Particle Microanalyzer Quick, Accurate

The need for quick and accurate chemical identification of small particles has led Dave Tallant of Surface Chemistry and Analysis Division 5823 to develop a laser fluorescence/Raman microanalyzer.

"The uniqueness of our microanalyzer is that it uses continuous and pulsed laser beams in conjunction with a microscope," says Dave. "We direct the beams through the microscope, giving us high resolution for small particles. And by small particles, I mean down to micrometer dimensions.

"Our test setup consists of off-the-shelf components. Essentially, a laser beam is directed at a sample of material. The scattered light is collected by a lens which focuses it on a monochromator, a prism-like component that separates it into a spectrum. A photomultiplier detects the wavelength-separated light and gives the particle's spectrum enabling us to identify the sample. The test setup is placed on a rigid optical table which floats on pneumatic mounts. The table damps out room vibrations that can cause the beam to jitter or wander."

The microanalyzer uses two light-scattering techniques—Raman and fluo-

[*Continued on Page Four*]

OBSERVING an epoxy particle magnified 100 times are Karen Higgins and Dave Tallant (both 5823). Karen is operating the laser fluorescence/Raman microanalyzer which displays magnified images on the TV screen. The microanalyzer, which uses continuous and pulsed laser beams in conjunction with a microscope, provides quick and accurate chemical identification of small particles.

LAB NEWS

VOL. 34, NO. 8 SANDIA NATIONAL LABORATORIES APRIL 16, 1982

Welding Technique Improved

New Laser Diagnostic Test Developed

Laser welding, used in the assembly of components and satellite instrumentation, calls for high reliability to insure that the component works—whether in a test or in a spacecraft hurtling through the cold vacuum of space.

One of the programs in Process Metallurgy Division 5833 is the development of laser weld schedules for some exotic as well as the more traditional materials. Put simply, a weld schedule is a recipe of selected welding conditions (such as power density and welding velocity) to produce a weld having certain desirable characteristics.

Traditional methods for developing weld schedules involve not only a great deal of materials science and heat transfer knowledge, but also a great number of trial and error welds coupled with generous doses of common sense.

Larry Pope and Tom McDonald (both 5833) are taking a more fundamental approach to laser weld schedule development by trying to understand what mechanisms within the laser beam correlate to certain weld characteristics such as spatter, hot cracking, brittleness, and porosity. To this end, Larry and Tom have developed a new diagnostics system that accurately measures the diameter and the relative spatial power distribution across any portion of the laser beam. They are currently obtaining data across the focused spot where the welding should generally occur. The research team's laser welder is a modified 400 watt pulsed neodymium: YAG (yttrium-aluminum-garnet) Raytheon SS500, called "super sport" for short.

"A solid crystalline YAG rod containing tiny amounts of neodymium," says Tom, "is optically pumped by high voltage flash lamps to excite the neodymium atoms into lasing. The beam is invisible because it's in the near infrared region of the spectrum, but it is not invisible to our special sensing device. This laser beam is then focused through a lens into the shape of a spot—it's in the region of the focused spot where we do our welding and also our beam diagnostics. Our laser produces a pulsed beam—in layman's terms little bullets of laser light are focused to melt the material to be welded. This is analogous to holding your hand in sunlight—you don't feel much heat because of the diffuse nature of

[*Continued on Page Four*]

DISPLAYING a sensor containing 10,000 photodiodes are Larry Pope, left, and Tom McDonald (both 5833). The sensor is a component in the laser diagnostic tester, developed by them, which will improve welding techniques used in the assembly of critical components.

Employees Are Invited

. . . to attend tomorrow's groundbreaking ceremonies at the site of the first of three buildings that will be the Energy Technology Lab complex just north of Bldg. 892 at 3:30 p.m.

Participating will be the entire New Mexico congressional delegation—Senators Domenici and Schmitt and Representatives Lujan and Skeen—who were instrumental in getting approvals for the $17.6 million complex. Sandia President George Dacey will host the occasion.

The site is outside the fences; families are welcome. Park north of Bldg. 880.

Antojitos

Naiveté of the Uninitiated--Thanks to an expert 3162 staff and an understanding management willing to lead a new editor through the labyrinth that is newspaper production, here's your LAB NEWS. Other than the obvious changes in the masthead (the box on this page), you'll find few departures from the Shunnian norm. Under John's regime, the paper remained one of the best papers in the WE system, arguably one of the best among all "house organs."

In coming issues you may notice some style and format changes designed to enhance the paper's readability. But I foresee no major changes in content. We'll try, as we always have, to reflect the achievements and interests of the Sandia community--Livermore and Tonopah as well as Albuquerque. I will push to include in tech stories some indication of the creative insight that led to the discovery, or the process, or the product--as well as, for the new-hire (those employees not yet vested), some reference to the Sandia resources--human, computer, equipment--that played a part.

