

# Sandia helps research team study underground disposal of carbon dioxide at New Mexico oil field

## Team pumps tons of CO<sub>2</sub> gas into depleted oil reservoir

By John German

Sandia is helping the US government take the first small steps toward reducing net US fossil-fuel emissions by examining how some human-produced CO<sub>2</sub> could be put back where it came from — the oil patch.

Since late December a multi-organizational research team has been pumping CO<sub>2</sub> gas into a depleted oil reservoir near Hobbs, N.M. As the reservoir fills, they listen to what is happening thousands of feet underground with the help of instruments that measure subtle subterranean changes.

The team's goal is to improve existing models that help researchers predict where CO<sub>2</sub> will go after it is pumped into a reservoir, how far and how fast it will move, and what chemical reactions occur as the gas interacts with underground minerals.

They also want to identify remote sensing techniques that are sensitive enough to measure these changes.

And they want to know what the capacity of the reservoir is and how close that capacity matches their estimates.

"This is an experiment," says Hank Westrich (1011), former manager of Geochemistry Dept. 6118. "We don't know if it is going to stay in the reservoir or migrate to an adjacent oil or gas reservoir immediately, or whether it might vent to the surface. We need to know that."

US power plants each year pump into the atmosphere some 2.4 gigatons of carbon dioxide produced in the burning of fossil fuels. Automobile emissions account for many more gigatons per year.

(Continued on page 4)

*"We don't know if [CO<sub>2</sub>] is going to stay in the reservoir or migrate to an adjacent oil or gas reservoir immediately, or whether it might vent to the surface. We need to know that."*



CARBON CLUES — Norm Warpinski (left) and John Lorenz are part of a Sandia team contributing to carbon sequestration research, in part by performing lab tests on core samples. (Photo by Randy Montoya)

## UNM and Sandia, with Lockheed Martin support, launch new policy center

### Office to tackle policy and technology issues linked to international security, strife

By John German

Officials of the University of New Mexico, Sandia, and Lockheed Martin on Wednesday signed an agreement that formalizes a unique collaborative initiative to nurture scholarly thought and research on policy issues linked to national and international security.

The agreement created a new Office for Policy, Security, and Technology at UNM. The office will focus on policy areas where technology and security are related, such as weapons of mass destruction, arms control and nonproliferation, terrorism and homeland security, environment, energy, critical infrastructures, borders, sustainable development, and region-specific issues such as water scarcity.

Signing the office's charter at a ceremony and news conference on Wednesday were UNM Acting President F. Chris Garcia, Labs President C. Paul Robinson, and Lockheed Martin Executive Vice President Michael Camardo.

### Multidisciplinary approach

The office will apply a multidisciplinary approach to its investigations, drawing on the expertise of political science, economics, and other

(Continued on page 5)

# Sandia LabNews

Volume 55, No. 4

February 21, 2003

Managed by Lockheed Martin for the National Nuclear Security Administration



## Romig, Jakowatz, Asay elected to National Academy of Engineering

"Pretty exciting, isn't it?" That was how Sandia VP Al Romig put it about news last Friday that three Sandians, Jack Jakowatz, Jim Asay, and Al himself, had been elected to membership in the National Academy of Engineering. Election to the NAE is among the highest professional distinctions that can be accorded an engineer.

"I am personally pleased but am absolutely delighted at the honor that having three Sandians elected brings to the work of the Labs," says Al.

"It's great news," said George Samara (1120), one of Sandia's earlier elected NAE members, in spreading word around the Labs of the honors. "Heartiest congratulations to Al, Jack, and Jim."

Academy membership honors those who have made "important contributions to

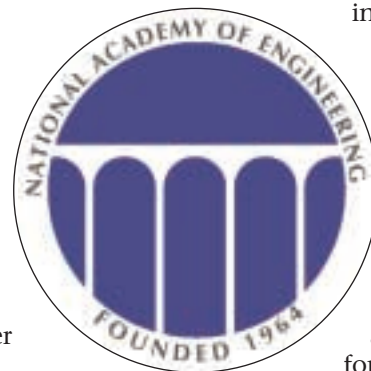
engineering theory and practice, including significant contributions to the literature of engineering theory and practice," and those who have demonstrated accomplishment in "the pioneering of new fields of engineering, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."

NAE President Wm. A. Wulf announced the awards in Washington on Feb. 14.

The three Sandians were among 77 new members and nine foreign associates elected, bringing the total NAE US membership to 2,138 and the number of foreign associates to 165.

This is the first time three Sandians have

(Continued on page 4)



Speaker probes the darkness inside the minds of 'lone wolf' terrorists 3

Labs, Bureau of Reclamation plot strategy for desalination R&D 5



6 Sandia, KAFB team up to safely destroy surplus explosives

8 Sandia board establishes new Audit and Ethics Committee

## What's what

As you know, unless you've been in a cave or a deep ocean submersible for the last couple of weeks, the government raised the terror alert to orange – just one shade down from the highest alert, red – and warned that people should prepare “disaster supply kits” for use in case of bio, chem, or nuclear terrorist attacks. That's serious business, of course, and people all over the country took the suggestion to-heart, emptying grocery and hardware store shelves of bottled water, canned food, plastic sheeting, and duct tape.

Scary as it might be, there could be some good in all this. For example, your 401(k) might be holding some Home Depot or Lowe's or Albertson's stock. Or maybe Garrison Keillor will be inspired to ask the Duct Tape Council to add another half-hour to Prairie Home Companion.

But you have to wonder about the message *The Albuquerque Tribune* was trying to deliver. Nearly a week after the alert turned orange and three days after the feds recommended making up a survival kit, *The Trib* advised readers in its lead story: “Experts warn N.M. against disaster panic” and labeled that warning “CALM ADVICE” – in big black all-caps 96-point type that stretched clear across Page 1. If you're not a newsy and wonder what's up with that, 96-point boldface all-caps type is not CALM!!

\* \* \*

When we think of “snail mail,” we usually have the US Postal Service in mind, but Rod Geer (12640) found out a couple of weeks ago that Sandia has it too. Rod's invitation to an awards breakfast for Division 12000 Employee Recognition Awards nominees showed up in his mailbox. The thing was, however, that it was for a February 2002 breakfast.

Getting a piece of mail late's not such a big deal, but missing a free breakfast. . . now, you wouldn't want that to happen very often.

\* \* \*

Here's a corollary to the opinion that we should work at keeping our identity as a national laboratory and not fuzz-up that identity by referring to ourselves as a company or corporation. The point being that as one of only a handful of national labs, we enjoy a unique identity definitively separate from the hundreds of thousands of companies and corporations.

The corollary is that as an extension of that uniqueness, perhaps we should consider giving buildings and special places names, rather than numbers. We already have the Steve Schiff Auditorium, and in the International Programs Building there are rooms named for Robert Oppenheimer and Andre Sakharov. Much warmer than TTC or Bldg. 823 or Rm. XX.

Any thoughts or suggestions?

\* \* \*

And in the spirit of “saving the best for last,” you'll surely want to watch for this year's issue of Labs Accomplishments, which will be delivered next week. Bill Murphy, who has edited this annual compilation of the gems of Sandia's work for the past several years, has outdone even his own usual sterling work this time, producing a full-color publication any organization would be proud to claim. Don't miss it.

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

## Sandia 'heroes' donated 1,602 units of blood in 2002

Sandia employees are being called heroes for donating 1,602 units of blood in 2002.

The thanks comes from Gretchen Cody of United Blood Services in a letter to Sandia President Paul Robinson. The organization's motto is “Give blood. Be a hero.”

“Heroes working at Sandia...donated 1,602 units of blood in 2002 for hospital patients' use,” says the letter. “Thanks to you and your organization for creating a convenient avenue for your personnel to participate in this life-saving program. Please let those who donated know their donations are greatly appreciated and desperately needed.”

## Feedback

### Oracle rumors baseless

**Q:** I keep hearing that the old Sandia accounting software was maintained by two or three people — the Oracle software takes hundreds. Is this true?

