

Labs bomb-disabling expertise helping protect athletes, spectators, bomb squads during '96 Olympic Games

Officials expect hundreds of bomb threats during 17-day event

By John German

Lab News Staff

As the '96 Summer Olympic Games in Atlanta bound out of the starting blocks this evening, federal, state, and local officials in charge of security for the event are in a classic Boy Scout frame of mind: Be prepared.

And as part of their diligent, Scout-like preparations, they've looked to a small team of Sandia researchers who know how to do one thing well — disable bombs without getting hurt.

Although Sandians won't officially be part of the Olympic security force — the largest ever assembled during peacetime, with more than 30,000 federal agents, police officers, and soldiers — bomb-disabling devices developed at Sandia, and much of the training to use them, will be behind the scenes in Atlanta as insurance against a potentially devastating terrorist attack.

Security a top priority

It's an important role, particularly when the Federal Bureau of Investigation (FBI) says it expects literally hundreds of bomb threats during the 17-day extravaganza, billed as the largest international sporting event in history. (See "Finding, neutralizing bombs may be an Olympian task in '96" on page 4.)

Between now and Aug. 4, some two million spectators, more than 10,000 athletes, at least 40 heads of state, numerous members of royal families, and many of the chief execs of the world's leading companies will have passed through Atlanta and visited the Games' 45 venues, most located within a few blocks of the city's center. Journalists from

(Continued on page 4)



VERSATILE OLYMPIAN — Chris Cherry (9333, kneeling, center) discusses use of the Sandia-developed Percussion-Actuated Non-electric (PAN) Disrupter with members of several of the nation's elite bomb squads during the first Operation: Albuquerque bomb disablement training conference in August 1994. Sandia bomb-neutralization expertise, in the form of the PAN Disrupter and Labs'-sponsored bomb squad training, will be part of security measures for the '96 Olympic Games in Atlanta. (Photo by Randy Montoya)

Sandia articulates eight new strategic objectives for the next decade

Sandia's new Strategic Objectives, the outcome of months of discussion and input from every level (*Lab News*, April 12, April 26, May 10, June 21), are now in virtually final form and available to all Sandians on the Internal Web. There are eight of them (see "Sandia's eight strategic objectives" on page 7), and they're already serving as the basis for decisions and resource allocations, says Executive Staff Director Ron Detry (12100).

But first, a little context. Much stays the same. The elements of Sandia's strategic plan other than the strategic objectives are unchanged from Strategic Plan 1994. As in the past, "exceptional service in the national interest" is considered the best expression of Sandia's corporate strategic

(Continued on page 7)

As in the past, "exceptional service in the national interest" is considered the best expression of Sandia's corporate strategic intent.

Sandia Sandia National Laboratories

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Sandia scientists and engineers win six R&D 100 Awards

Winning technologies represent a wide-flung net of Labs innovation

By Neal Singer

Lab News Staff

Sandia researchers have won six R&D 100 Awards in this year's competition, according to letters of notification received by the principal investigators of each project. The awards honor inventors of the 100 most significant technological innovations of 1995, as judged by a panel of experts selected by *R&D Magazine*, a technical trade publication that sponsors the annual competition.

The contest, dubbed the "Oscars of Invention" by the *Chicago Tribune*, has grown in prominence since its inception in 1963. Since the late 1970s, when Sandia first competed, the Labs has won 41 times.

"I was delighted to hear that SNL had captured so many R&D 100 Awards," says Sandia President and Labs Director C. Paul Robinson. "These awards reflect the increasing value of the inventions and innovations created in our programs. The university and industrial participation in some of these efforts also indicates the increasing use and value of partnerships. I congratulate all of you who earned these honors for the Laboratory."

The researchers will receive plaques at a formal banquet on Monday, Oct. 14, in the Grand Ballroom of the Bellevue Hotel in Philadelphia.

The six winning Sandia projects (see "Sandia's six new R&D 100 Award winners" on page 6) flung a wide net in the field of invention.

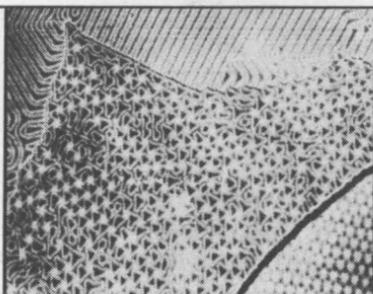
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Fundamental dynamics of thin films targeted in new research

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Sandia solar dish may be seen at Summer Olympics in Atlanta

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8 Doing Sandia's weapons work better, faster, and cheaper

9 Galileo spacecraft, with its Sandia chips, images a new world

This & That

It buys less bread by any name - Why must we butcher our language by using senseless bureaucratic language? The latest wacky term I'm hearing and reading is related to Sandia's performance/compensation review process: "negative raises." These are "supported for employees whose salary is not in line with their performance/contribution." With a few more than 8,000 employees, there may be a few whose salary should be reduced, but - please folks - let's not turn this into the silly season by calling a salary cut a "negative raise."

* * *

Some sensible words - While it doesn't read quite as well as a John Grisham novel, the Labs' new Strategic Objectives document isn't nearly as long, and I think it's worth your reading time. It provides a good explanation of what we're about and how we plan to go about our business in the next few years. You can find the objectives by clicking on the Strategic Objectives icon on Sandia's Internal Web home page; the icon will remain there through the end of July. The objectives will remain on the Internal Web after that at the following uniform resource locator (URL): <<http://www-irn.sandia.gov/organization/div1/960702.htm>>. For a summary story about the Strategic Objectives, see page one.

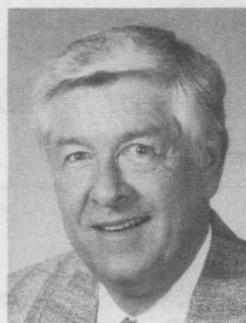
* * *

Help on the way for AARP eyes - Many of us AARP-eligible folks have a tough time remembering people's names, especially when we haven't seen them for the past three hours or so. When visiting with a fellow employee in the past, we at least had the option to sneak a peek at the name on his or her badge, but the names are in such small type on the new standard DOE badges (now used at Sandia/New Mexico) that they're very hard to read without getting up close and personal.

However, help is on the way from the friendly folks in our badge office (7437-1). Team supervisor Melanie Florez says her office will offer employees and on-site contractors a new combined quick reference and hazardous materials classification card that can help solve the problem (watch for details soon). The card will include your first name in large letters at the bottom; when mounted behind your badge in a special new holder, your first name will hang just below your badge. After we get them, we can at least say, "Hey, Otis. Good to see ya," even if we can't remember Otis's last name.

- Larry Perrine (845-8511, MS 0129, lgperri@sandia.gov)

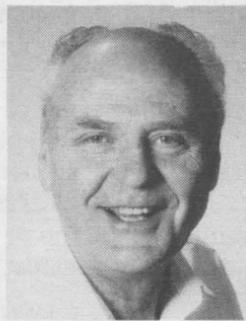
Recent Retirees



Dan Ross 29
8206



Jerry Williams 38
2261



Ray Culy 36
8812



Vic Ham 34
8713



Al Mederios 33
8534



Marge Mederios 30
8811



Ted Simmons 27
8206



Mary O'Shea 36
8523



Al Bastion 37
8615



Ron Fugazzi 33
8940



John Seuser 37
8284



Bill Kent 30
8361

Feedback

Q: On April 5, 1996, the stock of the equipment manufacturing segment of AT&T (LUCENT) was put on the market. I, and probably many other Sandians who have AT&T stock, are eager to know how this will affect us. Can you please find out what AT&T's plans are for stockholders, and specifically how the holders of AT&T stock in our Fidelity account will be affected?

A: AT&T and Sandia are jointly working with Fidelity on the Lucent Technologies spin-off process since both plans hold AT&T shares and Fidelity is the recordkeeper for both plans. Many decisions including the precise timing are still to come and only the basic structure is in place. What we do know is:

- Later this year, AT&T stock will be split into two separate stocks: AT&T and Lucent

Technologies. Concurrently, in the Savings Plans, the AT&T Shares Fund will split into the AT&T Shares Fund and the new Lucent Technologies Fund. Sandia participants with balances in the AT&T Shares Fund will then have balances in both the AT&T Shares Fund and the Lucent Technologies Fund, which will be listed as separate funds in their quarterly statements.

- Direct shareholders of AT&T will retain their AT&T shares and will receive a share of Lucent Technologies for "x" number of AT&T shares held. This process will not be exactly mirrored in the Savings Plans since the AT&T Shares Fund is unitized, meaning that it contains both shares and cash equivalents for liquidity.

- In the Sandia Savings Plan, participants will have to move their funds out of both the AT&T Shares Fund and the Lucent Technologies Fund by June 1, 1998. Of course, since 1993, no new contributions or loan repayments could be deposited into the AT&T Shares Fund. This restriction will now also apply to the Lucent Technologies Fund.

- In conjunction with the Lucent Technologies Fund spin-off there will be a "quiet period" in which the behind-the-scenes accounting and auditing work will occur. No activity can take place in the AT&T Shares Fund or the new Lucent Technologies Fund during this time.

Details of the entire process are still emerging. A communication is being prepared and will be sent to all Sandia Savings Plan participants around mid-summer.

Ralph Bonner (10500)

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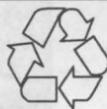
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Atomic ripples: Fundamental dynamic properties of thin films under scrutiny in newly funded project

Sandia proposal wins in DOE materials science new initiative competition

By Nancy Garcia

California Reporter

Flakiness may be an undesirable quality in general, but in thin films, not staying put can be disastrous.

Adhesion matters in everything from corrosion-protective coatings to the layering of microelectronic components.

"Thin films are incredibly important," says physicist Bob Hwang of Surface Chemistry Dept. 8716. "A key factor is how resistant they are to mechanical damage." Until now, one way to check adhesion has been to see if the film lifts off with a piece of tape.

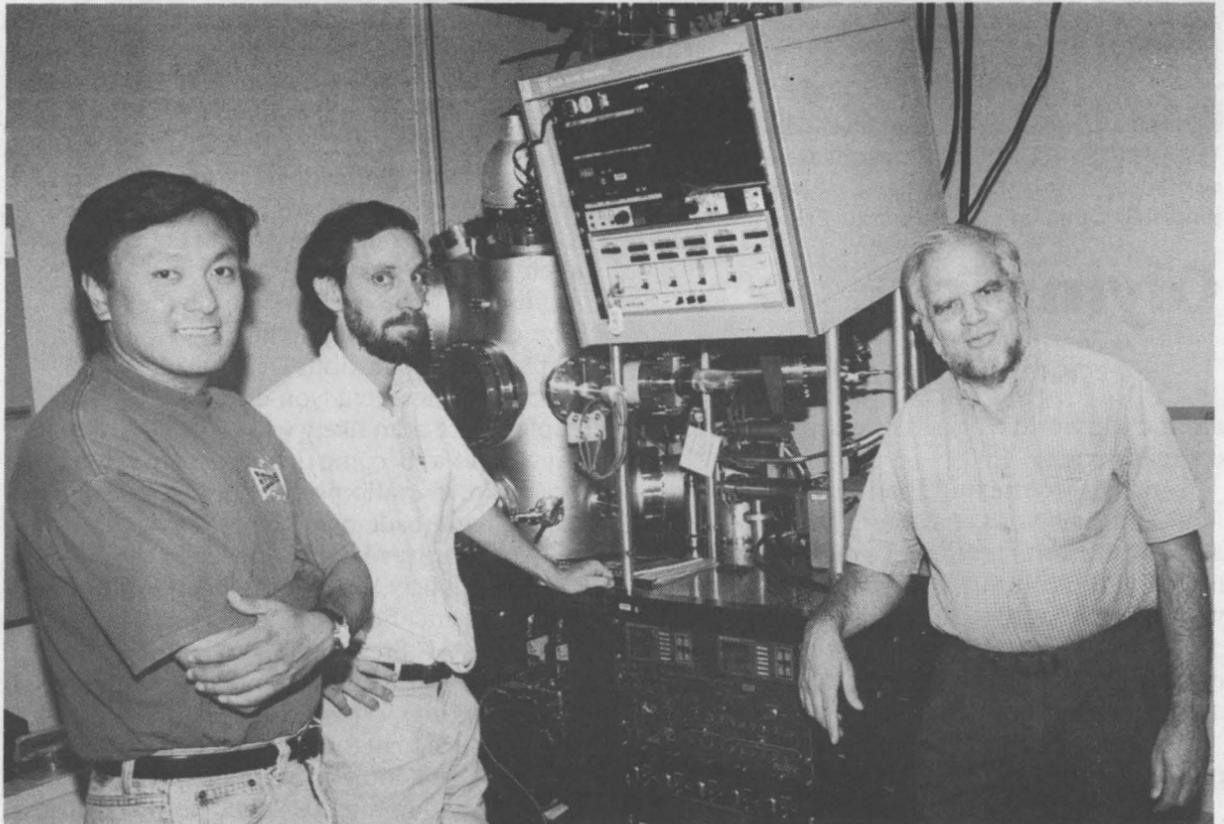
To understand adhesion in a fundamental way, a team of Sandia scientists — Bob Hwang (8716), Norm Bartelt, and John Hamilton (both 8717) — will observe and model the structure of thin films.

