

MUSE gives virtual reality a humanistic new twist

'Creve's craft' can cruise outer space or the inside of a microchip

By Howard Kercheval

Lab News Staff

A laboratory down a corridor behind an ordinary-looking door in Sandia's Advanced Manufacturing Processes Laboratory (AMPL) is being sought out by more and more people lately. They are eager for a demonstration of a virtual reality shell that is anything *but* ordinary, so flexible and adaptable a way of interacting with computers that it is described as nothing short of a paradigm shift.

Creve Maples of Computer Architectures Dept. 1415, who named his invention Multi-dimensional User-oriented Synthetic Environment (MUSE), has used it to explore the insides of molecules, the structure of the human brain, and the behavior of materials under stress (from within the materials), among other things. That is made possible through use of a feature called a virtual craft, which the user can 'enter' and navigate through computer space, such as the inside of an electronic chip, or across vast distances, such as to the edge of the solar system.

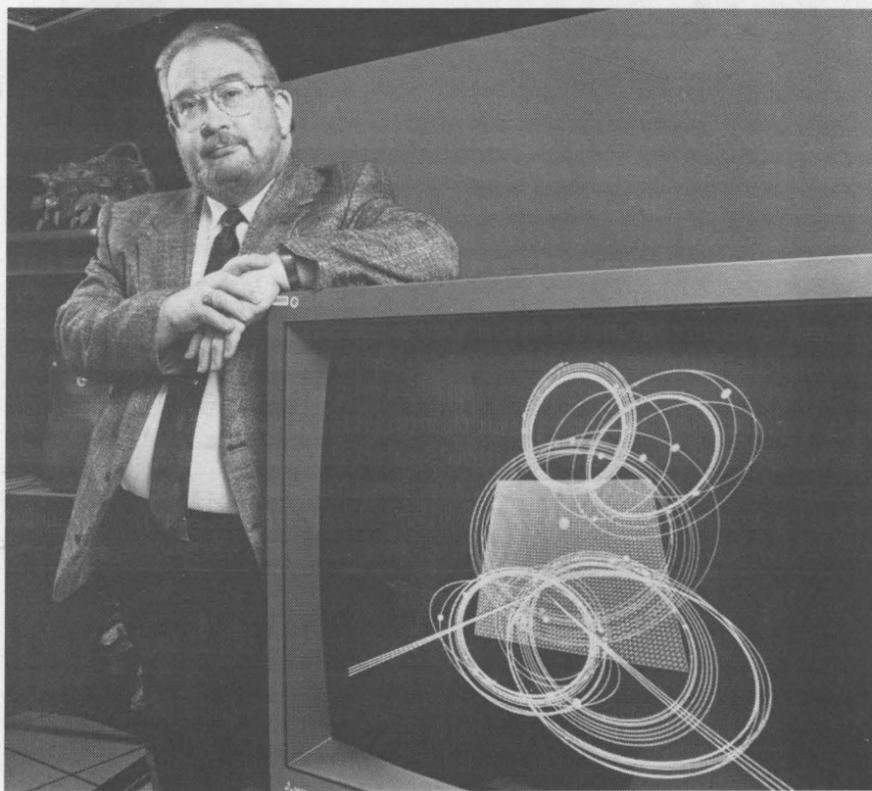
Virtual navigation craft provides displays

The walls of the virtual craft provide displays of information that could be related to the journey, or anything else — including live video, sound, still pictures, or data.

MUSE is currently under patent review. It and a companion application to manufacturing technology — Virtual Interactive Environment Work Space (VIEWS), which Creve and Arlan Andrews, Manager of Advanced Manufacturing Initiatives Dept. 2902, developed jointly — have attracted interest from industry, government, and education.

"What we've developed," says Creve, "is a system that is incredibly flexible, that can adapt and be altered dynamically as new ideas and technology develop. These changes can then be incorporated without

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WORLDS IN MOTION — Creve Maples (1415) stands by a monitor displaying the solar system as presented by his new virtual reality shell MUSE. The model has the nine planets in motion around the sun, and each planet's moons in motion around the planet. Creve says MUSE is unique among virtual reality applications because of its extreme flexibility and seemingly limitless adaptability.

(Photo by Randy Montoya)

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Nonproliferation conference enlists national labs' expertise

Stopping the spread of nuclear, chemical, and biological weapons

Faced with growing regional tensions in a world no longer held in balance by two superpowers, the talents of the national laboratories must be channeled to face a new threat — the proliferation of weapons of mass destruction.

That's what Sen. Sam Nunn, chairman of the Senate Armed Services Committee, said during a two-day nonproliferation conference at Los Alamos last week involving ranking military and DoD officials and representatives of the DOE labs. Sandia President Al Narath, Executive VP Jim Tegnalia, and Systems Applications 9000 VP Gerry Yonas headed the Sandia delegation. Sandia is playing a role in shaping the national counterproliferation program (*Lab News*, April 29).

Nunn called the possible spread of nuclear, chemical, and biological weapons the most serious problem facing the US during the two decades following the end of the Cold War.

"What we thought would be nirvana has become a world of spreading ethnic, religious, and even tribal warfare," he said.

US Deputy Secretary of Defense John Deutch, who helped author a recent report outlining nonproliferation needs, told conference attendees there are significant technical opportunities for both private industry and the labs in the nonproliferation arena.

The report calls for about \$400 million in new funding for nonproliferation-related technical projects. About \$300 million of that funding will be allocated through DoD. Although most of the funding should be available in FY96, as much as \$100 million could be included in the FY95 budget.

New Mexico Senators Pete Domenici and Jeff Bingaman both called for quick action on nonproliferation and counterproliferation issues between DoD and DOE.

Sandia fails property audit; new task force will study fixes

By Julie Clausen

Media Relations Dept.

Sandia's property management system will undergo an in-depth review in the coming months to determine the causes behind a failing grade received in an audit last month. The "unsatisfactory" rating resulted after a team of Department of Energy auditors found numerous problems in the way Sandia/New Mexico employees handle and store computers, furniture, and other equipment at the Labs.

The DOE/AL (Albuquerque Operations Office) team will recommend that DOE Headquarters disapprove Sandia's personal property management system.

One of the more serious findings concerned the leaving of equipment — including personal computers — outside and unprotected from the weather. Although three large tents had recently been erected to house property awaiting reapplication (*Lab News*, April 29), auditors discovered unprotected equipment outside regular Sandia work areas.

In many instances, employees who were

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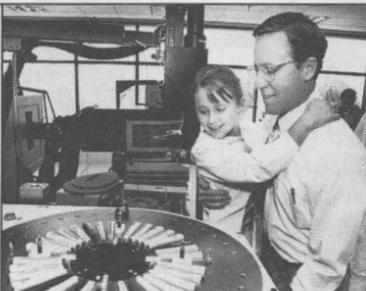
DOE auditors discovered unprotected equipment outside Sandia work areas.

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O'Leary asks Sandia to take its diversity plan 'on the road'

This & That

A real paradigm shift - I'm not fond of the buzzword "paradigm," but you'll find it several times in Howard Kercheval's page-one story about MUSE - a virtual reality tool developed by Creve Maples of Computer Architectures Dept. 1415. This is knock-your-socks-off, high-tech stuff that's generating extraordinary interest outside the Labs, and Creve describes it as "a whole new paradigm of human-computer interaction." I hope you'll take time to read about it. It's exciting, and it may be your last chance to read the "P" word in the *Lab News*.

* * *

Sandians one and all - Some folks continue to express confusion about how we, as Sandia employees, relate to our management and operating contractor, Martin Marietta. One person sent this inquiry last week: "Sandia Corporation is a full Martin Marietta group, and Sandia Corporation runs Sandia Labs, so: (1) As a staff member, am I considered a Martin Marietta employee? (2) Are senior management Sandia Corp., Sandia Labs, or Martin Marietta employees?"

We are all employees of the *Sandia Corporation*, staff and management alike, and that includes all the folks who have transferred here from Martin Marietta. Sandia Corporation is a legal entity (wholly owned subsidiary of the Martin Marietta Corporation) that exists specifically to run Sandia National Labs.

* * *

A blast on the hill? - In our March 18 issue, I noted there have been three nuclear detonation tests in New Mexico - two peaceful underground tests in the 1960s and the world's first (above-ground) test, "Trinity" back in 1945 in an isolated area north of Alamogordo. Many of the engineers and scientists who developed the original "gadget" were, of course, working in Los Alamos. But one 1993 edition of a computer-based (CD ROM) encyclopedia got things a little confused, notes Sandian Doug Minnema (5209), who's currently on temporary assignment with DOE Defense Programs in Germantown, Md. An entry about Los Alamos' Bradbury Science Museum says the museum allows visitors to trace the development of nuclear energy, and adds that "Los Alamos has the distinction of being the site of the world's first atomic bomb explosion."

* * *

Dandy bunch of daughters - Congrats to the Sandia Women's Program Committee and everyone involved in making "Take Our Daughters to Work Day" a big success at the Labs. Sandia/New Mexico hosted 850 girls ages 9-15, and Sandia/California hosted 102 more. *Lab News* photographer Randy Montoya recorded some of the young New Mexico women and their parents at work (see page eight). We understand Sandia administrators are planning a future "Take Our Sons to Work Day."

* * *

Out of Focus - This may hold up to win the least-useful photo caption of the year award: The April 8 issue of the *Kirtland Focus* newspaper showed a photo of the giant Russian An-124 cargo plane that delivered four Topaz II nuclear reactors that Sandia and other Albuquerque area research groups are studying. A uniformed man (maybe the pilot) is seen standing in front of the plane, which is the second largest cargo plane in the world. The caption: "The An-124 is many times larger than a human being."

- Larry Perrine

Employee pension plan forum is May 25; both Sandia sites involved

Sandians who want more information about the Labs' pension plans are invited to attend a panel discussion and question/answer session Wednesday, May 25. The special forum is intended to address recent changes to the plans - Retirement Income Plan and Pension Security Plan - to discuss the DOE Inspector General's recent report that recommends that "excess assets" from the plans be turned over to the federal government (*Lab News*, April 29), and to clear up any misconceptions about either issue.

The forum will be centered at Sandia/California and video-linked to the Sandia/New Mexico Technology Transfer Center. The two-hour forum will begin at 1 p.m. California time, 2 p.m. New Mexico time.

Charlie Emery, VP for Human Resources 3000, will lead the panel discussion from California; Pat Smith, Director of Human Resources and Business Operations 8500, will host. They will be joined there by Charles Mika, Manager of Pension Fund/Benefit Program Management Dept. 3542, and Jo Sandelin, California Site retirement counselor (8522). Participating from the New Mexico Site will be Ralph Bonner, Director of Human Resources Center 3500, and Mark Biggs (3542), senior pension/insurance planner.

Q&A session included

The panelists will give opening remarks, and a question/answer session will follow. Sandians are encouraged to submit questions in advance of the forum, but questions can also be submitted during the forum at both sites. Forum planners ask that all questions be submitted in writing to avoid any misinterpretation.

Sandia/California employees may submit questions in advance to Jo Sandelin at mail stop 9111, fax 294-2006. Sandia/New Mexico employees may submit advance questions to Charles Mika at mail stop 1026, fax 845-0098. Retirees are also welcome to mail their written questions to Charles Mika: Sandia National Laboratories, Department 3542, Mail Stop 1026, Albuquerque, NM 87185-1026.

The *Lab News* will cover the forum in our June 10 issue.