**A:** No, it is not true. The staff that implemented Oracle also had responsibility for maintaining and supporting the old accounting/property/inventory/purchasing/accounts payable/case/general ledger systems. So, the number you heard about (the two or three) were the only dedicated staff to the old system, while the others were dual-tasked and were responsible for implementing the new system as well as maintaining the old. The hundreds number you hear about are the persons who are involved in a day-to-day basis with financial, procurement, manufacturing, and reporting modules that use Oracle Enterprise Resource Planning software to accomplish their jobs. The staff supporting Oracle is less than what the old in-house-developed systems had. — *Ralph Borner*

### For the record

The Feedback reply in the Feb. 7 issue (page 3) indicated Sandia employees' 401(k) matching funds are paid by Lockheed Martin Corporation. They are paid by Sandia, about \$20 million a year.

\* \* \*

The photo on the front page of the Feb. 7 issue of *Lab News* misidentified the person pictured with Sandia's newly upgraded Annular Core Research Reactor (ACRR). The person in the picture was Rick Gomez, not Ron Farmer.

# Sandia LabNews

## Sandia National Laboratories

<http://www.sandia.gov/LabNews>

Albuquerque, New Mexico 87185-0165

Livermore, California 94550-0969

Tonopah, Nevada • Nevada Test Site • Amarillo, Texas •

Carlsbad, New Mexico • Washington, D.C.

*Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a subsidiary of Lockheed Martin Corporation and a prime contractor to the US Department of Energy.*

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

**Bill Murphy**, Writer . . . . . **505/845-0845**

**Chris Burroughs**, Writer . . . . . **505/844-0948**

**Randy Montoya**, Photographer . . . . . **505/844-5605**

**Nancy Garcia**, California site contact. . . . . **925/294-2932**

**Contributors:** Janet Carpenter (844-7841), John German (844-5199), Neal Singer (845-7078), Larry Perrine (845-8511), Howard Kercheval (columnist, 844-7842), Will Keener (844-1690), Iris Aboites (844-2282), Rod Geer (844-6601), Michelle Fleming (Ads, Milepost photos, 844-4902).

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

Classified ads . . . . . **505/844-4902**

Published on alternate Fridays by Media Relations and Communications Dept. 12640, MS 0165



## Labs Accomplishments available next week



The SnifferSTAR chemical sensor is featured as the cover photograph of the Labs Accomplishments 2003 issue of the *Lab News*. Labs Accomplishments 2003 will be distributed to all Sandians during the week of Feb. 24.

The cover photo (at left), shot by *Lab News* photographer Randy Montoya, shows researcher Doug Adkins, a member of the SnifferSTAR development team, examining a prototype of the sensor in an acrylic wind tunnel. The sensor, which mounts on a drone aircraft for remote surveillance of battlefield environments, weighs less than a golf-ball and uses the motion of the aircraft to collect air samples for analysis. It can detect blister and nerve agents but ignores common interferents.

SnifferSTAR is a joint effort of Sandia and Lockheed Martin and is part of Lockheed Martin's Shared Vision program.

It is one of more than 150 accomplishments featured in this year's publication. Accomplishments are selected through the Labs' VP offices and represent a sampling of the best work done in the technical and administrative sides of the Labs.

# Kathleen Puckett peers inside lone terrorists' minds

By Nancy Garcia

Although she never interviewed them, retired FBI special agent and psychologist Kathleen Puckett has spent hours reviewing the files of 10 "lone wolf" domestic terrorists for forensic analysis.

Now a counterintelligence expert at Lawrence Livermore National Laboratory, she presented the results of her study to a full auditorium at a security awareness event last month at Sandia/California.

The individuals she studied included Oklahoma City bomber Timothy McVeigh, Unabomber Ted Kaczynski, right-wing extremists, and violent anti-abortionists.

She said the study was commissioned by the FBI's Counterterrorism Division to see "if there was any way we could have seen this coming ahead of time." She determined that law enforcement had some opportunities to spot a potential lone terrorist because they did repeatedly try to join identified groups.

"The attempted affiliations . . . provide visibility to law enforcement," she said. "Otherwise, they're lost out there in the fabric of the country."

She explained that groups appeal to a need for connection. "The tie that binds is paranoia," Puckett said. "Distrust and suspicion are the social cement that holds them together."

Affiliation provides emotional connection, social connection (including identity and stature), and cognitive connection through conspiracy theories that seem to hang together.

Lone terrorists, however, become socially isolated because of their failure to adjust. They are either rejected by the group or reject it. They cling to the group's ideology with an intensity fueled by anger and isolation. The ideology, she said, "would never reject them, abandon them, or let them down."

Convinced of the rationale for the group's existence, they dedicate themselves totally to that cause and pursue activities that fulfill their need to matter.

Group members, on the other hand, tend to engage in more talk than action. "It's mostly talk," Puckett said: "I hate them too — let's hate them together." They bond.

Timothy McVeigh, convicted of the 1995 bombing of the Murrah Federal Building in Oklahoma

she studied, but all had average or better intelligence, she said. Ranging from 21 to 40 years old, the men were in what she called the prime age for violent behavior. A few had suspected or confirmed mental illness, too.

Joseph Paul Franklin, who allegedly tried to spark a race war by killing more than 20 people from 1977-1980 as a sniper, was "probably the most psychopathic of this group," Puckett said.

John Salvi III, who killed two Planned Parenthood receptionists and wounded others, "was most clearly mentally ill." He committed suicide in prison in 1986.

Kaczynski opted to plead guilty rather than accept a mental-health defense he felt was being forced upon him. Another lone terrorist, anti-abortionist Paul Hill, gravitated to a more extreme stance after enjoying national media attention on the Phil Donahue show. He shot two and wounded one outside a clinic. Committed

to death row, he remains an unrepentant defender of the unborn.

One person she studied remains at large, Eric Robert Rudolph, who allegedly carried out the Centennial Olympic Park bombing in Atlanta and bombings at a gay nightclub and an abortion clinic in 1997 as well as a fatal bombing in Birmingham in 1998.

In all cases, Puckett found, a political cause was never the ultimate cause of the terrorist acts. She found the individuals already possessed psychological precursors that predisposed them to act from the pain of social isolation. "All these people wanted to matter," she said. Since they could not matter as part of a group, they sought to matter by causing a destructive impact on society.



WHAT MAKES HIM TICK? This sequence of photographs of Unabomber Theodore Kaczynski suggests a man becoming increasingly alienated from society. Kaczynski was one of the 'lone wolf' domestic terrorists studied by retired FBI Special Agent Kathleen Puckett, who now serves as a counterintelligence officer at Lawrence Livermore National Laboratory. She recently shared her insights about 'lone wolves' with an audience at Sandia/California. (Photos compiled by CNN)

City, typified the failed social adjustment and attachment to a cause. Executed in 2001, he remained "a true believer to the real end," Puckett said.

Like many lone terrorists, he accepted what he called "collateral damage" (the death of 19 children among the 168 fatalities) but did not intend to die himself.

"Most terrorists want to live to fight another day," she said, adding, "They really would rather have been part of the great march to glory with the group."

Puckett read the thousands of pages of writings of Theodore Kaczynski, who operated for 17 years, mailing letter bombs from his cabin in the Montana wilderness. "He was very, very needy," Puckett said. "He was totally convinced his life would be complete if he could just get a woman to join him in the woods." The only times his misery did not appear in his writings coincided with the times he was building a bomb, she said.

He was the brightest among the 10 individuals

**Sandia California News**

## Tech transfer consortium honors EUVL project

By Nancy Garcia

The Federal Laboratory Consortium for Technology Transfer has granted the Extreme Ultraviolet Lithography (EUVL) project an Excellency in Technology Transfer award for its next-generation technology to produce faster and more powerful microchips.

The EUVL team is made up of scientists and researchers from Sandia, Lawrence Livermore, and Lawrence Berkeley national laboratories working as the Virtual National Laboratory. The team has successfully transferred the EUVL technology under a multiyear CRADA (cooperative research and development agreement) to the Extreme Ultraviolet Limited Liability Co. (EUV LLC), a consortium headed by Intel Corporation that includes chipmakers Advanced Micro Devices, IBM, Infineon, Micron Technologies, and Motorola.

Current lithography technology — which uses light, focused by lenses, to imprint features etched on a silicon chip — has advanced during the past 25 years to essentially double the number of features that can be packed onto each chip every two years. However, by 2007, the steady reduction in feature sizes possible with visible and ultraviolet-light lithography is expected to reach a physical limit, halting advances in the speed and power of microprocessors.

