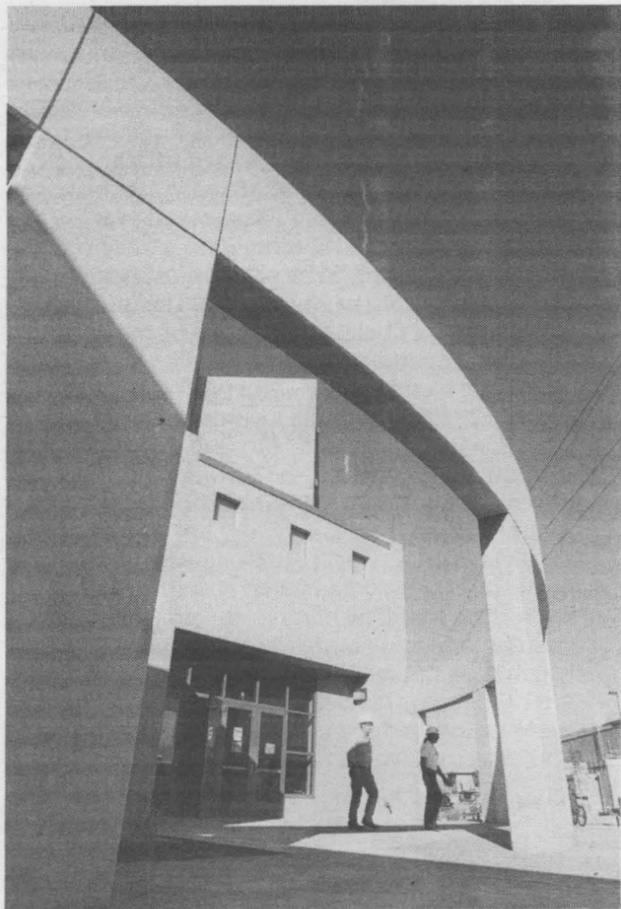


Center for National Security and Arms Control building focuses on preserving peace through high-tech vigilance

CNSAC brings under one roof Sandia's major national security program areas



By Chris Miller

The Cold War is over. Now it's time to preserve the peace.

That's the essence behind the mission of Sandia's newest building — the Center for National Security and Arms Control (CNSAC), Bldg. 810, in the center of Tech Area 1. Dedication ceremonies celebrating the new building and its role in preserving national security were scheduled to be held Thursday (Aug. 28). The event also observed Sandia's rich heritage as a weapons and national security DOE laboratory that dates back nearly 50 years.

"As we stand on the threshold of the 21st century, we can see we won't be fighting a cold war, but the gains we have made have to be preserved," says Roger Hagenhuber, VP for National Security Programs Div. 5000. "There's always a risk in making peace. Unless you've subdued the other guy

"There's always a risk in making peace. Unless you've subdued the other guy totally, you must be constantly vigilant."

totally, you must be constantly vigilant, never letting down your guard, or the peace will prove to be short-lived and just an interlude to the resumption of war."

Secretary of Energy Federico Peña visited CNSAC on Monday and later praised the center's programs and mission at a news conference. (See Peña's comments on page 5.)

The centerpiece of Sandia's expertise

Roger sees CNSAC's varied programs taking on highly proactive roles in fulfilling its mission.

"We have a new relationship with the Russians, and the world continues to change. We are not free of threats. We need to look ahead and anticipate those threats. What we must do is wage peace," he says.

Roger's Chief of Staff Bill Knauf calls CNSAC "the physical representation and the very centerpiece" of Sandia's ability to apply world-class technologies and expertise to national security challenges.

"It represents the excitement and energy that will enable the Labs to contribute as significantly over the next 50 years as it has during the past half century," he says. "CNSAC is a proud tribute to our heritage and, above all, a solid foundation for sustaining our tradition of exceptional service in the national interest."

Dave Nokes, Director of CNSAC's Systems Research Center 5900, praises the integration of
(Continued on page 4)

Sandia National Laboratories

Sandia LabNews

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Sandia needs more good partners, Labs leaders told at fall forum in Taos

By Bruce Hawkinson

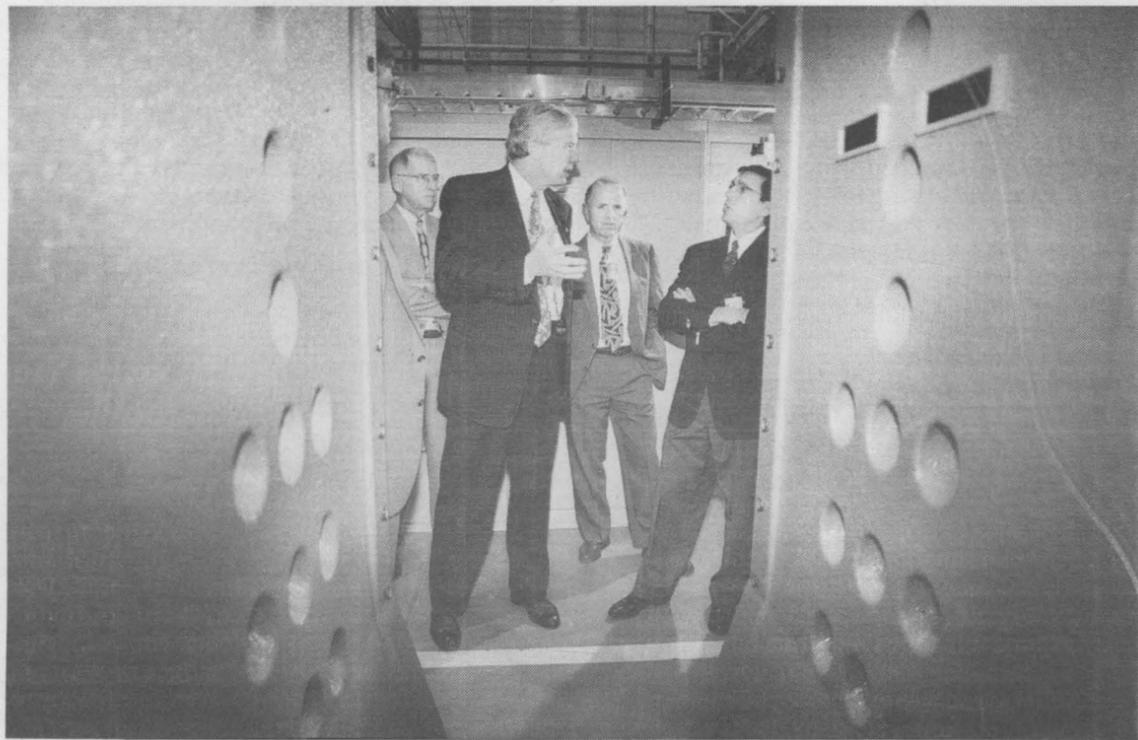
Laboratory business partnerships are like marriages. The great ones are long-term relationships in which each party complements the strengths and weaknesses of the other; each one gains significant benefit; and each develops a high level of trust in, and respect for, the other.

As Laboratory Director Paul Robinson said in inviting Sandia's vice presidents and directors to this year's Fall Leadership Forum, held last week in Taos: "Partnering — it's not just a management fad. Today it's an institutional necessity. In these days of budgetary brinksmanship, national laboratories in general and Sandia in particular must succeed at partnering. We risk the support from the nation, and even our continued existence as a laboratory, if we fail to strengthen ourselves internally through teaming and partnering. We risk losing our cutting technological edge if we decline to team and partner externally."

"Partnering — it's not just a management fad. Today it's an institutional necessity."

Deputy Director John Crawford's remarks opening the forum included a discussion of the "vital few" goals and strategies for the next three to five years. Several of the goals depend on strategic partnerships, and one of the "vital few"

(Continued on page 10)



SECRETARY OF ENERGY Federico Peña (right) gets a firsthand look at Sandia's explosives detection portal during an impromptu visit to Sandia/New Mexico on Monday this week. His whirlwind visit also included a sneak preview of the new Center for National Security and Arms Control and a briefing with local media. See more coverage of the visit on page 5 of this issue. (Photo by Randy Montoya)

2 DOE fines Sandia for radioactive materials handling incident

3 Sandia/CA researchers patent novel extreme UV light source

Sandia's first 50-year employee recalls his long adventure

CFO & CIO partnership promises faster, cheaper, better business

6 ▶

8



This & That

Did you miss me? - Thanks to Editor Ken Frazier who filled this space last issue with meaningful material - possibly setting a bad precedent for me. I was "vacationing" in Davenport, Iowa, with my wife Renae (6001), who was attending her 25th-year high school reunion. Unfortunately, it was held there instead of in the Canadian Rockies, which I would have preferred. This was my first opportunity to meet Renae's former classmates. Most were OK, but I thought several were pretty rude for asking her why she brought her uncle to the reunion.

* * *

Happy 100, Marie! - Sandia retiree A. Marie Thompson celebrated her 100th birthday Aug. 28. Marie worked at Sandia as a printer beginning in the late 1940s and retired at the end of 1960. Neita Tucker, Marie's niece and a 1993 Sandia retiree herself, says Marie still enjoys good health and lives in Phoenix with her daughter, former Sandian Betty McKinstry.

Although I reported several years ago that a former employee who had worked here for a time on loan from AT&T had reached 100, I believe Marie is the first bona fide Labs retiree to celebrate a 100th birthday.

* * *

Roy Crumley's long adventure - On Sept. 9, Homer (Roy) Crumley (10232) becomes the first Sandian to achieve 50 years of service. Our heartiest *Lab News* congratulations to Roy! Although Sandia itself won't officially be 50 years old for a while yet, Roy began his service when Sandia was known simply as Z-division, an offspring of the Manhattan Project. Don't miss John German's interesting page 6 story about Roy and some of his recollections of early Sandia.

* * *

Fluff stuff - Sandians love to pronounce initialisms - especially those pertaining to management - in irreverent ways. For example, although the Sandia Quality Leadership Council (SQLC) is being renamed, it is often referred to around the Labs as "squelch." So, it shouldn't shock our leaders to learn that last week's Fall Leadership Forum is lovingly referred to by some employees as "fluff." I'm still mighty puzzled about why our Fall Leadership Forum is held in the summer. Maybe you have to be in upper management to understand that kind of reasoning. It really should be the SLF, or "sluff." Whatever you call it - fluff or sluff - you can read Bruce Hawkinson's account of the big confab beginning on page 1.

* * *

Fourth Estate sometimes leads to fifth - Someone asked me how I like working again in the Labs' media relations group, where we deal with print and broadcast media on all kinds of Sandia stories and issues. I said fine usually, but that dealing with our "Fourth Estate" friends on some days makes me feel like going home and downing most of a fifth.

- Larry Perrine (845-8511, MS 0167, lgperri@sandia.gov)

DOE fines Sandia for 1996 radioactive materials handling incident

The Department of Energy's Office of Enforcement and Investigation has issued a "preliminary notice of violation" against Sandia for failing to follow safety procedures associated with an incident at the Radioactive and Mixed Waste Management Facility (RMWMF) in August last year.

The violation, if it becomes final, may result in a fine of \$56,250, to be paid out of Lockheed Martin's fee for managing Sandia. The incident falls under the nuclear safety rules of the Price-Anderson Amendments Act of 1988.

While sorting waste at the RMWMF in Area 3 on Aug. 2, 1996, a Sandia worker detected contamination on the outside of his personal protective equipment and left the sorting room to have the contamination removed. Sorting work at the facility was stopped.

Evidently, a "hot" particle consisting primarily of strontium-90 had fallen onto the floor of the sorting area. The particle was no larger than a grain of sand and emitted mostly beta radiation, which does not readily penetrate solid material. After the room was cleaned, Sandia radiological workers surveyed the room using gamma radiation detectors, which failed to detect the particle.

No adverse health effects

Prior to work being resumed, clean plastic was taped down over the floor of the room. On Aug. 16 after several days of work, a radiological control technician found the hot particle stuck under a piece of the tape. It was placed in a bag and then in a lead-lined container.

On Oct. 7, a second radiological control technician opened the container and measured the radiation from the particle. That led to the involvement of a DOE staff member who notified a Sandia manager. The manager then began an extensive process of identifying root causes and corrective actions relating to the incident.

The incident resulted in no adverse health effects to any worker, and exposures did not exceed regulatory limits, says Tom Blejwas, Director of Environment, Safety, and Health Center 7500.

A Sandia dose reconstruction shows that the maximum skin exposure to any worker was 16.6 rem of beta. Sunburn effects (the first indication of exposure) don't occur until 100 rem or more. Also, because the particle emits very little gamma radiation, the potential for exposure to extremities or internal organs was very small.

Root causes and corrective actions

Teams of technical specialists from Sandia and DOE have conducted rigorous root-cause analyses of the incident and have identified a set of facility-specific corrective actions and some site-wide actions.

According to the DOE notice of violation, issued Aug. 14, 1997, the failure to "adequately survey the contaminated area" and to "implement safety controls designed to minimize worker radiation exposures" directly resulted in unnecessary exposures to three workers over a two-week period.

"Workers who discovered the radioactive particle failed to properly control it, did not determine worker doses promptly, and failed to inform the Energy Department of the event," the document states. "While subsequent dose reconstruction showed that the exposures were below regulatory limits, greater exposures could have easily occurred given the absence of controls."

Since the incident, procedures and other work documents have been rewritten or revised and new training has been conducted. At meetings, Sandia waste operations management has emphasized to RMWMF workers the importance of following procedures and communicating potential problems. Systems for improved work control at the facility have been developed and implemented.