Sandia LabNews

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MARTIN MARIETTA



INTEL INSIDE— Intel Corporation Chairman Gordon Moore (left), gets briefed by Harry Weaver (Microelectronics Prototyping Dept. 1321) during a tour of Sandia's Center for Microelectronic Technologies (CMT) May 3. In a three-hour Sandia visit hosted by President Al Narath and Chuck Gwyn (External SI Programs Dept. 1302), Moore had a working lunch with Sandia officials, toured the CMT, and heard briefings on Sandia, technology transfer, SEMATECH, and high-performance computing using Sandia's Intel Paragon super-computer. Bob Blewer (Advanced Silicon Projects Dept. 1305) gave an overview of Sandia's cooperative projects with Intel, the world's largest semiconductor manufacturer. Later that day, Moore opened Intel's annual stockholders' meeting at the Albuquerque Convention Center.

Sandia physicist takes research to edge of the world

Ham radio, natural history interests drive trip to Antarctic island

By Judy Kimsey

Lab News Correspondent

It has been described as the "most isolated place in the world." No one lives there. It is covered year-round by a glacier. Pack ice surrounds it most of the year, making it impossible for ships to approach. On a balmy day, the temperature hovers a little above zero. There have been more landings on the moon than here.

So, why in the world would anyone want to spend six weeks on Peter the I Island, a Norwegian possession inside the Antarctic Circle?



BOB SCHMIEDER

Sandia/California's Bob Schmieder can think of several good reasons. When not occupied with his job as a physicist in Computational Materials Science Dept. 8341, Bob pursues three other interests — under-

water explorations, natural history, and ham radio operations. In January, he combined the latter two interests on an expedition to Peter the I Island, off the coast of West Antarctica, in the company of eight fellow radio amateurs.

DXing

The privately funded expedition grew out of a subset of ham radio operators given to a pastime called "DXing." DXers come in two types: those who like to contact remote locations, and those who like to go to remote locations and be contacted. Bob falls into the second category.

"For several years now, Peter the I has been listed as the most desired location to contact. After all, it's about as remote as you can get," Bob says. "I joined the team of eight other radio amateurs who launched the expedition to the island. It required two years of preparation, 10 tons of gear, and cost approximately a quarter million dollars to field. After setting up operations, we made 60,000 contacts — a world record for remote contacts."

However, Bob had another motive for joining the expedition. Very little natural history data exist for Peter the I. The island's remoteness also played into his desire to collect samples — invertebrates, plants, snow, sea water — and meteorological data for analysis. The samples could then be turned over to various government and research organizations.

"Here in California, collecting a few samples sounds easy," Bob says. "Pick a plant or two, scoop up a little water, grab a rock. On Peter the I, it was a different proposition altogether. Snow was about the only thing that was really handy."

Sample collecting the hard way

The first snag occurred in London, where overweight baggage forced Bob to leave much of the instrumentation required for his research. From London, the team flew to the Falkland Islands and boarded a Russian ice breaker headed for Peter the I. However, icebergs and 200-foot cliffs prevented the ship from getting close enough to put the team ashore, so a helicopter obliged for the last leg of the trip.

When he first saw the island, Bob realized

what a difficult task he had set for himself. The 10-mile-long, 5-mile-wide island is covered by a glacier strewn with crevasse fields, making it dangerous to walk in certain areas. Thick ice covered the rocks, with only a few small patches of bare rock showing where plant, invertebrate, and rock samples might be collected. As for water, the 200-foot cliff separated the radio amateurs from the sea, negating any possibility of marine samples.

When he wasn't busy contacting other radio amateurs, Bob worked his way toward a small stretch of bare rock several hundred yards from the camp. From this spot, he collected conglomerate and basalt rock samples, and several lichens. No invertebrates were found. To solve the water sampling problem, Bob asked a crew member from the Russian ship to collect samples. For meteorological data, he relied on the ship's records.

"I finally got most of the samples I wanted. The only one easy to obtain was snow," Bob says wryly.

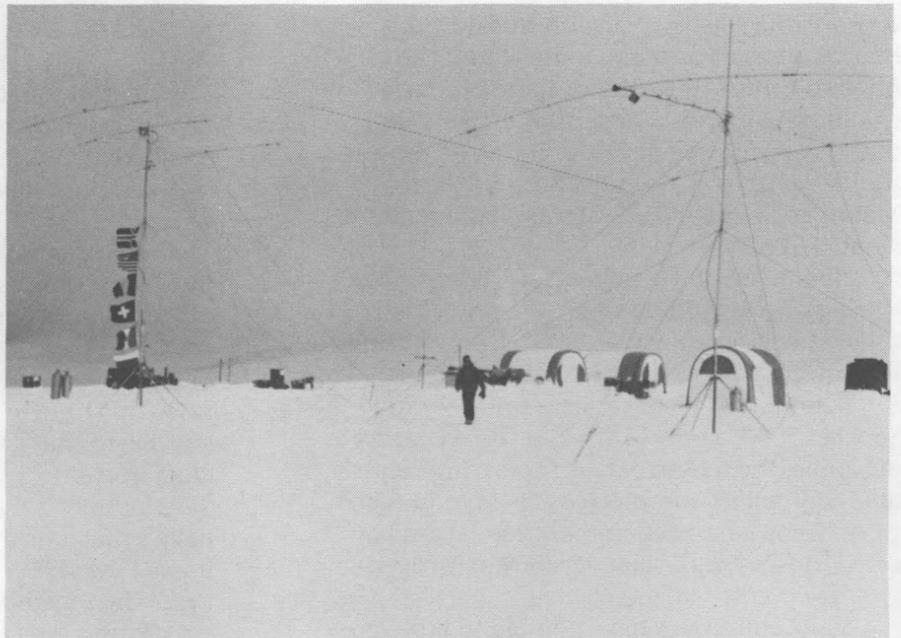
Gondwanaland and other musings

The team left Peter the I at the end of February, after a six-week stay. Upon his arrival in California, Bob turned over the rocks to the US Geologic Survey, where they will be dated and subjected to petrographic analyses to determine composition.

"Researchers can then compare the rocks to those found in other areas," says Bob. "It may help in determining how the continents formed, and how continental drift might have occurred. Peter the I may be the small remnant of Gondwanaland — that's what the land mass was called before it broke up into continents."

The lichens have been turned over to the UC Berkeley Herbarium for similar research and analysis. The meteorological, water, and snow samples have been analyzed and the data are being studied. According to Bob, one point of interest in the meteorological data concerns a temperature spike — a veritable heat wave — of approximately 15 degrees that lasted a couple of hours.

"It would be interesting to analyze that peak, and see what's going on," he muses.



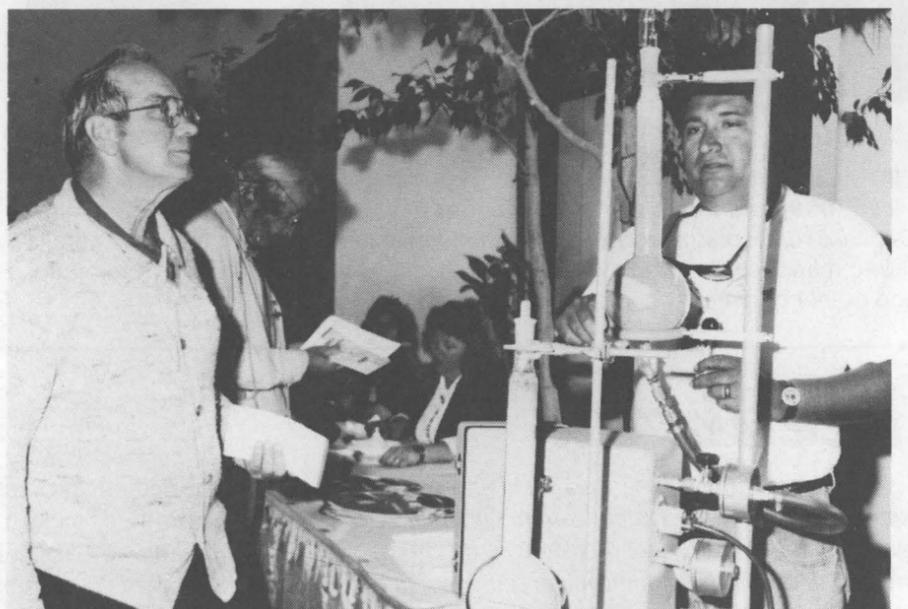
THAT'S REMOTE — The expedition's camp on the ice-covered surface of Peter the I Island, off the coast of Antarctica. Bob Schmieder and his eight colleagues made more than 60,000 ham radio contacts, a record for so remote a location.

Sandia California News

Oceanic research is not a new endeavor for Bob. For the past 20 years, he has fielded his own nonprofit research group, Cordell Expeditions. The group's goal is to explore and describe isolated, hard-to-reach places. Bob has written several books regarding these efforts and has achieved a major environmental victory as well. The group played a key role in establishing the Cordell Bank National Marine Sanctuary off the coast of Northern California.

"Most environmental sanctuaries are protected by regulations, which can be changed at someone's whim," says Bob. "We made sure that the Cordell Bank was protected by an Act of Congress. It would be difficult to reverse its status as a marine sanctuary."

Bob has already completed a book about his recent trip to Peter the I Island, and is continuing exploration through Cordell Expeditions. As for his next trip — who knows? But it's probably a safe bet that it will be somewhere that few people would think of going.



Some 300 Sandians turned out for the California site Earth Day '94 activities on the Combustion Research patio April 21. There were exhibits from local companies and nonprofit groups as well as displays set up by Sandians. John Chavarria (8644) is demonstrating a tritium air sampler, which collects samples by sucking air through the flask. The moisture remains to be analyzed. Carl Wackerly (8417), at left, checks it out.

Property audit

(Continued from Page 1)

responsible for the equipment said they had purchased new equipment and didn't have room for both the old and the new. In the majority of the cases, the employees had not requested that the items be picked up for reapplication, says Bob Eldredge, Manager of Property Systems Management Dept. 7616.

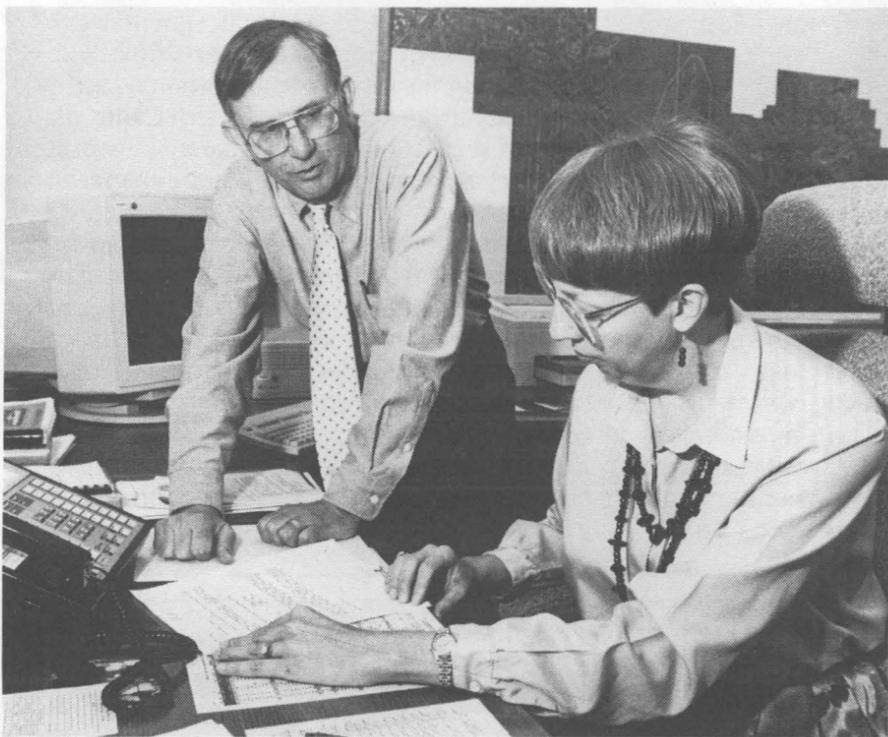
"Out of all of the findings, we felt this was the most serious," Bob says. "We think it's totally unacceptable to leave anything outside unprotected, for a day or even for an hour."