EUVL has been targeted by industry as the next-generation lithography approach to be introduced in 2007 for high-volume manufacturing. It uses extreme ultraviolet light with a wavelength 10 times shorter than the current wavelengths. Since the shorter wavelength is absorbed by lenses, the EUVL system must use a reflective optical system (coated mirrors) instead of transmitting lenses for the operating wavelength of 134 angstroms. Industry watchers say EUV lithography could be used for

the next decade, contrasting current lithographic techniques that are typically outdated within a few years.

The first full-scale prototype EUVL machine, located at Sandia's California site, was completed in 2001. The technology demonstrated by the prototype machine will make possible microprocessors that are 10 times faster with 10 times as many active transistors and memory chips that can store 40 times more information.

"This recognition marks another milestone in the evolution of EUVL technology," says Don Sweeney, Livermore's EUVL program manager and director of the EUV Virtual National Laboratory. "It truly is an honor to be recognized for the successful transfer of fundamental science developed at the national laboratory level to the private sector."

The FLC award is given only to organizations that have successfully transferred a technology to a commercial company. A panel of technology transfer experts from industry, state and local government, academia, and the federal laboratory system



LINING UP — The Extreme Ultraviolet Lithography tool, shown here being aligned during its assembly at Sandia/California, is now subject to industry interactions in a Resource Development Center. Through tests conducted at this user facility, tool-making manufacturers are developing new commercial chip-patterning devices to supply the microchip manufacturing industry. (Photo by Randy Montoya)

evaluated the nominations.

The Federal Laboratory Consortium for Technology Transfer is a nationwide network of more than 700 federal laboratories that provides a forum to develop strategies and opportunities for linking laboratory technologies with the commercial marketplace. The FLC was organized in 1974 and formally chartered by the Federal Technology Transfer Act of 1986 to promote and strengthen technology transfer nationwide.

## Academy members

(Continued from page 1)

been elected to NAE membership in the same year. And, as Al points out, it means that five Sandians have been elected in the last two years. Last year Jeff Brinker and Gordon Osbourn were elected (*Lab News*, Feb. 22, 2002). Al says he believes this brings the number of Sandians, including retired Sandians, elected to NAE over the years to about 15.

*"I'm especially proud that the Academy has seen fit to induct these individuals, particularly since some of their greatest accomplishments have been performed in the classified realm."*

Here are the NAE listings and citations:

**Charles [Jack] Jakowatz Jr.**, Manager, Signal Processing and Research Dept. 5912. "For innovations in synthetic-aperture radar-image processing critical to military applications and environmental monitoring."

**Alton [Al] Romig Jr.**, Vice President, Science, Technology, and Partnerships, and chief technology officer. "For outstanding contributions to the science and technology of materials and for innovative research and development of defense systems."

**James Asay**, Deputy Director, Weapon Science Applications, Sandia. "For leadership in engineering research and management of shock waves and for the development of tools that have contributed to national security." Jim retired recently from Sandia after 32 years and



Al Romig

Jack Jakowatz

Jim Asay

is now a research professor and associate director at the Institute for Shock Physics at Washington State University, Pullman. Last fall he was honored with the American Physical Society's Shock Compression Science Award (*Lab News*, Oct. 10, 2002).

"I was extremely proud to hear that the National Academy of Engineering had elected three more Sandians to membership," says Sandia President and Labs Director C. Paul Robinson, who himself was elected to NAE in 1998. "Each is exceptionally worthy of membership, and it's even more remarkable

that the specialties of these three are so diverse: Al Romig, who is a premier materials scientist, Jim Asay, who is a world-recognized expert in equation-of-state technology, and 'Jack' Jakowatz, who has pioneered real-time SAR with many important applications.

"I'm especially proud that the Academy has seen fit to induct these individuals, particularly since some of their greatest accomplishments have been performed in the classified realm. It should be encouraging to all Sandia engineers that such outstanding work can be awarded Academy membership." — Ken Frazier

## CO<sub>2</sub> sequestration

(Continued from page 1)

It's a health hazard to those who breathe it, and if global climate change is real, emissions of man-made CO<sub>2</sub> are probably a leading cause.

The southern New Mexico collaboration is one of several regional partnerships that make up DOE's Carbon Sequestration Program, funded by the Office of Fossil Energy.

The larger program is exploring all the ways carbon dioxide could be captured at the smokestack and disposed of in a safe place.

It supports the President's Global Climate Change Initiative (GCCII), which seeks to slow the increase of CO<sub>2</sub> concentrations in the atmosphere and to ensure that a suite of commercially ready sequestration technologies are available by 2012.

DOE-funded teams, for instance, are exploring the possibility of injecting CO<sub>2</sub> into aquifers or the deep ocean, where the gas would be harmlessly dissolved in water.

Others are studying how to speed or improve the natural carbon absorption processes of forests and the ocean's surface.

The total capacity of US geologic repositories — depleted oil and natural gas reservoirs, aquifers, and unmineable coal beds — is estimated to be between 300 and 3,200 gigatons of carbon dioxide.

The DOE program proposes a combination of various carbon sequestration efforts to significantly lower net carbon dioxide emissions

*The total capacity of US geologic repositories is estimated to be between 300 and 3,200 gigatons of carbon dioxide.*

*"We might raise more questions than we answer," he says. "But that's OK. This is a stepping stone to larger projects."*

long enough for the US to transition to cleaner energy sources.

### Ear to the ground

The oil reservoir project is led by DOE's National Energy Technology Lab and includes researchers from Sandia, the Colorado School of Mines, the Petroleum Resource Recovery Center at New Mexico Tech, Los Alamos National Laboratory, and Kinder Morgan, an enhanced-oil-recovery company.

Using a small, one-mile-square depleted oil reservoir near Hobbs, donated as a test bed for the project by Strata Production Company, the team pumped about 30 tons of CO<sub>2</sub> per day into the reservoir from early December until mid February.

As the gas was injected, downhole geophones much more sensitive than the human ear listened for the snap, crackle, and pop that occurred as the gas induced very small earthquakes called microseisms. Such sounds, it was hoped, would help the researchers follow the CO<sub>2</sub> front as the gas spread underground.

Other seismic monitoring was done before and after the gas injection using lines of geophones laid out on the surface above the reservoir. As a truck with a large gas-driven thumper, parked at various locations on the surface, created vibrations, the surface instruments measured seismic waves that reflect off underground features.

Seismic surveys also are being performed between wells that straddle the reservoir. A pressurized air gun creates vibrations from one well while sensors in the other record the vibration

signatures. Readings are being taken as the sensors are moved up the borehole in 10-foot increments.

### Gigabytes of data

With the gigabytes of data they are producing, the team will create three-dimensional images of the underground geology. The data will be compared with those from similar measurements taken before the CO<sub>2</sub> was injected into the reservoir.

Changes between the two sets of images will provide clues about what is happening underground. Los Alamos and the Colorado School of Mines are performing the data analysis.

The data also will be used to adapt 3-D geophysical computer models used for oil and gas exploration to models that will help predict results of future geologic carbon sequestration efforts.

"The current models depend on some assumptions," says Norm Warpinski (6116), Sandia carbon sequestration program manager. "We don't know where those assumptions are wrong."

"We might raise more questions than we answer," he says. "But that's OK. This is a stepping stone to larger projects."

Sandia's role is to provide technical support of the geologic modeling effort and study in detail the chemical reactivity and fate of the CO<sub>2</sub> in laboratory tests.

During the past year Sandia researchers have conducted a series of lab experiments on core samples from the reservoir to study the expected chemical interactions between the CO<sub>2</sub>, a brine, and the underground minerals. They'll test post-CO<sub>2</sub> core samples, as well.

The Strata reservoir near Hobbs is the first US site dedicated to CO<sub>2</sub> sequestration rather than enhanced oil recovery. (The oil industry pumps CO<sub>2</sub> into active oil reservoirs as a way to recover remaining oil that is difficult to extract.)

Sandians involved in the project include Norm, Jim Krumhansl (6118), Carlos Jove-Colon (6851), John Lorenz, Scott Cooper (both 6116), and Hank.

# Sandia, Bureau of Reclamation release research strategy for cost-effective water desalination

By John German

Sandia and the US Bureau of Reclamation (USBR) last week announced the release of a Technology Roadmap to guide future investments necessary to reduce the cost of water desalination.

