

# Sandia-led research may zap old beliefs about lightning protection at critical facilities

Triggered lightning tests leading to safer storage bunkers

By John German

Lab News staff

Sandia research into nature's most striking phenomenon is jolting some long-standing beliefs about how to protect concrete structures from damage caused by lightning. The findings may prompt updated construction standards for certain critical facilities, such as oil refineries, chemical plants, and financial institutions.

Lightning strikes the earth's surface an average of 6,000 times a minute. In the US, it does an estimated \$138 million in damage each year, according to the National Fire Protection Association (NFPA). A direct strike to a building can start fires; damage electrical, communications, and computer systems; and in rare instances injure or kill a building's occupants.

You can't stop lightning from striking a building, but many facilities employ lightning protection systems meant to conduct the electrical discharge from a strike through the building to the ground along specific conductive pathways, minimizing damage to the building's structural and electrical systems.

## Better bunkers the goal

Typical lightning protection systems utilize such equipment as grounded lightning rods meant to draw the strike to a preferred spot and away from vulnerable parts of a building's structure, a "downconductor" line meant to convey current through the building to the ground without electrifying the building's infrastructure, and "earthing" systems meant to disperse and dilute the current at ground level.

In 1991, Sandia began a series of triggered



A LIGHTNING BOLT strikes Albuquerque during a summer thunderstorm in 1992. Walt Dickenman of Creative Arts Dept. 12620 photographed the storm from the West Mesa.

lightning tests on buried DoD nuclear weapons bunkers as part of a DOE program to improve the safety of the nation's stored nuclear weapon stockpile (*Lab News*, July 24, 1992).

Although safety systems in modern nuclear weapons employ a series of electrical and mechanical switches that would prevent a stray electrical discharge from detonating a weapon or its high

explosives, researchers wanted hard data about the electromagnetic field that might pass through a concrete structure struck by lightning, as well as about how electric current travels through a structure's structural elements. Such data, it was hoped, would lead to improvements in the way such facilities are constructed in the future.

(Continued on page 4)

## DOE Secretary Peña lauds Labs work at end of marathon New Mexico visit

By Howard Kercheval

Lab News staff

Energy Secretary Federico Peña summarized his Monday tour of Sandia as a glimpse of "extraordinary" work, telling reporters at a wrap-up news conference the DOE labs "really are the crown jewels of the [DOE] system [and we] must continue to ensure that their world-class leadership continues."

The visit to New Mexico was his first official trip outside Washington since becoming DOE secretary.

Peña recalled that as transportation secretary during President Clinton's first administration, he had visited the Labs for a look at its transportation-related work. And as new DOE secretary, he said,

"It was my intent to come to New Mexico first because of the very constructive and important relationship the Department of Energy has had with the state and with our labs and with WIPP for

(Continued on page 5)

*Peña's trip to New Mexico was his first official trip outside Washington since becoming DOE secretary.*

# Sandia Lab News

Vol. 49, No. 8

April 25, 1997



## Comet crash: Teraflops computer simulates colossal comet impact

Sandia exercise a tuneup for world's fastest computer

By Ken Frazier

Lab News editor

Even before it's at full strength, the new teraflops (trillion operations per second) supercomputer at Sandia is making a big splash worldwide.

During the initial testing of the new computer, Gil Weigand, DOE Deputy Assistant Secretary for Strategic Computing and Simulation, requested that Sandia complete a simulation that would be of general interest to the scientific community. For this reason, and also to generate unclassified data to test innovative visualization techniques, Sandia scientist David Crawford (9232) has carried out a computational simulation of a major cosmic event of potential significance to all people on Earth: What would happen if a kilometer-wide comet struck the ocean? A kilometer is about the size of the largest frag-

ment of Comet Shoemaker-Levy 9 that crashed into Jupiter in 1994 — an event that was also the subject of highly praised computational simulations by Dave and colleague Mark Boslough (also 9232). The close correspondence between those predictions of a visible plume rising above the rim of Jupiter and the actual plume as observed by astronomers lent even more confidence to the accuracy of the Sandia simulation codes.

The new calculation again used Sandia's famous CTH "bang and splat" shock physics code, but this time the simulation was run on 1,500 processors of the new Intel Teraflops computer being installed in Bldg. 880. That's only one-sixth of the expected final 9,000-processor configuration.

The calculation assumed a 1-kilometer-diameter comet (weighing about a billion tons) traveling 60 kilometers per second and impacting

(Continued on page 6)

Computer algorithm identifies unique molecular fingerprints

3

Protonic memory device helps eliminate computer 'amnesia'

6



9

Labs' photovoltaic project with National Park Service lauded

12

UN Ambassador Richardson praises Labs during arms control confab

# This & That

Peña early visit encouraging - It was great to see Secretary of Energy Federico Peña's interest in the work of Sandia and other New Mexico DOE facilities so early in his term. Spending four full days in the state after being in his DOE post just more than one month indicates that he may have an extraordinary level of interest in activities here. Secretary Peña wrapped up his New Mexico visit Monday by touring several Sandia facilities and participating in technical briefings. See Howard Kercheval's story beginning on page 1 and related photos on page 5.

\* \* \*

Family service special mentions - We established records for families at both Sandia/New Mexico and Sandia/California in the last two issues. Now we wrap it up with some "special mentions."

The three Church brothers have a combined 121 years of service, averaging a little more than 40 years each. Hugh (6612) recently completed 40, Ted retired with 43, and Allen retired with 38 (but still works here as a contractor in Dept. 9333).

The "longest-running sister and brother act" is retiree Marcie Samuelson (47 years) and Tex Samuelson (40 years, who retired just this month); they average more than 43 years each. Two more brothers, John (dec.) and Sam, also worked here along with Sam's wife Debby.

Perhaps there are more, but I discovered three other families who've had four brothers or brother/sister combinations who worked full-time at the Labs. I won't list their individual or collective years of service, but all three families have substantially more than 100 years of Sandia service.

•Four Fjelseth brothers worked here: Paul (ret.), Jim (dec.), Don (ret.), and Lewis (ret.).

•Brothers and sisters Alfredo (Fred) Peña, Ralph Peña, Frieda Salazar, and Rose Gallegos worked here. The first three retired from the Labs; Rose worked here for a short time in the early '50s. Father Rafael Peña also worked here in the late '40s and '50s before retiring.

•Four Cordova brothers, all now retired, worked at Sandia: Sesario, Ernest, Leo, and Adelico (Al). [Thanks Theresa Garley (4414) for sending me a photo of the Cordova brothers that ran in a 1980 *Lab News* when they collectively reached 100 years of service.]

There's one more thing I want to know - whether we have any fourth-generation Sandians. I discovered during this friendly family competition that we have several third-generation employees, but so far no fourth-generation ones.

\* \* \*

Sipping and surfing don't mix - Since assuming the Sandia External Webmaster job, I've become convinced from some strange incoming inquiries that some people may be having one too many glasses of wine while Web surfing at home. As Dave Barry says, "I AM NOT MAKING THIS UP." One fellow wanted to know what became of the deformed frogs in certain Minnesota lakes. I'm still not sure why he sent that inquiry to me. Maybe he thinks they all hopped - or hobbled - to New Mexico!

- Larry Perrine (845-8511, MS 0129, [lgperri@sandia.gov](mailto:lgperri@sandia.gov))

## DOE's Vic Reis says labs' strategic mission is clear

Nine words describe the mission of the US nuclear weapons complex for the foreseeable future: "Maintain a safe and reliable stockpile indefinitely without testing."

"I think our vision is that clear," said Vic Reis, DOE Assistant Secretary for Defense Programs, before a capacity crowd at the Technology Transfer Center April 17. The presentation, video-linked to Sandia/California, was hosted by Roger Hagengruber, VP for National Security Programs Div. 5000.

The good news, said Reis, is that DOE and national laboratory leaders appear to have "turned an intellectual corner" in their ability to convince experienced members of Congress and other key leaders in Washington that science-based stockpile stewardship will work.

Three-and-a-half years ago, he said, people were asking if it could be done. "Now it's not 'can you do it at all' but 'do you have the funds to do it,' 'tell me more about the program,' 'what goes first,' 'what goes second,' and so on," he said.

### Stockpile Life Extension Program

The blueprint provided by the Stockpile Life Extension Program (SLEP) has helped turn that corner, he says. In short, he said, SLEP proposes to eventually replace (or at least consider replacing) every part of every weapon in the stockpile in an effort to keep existing weapons reliable longer.

Over time, fulfilling SLEP's goals will become more difficult because of the declining number of experienced weapons designers at the national laboratories. To succeed, said Reis, the weapons complex needs to rapidly define the roles each site and each organization is going to play in fulfilling its vision and translate that alignment into programs and budgets.

"We know what the tasks are, we are beginning to understand what our roles are," he said. "What we have to do very quickly is become coherent. . . . Our vision is one of time urgency - considerable time urgency."

Sandia's part in this, he said, lies in its systems integration strengths. "This is the place where a lot of this stuff all comes together," he said. "You have the excellence in components, but really what this place is about, I think, is putting it all together into an extraordinarily complex system."

That involves integration of many competencies, he said. It's Sandia's integration expertise that will allow the Labs to be a "major player" in defining coherently new stockpile maintenance processes complex-wide, he said.

### Secretary Peña's interest

Reis also discussed new Secretary of Energy Federico Peña, who has demonstrated he is interested in learning about the laboratories "real fast," said Reis. That's why he's visiting Sandia now rather than later, he said. (See related story beginning on page 1.)

Prior to his confirmation hearings recently, Reis said, Peña compared maintaining the nuclear weapons stockpile without testing to cleaning and oiling the parts of a rifle, putting the rifle back together, and then never firing it to see if it works - "except with 5,000 or 6,000 parts it's a lot more complicated than a [rifle]," Reis added.

During questions-and-answers, Reis was asked how the US could continue to convince the rest of the world it possesses a credible nuclear deterrent in the absence of nuclear testing. "The first person we have to convince is the President of the United States [and US military leaders]. . . . If they're convinced, I think the rest of the world will be convinced."

Who will convince the President? Ultimately, the DOE lab directors, said Reis, who will be passing along evidence developed by laboratory employees. "Every person in this room is basically involved," he said. "You've got to feel those weapons will work. If you don't, then your vice presidents won't and the lab directors won't."

"You're getting a lot of trust," he added. "Ultimately, we're depending on your technical competence and the scientific integrity of this laboratory."  
-John German

## Employee death

George Allshouse of Target and Analysis Dept. 9571 died April 12 in an automobile accident. He was 58 years old.

George was a Distinguished Member of Technical Staff and had been at Sandia since 1979.

Survivors include his wife, Beatrice, and son, George C. Allshouse.

## Sandia LabNews

### Sandia National Laboratories

An Equal Opportunity Employer

<http://www.sandia.gov>

Albuquerque, New Mexico 87185-0165

Livermore, California 94550-0969

Tonopah, Nevada • Nevada Test Site • Amarillo, Texas

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corp., a wholly owned subsidiary of the Lockheed Martin Corp. and a prime contractor to the US Dept. of Energy.

Ken Frazier, Editor .....505/844-6210

Barry Schrader, California site contact .....510/294-2447

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

Published Fortnightly on Fridays by  
Employee Communications Dept. 12640, MS 0165

LOCKHEED MARTIN

## First High Consequence Engineering conference set for May 14-15

"Assuring the Performance of Buildings and Infrastructure" is the first in a new series of "High Consequence Engineering" conferences sponsored by Sandia.

The inaugural architectural surety conference, scheduled for May 14-15 at the Hyatt Regency Hotel in Albuquerque, focuses on technical issues and capabilities as they relate to the performance of buildings and infrastructures to meet the needs of national surety objectives. Experts from national, international, private, industrial, and academic organizations will offer case studies and lessons learned in areas such as threats, risk management/assessment, engineering/construction, surety principles, governmental issues, and analysis techniques.

The conference will feature a number of breakout sessions focusing on such issues as reliability, probabilistics, cost trade-offs, litigation, insurance, failures, codes, materials/testing, methods, mitigation systems, systems integration, and virtual reality. Applied technologies that meet surety needs will be showcased.

For registration information, call Ruth Duggan at 844-4701. Other conferences in the High Consequence Engineering series include "High Consequence Operations Safety," "High Integrity Software," "Material-based Life Prediction," and others. The six-conference series runs through November.

# Unique molecular fingerprints predicted through theoretical chemistry

Calculations could help capture a carcinogen 'red-handed'

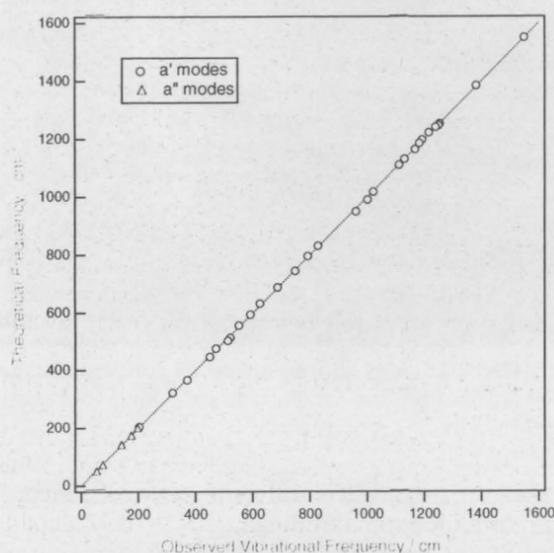
By Nancy Garcia

California reporter

Trying to fingerprint a potential cancer culprit so it can be rapidly detected if it escapes smokestacks, quantum chemist Celeste Rohlfling (8353) of Sandia's Combustion Research Facility has conquered a large computational challenge.

She forecast, with the help of Cray supercomputers at DOE's National Energy Research Scientific Computing Center, how the flat rings and rods of benzo[a]pyrene would vibrate and flutter when excited by light. The release of this particular compound is regulated as a carcinogenic substance.