Lynn Jones, Vice President for Laboratory Services 7000, agrees. Although space is scarce at Sandia, there is no excuse for leaving valuable equipment unprotected, she says. In many cases, second-hand equipment can be used by other Sandia employees or government agencies, she points out.

Some employees have pointed to problems with delays in pickup by the property reapplication people, and that issue is being addressed (see Feedback item below).

41 findings most serious

The audit, called the Contractor Personal Property Systems Review (CPPSR), is usually held every two years. Conducted this year April 4-29, the CPPSR took a "snapshot" of property management practices during that time, such as how the Labs acquires equipment, recycles it, and how property is loaned, maintained, repaired, and stored. Personal property is defined as everything that Sandians use to do



TROUBLING FINDINGS — Lynn Jones (right), Vice President for Laboratory Services 7000, and Bob Eldredge, Manager of Property Systems Management Dept. 7616, discuss a recent DOE property management audit that gave Sandia failing marks for the way Labs employees handle and store computers, furniture, and other equipment.

Feedback

Q: Several times I have had to ship unwanted equipment to Property Reapplication. On approximately 50 percent of those occasions, it has taken more than a month for someone to come and pick up the unwanted equipment or take it to salvage.

I do understand that at times Property Reapplication gets backed up, but at this very moment there is material in my building that I called about having picked up more than two months ago. I still would like to have this stuff picked up.

A: I am pleased to tell you that we have

streamlined our processes and reduced our excess property pickup cycle time.

In early January, a Property Reapplication Project Team was established to address issues regarding Property Reapplication and Property Management. This team will continue looking at all areas of Reapplication for new, innovative, and creative ways to streamline processes, cut costs, and decrease the amount of cycle time for pickups.

Dody Hoffman (7600)

We must fix this problem, says Al Narath

The unsatisfactory rating Sandia received on a recent property audit shouldn't be taken lightly, according to President Al Narath. While employees may be inclined to blame it on "the system," it comes down to each individual's stewardship responsibility regarding government property.

"I think what is essential is that we not just blame the process, but each and every one of us hold ourselves personally accountable and do what we can to improve some of the sloppy practices we've fallen into," he says. "It's time to pull up our socks and fix a problem that's very embarrassing to our laboratory."

Not only is it embarrassing, but it could have a much further-reaching adverse impact, he says. The audit results come at a time when members of Congress and others are taking a critical look at the role and usefulness of the national labs. "If nothing else, it could result in even more government

oversight than we are already subjected to, the result of which will be an even greater impediment to getting useful work done," he says.

"The issue is one of 'critical concern' to the Department," says Rich Marquez, Assistant Manager for Management and Administration at DOE's Albuquerque Operations Office (DOE/AL). "There is no question that the DOE has begun to take a much more thorough review of contractors' personal property management practices."

He says it is essential for Sandia and DOE/AL to work together to expediently fix the problems, adding that Sandia officials have already given assurances of their commitment. Representatives from DOE and Sandia plan to meet quarterly to discuss progress toward solutions.

"I'm also very confident once we're challenged we'll rise to the occasion and fix the problem," Al says. "We've got to do it very quickly."

system, which tracks the building and room locations of equipment, is not updated frequently enough with information on property transfers and moves, the audit found.

Auditors were concerned about the number of vehicles in Sandia's motor pool. They recommended an in-depth review to determine potential excess and to increase sharing of vehicles to ensure maximum use of underutilized vehicles.

At-home computers another concern

They were also concerned about the number of computers loaned to employees for at-home work use. The report recommends a revision of policies to ensure adequate justification and monitoring of property for employee home use.

A sampling of the repeat findings recommend that Sandia:

- Devise a system to verify that employees have checked data bases of excess property before purchasing new equipment. The current purchase requisition form merely requires that the approval authority check off a box stating that such sources have been checked.

- Maintain better control over deliveries made directly to line organizations to ensure that the proper paperwork has been generated. Purchases that do not follow established procurement procedures do not get a bar code label and cannot be accounted for or tracked as inventory.

- Conduct management walkthroughs of all storage areas including non-Kirtland Air Force Base locations. The purpose is to ensure that property in storage is not forgotten.

- Review and update its records for borrowed property. In some cases, equipment loaned to schools and other institutions remains there long after the term of the loan has expired.

"Our system is just not strict enough," Lynn says. "But we've got to be sure we don't go so overboard with fixes so that it becomes more expensive and more difficult to do our jobs."

Because of the audit, a team will be appointed to delve into the causes of the findings and determine what changes are needed.

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"Our system is just not strict enough."

Virtual reality

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changing the application code. Probably the most significant features of MUSE are its attention to human perception, its hardware independence, and its software modularity."

MUSE uses no commercial software, he says. Rather, it is "a whole new paradigm of human-computer interaction" that makes dealing with people more humanistic and less computerized.

Arlan agrees. "When I first saw MUSE in operation last June," he says, "I knew I had found the enabling technology to realize a vision I first wrote about in 1980 when I was with AT&T Bell Labs in Indianapolis — to create what would now be called a 'virtual reality design terminal,' a method whereby a single designer could call up and draw three-dimensional images, port in computer analyses, and then send out the final production data to a rapid manufacturing facility."

MUSE enables rapid manufacturing

After that initial demonstration, Arlan says, he began working out a way to use MUSE in rapid manufacturing applications.

Details were worked out among Ed Barsis, Director of Computational/Computer Sciences and Math Center 1400; Jim Searcy, Director of Manufacturing Technologies Center 2400; and Bill Alzheimer, Director of Advanced Manufacturing Center 2900, establishing the Virtual Manufacturing and Synthetic Environment Laboratory (VMSEL), which opened Jan. 17.

Arlan says the vice presidents of Research and Exploratory Technology Div. 1000 and Component Development and Engineering Support Div. 2000 — Bert Westwood and Heinz Schmitt, respectively — view VMSEL as a good example of cooperation between core competencies research and application of the Labs' advanced manufacturing thrust.

Arlan says more than 400 people representing more than 60 government agencies, universities, and companies have come to the VMSEL for demonstrations since then.

"On the road, Creve and I have demonstrated MUSE by videotape to NASA, NIST [National Institute of Standards and Technology], the White House Science Office, ARPA

"We have met with overwhelming approval and requests to use MUSE."

[Advanced Research Projects Agency], and several industries and consortia," he says. "We have met with overwhelming approval and requests to use MUSE in a vast range of applications."

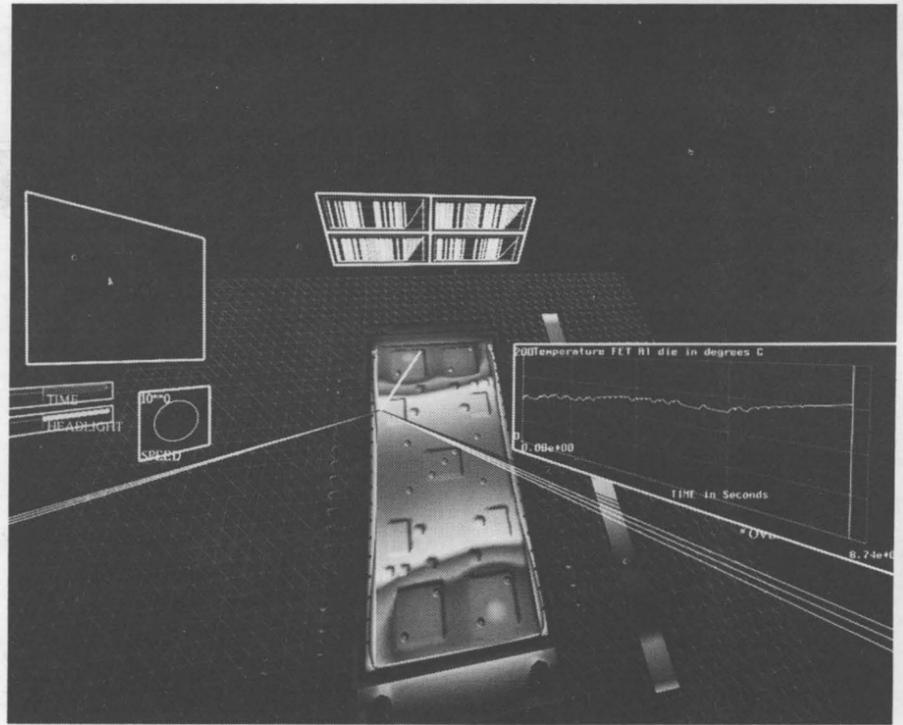
MUSE also is being deployed where it was created, at Sandia. It permits, for example, the dynamic exploration of a functioning multichip module package that fuses information from very different sources — three-dimensional computer-aided drafting data (Pro-engineer), finite element analysis (Cubit), thermal analysis (Jacq3D), and electrical simulation (Spice and Saber). This allows designers to probe circuit operation and alter substrate thermal properties in real time, and view the results on the virtual craft's data displays.

"That is the first time that has been done anywhere," says Arlan. "Recent statements in virtual reality publications have said that such 'data fusion' is a decade away. In MUSE, it has already been realized."

While neural networks and artificial intelligence have attracted much attention during the past couple of decades, in attempts to get the computer to mimic the function of humans, Creve says MUSE takes the opposite approach.

"Humans have certain incredible capabilities that we're not even remotely close to duplicating in the computer," he says. "What we're trying to do is create a symbiotic system that enables the computer to do that which it does well, and humans to do what they do well."

Its adaptability is its key feature, Creve says, ticking off various technologies already in use — a mechanical stereoscopic boom system, a head-mounted display, a flat-screen stereo or standard terminal, a projection television set, voice recognition, speech synthesis, audification of data, and force feedback. "All of these can co-exist in the same environment," he



CHECKING A CHIP — The short white line in the center of the picture shows the MUSE virtual craft probing a transistor component in a multichip module to determine its temperature and electrical conductivity. Thermal variations during operation are overlaid on the graph instrument at the right, and logic signals from circuit simulation are displayed in the center, just above the module. The darker shades at the ends of the module and the lighter shades in the center represent electrical current flowing through the module.

says. "MUSE is the only system I know of that would enable you to create a shared environment in which each mode was independent."

Features include a virtual steering wheel that the user can plug into anything to turn that object into the virtual craft that can be navigated by the user. Creve illustrates the principle with the story of a molecular biologist using a standard virtual reality environment to examine the docking characteristics of a molecule. She manipulates one molecule in an attempt to move it closer to another one.

See molecule from inside

But this is simply using computer technology to do what the biologist would have done several decades ago: holding two models and moving them together to see how they fit. The problem here, however, is that objects visually get in each other's way.

Using MUSE, however, says Creve, she could shrink herself to its size, then 'go' inside the molecule and stick the steering wheel into one of the molecules where she can use her entire visual capability to see the actual docking surfaces and how they fit.