Their proposal was recently funded in the FY98 New Initiative Competition by DOE's Office of Basic Energy Sciences, Division of Materials Sciences. Their work should help predict, understand, and reproduce thin-film properties.

"The way people have looked at mechanical properties of thin films in the past is extrapolation of bulk properties," Bob says.

"Atoms govern the way solids work, but 'interfacial dislocations' govern the way thin films work."

The dislocations are shifting arrangements of atoms. They relieve strain by rippling along



JOINING FORCES on a newly funded project to study the dynamics of thin films are Bob Hwang (8716), Norm Bartelt, and John Hamilton (both 8717). The researchers are flanking an ultrahigh-vacuum chamber and controls used for film deposition.

"That's what's new."

He believes the ridge-shaped dislocations fluctuate much the way an ocean swell causes water in one spot to rise and fall. Adhesion

might be likened to the way Velcro snags together.

The film tends to come undone where the substrate is not flat, just like old Teflon will peel from a scratched pan. The shifting patterns of atoms stacked together might be compared to a pyramid of cannonballs combined in different ways.

In addition to the experimental work, the team will model and interpret the observations in the newly funded initiative.

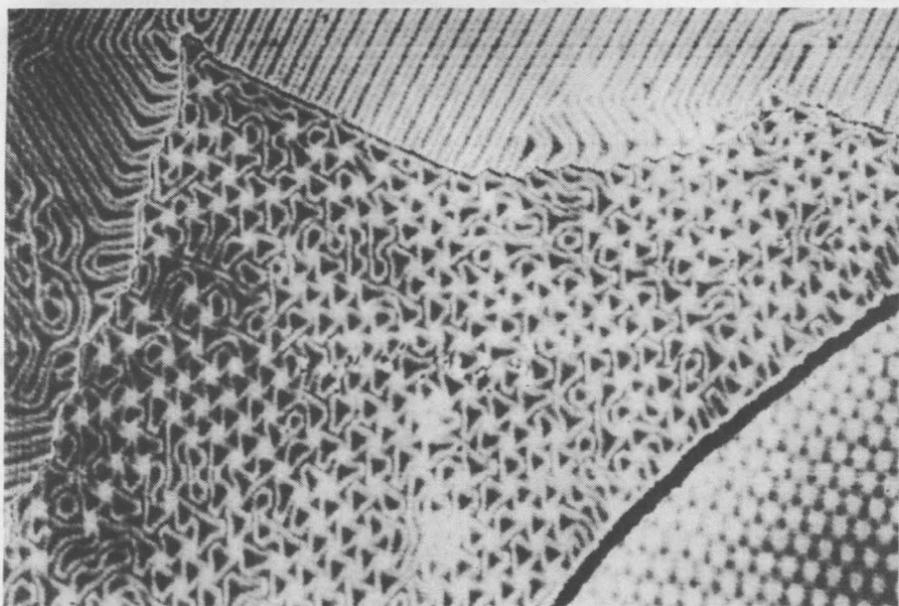
If research elucidates what happens when thin films detach, then thin films might be designed to avoid those conditions, says Dept. 8717 Manager Bill Wolfer.

For instance, coatings to prevent corrosion in the nuclear stockpile might be engineered to remain intact over the years. Adhesion could be optimized in layers of integrated circuits and microelectronics.

Other collaborators are at the University of Minnesota and Brookhaven and Oak Ridge national laboratories. The researchers also work with Jack Houston and Terry Michalske of Surface and Interface Dept. 1114, using the interfacial force microscope at Sandia's New Mexico site to assess thin-film properties.

To begin, the team will investigate simple metal films of copper, gold, or silver on a substrate of ruthenium, which is uniformly flat and unlikely to form alloys with the films.

"It's truly a new field of research," Bill



ATOMIC REARRANGEMENTS that relieve strain in thin films create different patterns seen in micrographs, such as these images of copper.

the surface of a substrate much the way a bulge in a carpet can be pushed across the floor. Bob himself has seen ripples fluctuate across the surface of a thin film as he watched on a scanning tunneling microscope. He says other people had made similar observations, but didn't understand them.

Swells in the atomic ocean

The team realized the images were made up of a fundamental unit "rearranging in different ways to accommodate strain in a layer." The rearrangements created different dark-and-light patterns called "reconstructions" that could resemble stripes, triangles, or honeycombs. They compare the changing patterns to the way different arrangements of atoms in a solid can result in either carbon or diamond.

"People don't understand the mechanical interactions and forces here," Bob says.

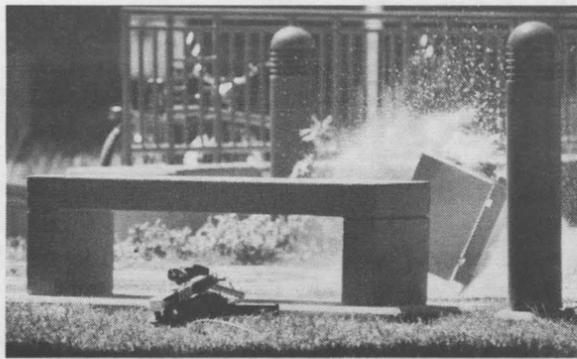
Sandia California News

says. "It has to do with how a substance sticks to a substrate."

The three-year project was one of three awarded from some 14 competing DOE materials science proposals. "It's quite an honor for Sandia to win this national competition," says Dept. 8716 Manager Ken Wilson.



FAMILY FRIENDLY EMPLOYER — Sandia/California was named the Family Friendly Employer of the Year for Livermore and Pleasanton at the cities' annual recognition dinner last month. Also recognized was Bradshaw Inc. North of Pleasanton for the same distinction. Sandia was commended for its flextime policy to help accommodate families with children, Dependent Care Spending Accounts that give employees tax benefits, and telecommuting, which allows some employees to work at home a certain number of days a week. Herb Blair (8366) nominated Sandia through his day care agency. Shown with him is Marge York, Manager of Human Resources (8522), who accepted the award on behalf of Sandia.



THE PAN DISRUPTER blasts a suitcase believed to contain a bomb from under a park bench in a simulated Operation: Albuquerque exercise.

Olympics

(Continued from page 1)

around the world will cover nearly 600 athletic competitions.

Add that to the multinational, multicultural, multireligious character of the Olympics, along with fresh memories of recent terrorist bombings both in the US and abroad, and you've got what the *Washington Post* described as an event "that could provide the world's extremists or kooks a rare opportunity to command wide public attention" — a chance to "make a really big splash," as one FBI official put it.

Although the FBI says it hasn't identified any credible terrorist threats against the Games, Robert Blitzer, the FBI's Chief of

Finding, neutralizing bombs may be an Olympian task in '96

During the the '96 Games, according to Robert Blitzer, the FBI's Chief of Domestic Terrorism, an FBI Olympic Intelligence Center will identify potential threats and provide relevant information to the more than 30,000 military troops, police officers, and federal agents in the field, who will help ensure that packages, vehicles, and individuals are properly screened prior to entering Olympic venues, as well as serve as a deterrent to terrorists.

In addition, the FBI, Bureau of Alcohol, Tobacco, and Firearms (ATF), and Defense Department (DoD) will manage an Olympic Bomb Management Center, charged with neutralizing explosive devices. The Center will be supported by military and civilian bomb detection teams at each event.

In preparation for the event, the FBI, Defense Special Weapons Agency (formerly the Defense Nuclear Agency), and other agencies have staged various mock terrorist attacks in Atlanta, including scenarios involving conventional weapons, and federal, state, and local agencies have responded to the scenarios as if they were real. A task force under Vice President Gore has presided over the preparations.

In addition to the FBI, ATF, and DoD, other agencies involved in the massive security effort include the Defense Intelligence Agency, National Security Agency, Public Health Service, Federal Emergency Management Agency, Drug Enforcement Agency, US Secret Service, US Customs Service, US National Guard, US Coast Guard, and others.

"There is hardly a government agency in public safety law enforcement that is not somehow involved in ensuring that the 1996 Olympic Games are safe and secure," said Blitzer.

Domestic Terrorism, assured a Senate panel recently that "with the tragedies of the World Trade Center and Oklahoma City bombings still fresh in our minds, as well as the knowledge of numerous other terrorist events which have taken place around the world over the past several years, I want to first and foremost convey to the Committee that [we] have made security for the upcoming Olympics a priority of the highest order."

Labs equipment and training

Two Labs' disablement systems will be available to bomb squads from the FBI, the Georgia State Police, the Atlanta Police Department, military Explosive Ordnance Device teams, and other agencies during the event, says Chris Cherry of Engineering Projects and Explosives Applications Dept. 9333. Sandia's Percussion-Actuated Non-electric (PAN) Disrupter more than likely will be deployed, he says, as it has become the primary tool used by bomb squads nationwide to disable conventional, handmade-type bombs remotely.

For security reasons, Chris isn't eager to divulge publicly how the PAN Disrupter works, but in general, he says, once a bomb is discovered, the PAN fires a variety of high-velocity projectiles through the bomb, disrupting its inner workings so instantaneously that it never has a chance to detonate. The device was licensed to a Kentucky-based manufacturer last summer, and numerous PAN Disrupters have been sold to the FBI, the Georgia Bureau of Investigation, Fulton County (Atlanta, Ga.), and other agencies nationwide, according to the manufacturer.

"The PAN will be pretty well represented at the Olympics," says Chris. "The comment I'm getting from the bomb squads is that the PAN is the most versatile disrupter on the market."

Another new Sandia tool that recently has become available to law enforcement agencies Chris refers to as the "Black Box." It also prevents detonation by disrupting a bomb's inter-

nal gadgetry in fractions of a second. Sandia has licensed the Black Box as well.

Perhaps just as critical to bomb squads as the Sandia equipment during the '96 Games will be the training the Labs has provided to various agencies in recent years. Although the FBI primarily is responsible for training bomb squad technicians at its Hazardous Devices School in Huntsville, Ala., Sandia and the Albuquerque Police Department have sponsored week-long bomb squad training conferences in Albuquerque during the past two summers.

Called Operation: Albuquerque (*Lab News*, Sept. 2, 1994), the conference draws representatives of the most elite bomb squads in the country, including from the FBI's Redstone Arsenal and US Secret Service. As part of the conference, bomb "techs" practice responding to simulated bomb threat scenarios involving bomb mock-ups built by Sandia.

"The goal is to practice advanced techniques that protect the life and limb of the public and the bomb techs," says Chris.

Operation: Albuquerque's invitation-only attendance has grown. The first year drew 24 top bomb techs; in 1995, 30 came. If the 1996 conference is held, Chris expects about 40 to attend. Many of the conference's participants will be in Atlanta during the next two weeks.



AN OPERATION: ALBUQUERQUE participant uses the PAN Disrupter to disable a bomb on the front seat of a parked car.



COSMOPOLITAN KIDS — Danelle Tanner (1276) and Harriet Morgan (3000) each adopted a child recently from Chelyabinsk, Russia, home of the Soviet-era nuclear weapons technology lab Chelyabinsk-70. In the left photo, Danelle plays with Alexander "Alexei" Vance Tanner, a three-year-old boy who made the trip from Chelyabinsk in late January. In the right photo, Harriet swings Kathryn Irina Morgan, a three-year-old girl adopted from the same orphanage in April. Danelle says she endured numerous false starts, days of air transit and layovers, stubborn bureaucrats, and inflexible adoption systems in both Russia and the US. Both new arrivals are adjusting well in their new culture and behaving like typical American three-year-olds. Harriet says Kathryn is "learning English very quickly, probably because she has to. My husband and I speak very little Russian." Many Russian children are being orphaned these days, particularly in cities like Chelyabinsk where the Cold War's end has ushered Russia's most severe economic hardships. Both children were adopted through Rainbow House International, an agency based in Los Chavez, N.M., near Belen. (Photos by Randy Montoya)

Sandia dish-Stirling solar technology showcased in Atlanta during Olympic games

Viewers of the summer Olympic Games in Atlanta may catch a glimpse of a prototype solar dish system that engineers at Sandia helped to develop.

The dish-Stirling solar system, which consists of a large dish of solar concentrators and a Stirling heat engine, is installed on the Georgia Institute of Technology campus, next to the Natatorium, site of the Olympic swimming events. The system is capable of producing 7 kilowatts of electricity and is connected into the campus' electrical grid. It will be in operation from the beginning of June through August.

"This project will demonstrate to domestic and international audiences one of DOE's premier renewable energy technologies and the capabilities of US industry," says Allan Hoffman, Acting Deputy Assistant Secretary of DOE's Office of Utility Technologies.

