



TWO DAYS AGO, Sandia's TOSI (Technical On-Site Inspection) Facility was visited by seven Soviet officials, three of whom are in the foreground here: (from right) Col. Nikolay Shabalin, of the Soviet Ministry of Defense and the ranking visitor; Sergey Kortunov, diplomat from the Soviet Foreign Ministry; and Oleg Shagov, of the Soviet Council of Ministries. The three are inspecting the scale model of the TOSI Facility used in briefings at the White House and the Pentagon. Beyond the scale model are (from left) Stan Fraley, John Holovka (both 9111), and Patricia

Newman (3144), who served as Sandia's interpreter. One of several stops on a tour of the US hosted by DoD's On-Site Inspection Agency, TOSI provided an opportunity for the Soviets to see some prototype models of systems that could be used at either country's weapon-production plants to verify that only treaty-approved weapons are removed from the premises. More pix from the Soviet visit next issue. (Photo by Randy Montoya, 3162.)

## Soviets Visit TOSI



# LAB NEWS

VOL. 40, NO. 8 SANDIA NATIONAL LABORATORIES APRIL 22, 1988

**Based on Force-Sensing Resistor**

## New Digital Tactile Sensor Developed

Pick up a champagne glass. There. Now, before you sip, stop and think about *how* you know how tightly — and how loosely — to grip it. After all, it better not slip out of your fingers, and it better not get crushed by those fingers either.

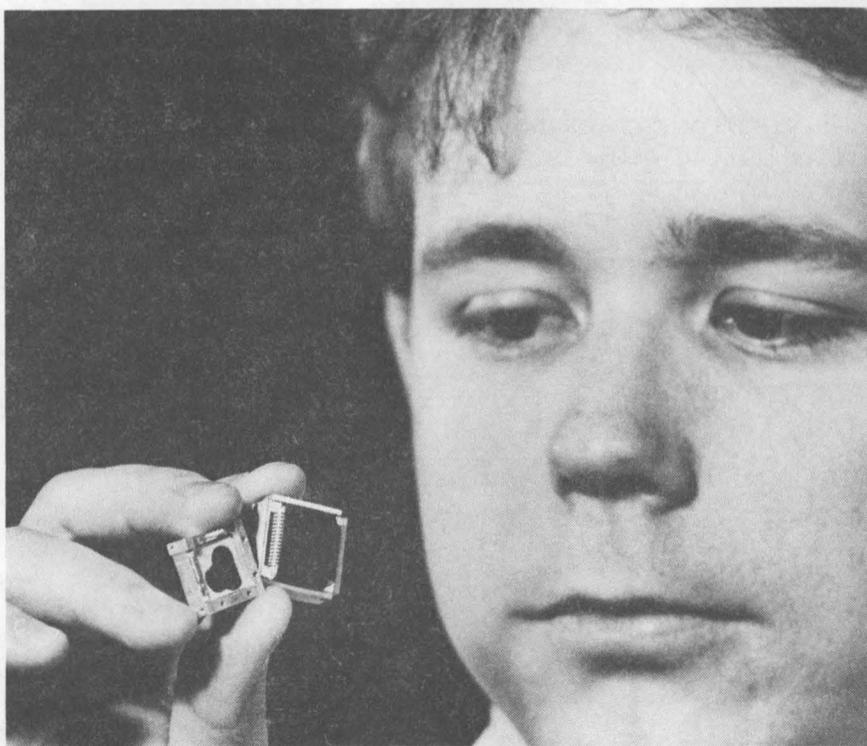
This tactile sensing problem — minus, of course, the Dom Perignon itself — is exactly the same as that faced by the researchers across the country who are attempting to replicate in their intelligent machines that exquisite balance between too tight and too loose (see "Sensors + Computers = Smart Robots").

Bert Tise of Sensor Components Div. 2533 has designed and tested a working prototype of a digital tactile sensor (DTS) based on a newly developed, commercial force-sensing resistor material.

The material could give an intelligent machine's "fingers" a better ability to grasp objects — "better" in that the DTS is compact, versatile, somewhat flexible, fairly robust, and quite accurate in its feedback to the computer that would control it. (For a description of how the DTS works, see "Force-Sensing Resistor Uses Piezoresistive Capability.")

"A DTS working properly in a computerized robotic system should allow the robot to manipulate objects that it's programmed to handle much as a human being does," explains Bert. "It should cause a robotic hand to apply the right amount of force in the right direction at the right time."

The sensing area of the new DTS is compact — only half an inch square, roughly the size of a human fingertip. The whole package, which contains the sensing area plus five integrated circuits, measures 0.8 x 0.8 x 0.25 inch.



The new force-sensing material is also versatile — able to sense forces ranging from an ounce to about a thousand pounds — so the DTS made from it is potentially useful for a wide range of applications. "At this stage of development, the DTS has much less sensitivity than a human finger," says Bert, "but it does have a wide range of detection-of-force ability."

The material is flexible enough for many applications. First, it can be wrapped around a finger just

as a Band-Aid can. So, although current versions of the DTS are designed to fit on pairs of flat grasping surfaces, new versions made from the material could wrap around cylindrical grasping devices. It's also flexible in that a DTS covered by the material "gives" enough to conform to many more-or-less flat surfaces.

The material is relatively resilient, or robust — constant flexing of the DTS surface will wear out the material, yes, but not immediately. "In use, we'd

*(Continued on Page Five)*

FRONT AND BACK of the digital tactile sensor (DTS) developed by Bert Tise (2533) for possible use on robotic "fingers." DTS on right shows side that would grasp an object. It's composed of two flexible 16-strip layers of a commercial force-sensing resistor material. DTS on left shows the results of electronics miniaturization, Bert's primary contribution to the new device.

# Antojitos

**Mike Michnovicz, Mel Merritt Merit Mention** With about 80 years of Sandia service between them, and with careers that have given them a certain amount of Labs notoriety, Mike (2833) and Mel (400) deserve a mention as they head into retirement next week.

Mike was a "military youngster" who came to Los Alamos to do photo reproduction for the Manhattan Engineer District in 1944. When the time came to get out of the service, Los Alamos asked him if he'd like the same job as a civilian. "I said 'sure,' and just changed my clothes," says Mike. That was on March 25, 1946, Mike's Sandia service date.

"Los Alamos was a cocoon," he adds. "Close-knit, comfortable, lots of camaraderie, but a cocoon nevertheless. So when Z Division was becoming Sandia in Albuquerque and I was asked if I wanted to join it and enter the outside world [comparatively speaking], I said 'sure' again."

So he moved to Albuquerque and became supervisor of Sandia's photo reproduction group in July 1948. He'd been dating Mary Lou in Los Alamos, so the move made his social life a bit difficult. He solved the problem by marrying her that November.

"Sandia has been a satisfying time and place," says Mike. "Good friendships, good lifestyle. And Albuquerque has been a good place to raise a family — seven boys, six girls. We'll stay here, and continue with our volunteer work, European travel, and so on. I'll miss Sandia, but I'm ready for the next chapter."

Mel, a native of Alaska, came to Sandia out of grad school on July 12, 1950. Until his clearance came through (on Aug. 2 of the same year!), he dug post-holes and performed other tasks appropriate to new PhDs out in what was to become Coyote Canyon Test Complex. "Jack Howard [retired Executive VP] was in charge of the Coyote project," says Mel. "He became a supervisor a few weeks later."

"I then worked under Everett Cox [former Sandian, headed the Weapons Effects Department until 1956] in the West Lab [now Officers' Club West] for a couple of years," Mel adds. "We built rigid models of structures and calculated their ability to withstand blast waves."

"It was a powerful department with a charismatic leader and exciting work to do," Mel continues. "And I helped interview job candidates such as Tom Cook [ret. EVP] in 51, Carter Broyles [7100] in 52, John Banister [7111] in 53, and Clarence Mehl [7112] in 54."

"I spent 25 years in nuclear testing, 10 years in nuclear waste disposal, and three years in Management Staff 400," Mel concludes. "The high point was my Amchitka experiments" — in addition to serving as scientific advisor, he did environmental impact studies, and the related public relations work, for Sandia's two high-yield underground nuclear detonations on that Aleutian island between 1968 and 73, then helped write a book, *The Environment of Amchitka Island*, published in 1977.

So long, Mike & Mel. It's been a blast (literally, in Mel's case).

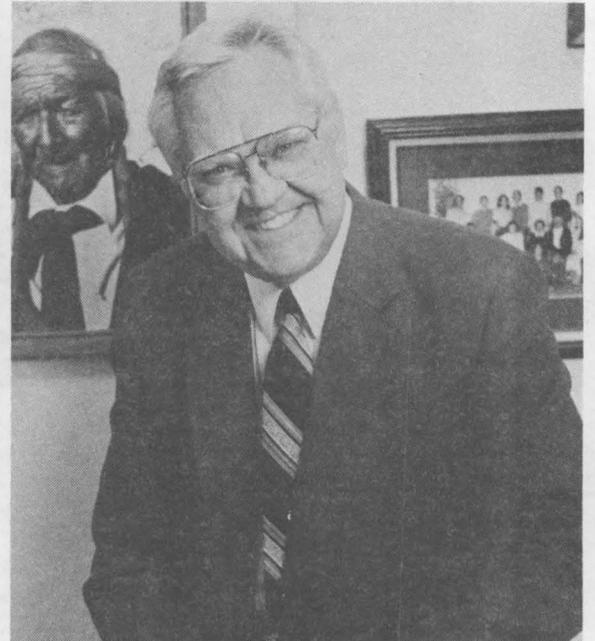
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**Sandia Seniority List** Mike has been number three. Once he retires, these are the top 10 Sandians: Bill Thomas (7251), 6/13/45; Howard Austin (7126), 3/4/46; Ed Harley (6226), 6/10/46; G. C. Hollowwa (3411), 7/16/46; Jack Suttman (9122), 9/9/46; Bill Pawley (3155), 5/19/47; Ted Church (7290), 5/26/47; Jo Davis (7531), 7/10/47; Vernon Brewster (7137), 8/5/47; and Bob Statler (7137), 9/2/47. ●BH

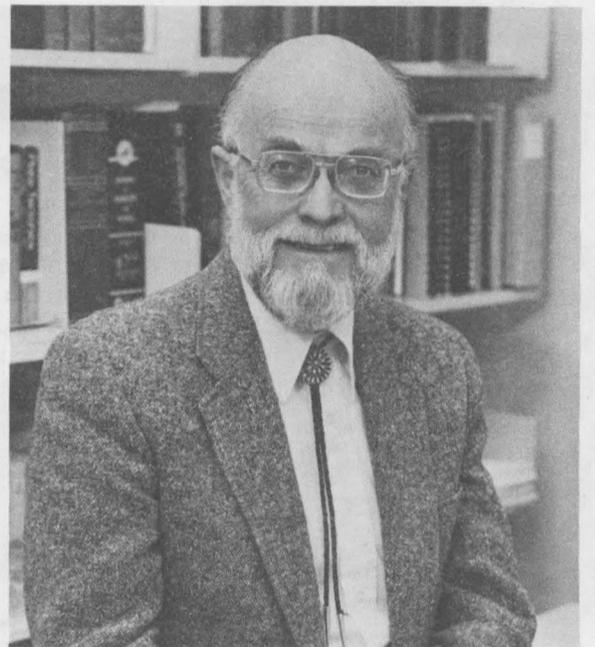
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Los dichos de los viejitos son evangelios chiquitos. (The sayings of the old ones are like little gospels.)

## Retiring



Mike Michnovicz (2833)



Mel Merritt (400)

## Congratulations

To Ann and Kent (5164) Meeks, a son, Kevin Kent, Jan. 29.

To Penny (7251) and George (5249) Greer, a son, Skelley Aubrey, March 24.

To Rita (3731) and Victor (3425) Baca, a daughter, Carlota Nicole, March 30.

To Margaret and Mike (3734) Rouse, a daughter, Melinda Michelle, March 31.

To Laura (143) and Frank Loudermilk, twins — a son, Eric Scott, and a daughter, Emily Ann — April 5.