Vibrational Frequencies of the  $S_1$  state of Benzo[a]pyrene



CONFIRMATION of theoretically predicted vibrational frequencies for the first excited electronic state of benzo[a]pyrene.

Celeste needed to distinguish it from related forms, or isomers, that contain the same 20 carbons and 12 hydrogens in varied arrangements. The unique motions that the benzo[a]pyrene configuration makes when excited by light served as a fingerprint that can be identified through spectroscopy.

"This is the first time anyone has calculated the geometry and vibrational frequencies for an excited electronic state of a molecule this large

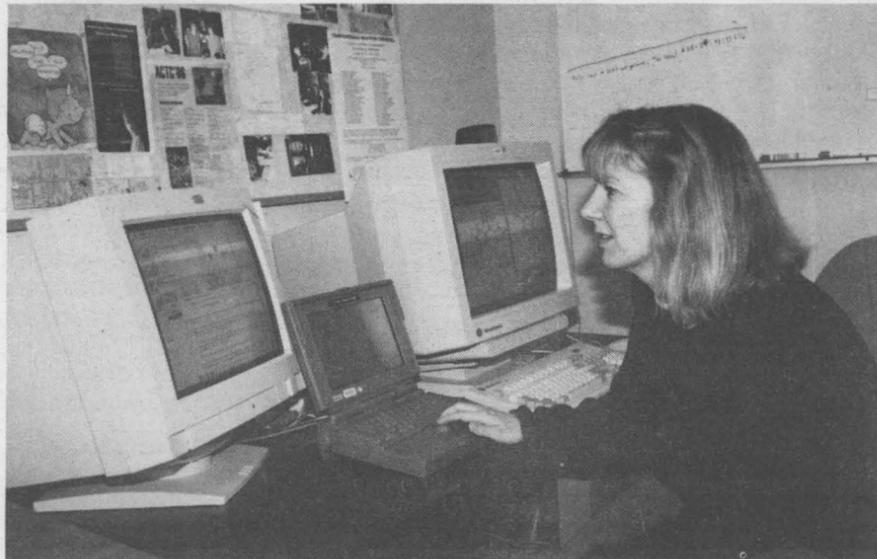
from first principles," she says.

Her predictions could contribute to development of continuous emissions monitors for refinery smokestacks, where regulated compounds are by-products of burning refinery fuels for process heat. Currently, emissions samples are periodically collected and analyzed at off-site laboratories. However, continuous monitoring would permit plant operators to detect any spikes in emissions to try to control them in real time.

In the laboratory, light can be used to single out benzo[a]pyrene from other isomers. First, light is shined on the compounds to excite them. Then, a discrete dose of additional light selectively ionizes the excited benzo[a]pyrene.

Celeste's experimental collaborators, Eric Rohlfling (8353) and postdoctoral employee Chris Gittins, saw several sharp peaks when they looked at the molecule's spectroscopic profile. They could not determine uniquely what motions led to different intensity peaks, however.

So Celeste tried to identify those motions through mathematical predictions without any



QUANTUM LEAP — Celeste Rohlfling (8353) has calculated the geometry and vibrational frequencies of the excited state of the largest molecule yet —benzo[a]pyrene, a cancer-causing substance (depicted on her computer screen) whose emission from smokestacks is regulated. Her work will help to monitor and minimize its release.

*"This is the first time anyone has calculated the geometry and vibrational frequencies for an excited electronic state of a molecule this large from first principles."*

## Sandia California News

experimental input. She first ruled out any unexpected behavior in the ground electronic state and found excellent agreement with the 10 vibrational modes that had been observed in the ground state. Then she calculated all 90 vibrational modes for the excited state.

When the molecule was excited through laser-induced fluorescence, 32 vibrational modes were observed in experimental spectra. Celeste assigned those modes to different bond stretches, bends, and torsions, once again with excellent agreement between her predictions and experimental observation. The agreement was within 0.03 kilocalories, a very small amount of energy.

Celeste says the calculations should help in the development of applications such as real-time monitoring of combustion products on a rooftop. "We can now understand the detailed spectroscopy of excited states of large molecules," she says. "In a way, it opens up a new door to develop diagnostic applications."

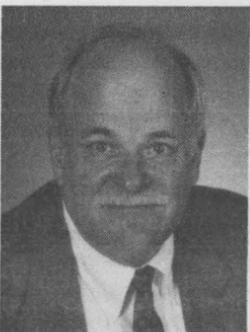
## Recent Retirees



George Hirota 37  
8515



Dwayne Mohrman 37  
8804



Robbie Robinson 32  
8301



Arnold Andrade 38  
8230

## Semiconductor radiation sensor experts assemble at Sandia workshop

One of the primary forums to discuss development of field-portable radiation detector technology took place last month at Sandia/California. More than 120 researchers attended from government labs, industry, and universities.

This annual forum, begun in 1995, aims to encourage timely information exchange and nurture collaborations. The workshops represent a range of activities in development of semiconductor X-ray, gamma-ray, and nuclear spectrometers and detectors that operate at room temperature. Participants discussed activities associated with source materials and growth of crystals, fabrication of devices, and development of systems (including specialized electronics).

The organizers at Sandia have tried to maintain the informal "workshop" atmosphere by not having proceedings published, as well as including significant time for informal discussions and questions. This most recent meeting also included time for system demonstrations. Presentations included reports about imaging systems being commer-

cialized soon for dentistry and others being developed for medical imaging and positron emission tomography.

The work at Sandia focuses on developing sensors and imaging arrays for use in prevention of smuggling of nuclear material, non-proliferation and treaty verification activities, monitoring of stored nuclear material, environmental remediation, and medical imaging. Other applications include industrial process monitoring, space applications, basic scientific instrumentation (such as devices for astronomical measurements), X-ray fluorescence spectroscopy, and safety. Themes relevant to all areas of application emerged, including the need to better understand the crystal properties and their effect on detector performance; mapping of detector properties; improvements in device processing and design; damage and stability; and developments in instrumentation and electronics.

This technology is now being developed not only in the US but also in Europe and Japan, noted workshop organizer Ralph James of Materials Processing Dept. 8230.

# Lightning tests

(Continued from page 1)

"Little data were available regarding the electromagnetic effects of a direct lightning strike to a concrete structure," says Marvin Morris, Manager of Electromagnetic Test and Analysis Dept. 9753. "We knew weapons magazines had been struck before, and we were confident in the safety of the weapons, but we wanted a set of verifiable measurements based on real lightning strikes to show us how to make improvements."

Normally air serves as an insulator, preventing an electrical discharge between the ground and an electrified cloud until the charge differential between the two becomes so great that a conductive "bridge" of ionized air particles is formed, initiating a strike.

In a triggered lightning test, a small rocket is launched toward a thundercloud above the object being tested. The rocket unspools a fine trailing wire attached at one end to a grounded structure, providing a ready conductor. The process not only triggers a flash in most cases, it also aims the strike to a point where its effects can be evaluated. It's really just a modification of Ben Franklin's historic kite and key test, Marvin says.

Sandia has conducted rocket-triggered lightning tests as part of its nuclear weapons safety mission since the early 1980s.

## Rebar integrity matters most

An initial series of tests in 1991 at an empty Army weapons storage magazine at Ft. McClellan, Ala., and later tests at simulated weapons maintenance cells in Anniston, Ala., evaluated lightning effects on concrete bunker-type buildings.

Sensors at various locations on the tested structures helped researchers measure currents in concrete rebar elements and in the lightning protection systems, voltage differences among structural elements, and inductance levels inside the structures.

*"... the lightning protection system played a limited role in directing current from a lightning strike."*

"What we found out was that the lightning protection system played a limited role in directing current from a lightning strike," he says. "Current traveled through the rebar, through concrete, through pipes, through cables, through vent stacks, and through the electrical systems, but in few cases did the lightning protection systems significantly affect the electromagnetic field inside the building."

The tests did show, however, that the degree to which the steel rebar rods in the concrete structure were connected played a far greater role in controlling electromagnetic effects inside the structure than did the lightning protection systems.

"When rebar and other conductors in a building form what is essentially a Faraday cage around the building, current from a strike tends to flow around the structure's shell and into the ground through pipes and other large metal conductors," he says. (A Faraday cage is a shell made of conductive mesh or parallel wires that routes an electrical current around the outside of the shell.)

## Tests led to safety improvements

The findings led the researchers to conclude that well-connected rebar in the ceiling, walls, and floor of a concrete building could improve lightning protection by a factor of 100. In contrast, a typical lightning protection system might improve lightning protection by only two or three times over a nonprotected structure.

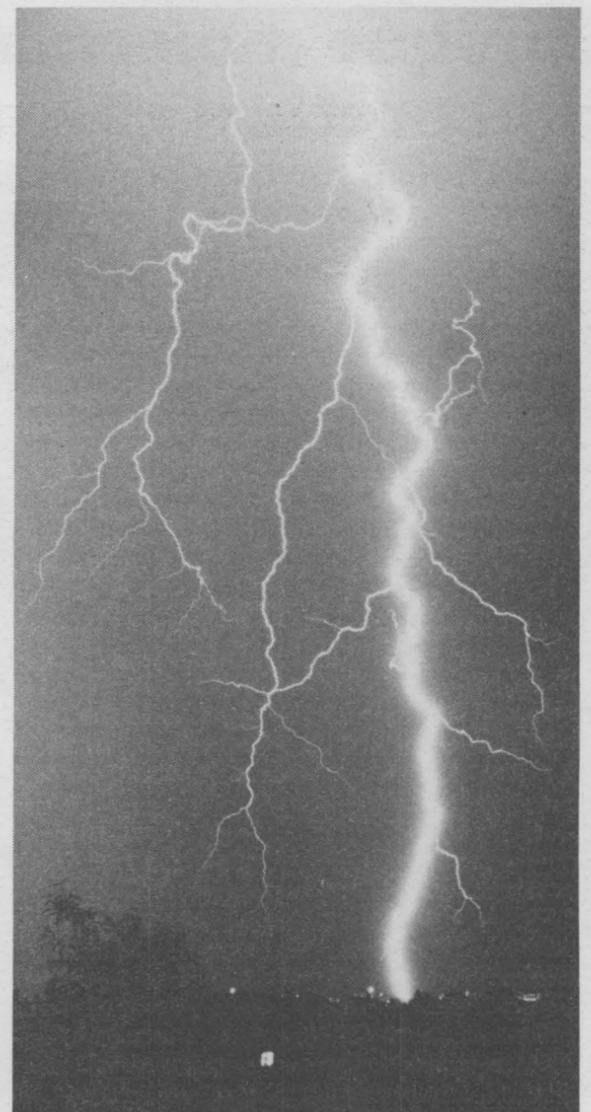
As a result of the tests, Sandia and the Army developed a system of rack-mounted measurement equipment and associated testing techniques. That equipment and a portable suitcase-sized version now under joint development will help the Defense Special Weapons Agency and the Army evaluate rebar integrity at thousands of weapons storage magazines worldwide and possibly abandon intensive, expensive maintenance procedures required to keep their lightning protection systems operational.

The tests also led to safety improvements for nuclear weapons assembly and disassembly cells and bays at DOE's Pantex plant near Amarillo, Texas. Subsequent Sandia tests helped verify the rebar integrity of Pantex's critical facilities, and improved surge protectors were installed in the buildings' electrical systems to minimize voltage spikes.

As a further outcome of the Sandia research, DOE, the DoD, and the Defense Special Weapons Agency are looking into updating their construction standards for new weapon storage magazines to include guidance on rebar construction.

Marvin suspects that the standards for other types of facilities — including those that house vital information or electronic systems (such as financial institutions and supercomputer facilities) and those at which a lightning strike might cause a serious accident or jeopardize people's safety (such as petrochemical plants and oil refineries) — might also be updated sometime in the future.

Because of a lack of technical information supporting the effectiveness of lightning protection systems, the NFPA subcommittee that writes national construction standards for lightning protection recently downgraded its lightning-related standards, making lightning protection systems optional rather than required. Marvin



LIGHTNING FLASH photographed by Lab News Editor Ken Frazier from the Sandia foothills during an August 1994 storm over Albuquerque.

expects that the NFPA will write new codes incorporating the Sandia findings.

## Prize-winning research

The research earned a Sandia team the prize paper award at the 1994 meeting of the IEEE's Industrial Applications Society national conference. Team members included Marvin, Kimball Merewether, Roy Jorgenson (both 9753), Richard Fisher (former Sandian), and George Schnetzer (ret.).

Sandia-led triggered lightning research continues. The University of Florida is conducting another series of lightning studies under contract with Sandia at its lightning research center in Gainesville, primarily to better understand how different grounding techniques can control the ground arcing that results from a lightning strike.

"You can't stop ground arcing, but we're showing that you can get arcs to occur where you want them to," he says.

The ongoing tests, it is hoped, will lead to further lightning safety improvements inside and outside the federal government.

"We sort of knew traditional lightning protection systems couldn't work based on back-of-the-envelope calculations," adds Marvin. "But there's nothing more convincing than measured data."

## Sympathy

To Louis Nogales (5513) on the death of his mother, Elaisa Nogales, in Albuquerque, April 11.

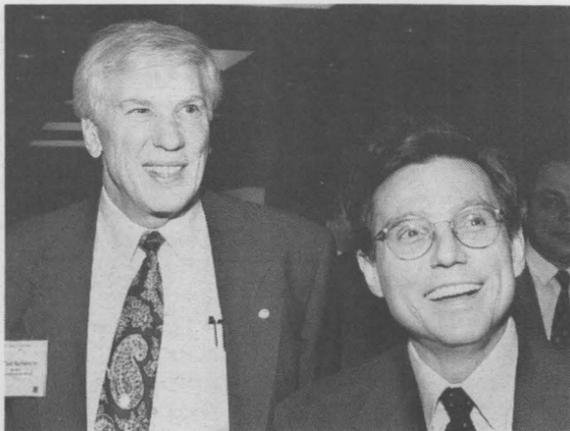
## Retiree deaths

Chester Corbin (81)	.....7121	.....March 13
Margaret Harper (77)	.....3172	.....March 18
Richard Davis (68)	.....5151	.....March 19
Glenn Wright (83)	.....9561	.....March 20
Henry Lucas (73)	.....8263	.....March 28
Gladys Sparks (92)	.....9230	.....March 29

Organization numbers indicate retirees' positions at the time of retirement and may not correspond to present-day organizations.