In addition, Sandia has begun Labs-wide adoption of the new DOE-approved Integrated
(Continued on next page)

Promote events for free on Labs' External Web

Upcoming Sandia-sponsored events and conferences open to the public or to specific outside groups can be listed for free on Sandia's External Web. The three or four nearest upcoming events are listed near the bottom of the External Web home page (<http://www.sandia.gov>), and a "complete list" link leads to a subpage (<http://www.sandia.gov/events.htm>) that lists all such upcoming events. Each event name is then linked to either a Web page (if available) that has details or to the e-mail address of a Sandian who can provide more information.

Only unclassified events that are open to people outside the Labs can be listed. Eligible events include those that are being held at Sandia or sponsored by the Labs at other locations.

For more information, contact Sandia's External Webmaster Larry Perrine (12640) at 845-8511 or e-mail lgperri@sandia.gov.

Employee death



RICHARD ORZEL

Rick Orzel of Transportation Systems Analysis Dept. 6641 died Aug. 11 after a long illness.

He was 57 years old.

Rick was a member of the technical staff and had been at Sandia since 1966.

Survivors include his wife Mary and

sons Richard and Robert.

Rick was very involved with United Way of Central New Mexico. Memorial contributions can be made to La Mesa Community Pre-School Day Care, 7401 Copper Ave. NE, Albuquerque, NM 87108.

Sympathy

To Shirley Anderson (12120) on the death of her husband, Donald Anderson, in Albuquerque, June 11.

To Freddie Heard (2345) on the death of his father, Tom Heard, in Albuquerque, Aug. 12.

Sandia LabNews

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LOCKHEED MARTIN

Clean, compact source of extreme UV light patented

Laser plasma source enables patterning of microchips with EUV lithography

By Nancy Garcia

The realization that atomic gas clusters could serve as microscopic solid targets that emit extreme ultraviolet (EUV) light when laser-heated has inspired a recently patented invention that enables research development of EUV lithography to pattern faster, more memory-dense microchips.

Until this invention, synchrotron radiation was the most technically mature alternative for creating EUV light for research lithography systems. An advantage of creating EUV light from laser-heated clusters of xenon gas is that the EUV light that can be gathered and used is potentially brighter than that from a synchrotron, which sprays radiation out in a pinwheel pattern.

In the Sandia invention, a small jet of xenon gas is cooled to temperatures within a few degrees of absolute zero by supersonic expansion into a vacuum. Xenon clusters, in which thousands of atoms are held together by weakly attractive Van der Waals forces, form at these low temperatures. The xenon clusters are heated to about 500,000 degrees Kelvin with pulses of laser light, becoming a plasma. The plasma re-radiates some of this energy, producing EUV light in the process.

Glenn Kubiak, a distinguished member of technical staff in Sandia's Advanced Electronics Manufacturing Technologies Dept. 8250, received a patent on the laser plasma source invention in November 1996, along with Professor Martin Richardson of the University of Central Florida, who was working on creating laser plasma targets from clusters of water droplets.

Glenn began working on laser plasma sources through the Strategic Defense Initiative program with Tim Tooman (8120) in 1987. Sandia began microchip lithography research in 1988. By 1990, Sandia's work on a high-fluence laser plasma source had received an R&D 100 award from *R&D* magazine. Sandia began a collaboration with AT&T on lithography research in the early 1990s.

"It was a natural collaboration," Glenn says, "because we already had several years of development of laser-produced plasmas at that time."

In an EUV lithography research program review at Sandia in April 1996, this source of EUV light allowed lithography researchers to meet several technical milestones. The milestones showed that there were no "show-stoppers" to creating a tool for patterning microchips with this shorter



GLENN KUBIAK

wavelength of light. The shorter wavelength allows creating smaller features than possible with the current commercial process that uses visible light.

"The cluster jet was the only thing that could have achieved that in the source area," Glenn says. Among its advantages are its efficiency at converting the applied laser power to emission of EUV light, and the absence of debris. Creating plasmas from solid laser targets of gold, copper, or tin generates debris that coats surfaces of the tool and ruins its ability to image the lithographic features

to be patterned at reduced sizes on silicon wafers.

This light source is being integrated into Sandia's laboratory research system capable of printing proof-of-principle, functioning microelectronics devices with EUV lithography. The first fully functional transistor patterned with EUV lithography was created on an earlier research lithography system in 1996.

To help develop EUV lithography for commercial use, Sandia is working as part of a Virtual National Laboratory with Lawrence Livermore and Lawrence Berkeley national laboratories.

Two Sandia combustion researchers earn presentation honors

Two Sandians have received citations for excellence following their presentations at the 1997 Society of Automotive Engineers (SAE) International Congress & Exposition.

Pete Witze of Combustion in Engines & Furnaces Dept. 8362 received this award in 1991 and 1977 as well. In 1997, his presentation topic was "LIF (Laser Induced Fluorescence) and Flame-Emission Imaging of Liquid Fuel Films and Pool Fires in an SI Engine During a Simulated Cold Start."

Bob Green (8262) was honored for his 1997 presentation "Planar LIF Observations of Unburned Fuel Escaping the Upper Ring-Land Crevice in an SI Engine."

Both Bob and Pete were given certificates based on evaluations by their audience. The SAE gives the recognition to 5 percent of the talks at the meeting. Past recipients from Sandia's Combustion Research Facility include John Dec of Dept. 8362, who received this honor in 1992.

The 1997 honors entail work sponsored by DOE under cooperative research and development

agreements with car companies for the Partnership for a New Generation of Vehicles, says Dept. 8362 Manager Bob Carling.

John Dec earlier received a prestigious SAE honor, the Horning Award, for technical excellence in the progress of understanding fuel combustion in internal combustion engines. His paper, "Ignition and Early Soot Formation in a DI Diesel Engine Using Multiple 2-D Imaging Diagnostics," written with Christoph Espey, now of Daimler-Benz, was honored at the October 1996 SAE Fuels & Lubricants Meeting. He used a variety of state-of-the-art laser diagnostics to find important new details of diesel combustion.

Previous Horning Award recipients from the CRF are Pete (1985) and Mike Dyer, Director of Materials and Engineering Sciences Center 8700 (1979).

In July, Bob Carling attended Vice President Gore's Sixth Automotive Technical Symposium about diesel emission research for the Partnership for a New Generation of Vehicles.

Sandia California News

Altitude record set in ARM-UAV program

The Altus 2 unmanned aerospace vehicle, built for the Atmospheric Radiation Measurement - Unmanned Aerospace Vehicle (ARM-UAV) program, has reached an all-time record altitude of 43,500 feet during flight demonstrations at Edwards Air Force Base in California.

Carrying a simulated payload of more than

300 pounds, this flight surpassed records of 41,600 feet set a week earlier. This milestone is just another in a series of successes for the Altus program.

Sandia, technical director for the ARM-UAV, which is a DOE global climate change research program, made the announcement in conjunction with General Atomics Aeronautical Systems, Inc., and the Naval Postgraduate School. Host services were provided by NASA through the Dryden Flight Research Center.

The Altus program has completed one deployment in the fall of 1996 in support of the ARM-UAV Program at the DOE Cloud and Radiation Testbed Site in north-central Oklahoma. This deployment consisted of UAV flights to investigate the interaction of clouds and solar energy in the atmosphere, culminating in a record-setting endurance flight of more than 26 hours measuring the heating and cooling of the Earth's surface over a complete day/night cycle.

Altus is being developed as a high-altitude, remotely piloted aircraft for climate research. Controlled from the ground, Altus offers the advantage of long endurance (up to 36 hours) and high altitude (up to 65,000 ft).

The ARM-UAV Program is conducting a month-long series of flights at the Cloud and Radiation Testbed Site in September to take advantage of the increased altitude capability of the Altus 2. These flights will continue research on the effect of atmospheric aerosols, water vapor, and clouds on global climate change.

(Continued from preceding page)

Safety Management System, which emphasizes safety through formal work planning, hazards analysis, hazards control, work performance, feedback, and improvement mechanisms.

The fine of \$56,250 was reduced from the possible \$75,000 penalty because, according to DOE, adequate corrective actions have been taken at the RMWMF since the incident. But DOE/HQ says it will continue to monitor implementation of planned site-wide actions, which include efforts to communicate lessons learned about the occurrence and to revise and improve a number of procedures.

The Labs-wide effort, it is hoped, will result in improved guidance to line organizations through the Radiation Protection Safety Committee, says Tom.

"We're grateful that no one was injured or exposed to dangerous amounts of radiation as a result of this," he says. "We've thoroughly investigated this accident and we've used it as an opportunity to strengthen our procedures to help prevent such incidents in the future. We are, in fact, working right now with DOE safety auditors to ensure that our new Integrated Safety Management System helps us provide a

truly safe work environment."

Preliminary notices of violation become final in 30 days unless the DOE contractor denies the violations occurred. Sandia does not plan to contest the violation.

In a related announcement, DOE has waived a potential \$40,000 civil penalty against Sandia for the December 1996 "scram" incident at the Annular Core Research Reactor (ACRR), citing an effective Sandia response.

"These two actions highlight the philosophy behind the Department of Energy's enforcement program, which is to use nuclear safety rules to encourage safety, not just to punish unsafe behavior," says Tara O'Toole, DOE Assistant Secretary for Environment, Safety, and Health. "The department will forego civil penalties if the contractor takes initiative to find and correct problems. However, we won't hesitate to issue penalties where that response is lacking."

Tom notes that the different approach to these two incidents by DOE demonstrates the importance of not only identifying potential problems but also promptly notifying management so quick action can be taken.

—John German

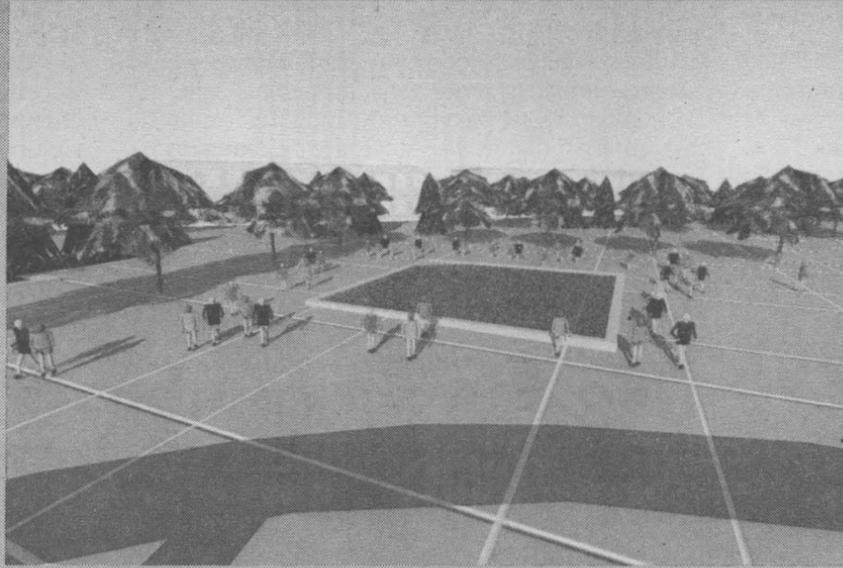
New CNSAC mall soon to be focal point of Tech Area 1

Imagine the president of the United States speaking to thousands of Sandians gathered among benches and trees on a concrete mall next to the new Center for National Security and Arms Control (CNSAC), Bldg. 810.

Within a few short months, such a scene won't be difficult to imagine. For by next February a new 450-foot-by-135-foot mall should be in place just north of CNSAC. The mall, designed by Design Workshop, Inc. of Albuquerque, will include a combination of large concrete areas interspersed with a variety of trees and shrubs. There also will be benches and tables throughout the area for people to use anytime the weather permits.

But what excites many Sandians about the new mall is its ability to accommodate several thousand people for special events, including visits from notable VIPs.

"This mall will create a focal point where Sandians can gather for meetings that might otherwise have been in the TTC (Technology Transfer Center), or to hear such notable speak-



NEW MALL next to the Center for National Security and Arms Control building will cover more than 60,000 square feet and provide a comfortable setting for gatherings. (Illustration looks north from the CNSAC entryway.) Construction of the mall is slated to begin in early September and be completed by February 1998.

ers as the president," says Roger Hagengruber, VP of National Security Programs Div. 5000.

Roger, who lobbied for the mall's creation, said Sandians were in need of an attractive space

large outdoor events."

Come February all we'll need is the president.

inside the tech area that would allow them to enjoy outdoor meetings and lunches, as well as accommodate large gatherings. Roger asked Pat Chavez, Manager of Capital Facilities & Equipment Program Office 5135, to work with Sandia's Facility Organization office, most notably Rico Ortiz, to come up with an initial design. Pat then took the plan to Executive VP and Deputy Director John Crawford to seek funding. Having witnessed the benefit of such a mall at Sandia/California, John committed to funding the project, Pat says.

Construction is scheduled to begin in early September and be completed by February 1998.

"This area will be a long-term asset for Sandia in which employees will benefit daily," Pat says. "It will also be the first time in Sandia's history that we will be able to take advantage of our ideal weather for

—Chris Miller

CNSAC building

(Continued from page 1)

CNSAC programs into one building.

"CNSAC represents the finest facility I know of for the close integration of arms control and related national security programs," he says. "It offers outstanding connectivity for experts working problems in this area, including the sharing of common databases and collocation of individuals who work on these problems. It positions Sandia to be a national leader in this work as we move into the next century."

Roger says consolidating Sandia's most secure operations into one building also reduces operational costs. Maintaining top security at scattered facilities throughout the labs, he says, was both costly and inefficient.

Peace-keeping technologies

In the same manner nuclear weapons helped to keep the Cold War on ice, sophisticated technologies are being designed to maintain the peace. A growing number of international agreements and treaties call for a halt to the spread of weapons of mass destruction. But those treaties will exist only as long as nations can be reasonably sure there are no violations. CNSAC has unique resources to provide that verification.