## LAB NEWS

Published Fortnightly on Fridays

SANDIA NATIONAL LABORATORIES

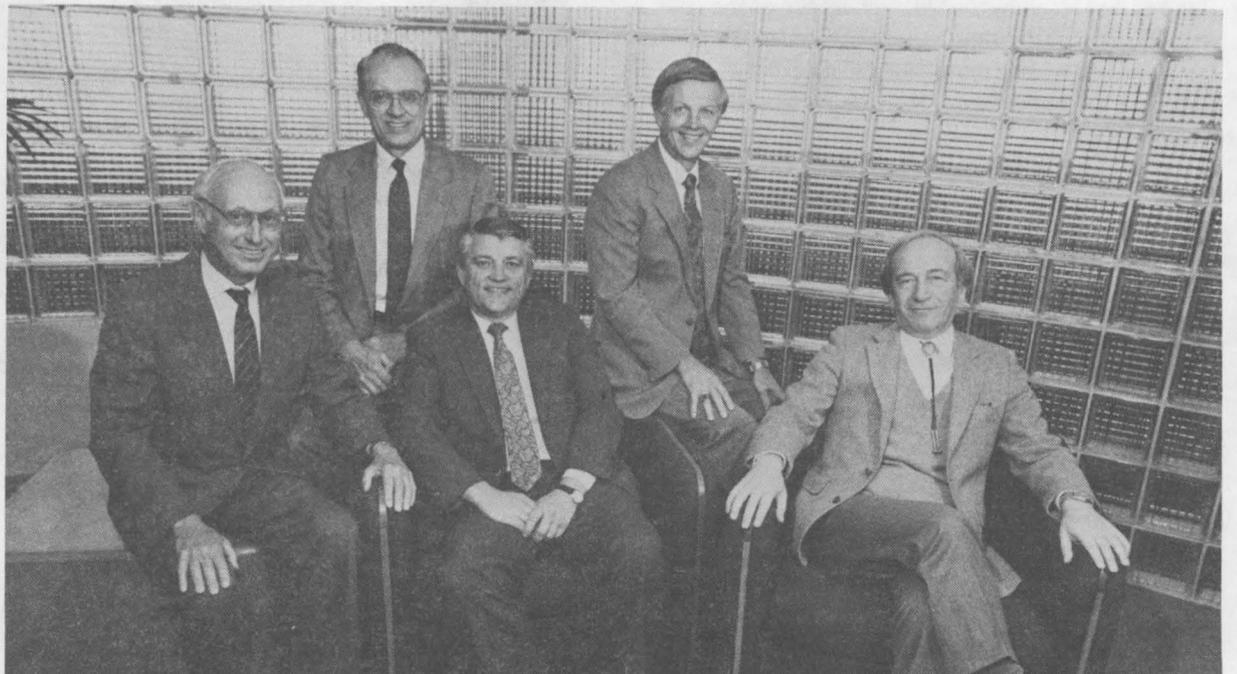
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SANDIA'S BOARD OF DIRECTORS met earlier this month at SNLA. From left: Irwin Welber (1); Orval Jones (20); Tom Thomsen, president, Technology Systems Group, AT&T Technologies; Lee Bray (30); and Sol Buchsbaum, executive vice-president, Customer Systems, AT&T Bell Labs. Unable to attend were board members Ian Ross, president of AT&T Bell Labs; and John Zeglis, senior vice-president and general counsel, AT&T Technologies.

# New Spin-Test Facility Helps Make W82 Reliable

A new high-speed spin facility, which recently went on-line in Area 8, enables Sandia weapon developers to better duplicate the spin environment an artillery shell "sees" after it's shot from a cannon.

The facility tests the electrical systems of 155-mm artillery projectiles (W82) after they've been flown at Tonopah Test Range. "Our goal is to see how the electrical system functions inside the artillery shell when it reaches the target," says Pat Gildea, supervisor of Environmental Test Division 8283.

"The shells fired at Tonopah are recovered by parachute, then brought back here," Pat continues. "We remove the electrical system, mount it in the spinner, and spin it up to the speed it saw during its flight test. That's to trip the ESD [environmental sensing device] so the electrical system can operate. Then we activate and fire it to demonstrate that it will function properly after the rigorous gun-firing environment at Tonopah."

The key element in the spin-test device is an 8-inch air-driven turbine that turns a vertical shaft. The lower end of the shaft has a mounting plate designed to hold the electrical system. In use, a test unit is mounted on the shaft and spun inside an evacuated containment tank.

"The tank was designed with an open pit underneath it so we can have the access we need to mount instrumentation necessary for testing," says Guy Prescott (8283), who conducts the tests of the W82 electrical system. "Wires running through the hollow turbine shaft to a slip-ring system allow us to collect as many as 100 channels of data."

"We spin the W82 system and its test fixture, which together weigh more than 100 pounds, at about 18,000 revolutions per minute," Guy continues, "but we have the capability to spin an 1100-pound unit up to 30,000 rpm."

## Automatic Centering, Leveling

The mechanism has a hydraulic lifting arm that permits easy mounting of a test unit on the vertical shaft; it also automatically centers the turbine precisely over the containment opening and ensures that the shaft is truly vertical. That's important — anything out of balance at high speeds could tear the shaft and turbine apart.

The facility control room, which is a safe distance away from the test chamber, has a Hewlett-Packard data acquisition system and a digital control panel that operates the spin-test facility. Data collected from a spectrum analyzer and the slip-ring system can be provided in hard-copy form to the W82 development staff minutes after a test.

The control panel has nine automatic interlocks to ensure proper operation of the test chamber. Func-



EXAMINING THE W82 test unit suspended on the shaft from the turbine above the six-foot deep containment tank are Pat Gildea (left) and Guy Prescott (both 8283). These test units are spun up to 18,000 rpm on the spin-test device.

tions such as vacuum pressure, oil pressure, acceleration and deceleration rates, rotation speed, and state-of-balance of the turbine are easily monitored from the panel.

Others who worked with Guy on the design, installation, and checkout of the new facility were Alice Johnson-Duarte, Jim Mitchell, Marty Mikolajczyk, and Hermann Folkendt (all 8283). Eric Schindwolf and Dick Wavrick of Rotational Dynamics Division 7543 consulted on the design and high-speed balancing requirements for the spin tester.



GUY PRESCOTT (8283) sits at the data acquisition system keyboard; control panel is visible to the rear.

## Congratulations

To Sandie and Ken (8144) Condreva, a daughter, Katharine Jane, April 5.

To Martha (8280) and Rich (8284) Campiotti, a daughter, Chloé Macadaan, April 8.

### What's in a Name? Sometimes, Everything



We hear of a doctor at a hospital in London who thought it would be good for the morale of patients and staff if he installed a piano in the department. So he put in for 300 pounds for a secondhand piano. The accounts people turned it down. Meanwhile, the doctor saw colleagues getting computers, scanners, and other high-tech equipment to the tune of thousands of pounds. Eureka! He asked for 300 pounds for a "polyphonic sound generator" and got his piano within a fortnight.

*New Scientist*



# SANDIA LIVERMORE NEWS

VOL. 40, NO. 8

SANDIA NATIONAL LABORATORIES

APRIL 22, 1988



JACK HICKMAN (400, right photo) briefs Sen. Pete Domenici on a Sandia Livermore RAPRENOx display that was part of a DOE exhibit, "Technological Advancements in Energy Conservation," in the Cannon House Office Bldg. rotunda in February. RAPRENOx was one of 14 energy developments demonstrated at the exhibit, which



was organized by Donna Fitzpatrick, DOE Assistant Secretary for Conservation and Renewable Energy. The RAPRENOx display, prepared by Combustion Technology Dept. 8360, is shown in photo at left; Mike Dyer (8362) stands by.

## Conversion Project Under Way for Low-Value Property

Most of the property Sandia employees are responsible for is about to experience a conversion, one of the most sweeping changes in the PMS (Property Management System) since its inception in 1973.

First, some background. Property control is big at Sandia. For one thing, the numbers are big — Sandia keeps tabs on some 132,000 items in the PMS database. That's an average of 16 pieces of appreciable-value property for every employee on roll. Total value of all those items is about \$885,000,000.

For another thing, the scope is big — Sandia is located in Albuquerque, Livermore, Tonopah, Nevada Test Site, Amarillo, and a sprinkling of smaller sites from Kauai to Florida.

Finally, the responsibility itself is big — all the items are legally owned by the federal government, which does not take lightly any carelessness about its property.

So much for the problem. The solution — if not its implementation — is simple: Control all property; that is, number every item, assign it to the organization or employee responsible for its protection, conduct inventories on a regular basis, and track accountability through the PMS.

Okay. But some property is much more valuable than other property. If it costs \$100 to control a \$10 item, something needs changing. That's what's happening currently as Property Management Services Dept. 3410 converts some 97,000 of its 132,000 pieces of property to a new "Low Value" category.

Traditionally, all property was controlled (or "accountable") if it cost more than \$1000 or was a "sensitive item." Now that figure has been raised — with DOE's concurrence and blessing — to \$5000.

But that doesn't mean that \$1000-to-\$4999 items no longer concern 3410 or the responsible employees. It means that there's a new name in the property control game — Low Value.

These are the criteria for Low Value property: Each item is worth more than \$1000 but less than \$5000, or it's identified as "special need" by management even though it's worth less than \$1000. Low Value items will sport a new orange bar-code-readable sticker.

### Fewer PT Cards in Future

More than a sticker-color and name change is involved here. Each bit of Low Value property will no longer have a separate Property Transfer (PT) card, which means that one Move Order — not a collection of PT cards — is all that's needed to authorize the transfer of accountability of several Low Value items to another location, another organization, or Property Reapplication (formerly Reclamation).

So the amount of record-keeping, as well as the frequency and length of inventories, can be reduced. (Each Low Value item will, as in the past, be listed on 3410's tab runs and assigned to the responsible organization or employee.)

The conversion began with Low Value items acquired after Oct. 1, 1987, and will continue through

1988 as existing items are recategorized during 3410's visits to individual organizations.

"So far, reaction by organizations has been, at first, concern," says Lettie Carroll (3412), who coordinated the conversion project. "But once we explain the new system, people like it. It's simpler, and it makes moving property from place to place within the organization easier."

"Sandia is in no way abdicating its responsibility for protecting government property," adds Vic Chavez, conversion project leader and 3414-2 supervisor. "We'll continue to inventory, using our new bar-code readers [LAB NEWS, Oct. 23, 1987], and we'll continue to keep track of equipment transfers through the Move Order or Shipper systems." (Inexpensive supplies will continue to be monitored via reports to supervisors of the items ordered by the organization.)

"Vic spent eight years with DOE in property management, responsible for all AL's property audits, including Sandia's," notes Lettie. "That experience made him a valuable resource in our two-year-long conversion project."

"This major transition could not have gone so well had it not been for the support and involvement of so many people in Dept. 3410," says Vic. "And Evan Ashcraft [Administrative Policies and Procedures Div. 132] provided invaluable policy guidance throughout the project; Andy Benjamin [2626] provided the support necessary to modify the PMS."

## Sensitive Items Demand Special Protection

Let's face it. Some things — things that are easily carried, easily concealed, and easily converted to cash or personal use — attract thieves more than other things. So some government-owned items are sensitive; that is, they have to be protected more stringently than others. At the same time, that protection must be cost-effective — not cost more to protect than the item is worth.

The new property-control guidelines establish \$400, rather than the former \$250, as the threshold for control of some sensitive items: hand-held calculators, TV sets with 13-inch (or less) screens, rifle telescopes, binoculars, video cameras, cassette recorders, and portable tools of the "general-home-use" type.

But other sensitive items are controlled regardless of cost: all other cameras (35mm, instant, and motion picture), camera lenses and strobe flash units, telephone answering devices,

portable VCRs (video cassette recorders) and playback units, hand-held transceivers, PCs (personal computers) and peripherals, and firearms.

And the following items, which were formerly sensitive, will now be included in the new "Low Value" category: balances and scales, PC monitors, PC printers, pagers, non-portable transceivers, and equipment pool items.

### A Warning, Not a Wish-List

The above is not a wish-list. It's a warning. Theft — whether from the government or from other employees — is a crime, and Sandia treats it as such. In addition to criminal-code penalties, employees who steal face disciplinary action up to and including termination of employment — and people *have* been terminated within the past several months for their involvement in theft.

