is estimated that about 18,000 households are not electrified," Sandra says. "Most live in dispersed, rural, and rugged areas in traditional hogans or mobile homes that are far away from the electric grid."

Cost of extending the grid to these locations is about \$25,000 a mile — too much to be feasible.

Sandra says her involvement is well received. She draws from her cultural heritage to explain options to the Navajos — some her relatives who live

in the arid desert tribal lands near Gallup — and other Native Americans and to serve as a cultural interpreter to Sandia. The goal is not to push a particular technology on the Navajo Nation, but rather to listen to needs and offer choices.

"It can be difficult for a technical person to understand that despite the presence of all the physical conditions that allow a particular tech-



SANDRA BEGAY-CAMPBELL, left, and two Navajo electrical technicians, Vircyntia Charley, center, and Melissa Parrish, check the batteries on a Navajo Tribal Utility Authority photovoltaic system in the Kayenta District, Arizona.

## Photovoltaics

Photovoltaics technology harvests the energy from the sun and converts it into electricity. The electricity is stored in batteries for future use in the home. Also part of the 880-watt systems is a small wind turbine. The photovoltaics gather electricity during the day, and the turbines generally operate at night when winds are higher.

## Timeline

In December 2000, Sandia, the Navajo Nation, and DOE signed a Memorandum of Understanding (MOU) authorizing collaboration and technology transfer for the Navajo Nation. This new working relationship focused on the environment, education, economic development, and communication. Providing power or energy became the backbone to the MOU.

On Nov. 5, 2001, President Bush signed the Navajo Nation Electrification Demonstration Act. This law directed the secretary of energy to establish a five-year program to assist the Navajo Nation to meet the electrical needs for the estimated 18,000 homes on the Navajo Nation that lack electric power.

nology to succeed, it still may not be acceptable because the community doesn't want it," she says. "Photovoltaics is a good option because it is a clean, quiet source of renewable energy that is in harmony with Native American philosophy."

Many of the people who are receiving the hybrid systems have never had electricity before. They relied on kerosene lamps and propane refrigerators. Some used dirty, noisy generators. The photovoltaic systems represent a change in lifestyle.

The units provide only a limited amount of power, and people have to learn how to manage their energy use. The 880-watt systems allow families to use small amounts of electricity at a time. Because of the small amount of wattage, the families can't connect systems to "energy hogs" like refrigerators or electric stoves. But they provide enough power for lights, computers, and small appliances.

"We've learned that the elderly find using these low-watt systems easy because they are naturally conservative," Sandra says. "Couples who work during the day and use electricity in the morning and evening also do well with the photovoltaic systems. People who have lived in urban areas with the grid find it hard to adjust."

# Shining Eagle award winners Chuck Jenkins, Robert Frazer give their time to help our community

Community Involvement (12650) recently announced the 2003 winners of the Shining Eagle and the first-ever Community Service Awards.

The Shining Eagle awards are presented to the Sandian and retiree who share the biggest amount of the time with our community. This year's winners are Sandian Chuck Jenkins (4152) and retiree Robert Frazer.

Chuck volunteered more than 1,000 hours, serving as a scout master of Troop 21, Rio Grande District. Robert volunteered more than 800 hours at Governor Bent Elementary School. In recognition of Sandia's Shining Eagle winners, Lockheed Martin Corp. awarded \$500 to the agencies of their choice. Chuck's choice was the Boy Scouts; Robert's was Wildlife Rescue.

The new Community Service Awards are awarded to an individual agency where Sandians

have volunteered 500-plus hours. This year's Community Service Awards were presented to Boy Scouts, Big Brothers and Big Sisters, and Harmony Project for the volunteer efforts of Gerry Quinlan (9224), Stephen Meserole (1822), Harold Anderson Jr. (14408), and David Werling (2341).

Community Involvement has a new Web-based database where volunteers can track their own hours. The database can be accessed at <https://cfwebprod.sandia.gov/cfdocs/Volunteer-Hours/templates/index.cfm> or by going to Sandia's home page, under About Me at Sandia, select Volunteers, then Volunteers' hours. It is updated by the HR database when volunteers change organizations.

The information is also used for corporate metrics and to view individual interest when fill-

ing corporate tables. "We don't just fill them with warm bodies, but with Sandians genuinely interested in the nonprofit involved," says Volunteer Program Manager Darlene Leonard (12660).

"The amount of time and money Sandians give to the community is really outstanding," says Darlene. "Over 400 volunteers worked on the Habitat for Humanity House, over 200 for Make a Difference Day, 60 for School to World, in addition to tutors, mentors, science fair judges, and CroSSLINKS. It is a joy to know that we work for a company made up of employees dedicated to their jobs and to their community."