We will continue in our attempt to capture not only the what but the why of management pronouncements--not only to maintain our own credibility but to enhance management's credibility within our readership.

Finally, we'll try to be interesting--interesting enough to lure you into reading us, maybe even enjoying reading us.

We'd like to hear from you when we succeed. But we're realistic enough to accept, with tongues only partially in cheek, the dictum attributed to columnist Russell Baker: In journalism, you get two reactions--none and bad. bh

feedback

Q. Regarding the opening of Bldg. 823, are we facing a monumental traffic jam at 4:30 p.m. when occupants of Bldgs. 821 and 823 try to leave at the same time and drive toward the Eubank gate?

A. A traffic study was conducted on Feb. 24 from 4:15 to 4:45 p.m. at the east exit of the 821/823 parking lot. Vehicles leaving the parking lot before 4:30 had to wait once for five vehicles to pass before entering the intersection. This appeared to be because of the heavy KAFB traffic that leaves ahead of Sandia. After 4:30, vehicles did not have to wait for more than one vehicle before entering the intersection. The observed waiting periods were less than could be expected with a traffic light. "Alternate merge" signs have been ordered and will be installed. If the traffic should become so heavy and unbalanced in the future that the merging traffic pattern is not satisfactory, a traffic light will be considered.

R. W. Hunnicutt—3600

Q. Why doesn't Sandia Laboratories require professional registration for its engineering staff? Many employees are given the title "Engineer" when, in fact, they are not.

A. Your questions was an interesting one and required some research on my part to answer. I spoke with several people at BTL as well as people here.

As you are no doubt aware, our personnel practices are based on those of the Bell System and particularly Bell Laboratories, rather than those of local companies. The Bell System and Sandia have not found professional registration to be a necessary ingredient of effective professional performance. Should certification be a job-required element, the Labs would no doubt defray the direct expenses associated with certification. We do encourage participation of our professionals in societal activities and support these activities both monetarily and by permitting participation during working hours.

Our classification system does not categorize employees by discipline. Rather, our technical professionals are termed Member of Technical Staff or Member of Laboratory Staff.

J. R. Garcia—3500

LAB NEWS

Published Fortnightly on Fridays

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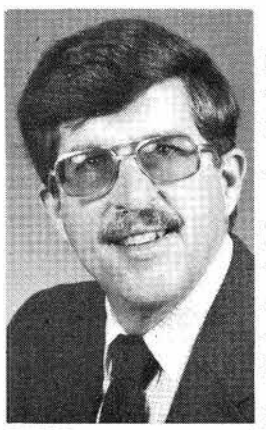
Editorial Offices in Albuquerque, 87185
Phone 505/844-1053 FTS 844-1053
In Livermore 415/422-2447 FTS 532-2447

BRUCE HAWKINSON, Editor
DON GRAHAM, Assistant Editor
CARL MORA, NORMA TAYLOR, writers
LOUIS ERNE, photographer
GERSE MARTINEZ, assistant
BARRY SCHRADER reports Livermore

Livermore Supervisory Appointments



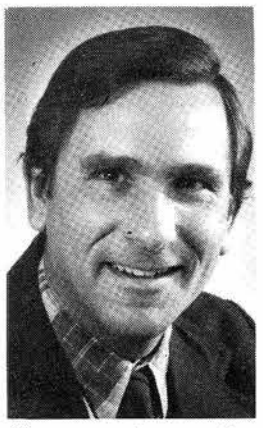
JAY GILSON to manager of Systems Development Department III 8130, effective April 1.

He joined Sandia Albuquerque in 1955, working as a mechanical engineer on the B28 program. In 1959 he transferred to Livermore to take part in the W38 program. Jay became a section supervisor of Computer-Aided Design in 1964, then moved up to division supervisor in Advanced Components Development in 1966. He returned to work on weapons projects in 1968, and in 1978-79 moved to the solar central receiver advanced technology program. Since 1979, he has been supervisor of the Strategic Systems Division.

Jay holds a Bachelor of Science degree in mechanical engineering from Illinois Institute of Technology.

He and his wife Barbara reside in Livermore where their youngest son is a senior in high school. They also have two grown children. Jay's outside interests include bicycling, auto mechanics, woodworking, and the opera.

* * *



PETER MATTERN to manager of Combustion Sciences Department 8510, effective April 1.

His career began at Brookhaven National Laboratory where he was a staff member from 1965-71, after which he came to Sandia at Livermore. Pete's first work at Sandia was on radiation effects in glass. He then moved to Systems Studies where he studied the use of large scale computers in the weapons complex. In 1977 he became division supervisor of Applied Physics working on Basic Energy Sciences projects in combustion and materials sciences.