The report, compiled by a panel of experts, also outlines needed advanced water treatment technologies.

Desalination technologies could provide new processes to remove salts and other contaminants from impaired waters cost-effectively and efficiently.

"The development of an adequate and viable water supply for the 21st century requires the coordinated efforts of many organizations in both the public and private sectors," says Tom Hinkebein (6113), the roadmap program manager who, along with Marie Garcia (1010), represented Sandia on the panel.

"The Technology Roadmap provides the framework for those interactions," he says.

The research roadmap defines a research and development path for desalination technologies, beginning today and continuing through the year 2020. If implemented, the strategy would support finding solutions to the nation's water supply-related needs by advancing water desalination technologies, he says.

"Cost reduction is the single most important factor necessary to increase the implementation of desalination, which will in turn reduce pressure on our limited fresh water supplies," says John Keys, Commissioner of the Bureau of Reclamation. "As we enter the fourth year of a drought in many western states, it is imperative that we develop new technologies to increase our domestic water supply."

The report is expected to be used to guide decision making by Congress, federal agencies, utilities, and research institutions and individuals funding or conducting desalination research.

The Bureau of Reclamation is asking the



SANDIA IS COORDINATING design of the Tularosa Basin desalination research facility that will serve as a national test bed to evaluate various desalination technologies.

National Academy of Sciences' National Research Council (NRC) to review the report to address whether the roadmap presents an appropriate and effective course to help address future freshwater needs in the United States.

The NRC also is asked to identify general priorities for research investments. A final report of the roadmap committee will be issued that incorporates the comments from the NRC and other national desalination experts.

Development of the roadmap began with a

discussion among members of an expert panel of major national-level water supply needs over the next several decades and included several case studies drawn from across the nation, says Tom.

Sandia and the Bureau of Reclamation convened the panel, which included representatives of the private sector, municipal water agencies, academic and other research institutions, and the federal government.

The report is available at [www.usbr.gov/water/desal.html](http://www.usbr.gov/water/desal.html).

## Policy center

(Continued from page 1)

social sciences together with expertise and relationships from technical disciplines and programs. Collaborations within and between Sandia and UNM will be of special attention, but the office will

actively seek to facilitate collaborations among multiple institutions and across disciplines.

"Technology can be a causative or curative agent of insecurity, but often can only be fully understood in a broader framework including economic, social, or political factors," says Roger Hagenruber (10), the office's first director.

"This office will seek to forge broad alliances among the many experts in diverse fields at UNM,

Sandia, and other organizations around the world committed to supporting thoughtful and effective national and international policy," he says. "The relationship between the University and one of the nation's national labs will be a unique advantage."

Roger most recently served as the Labs' senior vice president for nonproliferation and arms control. His Sandia career included assignments to negotiating teams in Geneva and service on national panels dealing with national and international security issues.

He also is a political science professor at UNM and is director of UNM's Institute for Public Policy (IPP), which operates a survey research center to

collect and analyze public attitudes about a variety of public policy issues including technology and national security.

The office will be located at UNM under Vice Provost for Research Terry Yates. A board of directors including a senior executive each from UNM and Sandia and one member of the community will oversee its activities.

Lockheed Martin is providing startup funding — \$250,000 a year for five years. The long-term goal is to create a base of support from corporations, policy foundations, government agencies, and other institutions that would make the office self-sufficient, says Roger.

### First steps

The primary function of the office, he says, will be to provide an environment where researchers from diverse disciplines and organizations can engage in research, projects, and education in support of the public service missions of UNM and Sandia.

In doing so, it will initiate research, develop curricula, organize conferences and seminars, host visiting scholars, engage students and interns, and convene multidisciplinary teams and task forces.

Among the office's first efforts, says Roger, will be to conduct an in-depth analysis of more than a decade of public opinion data on national security issues that has been collected for Sandia by the IPP.

The office will also develop curricula for short courses intended for students, business leaders, and government officials on such topics as homeland security, weapons of mass destruction, and terrorism; create a master's degree program in international policy and technology; organize a conference on technology and security topics of specific interest to New Mexico and the Southwest such as water and border issues; and initiate a distinguished speakers series to share the perspectives of national and international luminaries in related fields.

## This is only a drill



SANDIA'S emergency first responders (such as the person at left) frequently run full-dress drills to exercise their skills, processes, and equipment. The photo, taken by *Lab News* photographer Randy Montoya during a recent exercise, shows a responder answering a call involving a potentially toxic gas release.



## Feedback

**Q:** I noticed in the *Sunday Journal* an article about the troubles at LANL. The article attributed the start of the trouble with the audit function being a part of the lab, instead of being independent. What is the situation at Sandia?

**A:** Independence is a necessary condition for an objective assessment system and a key aspect of a robust assurance system (i.e., a system to inform all stakeholders of the enterprise that expectations, whether expressed as rules or performance objectives, are being met or are likely to be met).

In general there are two components of independent assurance: those provided for from within the organizational structure of the enterprise and those either imposed by oversight authorities or requested by management that are performed by parties external to the enterprise. Both components are necessary for a robust assurance system. Comparing and integrating these two independent sources of assessment information allow for a higher level of assurance and better fulfillment of oversight responsibilities.

At Sandia, the independent internal assurance function for business matters (financial controls, resource controls, quality, ES&H etc.) is largely the responsibility of Audit and Ethics Center 12800. This center has structured its Internal Audit function in accordance with the standards of the Institute of Internal Auditors. The Professional Practices Framework provides the following key attributes with respect to independence:

**1100 Independence and Objectivity**  
The internal audit activity should be independent, and internal auditors should be objective in performing their work.

**1110 Organizational Independence**  
The chief audit executive should report to a level within the organization that allows the internal audit activity to fulfill its responsibilities.

**1110.A1** The internal audit activity should be free from interference in determining the scope of internal auditing, performing work, and communicating results.

**1120 Individual Objectivity**  
Internal auditors should have an impartial, unbiased attitude and avoid conflict of interests.

With respect to organizational independence, the Director of 12800 reports directly to the Executive Vice President (EVP) and President. The Director is a member of key executive oversight councils such as the Risk Oversight Management Council (RMOC) chaired by Executive VP Joan Woodard with eight LLT members on the Council, and also interacts and provides reports to the LLT audit organization, which reports to the Lockheed Martin Corp. Audit and Ethics Committee of the Board. The Director also reports to the Sandia Board of Directors (the Board was recently restructured to have a Governance committee and an Audit and Ethics subcommittee). Private time with the Board of Directors at these meetings without any Sandia management is routinely provided for the Audit Director. Further, there is frequent dialogue with the DOE/IG and GAO, providing opportunities for checks on assessment scope and process. To maintain their reliance on the Sandia internal assessment process, DOE/IG annually audits the Internal Audit department.

The internal audit function is formally chartered by the President and EVP of Sandia and the VP of Lockheed Martin internal audit. That charter addresses the audit responsibilities and requirements for unimpeded access to personnel and documentation. Details of the Audit Center's responsibilities and authorities are incorporated in our business rules in CPR001.3.5 Audits, Assessments, and Appraisals. The Audit Center also participates in a peer review process on a triennial basis that provides external review and comparison of assessment processes.

Individual objectivity and competence is addressed by several Center practices. These include selecting individuals having appropriate education and background, attaining relevant professional certifications, and assigning personnel to minimize potential conflicts of interest or past history bias potential. Internal audit processes follow general requirements of the Lockheed Martin Corporate Internal Audit Statement (CAPS 013) designed to comply with all IIA standards and guidance for the Professional Practice of Internal Auditing, including a Code of Ethics. In addition, Internal Audit's reports are reviewed by the Lockheed Martin internal audit organization, and associated corrective actions are tracked by Lockheed Martin management.

These features represent industry best practices and, in total, assure that the Audit and Ethics Center is as free, as feasible, of influence that could limit its scope or its objectivity. — Jennifer Crooks (12800)

## Sandia establishes new Audit and Ethics Committee

Sandia has consistently tried to make sure that its audit system is independent and objective. (See adjacent Feedback.) Most recently that commitment has gone one step further.

A new Audit and Ethics Committee — a subcommittee of the Sandia Corp. Board of Director's Governance Committee — has been established that consists only of "outside" board members who are not from Sandia or Lockheed Martin.