Sandia has provided technical support to the development of the dish-Stirling system since the late 1980s. The system is a joint venture of DOE's solar program at Sandia and Cummins Engine Co., a leading manufacturer of diesel engines and generators. The National Renewable Energy Laboratory in Golden, Colo., a DOE national laboratory, also has provided technical expertise to the system, primar-

ily in the area of optical materials. Current work on the system focuses on increasing its efficiency while bringing down its price.

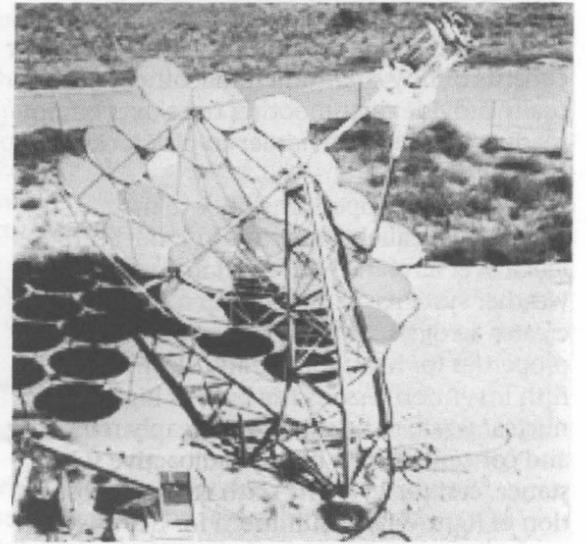
"Sandia has helped in all aspects of the project, including its engine, mirrors, receiver, and controls," says Craig Tyner, Manager of Solar Thermal Technology Dept. 6216.

The dish-Stirling system is named for its two major components: a dish-shaped solar concentrator and a Stirling heat engine. The concentrator focuses the sun's heat onto a receiver, which collects and transfers it to the engine. The engine is a sealed system filled with gas, and as the gas heats and cools, its pressure rises and falls. The change in pressure is controlled to make the pistons inside the engine move, producing mechanical power. The mechanical power in turn drives a generator and makes electricity.

The system is designed for remote sites. "It typically will be used in third-world countries for applications such as pumping water, operating a mill, or providing power to a remote village," Craig says.

An added advantage of the system is its versatility: When the sun doesn't shine, the engine can be heated with an auxiliary fuel such as natural gas, propane, or heating oil.

The dish-Stirling system on the Georgia



DISH IT OUT — A dish-Stirling solar system, very much like the one shown here, will be flexing its energy muscles in Atlanta during the '96 Olympics.

Tech campus is one of only four full systems. The others are in Dallas and Abilene, Texas, and Fort Huachuca in southern Arizona.

The system in Atlanta sits on the site of Georgia Tech's former Advanced Component Test Facility, which conducted pioneer work in solar thermal technology during the 1970s and 1980s.

— Chris Miller

Lockheed Martin VentureStar design wins NASA competition to demonstrate reusable launch vehicle

Proposal beats out concepts submitted by McDonnell Douglas, Rockwell

NASA has selected Lockheed Martin's VentureStar as the winner of the X-33 Single-Stage-to-Orbit (SSTO) Reusable Launch Vehicle (RLV) competition. The VentureStar is shown at right in an artist's conception. Lockheed Martin manages Sandia for DOE.

VentureStar won the NASA bid over the McDonnell Douglas Delta Clipper, a vertical take-off-and-landing rocket that received considerable publicity during its testing at White Sands. It also won the nod over a Rockwell entry that was closely derivative of that company's Space Shuttle.

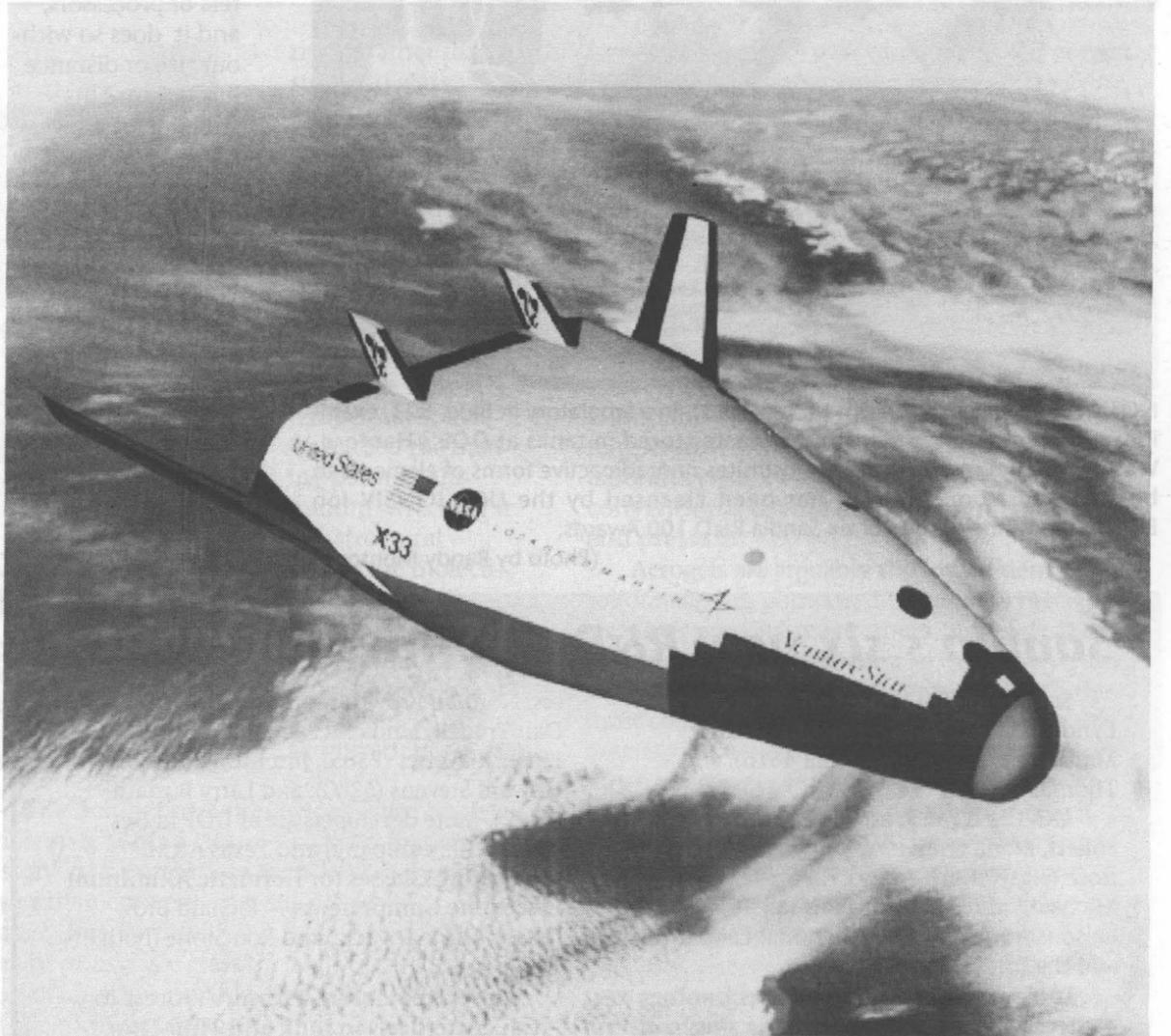
Lockheed Martin's project will be valued at more than \$1 billion through 2000; the company will produce a subscale demonstrator vehicle scheduled to begin flying in March 1999.

VentureStar flights will demonstrate the technical and financial feasibility of creating a fleet of RLVs sustained by the commercial space launch market. Development of the full-scale, operational VentureStar will begin around the turn of the century.

VentureStar, which will launch vertically and land horizontally, features an aerodynamically efficient lifting body configuration — it flies without wings — innovative linear aerospoke engines that adjust themselves to perform with maximum efficiency at all altitudes, extensive use of high-strength, low-weight composites, fast mission turnaround through aircraft-like servicing, and standardized containers for payloads.

The VentureStar will be the first new heavy launcher designed in the US in almost 30 years. The linear aerospoke engine and the wingless lifting-body design, however, tap into and advance developmental work done in the 1960s and 1970s.

The intent of next-generation RLVs is to



reduce the cost to put a pound in orbit from the current \$10,000 to \$1,000 and ultimately to perhaps as little as \$100.

Lockheed Martin's Aeronautics Sector and its famed Skunk Works advanced design unit led the winning VentureStar team.

Major industry partners in the VentureStar

project include Allied Signal Aerospace, Rocketdyne, Rohr, and Sverdrup. Locally, Phillips Lab at Kirtland Air Force Base has been involved in the X-33 project since its inception, making key contributions in the area of lightweight composite materials.

— Bill Murphy

R&D 100 Awards

(Continued from page 1)

Winning devices include one that encrypts data — including video and voice — transmitted over the Internet and then decodes it upon arrival, preventing information piracy. Another consists of tiny smart micromachines to eventually provide cars smoother rides over bumpy roads as well as form harder-to-pick locks on nuclear weapons.

Yet another opens the door to meta-massively parallel computers to model turbulence over airplane wings and in Earth's weather systems, while a cheap new technique creates aerogels that boast excellent insulation properties for heat, sound, and electricity. A fifth invention lessens the bulk of high-level nuclear waste to be stored by cheaply removing and concentrating a highly radioactive substance, cesium-137. The sixth enables substitution of lightweight aluminum for heavyweight steel as part of a casing to protect electronic circuits.

Here are short descriptions of each of the six winning technologies:

• **The Scalable ATM Encryptor device** — This protects the confidentiality of computerized data — including voice and video — by encrypting it at the place of origin and decoding it upon arrival, says its principal developer, Lyndon Pierson (4616). The device, which pro-

tecs against information piracy, is intended to work across interfaces that operate at vastly different data rates, such as mainframe and table-top computers, and thus allows "fast" and "slow" talkers to communicate. ATM — an acronym that stands for Asynchronous Transfer Mode network — is probably the fastest method to communicate packets of information across the Internet.

Unlike other encryptors, the Sandia device does not slow messages while encrypting them, nor does encryption amplify errors already existing in the message. Encrypted messages traverse the Net without difficulty because the device permits information at the head of data packets to pass unencrypted. Since headers include addresses, the data cells can be routed through interlocking networks to their intended destination.

"There are no direct competitors to the Scalable ATM Encryptor, since there are currently no end-to-end encryptors generally available that can operate with recently standardized switching and transmission technology," says Lyndon.

• **The OC-12c ATM Protocol Engine** — First there were individual supercomputers whose computational results were transmitted on a single output line. Then came massively parallel computers that shared information among processors in a group but also output information only on a single line. Now, the ATM Protocol Engine, designed by Sandia

jointly with GigaNet, Inc. for the Intel Paragon computer, dramatically improves parallel supercomputer performance by extending parallelism between clusters of processors, and it does so without size or distance limitation. This should create a very high level of computational power and communication capability — in effect, a meta-massively parallel computer — that allows supercomputers to attack a class of problems not addressable before, says Sandia researcher Steve Gossage (4616).

The device adds parallel communications to parallel computing — the internal communication capability of the supercomputer could be matched by the capability of the external communications by adding ATM Protocol Engines. The low delay, or latency, in communications passing through the device means that meta-massively parallel computers could be developed to model currently insoluble problems like Earth's weather systems. To fully realize these benefits, further research will be needed in the areas of operating systems, databases, applications, and input-output drivers.

The Protocol Engine, in tests at Sandia and at Oak Ridge national laboratories, was faster than the only competitor in its class, the High Performance Parallel Interface, or HIPPI.

• **Integrated Micromachine Technology** — Micromachines that "think," and do so on a thumbnail-size computer chip, are being manufactured in batches at Sandia, due to work led by researcher Steve Montague (1325). By fabricating micromachines in channels etched six microns deep into silicon chips and then burying the millimeter-square machines in baths of hardening material — in this case, silicon dioxide — the machines are protected while control circuits are fabricated on the remainder of the chip.

"If you first sink the machine in a trench and then fill in around it, you've recreated a pristine wafer for doing electronic processing," says Steve of his invention. When the circuits are completed, the material protecting the micromachines is chemically removed.