Pete has a bachelor's degree in physics from Yale University in 1961 and a PhD in the same field from Cornell University in 1965.

He and his wife Nancy have three daughters and reside in Livermore. He is active in the American Physical Society and the Livermore Girls Soccer Club. His recreational activities include squash, tennis, photography, roses, and Kung Fu.

Sympathy

To Gary Drummond (8336) on the death of his wife in Livermore, April 3.

To Steve Schwegel (8271) on the death of his father in Castro Valley, April 3.

Molten Salt Systems Feasible For Next Solar Power Plants

"If we had known then what we know now, the Barstow solar power generating plant would have used molten nitrate salt as its heat transfer and storage medium," says Ray Mar, supervisor of Exploratory Chemistry Division 8313.

The Barstow pilot plant, called Solar One, is in its acceptance phase, and first power generation is scheduled this month. In the Solar One design, solar energy is focused onto tubes in which high-pressure steam is generated. The water/steam loop goes from the receiver to the power generating turbine or to a heat storage tank. Thermal energy is stored in oil/rock media inside the tank.

"An attractive alternative to the Solar One design is a system using nitrate salt for heat transfer and energy storage," Ray says. "The advantages to be gained are many. For example, a costly heat exchanger could be eliminated, operation would be safe, ambient pressures, and the system would not need to be closed to the atmosphere. Economics is the key issue."

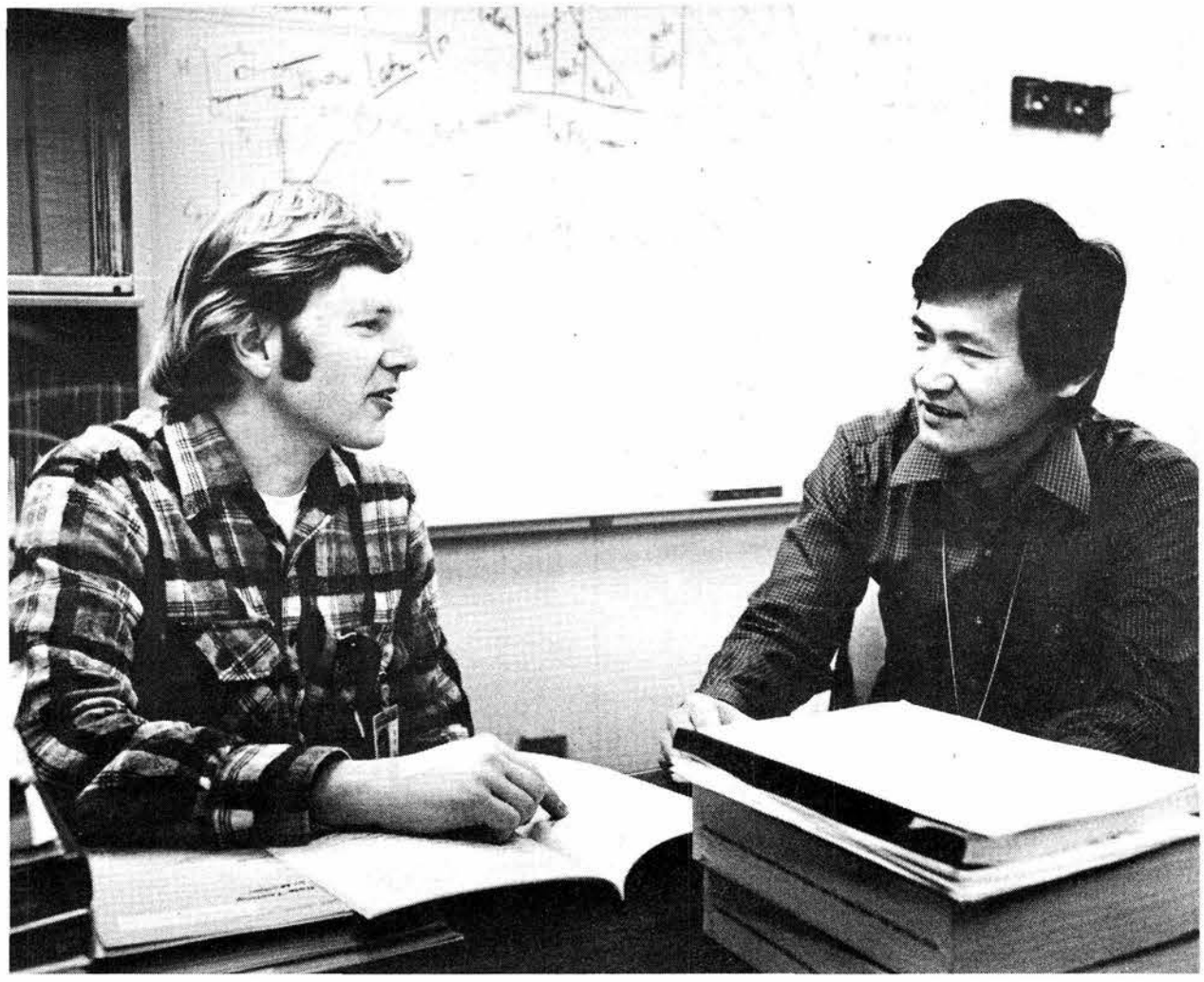
Detailed cost studies have been completed by Bill Wilson's Solar Thermal Subsystems Division 8453, and a convincing case has been made for a second generation nitrate-based system.