"The idea of total independence for our audit teams has been high on our radar screens for a long time," says Executive VP Joan Woodard, who also heads up Sandia's Risk Management Oversight Council. "This idea of a subcommittee of the board that consists of no Sandians or Lockheed Martin affiliated people leads us further in that direction. The idea started more than six months ago with the design of an active role for the board in providing assurance to NNSA of the quality of the laboratories operations."

For example, it will allow Jennifer Crooks, Director of Audit and Ethics Center 12800, to go before the Audit and Ethics Committee and discuss matters of concern freely and not feeling inhibited by having Sandia upper management — her bosses — in attendance.

The new Audit and Ethics Committee is still evolving. It currently has two members — Bill Howard, chair, and Donna Bethell. A third will be added soon.

The subcommittee will oversee the efficacy of the Sandia Internal Audit and Ethics function through review of the annual audit plan and quarterly review of issues and trends.

Independent and objective auditing by the 40 people in Jennifer's division is achieved in several ways. For example Jennifer reports directly to Joan and Sandia President Paul Robinson. As a result auditors are not pressured by groups being audited. "We vow to remain vigilant in making sure Sandia audits of its operations are independent, fair, and unflawed," Joan says. — Chris Burroughs

## Job Shadow Day brings 40 students to Sandia



**ROCKET NOZZLES** — Sandia's Todd Criel (15426) discusses how engine nozzles guide a rocket in flight with Daniel Nava and Nalton Antonio (right), both freshmen at Del Norte High School. The two were among about 40 students who took part in Groundhog Job Shadow Day at Sandia, an opportunity for one-on-one and small group interactions between area high school students and Sandia employees, organized by the Labs' Corporate Outreach group (12650). Seven area high schools participated in the program. Marisa Tapia, an Albuquerque High School (AHS) junior recounted a number of interesting experiences during her day at the Labs. "We found out what is involved in being an engineer," she said. "It takes determination," added classmate Sheana Perry. "And, you can tell that the people here enjoy their jobs." Gary Chavez, an AHS senior, said he enjoyed his day at Sandia and will major in "something in science, possibly chemistry," at UNM next year.

(Photo by Randy Montoya)

## Recent Patents

William Sweatt (1743), Stephen Gentry (5712), Clinton Boye (5710), Carter Grotbeck (5712), Brian Stallard (5712), and Michael Descour: Information-Efficient Spectral Imaging Sensor.

Tina Nenoff (6233) and May Nyman (6118): New Silicotitanate Molecular Sieve and Condensed Phases.

Sherry Morissette, Joseph Cesarano II (1843), and Duane Dimos (1801): Solid Freeform Fabrication using Chemically Reactive Suspensions.

Donald King (6424), Laurence Sadwick, and Bernard Wernsman: Microminiature Thermionic converters.

Frank Peter (2614), Richard Givler (9114), Kevin Zavadil (1832), Paul Galambos (1769), Randy Shul (1763), and Christi Willison Gober: Surface Micromachined Structure Fabrication Methods for a Fluid Injection Device.

# Don't tug on cape of karaoke performers; just applaud

## Coronado Club after-work group attracts singers from across Labs

By Neal Singer

Several visitors to the usually peaceful Coronado Club bar experienced a peculiar double vision — eyes not quite coordinating — on a recent Thursday evening as they looked across the bar's color TVs into a new space opened in what, during the day, is cafeteria land.

The bar's large TV screens featured the usual beautiful people in perfect clothes in the color-matched settings that customarily entertain us while we sit still. But slightly beyond them, were, well, Sandians, us, in all our glory — T-shirted or in ties, in jeans or in dresses, perhaps short or long a pound or two, holding wireless microphones close to lips and singing. Some performers hit surprisingly clear, pure notes as they stood either anonymously in the new room's doorway or belting it out on stage.



LADY SINGS IN BLUE — Barb Reser leaves work behind and gets into her song.

The visitors — members of a Sandia group called the World Improvement Society, which holds the simple credo that the world improves with a few after-work beers and a little conversation — decided this was worth a closer look and changed tables to sit in the adjoining room.

Over an impromptu wood-floored stage, on a large raised monitor, appeared emotional words that seemed somehow shockingly out of place at Sandia:

*I can't get enough of your love, babe.  
I can't get enough  
Can't get enough  
I can't get enough  
Of your love, babe.*

As e-mail, the refrain might be censored. But there it was, up on a public video monitor for all to see.

Or there were words that might not find expression at most positively oriented staff meetings:

*I'm .... so sad and lonely....  
I got nobody, nobody cares for me,  
Or they were funny:  
I told her I was a flop with chicks  
I told her I had been that way since 1956...*

Ominous:  
*When godfearin' women get the blues,  
There's no tellin' what they gonna do.*

Coming of age:  
*Who doesn't know what I'm talking about  
Who's never left home, who's never struck out,  
To follow a dream...*

And patriotic:  
*Everywhere from around the world  
They're coming to America.  
Got a dream they've come to share,  
They're coming to America.*

One WIS member noted he had never really understood the words of these songs before seeing them written out in front of him as the music played.

*You let the wrong words slip/when kissing persuasive lips/the odds are you/won't live to see tomorrow/secret-agent man.*

The words on screen were highlighted as their turn came to be sung. Some singers found security in staring at the words, blanking out the audience, while others detached from the screen enough to move around the stage and even, occasionally, among the customers.

Meanwhile, those at tables, when not drinking, talking, or applauding, were doing what Sandians

do best — looking through books. But these white looseleaf-bound volumes contained no DOE regulations. On each of 111 pages were the names of approximately 100 songs, arranged by artist; a second set of pages arranged the same 11,000 songs by title. The bolder customers wrote down the name and index number of a song on the paper provided, submitted it to the dee-jays, and sat back down to await their turns as entertainers. The audience did double duty as performers, and the performers, as audience.

WIS requested an explanation. We learned that this was a karaoke bar set up every Thursday night at the Coronado Club by the husband-and-wife entrepreneurial team of Tony and Mary Romero, aided by their daughter Joanne. The couple claim that their computerized equipment — which houses their extensive song repertory, gives vibrato and depth to thin voices, and moderates overly soft or loud ones — is the best in Albuquerque. (The WIS did not check this assertion but rated the electronic manipulation skillful.) There is no charge to sing (costs are paid by the Club), perhaps one reason why the singing was nonstop as Sandians from many work groups participated.

The question in our minds was why apparently conservative people pick up a mike and sing to others in a bar.

Scott Pinnick of CSU Special Projects (9621), a member of the self-styled Red Rover group who wear customized red T-shirts at the club, said, "I never thought I would do it. The first time I tried, I waited until almost everybody left. It was harder than it looked. But it was something I'd always dreamed of doing. Everybody's thought about being a recording artist at some time or other. It's not a major dream — not your life, not your career. But karaoke gives you to chance to experience it. Some bars, they boo you, but here, it's doesn't matter how bad or good you are. If you can take that first step and get up, it just latches on to you. If you really like singing, this is the place you can do it."



RESIST US? IMPOSSIBLE! — From left, Morgan Davis, Mike Watson, and Scott Pinnick of the Sandia Red Rovers show soul.

Other Red Rovers are Morgan Davis and Mike Watson (also 9621).

A WIS member, trying to understand, reasoned that perhaps it was not karaoke that was peculiar but that in the US there are so few places to sing. People sing (he enumerated) in private in one's car or shower, in choirs or caroling, at birthdays, or on disks if one is a professional making money. "Here, you can sing all these wonderfully original songs, nobody minds, and have a whole orchestra singing along with you."

Karaoke may be strange to most of us, but on Thursday night, table occupants are reasonably numerous. According to club bartender Mendy Lori, "Karaoke night is the biggest night at the Club."

The audience does seem livelier than the customers in most bars, but they don't all come to perform. David Tenorio (12345) attends most sessions but doesn't sing. "I'm saving myself," the 26-year Sandia veteran quips. "I'll sing when I'm close to retirement." Why does he come? "I enjoy the people; they leave work at work and go to have a good time."

Some, like Myra Edaburn (12610) of Video Services, feels safer in the protected environment of the on-base club. "I like listening to the people, enjoy the company, and find it entertaining."

One highly visible performer is David Dobias, (10848), who sings in Willie Nelson-like mellow tones and wears a dark-colored cowboy hat with dangling feather, jeans, cowboy boots, and western-style shirt. "My sister made the hatband and feather for me for a company retirement party," says David. He has sent in tunes he wrote to record companies, but their replies haven't paid any bills. "Now singing is just a stress reliever and a fun thing."