"You can't do that on a flat screen, you can

(Continued on Page 6)

Armchair astronauts, baseball fans also might be aMUSED

*Fly me to the moon
and let me play among the stars,
let me see what life is like
on Jupiter and Mars. . .*

If Frank Sinatra had had access to Creve Maples' MUSE lab when he recorded those lyrics several years back, he could have done just that — flown to the moon and distant planets: Creve does it on a regular basis. Not really, of course, but virtually really.

It was on one of his 'trips' to observe Jupiter's moons that he 'learned' just how fast the giant planet rotates on its axis — once about every seven Earth hours. He knew that from dealing with the data, but experiencing it through MUSE made it a more profound realization.

In addition to the impact he expects MUSE to bring to engineering, manufactur-

ing, medicine, and other fields, Creve can conjure virtually limitless potential applications — like, for example, baseball.

He says executives of companies that make baseball pitching machines have wondered for years why they've never been used much by serious people. Recently one of those companies produced a new model, but they also went out and filmed a pitcher who is shown on a real projection screen.

Pitcher's wind-up cues batters

"The pitcher winds up, and when he pitches, a physical ball comes out of the screen at the point of his hand action," he says. "Now even professional baseball players are using the machine. Why? It's all back to perception: Until the filming, they didn't realize how many cues you subconsciously get

from watching the wind-up of the pitcher."

In another baseball application, a fairly well known pitcher was having some problems with his hand and was concerned that he was damaging his hand permanently. In order to determine what was happening, he was fitted with a data glove — a virtual reality device — and then he pitched balls.

The glove instrumented everything that his fingers and hand did, and put the information into the computer for analysis.

"Now fuse the images," says Creve. "Take that information and program it into a pitching machine. There he is up there on the screen, and a whole baseball team can train against him without him even being there. That's not far away from being a reality, and yet that is a virtual environment using virtual reality tools in both cases."

Sandia was part of 'a good year,' says Norm Augustine

Martin Marietta CEO visits Sandia

By Ken Frazier

Lab News Managing Editor

"We had a good year last year." Thus did Norm Augustine, Chairman and Chief Executive Officer of Martin Marietta Corporation, succinctly sum up the company's status in his first in-person annual report to Sandia management since Martin Marietta became Sandia's management and operating contractor for DOE last Oct. 1.

Augustine's Chairman's Presentation, an informal two-hour visit with about 100 Sandia management attendees May 3 in the Building 962 auditorium, was part of his Regional Chairman's Tour of company sites conducted each year just after the annual shareholder's meeting. He said Sandia was the fifth stop on the 17-site tour.

Before starting his presentation, Augustine surprised Sandia President Al Narath by presenting Al with his 35-year service award. He praised Al as a national leader well known and respected in Washington and "perhaps the pre-eminent spokesman on behalf of all the [DOE national] labs."

A year of growth

Augustine said despite the federal reductions in overall defense spending this past year, Martin Marietta grew to its largest sales volume (in constant dollars) ever, increased its book

value per share, increased employment to a record 95,000, and ended the year with a "very strong" balance sheet.

"We had mission success — with one exception," he pointed out, the exception being a series of failures by the Space Group, including several highly publicized launch failures and the loss of the Mars Observer spacecraft. He said steps have since been taken to tighten up systems engineering procedures. "We're well on the path to recovery. Almost every week we now have a major space event." As if to prove his point, less than an hour later at Cape Canaveral a Martin Marietta Titan IV launched a classified defense satellite into orbit.

Just the day before, on May 2, he said, Martin Marietta completed the transaction buying General Dynamics Corporation's space systems



CHAT WITH THE CHAIRMAN — Bill Dawes, Jr. (Education Outreach Dept. 3020, left), Ed Graham, Jr. (Facilities Operations and Maintenance Center 7800), and Len Hiles (Electronic & Mechanical Engineering Center 8400) talk with Martin Marietta CEO Norm Augustine (right) before his talk to Sandia management last week.

division. Last month a Martin Marietta bid to purchase Grumman fell through when Northrop offered more for the company than he said Martin Marietta had decided in advance it was willing to pay.

Augustine catalogued three important events for Martin Marietta last year: completing the consolidation of its acquisition of General Electric's space electronics group (the two entities are now "totally integrated"), reducing manufacturing overcapacity by closing 4.5 million square feet of plants, and becoming operator of Sandia. "To your great credit, the transition has gone smoothly," he said.

Sandia's technology relevant

Augustine spent 45 minutes answering questions from the Sandia attendees. Some highlights:

On Sandia's role with industry: "Most Sandia technology is fairly relevant to leading industries today." But he said it's hard for companies to get R&D even from their own labs into their manufacturing plants, so it's doubly difficult for labs like Sandia to help other companies. The key, he said, is understanding customer needs. "You better understand your customers."

On concern over Sandia still being able to provide unbiased technical advice: "Your affiliation with Martin Marietta should never in any way taint your advice to your customers."

On Sandia's distinctiveness: "I think Sandia is more application oriented than the other [DOE] labs, stronger in engineering skills, and has a great tradition of accomplishment. I think Sandia is in the right technologies in terms of commercial applications. I'm particularly thinking of electronics where you have super capabilities, both here and in California. I think that's going to serve you very well."

His vision for Sandia five years from now: "Al can answer that question better than I, but I'll give you my view. . . I would think that part of the principal mission would be to serve as a national asset, creating technology for application by private-sector and commercial markets. I would think the kind of technology you would focus on would be high-risk, high-pay-off, long-term, high-entry-threshold-price technology — the kind that's not really done in the private sector but is awfully important to the private sector. In terms of employment level I would assume you'd be about the size you are today. I would not look for great growth nor great shrinkage."

Virtual reality

(Continued from Page 5)

only do it in a synthetic environment," he says.

The New Mexico Museum of Natural History has proposed using MUSE to enable visitors to experience the weather through geologic time, travel the Santa Fe Trail, and put dinosaur bones together.

"One could lay the bones down, scan them into the computer for shape, and create the reconstruction in virtual space," Creve says. "This doesn't damage the bones. If one puts a bone up there it hangs there, and if one wants to move it and change it, that can be done."

He has also had several conversations with the chairman of the University of New Mexico Physics Department about using the system to create a virtual physics lab where students could conduct experiments at their own pace. He believes that, and similar uses in other disciplines, might help stem the science and engineering dropout rate.

"Technology such as this can radically affect the future of education and the way we learn," he says. "It can enhance our basic human capabilities by allowing us to learn by experiencing — rather than thinking about — information. It can put the magic back into the educational process."

Creve also sees, or imagines, medical applications in MUSE's future: training stroke victims to use the other arm when one is rendered useless, recognizing precursor symptoms of heart attacks or periods of depression and seeking preventive measures, or even learning to trigger the body's natural systems

"Because of its inherent flexibility and adaptability . . . there is nothing else like MUSE on Earth."

to counteract impending problems.

"In a virtual physical therapy environment," he says, "the computer tosses you a ball, but the speed of that ball can be exquisitely slow and go outside the laws of physics so that as you move your hand to catch it, you really can feel, you can force the muscles into the right position. The better you become, the more the computer speeds it up, with the idea of keeping just a touch ahead of you, not frustratingly ahead of you."

IEWS could be used to create manufacturing stations combining, for example, marketing, electrical engineering, and mechanical engineering in a shared environment to design an article to be manufactured. Even though they could be physically distant from each other and use different equipment, MUSE could link them, putting them in a virtual common room to do their work.

Designs on disk

When their work was finished, it would have been recorded on a compact disk, which could be used in the actual manufacturing of all parts of the article. The disk would also contain all the discussion of the designers, giving future follow-up designers the rationale for the original design, in addition to statistical data.

Creve says a number of organizations already are interested in acquiring MUSE through licensing, including General Motors; the Litton Corporation; NASA, for use in both education and astronaut training; and Proctor and Gamble, for use in the widely different fields of modeling drugs and interpreting economic information.

"Because of its inherent flexibility and adaptability, its ability to allow users to interact with information in ways that can be described only as paradigm-shifting, there is nothing else like MUSE on Earth," says Arlan. "For the moment, Sandia possesses a technology advantage that can be leveraged for the benefit of our Lab, our state, our industry, and our nation."

Recent Retirees



Roy Fitzgerald
5838 34



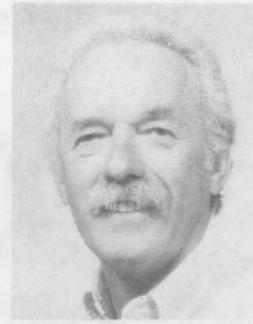
Serafico Carrillo
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Ernest Niper
5833 38



Vic Schulze
5921 31



Carl Schuster
5806 37



Billy Stanton
5111 32



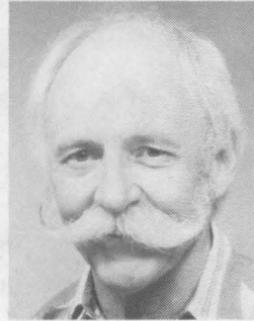
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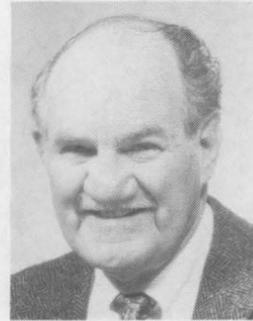
Norm Widenhoefer
9215 37



Tom Cleveland
2482 33



Ron Hill
2756 30



Leland Pierce
5102 38



Bob Barton
7612 24



Ken Jones
2883 35



Richard Vigil
5849 35



Nick Magnani
5405 25



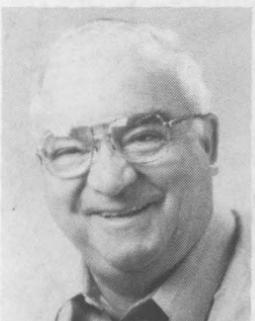
Milo Navratil
9305 37



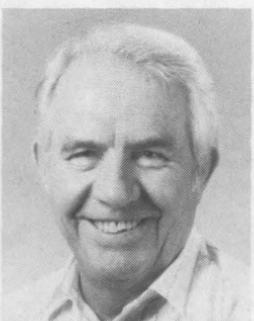
Richard Chavez
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Gerald Fowler
1114 18



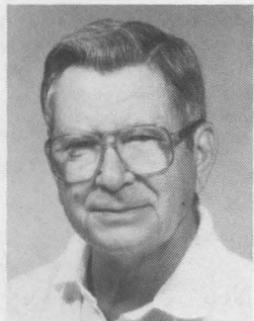
Ron Snidow
2476 35



Reuben Weinmaster
2652 35



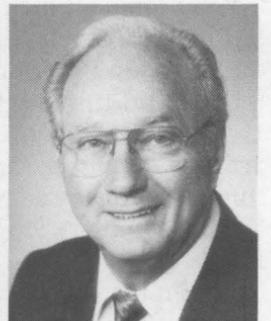
Otis Cox
10600 30



Bill Zagar
2883 35



Don Adolphson
8281 36



Ferd Thome
8631 35

Property audit

(Continued from Page 4)

Executive Vice President Jim Tegnalia will appoint a project manager from outside Org. 7600 to lead the review. The goal is to get the property management system reapproved by DOE by the end of 1994.

After the causes have been identified, the team will develop a complete, corrective action plan. Staff members from DOE/AL will work closely with the team during the development and implementation of the plan to ensure that the concerns identified are fully addressed. Dody Hoffman, Director of Logistics Management Center 7600, affirms her commitment to improve property management processes to maintain compliance.