For instance, Sandia is developing security systems for nuclear material storage and transport to ensure that those materials don't fall into the hands of terrorists or aggressive states; creating seismic and infrasound (very low frequency



PATRICIA NEWMAN (5337) stands on the podium in the CNSAC auditorium, which provides seating for 100 people.

sound) systems and satellite-based systems to ensure compliance with the Comprehensive Test Ban Treaty; designing synthetic aperture radars that provide images of ground terrain during day or night or through cloud cover; and producing advanced microsensors, much smaller and more accurate than current systems, to detect chemical

and biological agents.

In addition, Sandia's Cooperative Monitoring Center is laying a foundation for trust among nations, even former enemies. The center, which is a part of CNSAC despite its location in Research Park east of the Eubank Gate, provides a neutral forum in which foreign visitors can learn about state-of-the-art technologies for treaty monitoring, and where they can discuss arms-control issues and policies. The emphasis is on workshops, demonstrations, and hands-on training.

Visitors often return home with a better understanding of how shared technologies can make cooperative agreements work.

While the CNSAC building brings under one roof Sandia's major national security program areas, much of the hands-on work to develop the technologies takes place throughout the Labs.

(Continued on next page)

"CNSAC provides first-class working space for many of those Sandians who carry out our vital national security work."

CNSAC's six principal goals

- Implement new sensor technologies to verify that no nuclear detonations occur in the atmosphere, underwater, or underground anywhere in the world. This includes seismic technologies, which detect and characterize underwater and underground nuclear explosions.

- Develop technologies to monitor nuclear materials and weapons to ensure the materials do not fall into the hands of terrorists or aggressive states.

- Work with former Soviet Union scientists and engineers to help refocus their day-to-day activities from weapons development to commercial enterprises. This includes collaborations with FSU scientists, enabling them to share access to technologies and test facilities in order to improve the safety and security of

their nuclear materials.

- Develop airborne satellite systems to detect and characterize telltale manufacturing emissions associated with nuclear, chemical, or biological weapons.

- Develop Sandia's capability to produce high-resolution, 3-D images of objects on the ground, using aircraft-mounted devices that direct electromagnetic energy to the ground and receive its reflected echoes. These images provide a more complete look at potential proliferation activities.

- Build trust and confidence among nations and agencies throughout the world through Sandia's Cooperative Monitoring Center.

'Revolutionary, visionary' CNSAC builds international trust, says Secretary Peña during Aug. 25 visit

Calling Sandia's new Center for National Security and Arms Control (CNSAC) "revolutionary and visionary," Energy Secretary Federico Peña Monday said the Center "will be the focus of a worldwide movement toward greater openness, accessibility, and mutual cooperation."

"Rather than waging war," Peña said, "we are waging peace by building a new era of international trust and security."

Peña, in Albuquerque on a vacation visit to his in-laws', made his comments during an afternoon news conference at Sandia. That morning he had been briefed on a number of Sandia programs and received a tour of the new CNSAC building, which was dedicated Thursday.

During the news conference, Peña also announced that a Sandia-developed explosives detection portal (see photo on page one) will be deployed "sometime in the next few weeks" at the Albuquerque International Sunport.

"We hope that with its [the portal's] demonstrated competencies," Peña said, "we can then develop it further and share it at many other airports throughout the country."

Peña, explaining that other business prevented him from participating in the formal CNSAC dedication, congratulated Labs President C. Paul Robinson, VP for National Security Roger Hagengruber (5000), and "the entire Sandia team" for its efforts to bring CNSAC to fruition.

CNSAC, he said, has a vital role to play in the nation's post-Cold War security.

"I believe that we face no greater danger to our national security," he said, "than from the



ENERGY SECRETARY Federico Peña (second from left) gets a briefing in the new CNSAC building from Roger Hagengruber (left), VP for National Security Div. 5000; Labs Director C. Paul Robinson (center); Labs Deputy Director John Crawford (second from right); and Bruce Twining, Manager of DOE's Albuquerque Operations Office.

possibility that a terrorist or rogue state would acquire weapons of mass destruction. And until we eliminate this threat our nation will never be secure.

"The work being done at the Center [CNSAC] is bringing Sandia's enormous technical

and scientific skills, once dedicated to winning the Cold War, to developing new arms control monitoring and verification technologies."

Peña had high praise for the work being done in bomb disposal technology.

"You know of course the problems we've had in the United States over the last several years [with terrorist bombings], but they are doing very good work here at Sandia in trying to anticipate new kinds of devices that might be used by terrorists, how best to detect those devices, and how best to dismantle them. I was briefed today on the very excellent work being done in the bomb disposal unit [Dept. 9333] and I must say it is state of the art, it is extraordinary; and I think it reflects the work the administration is doing in trying to anticipate, as much as possible, how we provide additional security for the American people in light of a changing world."

Peña also cited Sandia's work in renewable energy and its establishment of a "virtual lab" with the Colorado based National Renewable Energy Laboratory, as a key element in the administration's long-term energy strategy.

In response to a reporter's question, Peña reiterated DOE's support for the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory.

While calling Sandia's z-pinch accomplishments "extraordinary," Peña said NIF and z-pinch are complementary programs and that the nation needs both.

"I know there have been some questions raised by some scientists about the value of NIF, but I think overall, we still strongly believe NIF is essential," he said.

Paul, sitting beside Peña during the news conference, agreed that the capabilities of the devices reinforce each other.

"I think both the facilities are needed . . . Our goal is to get greater utility out of our facility as well as out of NIF because there's challenge to go around for all of us as we try to find a substitute for nuclear-weapons testing."

The real debate surrounding NIF, added Paul, has been, "Is there sufficient funding to do all of them?" — NIF, z-pinch, and other science-based stockpile stewardship facilities, while still providing resources for conducting other vital surety activities.

In this regard, Paul said, "There have been some very important deliberations done with the administration, and as we followed up with deliberations in the Congress. . . It's my belief and my hope that both the administration and the Congress will align to provide enough money for both of these important facilities to move ahead."

—Bill Murphy

(Continued from preceding page)

Also, many Sandia scientists and engineers travel periodically to the former Soviet Union to work jointly with the Russians on nuclear protection programs, as well as to other places throughout the globe to help nations develop responses to national security threats.

CNSAC is home to four elements of Sandia's National Security Program:

- The Systems Analysis team keeps abreast of national defense policies and evaluates the effects that new technologies have on the deployment, vulnerability, and use of nuclear weapons systems.

- The Advanced Concepts group investigates new and conventional technologies and proposes countermeasures to potential threats.

- The Systems Assessment team assesses foreign technologies and supports DOE efforts to identify threats to US national security.

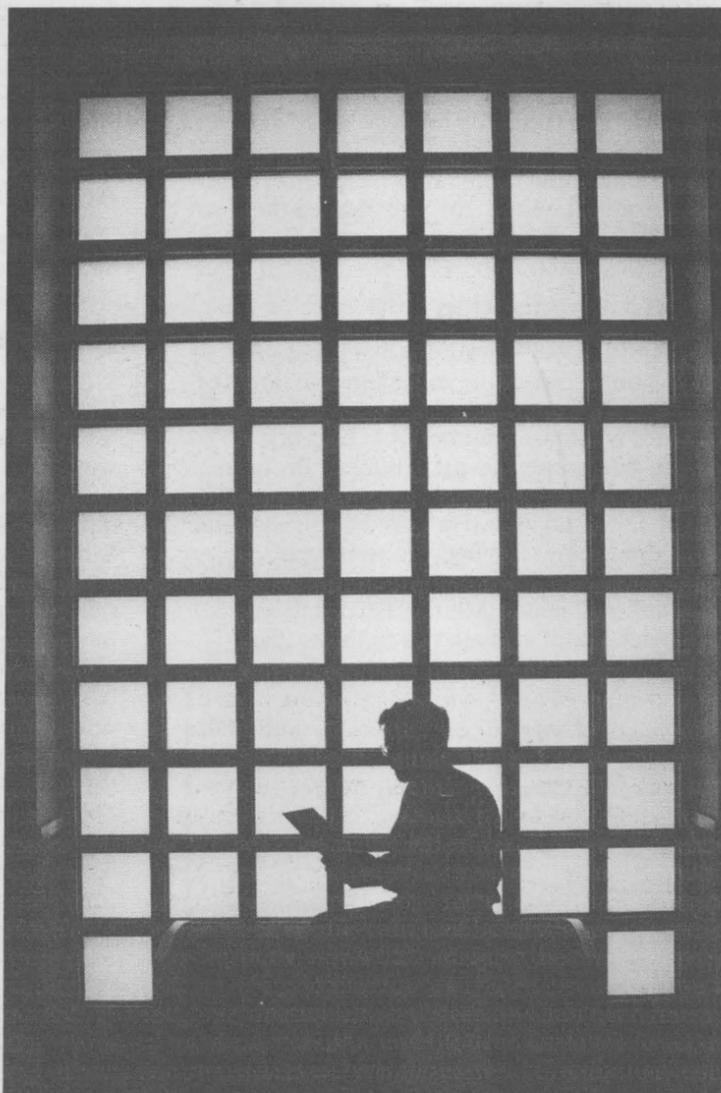
- The Remote Monitoring and Verification group supports international arms-control treaties by designing, engineering, producing, and fielding monitoring instruments and by advising the US government on verification needs.

The facility

An important, in fact, indispensable feature of the \$34.5 million CNSAC building is its physical layout that guarantees secure communications.

In addition to office space and conference rooms, the 85,000-square-foot building has an auditorium that includes high-resolution monitor displays, as well as microphones and connections for PC-based presentations at each of its 100 seats. The auditorium also is equipped with large-screen video projection and multicamera digital recording.

"The philosophy we adopted when we began to 'open up' the laboratories for more visitors and



TOM BARGER (5932) finds a comfortable spot to read in the new Center for National Security and Arms Control building.

(Photos by Randy Montoya)

community interactions was to have fewer of our projects be classified," says Labs President and Director C. Paul Robinson. "However, for that remaining portion of our work where secrecy is vital to the nation's continuing security, we have put in place very tight security. CNSAC provides first-class working space for many of those Sandians who carry out our vital national security work."

Recollections from Sandia's first 50-year employee

When it comes to the Labs' history, Roy Crumley has seen it all

By John German

On Tuesday, Sept. 9, Roy Crumley plans to come to work like any other day.

Except that he won't have to traverse miles of scrub brush along dirt roads on a motor scooter. Except that his office building won't be surrounded by hundreds of bombers just returned from World War II. And Harry Truman won't be president.

Yup, other than a small gathering of his co-workers, and a cake with a "50" in frosting, it'll be like any other day of Roy's Sandia career.

On Sept. 9 Roy will be the first person to put 50 years of Sandia service behind him. The next closest is Merrill Jones: 49 years, 2 months (see "Sandia employee seniority - Top 40" below). Roy is the only active Sandia employee who was here when Sandia wasn't "Sandia," but Z-division — offspring of the Manhattan Project.

Why stay with the same company, virtually in the same position, for five decades? "It's a great place or I wouldn't still be around," Roy says.

Need to know

Fifty years ago today, 18-year-old Roy had just graduated from St. Mary's High School near downtown Albuquerque, class of '47. He'd recently lost his part-time job at Safeway to a soldier returning from the war. His family had no money to send him to college. He occupied himself flying gas-powered model airplanes.

A family friend, Bill Dennison (ret.), asked Roy if he'd be interested in earning a paycheck at a remote outfit called "Z-division" in the foothills southeast of Albuquerque. Roy had only a vague idea of what Z-division did, but he agreed. He needed a job.

A few months later he met his new boss, director of "Z-10," Z-division's procurement organization. Roy spent a few weeks learning the ropes in the warehouse, then was assigned the task of amassing a library of catalogs for Z-division's 500 employees to order supplies from.

Back then, Sandia's role as the engineering and ordnance division of Los Alamos Scientific Laboratory was to stockpile the materials and parts needed to build nuclear weapons, with the ultimate goal of rapidly boosting the number of US nuclear weapons from the 13 the nation possessed in early 1947. All of Sandia's



Roy Crumley in 1947



WHERE WILL YOU BE IN 2047? On Roy Crumley's first day of work in September 1947, he never thought that far ahead. He was just a high school graduate who needed a paycheck after being displaced from his part-time job by a soldier returning from World War II. Today Roy is Sandia's first 50-year employee and the only remaining Sandian to have worked at Z-division, which became Sandia Laboratory in early 1948. He posed last week with another Z-division veteran, Bldg. 828 in Area 1, one of Sandia's first permanent structures. (Photo by Randy Montoya)

procurement took place through Los Alamos and, ultimately, the University of California (UC), which managed the lab for the federal government.

One of Roy's early jobs was as a courier. He remembers traveling back and forth between Sandia and "The Hill" in an olive drab '41 Ford with procurement paperwork to be signed at Los Alamos and then shipped on to UC. He had only a vague idea about what the stuff he helped procure was being used for.

"Back then they only told you what you needed to know to do your job — and I didn't need to know much," he says.

The only "line-of-sight" Roy needed then was his paycheck — \$165 a month — a windfall for a high school graduate in 1947.

A classy organization

In spring 1948 Roy got his first promotion. As Sandia's only "buyer," he made sure the stocks of raw materials were adequate and prepared purchase orders for whatever was needed — bags of cement, steel, paper products, lumber. Because builders couldn't keep up with Z-division's rapid growth, most supplies were stored outside in large crates, even some classified weapons parts.

Security was tight. If you were working late or on a weekend, an MP (Military Police officer) would yell "Halt!" and ask you to throw your

badge to him. "He'd keep his distance, and he'd really inspect it, front and back," he says.