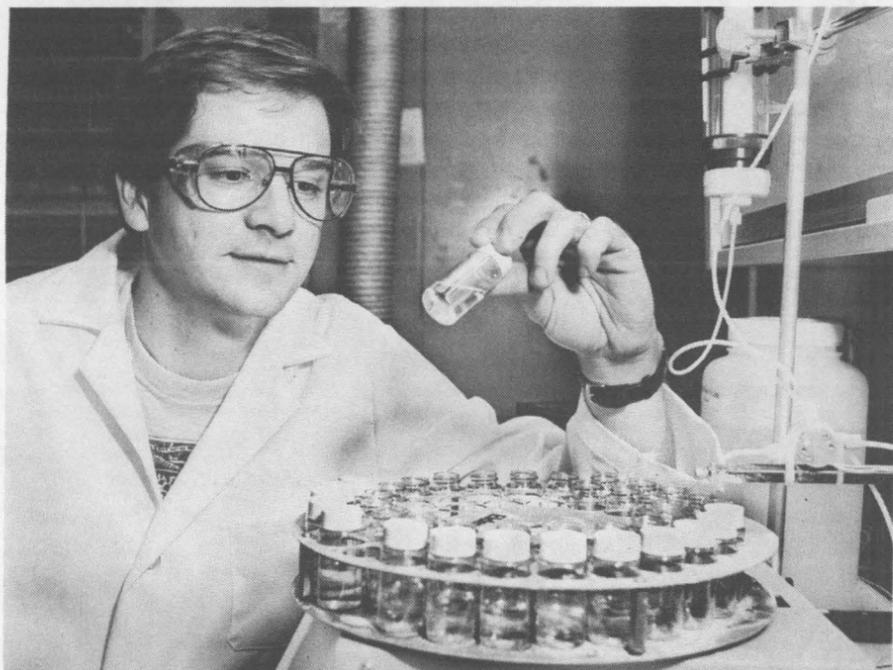
Sandia also plans to transfer aspects of the technology to industrial partners such as Analog Devices of Wilmington, Mass., which produces automated sensors for automobile airbags. The Sandia work should enable a new generation of inertial measurement systems such as active skid-control systems for cars and active vibration suppression systems to smooth vehicular passage over bumps or washboarded roads, says Paul McWhorter (1325), manager of the effort.

This work was funded by Weapon Systems 2010 — one of ten programs in Sandia's National Security Sector — under the direction of Michael Callahan (5202). One of the objectives is to shrink the size of critical weapon components.

• **UOP IONSIV Ion Exchanger** — By removing radioactive molecules from a material impregnated by them, researchers greatly reduce the volume of material that must be stored as so-called "radwaste." Sandia scientists, working with researchers at Texas A&M University, have created an inorganic material particularly useful for separating highly radioactive cesium from other wastes. Cesium is a byproduct from the production of nuclear weapons. Treatment of this waste by the Sandia separator reduces by a factor of 600 the volume of highly radioactive material that must be encapsulated in glass or ceramics for long-term disposal. Because the new material is inorganic, it is unaffected by radioactivity.

The material is called crystalline silicotitanate. Its two forms are powder (IE-910) and pellet (IE-911). A license, granted by Sandia to produce the materials, has been awarded to the Des Plaines, Ill., company UOP, which specializes in molecular sieve ion exchangers and helped develop the granular form of the ion exchanger. Los Alamos National Laboratory estimates the new technology will save \$450 million in operating and capital cost for cleanup of the Hanford, Wash., site, reducing operating costs of cesium-137 removal there by 50 percent.

The sieve works in the form of a crystal lattice.
(Continued on next page)



NOTHING THERE NOW — Jim Miller (6211), in a laboratory in Bldg. 823, examines a simulation of underground waste stored in tanks at DOE's Hanford, Wash., site. The sample, which substitutes nonradioactive forms of elements to be removed from solution, has been cleansed by the UOP IONSIV Ion Exchanger, winner of one of six Sandia R&D 100 Awards.

(Photo by Randy Montoya)

Sandia's six new R&D 100 Award winners

Scalable ATM Encryptor device — Lyndon Pierson, Joseph Maestas, Luis Martinez, Edward Witzke (all 4616), and Thomas Tarman (9417).

OC-12c ATM Protocol Engine — David Follett, Maria Gutierrez, Richard Prohaska, from GigaNet, Inc.; Sandians Steve Gossage, Michael Vahle, Thomas Pratt (all 4616), and liaisons from Oak Ridge National Laboratory and the Intel Corporation.

Integrated Micromachine Technology — Steve Montague (1325), leading a team of researchers at the Microelectronics Development Laboratory.

UOP IONSIV Ion Exchanger — Robert Dosch, Sandia (deceased); C.D. Holland, Chemical Engineering Dept., Texas A&M University; C.V. Philip, research scientist, Texas A&M University. Additional Sandia develop-

ers: Norman Brown (ret.), James Miller (6211), Dan Trudell, Linda McLaughlin (both 6212), Elmer Klavetter (7585), Jim Krumhansl (6118), Howard Stevens (6200), and Larry Bustard (6472). More developers are at UOP (a Des Plaines, Ill., company) and Texas A&M.

Sealing Glasses for Hermetic Aluminum Electronic Components — Richard Brow (1833), Larry Kovacic, and Ron Stone (both 1492).

Low-Temperature/Pressure Process to Produce Aerogels in Bulk and Thin-Film Form — Jeff Brinker (1831); Douglas Smith, UNM professor and president, NanoPore, Inc.; Ravidra Deshpande, Armstrong World Industries; and Sai S. Prakash, Dept. of Chemical Engineering and Materials Science, University of Minnesota. (Deshpande and Prakash are former UNM students.)

Objectives

(Continued from page 1)

intent. The corporate mission articulated in the 1994 document and the values — integrity, quality, leadership, teamwork, and respect for the individual — were reaffirmed and remain in effect.

Sandia's senior managers and the Sandia Quality Leadership Council (SQLC) pondered both the Labs' near-term and long-term future. These assessments helped shape the statement of objectives.

In the near term, many of the participants said they expect an increase in regional security threats caused by cultural animosities, competition for resources, and proliferation of nuclear, chemical, and biological weapons. The goal is to safely manage such threats so that the longer term outlook is one of increasing stability and prosperity.

The following "definition of scope" was articulated:

- Sandia is a federally funded national laboratory founded to provide the nation's nuclear deterrent and dedicated to rendering exceptional service in the national interest. We are and will remain one of the primary providers of the engineering and science needed to assure security for our nation.
- Sandia has historically focused on defense against foreign military threats. Over time, threats to the nation have grown increasingly complex. Our security can now be challenged from inside as well as outside, by economic as well as military action, by rogue groups as well as foreign states, and by control of the global distribution of

Sandia's eight strategic objectives

Here are Sandia's eight strategic objectives for the next decade, as established by the newly released planning document. The first four focus on what Sandia intends to accomplish; the second four, on how Sandia intends to do its work, revealing adoption of private-sector-like approaches to Labs' operations.

- Assure a nuclear deterrent that always meets the needs of the United States.
- Reduce the vulnerability of the US to proliferation, threat, and use of weapons of mass destruction, and to other nuclear incidents.
- Contribute to the surety (safety, security, and reliability) of energy and critical global

infrastructures.

- Develop high-impact responses to emerging national security threats.
- Apply excellence as the standard against which we select people to join and remain at Sandia and against which we measure the performance of both teams and individuals.
- Create a laboratory that works better and costs less, with an infrastructure that is a competitive advantage for our strategic missions.
- Make advances in the state of knowledge as well as apply these advances to the solution of our customers' technical problems.
- Maximize our beneficial use of strategic partnerships.

energy and vital natural resources. "Sandia is a unique institution," says the document. "It has responsibilities for government missions, but its philosophy of research and development derives from an industrial heritage. The research we conduct is strategic for our missions; we perform 'science with the end in mind' rather than pursuing knowledge for its own sake."

"We are a national security lab," it emphasizes. "We are differentiated by the combination of our systems view, approach, and expertise; our engineering roots; and our practice of science with the end in mind."

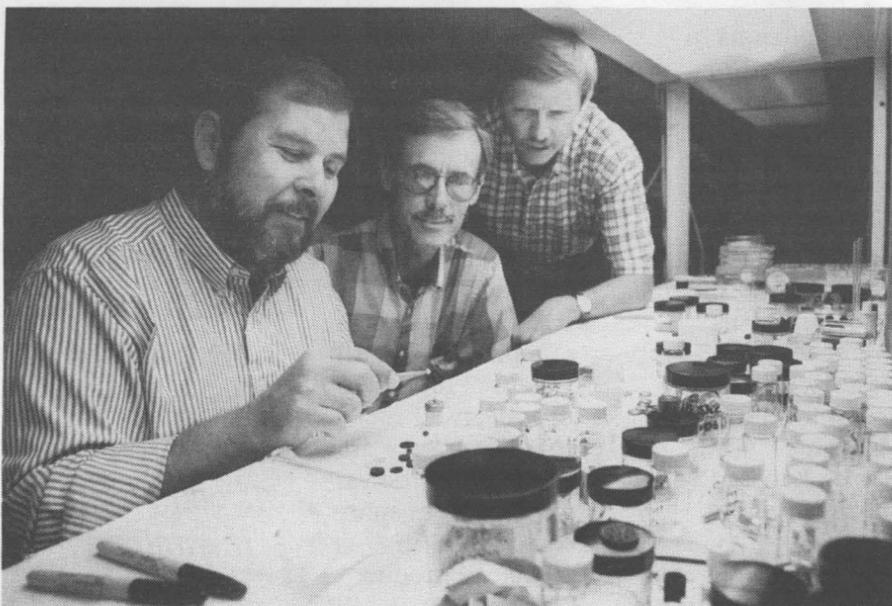
The document points out that Sandia's assignments tend to be "threat-driven" — Sandia develops technologies to help the US respond to a wide array of threats. These assignments are usually performed for Sandia's "principal customer," DOE, or for the Department of Defense. But there is also a second aspect to Sandia's work. This comes about

when another federal agency has a specific need that may be served by Sandia's capabilities. "It is appropriate that a 'truly national' laboratory engage in both kinds of work, in support of a wider array of national agencies," says the document.

The document elaborates on all these matters. Copies are available to Sandians on the Internal Web. Click on the Strategic Objectives icon on the Sandia home page.

The strategic planning process was designed and led by Paul Shoemaker of the Executive Staff (12100).

"In my experience — and this is now my third strategic planning process at the Labs — this has been the most fulfilling and productive one of them all," says Paul. "I congratulated the SQLC members for their willingness to accept constructive criticism from the managers and for committing themselves to a schedule and keeping to it. They deserve a lot of credit." — Ken Frazier



AIRTIGHT COMPONENTS — An R&D 100 Award-winning process developed by (from left) Ron Stone, Larry Kovacic (both 1492), and Richard Brow (1833) for forming durable glass out of phosphate rather than silicate allows the glass to be more readily adhered to aluminum, making possible lighter-weight, hermetically sealed electronic components. (Photo by Mark Poulsen)

(Continued from preceding page)

tice that has a net negative charge balanced by positively charged, mobile ions found in channels in the lattice. The mobile ions are exchangeable with other ions when placed in solution, and the spacing of the lattice's planes as well as its chemical environment are arranged to favor absorption of cesium, according to Jim Miller (6211), one of the Sandia developers.

• **Sealing Glasses for Hermetic Aluminum Electronic Components** — Steel is heavy, aluminum light. Automobile makers and aerospace companies now may use aluminum and glass to hermetically seal electronic compo-

nents, rather than steel and glass, because of a process developed at Sandia to form glass out of phosphate rather than silicate — the usual material of choice for glass makers. Silicate-based glass flows and melts only at temperatures that far exceed the melting point of aluminum, wrecking it as a structural entity; the molecular structure of phosphate-based glass permits it to flow at much lower temperatures, where aluminum remains stable.

The Achilles heel of previously developed phosphate sealing glasses had been that they dissolved in water more than 1,000 times faster than conventional silicate sealing glasses. But, by modifying the molecular structure of phosphate glass through the incorporation of aluminum oxide, "we could improve its chemical durability to the point of being comparable to silicate glasses without sacrificing the desirable sealing properties," says Richard Brow (1833), principal developer.

Another advantage of the new method, which has been patented, is that it makes reliable hermetic seals between aluminum alloy shells and copper alloy pins. "We are unaware of any commercially available thermal expan-

sion-matched glass that can directly seal copper contacts into an aluminum package," says Dick. "Our method could improve the electrical performance of hermetic components."

• **Low-Temperature/Pressure Process to Produce Aerogels in Bulk and Thin-Film Form** — A 60-year cost barrier that prevented widespread commercial utilization of aerogels has been removed by Sandia researchers. Led by principal developer Jeff Brinker (1831), a newly developed Sandia process eliminates expensive high-pressure, high-temperature processing in favor of standard laboratory glassware, simple procedures, and conventional drying at room temperature and pressure.

Aerogels are arguably the lowest density solid materials, composed of up to 99 percent air. Their porosity makes them highly desirable insulators for heat, sound, and electricity. They are made from gels — substances of which the most commonly known variety is the gelatin desert, Jell-O — but the trick is to remove moisture from the gel without causing the substance to collapse. Previous methods of creating aerogels have used high temperatures and high pressures to exceed the critical temperature and pressure of the material, allowing the gel to spring back to its original form, minus its moisture. However, these methods are expensive, potentially dangerous, and the resultant product degrades upon exposure to water.