Inventory tracking commendable, however

Although the audit, in general, was critical of Sandia's property management system, it did commend Sandia in several areas, including its inventory-tracking capabilities. The auditors randomly selected 100 items from Sandia's inventory data base and, using information in the data base, were able to locate 99 of the items. This corresponds closely to inventory results dating back to 1983 in which Sandia has located 99.8 to 99.92 percent of the value of its property. In the 1992-93 wall-to-wall inventory, Sandia located 99.54 percent of the value of its property. The books won't be closed on that effort until the end of this year.

In the meantime, anyone at Sandia/New Mexico who sees equipment exposed to the weather should call Larry Chavez (7617) on 844-7785. DOE's property management auditors are expected to visit Sandia/California in several months.



LOCAL CITIZENS discuss hiring an independent facilitator to help create a citizens advisory board for Sandia and the Inhalation Toxicology Research Institute. When established, the board will advise DOE's Kirtland Area Office on the environmental restoration, waste management, and related issues at both facilities. Pictured at a recent meeting are (clockwise around table from far left) Wallace Ford, director of the New Mexico Conference of Churches; Linda Alexander, Rodey Law Firm Environmental Department; Barbara Rosnagle, natural resources chair of the League of Women Voters of New Mexico; Garland Harris, Citizens for Alternatives to Radioactive Dumping; Al Stotts, Media Relations Dept. 12630; and Steve Baca, Community Involvement and Issues Management Dept. 12650. The Conference of Churches is acting as administrator of funds for the citizen board process, and Ford is the project manager.



Reflections of Melanie Sifford, age 10, mirror her delight in learning about the work mom Catharine does in the thin-film deposition clean room.

Sandia Spotlight



Tim Mirabal, Analog ASICs and IC Simulation Modeling Dept. 2272, explains how integrated circuits are tested to daughters Alisha (center), 13 years old, and Amanda, 11.

More than 950 young women visit Labs on 'Daughters Day'

Photography by Randy Montoya

"Take Our Daughters to Work Day," sponsored April 28 at Sandia by the Women's Program Committee, was a big success, attracting 850 young women to Sandia/New Mexico and 102 to Sandia/California.

By the year 2000, two out of three new entrants into the labor force will be women, according to the group "Wider Opportunities for Women" in Washington, D.C., but many women continue to be enrolled in education and training programs that prepare them for low-wage jobs in traditionally female occupations.

"A goal of the Women's Program Committee is to encourage women to seek careers in science and engineering through outreach activities like this special day," says Linda Lovato, Women's Program Coordinator in Diversity Planning Program Dept. 3612.

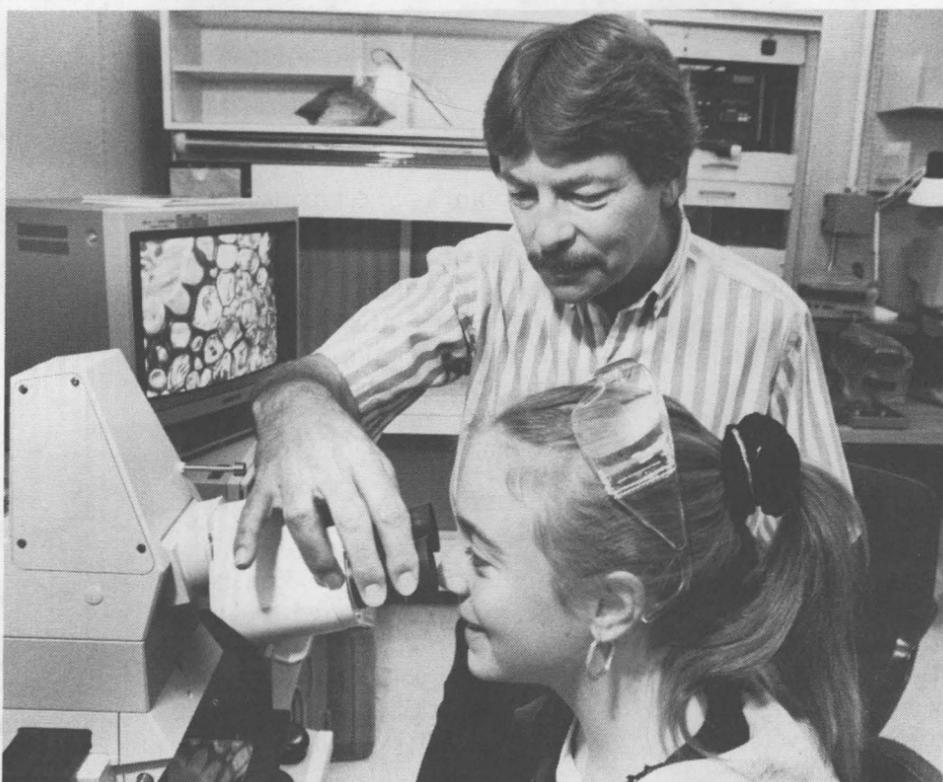
From the looks of these scenes recorded at Sandia/New Mexico, Sandia's young visitors are very interested in science and engineering.



Not so mysterious when explained by Margie Tatro, Photovoltaics Dept. 6219, photovoltaic concentrating lenses are fascinating to the girls who visited the Photovoltaics lab.



Michael Tebo, Component Information and Management Dept. 2252, shows daughter Kim, 8 years old, some of the equipment used to test integrated circuits.



Zooming in on a nickel-plated ceramic sample with a powerful microscope was proof enough for 12-year-old Meghan Strascina that dad Jak does some very interesting work in Tube Lab 2566-1. "I wanted her to see something of a technical nature, something she could get into," says Jak. "Take Our Daughters to Work Day provides an opportunity to emphasize the good things about science and technology."

O'Leary: Labs diversity progress beyond expectations

Secretary wants Sandia to 'take it on the road'

Energy Secretary Hazel O'Leary says she is excited about Sandia's diversity progress and wants the Labs to begin spreading the word to other parts of the DOE complex.

Several Sandians presented an overview of Sandia's diversity plan during an April 19 meeting at DOE Headquarters in Washington. O'Leary requested the meeting following a recent visit to Sandia by Corlis Moody, Director of DOE's Office of Economic Impact and Diversity.

During the meeting, O'Leary, Moody, and members of Moody's staff heard how Sandia incorporates various overlapping diversity issues into its new Strategic Plan for Diversity.

Berweida Learson (3612) described Sandia's goals for achieving work force diversity. Anthony Thornton (3020) demonstrated how education outreach activities become a "pipeline" to Sandia's work force by encouraging young minorities and women to pursue careers in science and engineering.

Mike DeWitte (12650) emphasized that building trust in the community is the key to spreading Labs' diversity efforts into the surrounding community. Donna Martin (10200) showed how subcontracting and technology transfer activities support small, minority-, and woman-owned businesses.

Also attending the meeting were Vic Reis, DOE Assistant Secretary for Defense Programs; Kathy Carlson, DOE Kirtland Area Office (KAO) Manager; Brenda Harmeson, Chief of KAO's administrative branch; Labs President Al Narath; Executive VP Jim Tegnelia; Charlie Emery, VP for Human Resources Div. 3000; Paul Shoemaker, Manager of Strategic Planning Program Office 4514; and Mike Robles, Director of Diversity Leadership Center 3600.

Following the presentations O'Leary expressed her personal commitment to diversity programs and said she was impressed with the broadness of Sandia's plan, its integrated approach to overlapping diversity issues, and Sandia's overall commitment to diversity.

She also suggested that Sandia act as a role model within the complex by taking its diversity plan "on the road," says Mike Robles. Already Sandia has received phone calls from two other DOE sites requesting more information about the Labs' diversity plan.

He says Diversity Leadership Center 3600 will be developing a plan during the next few months for carrying out O'Leary's request. "We're not quite sure what the Secretary meant

by 'take it on the road,' " he says, "but it indicates that she views our diversity plan as a model for the DOE complex."

— John German

First Thunderbird Awards go to 16 seniors who turned lives around

Sixteen graduating high school students from Albuquerque last week received the first-ever Martin Marietta/Sandia National Laboratories Thunderbird Award designed for at-risk students who have turned their lives around.

Each received a \$1,000 cash award at the May 5 award luncheon for the recipients and their families. The luncheon, at the Kirtland Air Force Base Officers Club, was followed by a tour of Sandia facilities.

"This award is for students who have refocused their energies from negative or nonproductive activities to those that enabled them to more fully achieve their potential," says Redd Torres Eakin of Community Relations Dept. 12640. "Martin Marietta established this program as one of the immediate ways in which our community could be enhanced by responsible corporate participation."

Students were nominated by their schools. To be selected, students had to demonstrate that they overcame major obstacles or adversity in achieving academic success and that they have enhanced the lives of others. They must also have improved their grade point average to at least 3.0 or the top 25 percent of their graduating class, and they must have a formalized plan of action following graduation.

"We hope these students will serve as role models for younger peers," says Redd, "so that their decisions will make a difference in the lives of others who follow them and ultimately make Albuquerque a better place in which to live."

Plans are in the early stages to begin a similar program in the schools near Sandia/California.

Recipients of the first Martin Marietta/Sandia Thunderbird Award, and their high schools: Alissa Hayden Moreno, Albuquerque; Erika Sevea Hanson, Cibola; Yvette Chavez, Del Norte;



REFLECTED GLORY — Christine Hans, one of the 16 winners of the first Thunderbird Award scholarships from Martin Marietta and Sandia, and her mother, Florence Baca, examine a stretched-membrane mirror at Sandia's National Solar Thermal Test Facility during a tour following the award ceremony. Christine is a graduating senior from West Mesa High School.

Khoi Tran, Eldorado; David Bartley, Evening; Ben Brackin, Freedom; Darian Rackham, Highland; Josh Viets, La Cueva; Tasha Marie VonAussdall, Manzano; Cecelia Wilson, New Futures; Jaime Santillanes, Recovery; Francine Sanchez, Rio Grande; Michelle Olney, Sandia; Natalie Hernandez, School on Wheels; Anita Martinez, Valley; Christine Hans, West Mesa.

Paul Robinson testimony says Labs' core R&D foundations in jeopardy

The scientific and engineering foundations of the DOE national security laboratories are in jeopardy, and caution must be used in considering any changes for them, Sandia VP for Laboratory Development Paul Robinson told a Senate Armed Services Committee subcommittee in Washington May 3.

In testimony before the Subcommittee on Nuclear Deterrence, Arms Control, and Defense Intelligence, Paul gave his views on the future of the three DOE weapons labs. The four elements of their national security mission focus — national defense, energy security, environmental integrity, and economic competitiveness — are "tightly interrelated and cannot be realized separately," Paul said.

He said Sandia's core competencies — the particular mix of premier technical capabilities needed to ensure mission success — have always been supported principally by DOE Defense Programs, but "unfortunately, that support base is diminishing at an alarming rate. In real terms, it is now lower than at any time since 1952." He said the support has declined by 15 percent in each of the last two fiscal years alone, and the trend is worsening.

"Our ability to sustain the technical foundations of the laboratory is jeopardized," said Paul. "This is a matter of acute concern to me. We must achieve stability of funding for our technology base or the Laboratories' ability to perform its DOE missions will be seriously impaired."

Paul said he believes the only affordable way to sustain essential core competencies is "through a strategy of dual-benefit management. This requires a directed mission in economic competitiveness."

Take Note

Full memberships in the American Nuclear Society for 1994 are being offered at \$35 during the month of May. This one-time offer represents a savings of up to 64 percent for new members. Special application forms are available from Sharif Heger at UNM on 277-2640 or Sonoya Ebara (7715) on 844-7864.