MULTIPLE-STROKE FLASH photographed during a 1993 rocket-triggered lightning test at Ft. McClellan, Ala., aimed at measuring electromagnetic fields on the ground near the flash. The appearance of multiple strokes in the time-exposed photograph is a result of wind drifting particles in the plasma column to the right.



Paul Robinson and Secretary Peña share a relaxed moment at a Sandia-sponsored arms control conference in Albuquerque. (Photo by Walt Dickenman, 12620)

## Peña's visit

(Continued from page 1)

many, many years."

He said that maintaining a safe, dependable stockpile without testing is a high priority of the administration and that he was reassured after seeing the technology Sandia brings to that mission. He specifically mentioned PBFA-Z (the world's most powerful X-ray source) and the teraflops supercomputer (the world's fastest computer) for simulation work and the work of robotics in dismantling weapons and storing components.

"I was very impressed with the scientific expertise I saw during my visit," he said. "The president believes we have a world leadership obligation [to avoid resumption of nuclear testing] and Sandia's work in that area is a very solid program. I have a lot of confidence in it."

### National laboratory system

Peña said he encourages each DOE lab to develop world-class expertise in a specific field, but notes the necessity for certain labs, like Sandia, to be multipurpose. He said he believes it is "important to integrate all the labs into a national laboratory system."

In response to a reporter's question about the propriety of federal expenditures on highways along Waste Isolation Pilot Plant (WIPP) transportation routes, he denied that the funding was intended to placate WIPP foes and win support for the storage facility, saying the money was allocated by Congress long ago. Besides, he said, "These are transportation impacts from a national facility, so it's appropriate to address them with national funding."

He was welcomed to Sandia by Labs Director C. Paul Robinson, who accompanied the group during tours of several sites and briefings about

work under way there.

Stops included and individual briefers were:

- National Security; Roger Hagengruber, Vice President, National Security Programs (5000) — weapons vault tour, special programs briefing, teraflops computer briefing.

- Particle Beam Fusion Accelerator — Z (PBFA-Z); Don Cook, Director, Pulsed Power Sciences Center 9500.

- Robotic Manufacturing Science and Engineering Laboratory; Pat Eicker, Director, Intelligent Systems and Robotics Center 9600.

- Microelectronics Development Laboratory; Al Romig, Director, Microelectronics and Photonics Center 1300.

- Energy and Critical Infrastructures; Joan Woodard, Vice President, Energy and Environment (6000).

Following a talk to DOE/AL employees after leaving Sandia, Peña ended his five-day visit to New Mexico and returned to Washington.

### Hispanic Cultural Center

Peña attended a gathering Sunday at the site of the future New Mexico Hispanic Cultural Center in Albuquerque, during which Sandia and Lockheed Martin donated \$30,000 to the cultural center. Vangie Samora, executive director of the Hispanic Culture Foundation, the center's private fund-raising organization, said the Sandia/LMC donation is the largest single contribution received so far and will be used "as a challenge grant to other associations and corporations."

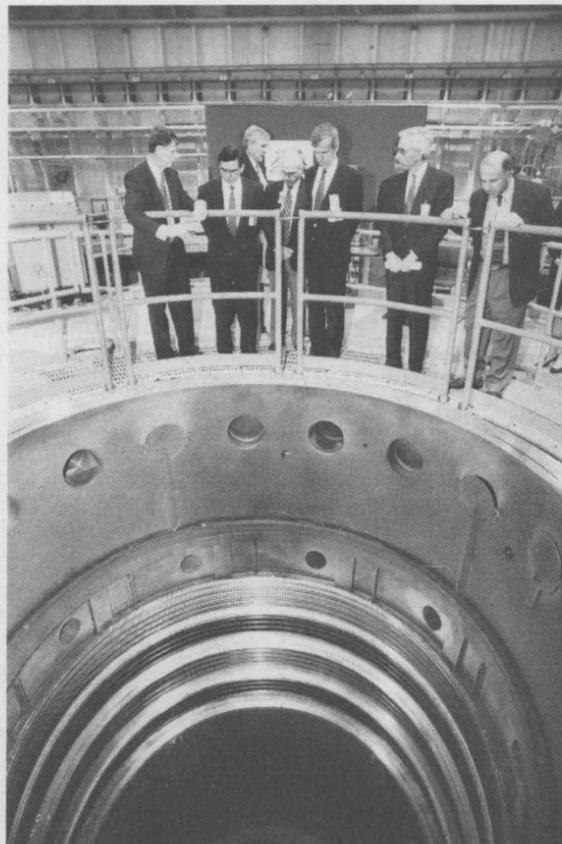
Addressing an overflow crowd of nearly 200 people, Peña said, "It is important that we remind all Americans, and the world, of the extraordinary contributions and impact Hispanic families have had in the Southwest for many centuries."

He told celebrants, "I want the Department of Energy to continue to be a good neighbor in the communities where we operate facilities."

He displayed that interest in being a "good neighbor" earlier in his visit by helping teachers, administrators, parents, and others string wires at Rio Rancho's Martin Luther King Jr. Elementary School as part of National NetDay. The volunteer group spent about eight hours Saturday wiring a local area network to make every classroom computer-ready (*Lab News*, March 28).

Trading quips with Sen. Jeff Bingaman, D-N.M., Peña whipped his coat off at one point along the afternoon stop and scrambled up a ladder to help pull a fiberoptic cable through space above a

*"I want the Department of Energy to continue to be a good neighbor in the communities where we operate facilities."*



HIGH POWER — DOE Secretary Federico Peña and party look down into the center section of PBFA-Z, the world's most powerful X-ray source. From left are Don Cook, Director of Pulsed Power Sciences Center 9500; Peña; Sandia President and Laboratory Director Paul Robinson; Vic Reis, Assistant Secretary, Defense Programs, DOE; Sen. Jeff Bingaman (D-N.M.); Elgie Holstein, Peña's chief of staff; and Bruce Twining, Manager, Albuquerque Operations, DOE/AL.

(Photo by Randy Montoya)

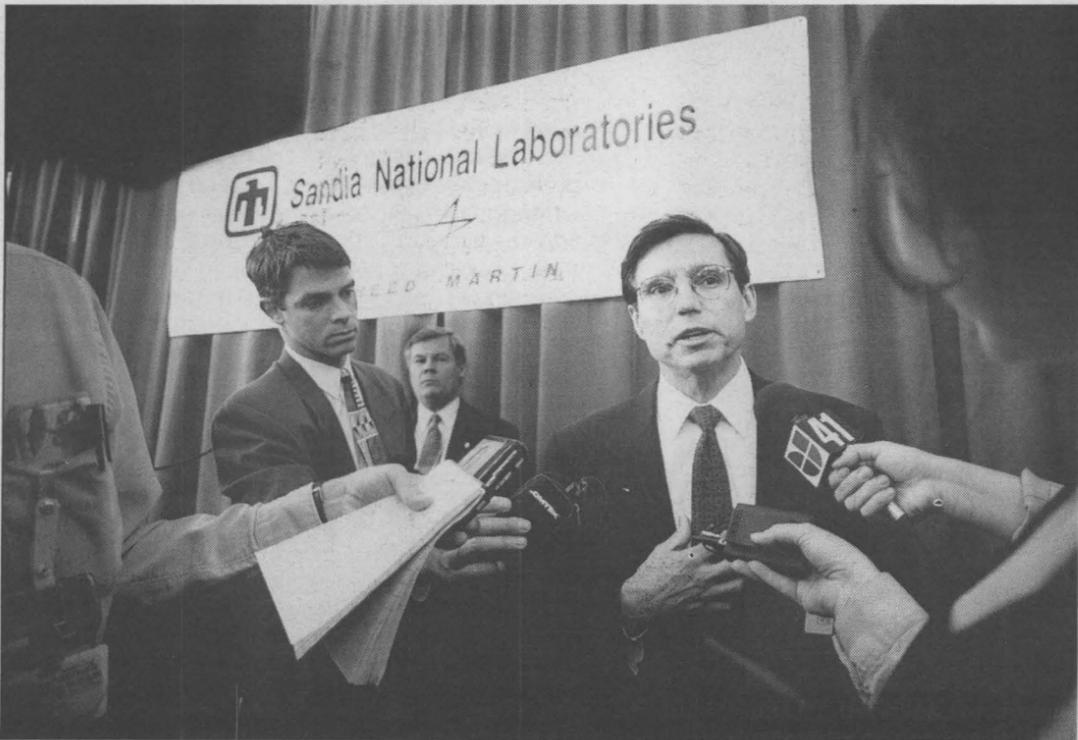
classroom's ceiling panels.

Earlier Saturday he visited the WIPP site at Carlsbad, after having had a private luncheon with Gov. Gary Johnson on Friday and saying afterward, "He is a strong supporter of WIPP, as am I."

And on Saturday night, he spoke briefly at a reception following that day's sessions of the Seventh Annual Arms Control Conference, sponsored by Sandia's Cooperative Monitoring Center in Albuquerque (see article on page 12).

As another stop on his DOE sites familiarization tour, Peña visited Los Alamos National Laboratory Friday and told reporters after touring the lab's TA-55 plutonium-handling facility he expects DOE to spend at least \$4 billion a year for at least the next decade on stewardship of the nation's nuclear weapons stockpile.

"We see a minimum of \$4 billion a year and I use 'minimum' intentionally," he said, adding that he disagrees with antinuclear activists that DOE environmental studies related to the weapons complex are inadequate.



TAKING QUESTIONS — Peña responds to questions from media after a Monday news availability session at Sandia. (Photo by Randy Montoya)



Z-PINCH — Peña, flanked by Bingaman, Robinson, and Reis, peers through a magnifying glass at a Z-pinch tungsten-wire target array used in the center of the PBFA-Z accelerator. (Photo by Randy Montoya)

# Comet impact

(Continued from page 1)

Earth's atmosphere at about a 45° angle. This is small as far as comets go (the massive Comet Hale-Bopp weighs about ten trillion tons).

The problem was divided into 54 million zones and ran for 48 hours.

The results, although dramatic, pretty much confirm earlier predictions about a comet impact, but they do so with much finer resolution in three dimensions than has ever before been possible.

## A revolution in science

"What's unique about this is we can now do three-dimensional simulations on the Intel teraflops computer that can fully resolve all the physics of the impact," Dave says.

The fully-resolved three-dimensional resolution is extraordinary.

"It's like an astronomer getting a new, more powerful telescope," says Mark. "I think it's a major step forward in science." He said the capability raises computational simulations to the status of a third branch of scientific inquiry equal to, and complementary to, experimentation and theorizing.

"It really is a revolution in science," Mark says. "A lot of major breakthroughs in science are going to come from these kinds of supercomputers."

He notes that the comet-impact simulation is something that can't be done any other way. "It's almost like doing an experiment — one you could never do. One you would never want to do."

Dave and Mark spoke at a news conference called quickly last week after a local newspaper report about the work was distributed nationally by the Associated Press.

## 300-gigaton impact

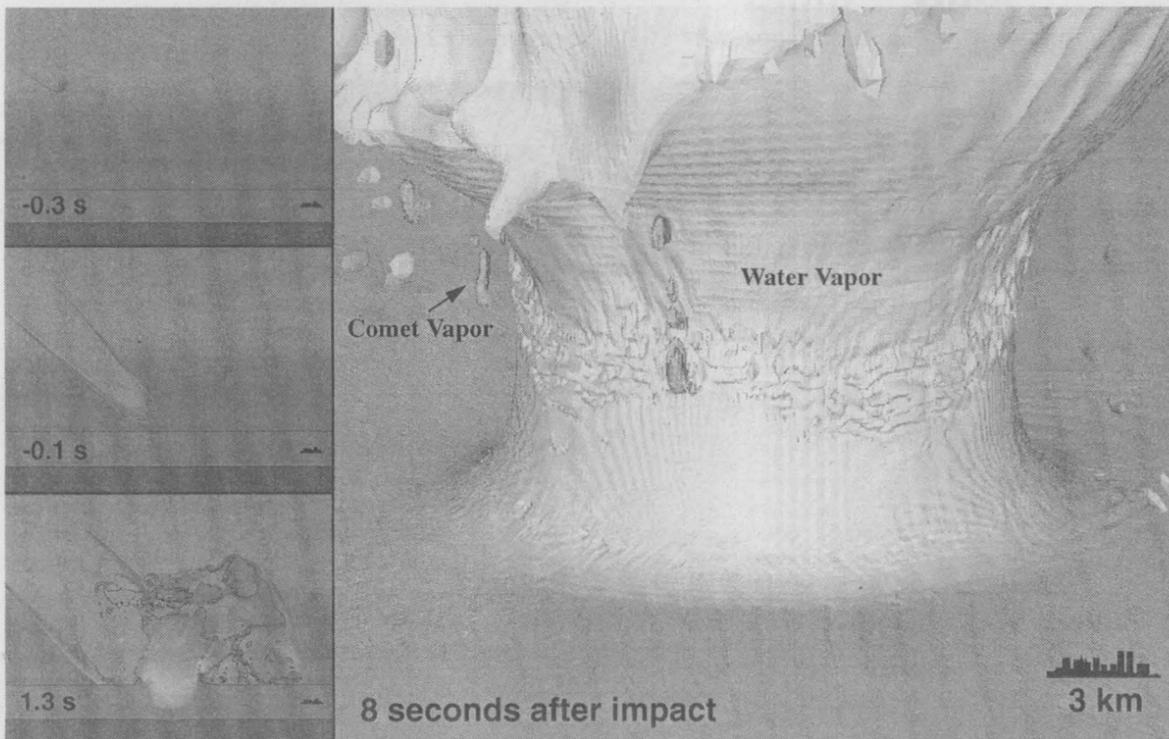
The news about the comet-impact simulation even led commentator Paul Harvey's nationally syndicated radio show that morning. News media in Florida were especially interested — the news reports noted that the tremendous splash from an impact in the Atlantic Ocean would, among other things, completely overrun Florida.