The Sandia method exhibits permanent, stable hydrophobicity, causing aerogels to be unaffected by atmospheric moisture that could otherwise degrade their insulating, optical, and acoustic properties. Cheaper by 33 to 66 percent than conventional aerogels, the method permits a wide range of conventional forming operations.

Product Realization approach to Labs' weapons work likened to a renaissance

Hundreds attend first Product Realization Day

Hundreds of Sandians associated with Labs Defense Programs (DP) activities turned out for Sandia's first Product Realization Day July 11 at Sandia/New Mexico and video-linked to Sandia/California.

The all-day event included morning presentations by Duane Lindner, Manager of Product Realization Program Dept. 1809; Heinz Schmitt, VP of Weapon Systems Div. 2000; Bob Eagan, VP of Electronics, Materials, and Components Engineering Div. 1000; and Ron Stoltz (8202) and Ray Harrigan (9602), product realization subprogram leaders.

Educational booths in the Technology Transfer Center lobby highlighted nuclear weapon activities at Sandia that are piloting product realization projects, as well as various technologies being applied in the pilots. Afternoon breakout sessions provided participants a chance to explore product realization issues and their relationships to Sandia's DP missions. A late-afternoon panel discussion closed the event.

What is product realization?

"Product realization," explains Duane, is a term used to define the complete life cycle of a product, including its conception, research and development, design, prototyping, test and evaluation, production, deployment, and ultimate disposal.

By examining a product's entire life cycle, he says, designers, manufacturers, and suppliers, often working together, find ways to improve the product, speed its fabrication, or reduce its life-cycle

costs. They accomplish this by examining how changes at individual stages in a product's life affect the product, processes, or costs during other stages.

Sandia is adopting advanced product realization approaches as a way to accomplish its nuclear weapons-related mission better, faster, and cheaper, he says. For instance, by working closely with manufacturing engineers to anticipate possible production problems, or

Product Realization is "a magic opportunity. . . that we cannot let slip through our fingers."

by using the latest in computer simulation capabilities, weapon designers might avoid costly production delays or dismantlement difficulties later.

"Sandia has a culture rooted in 40 years of doing its job based on a regular rhythm of new nuclear weapon assignments," he says, "and Sandia's culture and organizational structure are optimized for that rhythm."

But as the US stockpile ages, Sandia's stockpile stewardship role is evolving to that of maintaining and refurbishing that stockpile within reduced budgets and in light of rapidly advancing products, processes, and information technologies. "Now a primary driver is reducing costs," he says.

Effective product realization can be achieved at Sandia in three ways, Duane says: (1) developing or adopting technologies that can be used to improve product cycles, (2) implementing improved processes, and (3) optimizing supporting business practices.

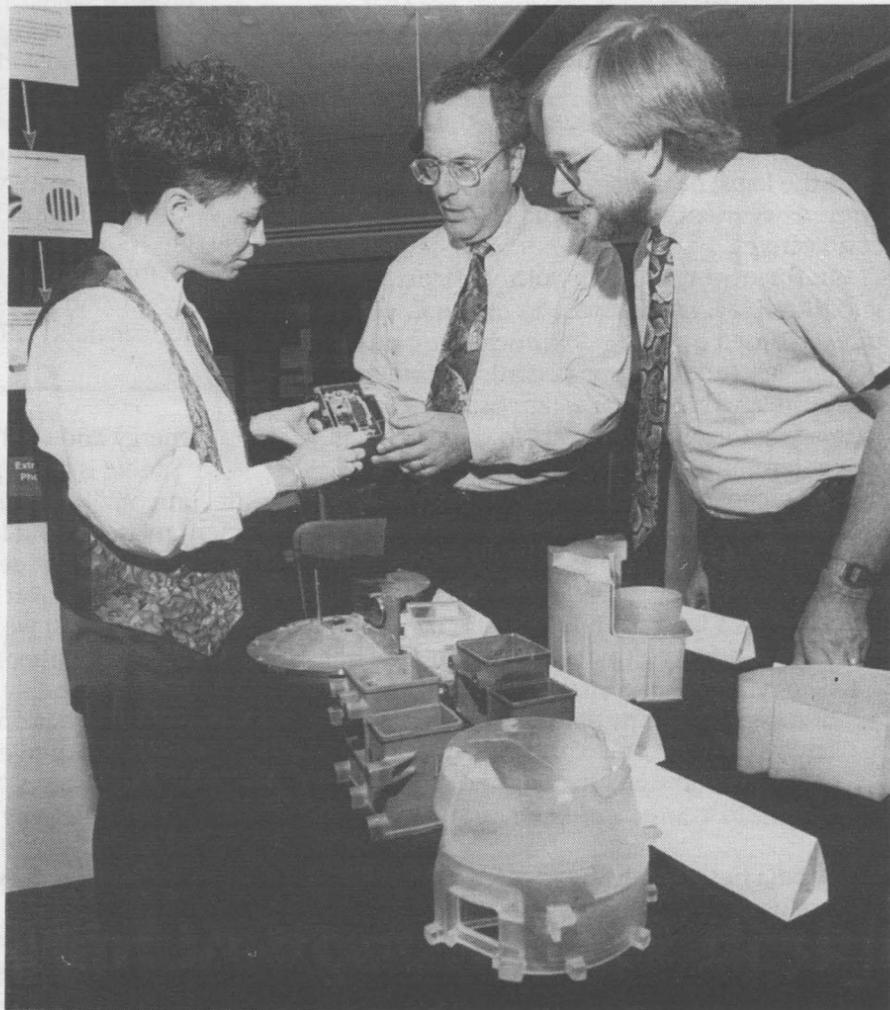
"Sometimes people forget that business practices influence a product's life cycle," he says. "In that sense, this needs to be a Labs-wide movement, not just a DP initiative."

The benefits of adopting new product realization approaches at Sandia, he says, will include "ubiquitous access to information, much faster product cycles, reduced costs, and tighter alliances with Kansas City [Allied Signal's plant in Kansas City] and industry."

Pilots and technologies

Currently, Sandia's DP Product Realization Program is organized into two subprograms. Ron Stoltz leads six pilot projects that are applying advanced product realization concepts to the design, development, and prototype of Labs weapons-related "product" lines, including neutron generators, firing sets, gas transfer systems, electronic component assemblies, telemetry systems, and radars. Ray Harrigan leads an effort to aid the pilot projects with "cross cutting technologies" in five technology areas: model-based design, manufacturing processes, agile fabrication, enterprise integration (computer-based information sharing), and business practices.

Heinz Schmitt, who sponsored Product Realization Day, called the event a "waypoint on a journey that began five years ago," when Defense Programs initiated a variety of projects in advanced manufacturing. Two years ago, those projects were consolidated in a



PRODUCT REALIZATION DAY — Beth Gonzales (2674), Ron Stoltz (5202, middle), and Product Realization Program Manager Duane Lindner (1809) discuss product realization approaches as they apply to nuclear weapon firing set assemblies at a booth in the Technology Transfer Center lobby July 11.

(Photo by Mark Poulsen)

cross-program Product Realization "Macro-project" by three DP program managers — Duane, Michael Callahan (5202), and Charlotte Acken (former Sandian). National Security Programs VP Roger Hagengruber (5000) subsequently established the Product Realization Backbone as a separate program within Defense Programs as a means of further integrating and accelerating the various activities sponsored by DP in advanced product realization.

Bob Eagan called Product Realization "a magic opportunity," for both Sandia and the nuclear weapons complex, "that we cannot let slip through our fingers."

Duane said: "Sandia's DP mission will endure, but changing requirements and a challenging environment demand that we fulfill that mission in a fundamentally different way. We all must make it happen."

Heinz likened advanced product realization at Sandia to a renaissance, saying its usefulness extends not only to Sandia's DP-related work, but also to its Work for Others activities with DoD and other agencies. He added that this is an opportunity for Sandians to "innovate, add value, differentiate, and implement."

The final viewgraph in Heinz's presentation: "GO FOR IT!"

— John German

Employee dialogue sessions July 22, 24

Labs President and Director C. Paul Robinson next week will conduct a series of employee dialogue sessions at two New Mexico site locations. Paul was scheduled to have presented two sessions in California on July 18.

Here are the schedules and locations for the New Mexico site dialogue sessions:

- Monday, July 22, 3-4 p.m., Sandia/New Mexico, BDM Bldg.

- Wednesday, July 24, 8:30-9:30 a.m. and 10-11 a.m., Technology Transfer Center, Bldg. 825.

Although the sessions do not follow a formal agenda, they generally feature brief prepared remarks from Paul, followed by an opportunity for employees to submit written and oral questions.

Galileo spacecraft photographs a whole new world

NASA's Galileo spacecraft, equipped with radiation-hardened chips developed at Sandia, has returned the first high-resolution images of Ganymede, the largest moon in the Jovian system. In the composite at right, created from images released last week, three Galileo images with a resolution of 74 meters per pixel and taken from an altitude of about 7,000 km are inset against a 1.3 km-resolution image of Ganymede (at right in composite) made by the Voyager 2 spacecraft during its 1979 flyby.

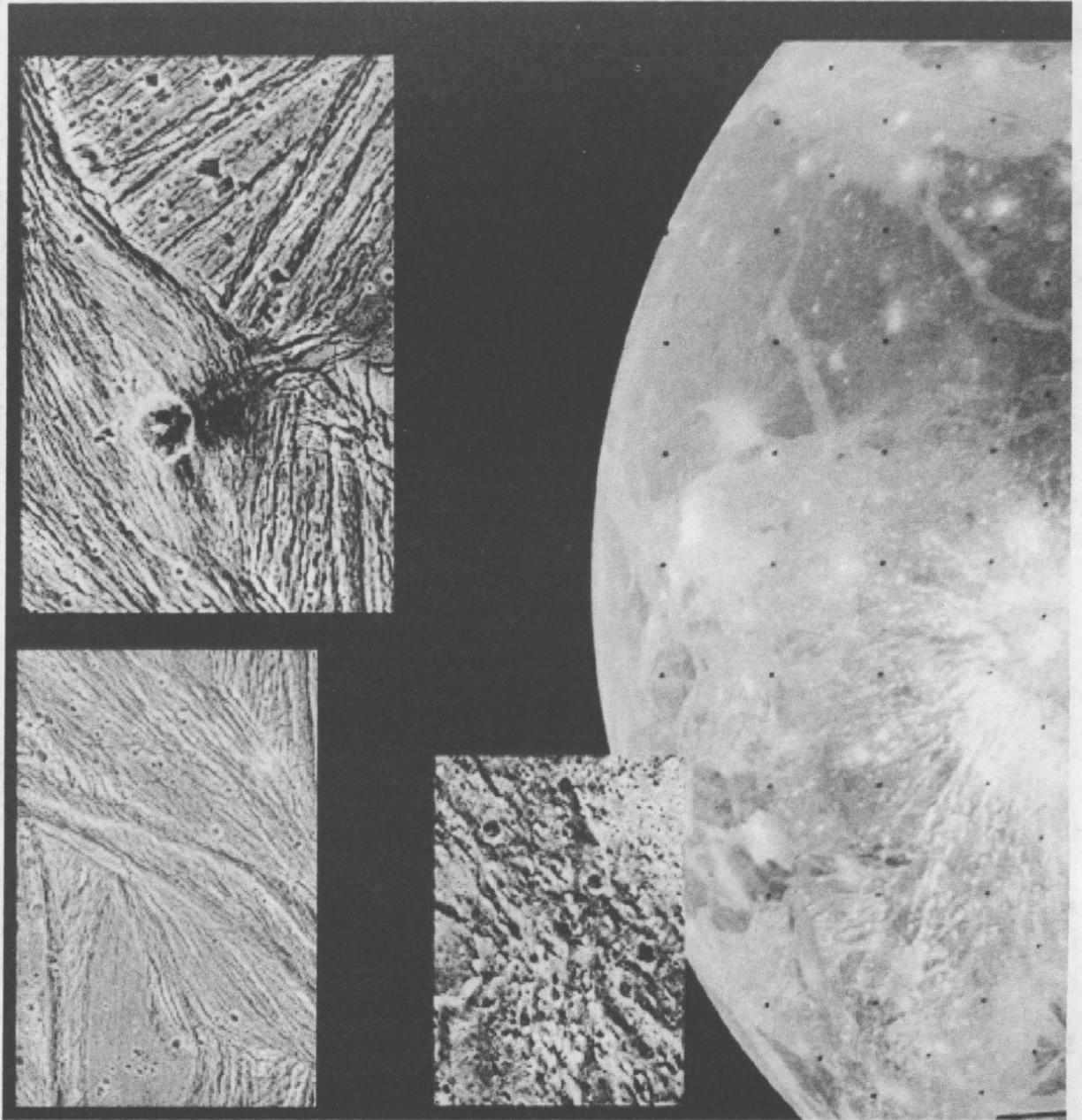
The Sandia chips, vital to the success of the Galileo mission because of the high-radiation environment of near-Jupiter space, were designed by a team of Sandia engineers headed by Ray Bair, Director of Electronic Components Center 1200 and fabricated in conjunction with Allied-Signal's Albuquerque Microelectronics Operation.