Barb Reser (2910), Military Liaison and Knowledge Management, whose husband and co-attendee is medical clinic administrator Terry Reser (3333), says the number of men and women who perform are roughly equal. Barb, one of the more lively performers, is one of the few who doesn't lock in to the teleprompter screen for words and comfort but dances across the stage rhythmically as she sings. "I have a good time," she says.

Her husband describes his experience differently. "For a long time, I just listened. Then I heard two guys sing and I thought I couldn't do worse than that. So I succumbed and sang. Somebody must do a vegetable check at the door because nobody's thrown rotten tomatoes at me yet." He used to come, Terry says, for the compelling reason that he carools with Barb, but now he comes for the camaraderie of the group.

Andy Rogulich, coordinator of the Weapon Intern Program (0632), says that 30 to 40 interns sometimes visit karaoke after early evening classes for camaraderie in a nonwork environment.

The karaokeists are always looking for new volunteers to emerge from silence into limited stardom, or just to have a good time.

## Photos by Randy Montoya



DAVID DOBIAS offers the cowboy's touch of sorrow and joy.

# Mileposts

Photos by Michelle Fleming



Mary James  
45 10501



Ward Bower  
40 6218



Conrad Stayner  
40 2913



Frank Bacon  
35 2502



Steve Burchett  
35 9126



John Long  
35 9322



Douglas Schuler  
35 2952



George Kaye  
30 5902



John Thayer  
30 10861



Charles Christensen  
25 2913



George Cordova  
25 14404



Benjamin Dominguez  
25 9334



Debbie Johnson  
25 12620



Stanley Kawka  
25 2345



Gregory Kolb  
25 6218



Tamara Orth  
25 2911



William Prgent  
25 5852



Leigh Saunders  
25 10263



Craig Lee Walker  
25 14401



William Wolf  
25 3115



Carol Amedeo  
20 15000



Mark Baumann  
20 5848



Michael Benavidez  
20 3114



Thomas Brewer  
20 12326



Viola Campos  
20 11500



Charles Duus  
20 15201



Raymond Gabaldon  
20 15309



Paul Gibson  
20 5735



Charmaine Grabowski  
20 10852



Joseph Gustwiller  
20 15417



Ann Marie Gutierrez  
20 3520



Michael Irwin  
20 6134



Mark Jenkins  
20 1769



Sandra Mays  
20 10267



Tim Moss  
20 6218



Michael Pedroncelli  
20 2338



Gary Polansky  
20 6406



Kenneth Reaves  
20 2993



Larry Rinehart  
20 15333



Michael Swanson  
20 5713



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

## MISCELLANEOUS

MOTORCYCLE TRAILER, 3-rail, \$300; black leather chair, \$200; double bed, Craftmatic, motorized, \$1,800. Campbell, 294-6000.

COMPUTER TABLE, w/cabinet & shelves, 50" x 28", matching printer stand, 24" x 28", \$75. Pike, 299-6153.

SEWING/EMBROIDERY MACHINE, Pfaff, model 1221, table included, paid \$1,400, asking \$450. Tennant, 275-8014.

LAB/BORDER COLLIE PUPPIES, 4 males, 4 females, \$50. Milliman, 804-4739 or 304-2247.

MOTORCYCLE HELMET, brand-spanking new, Biker's Choice Skid Lid, black, XL, DOT/SNELL approved, \$30. Buteau, 856-7705.

SCREEN DOOR, wooden, 3' x 6'8", w/expanded metal on lower half; 90-ft. of 3/4-in. OIA copper tubing. Nelson, 265-7482.

TREADMILL, used 10 times, excellent condition, Pro-Form Crosswalk, 1/4-mile lap readout, time, distance speed, \$239. Locher, 266-2021.

VACUUM, 2000 Rainbow Air Purifier, new \$1,600, asking \$1,000; Juice-man, complete w/tapes & books, \$75. Gonzales, 296-9055.

WOOD-BURNING INSERT, w/blower, clean-out tray, excellent condition, \$950; cord of wood. Gallegos, 293-8885.

EDGE-SANDER, Delta, w/5-ft. tilting table, cost \$2,000, asking \$1,000; air-compressor, shaper, router. Rogers, 256-0066.

MACAW, Severe, 17-yr.-old DNA male, talks, needs to be "only child," adult environment, w/cage, \$600. Casey, 610-4327.

GUIARS: Austin (fender copies), red, strat, \$88; J-style bass, blue \$144; 15W & 25W amps. Bailey, 281-3265.

EXERCISE CYCLE, Airgometer, full-body aerobics, 7-function electronic monitor, owner's manual, \$90. Schmitt, 856-1280.

POOL HEATER, 181,000-Btu, \$600; refrigerator, side-by-side, w/ice & water in door, \$300; queen mattress set, \$50. Kolb, 271-1775.

ENTERTAINMENT CENTER, solid oak, lots of storage, locking video drawer, glass doors, roll-top-type TV door, mint condition, \$450 OBO. Johnson, 250-3205.

NATIONAL GEOGRAPHIC MAGAZINES, 1989-2002, not complete set, not collector quality, free. Neidel, 873-4903.

LIFT TICKETS, Angel Fire, 2002-2003 season, regularly \$45, all 6 for \$150 or \$30 ea. Orth, 792-1926.

REFRIGERATOR, \$100; queen waterbed frame, \$75; ceiling fans, \$25; rocking recliner, \$50; microwave, \$25; more. Beck, 275-3226.

COMPUTER DESK, wood, D20" x H30" x L60", pullout keyboard tray, \$45; bird "flight" cage, D16" x H31" x 14", \$40. Blickem, 323-6832.

COFFEE TABLE, oak, 60" x 24", heavily built, beveled glass top inserts (2), shelf below, excellent condition, \$95. Mendel, 299-6785.

WATERBED, single, w/heater, shelf headboard, 6 drawers, \$100; desk/dresser, 4 drawers, w/mirror/bulletin board, ask colored, \$50. Newman, 266-6928.

LIFE FITNESS LIFE CYCLE 5500, home version of gym model, paid \$1,200, asking \$500. Sumlin, 266-3883.

SOFA, \$50 OBO. McLendon, 975-3909.

SCANNER, Epson flatbed 1660-Photo, USB for PC or Mac, film & slide attachment, unused, \$95. Holmes, 292-0898.

RUBBER STAMPS, 21 different sets, various prices. Baca, 771-8728.

MOVING SALE, Feb. 22, 8 a.m., 7205 Ottawa Rd. NE, many items must go. Foucher, 883-8638.

GOLF SHOES, women's, Foot Joy, size 8-1/2 wide, worn twice, \$25; blood glucose meter, free. Blackburn, 828-9687.

DRUM SET, 5-pc., Pearl Export Select, Zildjian ZBT Plus cymbals, hard plastic cases, \$1,500 OBO. Chavez, 450-8270, after 2 p.m.

MOVING BOXES, cardboard, small, medium, large & wardrobe, 25¢ ea., small & medium ones. Barnard, 771-4620.

DINETTE TABLE, w/18-in. leaf, 6 chairs, good condition, \$300; girl's bicycle, 16-in, good condition, \$25. Surbey, 823-2843.

PC MEMORY: 128MB SDRAM, PC 133 ECC, \$25; 512MB SDRAM, DDR266, 184-pin, Kingston, \$45. Ritchey, 298-4311.

SPEAKERS, KLH, new in box, 3-way, 8-in., large bookshelf type, paid \$85, asking \$55/pair. Kureczko, 286-4426.

LATERAL FILE, metal, 5 door shelves, professional quality, excellent condition, home office record storage, cost \$800, asking \$195. John, 345-4006.

COMPUTER, Micron 333 MHz, P2-MMX, 4GB HD, 64MB RAM, 40x CD-ROM, 17-in. monitor, Okidata 4W printer, speakers, \$225. Shewnack, 266-5901.

HANDHELD COMPUTER, Sharp Zaurus SL-5500, 206 MHz, barely used, \$300 OBO. Madden, 272-7458.

BEDROOM SET, rustic, queen headboard, mattress, box spring, 6-drawer dresser, w/mirror, nightstand, \$600. Casbourne, 268-3942.