But that was just a short-term effect.

Here's what the new Sandia simulations show (see illustrations below).

The simulation starts with the comet 30 kilo-

*"It's almost like doing an experiment — one you could never do. One you would never want to do."*



Cross-Section

Aerial View

COMET CRASH — Sandia supercomputer simulations of a one-kilometer comet entering Earth's atmosphere, approaching the ocean's surface, and impacting the ocean, deforming the ocean floor and creating a giant high-pressure steam explosion rising into the stratosphere. The explosion ejects comet vapor and water vapor into ballistic trajectories that spread around the globe. The New York City skyline is shown for scale.

# Protonic computer memory recalls information when power goes off

One of the minor horrors of the computer age is to be working on a document not yet saved to the hard drive "memory" and lose everything because of a power outage or a screen freeze-up that forces the operator to shut down the computer.

Attempts to create circuits that save what's "up" on a screen have used high voltages, which quickly wear down computer electronic components, and have been expensive.

Now scientists at Sandia and at France Telecom have applied for a patent on a prototype memory-retention device that is inexpensive, low-powered, and simple to fabricate.

The device, referred to as "protonic," was reported in the April 10 issue of the journal *Nature*.

Development of the process had its origin on the back of a napkin at an IEEE conference in December 1995 in Charleston, S.C. The discussion, subsequent work, and patent involves Sandians Bill Warren (1812), the principal investigator; Karel Vanheusden (1845 and University of New Mexico); Dan Fleetwood (1332); and, at France Telecom, Roderick Devine.

To transmit data, the device uses embedded protons, which remain where they are when the power turns off, thus preserving the information. In devices such as D-RAMs (dynamic random access memory), typically based on electron flow, the information is lost when the power is turned off.

To create the memory-retentive chip, only

a few steps must be added to the hundreds currently used to fabricate microchips. The key additional step is to bathe the hot microchip in hydrogen gas. The gas, permeating the chip, breaks up into single ions — protons — at defects in the silicon dioxide. (The defects were created by the heat of the manufacturing process.) The protons can roam only within the chip's central layer of silicon dioxide, where they are trapped by two layers of silicon that sandwich the silicon dioxide.

The Sandia researchers found that:

- A positive low-voltage applied to one side of the silicon repels the protons to the far side of the silicon dioxide.

- A negative low-voltage applied to the silicon attracts the protons to the near side of the silicon dioxide.

If the power is turned off, the protons stay where they are, retaining information in the chip circuit.

First observation of the effect that protons remain in silicon when it is baked at high temperatures in hydrogen gas came as part of a systematic study at Sandia and France Telecom of the effects of hydrogen on silicon.

"For defense reasons, we're always interested in radiation-hardened, low-voltage chips," says Dan.

The work is funded by Sandia's Laboratory Directed Research and Development Program, which finances speculative defense-related research, and the Defense Advanced Research Projects Agency.

—Neal Singer

screening out much sunlight for long periods of time and disrupting agriculture, among other effects. "Simulations of this kind can help pin down that energy threshold and help answer the question: Is it a regional or global catastrophe?"

## Low-probability, high consequence

What is the likelihood of something like this happening?

Mark says the estimated probability is that an asteroid or comet with this energy strikes Earth about once every 300,000 years. Another way of looking at it is that there is about a 1 in 3,000 chance of its happening in a given century. "It's a low-probability, high-consequence event," he says. "But if it did hit, the probability of your becoming a victim would be high."

Sandia's teraflops computer is a joint development of DOE, Sandia, and Intel. It represents the initial goal of DOE's Accelerated Strategic Computing Initiative (ASCI), a ten-year program designed to move nuclear weapons design and maintenance from a test-based to simulation-based approach. DOE announced last December, when the machine was then still at Intel, that the one-trillion-operations-per-second breakthrough had been achieved.

The full machine is expected to have a peak performance capability of 1.8 teraflops, or 1.8 trillion mathematical operations per second. DOE and the weapons labs are developing continually more powerful supercomputers to simulate the complex 3-D physics involved in nuclear-weapon performance and to accurately predict the degradation of nuclear weapon components as they age in the stockpile.

The comet-simulation was essentially a test of the teraflops machine's capabilities. "This is an exercise for the computer," says Mark (who notes that he's also using it for a weapon-component simulation), "but we wanted to do something that people would be interested in."

Color images and animation are available at this Web site: <http://www.sandia.gov/1431/COMETw.html>

 **Congratulations**

To Vicki and Doug (2314) Weiss, a son, Seth Alexander, April 12.

# Labs' electronic purchase requisition system will dramatically reduce cycle time for purchases

**New system will cut days off cycle time, save Labs \$1 million annually**

By Bill Murphy

Lab News staff

Beginning Oct. 1, a lot of Sandians will be taking a lot fewer steps in the line of duty; that's when the Lab's electronic purchase requisition (EPR) system is slated to go online, eliminating the need to walk purchase requisitions through a cumbersome approval process. The new process, a Web-based application, will bring the purchase requisition form and all the associated workflow processes to individual desktops.

The new EPR process is expected to save the Labs perhaps \$1 million annually and dramatically reduce cycle time for the 52,000 purchase requisition transactions conducted each year.

The transition to EPR is just one of some two dozen significant changes in business practices, policies, and procedures that will be rolled out between now and the beginning of the next fiscal year (*Lab News*, April 11).

The widespread changes, including implementation of commercial software products to facilitate electronic commerce, are intended to streamline Labs' processes, make them more efficient and effective, and bring them into line with widely recognized "best business" practices.

Although the full EPR system won't be available Labs-wide until next fall, a few Sandians have been beta-testing a somewhat less robust version of the system for a couple of months now. One beta-tester who has been doing conventional purchase requisitions for five years says he will "scream bloody murder" if anyone tries to take the EPR system off his desktop.

Gary Graham, delegated buyer for Dept. 1486, says the EPR process is easier, faster, and better in every way than the paper-based purchase requisition process.

"If there's a downside, I don't know what it is," he says.

That kind of response is music to the ears of Skip Reeder, Manager of Administrative Program Office Dept. 10210 in Procurement Center 10200, and his team, who have been working for some time to make the electronic purchase requisition a reality.

Skip says the existing, paper-based purchase

requisition system was ripe for a makeover because of its inefficiencies and its significant negative impact on cycle time and staff productivity. The work on the electronic purchase requisition system is funded by and is part of the Enterprise Business Application project, which is looking at administrative processes that can be automated with commercial software across the Labs.

As Skip describes it, here's the way the current system works:

You complete a paper purchase requisition. You then hand carry it to your manager for approval, after which you need to determine where else it needs to go — sometimes, depending on the nature of the purchase, special approvals are required. Once you've figured out where it needs to go, you have two choices: you can either put it in the mail or walk it through the system (more on that later). If you put it in the mail, it's going to spend several days getting to its next stop. And once it gets where it's going, the PR form goes into an in-basket, until someone pulls it to work on it, sign it, and send it on.

Eventually, the form finds its way to the accounting certifier, who reviews it to make sure the work has been done, that the funding actually exists on the case, and that all the data on the form are accurate.

Once everything has been resolved to the accounting certifier's satisfaction, the form is channeled to the purchasing manager, who assigns a buyer to make the purchase. Whew!

"Our best information," says Skip, "is that it takes about 16 days from the time a purchase requisition is initiated until it reaches the accounting certifier, and then it takes up to two days to go through the purchasing manager, who assigns it, enters that information into the system, and forwards the requisition to a buyer. So it takes approximately 17 days on average to get a purchase requisition into a buyer's hands."

The other way speeds up the process, but at a cost. You can fill out the purchase requisition and then walk it through — physically hand-carry the form around to everyone who needs to approve it.

"You actually stand there and try to get someone to sign it," Skip says, "and then you take it to someone else and try to get them to sign it and then to someone else. So the cost to our user ends up being one of two things: You either spend the time to walk the paper through the process or you stick it in the mail and you spend the time trying to call people where you think it is to make sure they got it processed and sent it on."

"Either way, it's pretty time consuming," he says.

## The old vs. the new

Compare that current way with the new way. First of all, the form will be on your desktop in the form of a Web-based application. And the application takes advantage of all the capabilities you'd expect from an electronic-based approach.

Based on information the requester provides, the system will "know" who needs to see and act on the requisition. Because the PRs are in electronic form, approvals can be obtained concurrently and can be made available to the buyer immediately. As part of a related process reengineering in procurement, Lynn Fitzpatrick (10231), a member of the reengineering team, has achieved a significant reduction in required approvals, reducing the number from 160 a year ago (not every transaction needs anywhere near that number) to approximately 60 today.

Another plus of the EPR system: Much of the information required on the paper form is already known within the Sandia financial system. One of the big causes of problems with the current PR system, Skip says, is that data on the requisition are not consistent with the data already within the system. Why? It's the almost inevitable result of having to handle the data over and over again, Skip says.

"We're asking for someone to find data that are in a system, transfer this information onto a

piece of paper, have someone review the paper, and then transfer the information back into a system. Every time you do that, you have escalated the chances for error. So, in the new process, the system already knows a lot of the information you used to have to provide, so we don't even have to ask certain questions anymore."

The implementation of EPR will "eliminate probably 80 percent of the most common errors that we find on purchase requisitions," Skip says.

The EPR system will introduce a number of new efficiencies into the purchase requisition process. The big cost savings comes from the elimination of the need to hand-carry forms through the system. A related savings comes from the simplification of the tracking process. Under the EPR system, requesters can get real-time data — right from their desktops — about where their requisition is in the approval process. Simply by typing in their purchase requisition number (each transaction has a unique identifier), the requester can satisfy himself or herself that the requisition is on track.

Another nice feature, says Skip — one that also enhances efficiency — is that if you happen to buy the same item or items on a fairly routine basis, you can create templates in the EPR system, just like you can in an application like Microsoft Word. Just call up the template for your routine purchase, change the few data that need to be modified, and send it on its way.

Skip says the new EPR system is on track for an Oct. 1 rollout. Training for users will probably occur in late September or early October. That training shouldn't be too traumatic for end users.

"One of the goals of the project from day one was to implement a process that is so intuitive that little or no training is required. In fact, we've actually had the human factors folks — Bev Ortiz and her folks — involved in the design of the system from its inception. Notwithstanding that, as we get into the September-October timeframe, there will be training sessions, probably at the TTC [Bldg. 825]."

Beta tester Gary Graham agrees that training shouldn't be too big an issue with the application. "It's really pretty straightforward, pretty simple," he says.

Skip sums up his assessment of the impact the electronic purchase requisition system will have by telling a story:

"When I was driving home the other day on Eubank I passed a sign that says 'If you lived at Willow Wood, you'd be home already.' It occurred to me that if we had electronic purchase requisition in place today, we wouldn't have people standing at the PR service center waiting to get those requisitions certified. They'd be long done already — without breaking a sweat."

## Around the corporation

LOCKHEED MARTIN

### Norm Augustine leaving Lockheed Martin CEO post, remaining as chairman

Norm Augustine will relinquish his post as Lockheed Martin CEO and retire Aug. 1 in accordance with what company spokesman Charles Manor said were his "long-standing plans." He will continue to serve as chairman of the LMC board.

Augustine will be succeeded by President and COO Vance Coffman, who will retain his position as president and take on the additional responsibilities of CEO. Coffman will be succeeded as COO by Pete Teets, who will also be named executive vice president. Teets currently is president and COO of the Information & Services Sector.

Augustine's retirement will come soon after his 62nd birthday. He plans to join the faculty of the engineering school at Princeton University, his alma mater.

He became CEO of Lockheed Martin nearly a decade ago and said in a message to management that he felt it was time to move forward with the succession plan already worked out. During that decade, purchases and mergers have made the company the world's largest defense contractor.



**TRIDENT OPENING** — Executive VP John Crawford addresses guests who attended an April 1 ceremony at the National Atomic Museum officially opening the museum's newest exhibit — a Trident 1 (C-4) submarine-launched missile (*Lab News*, Dec. 20, 1996). During brief remarks, John discussed the longtime partnership between the space industry, including Lockheed Martin, and DOE, including Sandia, leading to the system's development and commissioning into the US nuclear arsenal in 1981. Dignitaries in attendance included Navy Capt. John Shaw, Deputy Director, Integrated Operations Directorate, Field Command, Defense Special Weapons Agency; and Carol Evanoff, Resident Director, Lockheed Martin Missile & Space Corp. The Trident's front section and cone-shaped multiple, independently targeted reentry vehicle (MIRV) mockups are seen behind John.

(Photo by Virginia Salazar, 12660)

## Sandia aces DOE review of safeguards and security program

"Satisfactory" just doesn't adequately tell the story of Sandia's feat in a recent DOE Safeguards and Security audit. For the first time in history, Sandia scored top marks ("satisfactory") in all aspects of the appraisal. The strong self-assessment program for safeguards and security is being credited with much of the success of the review.

Nearly 40 auditors, most of them from DOE/AL's Security and Nuclear Safeguards Division, visited the Labs Feb. 24-March 7 to assess Sandia's safeguards and security program performance in five areas: program management, program operations, information security, nuclear materials control and accountability, and personnel security.

Within these areas were 32 subcategories, all of which received satisfactory ratings.

In addition to Safeguards and Security Center 7400 activities, the survey also examined computer security operations under the umbrella of Information Services (4400) and Information Processes (4600); Benefits and Medical Services (3300); Logistics Management (7600); Procurement (10200); and security functions performed

*"DOE has found our internal assessments to be aggressive and comprehensive. Thus, they have been able to rely and depend on these evaluations."*

by line personnel throughout the Labs.