In 1994, Sandia was presented NASA's Public Service Group Achievement Award for its development of the spacecraft's specialized chips.

And those chips delivered: According to Galileo Project Scientist Torrence Johnson in an interview in the July 8-14 *Space News*, the Galileo spacecraft showed no degradation due to radiation after arrival at Jupiter.

Over the next 18 months, Galileo is scheduled to rendezvous with several of Jupiter's moons, returning a wealth of data, including images that Johnson says will "typically be hundreds of times better" than Voyager images. During its first encounter with Ganymede (there will be three more during the spacecraft's elegant orbital dance around Jupiter), Galileo revealed that the surface of the moon has been extensively bombarded by comets and asteroids and dramatically wrinkled and torn by tectonic forces. Galileo also discovered that Ganymede very likely has its own magnetosphere. If that is the case, it suggests a possible molten iron core or a thin layer of conducting salty water beneath its tortured icy crust.

In the inset image at top left, a mixture of terrains studded with a large impact crater is apparent in this view of Ganymede's Uruk Sulcus region. The image at lower left shows



ridges, grooves, craters, and relatively smooth areas in the same region. The image at lower right shows ancient impact craters, which according to planetary experts, testify to the great age of the terrain, dating back several billion years. (NASA images)

Feedback

Q: Are there any plans to move those of us in "exile" at the BDM facility back to mainstream Sandia? Although the physical facilities are attractive, there are numerous problems, such as an inadequate voicemail system, a computer network that is unreliable, limited access to the Sandia Internal Web, and a general feeling that we are not a part of Sandia. Being remote limits us to access to classes, colloquiums, bus service, carpools, retirement parties, etc. In addition to these "hardships," the traffic in the Yale/Gibson area is voluminous. The area around the BDM facility is "scary" at times to those of us who walk at lunch time. I personally would vote in favor of moving back to the main Sandia area.

A: We would like to have you back on-site and are working hard to accomplish that. It is a corporate goal to reduce the amount of off-site leased space. Over the past year, we have moved about 100 people out of BDM to on-site locations (mainly Tech Area 3, where the moved people's work is mostly located). We have a plan being worked at this time to move about 30 more. Eventually, we plan to have all those whose work is best performed on-site, on site.

Why not everyone sooner? Because it is very expensive and we have to prioritize our limited funding for corporate moves. Reducing leased space is a high priority and we plan to continue working on moving people back. If you wish details on the movement out of leased space, please give Brad Skinner in Dept. 7312 a call. Brad is the project leader on the above-referenced plan and he will be happy to share information with you. Thanks for your comments.

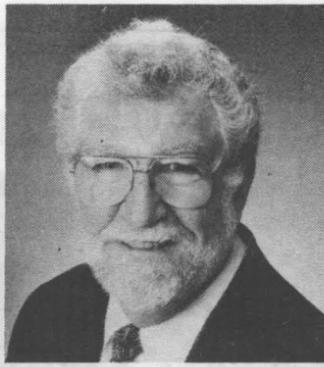
Jim Martin (7300)



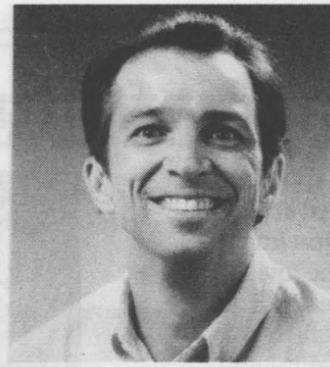
COMPLEX OFFICIALLY OPEN — Charles Emery (VP for Human Resources, left), Tom Evans of DOE Headquarters, and DOE/AL Assistant Manager for Management and Administration Richard Marquez officially open the DOE's newly renovated Energy Training Complex (ETC) during the building's grand opening June 25. Renovation for the complex, which was built in 1936 and originally served as the Sandia Girls School, was begun in 1994 under the direction of DOE headquarters, DOE/AL, and DWL Architects in Albuquerque. Composed of several buildings and currently housing an auditorium and nine training/meeting rooms, the complex, on Maxwell north of Gibson Blvd., has been used in the past as a hospital, research facility, and Kirtland officers' club, and has been nominated for the National Register of Historic Places. Since September 1995 the ETC has hosted more than 330 training and meeting activities with more than 7,000 attendees. Plans for advanced training and learning technologies are under development.

Mileposts

July 1996



Gene Ives 40
5200



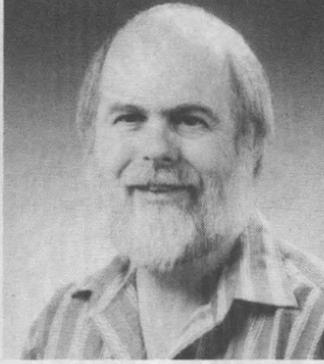
Neil Lapetina 15
14309



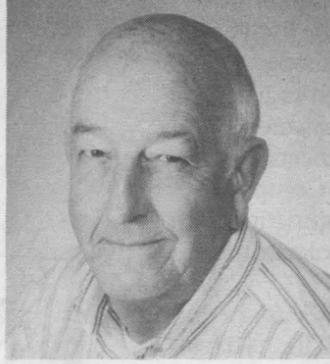
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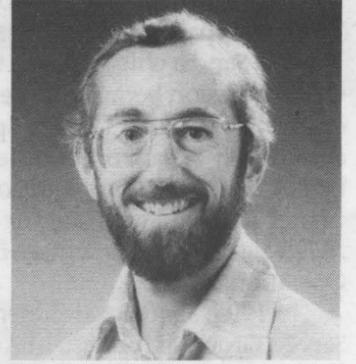
Charles Johnson 40
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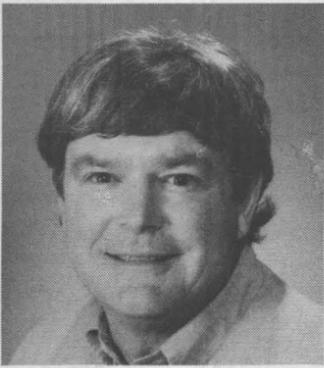
Gerald Wymer 15
12365



Robert Miller 35
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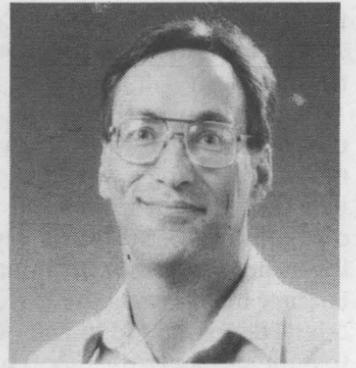
Thomas Essenmacher 15
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Peter Witze 30
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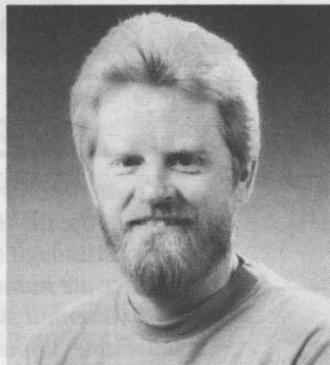
Jacqueline Chen 15
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Martin Imbert 20
2664



Russ Miller 20
2266



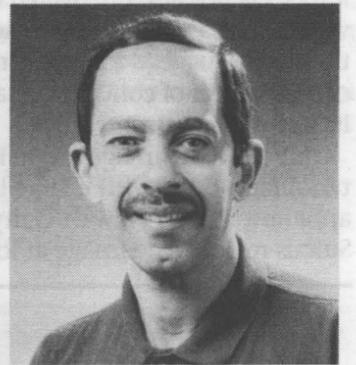
David Morrison 15
4911



Dennis Nelson 30
8812



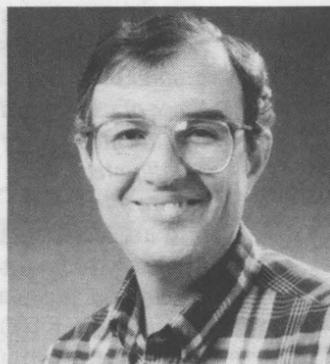
Pat Miller 15
7312



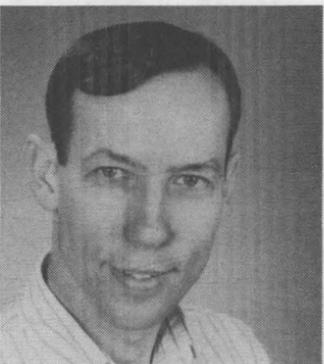
Wilbur Martin 20
9783



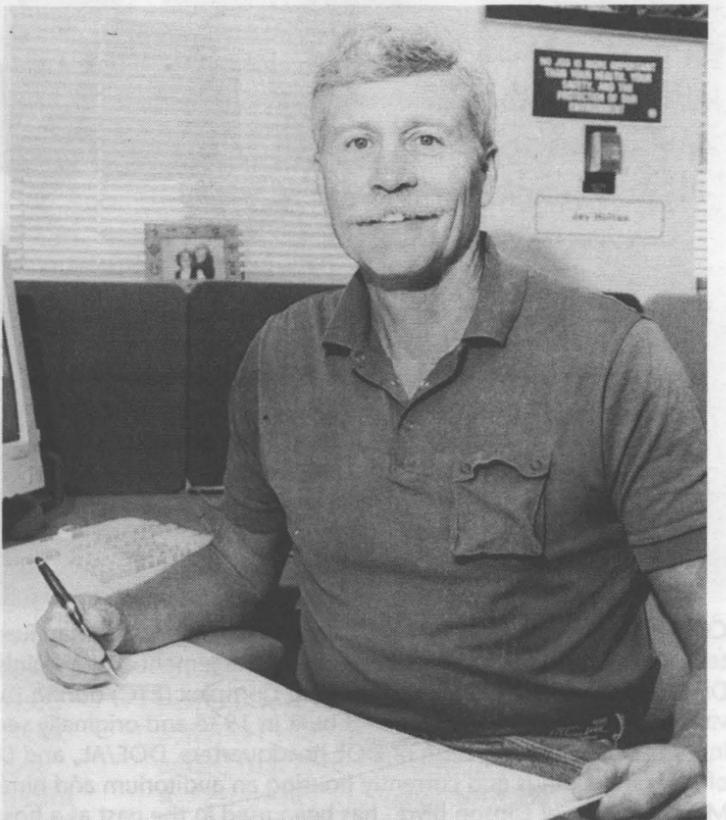
Samuel Johnson 15
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Tom Baca 20
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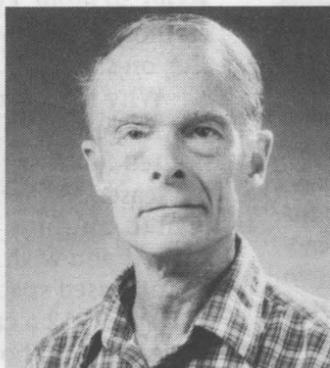
John Didlake 20
5209



Jay Holton 30
7816



Darlene West 20
8809



Tom McConnell 35
5934



Kenneth Lee 20
8746

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

MISCELLANEOUS

SANDIA T-SHIRTS, \$9; golf shirts, \$15; coffee mugs, \$8; caps, \$8; South 14 Project, Lab News office, Bldg. 811 (north of Bldg. 800). Shunny, 265-1620.

STEEL BUILDING, 16' x 20', delivered w/plans & warranty, you erect, great buy, \$1,700. Cocain, 281-2282.

HORSE STALLS, 3 portable, 12' x 12', all metal, w/hinged feeder boxes & doors, no roof, \$1,800. Striker, 281-7945.

CORDLESS MICROPHONE, Lavalier VIX System, w/Sony ECM40 microphone, used twice, box & manuals, \$225. Aguilar, 238-0567.

FOUR-WHEEL DRIVE AUTOMATIC HUBS, Ford, 3/4-ton, Dana 50 Series, \$50. Walston, 296-0372.

CAMPER SHELL, Barr-Tor pop-over, \$1,200. Knight, 839-0948.

DIAMOND SCAN MONITOR, 17-in. Mitsubishi, w/RGB cable, \$200. Barnaby, 255-5624.

SCUBA GEAR, mask, snorkel, fins, booties, \$250 OBO; 2 twin beds, \$150 ea. Darr, 275-7392.

AIR FILTERS, new, Fram model CA2740, fit Honda/Mazda cars & Ford/Mazda trucks, \$3.50 ea. or 2/\$6.00. Schkade, 292-5126.

SOFA/LOVESEAT, 4 months old, Scotch-guarded, Southwestern, w/matching coffee table, 2 end tables, 2 lamps, 2 matching decorations, \$900. Ortiz, 831-5657.