## Take Note

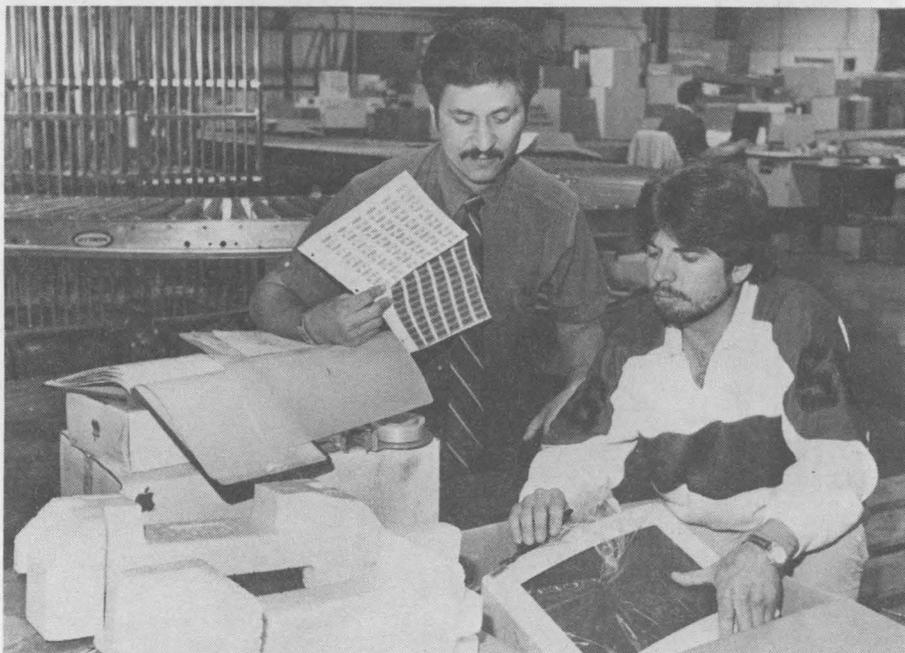
The Sierra Club has scheduled a base-camp training session, "Habitat Studies," in the Gila Wilderness May 15-21. It's for amateur naturalists who would like to learn more about natural resources and how they're measured and evaluated. Camp location is in the first US area to be designated wilderness. Camp cost is \$495, and is open to Sierra Club members. Club membership is \$33/individual, \$41/joint; seniors and students \$15/individual, \$23/joint — open to anyone. Transportation will be available from Silver City to the trailhead. Trip brochures are available from Sierra Club Outing Dept., 730 Polk St., San Francisco, CA 94109. For more information, contact Kent Pfeifer (1113) on 865-3025.

### Sink Your Teeth Into This . . .

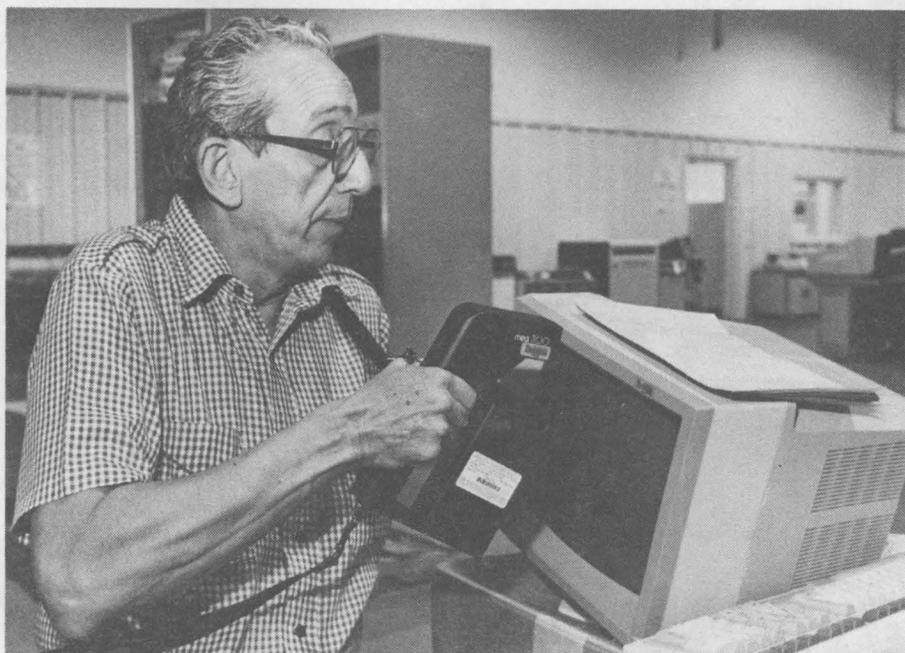


Researchers have measured the strength of the human bite. Our molars can apply a force of 400-800 newtons, while our incisors and canines can reach a respectable 250-300 newtons. (For comparison, the force exerted by gravity on a person with a mass of 70 kg. [154 lbs.] is around 686 newtons.) Theoretically we should be able to crack hazelnuts with our cheek teeth.

*New Scientist*



**STICKERS FIRST AND LAST** — Each piece of accountable property begins its tour of Sandia duty by acquiring its own Property Management System identification sticker; removing the sticker is among the final steps when it's shipped out of Property Reapplication. In left photo, Receiving's Richard Phelps (3413) unpacks a



carton as Vic Chavez (3414) prepares to apply a sticker to the new equipment. In right photo, Tony Torres (3413) is ready to scan the sticker's bar code one last time. After the monitor has been deleted from the inventory, the sticker will be removed and the monitor will be available to other government users.

## DTS

cover the DTS with a thin, protective elastomer to provide human-finger-like 'give' and some protection for the polymer material covering the DTS," Bert points out.

And it's accurate; the DTS's network of resistors senses the amount of force it's applying to an object and instantaneously — "in the milliseconds range," says Bert — provides that data to the computer to which it's attached. The computer, then, can respond by increasing or decreasing the force needed to grasp the object.

### Breakthrough Is Circuitry Miniaturization

Bert's real breakthrough in this DTS prototype is circuitry miniaturization. "In the two-plus years I've been working on the project at least part-time, I've been able to pare the circuitry down to the bare essentials," he notes. "The problem is to isolate each resistor — and in a 16 x 16-resistor unit, that's 256 taxels [tactile elements] to be isolated. It takes some pretty sophisticated electronic techniques to define the resistance value at each taxel and to put those electronics inside the sensor itself.

"Our earlier DTS version — and the typical research version around the country — had 32 leads from the force-sensing material on the 'finger' out to an electronics package on the 'wrist,'" he continues. "Essentially, we've put the electronics into the fingertip, so our current DTS version has only five leads from the fingertip to the computer."

Bert will present a paper on the DTS at IEEE's International Conference on Robotics and Automation in Philadelphia next week. He was assisted in the early stages of his research by Angela Denham (now 2565).

●BH/Larry Perrine (3161)

## Sensors + Computers = Smart Robots

Sandia and many other R&D laboratories are trying to improve the ability of robots to handle objects with a greater degree of sensitivity and accuracy than they now can master.

That improvement is especially needed for "smart" robotic systems. These systems use computers to process information gathered by various kinds of visual, acoustic, and tactile sensors and then to make the decisions that direct the robot's actions. That is, smart robots interact with their environment, changing their actions in response to the objects they're manipulating, the orientation of those objects, and the task to be performed.

Smart robotic systems may someday be used by industry, government, and the military for tasks that people don't do efficiently, safely, or willingly. Sandia (notably Computer Sciences Dept. 1410 and Advanced Systems Dept. 5260) is researching a variety of smart robotic systems, including some that may automate mechanical assembly and other manufacturing processes, handle nuclear wastes, patrol interior and exterior areas to detect intruders and hazardous events, maintain mechanical equipment in hazardous environments, or destroy enemy vehicles on the battlefield. Several of these applications might employ tactile sensors.

"We're still a long way from a production version of a DTS [digital tactile sensor]," says its primary developer, Bert Tise (2533). "But we're coming closer to a working prototype that could be used in Sandia's research on dextrous manipulation." (Manipulation is, of course, just one of the talents a robotic system needs to be "smart"; others include recognition, orientation identification, articulation, and so forth.)

## Force-Sensing Resistor Uses Piezoresistive Capability

Key to the digital tactile sensor's (DTS) ability to apply just the right amount of force, or pressure, to grasp an object is a three-year-old kind of force-sensing resistor. The resistors are made from a thick-film piezoresistive polymer manufactured by Interlink Electronics of Santa Barbara, Calif. Sandia was the first lab to use the polymer in a tactile sensor.

(Interlink, interestingly enough, was started by a group of musicians who bought the patent on the force-sensing resistor from its inventors because they wanted to develop electronic drums. That goal has now been met; in the meantime, researchers at, to name a couple, AT&T Bell Labs and Columbia University have become interested in the material's force-sensing capabilities.)

The electrical resistance of the sensing elements of a piezoresistive material varies inversely with the load applied to the elements. That is, the resistance drops as mechanical load (or

force, pressure) increases. And that's because a piezoresistive (*piezo* is from the Greek "piezein," meaning to press, squeeze) material offers less and less resistance to an electrical current flowing through it as the mechanical load gets higher and higher.

In Bert's DTS, two layers, each composed of 16 thin strips of the new piezoresistive material, are placed across each other at right angles to form a sort of cross-hatch pattern. With 16 rows and 16 columns, the device contains 16<sup>2</sup>, or 256, taxels. Effectively, each taxel is a separate piezoresistor.

In use, the amount of pressure applied to an object grasped by the DTS is fed (as a function of resistance drop caused by pressure on the object at each taxel) to the controlling computer. In the Interlink material, resistance changes rapidly for loads below 16 pounds; at higher loads, the change in resistance is slower.



BASIL STEELE (5249, left) AND JIM CHAPEK (5249, second from right) give Albuquerque High School students Niambi Ingram and Brandon Bailey a hand with their radio projects. The projects are part of a five-week electrical engineering course co-taught by Basil and Jim and sponsored by the National Technical Association and Sandia's Black Outreach Program. "We try to give students practical experience — in this case, building their own AM/FM radios — to go along with electrical theory," says Basil. Also available to APS students is a computer course designed by Roberta Ingram (7254). "The class includes computer literacy and application," says Roberta. "Each student works directly with a computer provided by APS." Lacey Learson (3428) and Larry Stevenson (5123) help teach the class of 41 students ranging from 5th to 12th grades.



DRIVER SAID they were delivering the Sandia payroll.



PRE-SANDIA LABS SANDIA BASE — Photo from Luke Heilman's (ret.) collection shows Sandia Army Base as it appeared sometime in 1946. Photographer was apparently standing atop a light beacon tower at the northwest corner of Hangar #2, one of two hangars near the flight line (see other photo). View is to northeast; street that

begins in foreground center is likely today's First Street. The two-story building at far right was then the Base Gymnasium at Wyoming and "F" Street (where the Kiva Cafeteria now stands). Area where Luke Heilman and Dave Tarbox (both ret.) planted poplars on Parade Ground in 1946 was behind and to left of the gym.

### Retirees Reminisce

## Post Engineers Planted Poplars on Parade Ground

It was the fall of 1946. Sandia Army Base's Post Engineer, Capt. Luke Heilman, and his assistant, 1st Lt. Dave Tarbox, and the few other officers stationed there decided (1) that the Base needed a parade ground — and (2) that the parade ground should be bordered by trees.

Formal approvals from higher authorities? Not needed. The war was over, and if a captain wanted to plant some trees, why not? (Ask Luke sometime

how the swimming pool on A Street south of the Coronado Club got built.)

So, one cool Saturday, Luke, Dave, some enlisted men, and Luke's three-year-old son Jim became poplar planters. The trees — really just 3- or 4-ft.-tall saplings, or "whips," as big around as a finger — had been acquired from Somewhere by a civilian agronomist who worked for Luke.

Why poplars? "They grow fast," says Luke.

"We were impatient because we didn't know how long we were going to be in the Army. In fact, we were trying to get out, but our job category was listed as critical, so we couldn't. And we certainly didn't know how long Sandia Base would be around." (Turns out it survived until July 1, 1971, when it was transferred to Kirtland Air Force Base and became known as KAFB-East.)

The work group first surveyed the portion of naked mesa defined by dirt roads (known today as F Street, D Street, 5th Street, and 7th Street) and set the stakes needed to meet military specs for straight tree lines and proper tree spacing.

Next came the hole-digging operation. "We brought in the Base's 2-1/2-ton truck with an auger, jockeyed it into position over each stake, and dug the holes," recalls Dave, who drove the truck part of the time and manned the auger the rest of the time. Someone — neither of the two officers, of course — shoveled some loose dirt and chicken manure into each hole. And little Jim Heilman, sitting on the back of the truck, dropped a whip into each hole. More dirt, some tamping, some water, then another hole, and another, and the job was finished that afternoon.

Soon after, a few of the trees received something of a setback. "We moved what was then called the Protestant Chapel from the corner just west of Medical to its current site [across D Street from the northeast corner of the Parade Ground]," recalls Luke. "We had to roll it right across some of the new poplars, but they were still young enough to bounce back."

### Four-Plus Decades

In spite of the short life span for which poplars are noted — "15 to 20 years," says Dave — most of the original 182 trees have survived more than 41 years, thanks to care by Post Engineers and their successors over the decades. But most of the trees are dying now, and KAFB is currently removing all of them from the Grounds on the grounds that dead limbs are endangering people and property.