The DOE audit of Sandia's Safeguards and Security program is one component of the overall, streamlined self-assessment process with which DOE now appraises Sandia's performance each fiscal year (*Lab News*, Feb. 28), according to Virgil Dugan, Director of Corporate Planning and Strategic Business Development Center 4500. Because the Safeguards and Security program is judged primarily on compliance with a host of DOE orders and rules, DOE performed the on-site assessment as a follow-up to Sandia's self-assessment of the program. Results of the recent audit will become part of the FY97 Multiprogram Laboratory Appraisal that the Labs will submit to DOE this fall, he says.

### Protective Force excelled

Tested extensively during the audit were members of Sandia's Protective Force. They were called upon to demonstrate suspect handling, alarm response, tactics and teamwork, and use of firearms. They also were required to pass written tests. All performed expertly.

Al Villareal (7432) served as Sandia's lead for the review. Other core team members were Linda Hurley and Conrad Carrington of Dept. 7432 and Ron Coonen of Dept. 7401.

Al says this survey was quite different from those of the past in several aspects and that the DOE team members proved true to their word that they were "here to help" improve Sandia's program.

"Throughout their time at Sandia," says Al, "the DOE team demonstrated open communication, worked with us to resolve concerns, pro-

vided ideas to correct findings, and made a real effort to commend the good work of specific personnel. Their interest was more in assessing performance than compliance, and we were able to work with them to show how we were meeting key performance objectives of our program. This represents a big change from the primarily compliance-based surveys of the past."

### High kudos

Receiving high kudos from DOE was the safeguards and security self-assessment program, headed by Linda. "Though it is a relatively new emphasis across the Labs, self-assessment is a four-year-old program in safeguards and security," says Linda. "A review board (four Sandians and a DOE/KAO representative) actively monitors development and progress of the assessment and ensures corrective actions are taken.

"The assessment is basically an internal audit by the people who do the work. They are in touch with what's going on in the program and with what needs to happen and are extremely sincere and professional in making the program a success."

Linda points out that the self-assessment program is not static but, rather, always improving.

Frank Gallegos (7400) says the safeguards and security self-assessments proved extremely useful to DOE during the survey. "DOE has found our internal assessments to be aggressive and comprehensive," says Frank. "Thus, they have been able to rely and depend on these evaluations. The high score on this survey and DOE's confidence in our internal reviews will most likely result in a

*(Continued on next page)*

## G.T. Holman III wins Security Police Officer of the Year award

*12-year veteran of the force is recognized by peers*

By Bill Murphy

*Lab News staff*

G.T. Holman III, a member Sandia's security force since 1985 and a full-time officer since 1990, has been named by his colleagues "Security Police Officer of the Year."

G.T. was selected after previously earning a "Security Police Officer of the Quarter" recognition during 1996.

Frank Gallegos, Director of Safeguards and Security Center 7400, puts G.T.'s recognition in perspective. "The SPO of the Year award is primarily a peer-driven recognition," Frank says. "I think it is a credit to G.T. that his peers consider him the best at the job they do from their point of view. To my mind, that's probably the highest recognition one can hope for."

G.T. (The "G" stands for "General," by the way) says he doesn't think there was any one single action on his part that led to the recognition. He says it was probably based on his finding several security infractions during 1996 — not big stuff, maybe, but indicative of good, solid security work. "I was just doing my job,"

G.T. says. And besides, he adds, "a number of the other guys did some really good work" during 1996, too.

It wasn't easy sailing for G.T. to arrive at the top of a very elite group of security professionals. In fact, before he joined the force, he says, he had never really thought about security work.

"Back in 1985, my father [G.T. Holman Jr., recently retired from Center 1100] told me they were hiring at Sandia. I said 'Hiring what?' And he said, 'Security officers.' It just sort of went on from there."

When G.T. first joined the force, he came in at a disadvantage. Lots of the other recruits, he says, were former military personnel. G.T. on the other hand, had never fired a weapon, in anger or otherwise.

"I was the worst shooter in my class. I scored a 116 out of a possible 300; by the end of the course, though, I was shooting 285."

G.T. says he has noticed significant changes in security procedures since he first came to Sandia. "In the old days, we weren't even supposed to fraternize with employees. We were very much apart. We were taught to think in a certain

way, but it seems like we're just supposed to trust almost everyone now. It's impossible for someone in my line of work not to think that the Labs doesn't look at security the way it used to."

Although G.T. says he has never had to draw his firearm in the line of duty, he, like all members of the protective force, receives semiannual training in firearms proficiency, shooting both sidearms and M-16 rifles. In addition, G.T. and his colleagues get lots of classroom training and regular sessions in a sort of virtual reality environment called — very appropriately — the "stress room," that is, the "security training and evaluation shooting system" room.

When G.T. enters the stress

room, training Lt. Ray Page helps him don a special version of the standard SPO sidearm modified to shoot beams of light. After making sure G.T. is ready, Ray dims the lights and starts an interactive, computer-controlled video, displayed on a six-foot screen.

The video is a little docudrama that begins innocently enough but quickly degenerates into a serious confrontation involving weapons. G.T., focusing intently, observes the deteriorating situation of the scenario and shouts a verbal warning at the screen.

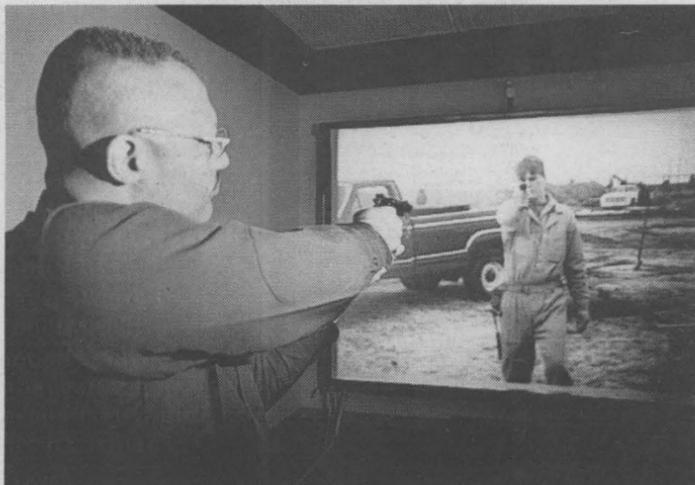
"Drop your weapon!" he shouts. The video image of the shooter seems to look out of the screen directly at G.T.

Again: "Drop your weapon!"

Instead of being deterred, though, the bad guy begins to raise his pistol to a firing position. In a split-second decision, G.T. fires. And fires again. Two hits register on the computer that drives the simulation. The bad guy didn't get off his shot. Ray looks over the data and tells G.T. he did well.

Center Director Frank Gallegos says G.T. represents the best of the best. "We're talking about the selection of the very best of a very well-developed, well-trained, and effective security police force that we have," Frank says. "Our folks are highly trained, committed, and prepared to deal with just about any emergency situation that we could have in the protection of information, nuclear materials, and the people and property that we have here at Sandia.

"We're pretty proud of them; we're proud of all of our SPOs and particularly of G.T. Holman, who was recognized by all of them as one of the best."



SPO OF THE YEAR G.T. Holman gets a virtual reality workout in use-of-force decision-making in the "stress room" training facility. (Photo by Randy Montoya)



# Sandia's renewable energy work with national parks earns Park Service Leadership Award

A partnership between Sandia and the National Park Service (NPS) has been chosen to receive a 1997 National Park Partnership Leadership Award for Resource Stewardship and Preservation. The award was to be presented to Sandians Hal Post and Mike Thomas of Photovoltaic System Applications Dept. 6218 and to Doug DeNio of the NPS Denver Service Center Wednesday at a reception and dinner at the White House Visitor Center in Washington.

The award, given by NPS and its foundation, is for efforts to "promote and expand the use of renewable energy in the parks . . . an outstanding example of a natural resource project with a national scope."

Hal and Mike say Sandia's Photovoltaic Design Assistance Center was initially contacted by the NPS Denver Service Center to provide technical training on photovoltaic systems to interested NPS personnel. (The Service Center functions basically as the architectural and engineering arm of the national parks.)

"From that initial contact," Mike says, "a partnership was formed in 1993 to promote energy conservation and increase the use of renewable energy at NPS facilities."

Jim Rannels, Director of DOE's Office of Photovoltaic and Wind Technology, lauded what he called an "exemplary partnership between the National Parks Service and the Department of Energy, through Sandia." He added, "The relationship that has evolved to the mutual benefit of the two agencies required long, hard work, and it took outstanding people like Mike and Hal to get to that point."

Mike says the NPS goals of protecting natural resources and pursuing environmentally friendly methods of supplying power are a good match with renewable energy research at the Labs. "A commitment to using renewable energy is a commitment to a less-consumptive lifestyle, environmental stewardship, social responsibility, global interdependence, and economic viability," says

Mike. "The National Park Service has taken a lead in these areas in our country."

Sandia, as part of DOE's National Photovoltaics Program, assists in developing and improving photovoltaic technology in the US and works to educate the public in uses of alternative energy technologies. "A key goal of this partnership," says Hal, "was to provide educational opportunities to park visitors in specific areas of energy conservation and renewable energy. This goal was a perfect match between the NPS interpretive emphasis and Sandia's efforts to educate about renewable energy options." More than 270 million people visit national parks annually.

One of the first accomplishments of the partnership was an assessment of current and potential uses of photovoltaic technology in national parks. The Renew the Parks assessment identified more than 600 photovoltaic-based power systems currently in use in the parks and myriad additional possibilities.

A driving force behind the initial 25 parks projects was to use photovoltaic power systems, which convert sunlight to direct-current electricity, to replace diesel-powered generators. These generators are noisy in tranquil park settings, costly to operate, produce emissions, and have potential for soil and water pollution associated with fuel storage and transportation. Eleven of the photovoltaic systems installed so far have replaced diesel generators. Seven projects have provided electrical power to facilities where no power was previously available.

Three of the projects — Grand Canyon North Rim Contact Station, Ariz.; Thoreau Center at the Presidio in San Francisco; and, most recently, a new visitor center at Salinas Pueblo Missions National Monument in New Mexico — have been



**PINNACLE OF POWER** — State-of-the-art photovoltaic system at Pinnacles National Monument, Calif. The photovoltaic system, including the array on the building's roof, replaces two aging diesel-powered generators and provides power to the service facility at Chaparral, on the west side of the park. The facility includes three ranger residences, a ranger station, visitor center, maintenance workshop, and campground.

installed in association with local utility companies. These companies provide photovoltaic systems as a customer service option and are finding photovoltaics to be cost-effective and reliable energy sources, especially in remote locations.

According to Hal, "This approach uses the existing energy supply structure in a nonconventional way to provide a win-win situation for the National Park Service, its visitors, the local energy supplier, and for photovoltaic technology. The associations are becoming more common across the western US."

Hal and Mike also have teamed with the US Forest Service and Bureau of Land Management in renewable energy partnerships. Together, these two agencies have stewardship responsibility for nearly one-third of the total land area in the US. The results of these associations can be found in the *Renew the Forests* and *Renew the Public Lands* documents. Copies of these, as well as *Renew the Parks*, are available through Sandia's Photovoltaic Systems Assistance Center, 844-3698, pvsac@sandia.gov.

— Kathy Kuhlmann

## Security audit

(Continued from preceding page)

waiver for this survey next year."

Frank says at the top of the list of those needing to be acknowledged for the success of this survey are the "people with security responsibilities throughout the Labs who do their jobs in an outstanding manner day-in and day-out." Specifically cited were: computer security representatives for each organization, document accountability custodians, authorized derivative classifiers, and material balance area custodians.

He praised the increased emphasis on partnering between Sandia and DOE this year. "DOE has adopted a new partnering philosophy that was evident during this assessment," says Frank. "They are sincerely interested in working with the Labs to provide a secure facility for DOE. It's more of a side-by-side relationship rather than the old face-to-face."

AI says other factors contributing to the success include "excellent, hard-working, dedicated staff; success integrating different organizations into the Safeguards and Security Program; an excellent working relationship with DOE/KAO staff; and better access to DOE for clarification on policy requirements."

Only eight minor findings were identified by the reviewers, compared to more than 40 findings for each of the past two surveys. During the management close-out, DOE credited the program with improving communications with the rest of the Labs, using resources effectively, reducing nuclear materials inventory, and conducting aggressive self-assessments.

Frank hopes the new DOE philosophy exhibited during this survey will extend to other areas as well. He's also offering their "tried and true self-assessment program" to assist any other interested departments at Sandia.

— Kathy Kuhlmann

## Sandian reduces US cost to 'visualize world peace'

Most retirees are happy to fold their tents and depart, but Sandian Ken Deller (5716) left the American taxpayer the equivalent of approximately \$100,000 when he went. The gift will make it slightly less expensive for the United States to visualize world peace.

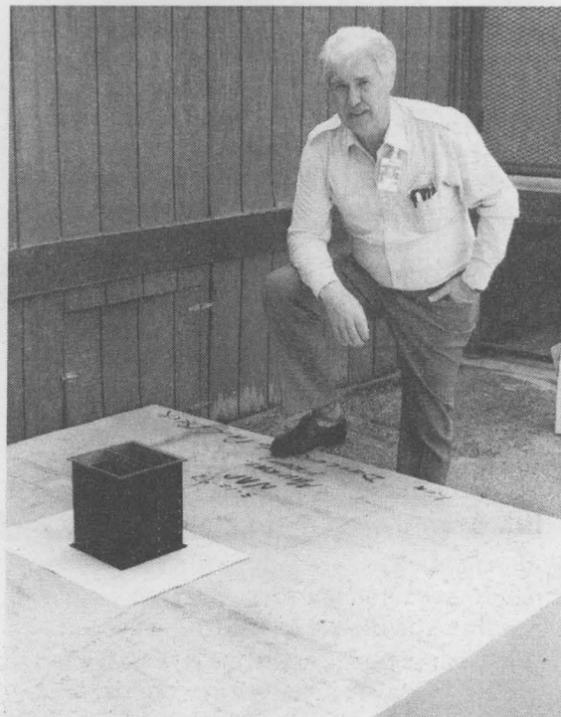
Ken, who retired April 17 from Sandia's Monitoring Systems and Technology Center, had helped test nuclear devices in Nevada almost three decades earlier. He recalled that the same alloy used to build boxes that protect electronic gear against radiation from outer space was also used for special tunnel doors to block radiation from underground nuclear devices at the Nevada Test Site.