TODDLER BED, w/mattress, Gerry, \$50; child carrier (backpack), Tough Traveler, \$35; high chair, \$20. Hensinger, 237-2677.

ARC WELDER, Lincoln AC-225, excellent condition, \$250 OBO; large butcher-block chair, w/cushions, excellent condition, \$85. Avila, 275-9572.

RADIAL TIRE, Firestone SteelFlex 950R16.5, LT m/s, new, w/8-hole rim, fits Ford, Dodge, Chev. trucks, \$90. Wright, 296-3850.

FOUR TIRES, general use, P205/65/R15, \$20 ea.; large, gray, hard-plastic office desk, \$50. Lopez, 881-3289.

GE ELECTRIC DRYER, good condition, must sell; 8-ft. green couch; oak entertainment center; hamster cage, w/apartment. Parr, 292-5019.

SEWING TABLE, for free-arm machine, \$30; 2 sewing chairs, storage under seat, \$30 ea.; TV stand, \$20. Pena, 271-5222.

SOLID OAK BEDROOM SET, Young-Hinkle, bunk beds, dresser, nightstand, mattresses, box spring, \$600. Hass, 299-3506, leave message.

COMPUTER SYSTEMS, 486DX-50, 486DX-2-66, 8MB; Pentium 60s, 16MB, CD-ROM, SB; all w/SVGA monitors, \$600-\$1,000. Burstein 899-8971, after 6 p.m.

FREE COMPUTER PAPER, 8-1/2 x 11, 4-ply w/carbons, full box, you haul. Dietzel, 294-4702.

FOUR CHROME RIMS, 15x6, Land Cruiser original equipment, \$10 ea. Beer, 262-9873.

GIRL'S BICYCLE, Schwinn, \$15; Tiara punchbowl, w/glasses, \$40; chain saw, Poulan, \$50; barbecue, \$10; archery bow, \$15. Blackledge, 294-6030.

SWIMMING POOL SOLAR COVER, 16' x 32' oval pool, \$50. James, 294-6837.

LUGGAGE CARRIER, Sears cartop, enclosed & lockable, used twice, \$50; NordicTrak Walkfit, w/exerciser computer, like new, \$450. March, 323-6784.

ZEBRA FINCHES, free, 7 available, 3 males, 4 females. Marozas, 281-8639.

REFRIGERATOR, Sears, 25 cu. ft., w/ice maker/dispenser, avocado, \$450; Sears washer, dryer, \$50 ea., \$500/all. Butler, 821-7148.

WATERBED, king-size, bookcase frame, waveless, \$50; Ford pickup spare tire, \$15; metal desk, \$10; Scott, 294-4240.

GIRL'S BEDROOM SET, 6 pieces, w/desk & hutch, \$325. Foflygen, 294-9768.

FOUR ALLOY WHEELS, SenDel Performance; two P245/60 tires, \$120; soft-side waterbed queen mattress, \$30; stair climber, \$40. Hickerson, 899-5158.

DORM REFRIGERATOR, \$65, assorted baby clothes, \$.50-\$2.50; double stroller, \$50; door jumper, \$15; high chair, \$40. Burstein, 899-8971.

BACKFILL, approximately 3 yds., clean, free, you haul. Pelzman, 292-6538.

PISTOL, semi-auto Taurus, Mdl PT22, 9-shot magazine, \$130; full-size video camera, HQ LXI, auto focus, hard carrying case, \$300. Baca, 345-0839.

COMPUTER PRINTER, Panasonic KX-P1124i, 24-pin, dot-matrix, excellent condition, \$100. Anderson, 897-2772.

BUNK BED FRAMES, metal, use two different sizes of mattresses, like new (without mattresses), \$80. Osburn, 286-1758.

NORDICTRAK PRO, 1 yr. old, electronic monitor, w/heart rate option, excellent condition, \$400. Thomas, 262-0171.

PIANO, Yamaha U1, walnut satin finish, 5 yrs. old, outstanding instrument, \$5,000. Ray, 294-7720.

WASHER & GAS DRYER, 2 yrs. old, excellent condition, \$325 OBO. Narrow, 256-9159.

WATERBED, queen-size, semi-waveless mattress, wood headboard, good condition, \$65. Creel, 839-7335.

FREE BOOKCASE, 5-shelf bookcase, brown plywood, needs some attention, you haul. Maxey, 831-2228.

COUCH, floral pattern, 2-piece sectional, 1 yr. old, originally \$2,500, asking \$900. Stringfellow, 294-4644, ask for Sherry.

POOL TABLE, Brunswick Bristol Oak, almost new, w/accessories, \$1,400. Kellogg, 833-1045.

TAOS-STYLE LOVESEAT & CHAIR, w/rust-colored cushions, good condition, \$300 OBO; mission-style console table & mirror, \$125. Lloyd, 822-8567.

VITAMASTER, premier series treadmill, excellent condition. Tanuz, 873-0492, ask for Shannon.

QUALITY CARPET, 20' x 20', lightest beige, 16' x 18' in very good condition, \$50. Chorley, 296-1454.

MINOLTA COPIER, \$50; electric stove, double oven, self-cleaning, excellent condition, \$200; auto tire chains, used once, \$25. Lucero, 296-1747.

HEALTHRIDER, superb condition, warranty, w/video & instructions. Kirby, 821-3938.

WHITE SEWING MACHINE, w/cabinet & accessories, \$100 OBO. Henry, 266-6467.

EXERCISE BICYCLE, Voit, \$35; storm door, 36-in., brown, \$35. Biffle, 293-7043.

FREE GRAVEL, 3/4" to 1", gray gravel & red lava rock, have lots. Dwyer, 271-1328.

COLOR TV, 19-in., Curtis-Mathes, \$75 OBO; girl's bike, 20-in. Schwinn, 5-sp., \$50. Rector, 286-1217.

SIX ALUMINUM WINDOW AWNINGS, removable for winter, \$150; pine-frame bunk bed, w/mattresses, \$120; pop-up camper (Scamper), \$475. Newman, 265-0477.

'95 FENDER STRAT, made in US, vintage sunburst lace sensor pickups, list \$1,100, selling for \$550. Cerutti, 271-8583.

ARMOIRE, contemporary design, high-quality, European hinges, 3 roomy shelves, drawer, 6-ft., \$1,000 new, asking \$500. Martin, 268-5892.

CAMPER SHELL, Toyota long bed, \$200 OBO; bumper, w/hitch, for Toyota truck, \$100 OBO. Avila, 275-9572.

REFRIGERATOR, almond, frost-free, 3 yrs. old, excellent condition, paid \$1,000, asking \$500. Parret, 332-8623.

COLEMAN ICE CHEST, 100-quart, \$25; catalytic heater, \$20; coffee maker, under-cabinet, \$15; SCM adding machine, \$10. Tucker, 869-3469.

NORDICTRAK, \$350; Toyota Supra bra, \$35; file cabinets, \$10; exercise trampoline, \$25. Hatch, 281-0543.

COMPUTER, 486SX/3, 8MB RAM, 110MB HD, 2 disk drives, Super VGA, color monitor, Star NP10 printer, Windows DOS 3.1, w/software, \$575. Minnear, 281-0946.

TRANSPORTATION

'85 CHEV. BLAZER S-10, Tahoe, 4x4, AC, PS, PB, AT, cruise, 70K miles, new battery, hoses & tires, \$4,300. Pollock, 821-7474.

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). Questions? Call Nancy at 844-7522. 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.

'84 MAZDA 626, 2-dr., 38K miles, PW, sunroof, standard transmission, \$1,750 OBO. McComack, 296-3936.

'85 CHEV. CAVALIER, 5-sp., new tires, front brakes, catalytic converter, 28 m.p.g., runs great, \$1,150. Kahle, 891-1783.

'91 MERCURY, low mileage, top condition, available July 19, owner leaving for Japan July 20, must sell, \$4,600, must see. Rael, 884-4778.

'91 TOYOTA CELICA ST, AT, AC, tinted, 54K miles, excellent condition, 1 owner, \$9,500. Keahbone, 831-6177.

'85 VW QUANTUM station wagon, new paint, radiator, battery, cassette, 109K miles, \$2,800 OBO. Essien, 343-8712.

'93 MAZDA B2600i LE, extra-cab pickup, 4x4, 5-sp., 39K miles, w/bed liner, new tires, excellent condition, \$13,500. Nelson, 828-2755.

'79 HONDA ACCORD, runs fine, great student car, AC, stereo cassette, good tires, \$900 OBO. Wright, 293-9599.

'92 MITSUBISHI MIRAGE, 4-dr., blue, 54K miles, AT, AC, excellent condition, below book, \$7,300, must sell. Zaffery, 294-6768.

'93 SATURN SCII, AC, 5-sp., sunroof, CD, excellent condition, \$12,995. Skaggs, 275-2449, ask for Lynnessa.

'71 OLDSMOBILE 442, convertible, AT, AC, PS, PB, AM/FM, 455 engine, recent engine, transmission, paint, interior. Loudermilk, 299-4621.

'96 TOYOTA TACOMA SRS, V6, 4x4, 5-sp., standard, PW, PL, X-tra cab, AM/FM cassette, cruise, 14K miles, \$22,000 OBO. Atcity 284-2701.

'90 JEEP WRANGLER, PS, PB, radio, 4-cyl., 5-sp., soft top, 56K miles, red, \$7,900 OBO. Ellis, 275-1609.

'93 MAZDA RX-7, twin turbo, touring model, excellent condition, wholesale at \$17,900 OBO. Emery, 291-1233.

'90 HONDA CIVIC DX, hatchback, metallic gray, excellent condition, very low mileage. Domingo, 271-1105.

'85 TOYOTA CELICA GT-S, convertible, AT, AC, power everything, 97K miles, red w/black top, \$4,500. Grumblatt, 271-9457.

'80 FORD MUSTANG, well maintained, AC, recent tires/battery, original owner, needs clutch work, make offer. Filusch, 299-5932.

'75 PLYMOUTH VALIANT CUSTOM, 74K miles, new battery, AT, AC, PS, PB, 4-dr., Slant 6, reliable, \$700. Rezac, 281-1816.

'72 PORSCHE 914 ROADSTER, 2-liter, twin carb, conversion, Monza exhaust, manual, extra paint, yellow, \$2,500. Savage, 837-2692.

'89 JAGUAR VANDAN PLAS, sandstone, garaged, showroom condition, 53K miles. Tapia, 269-8300, leave message.

'92 GMC SAFARI CONVERSION VAN, AT, PW, PL, AC, cassette, cruise, 60K miles, \$15,625. Wiley, 897-1891.

'96 FORD T-BIRD, 2-dr., V8, mystic blue, loaded, leather seats, moonroof, must sell, \$21,500 OBO. Cano, 899-5047.

'90 DODGE GRAND CARAVAN LE, AC, PS, AM/FM cassette, PL, PW, cruise, running boards, custom paint, 70K miles, \$7,500. Herrera, 884-4925.

'70 AUSTIN MINI COOPER, 4-sp., bids through 7/24, right to refuse bids, subject to prior sale, as is. SLFCU, 237-7384.

'90 JEEP CHEROKEE, gray, 4x4, 6-cyl., AC, 81K miles, \$8,000. Baldonado, 765-1961.

'69 CORVETTE 350 COUPE, 4-sp., PS, PB, AC, current owner since '79, blue, very good mechanically, \$10,500. Wilde, 281-7027.

'84 BMW 633Csi, 42K miles, many new items. Surran, 256-7344.

'94 CHEV. BERETTA, 2-dr., white, AT, 4-cyl., AC, very low mileage, best offer. Del Real, 275-5725.

'89 HONDA PRELUDE 2.0s, 5-sp., AC, AM/FM, power, silver, excellent condition, garaged, \$7,500. Chavez, 344-7472.

'95 OLDS CUTLASS SUPREME SL, less than 12K miles, like new, \$14,800. Hutchins, 822-1335, evenings.

'86 TOYOTA 4RUNNER SR5, loaded, new engine, CVs, clutch, altimeter, sunroof, runs great, \$7,600 OBO. Roybal, 296-8493.

'78 GMC SIERRA GRANDE PICKUP, low miles, 90K miles, heavy 1/2-ton, great condition, short bed, \$2,000. Henley, 821-5457.

'86 DODGE MINIVAN, only 85,500 miles, good condition, maroon, AT, PS, PB, AC, \$2,200. Henley, 877-0426.

'92 SATURN, 4-cyl., approx. 59,575 miles, bids through July 23 until 4 p.m., shown Monday-Friday to 4 p.m., right to refuse bids, subject to prior sale, as is. SLFCU, 237-7382.

'73 VW SUPER BEETLE, orange, new clutch, rebuilt engine, spare engine & misc. parts, \$1,500. Claghorn, 884-4483.

RECREATIONAL

MITCHELL DOUBLE BED fishing hut/slide-out, fits long bed pickup, \$600. Romero, 897-2690.