The area will, however, remain a KAFB landmark. It has been renamed Hardin Field, after AF Lt. Gen. Ernest "Moose" Hardin (1916-1986), who became Assistant to the Director of DOE/AL after he retired from the military. Now used mostly as a walking/jogging track and occasionally as the site

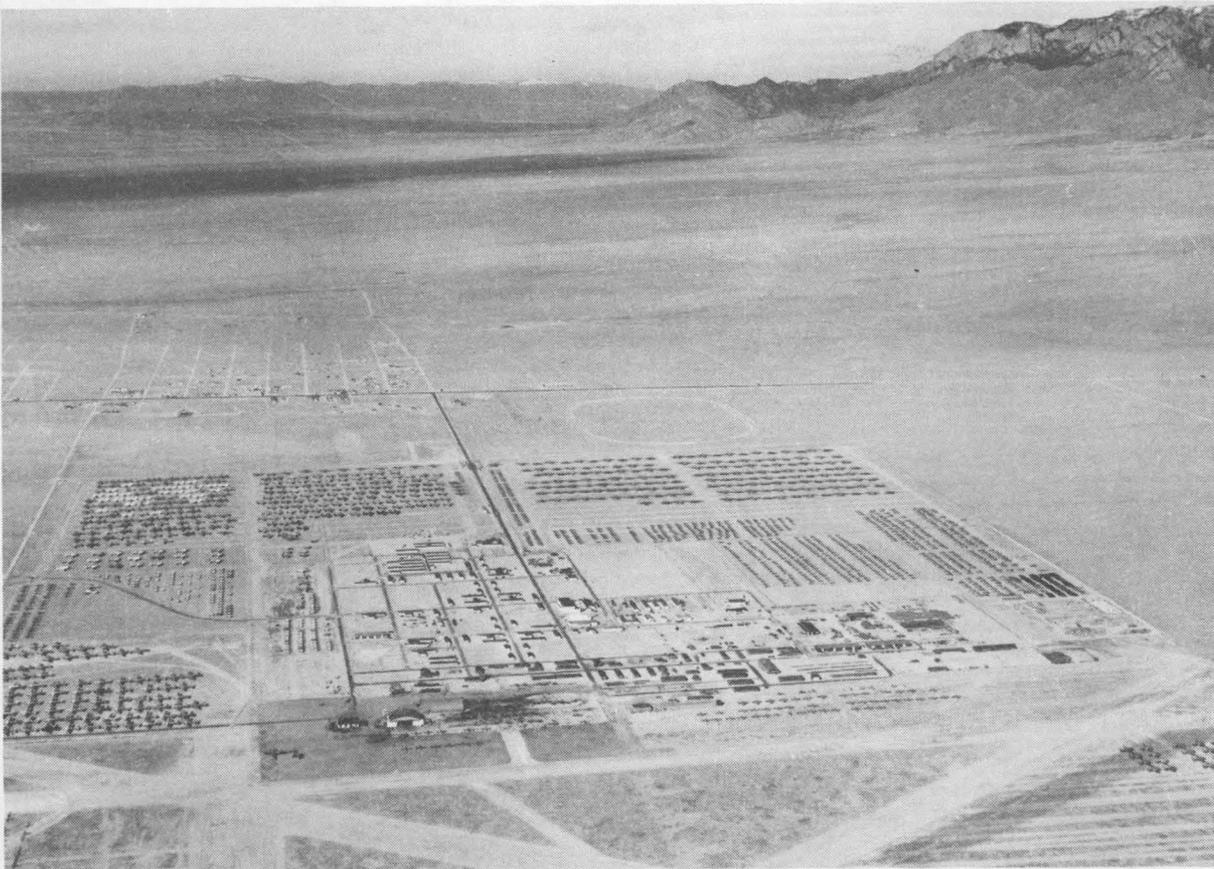
*(Continued on Page Seven)*



POPLAR PAPAS — Luke Heilman (left) and Dave Tarbox (both ret.) returned recently to the Parade Ground to say goodbye to the trees they planted, on a whim, more than 41 years ago when they were Army officers.

## Retiree Deaths

Kenneth Campbell (73)	July 9
Joseph Bunch (84)	July 15
Gordon Troyer (74)	July 28
Helen Hoppin (83)	Aug. 3
Joseph Torres (83)	Aug. 6
Jose Perea (76)	Aug. 16
Julian Moody (77)	Aug. 19
Earl Sherwood (67)	Aug. 27
Beresford Gilkes (64)	Aug. 29
John Sitts (79)	Sept. 19
William Countryman (66)	Sept. 20
Juan Gabaldon (86)	Sept. 21
William Dowd (71)	Sept. 25
Harold Riley (81)	Sept. 26
J. B. Sweatman (76)	Oct. 2
Cedric Senter (74)	Oct. 12
Lewis Carl (75)	Oct. 18
Pearl Payne (84)	Oct. 29
Josephine Sandusky (84)	Nov. 1
Edith Titus (68)	Nov. 2
LaVern Demond (76)	Nov. 16
Emma Benderman (77)	Nov. 22
Esther Donaldson (86)	Nov. 23
Paul Koetting (78)	Nov. 26
Vern Sowards (70)	Dec. 9
John Fuqua (70)	Dec. 9
James Birchfiel (71)	Dec. 16
Monico Martinez (77)	Jan. 4
Geneva Howell (89)	Jan. 6
Joe Ferguson (74)	Jan. 10
James Armstrong (74)	Jan. 11
Myron Barnes (65)	Jan. 14
Clarence Canady (84)	Jan. 15
Jeremiah Donovan (73)	Jan. 22
Jack Graham (70)	Jan. 22
William Shepard (65)	Jan. 26
Bert Quelle (82)	Jan. 26
Kathryn Duvall (71)	Jan. 28
Irvin Pytlik (67)	Feb. 16
Helen McKenzie (69)	Feb. 19
Lucille Long (84)	Feb. 26
Roscoe Brooks (75)	Feb. 28
John Watkins (72)	March 6
Pierre Chevalier (84)	March 8
Nadine Sheppard (68)	March 18
Vivian Wuttke (66)	March 28
Elvin Beezley (65)	March 30



AERIAL VIEW of Sandia Base in 1946 (looking north) clearly shows the old Albuquerque Army Air Field runways in foreground. Photo on preceding page was probably taken near Hangar #2 (now KAFB's body shop, a part of the Vehicle Maintenance Branch), the curved-roof building in left foreground. Hangar #1 (now Bldg. 20348, the Branch's tire shop) is just west of Hangar #2. (Both hangars are due west of the National Atomic Museum.) Only other building still extant is now the Sandia Area Federal Credit Union, located east of the hangars across Wyoming Avenue (the dark vertical line in center of photo); Wyoming runs north and connects with Central Avenue, then also US 66. Base Gymnasium is marked by the large black roof just east of Wyoming. Pre-poplar Parade Ground is the open field a block east of Wyoming and beyond and to right of gym. Church several blocks right of gym (where Tech Art is now located) was the one Luke and Dave helped move to a site across from the northeast corner of the Parade Ground; no longer structurally sound, it was recently demolished. Oval between the Base and Central was an automobile race track. The Base was nearly surrounded by surplus WWII airplanes awaiting destruction or sale.

**(Continued from Preceding Page)**

of a military ceremony, the area will be landscaped and developed to promote a wider variety of outdoor activities for those who work on KAFB.

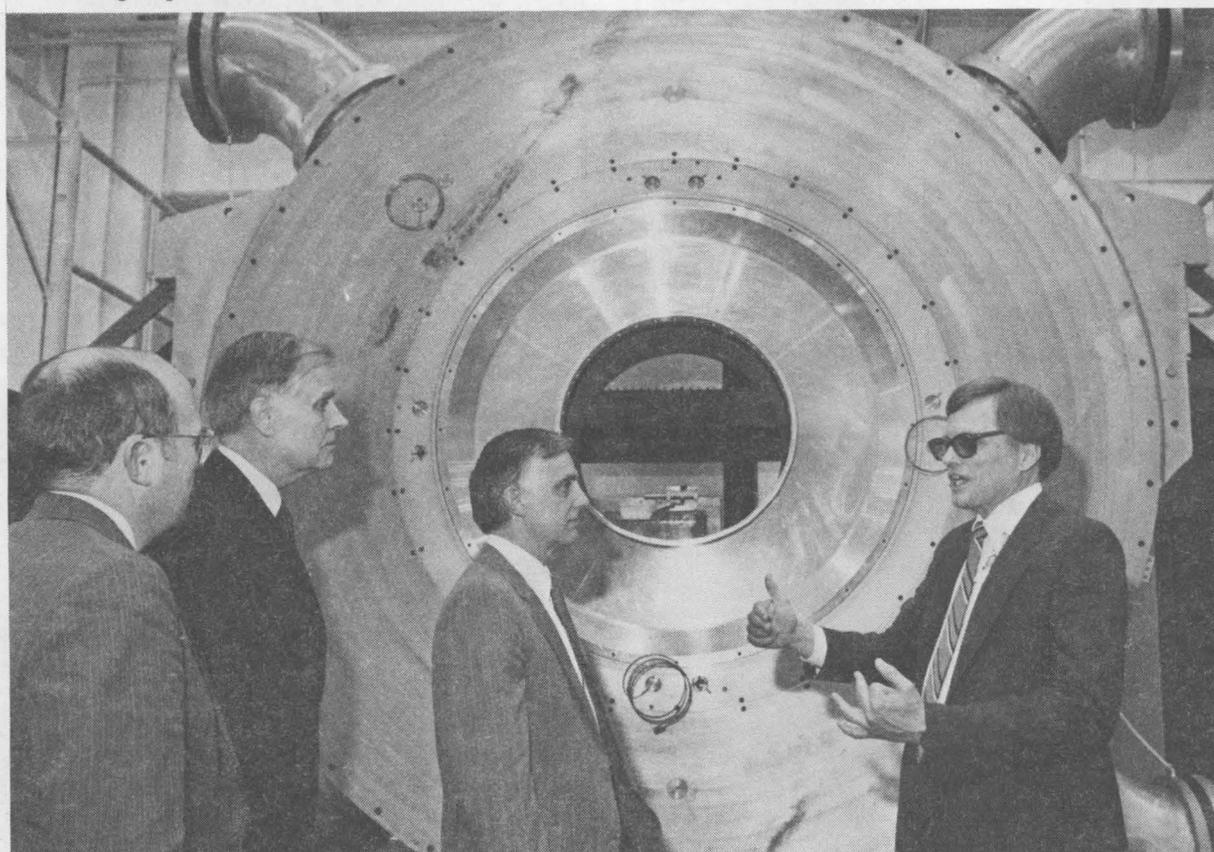
Luke and Dave? The poplar-planting caper certainly wasn't their first together. They had met in the Army in 1943 and had served on several of the same bases during the latter part of WWII. They'd arrived on Sandia Base via the Manhattan Engineer District in Los Alamos.

Dave escaped from the Army and into Sandia's Field Test group in December 1947. And by the sum-

mer of 1948, Paul Larsen, then Director of the Sandia Branch of Los Alamos Scientific Laboratory, had managed to convince the Army that Luke could do the country more good as head of Sandia Branch's plant engineering group than as Post Engineer of Sandia Base.

Both men held a variety of management posts at Sandia. Before Luke retired in early 1983, he was director of what is now 7200 and 7400. Dave was the director of 3400 when he retired in late 1983.

And little Jim? He's now an area manager for TRW in Atlanta. ●BH



JIM POWELL (1230, right) discusses Hermes III during a Sandia visit by attendees at the Air Force Contract Management Division's recent Industry Joint Executive Conference in Albuquerque. In front of a Hermes III assembly unit are (from left) Jeffrey Grant, vice-president of Hughes Aircraft; Richard Seaberg, also of Hughes; and Karl Thomas, president of Pratt and Whitney's Manufacturing Division. Executives from several other aerospace firms — Boeing Aerospace, Northrup Corp., and Rockwell International — also attended the conference. They were hosted by members of the Albuquerque Economic & Development Board and Albuquerque's Office of Business and Economic Development.

## February Earnings Factors

	Earnings Factors
<b>Savings Plan for Salaried Employees (SPSE)</b>	
AT&T Shares	.9837
Government Obligations	1.0100
Equity Portfolio	1.0520
Guaranteed Interest Fund	1.0067
Diversified Telephone Portfolio	
Unrealized Appreciation	.9914
Realized Appreciation	.0000*
<b>Savings and Security Plan — Non-Salaried Employees (SSP)</b>	
AT&T Shares	.9834
Guaranteed Interest Fund	1.0068
Diversified Telephone Portfolio	
Unrealized Appreciation	.9915
Realized Appreciation	.0001*

\* The 1 has been removed from the earnings factor. Current month's DTP earnings may be calculated directly: Earnings Factor x DTP Current Worth = Current Month's Earnings.