Retiring and not shown in LAB NEWS photos: Irving Hall (5845).

"I urge you to exercise caution as you evaluate proposals for changing or restructuring the DOE laboratories. . . The technical leadership of the DOE national security laboratories is the result of decades of stable support that permitted the cultivation of outstanding core competencies. These competencies, and the synergy they develop under good management, may be difficult to reconstruct under other circumstances or at another time."

La Mesa Community Center's second annual spaghetti dinner will be held Wednesday, May 18, at La Mesa Elementary School (7500 Copper NE), from 5:30 to 8 p.m. This dinner raises funds to support the children of the La Mesa neighborhood through sponsoring nonprofit organizations. Tickets are \$4.50 at the door and \$4 in advance. For more information, contact Merri Lewis (6216) on 268-5025 or Joann Carlberg on 255-2195.

Mileposts

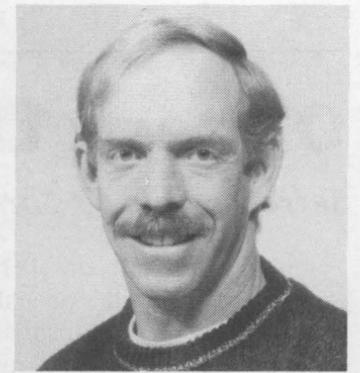
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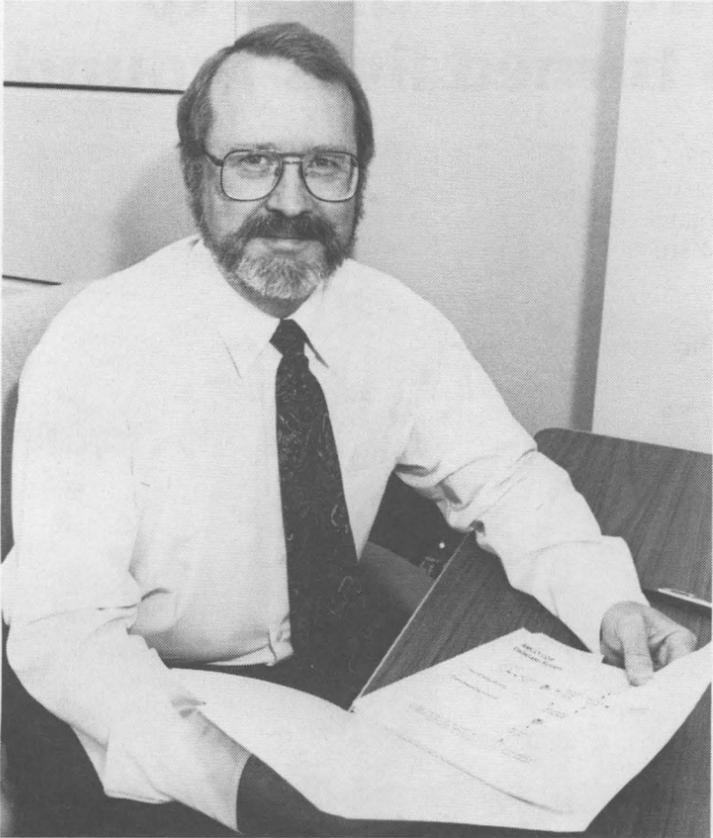
G. T. Holman
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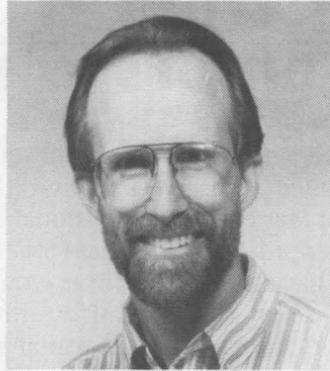
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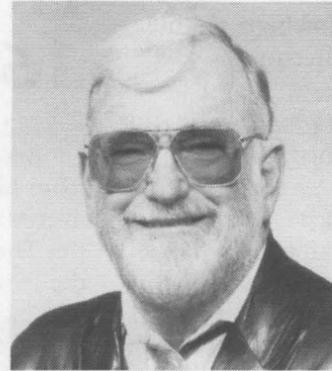
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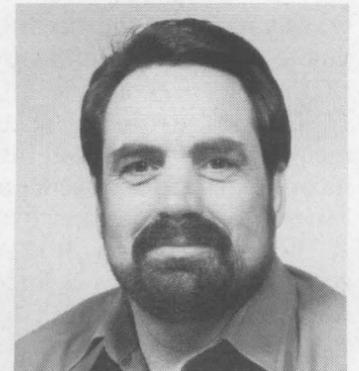
Don Schueler
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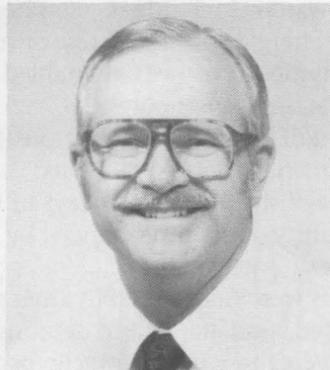
Ray Burchard
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Jack Walker
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Frank Lasky
2222 20



Joe Honest
7313 25



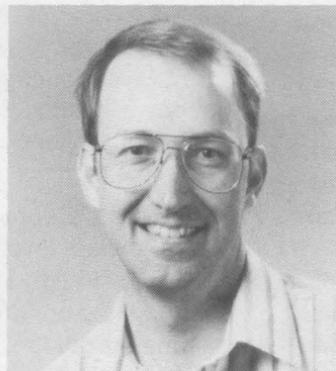
Judy Jewell
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Cook Story
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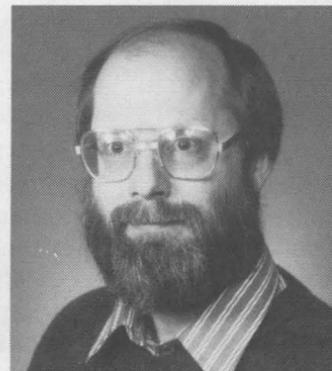
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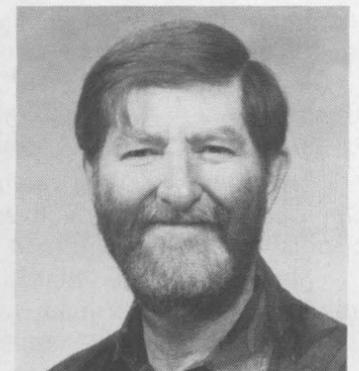
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Robert Miera
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Bill Even
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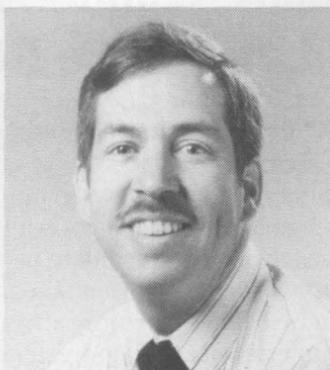
John Anthes
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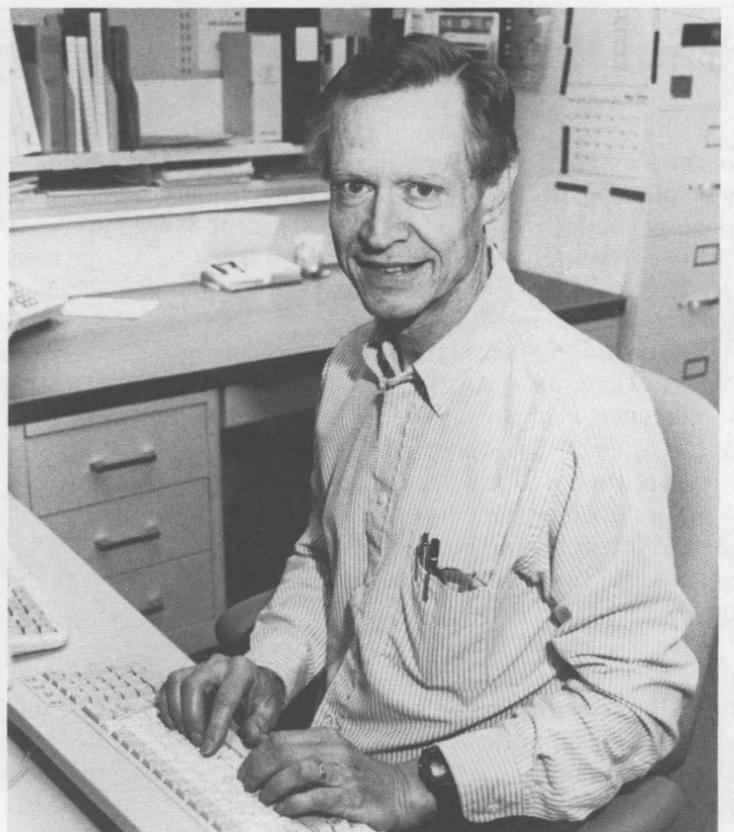
Greg Hawley
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Darwin Newcom
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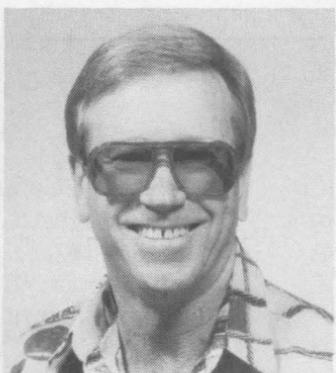
Ed Nava
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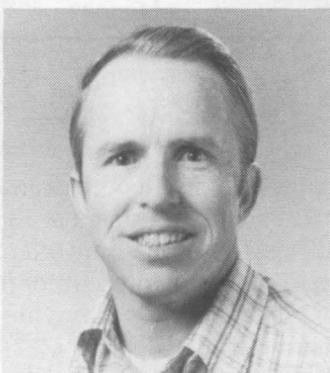
Fred James
2615 30



Eva Leong
8525 20



Jimmie Hendry
7811 15



Michael Hall
9122 20

Welcome

Albuquerque — Lori Heustess (5923), Jack James (10221), Jean Roland (7713)
Other New Mexico — Chris Miller (12630)
Louisiana — Jeffery Hampton (10322)

Congratulations

To Michele and Brian (5838) Naylor, a son, Jacob Brent, April 27.
To Cathy (6641) and Brian (6113) Ehgartner, a daughter, Brenna Anne, May 3.

Recent Patents

Douglas Adolf (1812), Mohsen Shahinpoor (1433), Daniel Segalman, and Walter Witkowski (both 1434): Electrically Controlled Polymeric Gel Actuators.

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

MISCELLANEOUS

DP GYM PAC WALL UNIT, Sears, complete, \$75 OBO; synthesizer, JEN SX-1000, 24 knobs, \$50 OBO. Padilla, 294-3127.

PLATES & COLLECTIBLES, bird, owl and waterbird sets, Fred Stone horse plates, must sell, make offer. Locher, 266-2021.

RETIRED DICKEN'S VILLAGE, buildings & accessories, including Crown-tree, C. Fletcher, Smithy, and others. Eaton, 293-0166.

CRIB, Simmons, hard rock maple, both sides go up & down, \$120. Eden, 821-3759.

WEDDING GOWN, size 6/8, chantilly lace collar and train, empire waist, full length mantilla veil, simple but elegant, \$100. Seyfer, 292-0179.

KIRBY VACUUM, w/attachments, about 10 years old, works fine, \$80. Krumm, 856-1221.

TENOR SAXOPHONE, Yamaha, excellent condition, \$700 OBO. Slutz, 299-3683.