For more information on Sandia's volunteer programs and current opportunities, call Darlene at 844-8024.

— Iris Aboytes

# Mileposts

New Mexico photos by Michelle Fleming  
California photos by Bud Pelletier



Gregory Soo  
30 8772



Jack Hudson  
30 9312



Steve Buck  
25 8221



Joan Funkhouser  
25 8224



Gordon Gibbs  
25 8225



John Smith  
25 8116



Rebecca Villane  
25 15344



Douglas Adams  
20 4138



Robert Dankiewicz  
20 8945



Elouise Dickenman  
20 10751



John Garcia  
20 8754



Nathan Golden  
20 1304



Judith Beckmann Hansen  
20 4224



Mark Jaska  
20 8353



Robert Kipp  
20 2565



Dennis Roach  
20 6252



Edward Walsh  
20 8964



Deanna Sevier  
20 5926



Ron Simon  
20 15272



Fernando Bitsie  
15 9124



Dave Brekke  
15 8517



Stephen Lott  
15 9905



Kari Neely  
15 8512



Ronald Schiller  
15 9524



This monthly column features Sandia news from 50, 40, 30, 20, and 10 years ago, but each column does not necessarily include items from each decade.

**40 years ago . . .** "You're breathing what we believe is the cleanest air in the world," Sandia's Willis Whitfield told a visiting group of physicians as they toured the lab's latest experimental clean room. Willis (now retired) invented the clean room in 1960, helping spark today's multibillion-dollar microelectronics industry. Clean rooms are used in other important applications including hospital surgery and pharmaceutical manufacturing. . . . A "fringe benefits" quiz in the June 5, 1964, *Lab News* revealed that 188 Sandians had health care claims in excess of \$500 the previous year, sick-leave pay for the average employee cost Sandia about \$115/year, and that an employee enrolled in the retirement plan for 35 years who

received an annual salary of \$6,000 and retired at age 65 would receive a whopping \$262/month for the rest of his life.

**30 years ago . . .** Several different missile-detection system tests were conducted for the Army using Sandia's aerial cable facility in Coyote Canyon. The tests involved actual firings of Redeye missiles. Besides recorded performance data, a laser tracker provided information on missile trajectory relative to the target for all tests, and cameras on board the target carriage provided visual records.

**20 years ago . . .** Pace VanDevender, then Manager of the Fusion Research Department (now VP 1000), announced a "significant advance" in Sandia's particle beam fusion research, the focusing of an intense beam of ions to the smallest spot size ever achieved — roughly the size of a pinhead. The article said the advance "greatly increases confidence that ion beams will be able to ignite a fusion pellet as scheduled for experiments beginning in 1988" on the Particle Beam Fusion Accelerator II machine, predecessor to today's Z machine. (For a 2003 report on where this research led, see <http://www.sandia.gov/news-center/news-releases/2003/nuclear-power/Zneutrons.html>.)

**10 years ago . . .** A *Lab News* article about

## Recent Retirees



Ellis Heustess  
41 5934



Mike Butler  
30 1744

Sandia's benefits programs said a recent recommendation by DOE's Office of Inspector General (OIG) would not be followed. The OIG had recommended sending several hundred million dollars in what it called "excess assets" in Sandia's pension funds to the federal government to help offset the budget deficit. The IG recommendation drew immediate strong opposition from many Sandians and from all five members of New Mexico's congressional delegation.

# CINT

(Continued from page 1)

where] are catching up.” He said they saw an institution in Taiwan that graduates 800 nanotech engineers yearly, and that 4.5 percent of Japan’s total science and technology budget was focused on nanotechnology. “Other countries are not only listening, they’re doing,” he said.

Tom Mayer, associate director for strategic research at LANL, imagined the future CINT center as “an international success, a place where all the nanotechnologists of the world feel compelled to come because of the quality, depth, and breadth” of the science and technology at the two labs.

Rep. Heather Wilson, R-N.M., anticipated “trillions of dollars” in impact to the economy.

Many found the most captivating talk to be that by Sen. Pete Domenici, R-N.M., who received a standing ovation for his support for science and technology at the two labs. Domenici described himself as “a technology optimist,” a phrase he said he had borrowed from Nobel laureate Rick Smalley, who was present in the audience.