'87 HARLEY FLHTC, 15K miles, many extras, great shape, still waiting for your call. Schrader, 298-4154.

'87 SUZUKI LS650 SAVAGE, great condition, new front tire, seats, air filter, \$1,675. Skogmo, 292-9773.

'94 HONDA CBR F2, clean, very fast, 5,500 miles, pipe, bra, excellent condition, \$5,200. Kubasek, 298-8668.

GIRL'S BIKE, 20-in. Schwinn, 5-sp., \$50. Rector, 286-1217.

'94 SUNBIRD FISH/SKI BOAT, OMC, 40-mph, 115-hp, Johnson, 150 hours, Shorlander trailer, extras, below NADA, \$9,000. Holmes, 292-0898.

'91 KAWASAKI KE100, perfect condition, only 1,800 miles, street-legal, never in accident, \$900 OBO. Wieting, 823-0160, ask for Jim.

LARSON BOAT, 18-ft., V-open bow, 350 Mercury I/O, 377 hours, mint condition, trailer, new cover, extras, \$4,950. Otts, 857-0641.

BICYCLES: 10-sp., 2 woman's, 1 man's, (Huffy & Carrera), excellent condition, \$30 ea. OBO. Kearns, 899-1037.

'85 COMPANION TRAVEL TRAILER, Kit Model 222, self-contained, electric hitch, 22-ft., excellent condition, \$6,500 OBO. Babcock, 299-3121, leave message.

'82 CHAMPION/CHEV. TRANSVAN MOTORHOME, 23-ft., self-contained, 52K miles, new tires, \$7,500 OBO. Bennett, 298-1142.

SKI/FISHING BOAT, 17-1/2 ft. Glassmaster, I/O open bow, stereo, Mercury cruiser, Dilly tandem trailer, \$4,900. Lusader, 298-3469.

'79 KAWASAKI 400, \$400. Robertson, 299-7561.

TOURING BIKE, Trek 520, new condition, 18-sp., CroMoly frame, \$350 OBO. Hanes, 292-6512.

'79 BOAT, Sea Star, 19-ft., dual-axle trailer, V6, V-hull, great shape, must sell, \$5,700 OBO. Beazley, 255-5652.

BOAT, MOTOR, & TRAILER, 14-ft. Grumman, 9.9-h.p. Suzuki oil-injected, Cox tilt-trailer, trolling motor, ready to fish, \$1,900. Adams, 821-0899.

WOMAN'S ROAD BIKE, custom, Gi-tane, (old), \$35; PhysioFit woman's city bike, \$100. Feibelman, 242-1946.

REAL ESTATE

4-BDR. HOME, 1,660 sq. ft., 2 baths, automatic sprinklers, landscaped 1/2 acre, central AC/heating, hot tub, \$119,000 OBO. Cibicki, 293-8400, ask for Jerome.

4-BDR. BRICK HOME, 2-1/2 baths, 2,200 sq. ft., active solar hot water, new furnace, cooler, hardwood windows, \$149,000. Diniz, 323-8644.

4-BDR. ASHCRAFT HOME, 2-1/2 baths, LR/DR, den, security system, hot water heat, excellent location & condition, 2,400 sq. ft., \$190,000. Olona, 268-3604.

4-BDR. HOME, 1,870 sq. ft., good condition, double garage, Comanche/Chelwood, great schools, park, \$135,000. Hoier, 275-1938.

3-BDR. HOME, Taylor Ranch, 1,370 sq. ft., 1-3/4 baths, wood stove, ceramic tile, 3-car garage, large lot, patio, new appliances. Serna, 899-9618.

3-BDR. HOME, 1,960 sq. ft., LR/DR, family room, study/4th bdr., 2-1/4 baths, country kitchen, great neighborhood, \$134,900. Winowich, 255-2611.

3-BDR. DOUBLE-WIDE mobile home, minutes to Wyoming gate, 2 baths, large kitchen, fireplace, skylight, DR, appliances stay, \$30,000. Harris, 298-4756.

3-BDR. HOME, Taylor Ranch, 1,424 sq. ft., 2 baths, FR, fireplace, 2-car garage, large cul-de-sac lot, landscaped, \$128,500. Whitaker, 899-9581.

4-BDR. HOME, 1-3/4 baths, 2,150 sq. ft., LR, DR, FR, fireplace, workshop, storage, beautiful NE neighborhood, 10 minutes to KAFB, \$159,000. Gourley, 844-5806.

3-BDR. HOME, NE Heights, 1,800 sq. ft., formal living, dining, deck w/city view, new tile, carpet, upgrades, \$158,000. Werner, 292-5520.

4-BDR. HOME, 2-1/2 baths, 2,740 sq. ft., +3,000 sq. ft. redwood decks/patios, magnificent views, Jacuzzi, alarm system, \$250,000. Rea, 296-4620.

3-BDR. TOWNHOUSE, Academy Estates, 1,550 sq. ft., 1-3/4 baths, fireplace, 2-car garage, in cul-de-sac, \$134,000. Dubes, 291-8783.

3-BDR. HOME, elegant 2,600 sq. ft., 2 acre forest, master bdr. suite, den, library, deck, spa, views, South 14, \$249,900. Wright, 281-1181.

LOT, Four Hills, 1/4-acre, 101' x 110', on secluded corner, established neighborhood, surrounded by nice homes, \$65,000. Ralph, 831-6841.

3-BDR. HOME, 2-story, Sandia Park, 2,300 sq. ft., 2-1/2 baths, 2-car garage, covered patios, 2 yrs. old, kiva, fenced, views, \$214,950. Salazar, 281-0560.

3-BDR. HOME, views, new carpet, Spain/Tramway, \$53,000 down, 6% interest, \$1,800/per month, only \$353,000, cash offers considered. Gallegos, 294-0233.

2-BDR. HOME, 2 baths, garage, auto-sprinklers, security iron, recent landscaping, immaculate, \$95,900. O'Malley, 271-9269.

WANTED

MUSICIANS, to form Sandia/KAFB brass quintet, need advanced-level French horn, trombone, & tuba player. Saloio, 880-1851, ask for Joe.

SMALL REFRIGERATOR, office-size. Valencia, 294-7367.

MOVING BOXES, used, any size, will pick up. McClain, 898-0739.

LOST & FOUND

LOST: \$80 from student's wallet, on bus #31 June 5, can be returned anonymously to Sandia Lost & Found, Bldg. 832, MS 1021. Fulione, 822-8311.

Robust hydrogen sensor finds a home at DCH Technologies

The Sandia developers of the Robust Wide-Range Hydrogen Sensor, a new-generation hydrogen-detection device that is smaller and faster than earlier versions, have completed a licensing agreement for the technology with DCH Technologies of Sherman Oaks, Calif.

The sensor is considered an outstanding advancement in hydrogen "sniffers" because it provides detection over a broader range of concentrations, from 0.0001 percent to 100 percent, and can operate over a greater temperature range, from -100°C to 140°C.

A unique palladium nickel (Pd-Ni) catalytic alloy, created and patented by Robert Hughes and Kent Schubert of Microsensor Research and Development Dept. 1315, is used to create the resistor and transistor that compose the sensor. The alloy's high sensitivity to hydrogen makes detection possible at concentrations below 1 percent and facilitates accurate detection at higher concentrations.

Located on a millimeter-square microchip, the sensor's small size is also considered a breakthrough advantage. At a nuclear waste storage site, where mixed wastes can produce volatile amounts of hydrogen gas, a tiny sensor could be placed under the lid of each waste barrel, something previously considered impossible.

A key to the sensor's invention was the integration of the Pd-Ni catalytic alloy with metal oxide semiconductor (MOS) integrated circuit processing in 1300's Microelectronics Development Laboratory. This process development, led by Jose Rodriguez of Intelligent Micromachines Dept. 1325, enabled the inte-

gration of analog MOS control circuitry to monitor and maintain the sensor at a constant temperature, which is required for accurate readings.

This special integration process of the Pd-Ni alloy makes the technology well-suited for transfer to industry, says Mike Knoll, Manager of Custom Microcircuits and Nonvolatile Memories Dept. 1341.

In 1993 the sensor won an R&D 100 Award and, according to Mike, has always been popular with its users, but for a number of years the project was unable to find a commercial manufacturer and vendor. Last February, however, DCH came to Sandia with a proposal: The company would take over manufacturing if a licensing agreement could be reached by April of this year. The 7th Annual US Hydrogen Meeting, a gathering of hydrogen producers and other related professionals, was convening at the end of April and DCH wanted to unveil its new product where it would get maximum exposure.

Craig Sheward of Technology Transfer and Commercialization Center 4211 helped negotiate the agreement. "There was tremendous interest in the sensor at the conference," he says. "It really went off well; it was perfect timing."

DCH has been "aggressively marketing the technology" since the conference, says Mike. Sandia produced prototype sensors that were used as safety monitors at NASA's space shuttle facilities, and DCH plans to provide Robust Hydrogen Sensors to Allied Signal, a subcontractor to Lockheed Martin on the X-33 reusable launch vehicle. — Philip Higgs

Coronado Club

July 21 — Sunday brunch buffet, 10 a.m. - 2 p.m. \$6.95 all-you-can-eat buffet. Kids 3-12, \$1, under 3 free. Music by Bob Weiler, 1-4 p.m.

July 25, Aug. 1 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

July 26 — Patio BBQ buffet. A la carte buffet 5-8 p.m. Pool open til 9 p.m. Music and dancing on the patio 7-11 p.m. Music by Coyote Moon.

July 27, 28, 29 — Club pool closed for swim meet.

Aug. 2 — "Western Night" dinner/dance. \$7.95 all-you-can-eat buffet, 6-9 p.m. Music by Isleta Poorboys, 7-11 p.m.

Retiree deaths

Raymond Shephard (78) ...8413May 28
Anthony Garcia (58)13915May 30
George Power (89)9133May 30

Help us recognize Sandians

The *Lab News* recognizes Sandia employees and retirees who receive honors and awards — work-related and community-related — and who have other outstanding achievements.

Has your friend, colleague, boss, or employee been honored for good works in a community or professional group? Named a fellow or elected to an office in a professional society? Received a best-paper award at a meeting? Had a book published?

If so, keep the *Lab News* in mind so we can give these folks a nod. Call Bill Murphy on 845-0845, or send him a note with a few details to Dept. 12640, MS 0165. In Livermore, contact Barry Schrader (8522) on 294-2447, MS 9111.

Sandia News Briefs

Sandian Huri Fraley wins recognition from DIA, CIA

Huri Fraley of Proliferation Projects Dept. 5908 has been awarded the Defense Intelligence Agency/Central Intelligence Agency Joint Service Award in recognition by her DIA colleagues of her superior performance in promoting cooperation between the CIA and DIA. Huri has been on assignment at Director of Central Intelligence/Nonproliferation Center's Information Technology Group at CIA headquarters for the past two years.

Fun & Games

Bowling — Congratulations to Women's Sandia Laboratories Bowling League (WSLBL) 1995/96 season champions: First place — Las Amigas: Diana Dobias, Sally Frew (3524), Dora Gunckel (6400), Lea Long, and Dee Schumpert (DOE); Second place — Pin Pals: Donna Chavez (4523), Anne Cosbey (4911), Judy Hansen (10232), Pat Mefford (4020), Lisa Trainor (4923), and Linda Zettel (4813).

The WSLBL rolled its last strike on May 2. This is the last season for this league established in 1969, when Lil Radtke (7447), who bowled in the league for many years, circulated a questionnaire to determine if there was enough interest to start a women's league (there were two men's leagues at Holiday Bowl at that time). Present-day members who bowled at the inception of the league include Peggy Burrell (ret.), Margaret Lucas Hawk (ret.), and Dora Montoya Gunckel (6400). Dora bowled continuously in the league from start to finish, a total of 27 years. Fees have changed over the years. In 1969 the bowling fee was \$2.30. In 1996 it was \$9.25. The sanction fee was \$1.75 in 1969 versus \$11.25 in 1996. Highest scores bowled in WSLBL: Estella Creel bowled a 290 scratch game in 1984 and Dee Schumpert bowled a 665 scratch series in 1987.



TORRENTIAL RAIN in south Albuquerque and Tijeras Canyon Wednesday evening, July 10, caused problems for local drivers and residents. Some areas reported as much as five inches of rain in a few hours' time. An unidentified Sandia employee attempted to cross Tijeras Arroyo on a road near Sandia's Robotics Vehicle Range the following morning but apparently underestimated the depth of runoff flowing out of Tijeras Canyon and grounded the underside of his pickup. A crew driving a Kirtland Air Force Base dump truck helped pull the stranded vehicle to safety. The recent rains also washed out a portion of the road leading to the South Gate and vehicles are being rerouted to other Kirtland AFB gates. The June and July rains in New Mexico nevertheless have been welcome following an unusually dry winter and spring.