In early 1948 Z-division became "Sandia Laboratory," a separate branch of Los Alamos, and in November 1949, AT&T (which managed the Bell system with Western Electric) took over from UC management of the new, separate lab. Roy remembers the trepidation among employees about WE's "takeover" from the "kindly" UC.

"That turned out to be an unnecessary worry," he says. "Western Electric was a classy organization that brought in quality people."

Arms race urgency

Roy says he can't remember when he realized Sandia was a key player in the "arms race" that spawned the Cold War, other than gradually becoming aware of "who the possible enemy was." But he remembers the sense of urgency that arose in the early 50s — the Soviet Union tested its first atomic weapon in 1949 and first thermonuclear device in 1953 — as Sandia began hiring the top-notch engineers and physicists needed to carry out Sandia's weapons design, testing, and ordnance missions.

"Before then all the critical work had been carried out at Los Alamos," he says, "and most Sandia people were former military people. That changed with the hiring program in the early 50s. That's when the PhDs started arriving."

In December 1954, Roy met his wife-to-be, secretary Jo Lowman, on the northwest stairwell of Bldg. 892. They've been married since April 1956.

In the 50s, 60s, and early 70s, a decreasingly isolationist US military policy created new technology needs, and Sandia began to branch out into different types of work, including making US nuclear weapons safe for shipping to and staging in foreign lands by developing special access codes, anti-intrusion technologies, and shipping containers.

In the mid 60s, Roy spent two years as section supervisor in Production Control (the only two years he wasn't in Procurement), then was promoted to division supervisor of Purchasing in 1967. He headed procurement for the Particle

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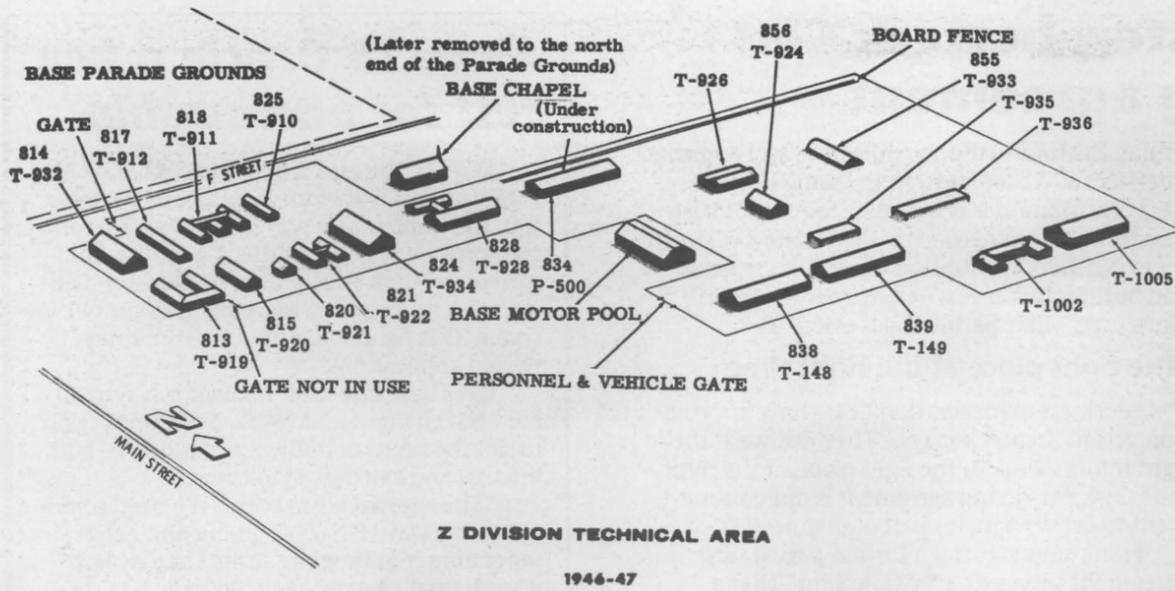


Roy Crumley in 1997

Sandia employee seniority — Top 40

The following are the top 40 regular Sandia employees by seniority. Thanks to Bonnie Vigil of Human Resources Division Information Systems Dept. 3050.

Name	Service date	Name	Service date
1. Roy Crumley (10232)	Sept. 9, 1947	20. Jose Suazo (2411)	June 10, 1957
2. Merrill Jones (5715)	July 6, 1948	22. Don Rigali (2400)	July 1, 1957
3. Horace Poteet (5933)	Nov. 14, 1951	22. Kenneth Flynn (12363)	July 1, 1957
4. Gilbert Leyba (1412)	April 2, 1952	24. Paul Martinez (7433)	July 22, 1957
5. Donald Robbins (9782)	Sept. 22, 1952	25. Carlton Furnberg (8116)	Oct. 25, 1957
6. Jacob Aragon (7435)	Nov. 26, 1952	26. Ernest Sanders (5831)	Nov. 4, 1957
7. Walter Dalby (2645)	Feb. 19, 1953	27. Larry Wilhelm (4913)	Nov. 26, 1957
8. Gordon Boettcher (1565)	July 10, 1953	28. Diana Mares (3344)	Nov. 28, 1957
9. Stan Spray (12331)	July 19, 1954	29. Mary James (10501)	Feb. 3, 1958
10. Robert Leslie (12364)	April 5, 1955	29. Gerald Gay (2412)	Feb. 3, 1958
11. Don Lewis (12332)	June 28, 1955	31. Tommy Sellers (5300)	Feb. 5, 1958
12. Jake Gonzales (1402)	Aug. 29, 1955	32. Charles Arning (5513)	March 27, 1958
13. Ben Sedlack (12303)	July 2, 1956	33. James Cole (9115)	April 15, 1958
14. Patrick Gildea (8412)	Sept. 10, 1956	34. Albert Dennis (6121)	April 17, 1958
15. Alfred Foster (2413)	Oct. 2, 1956	35. William Love (9719)	June 16, 1958
16. Marvin Plugge (5511)	Feb. 11, 1957	36. James Wright (2200)	June 25, 1958
17. Hugh Church (6612)	March 4, 1957	37. James Duggar (8120)	June 30, 1958
18. Robert Reed (2121)	April 1, 1957	37. William Paulus (5845)	June 30, 1958
19. Robert Foster (1544)	June 4, 1957	39. John Middleton (12363)	July 1, 1958
20. Harold Spahr (9115)	June 10, 1957	40. Albert Harrison (8513)	Aug. 4, 1958



MAP OF Z-DIVISION in 1947. Bldg. 828 is the only building on this map that remains standing. Main Street (bottom left) is Wyoming Blvd. today.

(Continued from preceding page)
Beam Fusion Accelerator II (now the "Z" machine), as well as Sandia's COIN (Counter-Insurgency) program to develop aircraft-dropped seismic sensors that could detect movements of enemy troops and heavy equipment in Vietnam.

He survived "the layoff" in 1973 (see "Roy Crumley remembers when . . ." at right). Shortly thereafter, the energy crisis of the mid 1970s put Sandia scientists to work finding better ways to tap the nation's energy resources.

Never needed a resume

Roy claims he has worked under 11 procurement directors and asked the current one, Dave Palmer, to join purchasing in the late '70s.

Once, in 1977, he admits he considered looking for another job. He even typed a resume, the only one he ever had. But he never used it. His boss convinced him to stay.

"I wondered if another job might offer more pay or benefits," he says. "I think everybody has gone through that at one time or another.

"When I started shopping around, I found it was hard to beat what Sandia was giving," he adds.

And it's not just the salaries and benefits, he says. It's the people. The mission. The quality of Sandia's work. All of it.

A Sandia savings plan participant since 1969, Roy says he could retire at any time if he wanted. But at a July 21 luncheon in his honor, Roy told some of Sandia's top executives he doesn't plan

on leaving soon either. His 50-year service anniversary is just another day at Sandia as far as he's concerned. (See "Do you know Roy? Celebrate his 50 years at Sandia Sept. 15" below.)

He does have his eye on that day two years from now, however, on which he says he'll be able to receive four paychecks simultaneously: 401K, retirement, social security, and payroll.

Joy Martinez (10232), a 30-year-old employee who has worked with Roy for about two years, says he has the mind of a young person. "He's like the Energizer Bunny — he keeps going and going," she says. "He does everything by the book. He's a real go-getter."

Julie McBride, a buyer in R&D Program Procurement Dept. 10230, says, "Roy's a great story teller. That's one of his big strengths."

"Fifty years went by much too fast," adds Roy. "It's hard to believe it's been 50 years already. But my wife has kept me young at heart and young in mind."

(Thanks to research historian Rebecca Ullrich of Sandia's history program for her help with this article.)

Once, in 1977, Roy admits he considered looking for another job. He even typed a resume, the only one he ever had.

Roy Crumley remembers when . . .

The following are Roy Crumley's recollections (paraphrased) of significant times in Sandia's history.

Commuting to work in the early days: Wyoming south of Central was open field on each side of a narrow two-lane road all the way to what is now Tech Area 1. When there was a heavy snow storm, people would get lost miles off course because they couldn't see the road.

Atmospheric nuclear testing in the Pacific: We knew it was going on, but there wasn't a lot of talk about it. If you weren't directly involved, you didn't need to know.

Early publicity about Sandia's work: Sandia always kept a low profile. There was never anything in the papers.

Arms race in the 1950s: No one used the term "arms race." Schedules for procuring things grew increasingly critical. I began to grow familiar with the names of the weapons when I prepared invoices for this test or that test.

"The layoff": Before Christmas 1972, we were told funding was in good shape despite some rumors we had been hearing. Around February 1, a list of people who might possibly be laid off was issued. I wasn't on the list. They offered an incentive to those people to leave. A lot of people didn't want to leave and were upset.

Corporate initiatives: I don't know whether these initiatives are making Sandia a better place or not. Sandia has always had quality products that were 99.9999 percent reliable. ES&H [Environment, Safety, and Health] and the Tiger Team seem to have raised people's consciousness about job safety.

Sandia's funding, long-term prospects: George Dacey [Lab President, 1981-86] said he didn't want to be president when Sandia's budget reached one billion dollars. In the old days when you had a problem, you just shifted more money and more people toward it. People are more conscious of funding now than ever before. Sandia will probably be here well into the future, but whether the level of funding and employment stays the same remains to be seen.

Generation X, company loyalty: Younger employees seem to get what they can get and move on. There's no investment. I guess I don't really blame them. There aren't many promotions anymore, even to fill openings. Commitment is a two-way street. If the company makes an investment, it should get a return on that investment, and vice versa. The longer you stay, the more relationships are built. When there are so many new faces, the camaraderie isn't there. It seems like the younger employees today are well educated and sharp. I wasn't nearly as sharp at that age. They have a lot to offer.

Advice to young employees: Do the very best you can, all the time. Don't sell yourself short, or the company. Give it full value and you'll get full value in return. Strive to treat people fairly, honestly, and with respect and integrity and you'll be satisfied with yourself.



SANDIA BASE IN 1946 looking north-northeast, shortly before Roy's arrival. World War II aircraft surround the Z-division grounds. After the war, hundreds of B-29s, B-24s, B-17s, and P-51s were retired to Sandia Base and cut up for scrap metal in 1946 and 1947. The intersection of Central and Wyoming is slightly left of and above the photo's center.

Do you know Roy? Celebrate his 50 years at Sandia Sept. 15

Colleagues of Roy Crumley are hosting a party at the Coronado Club on Monday, Sept. 15, 3:30-5:30 p.m. Anyone who has known or worked with Roy during his 50-year Sandia career is welcome. Refreshments will be served.

Please RSVP to Joy Martinez, 844-3721, jlmart@sandia.gov; Ramona Rael, 844-1337, rerael@sandia.gov; or Martha Trujillo, 844-6474, mgtruji@sandia.gov.

Getting to 'cheaper, faster, better': CFO and CIO sign partnering agreement

By Bill Murphy

In an era when the Labs has made forging technical and business partnerships a key strategic objective, Chief Financial Officer Frank Figueroa and Chief Information Officer Mike Eaton see that partnering makes sense for their "how" objectives as well.

The two leaders this week signed a formal agreement committing themselves and their organizations to an integrated response to the Labs' new corporate goals and the requirements of its business managers.

There was, to be sure, a certain inevitability to this partnership. In signing the agreement, Frank (10000) and Mike (4010) are formalizing a relationship that is well underway. The two organizations, notes Frank, have



FRANK FIGUEROA

Business managers don't care how information gets to them. They just want the right information, in the right place, at the right time.

several joint initiatives to meet the corporate goal of a support infrastructure that is a competitive business advantage and that contribute to making the Labs' operations "cheaper, faster, and better."

"I see this agreement as the one of several engineering and infrastructure

partnering agreements that must be forged to deliver the information that our business managers consider vital to their success," Frank adds.

Here's how CFO and CIO responsibilities make their partnering important to Sandia's business managers: The CIO is responsible for estab-

lishing the information architecture and requisite interfaces and standards. At the same time, the CFO organization is responsible for critical business information needed by the business managers. Neither organization can fulfill the goals and business managers' requirements working alone, says Mike; partnering is essential.

'The right place at the right time'

"Business managers don't care how information gets to them," he says. "They just want the right information, in the right place, at the right time. This partnering agreement is our commitment to deliver a major part of that need."

Frank says signing a formal partnering agreement serves as a "visible sign" that a shared commitment to the corporate goals comes from the highest level of their respective organizations.

"Frankly, at the staff level, our folks are already working together pretty well.

The agreement really puts us personally on the line to model the

partnering behavior and to deliver. I think this has important symbolic value. We want to have that signed agreement as something tangible to remind us of our joint commitment to meet our corporate goals and the needs of Sandia's business managers.