## Events Calendar

**April 22** — John Renbourn on acoustic guitar; English folk music blended with blues, ragtime, and jazz; 8 p.m., KiMo Theatre, 848-1374.

**April 22-24** — Pottery demonstration: Juan Tafoya of San Ildefonso Pueblo demonstrates traditional pottery making; special event for Lost and Found Traditions exhibit; 10 a.m.-2 p.m. Fri., 1-5 p.m. Sat.-Sun.; Albuquerque Museum, 243-7255.

**April 22-May 15** — "Screwing Around," play by Grubb Graebner, a contemporary look at sex and power in the Duke City; 8 p.m. Fri.-Sat., 6 p.m. Sun.; Vortex Theatre (2004-1/2 Central SE), 247-8600.

**April 22-June 12** — Exhibit: "Leonardo da Vinci: The Inventions," hands-on exhibit sponsored by IBM; 10 a.m.-5 p.m. Tues.-Fri., 1-5 p.m. weekends; Albuquerque Museum, 243-7255.

**April 22-June 12** — "Lost and Found Traditions, Native American Art 1965-1985," national traveling exhibit organized by the American Federation of the Arts; 10 a.m.-5 p.m. Tues.-Fri., 1-5 p.m. weekends; Albuquerque Museum, 243-7255.

**April 23** — Garden Fair, 9 a.m.-4 p.m., Albuquerque Garden Center (10120 Lomas NE), free, 296-6020.

**April 23** — "Miko and His World," mime; 2 p.m., KiMo Theatre, 848-1374.

**April 23 & 30** — "Dr. Seuss Alive," production for children by John Adams Middle School students; 2 p.m., Rep East (new home for educational program of New Mexico Repertory Theatre at 3211 Central NE), 260-0331.

**April 23-June 6** — "Dinosaurs in Action": exhibit of 7 near-life-size mechanical dinosaurs including stegosaurus, parasaurolophus, ankylosaurus, dimetrodon, and pteranodon; 10 a.m.-5 p.m., New Mexico Museum of Natural History, 841-1374.

**April 24** — Pterosaur Kite-Flying Contest, 10 a.m.-5 p.m., New Mexico Museum of Natural History, spectators free, 841-8837.

**April 24** — Concert, UNM Symphonic Wind Ensemble, conducted by Harold Van Winkle, featuring Keith Lemmons on clarinet; 4 p.m., Popejoy Hall, 277-4402.

**April 24** — Choral Fest, New Mexico Symphony Chorus, conducted by Roger Melone, with guest choruses; featuring music by Rossini, Perichetti, Brahms, Webern, H. Stevens, and Stephen Foster; 3 p.m., First United Methodist Church (4th & Lead SW), 842-8565.

**April 27** — "My Sister the Dragon," 30-minute play performed by the Albuquerque Children's Theatre; 7 p.m., New Mexico Museum of Natural History, free, 841-8837.

**April 28** — Concert, UNM Chorus and Symphony Orchestra, performing "Creation" by Haydn; 7:30 p.m., St. Paul Lutheran Church (University & Indian School Rd. NE), 277-4402.

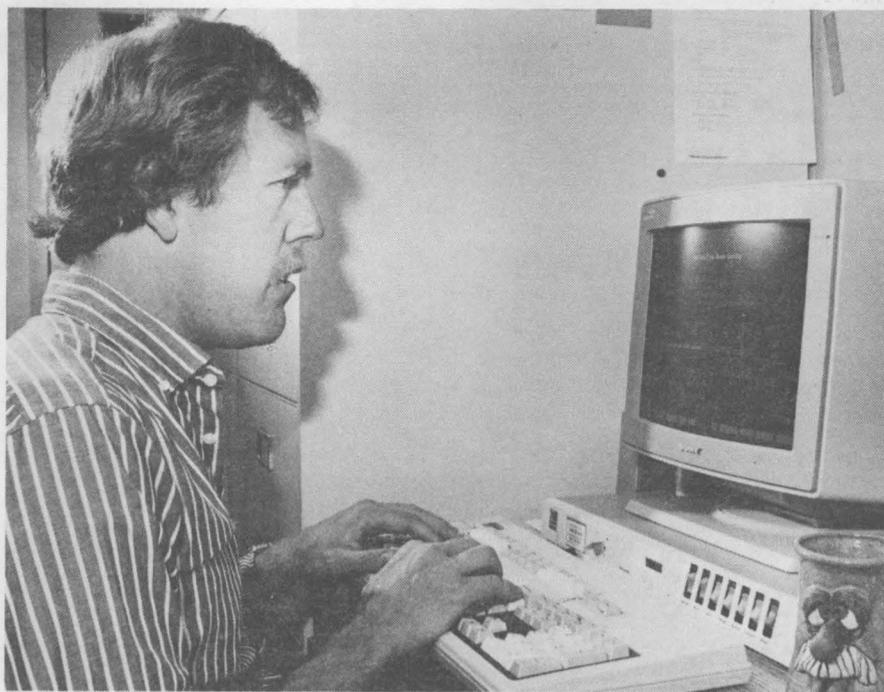
**April 29-May 1** — Pottery demonstration: Seferina Ortiz of Cochiti Pueblo demonstrates traditional pottery making, Virgil Ortiz demonstrates contemporary sculptural forms; special event for Lost and Found Traditions exhibit; 10 a.m.-2 p.m. Fri., 1-5 p.m. Sat.-Sun.; Albuquerque Museum, 243-7255.

**April 30** — Iris Society Show, 12-5 p.m., Albuquerque Garden Center (10120 Lomas NE), free, 296-6020.

**April 30** — Pops Concert Four, New Mexico Symphony Orchestra, conducted by Roger Melone; special guests, The Canadian Brass; 8:15 p.m., Popejoy Hall, 842-8565.

**May 1** — Fashion Show: traditional and contemporary American Indian clothing, by Fashion Club students of the Institute of American Indian Arts; special event for Lost and Found Traditions exhibit; 2 p.m., Albuquerque Museum, 243-7255.

**May 2** — "Human Arms," dance performance by Harry Streep and Company; 8 p.m., KiMo Theatre, 848-1374.



**DOBIS from Your Desk**

**DESK-TOP DOBIS** — The Tech Library's book and periodical catalog (DOBIS) is now accessible from the office PCs of those who meet access requirements. Tom Bickel (6258), who helped design the remote access system, can now enjoy the results of his efforts.

## Let Your Computer Do the Walking

If you're one of the lucky Sandians, you no longer have to walk over to Bldg. 804 to see what books and periodicals reside in the Tech Library's collection.

That is, if you meet the access requirements, you can now reach the Library's on-line book and periodical system, DOBIS, from your own office via Sandia's Terminal Switching Network (see "DOBIS Access Requirements" box).

Once you've mastered that link-up, you can then:

- See whether the Library has a copy of a particular book or periodical;
- See what the Library has on a particular subject;
- See whether a given book is checked out;
- Request the Library to send you a book in the interoffice mail; and,
- Place yourself on a waiting list ("on hold") for a book checked out to another user.

If all this sounds attractive, plan to attend a demonstration and training session in the Technology Transfer Center on Thursday, April 28, from 2 to 3 p.m.

So far, only the Books Catalog (which also contains periodicals) is available for remote use. A similar service is planned for the Reports Catalog, which includes both classified and unclassified reports (including SAND reports).

"Opening DOBIS for remote access is the culmination of several years of effort by those of us in the Library," says Nancy Pruett (3142). "We couldn't have done it without an active group of volunteers, who were great at both prodding and problem-solving."

The volunteers tested and made suggestions for improvement at several stages in the development process. They include William Averill (2111), Ray Berg (2534), Tom Bickel (6258), Roy Bourcier (1832), Jeff Gilkey (9132), Stephen Guthrie (8343), Harry Hjalmarson (1151), Alan Hurd (1152), Wendell Jones (1832), Sandra Lormand (8524), Vilija Markunas (6320), Doug Nicholls (9014), Craig Searls (9114), Jim Todd (6257), and David Vehar (6452).

### DOBIS Access Requirements

In order to access DOBIS outside the Library, a user must have:

- 1) A terminal drop connected to Sandia's Terminal Switching Network (TSN) with "secure unclassified" access;
- 2) Appropriate hardware and software. The Library provides full technical support for VT100 users and users with an IBM PC, XT, AT, or PS/2 running either VTERM or YTERM terminal-emulation software. Access via other hardware and software combinations is allowed, but only minimal support is available;
- 3) A DOBIS user ID and password. To get these, submit a DOBIS LIB3 Password Request Form. Forms are available at the Library Information Desk, or by calling 4-2869 or 4-3949.

For further information, contact Nancy Pruett (3142) on 4-2684.



**FAMILIAR FIXTURE** at the Bldg. 800 snack bar — officially known as the Sandia News Stand — is Tony Castillo, who marks 30 years of snack bar service on April 28. Tony operates the facility through a contract with NM Division of Services for the Blind. "I'd like to stick around for another 30 years," says Tony with a smile. "It's a great job."

# Sandia Secretaries: A Blend of Experience and Education

The secretarial profession faced some dire predictions a few years ago: Office technology would eliminate many secretarial jobs, narrow others drastically, and limit career mobility.

Not so. Sandia's secretaries continue to play a vital and ever-more-sophisticated role in the business of keeping the Labs' organizations running smoothly and producing their principal product — new knowledge.

But over the years the secretarial role has changed — and Sandia secretaries have used a combination of experience and continuing education to meet the challenges of those changes.

Marcie Samuelson (3428) is a case in point. She joined Sandia in 1949 when Labs employees numbered in the hundreds rather than the thousands.

"The changes during my 39 years at Sandia can be seen most vividly by looking at the changes in the tools we used over that period," says Marcie.

"When I first came to Sandia, I brought my principal tool with me — an Esterbrook fountain pen. Sandia provided the rest: a manual typewriter and a bottle of Skrip ink. [Remember putting the lid on tight and tipping the bottle to fill the little reservoir inside the top?]

"In those days," recalls Marcie, "we punched time cards and worked at single-pedestal wooden desks. You weren't considered properly initiated until



IRENE MEYERS (7213, left) shows Becky Jerome (5268) pictures of events during her tenure as president of the Albuquerque Chapter of Professional Secretaries International. Irene became a Certified Professional Secretary (CPS) in 1971. Becky became certified in November 1987 by successfully passing all six sections of the CPS exam administered by the Institute for Certifying Secretaries, a department of Professional Secretaries International.

is (A) integrated or (B) not integrated:

1. CAD/CAM
2. COM/CAR
3. Icons
4. office system pyramid

A tough exam? You bet! It's predicated on the premise that a competent secretary should have a basic knowledge of business law, economics and management principles, business organization, behavioral science, office technology, and accounting — the six subject areas covered by the exam.

In recognizing the CPS as a badge of professionalism — an indication of quality in its secretaries — Sandia began offering in the spring of 1986 a series of out-of-hours courses designed to review all six subject areas of the CPS exam. The final course of the series, Economics and Management, is now in progress. The course is being taught by Etta Moore (3452; CPS 1972).

Others who have taught in the program are Sue Henderson (3700; CPS 1985) and Linda Caudell (5127; CPS 1985) — Behavioral Science in Business; Wanda Whitham (6400; CPS 1973) — Office Administration and Communication; and Robin Cassell (5260; CPS 1971) — Business Law and Office Technology.

The CPS exam will be offered in May and again in November.

Twenty-five Sandia secretaries have already earned the CPS by successfully completing all six parts of the exam.

How difficult was it to prepare for the exam? That depends on whether the preparation was before or after Sandia began offering the review courses.

Irene Meyers (7213) took the exam in 1971. "I took two college courses in accounting — and paid the tuition fee myself — to prepare for that part of the exam," says Irene. "In addition, because I had to go to Dallas for the exam, I also had to pay for air fare, hotel accommodations, and meals — to say nothing of the time involved."

Becky Jerome (5268), who took the exam last November, had a quite different experience. She took five of the courses offered in the review program, reviewed economics on her own, and took the exam right here at Sandia — now the only testing center in the state. (But she's completing the final course of the review series just for her own satisfaction.)

"I'm intrigued," she says, "by the fact that the College of Santa Fe offers CPS holders college credit toward a degree in a related field. That may be an interesting possibility for the future."

Both believe, however, that the most important benefits of becoming certified are the boost to the secretary's pride and improvement in job performance.