As he understood it, Domenici said, “A technology optimist is one who believes that the problems of mankind are problems that mankind, because we don’t do it right, has either directly or by inaction chosen not to



REP. HEATHER WILSON, R-N.M., also spoke at the Center for Integrated Nanotechnologies (CINT) groundbreaking. She said she expects it to have “trillions of dollars” in impact to the economy.

(Photo by Randy Montoya)

solve. Every human problem that is big, is solvable, and if we didn’t, we ought to, and if we claim we can’t, we’re fools.”

The senator, who apparently felt no need of talking points, expressed his observations on a wide range of topics in so direct a way that there was hardly a rustle in the audience, though he spoke at some length. He criticized the amount of federal funds diverted from the physical sciences to the National Institutes of Health, said he was publishing a book on nuclear power that was his vision for the future, and mentioned with satisfaction the recent statements by leading environmentalist James Lovelock that nuclear energy was the only way to bring power to all of humanity without destroying the Earth.

He commented favorably on government’s part in creating SEMATECH, which had brought about America’s supremacy in microchips and “filled up America’s economic basket beyond anything we could imagine.” He saw this as a valid model for the current DOE support for nanotechnology. He chastised both labs for taking too long to bring scientific breakthroughs to the marketplace and ridiculed opponents of globalization by comparing current problems for up-and-down economies with the inefficiencies and “inept prioritizations” of socialist countries.

He also simultaneously praised DOE and expressed blunt dissatisfaction with criticism of it: “They bring, all in all, with everything, about \$6 billion into the state. It’s fine to seek new economic development, but you don’t kick what you’ve got in the butt when you’re looking for new sources. I’m amazed at the negativism that comes forth, or the . . . belief that our labs will not work to preserve our environment.” He praised the WIPP project — “America put more money in an underground facility for transuranic waste than any country in the world would have done by fivefold!” — and threatened to lead a public event to praise DOE.

Said CINT director Terry Michalske of the wide-ranging speech, “It was the highlight of



NUMEROUS DIGNITARIES were on hand for the May 25 groundbreaking of CINT. Here they wear hardhats as they turn dirt for the new building.

(Photo by Randy Montoya)

the whole affair. We [others] did everything okay, it was all smooth and nice, but the senator’s speech was different. You don’t often get to hear from someone who’s so knowledgeable about the state of our nation and is so candid in his remarks, sharing openly and honestly his views about our nation. Politicians aren’t noted for that. Usually you hear what they say and you interpret what they’re trying to manipulate. That certainly wasn’t the case here.”

In 1999, Terry, then under the tutelage of Sandia VP Al Romig, first proposed the idea of CINT in a white paper to DOE. He resisted suggestions from Washington reviewers to remove LANL from the proposal, favoring instead the joint approach ultimately adopted. Sandia’s portion of CINT is now under the overall direction of VP Pace VanDevender (1000).

The Center’s core facility, funded by DOE’s Office of Science, will be headquartered on DOE land just north of the Kirtland AFB Eubank gate in a 96,000-square-foot building. From that central point, researchers from around the world who have presented proposals of interest will be sent to gateway facilities at either lab — a new 33,000-square-foot building at LANL, or the first floor of Bldg. 897 at Sandia. The \$76 million CINT project, taken together with the nearly half-billion dollar MESA complex and nearby computational access, will be the largest investment in the world in micro/nano technologies. Thirty-five nanotechnology research projects from 24 universities in 16 states and Great Britain are already under way.

## Physical Fitness Day features variety of activities



BALANCE OF ATTRACTION — Sandians check their balance during Sandia’s annual Physical Fitness Day. The real test is doing it with eyes closed. The balance assessment was one of the activities along with core training, golf fitness, a set of strengthening and sculpting exercises, and walking.

## Feedback

**Q:** Just wondering why the speed limit changes in different places on the same road, depending what direction you are heading. If you are going to Area 3, the speed limit on Pennsylvania doesn’t change to 50 mph until just before the road goes down across the bridge. Then if you are traveling away from Area 3 north on Pennsylvania, the 50 mph doesn’t change until after it passes Wyoming; then it goes down to 40 mph. Why isn’t it the same each way on this stretch? Also, curious since base police are very frequently sitting there with speed guns monitoring us remote area workers making our commute to our far-away work areas.

**A:** I can see how different speed limits in the same area would seem confusing at times, but it is not unusual. There are several instances of a similar nature within the city, for example, Second Street between Griegos and Montano. Speed limits are determined by a variety of factors such as vertical curves, sight-distance, traffic flow, side-street entrances, traffic volume and accident rates. Each direction is treated independently. The posted speed limits, though different, are appropriate for the current roadway conditions.

— Ed Williams (10864)