"Working together, partnering, doesn't mean we won't disagree professionally from time to time," Frank says, "but whatever disagreements we have, we will resolve internally within the context of the corporate goals and the business managers' requirements. Then we will speak with a common voice and deliver. That's what this is all about for Sandia and for the business managers."

The acid test for the new pact is the integration of the CFO's new Oracle financial project (see "Oracle brings 'best business practice' software to Labs' financial systems," at right) with the CIO's

(Continued on next page)



MIKE EATON

Move to Oracle a key test for partnership

Perhaps the area where the CFO and CIO organizations will work most closely together is in the implementation of the Oracle financial software system. Oracle, a commercial software system widely used in industry, will replace a homegrown (developed in-house) system that Sandia has used for its money-related applications.

Over time, the Labs' homegrown system has been changed and tweaked time and again to suit the needs of individual customers, both internal and external, Frank says.

"The approach has been, 'We need something this way? Fine. We go out and get a programmer to program it the change. But it's extremely expensive to do so.'

So, says Frank, the existing system, while it has been good at evolving to meet various reporting requirements, has also resulted in a "somewhat laborious" system.

"The system is not tuned for agility, for the needs of our internal customers. It also is expensive to maintain and make changes."

With an eye on increased agility, and a mandate from DOE, Lockheed Martin, and Sandia's leadership to adopt best business practices, a decision was made to scrap the existing system and migrate to Oracle.

"But even if you were to take our CFO/CIO commitment to meet the corporate goals and the needs of our line managers out of the picture, you'd still be left with a non-Year-2000-compliant financial system," Frank says. "Fixing that would be a big job in itself, and when you were done, you'd still be left with this awkward, laborious system."

The move to Oracle puts the main burden of upgrades on the supplier's shoulders: "That will all be done by Oracle. And for us to then adhere or adapt to a new version will be much, much less expensive than if we had to redo the software ourselves for a big new capability that we might want to have.

For additional information on the Oracle Financial Project, contact Oracle Project Director Ralph Bonner (10300) at 845-3511.

The Enterprise Information Plan: Building the shared vision of and commitment to information as a Sandia business advantage

"Use your world-class information system and technology to provide Sandia business advantage." That was the advice the Red Team gave Mike Eaton, Sandia's Chief Information Officer, last summer. From its commercial perspective, the Red Team was very impressed by Sandia's investment in information, but said it didn't perceive the business advantage Sandia sought to gain from that investment. The IS&T Red Team recommended an Enterprise Information Plan (EIP) as a vehicle to identify and realize that business advantage.

Mike implemented all of the Red Team's recommendations but felt the EIP recommendation was particularly crucial. So crucial, in fact, that he hired the Red Team Leader, Doug Weaver (then Org. 6604, now 4013), to make the EIP a reality.

"Developing the EIP shared vision of information as a business advantage has taken much longer than we thought," said Doug. "We've needed several rounds of ever-more-detailed bottom-up focus groups and top-down SQLC guidance and direction. But after almost nine months of work, we now have a shared Sandia vision of information business advantage — a revolutionized product realization process that seamlessly integrates engineering, business, and management tools and information."

"The corporate strategic planning process and the Enterprise Information Planning [EIP] process have both made it crystal clear," says Mike, "that our business managers see their ability to exploit technical and management infor-

mation as vital to Sandia's future.

"The two plans," he says, "mandate a virtually integrated information system, one in which information is entered once and used often. We've decided to put special emphasis on the relationship between our two organizations to make virtual business management information a near-term reality."

"Our business vice presidents consider a revolutionized product realization process crucial to the Labs' viability in the marketplace of the 21st century," Mike says. "To remain viable the Labs needs to develop a models- and simulation-based engineering process where products are fielded with the same or greater confidence but with less testing, time, and cost. To develop such a process, the existing product realization process must be reevaluated, integrated, automated, and seamlessly supported with engineering infrastructure information.

"To improve customer satisfaction, we must also manage business and project performance in new ways — not just manage the expenditure of money. Business and work management must be an integral part of the new product realization process and be seamlessly supported by infrastructure information.

"As you can see," said Mike, "the shared information vision is a huge undertaking; as challenging as any Sandia system development effort. It involves the work of almost every Sandian in one way or another."

"Given the outcome our business managers

require and the need for pervasive involvement," said Mike, "we also need a new enterprise approach to achieving it — our traditional organization-centric approach just will not work. Locally optimized piece-part solutions haven't and won't deliver the desired outcome. As a result, we're piloting a different approach, one in which partnerships are used to embed enterprise information commitments and deliverables in the work of the Laboratories."

Three EIP projects (models and simulation product realization project led by Paul Hommert, integrated and automated product realization process project led by Gary Ferguson, and work-centric infrastructure information project led by Paul Merillat) will be defined and managed as a system with a common enterprise information architecture, but the tasks will be distributed throughout the laboratories. Partners are asked to set aside a part of their own resources to help achieve the enterprise vision. Mike led the way, carving out 10 percent of the indirect information budget to support the EIP projects.

"There is certainly risk in this new approach," said Mike, "but as Gary Ferguson says, 'If you want to change the outcome, you've got to change the process for achieving that outcome.'"

If you would like more information about the Enterprise Information Plan, projects, and partnerships, contact Mike Eaton or Doug Weaver. The FY98 EIP will be released in September.

Sandia plasma-monitoring computer program saves money for microchip and circuit board makers

By Neal Singer

A glitch in a microchip manufacturing plant can be costly. After hundreds of internal processes have nearly fabricated the next batch of wafers and, say, circuits are etched to the wrong depth and the defect goes unnoticed, the ruined lot may mean millions of dollars in sales have been delayed or lost.

A sophisticated computer program developed by researchers at Sandia, coupled with a camera and peripheral equipment, should help microchip fabrication companies sharply reduce the number of these large losses.

"It's to a corporation's advantage to recognize and correct malfunctions in production as they occur. The possibilities of loss are enormous, running into the millions of dollars," says Sandia scientist Pam Ward (1812), who with Sandia researchers Joel Stevenson (1841) and Michael Smith (9577) developed the technique.

The relatively inexpensive technology also rectifies fabrication errors in the last stages of manufacture of printed circuit boards. An intact, high-end circuit board batch sells for about \$100,000.

Entrepreneurial leave planned

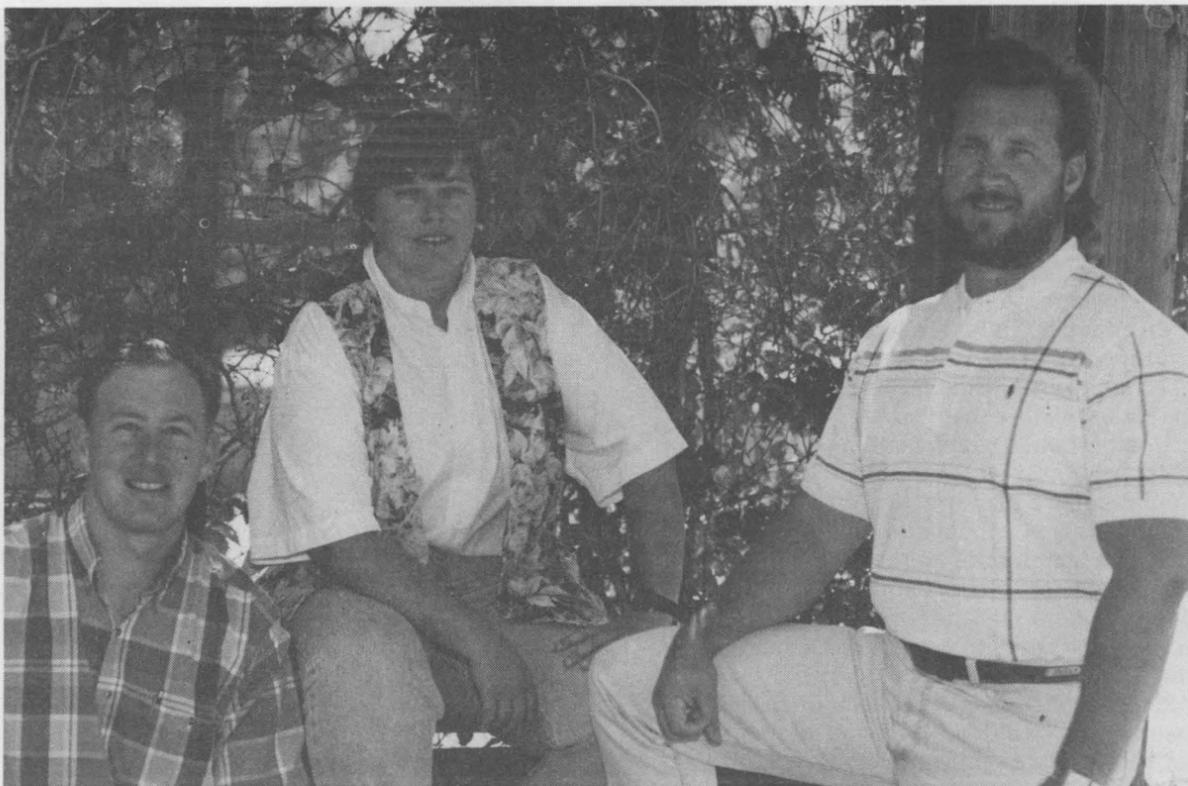
Pam plans a two-year entrepreneurial leave to market the product they created.

The program and machine package will be made available to interested companies "at competitive prices," according to Pam.

Says Rick Markle, a senior process engineer at Advanced Micro Devices, a chip fabrication company in Austin, Texas, "From a user's standpoint, I was floored by the sophistication yet simplicity of the revised software."

The Sandia program can control up to 64 pieces of equipment, and, once the monitor detects failure, can page help, sound an alarm, do diagnostics, adjust plasma parameters, or replace a part.

The technology was originally developed to aid the US circuit board industry, which was "imploding" from foreign competition during the late 1980s, says Cliff Renschler, manager of Electronic and Optical Materials Dept. 1812. To rely on foreign manufacturers for a key item of America's defense was a less-than-desirable



TEAM MEMBERS, from left, Michael Smith (9577), Pamela Ward (1812), and Joel Stevenson (1841) developed the computer program that should help microchip and circuit board manufacturers save millions of dollars each year.

situation, he notes. Sandia played a part in the successful effort to reverse this trend.

Since printed circuit boards and microchips are both etched by plasmas — hot ionized gases — extension of the monitoring technique from board to chip manufacturing was an obvious progression, says Pam.

The Sandia process uses a camera that spectroscopically analyzes optical emissions from plasmas as they etch printed boards or silicon wafers. While the technique is not new, Sandia's sophisticated programming allows near-instant analyses of emitted wavelengths to detect if the plasma is misbehaving.

"Plasmas have a fingerprint," says Pam. "Our tool looks at that fingerprint, then compares it to fingerprints of known failure. The pattern recognition is done by a laptop computer, which is part of the tool."

"It's absolutely valid to say that Sandia has delivered by learning what industry needed, and we're excited for '97," said Markle of Advanced Micro Devices earlier this year. The company has been working with Sandia on the project since September 1995 as part of a SEMATECH project and put the new developmental program in place in December 1996. Sematech is an Austin-based consortium of American semiconductor manufacturers.

The problem with plasmas, says Pam, is that "they don't always behave as they should. Two or three gasses may be involved, and manufacturers hope that everything remains constant, but the mechanisms are temperamental. There may be a leak that allows air to enter and form

its own plasma. Or, the flow controllers — electronic valves — may stick, producing the wrong mix, or the pumping speed may be off, or a residue of moisture may be in the system. It all affects how plasma performs."

In circuit board fabrication, while the technique of monitoring plasmas to etch circuits was well known, the complex program developed at Sandia allows corporations to analyze the process as it occurs and correct a variety of malfunctions before a batch is spoiled.

Curiously, one circuit board problem the technique can't overcome is what it was originally designed to detect — the moment of complete removal of the epoxy smears that develop near the end of the fabrication process, when epoxy substrates heat, liquefy, and flow into circuit holes as they are drilled. According to Pam, "It's not like removing oil from a surface — epoxy is part of the board's makeup, and will always emit visual signals that epoxy is present."

The technique does help the circuit board industry approximate the moment of removal by assuring that the plasma is healthy and working accurately, says Pam.

The smear detection aspect of the technique works better on semiconductor wafers, which consist of a masking material over silicon. "Once the mask material is removed, it's all gone," says Pam.

The technology is an outgrowth of work performed in a cooperative research agreement between Sandia and the National Center for Manufacturing Sciences in Ann Arbor, Mich., to improve the manufacture of circuit boards.

(Continued from preceding page)

new Enterprise Information Plan "work-centric" information architecture and tools (see "Enterprise Information Plan," on preceding page).

"The existing financial system," says Frank, "is very good at satisfying the needs of the financial process and DOE but not very good at meeting the requirements of business managers and our other customers.

"What we're committing to," says Mike, "is seamlessly providing financial information for our business managers in the language and format of their work, not of accountants, eliminating their need to reformat and manipulate the data to make it usable. The line can then focus their resources on real customer work."

★ Congratulations

To Kathy (1823) and Todd (1811) Alam, a daughter, Zoe, June 17.

To Sharon and Jeff (6853) Danneels, a daughter, Ashton Alixandria, July 19.