As President Welber noted at the inauguration of the review program (LAB NEWS, April 25, 1986), "We need people who develop new skills, exploit their potential, and see their work as something in which they take pride. . . . Job performance is still the bottom line." ●DR

[Quiz answers: B and BABB]

*In Honor of Professional Secretaries' Week  
President Irwin Welber and the 1988 Secretarial Committee  
invite all Sandia Secretaries to*

**Meet the President**

*Monday, April 25, or Tuesday, April 26, 1988*

*9:00 a.m. - 10:00 a.m. at the TTC*

*Mr. Welber will begin speaking promptly at 9:00 a.m.,  
followed by an informal reception.*

*Coffee and donuts will be served.*

you had spilt your ink and made a big stain on your desk. That stain was like an announcement to the whole world that you were now a fully initiated member of "The Corporation."

"Back then," continues Marcie, "we didn't have to fix the copiers, because there weren't any. We made up to 14 copies of documents using bond, carbons, and onion skin paper — on a manual typewriter. And there was no 'white-out.'"

Marcie also remembers her first electric typewriter: "We thought we had reached the ultimate in high-tech equipment."

Then came IBM Selectrics — and print wheels — and then memory typewriters.

Marcie now uses an IBM PC and a LaserJet printer.

Would she like to go back to the good ol' days? "Absolutely not," she says. "I never want to see another piece of carbon or onion skin paper!"

## CPS Review Program

Equipment isn't the only thing that's changed.

It's now easier for secretaries to continue their educations and advance their professional status by working toward becoming a CPS, a Certified Professional Secretary.

Not that the CPS exam itself, a grueling two-day affair — and the last step in the certification process — is easy. Candidates must correctly answer hundreds of questions like these:

- The tendency to credit a person for many traits on the basis of his/her demonstration of one trait is known as:
  - A. the Hawthorne effect
  - B. the halo effect
  - C. Maslow's theory
  - D. Theory X
- For each condition below indicate whether it

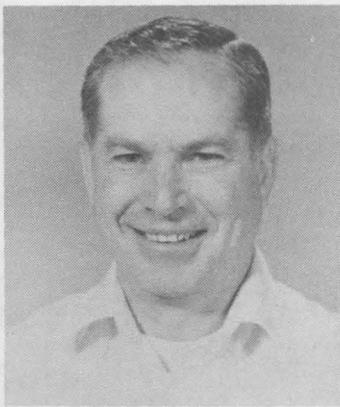


LIKE CANDLES ON A BIRTHDAY CAKE, the telephone directories Marcie Samuelson (3428) displays represent just about half of her 39 years at Sandia. She joined the Labs in 1949 when Sandia was known as "The Corporation" and company telephone books were thin little volumes listing hundreds rather than thousands of employees.

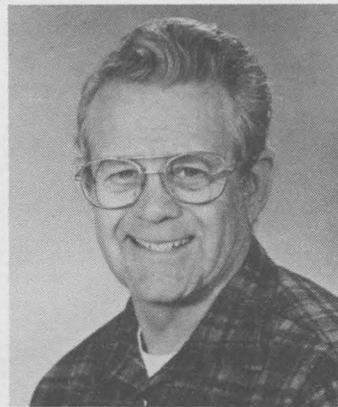
# MILEPOSTS

## LAB NEWS

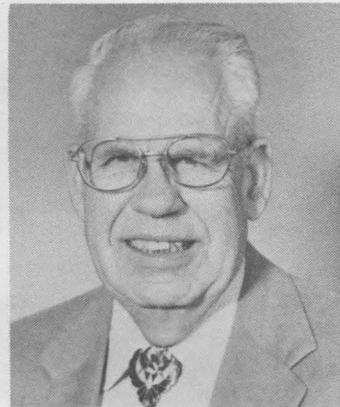
APRIL 1988



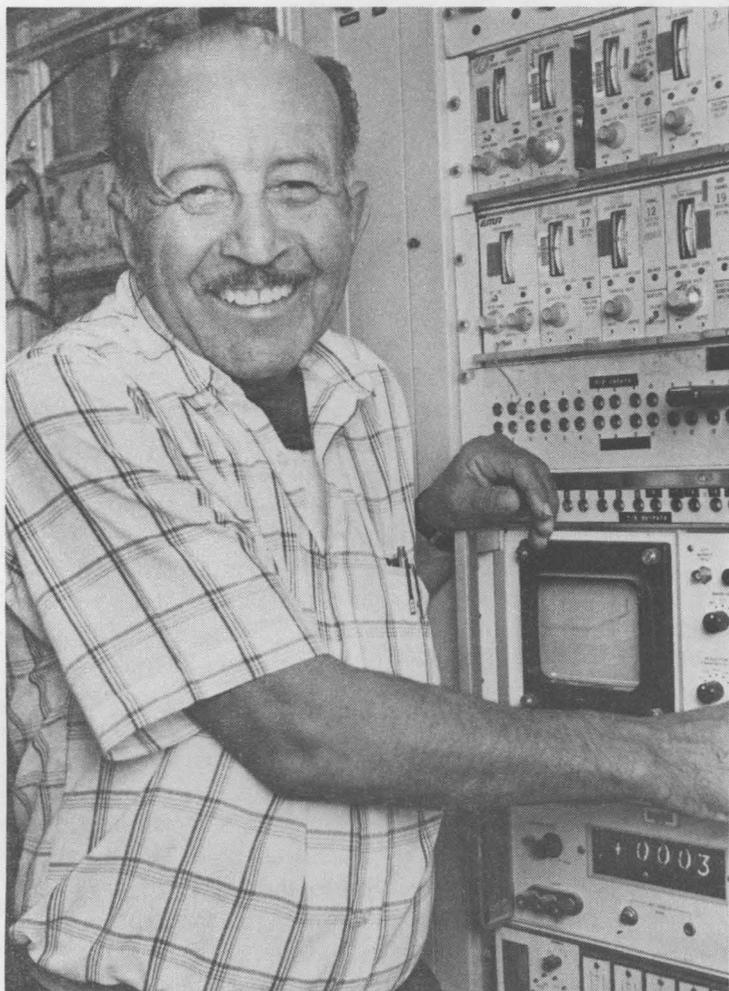
James Lohkamp (5151) 25



Roy Smith (2632) 20



John Banister (7111) 35

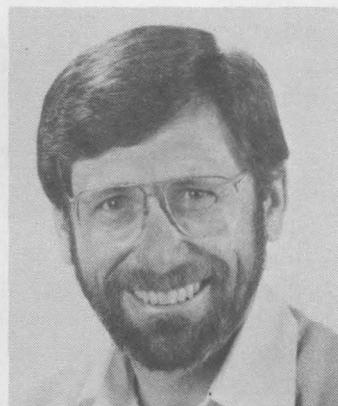


Adolfo Martinez (7523)

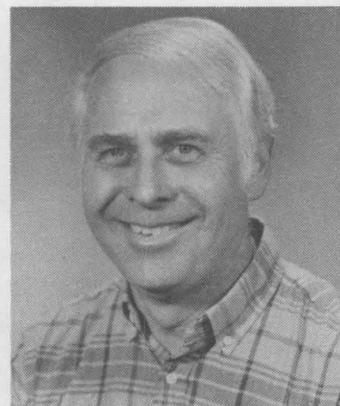
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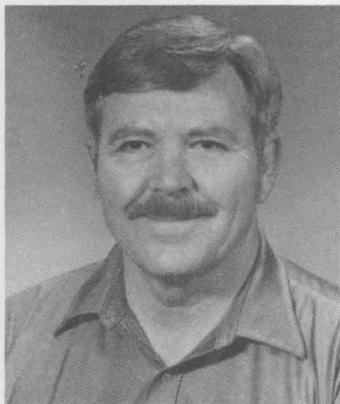
Bill Roche (7413) 30



Steve Folkendt (8536) 25



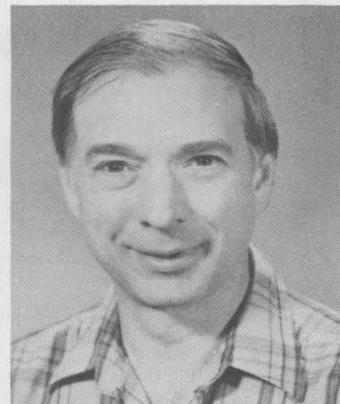
Winn Erdman (7535) 30



Carl Longerot (2116) 30



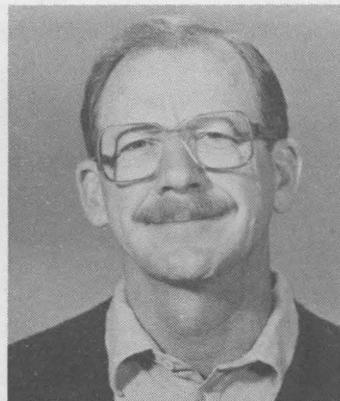
Billy Pontsler (DMTS, 8162) 35



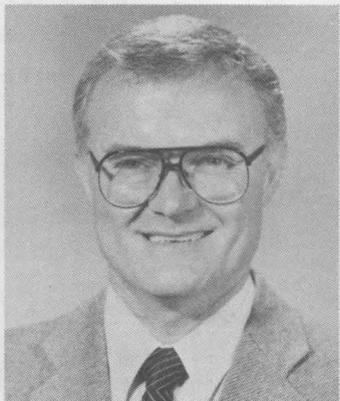
George Kaye (5151) 15



Dick Andes (120) 30



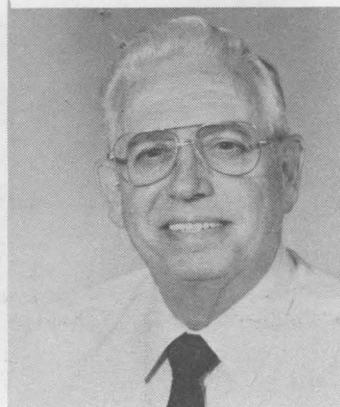
John Cawfield (7533) 20



Donald Love (121) 25



Ellis Heustess (5215) 25



Ben Gardiner (7411) 35



Don Putz (8443) 20



Ed Wittwer (9213) 35

# Fun & Games

**Running** — The Fourth Annual Runners' Pentathlon is scheduled for May 1 at Albuquerque's Milne Stadium. The distances are 3200, 800, 200, 400, and 1600 metres, in that order; first race is at 8 a.m. All finishers receive a custom patch. Top three scorers in each five-year age group (men & women) will be awarded medals. Runner with the highest score will be named Meet Champion; a handicap

scoring system gives all ages a chance to win. Entry is free to 1988 NMTAC (New Mexico — The Athletics Congress) members and \$6 to all others if registered before April 28; add \$3 on race day. Forms are available at Gardenswartz Sportz, Gil's, Sun Sports, and both Base gyms. For more information, call Tom Bell on 821-2454 nights.

\* \* \*

**Flying** — Meet people involved in all aspects of flying and find out how to become a pilot at the Kirtland Aero Club open house on May 7. Rides are available for \$7.50/adults and \$5/children under 12. During the May membership drive, the membership initiation fee is \$25 and the first month dues are free. The Club is located on KAFB West, Hanger 482. If you have questions, call 242-4184 or 4-0884.

## UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

**Deadline: Friday noon before week of publication unless changed by holiday. Mail to Div. 3162.**

### Ad Rules

1. Limit 20 words, including last name and home phone.
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.

### MISCELLANEOUS

TELEPHONE, Northern Telecom Contempra, white, rotary-pulse dialing, desk/wall mount, 76" cord, modular plug, adjustable bell volume, \$10. Schkade, 292-5126.

HOTPOINT BUILT-IN DISHWASHER, needs hose and door latch. Jones, 298-4741.

PAVING BLOCKS, 12" x 16" x 2-1/2", \$1/ea.; 8" x 12" x 2", 50¢ ea.; misc. block & brick, 10¢ to 50¢ ea.; tree well blocks, \$3.50/set. Mozley, 884-3453 leave message.

SEMI-WAVELESS WATER BED, king-size, 4-drawer, mirrored bookcase headboard, heater, mattress pad, 3 sets sheets, \$350. Blatt, 765-9439.

FURNITURE: couch, chairs, end tables, lamps, etc. Robb, 821-2999.

HEAVY-DUTY BLACK PLASTIC, 12' wide x 100' long, \$25; new misc. sprinkler supplies. Collins, 292-0495.

MODINE GAS FURNACE, 50,000 Btu, hangs from ceiling, \$140; Sears water softener, \$50. Skogmo, 292-9773.

AM/FM RADIO & RECORD PLAYER, console, \$250; metal desk, \$65; sink countertop, 87", \$100; E.V. speaker, \$40. Gallegos, 294-0233.

TWO RIMS, 4-lug, new, \$15/ea. OBO; double sink, yellow, \$25 OBO. Long, 294-4591.

SHERRILL LOVE SEAT, gold velvet; Rowe sofa, olive and lime. Wagner, 823-9323.