There are no more nuclear test explosions in Nevada.

Ken called former co-workers and learned that a thick slab of unused alloy was still at the testing site — enough to make more than 90 of the 8-inch-cube boxes used to house electronic imaging packages in satellites. Material for each box costs nearly \$1,000.

Says Ken, "I knew there might be excess material and it seemed a reasonable thing to call up and find out."

The 7,000-pound slab was forklifted onto a commercial truck and shipped to Sandia/New Mexico last summer. Plans are for it to be recycled for use in space beginning in approximately the year 2000, with the 13th in a series of 21

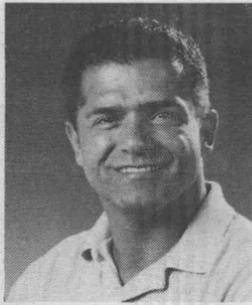


**I CAUGHT ONE THIS BIG** — Ken Deller (5716) with his foot on the 13-inch-thick door he scavenged from the Nevada Test Site to turn into radiation-protection boxes like this one for satellites in space.

Global Positioning Satellites meant for use in treaty verification observations.

# Mileposts

April 1997



Steven Rivera  
15 7435



Cecilia Castillo  
15 10241



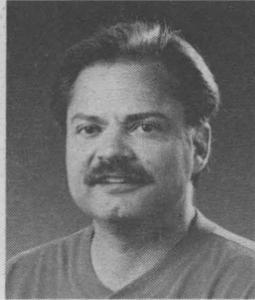
John Moore  
30 2123



Ed Roberts  
30 5515



Alice Montoya  
20 9321



Mark Weber  
20 7901



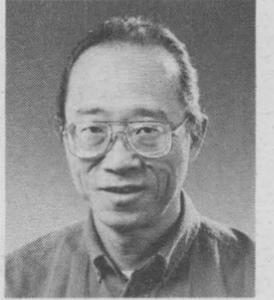
Kenneth Chen  
15 12332



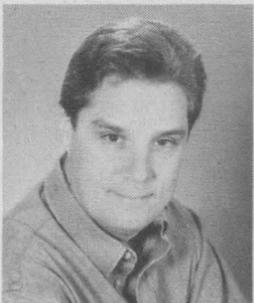
Jim Pergrossi  
30 8513



Lee Ann Hubbs  
20 8533



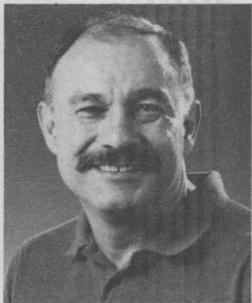
John Yip  
15 2102



Paul Lari  
15 2265



Sharon Walsh  
15 4621



Chuck Atencio  
15 10244



Lorri Castillo  
15 7435



John Bentz  
20 6423



## US Savings Bond drive set for May 12-23

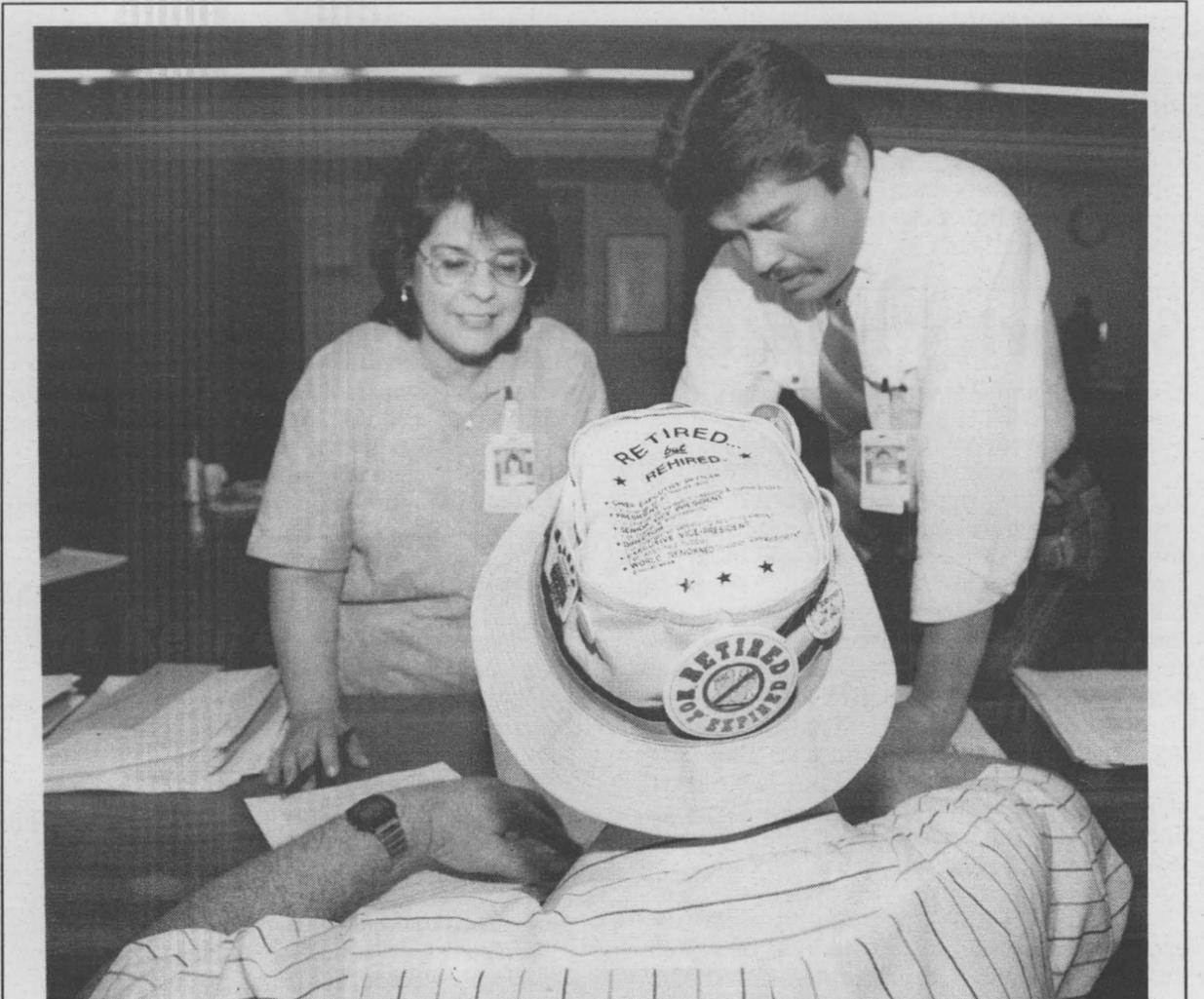
For more than 50 years, US Savings Bonds sold by the US Department of the Treasury have kept their appeal because they are affordable and safe, offer certain tax advantages, and have changed with the times as the interest rate environment has changed. They're intended for investors who want to save for the long-term yet are flexible enough for those who must have funds available, if needed.

Sandia is holding its annual US Savings Bond Drive May 12-23. Center representatives will distribute literature and hold meetings to discuss questions employees might have about the advantages of savings bonds and how to obtain them through the payroll deduction plan.

Last year's bond drive resulted in 71 percent employee participation, 15 percent lower than the year before. Heinz Schmitt, VP of Weapons Systems Div. 2000, is the 1997 Savings Bond VP Champion. "Sandians have a long history of supporting savings bonds. We want to turn back the clock to a time such as 1994, when participation was as high as 88 percent," he says.

Incentives to encourage participation will again be offered this year. "The center attaining the highest percentage of growth in participation will be eligible to participate in a raffle for a prize," says Juanita Sanchez (12650), Savings Bond Program Administrator. She says center representatives will also be eligible for recognition awards.

This year's bond drive theme is "US Savings Bonds, a great way to save." Savings bonds are easy to buy through the payroll deduction plan and you pay no fee or commissions. They are backed by the US government and can be replaced if they are lost, stolen, or destroyed. The Series EE savings bonds you buy today will earn market-based rates for 30 years. Although your investment continues



**READY FOR RETIREMENT** — Shirleen Perez and Leroy Marquez, both of Staffing Dept. 3535, help retiree Bill Jacklin (foreground, formerly of Analysis Dept. 5913) complete his termination paperwork last Thursday. Bill was one of 96 Sandians to officially depart the Labs on April 17 — the last day employees receiving Voluntary Separation Incentive Program (VSIP) benefits could terminate. Human Resources set up a special one-stop VSIP processing center in the Technology Transfer Center Lobby that day in anticipation of the increased number of VSIP departures. (Photo by Randy Montoya)

to grow for 30 years, you can cash bonds any time after six months. The money invested in savings bonds directly helps finance the government's borrowing needs. Two series of savings bonds are now issued, EE bonds and HH bonds.

There's no time like today to begin saving to provide for a secure tomorrow, says Juanita. Whether your financial needs are for a new home, car, vacation, education, retirement, or for a rainy day, US Sav-

ings Bonds will help you reach your goals with safety, market-based yields, and certain tax benefits, she says.

For detailed information about US Savings Bonds, see the Bureau of the Public Debt's Web site at <http://www.publicdebt.treas.gov/sav.htm>. Information includes anything you might want to know about savings bonds and a "Savings Bond Wizard" for calculating what your bonds are worth.