🤝 Welcome

New Mexico — Douglas Brown (7842), Russell Elliott (11500), David Fein (1832), Christopher Gallegos (2343), Leroy Martinez (9651), Wallace Widerkehr (7842), Larry Nicholson (5845)

California — Heidi Smartt (6544)

Texas — James Stewart (9118)

🏌️ Fun & Games

Golf — Lockheed Martin and UC Berkeley (through Sandia and Los Alamos National Laboratory) are sponsoring a charity golf tournament at Los Alamos Golf Course on Friday, Sept. 19, at 9 a.m. Deadline for registering and submitting payment is Aug. 29. Sandia registration for the tournament includes a \$100 fee per participant. Proceeds will be used to build a house for Habitat for Humanity, which Sandia is sponsoring this year.

The tournament is a shotgun format, mixed scramble, with prizes, trophies, and lunch. First place winners will each receive \$150; second place, \$100; third place, \$80; fourth place, \$60; and fifth place, \$40. Participation is limited to the first 60 Sandians who sign up. Please contact Linda Worden (10000)

via e-mail or at 844-9804 for more information and an entry form. Make checks payable to Habitat for Humanity.

Bowling — Winners of the Four-Game No-Tap Scotch Doubles Tournament at Fiesta Lanes March 22-23 were Mary Alice Padilla (7833) and Vic Padilla with a 1,438 combined four-game handicap series. Second place went to Claudia Gonzales and Ernie Lovato with a 1,437 combined four-game handicap series.

! Take Note

Retiring and not seen in *Lab News* pictures: Arlyce "Archie" Stannish (10244), 31 years.

It's a small world: Labs micrograph wins top prize in international contest

Joel R. Wendt of Compound Semiconductor Materials and Processes Dept. 1314 won the Grand Prize in the third annual Micrograph Contest held in association with the 41st International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication in Dana Point, Calif.

The field of entries from around the world included micrographs taken using electron, ion, photon, and scanning probe techniques.

Joel's winning scanning electron micrograph, which he calls "Nano-Velcro," resembles a cylindrical burr attached to a shag carpet; actually the "burr" has a diameter of 8 micrometers and the "pile" is submicron in scale. According to judges, the micrograph was chosen both for its visual appeal and its technical quality.

The micrograph was taken during routine inspection of a two-dimensional photonic band gap (PBG) structure that had been patterned by electron beam lithography and reactive ion-beam etching.

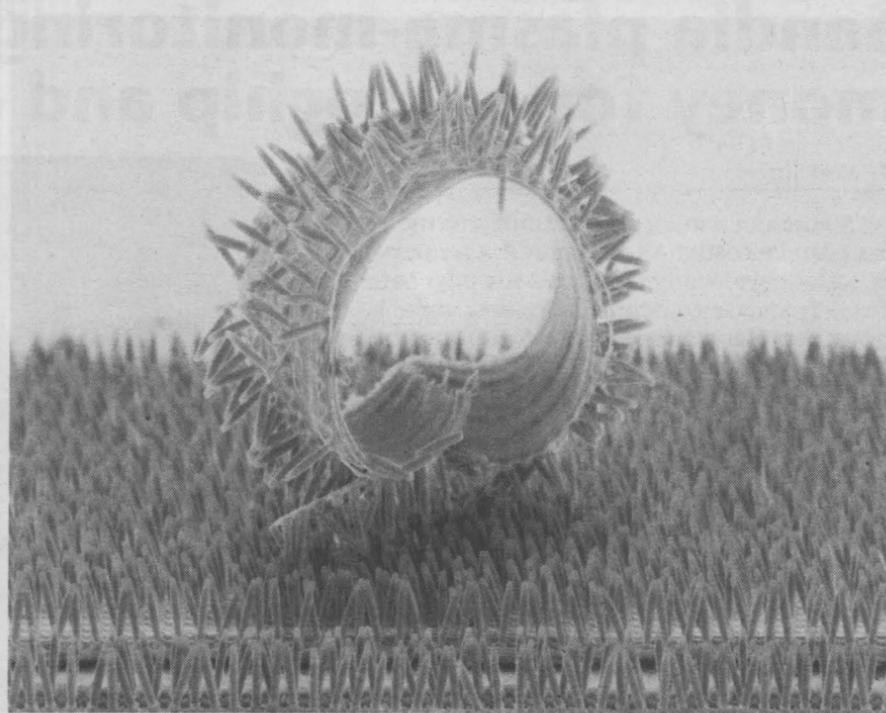
In general, a PBG structure consists of a high-contrast, periodic modulation of the refractive index on a length scale on the order of the wavelength of the incident radiation. Such a structure exhibits a photonic band gap analogous to the electronic band gap in a semiconductor crystal lattice.

Such a structure is of practical interest because it can be exploited to control spontaneous emission in semiconductor lasers, leading

to lower thresholds and higher efficiencies, and as an alternative technique for the creation of waveguides and mirrors in photonic integrated circuits.

Under normal circumstances, the PBG structure consists of a uniform, square or hexagonal array of vertical, cylindrical posts. In the case depicted in the micrograph, delamination occurred at the GaAs/AlAs interface near the base of the etched posts. Relaxation of the stress present in the structure resulted in the shag carpet-like appearance of the posts, which remained attached to the substrate, and in the formation of the burr from a strip of the posts which came completely loose from the substrate, curled up, and ultimately lodged in the "carpet pile."

Team members involved in the PBG work



and their primary contributions are: Joel Wendt (1314), electron beam lithography; Allen Vawter (1314), reactive-ion-beam etching; Shawn Lin (1312), PBG design and characterization; and Hong Hou and Gene Hammons (both 1314), material growth.

Fall forum

(Continued from page 1)

is quite specific: "Form partnerships between Sandia and other national and world leaders that will benefit the nation by creating capabilities which are much more than the sum of the partners. They will benefit Sandia and its customers by the synergistic effects of strong partnerships."

Drivers and benefits

During the forum, Kathleen McCaughey (9700) discussed some of the drivers for internal partnerships: cost reductions, changing business environment, and increased customer expectations. She presented some of the benefits derived from successful interlab partnerships: stability and security, alignment of mission statements, customer focus, more efficient delivery of products and services, and improved customer satisfaction. She also talked about the barriers: the "indirect funded vs. direct" problem, overlapping spheres of influence, opposition to change, and the "scarcity mentality," which pushes organizations to compete rather than cooperate with each other.

Lenny Martinez (14400) provided a case study of the successful internal partnering that Sandia's in-house manufacturing program has accomplished in a relatively short time. "It wasn't easy to install a manufacturing facility in an R&D laboratory," he noted. "But we've done it, and it works."

Warren Siemens, Director of Technology Partnerships & Commercialization Center 4200, presented a "starter kit" (also available on the Internal Web) about external partnerships: the need for them; the potential partners (industry, universities, other federal laboratories, international entities, etc.); and the difference between "strategic" partners and other partners, and how we can nurture the strategic ones.

Again, Warren said the reasons to form partnerships are compelling. External partnerships allow the Labs to better meet its mission requirements, enrich its science and technology base, complement Sandia's capabilities, maintain Sandia's competitiveness, leverage the Labs' limited resources, and generate additional funding.

So just do it!

So why isn't Sandia courting all possible suitors, wooing any industry/university/laboratory that knocks on our door — or whose door we can find?

One reason for some caution gets back to the marriage analogy: No relationship is better than a bad one. And the good ones — here defined as

strategic partners — are, like good mates, hard to find and harder to bond with. (If they're highly desirable for us, they're probably highly desirable to lots of other institutions.)

What is a strategic partner? Warren noted these qualifications: It should significantly contribute to realization of our corporate strategic objectives; allow us to maintain pace with rapidly advancing technology areas of strategic importance to Sandia; complement our strengths and enrich our technology base; and validate a technology so we can deploy it for our mission applications.

One notable Sandia success in attracting and nurturing a strategic partner is the Goodyear relationship. Goodyear VP Dick Steichen told the forum that his company was first attracted to Sandia by an article about parallel computing in the Labs' technology transfer magazine (since supplanted by *Sandia Perspectives* and Sandia's External Web site).

Following through like an enlightened suitor, Sandia furthered the relationship by asking about Goodyear's needs, not telling about Sandia's capabilities. And the two found solid grounds to build a complementary relationship: Goodyear wants to develop the world's most sophisticated and detailed model of extremely complex dynamic devices (they're called tires), and Sandia wants to lead the world in high-performance computer modeling and simulation.

Even so, the relationship probably wouldn't have been so mutually profitable (much less extended to cover 20-some tasks now) if the two companies didn't have compatible values and cultures.

Dan Arvizu (1800) talked about a successful strategic partnership his former center (6200) had developed with its counterparts at the National Renewable Energy Laboratory. But Mim John

Newest Sandia Fellow honored

At the Fall Leadership Forum Tuesday evening, Sandia Fellow Wendell Weart (6000; see May 9 *Lab News*) and his wife, LeAnne, were guests at a dinner in their honor. Wendell's VP, Joan Woodard, reviewed his career from the underground testing years to the Waste Isolation Pilot Plant decades ("from a focus on nanoseconds to a focus on millennia").

President Paul Robinson called Wendell "an inspiration to young scientists and engineers for years to come." Via videotape, retired Executive VP Orval Jones praised

Wendell's "steady calm" in the face of WIPP detractors, and former DOE senior official Leo Duffy reminisced at some length about Wendell's accomplishments.

After receiving a new bolo tie (featuring a chunk of 225-million-year-old salt), Wendell responded, "I can't tell you how much that means to me." He thanked the audience, then added, "We will get WIPP open; there is no alternative. . . . I used to say I'll keep working until WIPP opens, but I'm not that rash anymore."

(8100) described some of the difficulties of forming partnerships with our sister weapons laboratories outside the traditional weapons development arena.

Fewer obstacles with consortia

Even more difficult partners, Joe Polito (9800) and Bob Park (11300) told the forum, are the agencies lumped under Work For Others (other federal laboratories and agencies, for example). They are covered by a host of often-changed and seldom-simple regulations and policies. Most directors involved directly in partnership development went away resolving to talk with Joe or Bob before they commit themselves or Sandia to any such relationship. (Sandians can subscribe via the Internal Web to the "Work for Others Proposal Manual" and get notified whenever there's a change in regulations and policies.)

Apparently, there are fewer regulatory obstacles involved when the partner is a consortium, such as SEMATECH or AMTEX. Jim Rice (6600) described the AMTEX relationship as "industry-driven, incredibly complex" but with a reasonable chance of, for example, reducing the time it takes for a cotton boll to become part of a parka from 52 weeks to 26. Sandia's computer-based product-realization work is playing a key role in AMTEX's demand-activated manufacturing.

John Crawford ended the conference by reiterating Paul Robinson's comments in the forum invitation letter on the importance to Sandia of partnerships: They're crucial to our future; they must be of mutual interest and benefit; and our potential partner must be supportive. (Note: The Fall Leadership Forum presentations by Paul, John, Kathleen, and Warren are on the Internal Web.)

Paul Shoemaker (12100) and James Kelsey (5700) organized the event.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

COLLECTOR'S JEWELRY, handcut/hand-made, large fetish necklace/earring set, single strand, value \$850, make offer. Freeman, 268-6235.

CHARM BRACELET, silver, w/7 Scottish terrier charms, by Agatha of Paris, exquisite, never worn, \$30. Wagner, 823-9323.

LARGE DOG IGLOO, insulated & vented, winter/summer, paid \$150, asking \$50. Wilson, 275-8384, after 6 p.m.

NEW WEDDING DRESS, one-of-a-kind, beaded white satin, woven bodice, short-sleeve, train, size 3-7, \$450. Culler, 821-4143, ask for Kim.

WARDS ELECTRIC DRYER, white, hardly used, permanent press, wrinkle guard, \$75; parrot cage, w/perches, seed, water cups, \$20. Chu, 275-9353.

CANVAS (SUNBRELLA) ROLL-UP CURTAIN, sunflower yellow/gray stripes; 9'3"W x 6'L, new, \$150 (40% off). Spear, 822-8982.

TUNTURI 504E RECUMBENT EXERCISE CYCLE, \$200. Schindewolf, 831-1940.

BABY STUFF: crib, strollers, boosters, car seats, high chair, toys (baby & toddler). Sobolik, 292-3959.

COMPLETE 5-PIECE WATERBED SET, nightstands, dresser w/hutch, 6-drawer platform, hibernation mattress & heater, very good condition, \$500. Page, 275-1665.

COMPUTER, Legend 386X, Packard Bell, video color graphic display monitor, Epson Action printer L-1000, \$200. Conway, 271-0770.

PORTABLE HUMIDIFIER UNIT, Sears, large-size, \$90 OBO; hamster cage, new in the box, \$15. Moonka, 856-1110.

THREE HAMSTER CAGES, good condition, some shavings, toys, new \$100, asking \$45 OBO for set. Chavez. 864-6996

PRECIOUS MOMENTS FIGURINES, pre-1990 issues, w/boxes. Hawkins, 296-8531.

CELLO, 3/4-size (student), Stradivarius replica, great condition, music stand, bow, \$495. Schaub, 821-7242.

CHILD CRAFT OAK CRIB W/MATTRESS, matching changing table w/fold-down top; both excellent condition, \$250. Jones, 899-1187.

COPPER REVERE WARE COOKING SET, 11-piece, two-thirds list price for pieces, entire set half list price, \$465; antique brass-bed frame, \$500. Raglin, 296-2018, after 7:30 p.m.

WEIGHTLIFTING BENCH, custom heavy-duty, adjustable, leg press/curls, mint, w/3 bars, 180 lb. plates, \$120 firm. Filuk, 281-0078.

DRUMS, 6-piece Pearl, all hardware plus quality Zildjian cymbals, excellent buy, \$1,500 OBO. Kottenstette, 450-3430.

GUITAR AMP, Peavy, 50-watt, all tube tweed, 2 channels & reverb, 1 yr. old, w/cover, \$400. Holmes, 897-0916.