SAILBOARD, Tiga Model One, complete, beginner to intermediate, \$375; antique Hoosier kitchen cabinet, w/flour dispenser, \$1000. Malone, 344-6318.

KAYAK, paddle, flotation bags, neoprene spray skirt, type-III life vest, \$300 OBO. Benecke, 344-7316.

SOFA SLEEPER, full-size, gold, \$75; 2 beige velvet recliners, \$50/ea., \$90/both. Koepf, 294-7136.

DOUBLE-GLAZED WINDOWS, metal-clad wood frame: nine 18-1/4" x 38-3/4", \$20/ea.; one 48-1/4" x 60", \$50; two 24" x 60", \$35/ea. Zimmerman, 897-1704.

VACUUM-TUBE FM TUNER, Eico model HFT-90, free to good home. Loucks, 281-9608.

FOLD-DOWN CAMPER, '79 Starcraft, \$2500. White, 877-4149.

KING-SIZE WATER BED, w/frame, \$150. Boslough, 884-0417.

FOUR-POSTER DOUBLE BED, white w/gold trim, mattress, box spring, \$45. Barr, 821-5870.

TWIN-SIZE MATTRESS and box spring, \$35; 5-gal. aquarium, complete set-up, \$15. Boal, 296-4660.

CAB-OVER CAMPER SHELL, removable bed, lights, curtains, windows, double door, \$500. Jimenez, 892-5726.

CRAFTSMAN SABER SAW, 1/2-hp, \$20. Rhoads, 298-6157.

ENCYCLOPAEDIA BRITANNICA, 1982, leather-bound, complete set w/all yearbooks, \$900 OBO. Gunn, 839-0363.

UPRIGHT FREEZER, Signature, white, 16 cu. ft., \$350; Admiral refrigerator, almond, 15 cu. ft., \$250; \$525/both OBO. Salazar, 892-4417.

CAB-OVER CAMPER, 7', 2-burner stove, icebox, water, storage, sleeps 2-4, fits Ford Ranger S-10 and imports, \$1050. Kulju, 299-8182.

COMPUTER FLOOR PANELS. Tuthill, 281-2562.

SAT TUTORIAL SOFTWARE, for Commodore 64/128, \$20; Bissell carpet shampooer, \$40; electric 4-qt. ice cream freezer, \$18; roof-mount basketball goal, \$20. Caskey, 296-6372.

TWO GREEK FLOKATI WOOL RUGS, pale gold, 8-1/2' x 5-1/4' (8-1/2' x 10-1/2' laced together), \$125/ea.; 2 matching Flokati floor pillows, \$10/ea. Lambert, 344-9012.

NU-WA TANDEM TRAVEL TRAILER, '83, 19', self-contained, foam insulation, refrigerator, other features. Goldenberg, 821-6207.

TAHLI INDUSTRIAL SEWING MACHINE, high-speed, motor, controls, make offer. Kraft, 299-2157.

CARPET: all wool, avocado, 15' x 16'; oyster, 12' x 17'; 2 pieces avocado shag, 12' x 16'; \$1 to \$3/yard. Montoya, 884-5174.

FOUR 6.50-16 LT TIRES, w/tubes, new, never installed, \$200. Rightley, 822-0383.

AUTOMATIC SPRINKLER TIMER, Lawn Genie, electronic, 6-station, never used, still in box, \$20. Wilde, 281-4511.

WINDOW AIR CONDITIONER, 12,000 Btu/hr., 115-volt, \$200. Ernest, 293-1757 evenings.

ROOF RACK, for Plymouth Horizon, new, still in box, \$75; Drawtite hitch, fits Horizon or Chev. Citation, \$20. McMullen, 298-2801.

FULL-SIZE MATTRESS FRAME, w/4 casters (2 are locking), \$25. Spilka, 888-9573.

SWING SET: one glider and 2 swings, seats need repair, free if you haul. Van Domelen, 299-3674.

ZOOM LENS, Kiron 28-85mm, for Canon, case, filters, \$50; acoustic guitar, case, strap, \$65. Brooks, 883-1485.

STEEL-CASEMENT WINDOWS, different sizes available. Lucero, 242-2012.

WOMAN'S DESIGNER DIAMOND WEDDING RING SET, new, one-of-a-kind, appraised at \$1600, asking \$1000. DePuydt, 892-4268 after 6.

FREEZER, 5 cu. ft., white, \$100. Nixon, 892-4685.

INDIAN JEWELRY, furniture, Wurlitzer organ, misc., estate sale, April 23, 9 a.m., 9400 Admiral Lowell NE. Patterson, 822-1196.

INFOCOM GAMES for IBM PC and compatibles, including clue books. Drotning, 294-4807.

YARD SALE, April 30, 9 a.m.-5 p.m., 828 Pawnee NE (south of Lomas between Chelwood and Tramway). Beatty, 299-3429.

HP 9816 COMPUTER, model 200, 768K RAM, extended keyboard, \$3000; 256K RAM boards, \$100/ea. Anderson, 268-1033 or 296-1760.

SKYLIGHTS, 24" x 48" and 24" x 24", \$80 and \$50; freezer, 17 cu. ft., \$130. Burchard, 884-5424.

WHITE BROCADE CHAISE LOUNGE, appraised value \$250, sell for \$125. Walter, 884-4282.

.357-MAG. S&W MOD 66, 4" barrel, w/nylon holster, 2 sets of grips,

speed loader, \$200. Davis, 298-3342.

POOL TABLE, bar-size, \$75. Pilson, 296-0210.

HARD CASE for video camera & accessories, cost \$135 at Baillio's Cost Plus Warehouse, sell for \$60. Bray, 292-2410.

SOLAR POOL BLANKET, fits 16' x 32' kidney-shaped pool, \$20. Dippold, 821-5750.

PORCH SWING, maple stain, \$12. Peterson, 256-7514.

LANDSCAPE GRAVEL and lava rock, free, you haul; colonial drop-leaf table; brown leather love seat and chair. Pruet, 293-6244.

GARAGE SALE, April 23, 8 a.m. to ?, 8128 San Francisco NE. Oliphant, 821-2751.

RCA COLOR MONITOR, 25", 3-head VCR w/unified remote, sell either or both, \$250/both. Westfall, 884-8701.

SOFA SLEEPER, custom-made, \$400; chaise lounge, \$150; wooden dressers, \$75-\$325; Magnavox stereo, \$60; prices negotiable. Davis, 265-9055.

FOUR TIRES, 2 Uniroyal Tigerpaw, 2 PwrKing: mounted, 5-hole, chrome, WW, steel radials, P235/75R15 M+S, 4-ply, \$50/ea. Hernandez, 268-5000.

### TRANSPORTATION

'86 NISSAN 200SX-XE, 2-dr., hatchback, sunroof, digital dash. Hassig, 292-3350.

'74 GMC PICKUP, 3/4-ton, PS, PB, AC, 4-spd., recent overhaul on 454 engine, \$1700. Smith, 384-5182.

'88 KX80 BIG WHEEL, 3 months old, never raced, \$1400. Marquez, 836-5153.

20" MOUNTAIN BIKE, CyclePro Skyline, 2 yrs. old, mountain-tested, rear knobby tire, bottle cages, new Unicorn fork, thorn-proof tires. Goodson, 291-9397.

TWO TRIALS MOTORCYCLES: '74 Yamaha, \$350; '74 Suzuki, \$250. Pryor, 294-6980.

'83 RX-7 GS, sunroof, AM/FM cassette, louvres, cruise, bra, 53K miles, \$6600 book, sell for \$5900. Ek, 892-3529.

'78 BMW R100RS, European model, extras, \$3500. Kovacic, 256-9867.

'81 YAMAHA X5400SH, 10K miles, \$600. Garcia, 268-3848.

'80 MAZDA B2000 PICKUP, 5-spd., AM/FM, extra set of steel-belted radials, includes camper shell, \$1795. Martin, 897-7660.

'82 PONTIAC J-2000, hatchback, \$300 below book; '82 Toyota pickup, LWB, AT, AM/FM, \$300 below book; 3-spd. bike, \$90. Gallegos, 294-0233.

'85 YAMAHA BIG WHEEL, 200cc, original tires, \$800 firm. Muirhead, 281-2925.

'83 MERCURY COUGAR XR7, power windows, power seats & locks, cruise, tilt, AM/FM tape. Bids accepted through April 29. We reserve the right to refuse all bids subject to final sale. SLFCU, 293-0500.

'79 CAMARO Z-28, all options, \$3200. Prevender, 296-8586.

'87 THUNDERBIRD, turbo coupe, 13K miles. Rollstin, 884-8293.

'87 NISSAN 200SX XE, hatchback, AC, 5-spd., louvers, bra, cover, white, 14.5K miles, \$10,100. Lifke, 822-1946.

'86 ISUZU TROOPER II, 46K miles, AM/FM cassette, AC, best offer. Blanks, 884-2300.

'83 KAWASAKI 750 GPZ, Kerker headers, \$1595. Hammons, 281-1205.

'79 YAMAHA XS, 1100cc, loaded, AM/FM cassette, cruise, adult-ridden, \$1500. Jaramillo, 1-864-3318.

'85 FORD RANGER, 4x4, w/camper shell, AC, V-6, 5-spd., aux. fuel tank,

27K miles. McClenahan, 294-8454.

'79 HONDA XR500 OFFROAD MOTORCYCLE, 4-cycle engine, 300 miles, \$750 OBO. Goldstein, 821-9531.

'85 FORD RANGER, PS, PB, AM/FM tape, 2.8L V-6, 13.5K miles, heavy-duty cooling, camper setup, 18-20 mpg, \$5650. Kulju, 299-8182.

'79 SUZUKI GS550E, 14K miles, one owner, garaged, new chain, rear tire, and battery. Jones, 299-1954.

BICYCLES: boy's 20" Rampar motorcross, \$40; man's English-made Raleigh 3-spd., \$45. Caskey, 296-6372.

'84 HOBIECAT 16 SAILBOAT, Highlander trailer, mast-raising system, storage container (3' x 4' x 2.5'), clamshell carrier, more, \$3500. Horton, 884-8989.

'85 MAZDA RX-7 GSL-SE, fully loaded, \$10,500. Konopka, 275-0960.

'83 VW QUANTUM WAGON, PS, PB, AC, cruise, 5-spd., AM/FM cassette, \$5400 OBO. Drotning, 294-4807.

'81 VOLVO DLT, turbo, 5-spd. w/OD, loaded, sunroof, new tires, \$6500. Jaramillo, 898-3168.

'80 CORVETTE, 69K miles, blue, 4-spd., AM/FM cassette, bids accepted through April 29, we reserve the right to refuse all bids subject to final sale. SLFCU, 293-0500.

'79 CORVETTE L-82, AT, all options, original condition, 46K miles, \$10,500 OBO. Wilde, 281-4511.

'71 GHIA CONVERTIBLE, second owner, new windshield, rebuilt engine, Blaupunkt radio, radial tires, \$5000 firm. Sandoval, 293-6003.

19' BOAT, Mark Twain w/302 Mercruiser inboard, needs some work, \$2500. Gibson, 888-0603.

'79 MERCURY MONARCH, 4-dr., AT, PS, PB, AC, cruise, AM/FM stereo, 6-cyl., \$1150. Prod, 296-3815.

FUJI BICYCLE, model S12S, 26", 12-spd., black w/chrome-tipped forks, custom seat, padded grips, \$150 OBO. Adams, 821-9079.

GIRL'S BICYCLE, Schwinn 3-spd., blue, 26" frame and wheels, \$30. Van Domelen, 299-3674.

'86 VW VANAGON WESTFALIA CAMPER, fully loaded, \$1200 under blue book, \$12,950 firm. Patterson, 822-1196.

MAN'S 10-SPD. BICYCLE, \$40. Peterson, 256-7514.

'72 CHEV. MALIBU, 307 V-8, PS, AT, new tires, AM/FM cassette, custom wheels, \$1000 OBO; '79 Honda XL-500, 12K miles, new rear tire, luggage rack, \$600 OBO. Murphy, 294-3667.

'74 CADILLAC ELDORADO, 2-dr., power locks and windows, \$1800 OBO. Davis, 265-9055.

BOAT, 20' Nordic Daycruiser, completely rebuilt 460 engine and Dominator jet, new cables, inside storage, at Elephant Butte. Miller, 281-3959.

ft. Gendreau, 268-3436.

3-BDR. HOUSE, garage, patio, pool, tennis, clubhouse, available for sale June 1. Cropp, 296-1877.

3-BDR. HOME, NE, 1-3/4 baths, den w/wood stove, remodeled kitchen and baths, assumable FHA, \$2500 down plus closing, \$77,500. Mitchell, 275-1527.