— Janet Carpenter

# Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

## MISCELLANEOUS

- SEARS TREADMILL (hardly used), \$400; original NordicTrack (hardly used), \$150. Hunter, 865-5745.
- SANDIA LOGO T-SHIRTS, \$9; golf shirts, \$15; mugs, \$8; caps, \$8; Panama hats, \$15; Lab News Bldg. 811, north of Bldg. 800. Campanozzi, 844-7522.
- ANTIQUA GRAND UPRIGHT PIANO, new Tiger Oak soundboard, \$550; king-size black-lacquer waterbed, \$175 OBO. Frazier, 266-2511.
- FILL DIRT, clean, excellent, great compaction, Taylor Ranch, free. Chavez, 857-1653.
- TIRES & WHEELS, 5 ea., Chev. 6-hole wheels, used P235x75R15 tires, w/trim rings & center caps, \$100. LeGalley, 822-0676.
- NORDICTRACK PRO, new condition, \$350. Hatch, 281-0543.
- ANTIQUA BEDROOM FURNITURE, solid walnut, double bed, vanity, mirror, chest, vanity stool, bed frame, \$3,800. Olona, 268-3604.
- FURNITURE, matching couch, 2 chairs, ottomans, \$300; kitchen table (glass top), 4 chairs, \$250. Hahn, 822-1341.
- ELECTRIC LADY KENMORE WASHER & DRYER, heavy-duty, gold w/black trim, good condition, \$300 both. Hettich, 831-0385.
- LAB/COLLIE, young female, affectionate w/children & other dogs, free. Giersch, 299-9512.
- CARVIN BASS AMP COMBO, 150W, 1x15, like NIB, w/head cover, \$250. Buttz, 822-1448.
- SOFA/SLEEPER, w/matching loveseat, Southwestern-style, hunter-green base color, \$500; barstools, 4 for \$50. Romero, 823-2335.
- COUCH/SLEEPER, \$75; wood daybed, \$100; dinette table, \$75; computer printer, \$75; all good condition. Garcia, 883-0288.
- FURNITURE: 3-piece bedroom set, bed, dresser, vanity, \$300; cedar chest, \$200; 2 bookshelves, \$80 set. Cossin, 262-0633.
- ANTIQUA OAK ICEBOX, excellent condition, \$700 OBO; pair Cerwin Vega speakers, \$150; large doghouse, \$50; Tasco telescope, \$85. Kirk, 281-6668.
- QUEEN-SIZE BED, Sealy Posturpedic mattress/box spring, w/frame, comforter, skirt, & linens, used as guest bed, \$275; moving boxes, various sizes, free. Sikora, 821-1983.
- POOL FILTER, 18-in. sand, good for above-ground pool, excellent condition, \$50. Ganter, 265-5007.
- PIANO, Baldwin Acrosonic, 28 years old, excellent condition, \$1,200 OBO. Beauheim, 822-0553.
- MATCHING LUGGAGE, maroon, large w/wheels, medium, cosmetic case, excellent shape, \$35. Barnes, 265-2836.
- SOUTHWEST SOFA, tan/beige, great for den, \$50 OBO. Maxey, 831-2228.
- SOFA & LOVE SEAT, recliners built into ends of both pieces, \$450 OBO. Anderson, 883-2647.
- TRUCK BOX, diamond plate, full-size, extra-deep, 2 trays on both sides, 1 sliding tray in center. Cordova, 864-8982.
- REFRIGERATOR, side-by-side, Sears, 18 cu. ft., avocado, \$75; 2 tall bookcases, \$60 ea.; exercise bike, \$35. Rechar, 292-1754.
- TV, 27-in. RCA Color Track 2000, beautiful oak cabinet, built-in stereo speakers, cable-ready, \$195. Nutt, 856-8267.
- CORNER ETEGERE, by Drexel, Country French iron & cherry wood, \$1,400 (retails for \$1,940 + tax). Spear, 822-8982.
- KENMORE APPLIANCES: washer and gas dryer, 4-years old, Series 70 HD, \$450; top-freezer refrigerator, \$399. Schkade, 292-5126.
- STYROFOAM, 1-in. thick, R-4, 6-8 large pieces, \$10/all; Inverness One-Touch hair removal (wax) system, \$40; 2 boxes beads/silver findings, \$25. Baldo-Pulaski, 345-0432.
- INFANT CAR SEATS, FP & Cosco, \$25 & \$20; microwave, \$50; Hoover vacuum cleaner, \$35. Williams, 344-9276.
- EXERCISE MACHINE, Brutus Excel, w/bench press, leg extension/curl, excellent condition, \$100; Gympac DP exercise machine, \$50. Avila, 275-9572.
- CANON CAMCORDER ES-900, 8mm, color view finder, extras, accessories, less than year old, \$650. Epperson, 271-9880.
- WOODEN BUNK/LOFT BED, bed board, matching student desk can fit under loft, \$100. Jones, 899-0642.
- DESK, 5-drawer, 30" x 60", \$80; wood file cabinet, 2-drawer, \$20; microwave oven, \$50; swivel-rocker office chair, \$50. Roach, 296-0432.
- ALUMINUM WHEELS, for '85 Honda CRX, good condition, \$100/both. Corlis, 822-0192.
- RETAINING-RING PLIER SET, \$100; SC145 axle nut socket, \$40; RLT2800 ratcheting lockout tools, \$40. Mays, 1-800-659-1779, then 844-5432.
- WASHER AND ELECTRIC DRYER, Sears best, 2-yrs. old, excellent condition, must sell. Cosbe, 237-9913.
- PISTOLS, Ruger Vaquero .44-caliber, custom gunbelt, new model, Super Blackhawk, Browning Buckmark Plus, .22-caliber. Rasmussen, 266-1097.
- DRAFTING TABLE, \$50; chair, \$35; velvet bedspread, \$75; desk, \$100; microwave, \$60, stand, \$25; couch, \$20; more. Hubbard, 291-8463, after 4:30 p.m.
- SOFA SLEEPER & LOVESEAT, w/side pillows, brown tweed, perfect for apartment, excellent condition, \$130. Plummer, 823-1619.
- KITCHEN TABLE, 4 chairs, \$70; Remington electric razor; golf clubs, bag/cart; 2 x 4 plastic lenses; microwave, Sharp carousel. Martel, 293-1892.
- HM CAMPER JACKS, 2 ea., \$75. Knight, 839-0948.
- REVOLVERS, .357 magnum, gun display case. Marder, 291-8140.
- SUNSET MEMORIAL MAUSOLEUM NICHE, single, eye-level height, \$2,000 minimum OBO. Work, 892-2805.
- NEW FRONT BUMPER, for '88 Chev. 1500, \$90; '66 LWB oak-bed kit, stainless hardware, \$325; dark brown carpet kit, \$70. Palmer, 256-3164.
- BABY CRIB, \$75; portable baby crib, \$25. Smith, 892-8633.
- SIMMON OMEGA ENLARGER, \$300; workbench/cabinet, \$50; 2 wood & canvas folding beach chairs, \$40. Hall, 298-6856.
- FERRET, male, descented & neutered, sweet & loving, loves kids, w/cage, many accessories, \$100. Wickham, 898-7601.
- GOLF BAG, Black Square Two brand, "stand-up" bag, putter, Callaway blade-style putter, w/hickory shaft, \$40 ea.; both perfect condition. Harms, 839-4852.
- BABY STUFF, adjustable high chair, \$40; portable crib/bassinet, \$50. Martinez, 294-6365.
- SAT SYSTEM, 6-ft. dish, C-band LNA, receiver w/remote, 1-year old, w/mounting hardware. Powell, 328-6709.
- ELECTRIC RANGE, 30-in. Whirlpool, w/overhead microwave, nice features, good condition, \$125. Aas, 856-6674.
- DINING ROOM TABLE, w/glass top, 4 chairs, \$50; lawn mower, \$25; garden hose, \$5. Yaniv, 294-4490.
- MERCURISER PROPELLERS, used on 165-hp inboard/outboard, one 16 x 17, the other 15-1/2 x 7, fine condition, \$30 ea. Meikle, 299-4640.
- COCKER SPANIEL, happy, small, black, 5-year-old female, neutered, papers, free to good home. Brainard, 291-9061.
- COUCH, pillow-back style, blue, white striped, 1-yr. old, additional decorator pillows, \$325. Gerwin, 881-0028.
- EUPHORBIA, 6-ft. tall, free. Vaughan, 291-9857.
- GARAGE SALE, April 26-27, 8:30 a.m.-3:30 p.m., desk, girl's bike, kitchen stuff, call for directions. Jean, 833-2165.
- GARAGE SALE, May 2-3, 3629 Erbbe NE, baby gear & clothes, motorcycle helmets, electric range, more. Schrader, 298-4154.
- GARAGE SALE, Friday & Saturday, May 2-3, 7 a.m., 7528 Rosette Drive NW. Kerr, 296-1991.
- GIRL'S BIKE, 16-in., good condition, great for children 6-10, \$35; dinette table, octagon glass on wood, \$20. Leslie, 275-7802.
- FARM ANIMALS, free; 2 adult rabbits, 1 male, 1 female; 4 kittens, 2 male, 2 female, "Buford" male potbelly pig. Gutierrez, 877-2742.
- OAK DAVENPORT, Brandt Ranch, Southwestern-style, \$150. Moll, 299-6497.
- WOMAN'S WILSON GOLF CLUBS, 3-9 & 1, 4, 5W & putter, excellent condition, great starter set, \$70 OBO. Maestas, 256-1374.
- TWIN MATTRESS SET, Simmons Beautyrest "Westminister," 1-year old, \$225; high-back swivel rocker chair, w/ottoman, like new, \$130. Levan, 293-0079.
- CERAMIC MOLDS. Gibson, 299-1830.

**DEADLINE: Friday noon before week of publication unless changed by holiday. MAIL to Dept. 12640, MS 0165, FAX to 844-0645, or bring to Bldg. 811 lobby. You may also send ads by e-mail to Nancy Campanozzi (nrcampa@sandia.gov). Call Nancy at 844-7522 with questions. Because of space constraints, ads will be printed on a first-come basis.**

- BIRDS, Zebra finches, few males available, \$5 ea. or 2 for \$8. Morales, 296-0928.
- CD PORTABLE MINI-SYSTEM, remote control, dual cassette, new, Sandia's 30-year service award, \$150 OBO. Manzanera, 296-3829.
- SECTIONAL, 2-piece sleeper, gray/tan tweed, good structural condition, fair upholstery, \$125 OBO; sleeper sofa, tweed, fair condition, \$50 OBO. Smith, 286-0702.

## TRANSPORTATION

- '86 TOYOTA MR2, fully loaded, 5-speed, tint, sunroof, bra, extremely well maintained inside & out, \$3,550. Bremer, 291-8297.
- '95 TOYOTA CAMRY LE, 4-dr., power everything, AT, power sunroof, great car, 35K miles, \$16,000. Darnold, 877-1680.
- '89 FORD BRONCO II XLT, 2.9L, 4x4, 5-spd., AC, cruise, sunroof, very nice inside & out, \$6,950 OBO. Potter, 294-3107.
- '96 HONDA CIVIC EX COUPE, silver, 5-spd., power everything, moonroof, 12K miles, like new, \$15,500, must sell. Trujillo, 828-2598.
- '89 FORD ESCORT, hatchback, 5-spd., alarm system, custom stereo, 95K miles, \$2,000 OBO. Shayne, 255-7664.
- '92 HONDA CIVIC CX, 3-dr., 5-spd., AC, AM/FM, many extras, 59K miles, excellent condition, \$7,200. Hollowell, 296-2111.
- '90 MAZDA MPV, 58K miles, 7-pass., V6, AT, dual AC, fully loaded, excellent condition, must see, \$8,700 OBO. Ottesen, 292-7147.
- '72 FORD BRONCO, 4x4, dana44, 302V8, 3-spd., AC, 150K miles, uncut, excellent body, transmission needs work, \$3,600. Reif, 299-4243.
- '85 FORD F150, extended cab, 4x4, AT, AC, PS, PW, cruise, 302efi, 88K miles, \$5,900 OBO. Stone, 869-7106.
- '96 MERCURY GRAND MARQUIS LS, AT, 4-dr., white, PS, PW, 17,300 miles, \$18,900. Burkinshaw, 833-5183.
- '89 PONTIAC BONNEVILLE, 4-dr. sedan, 85K miles, original owner, excellent car, \$4,700. Nagel, 298-2779.
- '89 BMW 325is, platinum, 5-spd., 2-dr., fully loaded, 77K miles, well below book, \$10,900. Heise, 450-7408.
- '89 FORD TAURUS WAGON, excellent condition, very well maintained, garaged, blue-gray, 3.0L, 82K miles, \$5,000. Mancini, 821-4039.
- '92 SUBARU SVX, AWD, power everything, cruise, alarm, warranty, climate control, low miles, negotiable, \$13,500 OBO. O'Neill, 255-1228.
- '90 PONTIAC TRANSPORT SE MINIVAN, great condition, CD, hitch, \$700 below NADA, \$7,500. Elbring, 243-1454.
- '95 FORD F150 LT, 4x4, extended cab, AM/FM cassette, security system, trailer pkg., LWB, AC, PS, 19K miles, \$19,000. Doak, 299-5766.
- '88 FORD CONVERSION VAN, dual AC, AM/FM cassette, \$4,100. Harrison, 822-8767.
- '96 JETTA, loaded, moonroof, 8-speaker sound, dual airbags, anti-lock brakes, under factory warranty, \$15,885. Ashworth, 831-5613.
- '94 OLDS CUTLASS, cruise, AT, anti-lock brakes, AC, warranty, 6-cyl., 3.1L, 20K miles. Steiner, 883-0523.
- '90 MAZDA PROTEGE, all-wheel drive, '94 engine, AC, PS, 5-spd., new paint, good interior, \$4,495 OBO. Barthelme, 284-1491.
- '88 FORD TAURUS SW, power everything, damaged in accident but engine not affected, \$1,000 OBO. Benjamin, 294-3228.
- '88 CHEV. CELEBRITY, excellent condition, ideal second or student car, PS, PB, AC, PS. Henfling, 869-4119.
- '87 CHEV. NOVA (Toyota Corolla clone), 5-dr., HB, white, 5-spd., AC, AM/FM stereo, runs great, \$1,950 OBO. Russick, 892-4283.

- '94 DODGE 250 CONVERSION VAN, fully loaded, excellent condition, \$17,500. Morrow, 299-5588.
- '82 VW RABBIT PICKUP, 77,500 miles, bargain, \$750 OBO. Reed, 275-2980.
- '94 VW JETTA GL, 4-dr., 5-spd., sunroof, 34K miles, excellent condition, \$11,250. Williams, 344-9276.
- '89 MAZDA B2200 PICKUP, 5-spd., AC, AM/FM cassette, runs great, \$3,400. Gallegos, 293-5634.
- '86 RX7 GLX, 86K miles, needs paint, book \$4,300, asking \$3,300, make offer. Shoaf, 296-6166.
- '92 MERCURY SABLE LS WAGON, loaded, silver, burgundy interior, excellent condition, \$7,900 OBO. Loescher, 299-7921.
- '95 FORD F250XL SUPERCAB, 4x4, 7.5L V8, AT, AC, low miles, white, excellent condition, perfect work truck, \$20,775. Amundson, 866-1300.
- '80 JEEP CJ5, 6-cyl., 4-spd., soft top, runs great, solid, looks good, \$4,400 OBO. Ludwigen, 294-7076.
- '88 TOYOTA TRUCK SR5, 4WD, 78K miles, AC, alarm, roll/push bar, stereo, numerous extras, \$7,300 OBO. Thompson, 292-2877.
- '86 BUICK RIVIERA, 77K original miles, loaded, immaculate, sunroof, touch computer, factory Bose, \$4,300. Jacobus, 271-1796.
- '72 OLDS CUTLASS SUPREME, 2-dr., V8, AT, PS, PB, AC, code alarm, new interior & disc brakes, excellent condition, \$2,595. Clevenger, 888-0209.
- '67 FORD LTD, 390 engine, hard top, new tires, dual exhaust, a classic, \$1,200 OBO. Estill, 883-1531.

## RECREATIONAL

- OVERTON DOOZIE 3,000-LB BOAT-LIFT KIT: never unpacked, 3/4-hp electric motor; all parts galvanized, \$695. Emery, 856-6950.
- '81 PACE ARROW, 32-ft., 45K miles, sleeps 6, awning, 454 Chev. motor, w/headers, great shape. Friday, 296-1652.
- '89 MOTORHOME, Southwind, 30-ft., rear island bed, dual air, TV, air suspension, excellent condition, \$30,000. Smith, 298-7365.
- '85 ALUMALITE TRAVEL TRAILER, 24-ft., 2-axle, 2-way frig., awning, \$5,695. Smith, 892-8633.
- ROAD BIKE, 21-in. Schwinn, 12-spd., good condition, \$90 OBO. Castelluccio, 294-3612.
- '95 PACE ARROW MOTORHOME, 35-ft., loaded, 9K miles, satellite, queen master, oak/leather/Corian, awning & towbar, estate sale, \$76,000. Wemple, 281-7661.
- '91 SEARAY BOAT 180, w/trailer, open bow, 150-hp outboard Mercury, w/skiing equipment, like new, \$10,000 OBO. Sjulian, 293-8555.
- DIAMONDBACK AXIS, Deore XT, grip shift, future shock fork, Veloci Raptors, refurbished brakes & drive train. Mills, 294-5219.
- BICYCLES, 20-in., 1 boy's & 1 girl's, excellent condition, \$35 ea. OBO. Baney, 294-8970.
- '91 CAB-OVER CAMPER, 9-1/2 ft., excellent condition, toilet, shower, water heater, full kitchen, \$2,500. Steffes, 286-1539.
- '88 SEARAY SEVILLE, 21-ft., w/2 axle trailer, 24 hrs., 265V6 Chev., like new, many extras, \$18,500. Claunch, 293-7415.
- MOUNTAIN BIKE, 24-in., 18-spd., Diamond Back, excellent condition, w/helmet & accessories, \$100 OBO. Garrett, 823-9837, evenings, ask for Tim.
- '83 YAMAHA 920, "Midnight" Virago, excellent condition, 1 owner, custom seat & hitch, 30K miles, \$1,495. Brosseau, 286-1969.
- SLATE-TOP POOL TABLE, 7-ft. Brunswick Bristol II, perfect condition, accessories, ceiling light, w/fixture, \$850. Chambers, 291-8574.
- '94 YAMAHA MOTORCYCLE, Model F750, 4-cyl., approx. 7,258 miles, may be seen at Albuquerque Yamaha. SLFCU, 292-8011, contact Mark.
- '86 BOUNDER MOTORHOME, 30-ft., basement model, garaged, awning, will sell fully equipped. French, 856-6126.
- COLEMAN POP-UP TENT TRAILER, full & queen bed, dinette/bed, 3-burner stove, heater, converter, awning, \$3,000. Rozelle, 298-0396.
- '84 KAWASAKI ZX 900 NINJA, 11K miles, adult-ridden, showroom condition, \$2,000. Lemon, 831-8993.
- TRANSOM SAVER, for outboard motor, \$25; clamp-on depth transducer mount, \$15. Holmes, 292-0898.