XT COMPUTER, w/286 upgrade, two 5-1/4" drives, 10MB HD, high-resolution color monitor, modem, works great, \$225. Roseth, 856-6964.

HORSE, gentle, 4 yrs. old, bay thoroughbred gelding, 16 hands, not fast enough for track, may make good hunter/jumper, \$1,250. Ashbaugh, 1-384-2671.

GENERATOR, portable, Honda EX-1000, 1000-watt, hardly used, new price \$700; sell for \$450. Hole, 255-1444.

CATHOLIC SCHOOL UNIFORMS, boys; camper, Mitchell, 11-1/2-ft., immaculate. Quintana, 898-6718.

KEYBOARD, Technics SX-KN800 w/stand, cover, owner's manual, like new, \$600; Crown accordion, 7 stops right, 5 left, \$700. O'Rourke, 296-9462.

PICK UP SPRINGS, HD overload; trailer brake unit; hitch & mirror; car mask for BMW/528E; wrench set; programmable light timer switch. Kallenbach, 869-5237.

KIMBALL CONSOLE PIANO, \$800. Moonka, 828-2368.

END TABLES, two, round, walnut, cabinet-style, \$40; hand lawn mower w/grass catcher, \$35. Lewis, 291-8181.

FUTON FRAME, double-size, walnut, w/extra firm futon w/cover, \$600; walnut desk, \$35; two chairs, \$35-\$50. Price, 242-0263.

LAWN MOWER, three yrs. old, \$50; pocket 9.6 fax/2.4 modem for Mac Powerbook, used once, \$50. Boom, 898-9141.

WATERBEDS, two king-size, one oak w/six platform drawers, one dark pine, one w/waterbed mattress, other w/conventional California King mattress. Montoya, 299-9601.

SEGA GENESIS GAMES, Altered Beast, Sonic 1&2, Faery Tale, plus Action Replay/Genie, \$25 for all. Ennis, 836-0504.

WEDDING DRESS & VEIL, Alfred Angelo, size 14, excellent condition, paid \$650, asking \$450 OBO. Perea, 869-4648.

LEATHER MOTORCYCLE JACKETS, good condition, all size large, high quality. Hammond, 823-9619.

MULTI-FAMILY GARAGE SALE, May 13 & 14, 8 a.m.-2 p.m., 10323 Betts NE, southwest of Candelaria & Morris, furniture, bicycles, toys, humidifier. Cocain.

TWIN-SIZE BED, French provincial, brand new mattress, comforter set included, excellent condition, \$150. Worden, 299-4915.

WOOD STOVE, Orley's air-tight, w/double-pane glass, double-wall, insulated, stainless-steel stove pipe, \$400. Glowka, 281-1488.

CLEAN FILL DIRT, you load & haul, free. Sikora, 296-1762.

BICYCLE SEAT, child's, \$15; Gerry backpack for child, \$20. Scott, 294-8627.

WHIRLPOOL RANGE, w/double oven, avocado, \$100; Graco stroller-bed, \$30. Martin, 822-9940.

BASEBOARD HEATERS, three, electric, 220-volt, 750-watt, 1,000-watt, 1,500-watt. Roberts, 255-9527.

NAVAJO RUGS, two, Teec Nos Pos style, 4' x 5', \$1,500; 2' x 3', \$800. Both earthtone colors, black, gray, and white. Nez, 898-2028.

COLOR TV, 9-in., w/remote, cable, '89 Sylvania, \$125. Lorence, 275-3586.

GOLF CLUBS, man's irons, Tony Peña TP810, 3-PW, \$75; bow, PSE Jet Flight Express, many extras, excellent condition, \$250. Gunckel, 299-4867.

RADIAL ARM SAW, Sears, 10-in., mounted on movable stand, w/extra blades, excellent condition, \$285 OBO. Liguori, 256-3613.

'89 ALUMALITE XL FIFTH WHEEL, 29-ft. one owner, non-smoker, AC, microwave, AM/FM cassette, awning, power lifts, \$12,000. Danlovic, 897-7964.

GARAGE SALE, May 14 & 15, 10 a.m.-4 p.m., 9729 Regal Ridge NE, oven, portable dishwasher, refrigerator, dishes, household miscellaneous. Olson, 823-9119.

FOLD-AWAY BED RAIL, Fisher Price, \$10; Gerry diaper pail, foot-operated, \$8. Both excellent condition. Meeks, 828-9825.

STOVE/OVEN/MICROWAVE UNIT, almond, like new, \$399; cast-iron double sink, almond, \$75; lawn furniture, \$50. Banks, 291-1794.

WATERBED, king-size, padded sides, 6-drawer underdresser, \$75. Baldwin, 897-8289.

SANTA FE OPERA TICKETS, "Abduction from the Seraglio," Saturday, July 16, 9 p.m., section 3, row N, seats 22, 24, 26, and 28, \$40/ea. Guillén, 271-2644.

LOVESEAT, dark blue, new condition, \$135; coffee table, \$35; miscellaneous children's clothes and equipment. Jackson, 275-7488.

YARD SALE, picture frames, books, adult clothes, dishes, outdoor motors, miscellaneous. Luikens, 881-1382.

PEAVEY MONITOR, Peavey microphone, TV stand, parts for 10-sp. bike. Garcia, 343-8207.

MULTIGYM DP300, \$25; walnut side chair w/arms, \$20; ski rack, gutter mount, \$40. Murata, 881-8459.

WATERBED, super single, dark pine, bookcase headboard, six-drawer under, sheets, heater, \$100. Kaufmann, 299-2031.

CAB-OVER CAMPER, '70 Mobile Traveler, 9-1/2-ft., private toilet, ice-box, used five times, needs little touch-up, good buy, \$1,395. Grenfiel, 344-9355.

CLOSET DOORS, bi-fold, 12-in. wide, \$5/pair; semi-automatic pellet rifle, Crosman 1977, new in box, \$50. Curzi, 296-5386.

LIVING ROOM FURNITURE: queen-size sofa sleeper, over-size chair w/foot stool, earthtone w/oak accents, \$300. Langwell 293-2728.

GIFT CERTIFICATE, toward purchase of U.S. West cellular phone, \$200 value, price negotiable. Cook, 888-2928.

TIRES & WHEELS, for Nissan Pathfinder or pickup, four Bridgestone 235 R15, mounted and balanced on factory chrome rims, 50% tread, \$49/ea. Thompson, 293-8390.

WEDDING DRESS, size 12, \$175; Kenmore electric stove, white, \$165; Pfalzgraff folk art stoneware set, \$95. Cates, 275-0143.

Deadline: Friday noon before week of publication unless changed by holiday. Mail to Dept. 12660, MS 0413, or fax to 844-0645.

Ad Rules

1. Limit 20 words, including last name and home phone (the Lab News will edit longer ads).
2. Include organization and full name with each ad submission.
3. Submit each ad in writing. No phone-ins.
4. Use 8 1/2" by 11-inch paper.
5. Use separate sheet for each ad category.
6. Type or print ads legibly; use only accepted abbreviations.
7. One ad per category per issue.
8. No more than two insertions of same "for sale" or "wanted" item.
9. No "for rent" ads except for employees on temporary assignment.
10. No commercial ads.
11. For active and retired Sandians and DOE employees.
12. Housing listed for sale is available for occupancy without regard to race, creed, color, or national origin.
13. "Work wanted" ads limited to student-aged children of employees.

AIREDALE PUPPIES, AKC-registered, one solid black, two black/tans, female, 8 wks. old, \$300/ea. Sorenson, 892-6823.

TABLE, glass top, white rattan, four upholstered swivel chairs, very nice, \$575. Biffle, 293-7043.

DOG, collie/golden retriever mix, male, two yrs. old, current shots, neutered, free to a good home. Miller, 823-1070.

COMPUTER, Amiga 2000, 40MB HD, IBM-XT card w/20 MB HD, lots of software, compilers, games, phaser, \$400. Sjaardema, 299-8042.

MOVING BOXES, free. Purcell, 281-1761.

GRACO BABY STROLLER, for two, light blue, excellent condition, \$60. Vortolomei, 898-4316.

DOUBLE BABY JOGGER, from Racing Stoller, red w/sunroof, 20 x 1.76 wheels, \$240; Century tandem stroller, \$80 OBO. Chow, 281-9235.

ANTIQUE TABLE, mahogany, one-drawer, drop-leaf, 48" x 40" open, pedestal base, appraised at \$400, sell for \$200. Shinn, 291-8825.

'80 ROYALS INTERNATIONAL FIFTH WHEEL, 40-ft., washer/dryer, AC, queen-size bed, live in or travel, \$13,500 OBO. Skogmo, 898-9140.

CEMENT MIXER, \$85; Reese class III receiver hitch, \$60; chest freezer, older, works well, \$75 OBO. Rodacy, 293-2668.

ROWING MACHINE, Tunturi, like new, \$35. Stanley, 255-3083.

DINING ROOM TABLE, w/four chairs, teak wood, 35" x 53", extends to 92", excellent condition, \$350 OBO. Rosinski, 823-1805.

AIR CONDITIONER, refrigerated, window mount, 5,000 Btu, \$95; Wynnor ski machine exerciser, \$135. Baca, 293-8449.

COUCH KIT, for full-size pickup, bought for \$350, good as new, \$100. Draelos, 296-3078.

MULTI-FAMILY GARAGE SALE, Sat., May 14, 8 a.m.-3 p.m., 4816 Galleta Rd. NW, furniture, clothes, baby items, more. Diltz, 899-0372.

GARAGE SALE, May 20-21, 8 a.m.-5 p.m., 6613 Barber Pl. NE, French provincial bedroom set, many household items. Hogan, 889-9414.

AIR KENNEL, medium-size dog crate, used once, \$55. Conway, 271-0770.

TRANSPORTATION

'89 CHEV. S-10 BLAZER, AT, V6, PS, PB, AC, AM/FM cassette, bed liner. Aboytes, 823-2791.

RECUMBENT BICYCLE, Ryan Vanguard, long wheel base, under-the-seat steering, 2,200 miles, \$699 OBO. Koch, 856-1362.

BICYCLE, Lotus, 22-in. mixed frame, 12-sp., \$55. Scott, 294-8627.

ROAD BIKE, Cannondale SR400, 3.0 Criterium aluminum frame, 62cm, Shimano RX100 components, profile bar, Avocet computer, \$350. Mann, 343-0524.

'91 ACURA, 4-dr., 38K miles, manual transmission, CD player, 75K miles extended warranty, \$19,900. Moonka, 828-2368.

WOMAN'S BIKE, 26-in., 10-sp., \$45. Lewis, 291-8181.

'89 NISSAN SENTRA XE, low mileage, white, 2-dr., \$4,400. Lin, 294-5908.

MAN'S ROAD/RACING BIKE, 10-sp., excellent condition, \$100; woman's road bike, 10-sp., excellent condition, \$100. Herrmann, 299-4577.

'83 BMW 320i, second owner, beautiful car, aluminum wheels, 5-sp., sunroof, 160K miles, needs paint, excellent mechanical condition, \$3,300. Berry, 294-0597.

'78 GMC MOTORHOME, class C, fully contained w/AC, outside awning, generator, 105K miles, great condition, \$8,500. Vernon, 293-8197.

'85 OLDS CUTLASS SUPREME V8, 2-dr., damage on driver's side, \$700 OBO. Ward, 266-6658.

'65 DUNEBUGGY, high-performance, lots of features, very fast, hate to sell, \$2,800. Rodriguez, 884-1691.