ENTERTAINMENT UNIT, oak, \$75; freezer, \$50; roll-top telephone desk, \$40; dresser, w/mirror, \$25. Barham, 293-2412.

DVD PLAYER, w/surround sound, speakers, \$100; Playstation 2 adapter, game, keyboard, \$40. Herrera, 298-8439.

BICYCLE CHILD CARRIER SEAT, fits behind bike seat, bolts to frame, \$10. Ferguson, 286-4390.

DINETTE SET, solid wood bench, Formica top, 2 leaf extensions, 4 chairs, can seat up to 12, \$350. Maxwell, 344-6157.

EXERCISER, Cardiofit, low impact, tones & strengthens, \$25; Philippine mahogany, 2-level end table, & lamp, \$20. Kepler, 296-0402.

FILE CABINET, 4-drawer, letter-size, gray, bars for suspended folders, good condition, \$20. White, 256-3095.

SOUTHWEST AIRLINE TICKET, anywhere Southwest flies, expires 1/16/04, \$310. Norwood, 292-0072.

DISK SANDER, 24-in., cast-iron base, bearings, heavy-duty, needs motor & pulleys, \$75 OBO. Thornberg, 869-0421.

VINYL WINDOWS, white S-H, never installed, sizes 2x4, 2x3, 3x6, 6x5 (side-by-side), \$720 new, asking \$350 OBO. Cocain, 281-2282.

SEAT COVERS, Dodge Durango, complete set, all 3 rows, custom fit, tan, paid \$600, asking \$400 OBO. Brown, 869-0704.

RV AIR CONDITIONER, Coleman, roof mount, 14A-110AC, 12,500-Btu, works great, \$275. Bailar, 259-6308.

BUNK BED, wood, \$85; *Astounding/Analog*, science fiction magazines, 1950's-1980's, \$2/issue; scrapbooks, 25% below retail. Forster, 293-7231.

TRAMPOLINE FRAME & springs, 12-ft., needs fabric, free. Clancy, 281-4469.

NORDICTRACK, older model, excellent condition, \$65 OBO. Rivers, 720-4701.

SLIDING SHOWER DOORS, 3-pc., great condition, \$35; 3 Tarzan movies, VHS, watched twice, \$11 ea. Herrera, 833-5035, ask for Paul.

DELTA 12-IN. PLANNER, great condition; roller blades, men's sizes 10-12 & 11, make offers. Mooney, 294-5161.

GOLF CLUBS, left-handed, Dunlop TD Plus, all irons, wedge, woods, putter, carry bag, \$50. Mileschosky, 266-5901.

## TRANSPORTATION

'93 MAZDA PROTEGE DX, beige, regularly serviced, 1 owner, 144K miles, clean, good condition, \$3,500 OBO. Lewis, 298-1296.

'92 FORD F150; '96 Ford Explorer, Eddie Bauer trim, bids accepted through 2/28/03, right to refuse bids, sold as is. Sandia Labs FCU, 237-7384.

'98 TOYOTA SIENNA LE, 5-dr., AT, 6-cyl., loaded, silver green, 48K miles, excellent condition, \$14,900 OBO. Umstead, 298-6354, ask for Matt.

'00 INFINITY I-30T, fully loaded, leather, all power, sunroof, 50K miles, \$22,800 OBO. Martinez, 269-9250 or 907-2632.

'98 VOLVO S-70, 2.5 turbo, fully loaded, excellent condition, must sell, take over payments. Royaboll, 565-2199.

## How to submit classified ads

**DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:**

- E-MAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 0165 (Dept. 12640)
- DELIVER: Bldg. 811 Lobby
- INTERNAL WEB: On Internal Web homepage, click on News Center, then on Lab News frame, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. 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. Submit the ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. **One ad per issue.**
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active and retired Sandians and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. **We reserve the right not to publish an ad.**

'78 CHEVY 1/2-TON, 4x4, 350 AT, good mechanical condition, recent brakes, carb & tune up, \$3,000 OBO. Hughes, 281-2854.

'98 TOYOTA TACOMA SR5/TRD, V6, 5-spd., AC, CD, charcoal, 116K miles, excellent condition, \$12,500 OBO. Tyler, 275-0186 or 846-0965, ask for Ryan.

'02 FORD EXPLORER XLT, AWD/4WD, V8, 6-CD, midnight blue, moon roof, extended warranty, low mileage, excellent condition, \$22,000. Schoeneman, 281-0036.

'91 TOYOTA PICKUP, short bed, 5-spd., Alpine CD, larger wheels/tires, 88K miles, excellent condition, \$4,350. Loucks, 255-9444.

'93 CHEVY BLAZER S10, V6, AC, PW, PL, 4-dr., 4WD, 1 owner. Blackwell, 897-5090.

'95 CHEVY DESIGNER CONVERSION VAN, V8, many options, white, great condition, \$7,500. Leong, 892-1564, www.swcp.com/~leongs/van.

'99 MAZDA MIATA, 5-spd., forest green, 38K miles, great condition. Clem, 271-0754.

'99 LANDROVER DISCOVERY II, 1 owner, new tires, gray, low miles, excellent condition, below book, \$19,000. Sweeney, 301-8957.

'01 VOLVO S40 TURBO, AT, ABS, CC, PS, PB, bright red, warranty, very nice car, \$15,000. Davis, 323-2877, ask for Mark.

'98 HONDA ACCORD LX, 4-dr., PW, PL, AC, white, 47K miles, great condition, \$11,500 OBO. Selever, 440-1951.

'98 FORD WINDSTAR, interior & body in excellent condition, all accessories work, engine needs repair, \$3,500. Garcia, 275-6515, ask for Keith.

'89 ACURA INTEGRA LX, 4-dr., 5-spd. manual, 111K miles, runs great, great gas mileage, \$1,800. Pratt, 256-7408.

'97 MERCURY GRAND MARQUIS LS, V8, 4-dr., sedan, PS, desert tan, 101K miles, excellent condition, \$5,200. Perkins, 293-5635.

'92 FORD RANGER, extended cab, V6, 5-spd., AC, CD, bed liner, green, 130K miles, good condition, \$3,000. Townsend, 265-1693.

'92 SATURN SC2, leather, PW, PL, sunroof, CC, CD player, white, 122K miles, \$2,500. Woods, 259-2228, ask for Becky.

'00 PONTIAC FIREBIRD, V6 performance package, loaded, AT, AC, Aero pkg., under warranty, low mileage, excellent condition, \$17,500. Hammond, 823-9619.

'94 FORD EXPLORER XLT, 4WD, 4-dr., AT, blue, receiver hitch, 99K miles, \$6,000. Warren, 294-5250.

'94 CHRYSLER CONCORDE, 3.5 V6, ABS, traction control, leather, loaded, trip computer, \$5,175. Jenkins, 897-1475.

'77 MERCEDES BENZ 450 SL ROADSTER, loaded w/extras, both tops, records, receipts, excellent condition, \$11,500. White, 294-5692.

'99 FORD MUSTANG, V6, AT, loaded, red, alloy wheels, adult owned, 47K miles, super condition, \$9,500. Perrine, 293-1429.

'92 MITSUBISHI GALANT, 5-spd., 4-dr., AC, PW, PL, tan, 127K miles, \$3,400. Baca, 897-3539.

'92 TOYOTA PICKUP, 4x4, camper shell, class III hitch, good shape, runs great, \$3,900 OBO. Lee, 797-1992.

'92 GMC SIERRA, 4x4, 5-spd., camper shell, new tires, well maintained, garaged, 180K miles, below book, \$5,900 OBO. Kuehne, 281-5446.

'98 FORD F150 XLT, extended cab, 3-dr., AT, short bed, 80K miles, excellent condition, must sell, \$8,200 OBO. Nguyen, 344-9216.

'93 PONTIAC TRANSPORT MINIVAN, V6, loaded, white, new tires & brakes, 84K miles, excellent condition, \$3,200. Maes, 291-1970.

'98 SATURN SC2, 5-spd., loaded, 35 mpg, 82K miles, great condition, book price \$7,500, asking \$5,800 OBO. Williams, 281-7848, ask for Carol.

'91 FORD TAURUS GL WAGON, 3.0 V6, new R124A AC system, 66K miles, excellent condition, \$2,800. Thomas, 883-9340.