GIRL'S FRENCH PROVINCIAL BDR. SET, \$200; treadmill, \$75; white bookcase headboard, twin-size, \$30. Pott, 821-2253.

EPSON PRINTER, \$20; Jane Fonda treadmill, \$35; FastTrack-2 exerciser, \$45; EasyGlider, \$20; all good shape. White, 275-0595.

SOFA BED, 8-ft. Southwestern style/colors, (soft mauve, blue, beige), \$250; recliner, light blue, \$75. Chacon, 792-1908, after 6 p.m.

YAMAHA PSR-36 KEYBOARD, w/stand, MIDI interface, stereo, digital synthesizer, starter kit w/5 song books, originally \$350, asking \$125. Ledwith, 821-9154.

COMPUTER, 486-66, 8MB RAM, 4x CD ROM, 28.8 modem, NEC 15-in. monitor, WIN 3.1, WordPerfect Office, 8 games, \$550. Green, 899-1109.

NORFOLK PINE TREE, 8-ft., free; '72 Saab Sonnet, as is, best offer; '81 Yamaha XT250, excellent condition, \$500. Hayward, 292-2980.

SPA/JACUZZI, divorce liquidation, 1-1/2 yrs. old, seats 4, 6-1/2' x 6-1/2', no foundation required, 110 vac, \$4,000 OBO. Grandon, 272-7615.

VIOLIN, Peter Steinhaus #1, excellent condition, fair-market appraisal by Robertson Violin Studio. Halbgewachs, 268-1584.

TWO CUTE MICE, w/cage, water bottle, wheel, good, bedding, food tray, \$15. Lear, 856-3347.

GARAGE SALE, baby stuff, maternity clothes, furniture, books, housewares, Sat., Aug. 30, 8 a.m.-3 p.m., 17 Sage Hill Drive, Placitas. Hietala, 867-9577.

ALTO SAX, Jupiter model, excellent condition, \$450 OBO. Slutz, 299-3683.

REPRODUCTION ANTIQUE SLEIGH-STYLE SOFA, sage & ecru colors, damask cushions, perfect condition. Gallegos, 298-2259.

TREADMILL, manual, barely used, \$20. Stump, 344-9340.

COLOR TV, 19-in. Sanyo, w/ remote, \$100; computer desk, from American Furniture, \$100. Ewen, 836-3563.

HEDGE TRIMMER, B&D, small/tough, \$15; rubber boots, size 10, knee-hi, great for washing car, launching boat, \$10. Freyermuth, 299-2053.

WATERBED, queen-size, Big Sur Hibernation series, softside, \$125; Sharp VHS camcorder, 12x zoom, \$100. Anderson, 281-1560.

VCR, RCA, 4-head, excellent condition, \$80; two Sony speakers, 8-in. woofers & tweeters, \$20/ea. Hayes, 299-1200.

QUEEN-SIZE SOFA BED & RECLINER, brown tweed, fair condition, \$40/both. Detorie, 299-1868.

PRINTERS: HP Think Jet, \$25; Okidata Microline 321, 9-pin, wide carriage, \$25; money back guarantee. Dietzel, 294-4702.

GENERATOR, Generac, 4,000-watt, 30-amp, contractor's grade, \$500; Delta sawbuck & extension table, contractor's quality, like new, \$600. Barlow, 505-820-6845.

WATERBED, queen, w/air mattress, headboard, 6-drawer pedestal, \$250; dresser & night stand, \$150; loveseat, blue, w/wood & brass trim, \$150. Hawn, 296-8346.

SHEEPSKIN SEAT COVERS (two), new, gray color, fits bucket seat, w/head rest, \$100 OBO. McDonald, 275-3334.

ANTIQUA SOFA, empire-style, very good condition, lovely upholstery, dated 1860-1870, \$600. Sharpton, 899-2292.

PANASONIC CAMCORDER, w/extras, \$575; AutoGolf practice net, \$50; pressure canner, hot-water canner, quart jars, \$30. Tucker, 869-3469.

EXERCISE EQUIPMENT, Tunturi bike, cost \$400, asking \$150; treadmill, Sears Lifestyle, adjustable, safety clip, pulse ear clip, \$250. Finley, 299-0739.

COLT CAR-15, Colt scope, collapsible stock; Colt .45 auto, circa 1915; new Marlin Papoose, w/scope. Roth, 248-1940.

HONDA EX1000 GENERATOR, \$600. McMurtrey, 881-1390, evenings.

BRUSH/GRASS TRIMMER, Tanaka, gasoline engine, new points & carburetor, runs but needs engine work, \$25 OBO. Lagasse, 298-0977.

TABLE SAW, Makita benchtop, \$125. Dwyer, 271-0741.

CAMPER SHELL for small Mazda, Toyota, new rear window, new gas lifters, \$250 firm. Tooley, 836-0220.

VICTORIAN CARVED MAHAGONY SOFA, three heart side chairs, red Tiffany-style swag lamp, (value \$2,500), \$1,400. Anderson, 296-3352.

QUEEN-SIZE WATERBED, bookcase headboard, w/lights, side railings, fiber-filled mattress plus sheets, \$100. Young, 821-5276, after 6 p.m.

ANTIQUA DINING TABLE, 5 chairs, \$800; clover-leaf table, \$75; Deacon's bench, \$150; daybed, w/trundle & mattresses, \$300; microwave, w/turntable, \$90. Katz, 821-8061.

OAK ROLL-TOP DESK, two 2-drawer hanging file cabinets, chair, \$600. McCollister, 299-9568.

TRAILER, 5x10 tilt, new, single axle, 3500 gvw., spare & extras, \$850 OBO. Lightle, 281-7575.

GARAGE SALE, motorcycle, bicycles, bike rack, exercise machine, books, CDs, tools, BR set, more, Sept 6, Edgewood. Brosseau, 286-1969.

HEALTHRIDER, original w/sheepskin seat cover, \$250 OBO; telescope, 3-in. reflector/catadioptric, \$100. Castillo, 899-1956.

BABY ITEMS: crib-n-bed, changing table, stroller, walker, infant car seat; all excellent condition. Henderson, 858-1321.

TWO NICE GUINEA PIGS, w/cage, water bottle, feeding dish, \$20. Poulter, 291-0607.

FIVE-HOLE CHEV. RIMS, fits '88 models/newer, gray chrome, strip w/black covers, nice condition, \$100/four. Grenfell, 344-9355.

SCHWINN EXERCYCLE, \$25; car-top ski rack, \$20; Raichle ski boots, size 12, \$10. Ezell, 821-1768.

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.

Ad Rules

1. Limit 18 words, including last name and home phone (We will edit longer ads).
2. Include organization and full name with the ad submission.
3. No phone-ins.
4. Use 8 1/2" by 11-inch paper.
5. Type or print ad; use accepted abbreviations.
6. One ad per issue.
7. We will not run the same ad more than twice.
8. No "for rent" ads except for employees on temporary assignment.
9. No commercial ads.
10. For active and retired Sandians and DOE employees.
11. Housing listed for sale is available without regard to race, creed, color, or national origin.
12. "Work Wanted" ads limited to student-aged children of employees.

TRANSPORTATION

'93 JEEP COUNTRY, 4.0L, real clean, ready to go, alarm, service warranty, \$14,500. Matz, 828-1936.

'89 VOLVO 740 GLE, 4-dr., blue, AC, PW, PS, PB, sunroof, very good tires & condition, \$6,900. Lane, 856-1341.

'91 FORD AEROSTAR XLT, 4WD, 86K miles, \$8,490; '90 Subaru Legacy sedan, AWD, 89K miles, \$5,600. Loucks, 255-9444.

'95 Jeep Wrangler, \$12,500; '76 Scout Traveler, \$3,500; '74 Maverick, \$1,250. Bailey, 281-4766 or 229-2990 pager.

'95 FORD F150 SUPERCAB XLT, 4x4, brilliant blue/royal, excellent condition, 39K miles, blue book \$19,900. Leonard, 281-4611.

'89 FORD E150 VAN, equipped w/wheelchair lift, driveable from wheelchair or removable front seat, 100K miles, \$11,500. Boyden, 293-5993.

'89 JAGUAR XJ6 VANDAN PLAS, sandstone, garage-kept, excellent condition, 66K miles. Tapia, 269-8300, leave message.

'96 CHEV. RED BLAZER, 4x4, 4-dr., Baja pkg., alarm, extended warranty, 16K miles, AC, AM/FM tape. McCabe, 836-7075.

'96 BUICK PARK AVENUE, 11K miles, mint condition, extended factory warranty, deluxe sound system w/CD player, \$22,000. Sellers, 344-5583.

'85 HONDA ACCORD, 4-dr., cruise, PW, PL, 161K miles, 5-sp., AM/FM cassette, runs well, \$800 OBO. Urrea, 890-7902.

'81 SUBARU WAGON GL, sport tan, 137K miles, run well, body needs work. Meisenheimer, 275-8193.

'94 TOYOTA PICKUP, extended cab, V6, AC, tilt, cruise, bedliner, 21K miles, \$12,775 OBO. Homan, 892-3346.

'90 CHEV. CHEYENNE, V6, short bed, 4x4, AC, CD, alarm, custom wheels, tilt, cruise, 57K miles. Martinez, 877-8665.

'95 YAMAHA YZF 600R, excellent condition, low miles, pretty, \$2,300 of extras included, sacrifice \$4,500 OBO. Robinson, 872-0764.

'76 FORD STATIONWAGON, V8, PS, PB, AT, mechanically sound, 2nd owner, \$700. Lenberg, 266-8988.

'89 JEEP CHEROKEE, great condition, white, 96K miles, 4-dr., AT, 4L cyl., \$6,500 OBO. Madrid, 296-7104.

'92 EAGLE TALON TURBO, 4WD, all-power, AC, AT, sunroof, excellent condition, 68K miles, \$9,500. Green, 281-4533.

'90 GRAND VOYAGER LE, 3.3L, V6, AT, 68K miles, luxury value pkg., excellent condition, \$7,900. Iman, 856-6500.

'76 GRAND PRIX, lots of new parts, needs engine, \$600. Macias, 242-3049.

'92 EAGLE TALON, cassette, tinted windows, AC, 5-sp., \$6,500. Sandoval, 866-6991.

'90 MUSTANG GT 5.0 CONVERTIBLE, red, AT, PS, PB, alarm, Prime wheels, w/BFG Comp TAs, 49.8K miles, \$9,900. Wilcox, 296-4725.

'95 SUZUKI SWIFT, 37,055 miles; '92 Ford F250, AC, PW, PL, 61,786 miles; '82 Toyota pickup, 5-sp., 120,144 miles, needs repairs to be serviceable. SLFCU, 237-7384, ask for Nancy.

'82 FERRARI 400i, rare 5-sp., V12, fast, powerful, 45K miles, ABQ emissions, red/tan, all original, great running car, \$31,900. Salyer, 823-1342.

'96 FORD F250 XLT, extended cab, 9K miles, 4x4, powerstroke, headache rack, tool box, running boards, hitch, extras, \$29,000. Mignardot, 254-9092, ask for Roy.

'93 PONTIAC GRAND AM, AC, tinted windows, 5-sp., low miles, new tires/rims, excellent condition. Trujillo, 877-0770, contact Pat.

'84 LINCOLN TOWN CAR, 128K miles, excellent running/driving, exterior rear doors body damage, \$550 OBO. Hole, 255-1444.

'79 FORD COURIER PICKUP, 5-sp., 7-ft. bed, aluminum shell, AM/FM radio, needs brakes, \$875. Riggins, 299-7778.

'95 MERCURY GRAND MARQUIS, 29K miles, ABS brakes, 1 owner, all maintenance records, excellent condition, below book. Clauss, 822-8101.

'89 PLYMOUTH VOYAGER LE, V6, AT, AC, cruise, tilt, tint, white, diligently maintained, excellent condition, \$5,850. Givler, 823-9715.

'94 FORD AEROSTAR, loaded, AC, 4WD, tinted glass, seats 7, very good condition, 74K miles, \$11,200. Hawthorne, 858-0922.

'77 PORSCHE 924, white/black interior, 4-sp., new paint, tint, Michelins, Blaupunkt AM/FM cassette, brakes, \$3,600 OBO. Gruebel, 332-9216.

'84 MERCURY MARQUIS, 6-cyl., 4-dr., AT, tan/brown, 90K miles, good condition, \$1,450 OBO. Kelly, 884-4443.

'88 PLYMOUTH GRAND VOYAGER LE, V6, AT, front/rear AC, loaded, very good condition, 1 owner, 133K miles, \$3,950. Drotning, 821-9598.

'93 ACURA LEGEND LS, 5-sp., leather, loaded, 48K miles, \$16,500. Souther, 888-4398.

'86 HONDA ACCORD, family owned, 148K miles, 4-dr., AC, silver & gray interior, \$2,500. James, 281-0914.

'73 CORVETTE, new red paint, 73K miles, 350 V8, AT, T-top, luggage rack, stock, excellent condition, \$8,950. Muirhead, 281-2925.

'90 FORD F150 SUPER CAB, SB w/topper, 351, AT, PS, PB, AC, AM/FM cassette, PL, PW, \$7,000. Carlson, 892-5645.

'94 FORD TEMPO, 4-dr., mint condition, AT, AC, PL, PW, 53K miles. Milliman, 286-0508.

'88 CHEV. 3/4-TON PICKUP, regular cab, Silverado, AT, camper shell, towing pkg., \$6,500 OBO. Bentz, 857-0728.

'95 MAZDA MIATA, 19K miles, AM/FM cassette, 5-sp., \$13,500. Haid, 298-7052.