REPO: '87 Chev. S-10 Blazer, AT, 122,518 miles, bids through May 24. Right reserved to refuse all bids; subject to prior sale. Vehicle sold as is. SLFCU, 293-0500 ext. 344.

'91 HONDA ST 1100, sport touring motorcycle, silver, many extras, factory warranty, 13K miles, excellent condition, \$7,150. Curtis, 281-8364.

'89 HONDA ACCORD LX, 4-dr., 5-sp., 51K miles, gray/gray, \$8,500. Scharrer, 883-8670.

'93 SATURN SPORT CAR-2, 2-dr., AT, AC, AM/FM cassette, 5K miles, must sell. Morales, 296-0928.

'92 TOYOTA CAMRY LE, V6, AT, AC, PW, PL, airbag, security system, sunroof, upgraded stereo/cassette, \$16,700. Saxton, 867-1171.

'84 JEEP CJ7, Laredo, hardtop, 54K miles, new tires, suspension, and brakes, excellent condition, \$6,700. Lanes, 856-7738.

'80 OLDS. CUTLASS, needs front transmission seal, and some body work, runs great, \$600 OBO. Jackson, 275-7488.

GIRL'S BICYCLE, 10-sp., yellow, Ross, older but in very good condition, no room in garage, free. Filuk, 281-0078.

HONDA TRAIL 90'S, one '77 model, 685 miles, \$500; one '70 model, 4K miles, \$375. Luikens, 881-1382.

BOAT, 12-ft. glass twin-hull, 9.9-hp electric start, 22 hrs, lights, depth, strong wheel, new trolling motor, garaged, loaded, \$2,495. Meidal, 255-6690.

'76 CHEV NOVA, 8-cyl., AT, w/power steering, reliable, \$600. Ortiz, 831-0551.

'79 MG MIDGET, to good home, 80K miles, was kept in professional storage area for five years, \$3,000. Venegas, 299-4324.

SAILBOAT, Styrofoam-board-type, fun for Cochiti, \$30. Curzi, 296-5386.

'77 CHEV. SUBURBAN SILVERADO, 4WD, 3/4 ton, 400 V8, PS, PB, AC, cruise, 73K miles, clean, excellent, \$3,700. Stronach, 294-1013.

'91 DODGE DAKOTA PICKUP, 4-cyl., 5-sp., \$7,000 OBO. Gibson, 344-8056.

'90 ACURA INTEGRA GS, 2-dr., 5-sp., loaded, 30K miles, \$11,995; '91 VW Fox GL, 4-dr., AC, 5-sp., 42K miles, \$6,900. Washburn, 275-3751.

'75 MG MIDGET, good condition, \$1,300 or trade for car with back seats. Chow, 281-9235.

'87 OLDS. CUSTOM CRUISER, 9-passenger, PS, PB, PW, power doors, 59K miles, great condition, \$5,900 OBO. Bragg, 275-3172.

BOAT, 12-ft. fiberglass, Johnson 6-hp motor, 2-wheel trailer. Hitchcock, 883-4970.

'63 WILLIS JEEP WAGONEER, reconditioned, 265 engine, all matching numbers, 4WD, \$2,000. Wendt, 345-6910.

'72 DODGE CHARGER, partially restored, many new items, AC, PS, PB, looks and runs fantastic, excellent condition. Baney, 294-8970.

'88 FORD THUNDERBIRD LX, AT, AC, PW, PL, 2-dr., black, red plush interior, 107K miles, \$3,750. Pickens, 856-7764.

BOAT, 22-ft. Balboa, shoal draft keel, furling jib, extra sail, Porta-potti, alcohol stove, trailer w/surge brakes, 8-hp outboard, excellent condition. Rodacy, 293-2668.

REAL ESTATE

4-BDR. HOME, 2-1/2 baths, beautiful landscaping, courtyard, approx. 2,150 sq. ft., walking distance to elementary school and park, under \$150,000. Rogers, 828-9241.

3-BDR. DOUBLE WIDE, 2 baths, on permanent foundation, 4.3 acres, one mile outside city limits of Portales, \$35,000. Martin, 894-0785.

4-BDR. HOME, 2,569 sq. ft. custom passive solar, east of Tramway, 5 miles to Area 1, \$192,500. George, 299-2281.

WANTED

MOTOR, from weed trimmer or chainsaw, gas-powered, any condition, prefer working, 21cc-32cc. Duncan, 271-2718.

WOODWORKING, individuals interested in taking or teaching a SERP course. Let's get a group together. Call SERP or Krumm, 856-1221.

TEMPORARY HOUSING, for responsible, quiet, male faculty member, during June-July work at Sandia. Krumm, 856-1221.

VEHICLES, small pickup or car, must be cheap; conversion of window van, to pull trailer. Roeschke, 266-8988.

PUSH LAWN MOWER. Washburn, 275-3751.

RELIABLE BABY-SITTER, for 11-year-old girl, June and July, approximately 32 hours a week. Jensen, 823-9203.

STONEWARE DINNER PLATES, Agate pass "Fabrique" pattern, reasonable. VanDeusen, 299-4328.

PC SYSTEM, 386 DX or better, must be complete and run well. Hueller, 296-0976.

SWIMMING POOL SLIDE. Ortiz, 898-9730.

LOST & FOUND

FOUND: Watch, left in an office area in Bldg. 892. Gentry, 5-8905.

Pool opens, for the weekend at least

Coronado Club activities

COME ENJOY the Sunday brunch buffet, May 15, 10 a.m.-2 p.m., at the Coronado Club, and then stay for the Tea Dance, with music by Joe Sais & Showcase.

HERE'S WHAT you've been waiting for! The Coronado Club swimming pool opens for the first time, Saturday and Sunday, May 21-22, 11 a.m.-5 p.m. Come be among the first to try it out, and start in on that spring tan. This is just for the weekend, though. The regular season opening is Saturday, May 28.

ANOTHER CHANCE for Sunday brunch

comes May 22, 10 a.m.-2 p.m. There'll be all kinds of breakfast items, and also crepes with strawberries and cream cheese, Baron of beef, ham, chicken drumettes, poached cod, and assorted salads, trimmings, and desserts. The cost is \$6.95 for adult members, \$7.95 for adult guests, children 4-12 only \$1. This time the Tea Dance music will be supplied by Bob Weiler, 1-4 p.m.

WE'RE CLOSED to the general public, Thursday, May 26, for the Sandia retirees' annual picnic. The April 29 *Lab News* gave the details.

Sandia News Briefs

Earth Day Festival awards announced

The Earth Day Festival April 22 at Hardin Field drew approximately 3,000 people. Elena Forbus won a hot-air balloon ride donated by Ray Bair, Center 2200 Director. "Treasures from Trash" contest entries provided creative ideas for new uses of discarded materials. "Treasures" included a woman's ring braided from telephone wire with wire rosettes made by Paula McCallister (7901), first place; a lion dance costume made with scrap materials by Chui Fan Cheng (7575), second place; and a set of white decorative storage boxes made by Dorothy Meister (1128), third place. Winners received a box of homemade truffles donated by Bess Campbell-Domme (1800), and a Sandia mug. Honorable mention was awarded to Andy Oravec (2882) for a lamp he made from pieces of glass and a wagon wheel hub base he found in New Mexico junkyards. If you have pollution prevention ideas and suggestions you'd like to share, call the Pollution Prevention Info-Line on 848-0500.

Dave Braudaway's service to IEEE recognized

Dave Braudaway, Primary Measurements Standards Dept. 1743, recently received a certificate of recognition for service on the Institute of Electrical and Electronics Engineers (IEEE) Nominations and Appointments Committee. This body assists the board of directors in developing a slate of candidates for election and appointment at the institute level. Dave has also completed three years as chairman of the Awards and Recognition Committee of the Technical Activities Board and chairman of the Awards Planning and Policy Committee of the Awards Board. He is senior past president of the Instrumentation and Measurement Society (one of 37 IEEE societies), and he has been confirmed as vice chairman of the Awards Board.

DOE Adventures in Supercomputing Expo held April 29

An exhibition of more than 70 computational science projects by high school students from throughout New Mexico was held April 29 at Cibola High School in Albuquerque. The Adventures in Supercomputing event, sponsored by DOE and Sandia, provides an opportunity for approximately 150 participating students to display their projects and meet other students involved in supercomputing. The program is designed to cultivate interest of women, minority, and disadvantaged high school students in science, mathematics, and computing. It provides high schools with curriculum materials, high-speed network access, supercomputing resources, continuing technical support, and computing equipment.

Send potential Sandia News Briefs to Lab News, Dept. 12660, MS 0413, fax 4-0645.

President's Quality Award brochures available May 26

Even though announcement of winners is months away, the second annual Sandia President's Quality Award (PQA) process is gearing up, and will get under way with availability of brochures from division quality coordinators May 26.

Leon Sikora of Corporate Quality Excellence Dept. 12909 says volunteers to help score applications will be sought through a May 16 *Weekly Bulletin* announcement.

Other dates to remember are:

- July 15 — deadline for submission of applications
- Sept. 1 — announcement of winners
- Oct. 20 — awards ceremony

More information is available from division quality coordinators or from PQA Project Manager Mary Nation of Quality Tools Dept. 12911 on 271-7929.



Employee deaths

Dwain Lee of Satellite Systems Engineering Dept. 9211 and his wife Marilyn died May 2 in a car accident in Texas.

Dwain was 54 years old.

He was a senior member of technical staff and had been at Sandia since 1964.

Dwain and Marilyn are survived by their children Michael, Susan, and Stephen.

Richard McKnight of Systems Development Dept. 9418 died May 3 after a long illness.

He was 59 years old.

Richard was a senior member of technical staff and had been at the Labs since 1956.

He is survived by his wife Marvis and son Joseph.

Sympathy

To Larry Irwin (9231) on the death of his daughter Kelsey in Albuquerque, April 22.

To Kevin Marbach (9212) on the death of his father in San Marcos, Texas, April 28.

Retirement Open Houses

The Labs is holding an open houses in honor of retirees **Casimiro Zamora** (2482) in the Area 1 Cafeteria (Bldg. 861) on Wednesday, May 18, 2-4 p.m.; and **Lyle Whelchel** (10200) in the Area 1 Cafeteria (Bldg. 861) on Wednesday, May 25, 2-4 p.m. Refreshments will be served. Friends and acquaintances are invited.

Take Note

Albuquerque Mayor Martin Chavez invites you and your community groups to "paint the town" on Saturday, May 21, 8:30 a.m.-4:30 p.m. The City of Albuquerque Graffiti Removal Services will help sign up groups and discuss site selections, supply needs, and coordinate the number of volunteers for your project. You will also receive instructions for picking up free supplies donated by sponsors. When you finish painting, you're invited to a volunteers' party at Civic Plaza. Hot dogs and refreshments will be served beginning at 1 p.m. If you're interested in cleaning up graffiti in your neighborhood, call 857-8055 for more information and to sign up.



SNOWY MEMORIES — They've now put their skis away for the season, but before doing so, the Sandia Singles Club went off for one final fling — a Sandia/DOE Singles Ski Weekend at Taos. Taking a break are, from left, Bob White, Sandy Culler, Lee Grymkoski, John Benecke, Ron Ater (hiding behind his skis), Lori Clugston, and Curtis Hodge. Sandy (of Org. 1323), secretary of the group, says the singles club has planned many other exciting activities in the coming months. One highlight will be a four-day hiking/photography camping trip to Canyonlands and Arches national monuments in Utah over the Memorial Day weekend. She says all singles are invited to join the club and share in the fun. Call Sandy for further information on 821-4143.