'99 HONDA CIVIC, 5-spd., loaded, PCS, 40K miles, asking payoff, \$11,000. D'Spain, 565-8456.

'96 VOLVO 850, leather, PW, PL, tint, only 56K miles, excellent condition, NADA \$12,000, asking \$10,500. Smithpeter, 856-7047.

'97 NISSAN MAXIMA, V6, AT, AC, PW, PL, CD changer, CC, security, 72K miles, excellent condition, \$10,500. McCrory, 292-7516.

'85 HONDA ACCORD, 4-dr., sedan, 160K miles, runs well, great car for student, \$1,000. Holzrichter, 298-5695.

## RECREATIONAL

JET-BOAT, '78 Nordic, 18-ft., 460 Ford, new top, tandem trailer, excellent condition, kept indoors, fast/safe/fun, \$5,200. Strong, 861-3725.

O'DAY DAYSAILER, 17-ft., monohull, jib, main, storm sails, 2-hp Honda outboard, Highland trailer, all excellent condition, \$2,500. Schaub, 821-7242.

MOUNTAIN BIKE, Men's Diamondback, great condition, \$90; Trail-a-Bike, children's attachable bike, excellent condition, \$90. Helfrich, 255-9580.

TREK MILLENNIA BIKES, His & Hers, 26-in. wheels, 18-spd., \$200 ea.; bike carrier, \$50; 2 wall storage racks, \$20 ea., many extras. Thompson, 323-0200.

'84 HILO CAMP TRAILER, 21-ft., sleeps 4-5, shower, toilet, sink, 2-way refrigerator, stove, heater, AC, hot water tank. Smith, 890-5388.

'02 HONDA 919 MOTORCYCLE, excellent mid-range power & torque, 4,700 miles, \$6,700. Delgado, 979-5209.

GIRL'S BIKES, w/hand brakes, 16-in. & 20-in. \$30 & \$50; toddler bed, white w/flowers, \$50; gates, \$20. Renk, 242-1277.

## REAL ESTATE

3-BDR. CEDAR-LOG HOME, new, 3 baths, w/extras, 2.49 acres, 1-1/2 hours from Albuquerque on Pecos River, \$395,000 OBO. Stevens, 301-1947.

2-BDR. MOBILE HOME, 2 baths, 1/2 acre, 11' x 36' addition, city lot, near school, 1-1/2 garage, carport, fenced, landscaped, nice area. Belen. Santestevan, 864-6198.

3-BDR. TOWNHOME, 1-1/2 baths, 2-story, approx. 1,300 sq. ft., no HOA, San Pedro/McLeod area, \$84,900. Vigil, 880-0026.

4-BDR. HOME, 2-3/4 baths, mountain views, 1,950 sq. ft., new carpet & paint, choice NE location, lease purchase option, \$162,000. Chavez, 294-4184.

5-BDR. HOME, beautiful, East Mountains, Tijeras, luxury living, 10 acres, w/opt. barn & 3-1/2 acres, \$329,000. Rowe, 259-5386, leave message.

3-BDR. HOME, 2 baths, 1,803 sq. ft., custom brick, Oppel/Jenkens, Willow Wood, 5 min. to base, \$175,900. Thomas, 294-2960.

2-1/2 ACRES, residential lot, SE of Moriarty, well, septic, power, gas, phone, paved roads, \$15,500. Dawson, 281-1235.

2-BDR. CONDO, 1-1/2 baths, 2-story, 1,141 sq. ft., NW location, excellent condition, \$83,000. Lahusen, 792-0990.

4-BDR. HOME, 2-1/2 baths, loft, 3-car garage, great city views, 2 yrs. old. To, 797-1309.

2-BDR. CONDO, 2 baths, 1-yr.-old refrigerator, skylights, very clean, NE Heights, \$68,000. Zaragoza, 220-1323, ask for Mary or 363-7653, ask for Ed.

## WANTED

DRUM SET, for young teen, wants to learn, reasonable, nothing expensive. Casey, 299-1055.

OLD STAMPS, materials or inkpad, used for stamping greeting cards. McClellan, 867-9204.

GOOD HOME, love & attention needed for 9-mo.-old female terrier X, housetrained, friendly. Zelnio, 877-1465.

RAILROAD TIES; 6-ft. chain link fencing, w/poles, needed for wife's garden, will pick up. Dempsey, 281-9101.

ROCK HOUNDING EQUIPMENT: black light, metal detector, Geiger counter, etc.; fireproof safe. Korbin, 299-9088.

R/C MODEL AIRPLANE PARTS, systems. Reed, 821-7782.

RIDE, student needs ride to & from Manzano HS to Indian School/Morris area, price negotiable, student preferred. Massoth, 296-6078.

SLIDE PROJECTOR, working, for Longfellow Elementary School, donation. Tapia, 857-0475.

BENCH PRESS, w/weights, new or used for under \$200. Didlake, 925-784-4709.

ROOMMATE, non-smoker, male, NE Heights, 3-bdr. home, \$325, plus 1/2 utilities, no pets. Lopez, 255-0818.

SOUTHWEST AIRLINE TICKETS, roundtrip, need 5 for July travel, will pay up to \$200 ea. Shields, 286-5917.

MEXICAN EQUIPALE CHAIRS, small round table, in good condition. Kercheval, 266-5833.

## LOST & FOUND

LOST: AudioVox cell phone, grayish-silver, Feb. 8, outside gate 4 by Medical. Johnson, 284-5044, ask for Kristy.

FOUND: silver dreamcatcher earring, w/silver feather, blue & yellow beads, behind Bldg. 891. Guyer-Stevens, 299-7651.

## SHARE-A-RIDE

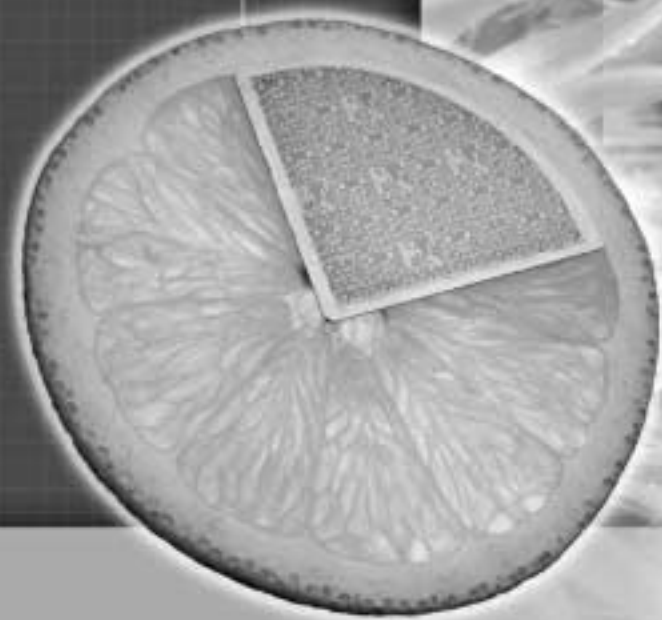
EAST MOUNTAIN VANPOOL, has openings, no need to drive, Frost Rd., N-14, Tijeras. Burns, 281-3922.



SANDIA NATIONAL LABORATORIES

# Integrated Microsystems Improve Stockpile

*Thirty individual microchips with acoustic wave sensors make up this quarter of a wafer, which fits nicely on an orange slice.*



**S**andia is developing new integrated microsystems and collections of microscopic smart devices that can sense, analyze, communicate, and react to their environment. Already used in automobile airbags, ink-jet printers, computers, and compact disk players, improved microsystems in weapons will provide:

- Robust guidance and instrumentation
- Self-diagnosis and communication of problems
- Improved safety and control

*Precision microcomponents, seen next to a ladybug, are fabricated by using tiny molds to mass-produce three-dimensional structures in a variety of materials, including metals, polymers, and ceramics.*

Seventh in a series of 10 posters on "Stockpile Stewardship: Strength Through Science" prepared by Public Relations & Communications Center 12600 (design by Mike Vittitow; photo by Randy Montoya) in cooperation with the Nuclear Weapons Strategic Business Unit. All 10 posters are on display in the Bldg. 800 corridor.  
NOTE: This poster was prepared prior to the 9/11 terrorist attacks on the US. Subsequently, Sandia sensor technology has found growing application in counterterrorism and homeland security.