- MOVING, JAYCO POP-UP CAMPER, sleeps 6, ice box, sink, heater, stove, \$1,000; dining set; coffee tables, stove, more. Norwood, 266-2717.
- '87 MICRO-MINI MOTORHOME, Conquest, 21-ft., Toyota chassis, 14-mpg, AT, good condition, sleeps 4. Johnston, 299-1830.
- CABIN RENTAL, sleeps 6, 2-story, 1-1/2 baths, fully equipped kitchen, w/microwave, Angel Fire, June week, \$350. Lagasse, 298-0977.
- '79 SUZUKI MOTORCYCLE, 125cc, good condition, good tires & transmission, \$550 OBO. Perez, 857-9677.

## REAL ESTATE

- 3-BDR. EAST MOUNTAIN HOME, approx. 1,800 sq. ft., 2 baths, 2-car garage, 2.5 acres. Putman, 286-1151.
- 3-BDR. HOME, 2 years young, 1-3/4 baths, 1,354 sq. ft., 2-car garage, sprinklers, F&B, all brick, vaulted ceilings, dog run, 25-minute commute. Lauben, 275-7466.
- 4-BDR. LOS CHAVEZ HOME, 3-1/2 baths, 4,060 sq. ft., 2.524 acres, rustic, part adobe, total \$194,800. Botner, 864-6007.
- FORTY ACRES, Manzano Mtns., 7,100-ft. altitude, secluded, serene, forested, wildlife free, owner financing, owner/agent. Conklin, 847-2280.
- 3-BDR. HOME, 1-3/4 baths, approx. 1 acre, pipe-fencing pasture, sprinklers, privacy fence, alarm, 2-car garage, landscaping, Peralta, \$125,000. Jaramillo, 866-0160.
- 3-BDR. CUSTOM HOME, Sandia Heights, 2 baths, 2,037 sq. ft., part adobe, 1 acre, mountain/city views, \$250,000. Meyer, 856-9649.
- 3-BDR. HOME, 1,600 sq. ft., 1/2-acre, 720-sq.-ft. hobby shop, deck, patio, \$129,900. Smith, 892-8633.
- 4-BDR. HOME, Four Hills, 2-1/2 baths, great room, city/mountain views, formal LR, balcony, deck, 2 covered patios, den. Vigil, 296-3590.
- 4-BDR. HOME, 2 baths, 2,350 sq. ft., recently remodeled kitchen & master bath, great Wyoming/Comanche neighborhood, \$179,000. Waggoner, 293-4755.
- 3-BDR. TOWNHOUSE, NE, 2-3/4 baths, 2 fireplaces, large garage, clubhouse, swimming, tennis, over 2,400 sq. ft., \$169,900. Williams, 294-4742.
- 4-BDR. HOME, near KAFB, 1-3/4 baths, 2 living areas, 1,730 sq. ft., plus enclosed sunroom, \$119,000. Tidwell, 275-0966.
- 2-BDR., Pecos, N.M., beautiful, 2 baths, double wide on Pecos River, decks, landscaped, \$95,000. Sayers, 877-8094 or 873-2815.

## WANTED

- DOG KENNEL, airline approved, 30-in. to 35-in. high, to fit 85-lb. dog. Brooks, 275-0056.
- COMPUTER, (486 or better). Harrison, 899-0193.
- BORDER COLLIE STUD, to breed w/our 2-1/2-year-old female, must be ABC papered, options negotiable. Cocain, 281-2282.
- HOUSEMATE, nonsmoker, no pets, to share 3-bdr., 2 baths, FR & LR home in east mountain area, \$300 per month, utilities included. Jennings, 281-4507.
- SWING SET & SANDBOX, good shape, for needy single mom, w/2 small girls. Brown, 232-8502.
- LEFT-HAND GOLF CLUBS, reasonably priced. Graham, 890-2748.
- '86 FORD F-150 CHASSIS, 4x4, reasonable. Duran, 867-0840.
- HOUSEMATE, M/F, to share nice 3-bdr./2-bath home, near KAFB/SNL, \$295/month + utilities. Rose, 293-2442, leave message.
- AC/DC COLOR TV, 13-in., remote, cable-ready; mulching lawnmower, no catcher bag. Kercheval, 864-6549.
- MERCATOR'S WORLD, all issues of Volume 1. Guzowski, 822-1058.

## LOST & FOUND

- FOUND: Silver & black-bead earring, parking lot south of Bldg. 823, 4/10/97. Garcia-Larkin, 844-6285.
- FOUND: Man's prescription glasses, in brown case, parking lot of Bldg. 811, 4/18/97. Campanozzi, 844-7522.

## Labs make world more secure, experts hear at international arms control conference

By Chris Miller

Lab News staff

Sandia and Los Alamos national laboratories have much to offer the nation in the area of waging peace, US Ambassador to the United Nations Bill Richardson told a gathering of international arms control experts in Albuquerque last weekend.

"We are seeing a safer and more secure world, and much of the work to make it that way occurs at Sandia and Los Alamos," Richardson said at the Seventh Annual Arms Control Conference, April 18-20 at the Sheraton Uptown Hotel. The conference, which drew government officials from every continent except Australia, was organized by Sandia's Cooperative Monitoring Center (CMC).



BILL RICHARDSON

"Here in this state we have a big stake in arms control agreements," Richardson said. "And there will be a strong role for the labs in the future in these areas."

Richardson took the occasion to advocate ratification of the Chemical

Weapons Convention, which was expected to be voted on in the Senate this week. The treaty bans the development and spread of chemical weapons and has already been signed by 170 countries and ratified by 72.

Treaty opponents question whether the treaty is verifiable and criticize a provision to share information on anti-weapon technology and equipment.

"The issue of verification is an important issue. And New Mexico's labs do very important work in verification and nuclear safety. We feel it is verifiable," Richardson said.

Sandia Director C. Paul Robinson told reporters in interviews after Richardson's remarks that the labs have been developing technologies and methods to monitor chemical weapons.

"Everyone is realizing the importance of integrating technology and diplomacy," Paul said. "We are directing our efforts at whatever threatens the peace of the United States and the world at large. Many of Sandia's technologies are developed for waging peace."

National Security Programs VP Roger Hagengruber (5000) told a reporter from *Defense News* that a more aggressive program to focus on arms control technologies began at Sandia in the mid-1980s.

"The largest array of arms control verification technologies [in the world] now exists at Sandia," he said.

Sandia's CMC, established about three years ago, represents a "physical manifestation" of the integration of those efforts, Roger said. The CMC is funded by DOE's Office of Nonproliferation Policy.

"The CMC is not a single thing, not an invention, but a concept. It's a collection of technical Esperanto" — the universal language — he said.

Roger conceded that technology alone can't provide nations with the means to achieve complete verification, especially when the numbers of weapons reach very low levels.

"If it comes down to one or two (nuclear weapons), there's no way to know if a country has a nuclear weapon," he said. "Cooperation in verification then becomes the mechanism for detecting changes in shared opinions, not single weapon violations."

Added International Security Programs Coordination Director Tom Sellers (5300): "No one is going to be able to invent a technique to verify all the agreements that are possible. In the end, if you don't have an atmosphere of trust and shared goals, there's no basis to make it work."

Roger said Sandia spends about \$200 million a year — about one-sixth of its budget — on the development of arms control technologies.

Conference organizer Jim Brown (5341) noted the annual Arms Control Conference brings together arms control experts from throughout the world to help build mutual trust and to discuss cutting-edge technologies in the arms control verification arena. The conference provides arms control experts with an informal forum away from Washington and the United Nations to speak freely about arms

## Coronado Club

April 25 — "Western Night" dinner/dance. \$7.95 all-you-can-eat buffet; steak or shrimp, \$8.95, 6-9 p.m. Music by Isleta Poor Boys, 7-11 p.m.

May 1, 8, 15 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

May 2 — Cinco de Mayo celebration. A la carte buffet offering Mexican cuisine and C-Club favorites. Floor show featuring Ballet en Fuego. Music by Midnight Magic, 7-11 p.m.

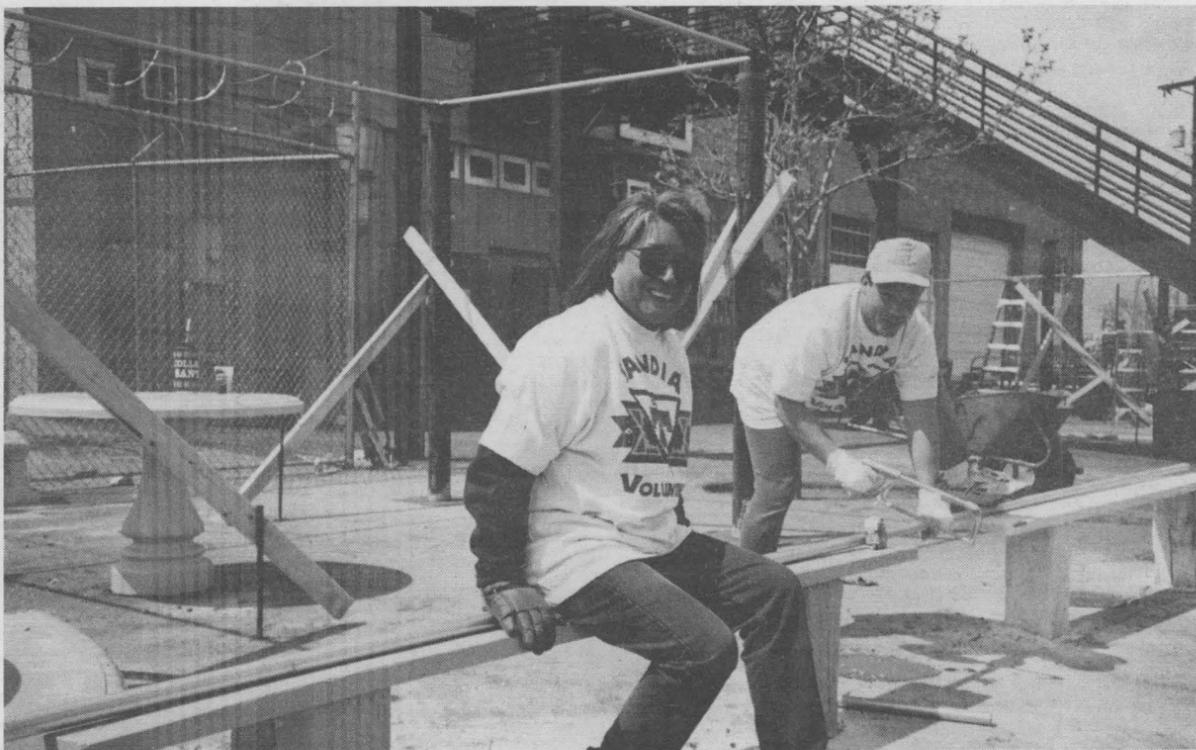
May 4 — Sunday brunch buffet, 10 a.m.-1 p.m. \$7.95 all-you-can-eat buffet. Kids 3-12, \$1, under 3 free. Music by Bob Weiler, 1-4 p.m.

May 9 — "Western Night" dinner/dance. Music by Isleta Poor Boys, 7-11 p.m.

May 11 — Mother's Day buffet. Call 265-6791 for reservations at 10 a.m., noon, or 2:30 p.m. seatings.

control issues.

In addition to keynote addresses, the conference included five panel discussions on the topics of the future of nuclear weapons, the future effects of conventional arms; China's role in strategic security issues, transparency and the new verification agenda, and implementation of the Chemical Weapons Convention.



PIPES AND PAINT — Labs Director C. Paul Robinson (in photo at right) got into the act and into the paint when Sandia Volunteers in Action sponsored a Week of Caring April 7-11 at St. Martin's Hospitality Center (1203 Third St. NW). Cathy Naranjo (2102) (in photo above) sat down on the job to hold a pipe steady for UNM's Anderson School of Business student Rob Matson to cut. A local United Way agency, St. Martin's provides services for homeless and near-homeless individuals in Albuquerque. Volunteers painted, repaired, and generally fixed up the shelter, and members of Sandia's Secretarial Quality Process Council collected donations of new toothbrushes, combs, socks, and small toiletries for distribution at the shelter. For information about Sandia's Volunteers in Action Program, contact Redd Eakin (12650) at 284-5209. (Photos by Redd Eakin)



## Sandia News Briefs

### Sandia, NASA to discuss human space flight cooperation

Sandia will host the Human Exploration and Development of Space Division of NASA's Johnson Space Center on Friday, May 9. The NASA division is making plans for human expeditions to Mars and the moon. The leaders of the division are coming to Sandia to conduct discussions on potential collaborative activities with the Labs. The NASA team will be led by division chief Doug Cook, accompanied by a number of his managers. The meeting will be held in the main conference room of Bldg. 6585 in Area 5. Interested Sandians are welcome to attend the morning session. Sandia will present an overview of its technical expertise from 9-10:30 a.m. NASA will present its exploration architectures and plans and an outline of some of its technological needs from 10:30 a.m.-noon. Since conference room space is limited, RSVP to Patti Sanchez at 845-9595 or pmsanch@sandia.gov if you plan to attend.