'62 MERCURY COMET, 2-dr., 83K original miles, original upholstery, \$3,000 OBO. Peters, 294-0363.

RECREATIONAL

'91 NOMAD TONGUE TRAILER, 26-ft., excellent condition w/extras. Chavez, 867-2213.

KLEPPER FOLDING KAYAK, 17-ft., 2-person kayak, cost \$3,290, asking \$950. Lord, 867-1252.

'87 SHASTA CABOVER CAMPER, deluxe, 11-1/2-ft. long, fits long bed, everything you want, \$4,000. McAllister, 281-5188.

MOUNTAIN BIKE, Trec 7000 AL frame, rock-shock, 18-in. frame, 26 lbs, \$500. Zender, 294-4145.

'82 BAYLINER, I/O, 19 ft., 125-hp Volvo Penta, \$4,100. Pastorek, 292-6323.

CAMPER SHELL, blue fiberglass, fits long-wide box, great shape, \$400 firm. Schaub, 865-8807.

MAN'S BICYCLE, Performance model 403, 18-sp., fair condition, \$50. Sikora, 821-1983.

'93 VACATION AIR TRAVEL TRAILER, Park model, 39-ft., tilt-out living room & bedroom, special built, \$17,500. Jarrett, 254-1035.

MAN'S CENTURION BICYCLE, 12-sp., \$40; woman's Schwinn 10-sp., hardly used, new \$200, asking \$80. Barnette, 861-2451.

MAN'S BICYCLE, 10-sp., Nishiki, w/extras, like new, \$75; camping equipment, Coleman 8x10 tent, 2-burner stove, lantern, heater. Thorp, 292-0169.

LOBO BASKETBALL, 2 chairbacks, full-or-half season. Bass, 856-2407.

BICYCLES: man's 5-sp.; woman's 3-sp., w/coaster & hand brakes, rear carrier racks. Switendick, 255-1003.

'95 JET SKI, Yamaha 650, Waverunner III, 3-seater, \$3,000 firm. Wackerbarth, 281-3207.

SPECIALIZED STUMPJUMPER COMP., all Shimano Deore XT components, 21-in. white frame, ground control mountain tires & Kevlar slicks, \$350. Dwyer, 271-1328.

'93 SEA-DOO, GTX model, 3-seater, trailer, \$3,800. Weatherbee, 869-2849.

POP-UP TRUCK CAMPER, SunLite, for full-size truck, heater, refrigerator, sleeps 4, \$1,700. Aubert, 286-9173.

CLASSIC BICYCLES: 40's Hawthorn, balloon-tire cruiser, \$75; 40's deluxe Hawthorn, \$300; 60's Raleigh Chopper, \$100. Yelton, 281-2893.

REAL ESTATE

'92 REDMAN 3-BDR. MOBILE HOME, 16' x 80', currently located in Meadowbrook Park, covered front deck, 2 baths, all appliances w/washer/dryer, refrigerator, gas stove, dishwasher, \$23,000. Portillo, 797-8047.

2-BDR. HOME, 1 bath, 1 block from UNM law school, oversized living room, 1-car garage, large yard, \$125,000. Ellis, 266-3618.

3-BDR. HOME, 1-3/4 baths, 2-car garage, 1,354 sq. ft., 15 minutes to SNL in Town Park, secured & gated, close to Sams and Wal-Mart, \$120,000. Conway, 891-5320.

3-BDR. HOME, 2-story, Sandia Park, 2,300 sq. ft., 2-1/2 baths, 2-car garage, 4 porches, 2 yrs., fireplace, fenced backyard, 2.25 acres, views, \$198,950. Salazar, 899-0483.

3-BDR. HOME, near KAFB east, 1-3/4 baths, AC, new roof, new paint, carpet throughout, large yard. Jaramillo, 296-6810.

'96 OAKWOOD 3-BDR. MOBILE HOME, Four Hills MHP, 16x80, 2 baths, all appliances, AC, carport, deck w/awning/skirting, \$34,500. Jaramillo, 292-3295.

3-BDR. HOME, 1-3/4 baths, 2-car garage, 1,565 sq. ft., near high school in Los Lunas, \$89,900. Mareda, 866-6121.

WANTED

SET of reasonably priced kid's golf clubs. Nation, 289-5605.

HOUSE LOT, in Four Hills, for single-family home construction, prefer 1/4 acre to 1/2 acre. Ambabo, 266-2383.

ROOMMATE, 3-bdr./2-bath home, NE, 10-minutes to base, nonsmoker, male/female, \$350/month includes utilities. Chavez, 298-7465.

TEXAS INSTRUMENTS HOME COMPUTER, video modulator, Model UMI 381 (circa 1980's). Aas, 856-6674.

DYNACO PAS PREAMP, working or not, very good cosmetic condition. Kessel, 702-897-2676.

HOUSEMATE, to share home, Constitution/Louisiana area, smoker/small pets okay, \$350/month + 1/2 utilities, available Sept 1. Shea, 232-8582.

HOUSEMATES, for 3-bdr., 1-3/4 baths, close to schools, easy freeway access, available immediately. Manning, 898-6084.

ADDITIONAL SINGERS, The Enchanters, contemporary choral group, auditions in early Sept. Piscotty, 296-2518.

DOORS, two 30" x 7', hollow metal & hardware. Monnet, 865-7941.

CAT-CARRYING CAGE, other cat accessories, cheap. Veltkamp, 271-0325.

PAPER DOLLS, pre-1960. Rosales, 837-1644.

FONDUE SETS, w/skewers & burners, good condition. Clausen, 856-4018

LOST & FOUND

LOST: Set of keys (car & house), w/leather/metal initial "D," w/other key-ring stuff. Perea, 845-8621.

FOUND: Smashed up silver bracelet, in parking lot. Perea, 845-8621.

Recipients praised during R&D 100 Awards reception

Quoting the comedian George Carlin, Paul Robinson joked about being afflicted by a feeling of "vuja de — the feeling that comes over you that none of this has ever happened before," in his opening remarks at an upbeat reception Aug. 15 in the Coronado Club to honor Sandia and Los Alamos winners of the R&D 100 Awards. The event was attended by an estimated 100 people and Albuquerque television station channels 7 and 13.

The Sandia director perhaps was referring to the remarkable variety in inventions — eight from Sandia, six from Los Alamos — that clearly have commercial as well as defense applications.

Sen. Pete Domenici, R-N.M., at whose request the reception was held, said approvingly, "There were many [inventions] beyond the primary mission" of national defense. Domenici, with his colleague Jeff Bingaman, D-N.M., in 1989 sponsored the National Competitiveness Technology Transfer Act — "Legislation," said Paul, that has "made all the difference today" in permitting creation of almost \$750 million in joint agreements between Sandia and industry.

Sig Hecker, Director of Los Alamos National Laboratory, praised both labs' entries. Al Narath, former Sandia President and now Lockheed Martin Energy and Environment sector president, also attended.

The two labs competed individually against entries from industry, universities, and other national laboratories that numbered "in the hun-

dreds," according to Vic Comello, an editor at *R&D* magazine, yet together the two labs accounted for 14 percent of the 100 awards bestowed. Selections were made by a panel chosen by editors of *R&D*, a Chicago-based industrial trade magazine that for 35 years has honored inventors of the year's most significant technological innovations to offer commercial promise.

The eight winning Sandia inventions were described in the July 4 *Lab News*. The inventors and their inventions highlighted at the ceremony follow.

- Paul Gourley (1112), Sandia, for a patented hand-held laser device that in a few moments can detect disorders of the blood such as sickle-cell anemia and changes in cell structure like those imposed by the AIDS virus, as well as track programmed cell death (apoptosis) and cancer (unrestricted cell growth) as they take place (*Lab News*, Aug. 15).

- George Guthrie and Bill Carey, Los Alamos, who developed a simple test to reveal the presence of a silent destroyer of bridges and tunnels before it causes extensive damage. The plague: a gel that forms within concrete and expands when moist to create a network of microscopic cracks that widen over time. The gel, which forms from the reaction of alkali and silica found within cement and aggregate, can be detected in less than five minutes. The new test costs less than a dollar per sample.

- Craig Taylor, Los Alamos. DryWash, a cleaning process that uses carbon dioxide — odorless, nonflammable, environmentally friendly — developed by Taylor, in combination with Global Technologies LLC, halves the time for conventional dry-cleaning and lowers energy consumption and labor costs.

- Garth Corey (1525), Sandia. In the world according to Garth, there will be only three percent of the number of black-outs and brown-outs that currently afflict the electronic equipment of large power users, once the PQ2000 Power Quality System is installed around the hemisphere. (The first system was installed last month in Georgia, USA.) The battery-based energy storage and delivery system monitors power lines for voltage sags, swells, or momentary interruptions and provides a high-voltage power source for up to 10 seconds — long enough for most momentary power disturbances to pass. The system will save computer data, worker time, and millions of dollars. PQ2000 was developed with the AC Battery Corp., the Electric Power Research Institute, Oglethorpe Power Corp., and Pacific Gas and Electric Co.

— Neal Singer

Longtime LANL Director Norris Bradbury dies

Norris Bradbury, Director of Los Alamos National Laboratory from 1945 until his retirement in 1970, died Aug. 20 at his Los Alamos home after a long illness.

Bradbury, the immediate successor to Robert Oppenheimer as director of the laboratory and its longest serving director, arrived in Los Alamos in 1944 to work on the Manhattan Project. He was in charge of assembling the nonnuclear components of the nuclear device exploded at the Trinity Site.

Sandia Labs President and Director C. Paul Robinson, who once headed Los Alamos weapons programs, called Bradbury "a common man who achieved uncommon things."

"Following Oppenheimer's departure, as well as many of the other leading scientists," Paul said, "Bradbury became a rallying point to build the permanent Los Alamos Laboratory — and he really succeeded. He was a leader — and took pride in putting in place the working conditions that were needed to do extraordinary science and engineering. He gave people the tools they needed and the freedom to do their best.

"With his Navy background, he turned out to be an extraordinary link to the military, and he practiced 'customer satisfaction' long before the term became popular. In his long retirement, he stayed in Los Alamos and lived his life simply and quietly. He, nevertheless, was a historic figure."



SEEING IS HEALING — National Atomic Museum historian and exhibit project coordinator Jim Wadell readies a mannequin that is part of the museum's latest exhibit — "Nuclear Medicine: Seeing Is Healing" — scheduled to open Sept. 12. The exhibit seeks to educate visitors about the medical uses of radioisotopes in hopes of stimulating public interest in nuclear medicine. Featured in the exhibit is a large gamma camera, the Picker PRISM 2000XP, donated by Picker International. The machine is used in hospitals to produce the tomographic images doctors use in diagnosing patients who may have cancer or other diseases. Museum Director Jim Walther says he hopes the exhibit will launch two related museum ventures: development of a more permanent display about nuclear medicine for the museum's planned new location, and creation of a traveling version of "Seeing Is Healing" for loan to science and health museums across the nation. The exhibit will run through February 1999. (Photo by Randy Montoya)

Coronado Club

Sept. 1 — Labor Day picnic and celebration; a la carte buffet line open, 11 a.m.-6 p.m. Music by Bob Weiler, 2-6 p.m.

Sept. 4, 11, 18, 25 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

Sept. 5 — "Western Night" dinner/dance. \$6.95 all-you-can-eat buffet (\$7.95 for guests), 6-9 p.m. Music by Isleta Poor Boys, 7-11 p.m.

Sept. 7 — Sunday brunch buffet, 10 a.m.-2 p.m. \$8.95 all-you-can-eat buffet; \$9.95 for nonmembers; kids 3-12, \$4.19; under 3 free. Music by Bob Weiler, 1-4 p.m.

Sept. 8 — Annual meeting and Board of Directors election, 5 p.m.

Sept. 21 — Sunday brunch buffet, 10 a.m.-2 p.m. \$8.95 all-you-can-eat buffet; \$9.95 for nonmembers; kids 3-12, \$4.19; under 3 free. Music by Bob Weiler, 1-4 p.m.

Sandia News Briefs

Town meeting to focus on internal job movement

An employee town meeting focusing on reengineered internal movement practices will be held Wednesday, Sept. 3, 2-3 p.m. MDT in the Technology Transfer Center Auditorium (Bldg. 825). The meeting will be simulcast to Sandia/California and to Sandia offices at Carlsbad and Washington/Virginia. The meeting, part of a series on Sandia's changing business practices, will offer information on new procedures for bidding on job openings, submitting an electronic resume, and more. The changes discussed in the meeting are scheduled to take effect on Oct. 1. For more information about changes in Sandia's business practices, visit Sandia's Changing Business Practices home page on the Internal Web at <http://www-irm.sandia.gov/announce/scbp/mgrtm.html>.

Have you had a dependent change recently?

The following reminder comes from Sandia's Benefits Office: Please notify the Benefits Office as soon as you gain an eligible dependent. All Class I (for medical and/or Dental Deluxe) and Class II (for medical only) dependents must be enrolled with the Benefits Office within 31 days of their eligibility or birth, or upon a "qualified change in family status." If you fail to enroll your dependent within 31 days, you will have to wait until the next Open Enrollment period to enroll the dependent for coverage effective the following calendar year.

Notify the Sandia Benefits Office as soon as any dependent loses eligibility. All Class I and Class II dependents must be disenrolled with the Benefits Office within 31 days of the "qualified change in family status" causing ineligibility. If you are enrolled in the Pre-Tax Premium Plan (for either medical and/or Dental Deluxe (Class I dependents only) premiums) and you fail to notify the Benefits Office within the 31-day time period, you will be required to pay the appropriate premium for that dependent for the remainder of the calendar year even though your dependent's coverage will end on the last day of the month in which the dependent became ineligible.