3/4-ACRE LOT at Angel Fire, includes water & electricity, price negotiable. Whitson, 822-0666 or 265-2955.

1-ACRE LOT, NE, fenced, 5-stall barn, power, water, owner will carry REC. Baker, 294-3334.

3-BDR. HOME, far NE Heights, 1-3/4 baths, LR, DR, FR w/FP, mountain views, cul-de-sac, 11-1/2 percent assumable, \$92,500. Gregory, 821-2125.

2 ACRES, Quail Run Estates, utilities available, proven water, meadow w/pinon and ponderosa. Roesch, 296-8248.

2450-SQ.-FT. HOUSE, Four Hills, city and mountain views, call for directions. Weisiger, 298-8243.

3-6 MOUNTAIN ACRES, north of I-40, 18 miles from SNL, will finance, \$7000-\$7500/acre. Sanders, 298-7734.

3-BDR. HOME, near Winrock, formal dining, country kitchen, 3+ car garage, FHA 9.5%, \$39,000 CTL, \$131,000. Collins, 266-5868.

1 OR 2 RESIDENTIAL LOTS at Elephant Butte, near lake, golf course, and T or C. Moreno, 294-4268 evenings or weekends.

2-BDR. TOWNHOUSE, Moon & Comanche, 1100 sq. ft., FP, skylights, 2-car garage, sprinklers front, back lawn w/deck, garden, assumable loan. Ashment, 293-2295.

2-BDR. PATIO HOME, off Tramway, 1650 sq. ft., 1-3/4 baths, views. Pike, 292-5080.

3-BDR. HOME, Candlelight Hills (NW of Eubank/Spain), 2321 sq. ft., 2 baths, LR, DR, FR w/FP, 2-car garage, open floor plan, cathedral ceiling, views, \$133,000. Spencer, 821-9115.

3-BDR. TOWNHOUSE, Eubank/Montgomery area, 2-1/2 baths, 2-car garage, Jacuzzi, redwood deck, alarm, 1750 sq. ft. Jojola, 292-7962.

3-BDR. HOME, 2-1/2 baths, 2-car garage, Jacuzzi, FP w/log lighter, skylights, 2167 sq. ft., views, assume 8% no-qualifying loan, \$119,000. Pierce, 299-2801.

10 ACRES, Highway 53, south of Grants, near Ice Caves, telephone, electricity, pines. Jeys, 1-285-5931.

### WANTED

HOUSEMATE, male, nonsmoker, close to KAFB, private bath, yard, bike path, partially furnished. Shaffer, 298-8302.

UNDER-COUNTER DISHWASHER, built-in wall oven. Moss, 298-2643.

ROLLAWAY BED, good condition. Long, 294-4591.

HOUSEMATE, nonsmoker, share 3-bdr. home, NE, 1-3/4 baths, \$200/mo. plus 1/2 utilities. Mitchell, 275-1527.

PLEATED SKIRT, sometimes called broom skirt, very small, very full, interested in skirt alone, blouse and skirt set, or dress, about size 8. Miller, 822-0008.

4-DRAWER METAL FILE CABINET. Montoya, 884-5174.

1976 US BICENTENNIAL MEMENTOS, any kind as long as they're reasonable. Schubeck, 821-3133.

DIESEL SUBURBAN, '85 or later. Asprey, 296-6673.

RELIABLE YARDBOY w/lawnmower to mow and trim lawn, Academy/Ventura area, \$10/week. Patterson, 822-1196.

OLDS. '86 OR '87, Cutlass Supreme, low mileage. Buckner, 828-0486.

### REAL ESTATE

10 ACRES, 7 miles south of Moriarty, near gas and electric, \$10,000 cash or \$12,500 terms. Smith, 384-5182.

3-BDR. HOME, east of Tramway near Lomas, 1232 Stutz Dr., 1400 sq. ft., brick ranch-style, \$78,000. Smith, 281-5065.

4-BDR. INMAN BRICK HOME, Academy Hills subdivision, 2-1/2 baths, 2400 sq. ft., sunroom, La Cueva/Eisenhower/Humphrey schools, \$149,900. Goodman, 821-4823.

2-BDR. CONDO, Cascade Village at Purgatory Ski Area, 2 baths, mountain views, \$110,000. McCoy, 821-2509.

10.436 ACRES, off Highway 14 to Highway 22, utilities available, 360-degree views. Montoya, 471-0669 after 6.

3-BDR. HOME, SE, den, 1-3/4 baths, 1-car garage, new kitchen, 1500 sq.

## Sagebrush-Shuffle Special: Isletans Back in Town

CATCH THE NEAREST STAGECOACH tonight and head on over to the Coronado Corral for some stimulating stompin' — courtesy of the Isleta Poor Boys (8 p.m.-midnight). Beforehand, chow down at the two-for-one special dinner; entree choices are filet mignon or fried shrimp. Reserve your dinner space with a call to the office (265-6791) immediately — preferably sooner.

THE TAILGATE TROOP (better known as the Coronado Wolfpack) gets together tomorrow (April 23) before the annual Cherry-Silver football game at University Stadium. The party starts at 1 p.m. (in the parking lot, of course), with Wolfpack-furnished hamburgers, buns, condiments, beer, wine coolers, and soft drinks. You bring a side dish to compliment those famous burgers, chairs, eating utensils, paper plates — you know, the usual picnic stuff. Oh yes — the game starts at 3 p.m.

TWO WESTERN NIGHT WINGDINGS are set for April 28 and May 5. Action both nights starts at 6 p.m., with free hour-long country/western dance lessons. Afterward, try out your newly acquired stomp skills from 7 to 10 p.m. (accompanied by the strains of Trio Grande). Free munchies and special drink prices throughout the evening.

DON'T SIT UNDER THE APPLE TREE — Instead, hum a little of Elmer's Tune, wear your String of Pearls, and sip a Moonlight Cocktail to get In the Mood for a big-band evening next Friday night (April 29) with Don Lesmen and crew (8-11 p.m.). The two-for-one special ahead of time features prime rib or poached halibut (maybe accompanied by a Little Brown Jug of something?). Dinner reservations requested.

T-BIRD CARD SHARKS plan more shuffle shenanigans on Thursday, April 28, starting at 10 a.m. These convivial conversationalists clearly know what a good time's all about, so plan to join them

### Take Note

The Education Forum of New Mexico, an organization that provides ongoing individual citizen leadership in education, will hold its annual meeting on April 30, from 1 to 4 p.m., at the Women's Club of Albuquerque (4600 Copper NE). Mary Ellen Saterlie of the Baltimore County Schools will describe the values-education program in her district. The Forum will culminate its three-year Literacy Study by distributing brochures with its final recommendations. For further information or reservations (cost is \$7.50), call 255-7799 (a.m. only) or 299-5274. Meg Wente (wife of Hermann, 1555) is president of the board of the Forum.

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The UNM IEEE Student Branch will celebrate its 25th anniversary on May 14 with a picnic at KAFB's Bicentennial Park from 11 a.m. to 3 p.m. All Albuquerque-area IEEE members are invited. Refreshments include hamburgers, hot dogs, and drinks. A special recognition ceremony will be held at 12 noon to charter IEEE student branch members. For reservations, call 277-1438 daytime.

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"Art in the Afternoon," an auction and raffle of fine art to benefit Special Olympics, is scheduled May 8 at La Posada's grand ballroom. Preview of auction items begins at 2 p.m.; auction and raffle start at 4 p.m. Items include oil and watercolor paintings, pottery, and jewelry by New Mexico artists. Admission is \$10 (includes \$5 raffle ticket). Tickets may be purchased at the door, or call auction chairman Mary Wilson (6312) on 299-0557 or Nisa Brown (6322) on 293-3941.

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Ducks Unlimited Kirtland Chapter will hold a fund-raising banquet on May 12 at the VFW Hall

for a little wheeling-and-dealing whoopee.

### Allocating Your Assets

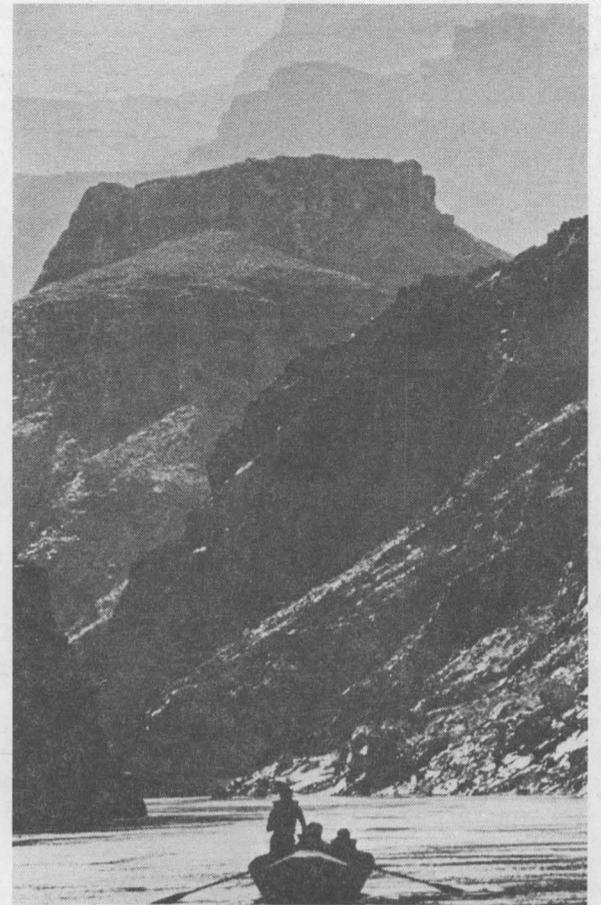
For those close to retirement, Guy Trujillo of Financial Network Investment Corp. discusses "Asset Allocation" — a high-tech approach to developing a portfolio consistent with needs and changing economic conditions — on May 3 at 5 p.m. in the Eldorado room. RSVP to Guy at 291-8585.

LET'S GET AWAY FROM IT ALL: That's your motto, once you've signed up for one of the terrific trips sponsored by the C-Club Travel Committee. Coming up:

*Laughlin, Nev. (April 29-May 2)* — If your gambler's luck holds, you may still find some available space on this one. Price of \$162/person (double) includes bus fare, three nights' lodging, side trips, and some meals.

*Canadian Rockies (Aug. 27-Sept. 4)* — Hurry; it's filling fast! For a breathtaking nine days, absorb magnificent mountain scenery — thought by many to out-Alp the Alps. The tab of \$876/person (double) covers RT air fare to Calgary, motor coach ground transportation, boat cruises and a snow coach tour, eight nights' lodging, and much more. Reserve your space with a \$300/person deposit; final payment's due July 27.

*White-Water Rafting (Aug. 8-17)* — Veteran river-runner John Shunny (ret.) leads this 280-mile boating adventure through the Colorado River's Grand Canyon (Lee's Ferry to Lake Mead). The \$895/person price includes meals throughout the river trip, as well as bus transportation from Lake Mead back to Lee's Ferry. John outlines the details at a briefing (with videotape) next Wednesday (April 27) at the C-Club at 4:45 p.m. Reservation deadline is May 7. To reserve a slot or to get further info, call John on 265-1620.



GRAND CANYON TRIP coming up: See C-Club news for details.

## Welcome

### Albuquerque

Eric Chavez (3426)  
Myra Chavez (21-1)  
Ellen Cook (21-1)  
Calvin Lewis (3426)  
Rachel Lujan (3426)  
Peggy Martinez (22-2)  
Justine McNabb (22-2)  
Paula Newcomer (1131)  
Bradford Skinner (7864)  
Rebecca Spires (3544)  
Sylvia Thomas (21-1)

### Maryland

John Scully (1832)

### Massachusetts

John Ludwigsen (5165)

### New Mexico

Suzanne Duggan (21-1)  
Bernice Lucero (22-2)  
Peggy Rhodes (22-2)

### Texas

Randal Roberts (7831)

## Sympathy

To Jim Plimpton (7110) on the death of his father in Albuquerque, March 18.



WORK EXPERIENCE TRAINEES (from left) Rosalin Castillo, Kurt Thunberg (both 6440), Ray Garcia (7833), Nancy Rodarte (3532), Christine Tamez (21-1), Juliette Zamora (4000), and Susie Serna (1120) head for Louisville, Ky., next week to attend the national Office Education Association (OEA) conference. They, along with trainee Valerie Johnston (3438, not pictured), placed in the top three in statewide office skills competition (different categories) last month, and will represent New Mexico in national competition at the Louisville conference. Sandia's 15 work experience trainees — all high school seniors — attend classes in the morning and work afternoons at the Labs, according to Soila Brewer (3533), program coordinator.