Ray's group, assisted by several other SNLL organizations, is wrapping up a concentrated effort to study materials problems that a second generation (post Solar One) solar power plant might encounter.

"Even though systems studies showed that nitrate salt offered potential for substantial cost savings, we did not know how feasible it was to use salt in a solar system," Ray says. "We were very concerned with some of the materials issues. Nitrate salts have been used in the petrochemical and metals industries for many decades, but this base of experience is limited to temperatures of 450°C. In a solar power plant, temperatures as high as 600°C are required. Some of the areas of concern were salt stability and containment material corrosion. In addition, basic properties required by designers and engineers such as heat capacity, viscosity, and density were not available at temperatures beyond 450°C. Our research program aimed at answering these questions."

For the past two years, chemists, metallurgists, and materials scientists of Materials Department 8310 under David Schuster have been engaged in research to gather engineering data and to expand the fundamental understanding of molten nitrate salts. A concentrated in-house effort was mounted as well as contracting for a number of studies with outside laboratories.

Bob Carling, who was assigned the task of defining, planning and implementing the overall program, comments on the progress made: "In less than three years we've demonstrated that nitrate salt systems are indeed technically feasible from a materials standpoint. To arrive where we are now in such a short period of time is an indication of the commitment Sandia scientists and engineers have made to solar."



FINAL DOCUMENTATION of extensive SNLL study of molten nitrate salt technology for a second generation solar power generating plant is discussed by Bob Carling, project coordinator, and Ray Mar, supervisor of Exploratory Chemistry Division 8313.

SANDIA LIVERMORE NEWS

VOL. 34, NO. 8 APRIL 16, 1982

"That's not to say all of the answers are known," cautions Ray. "To be economically effective, the components of a solar power plant should operate with minimum maintenance over a 20- to 30-year period. Our studies have kept the long life requirement in mind at all times. A sound fundamental understanding of nitrate salt behavior is essential if we are to use laboratory results to predict performance over this expanded time frame."

Early studies zeroed in on a 50/50 mixture of potassium nitrate and sodium nitrate as the most attractive salt composition. This mixture offered thermal stability at high temperatures and good physical properties such as thermal conductivity, heat capacity, viscosity, and density. Further, it was determined that this molten salt composition was compatible with atmospheric air.

Corrosion experiments have shown candidate materials will be oxidized by the nitrate salt. The trick is to find an alloy which forms a protective oxide—an oxide which once formed will serve to slow the corrosion process. A multifaceted corrosion program has been completed by Bob Bradshaw (8313), Steve Goods (8316), Don Missen (8312) and Dan Dawson (8453) in which the synergistic effects of fluid flow, thermal gradients, mass transport, dissimilar metal coupling, thermal cycling, and mechanical stress were studied. Data from their experiments suggest there are several suitable materials for use, with Incoloy 800 as the currently preferred choice.

"The future for a second generation molten salt based solar plant is cloudy," Ray says. "It is very important that we complete the documentation of our studies now. We are comfortable with our conclusion that molten nitrate salt systems are technically feasible from a materials standpoint, and we have the experimental data to support our position. We intend to make sure the nitrate salt technology base is ready and available for use when needed."

"The Chinese invented both paper and printing . . . . Yet despite China's early advances, the unwieldiness of its script—which can contain up to 50,000 characters—has kept the country in the Dark Ages in information technology. While offices in the West are rife with word processors and other computerized devices, China is still waiting for its first efficient typewriter." Loh Shiu-chang (Chinese U., Hong Kong) thought that "just as English breaks down into a 26-letter alphabet from which an infinite number of words can be formed, it should be possible to find a set of basic brush strokes from which the full set of Chinese characters could be formed . . . . (Loh's) team assembled a Chinese 'alphabet' of 366 basic components. Each component is linked to the 16,000 Chinese characters stored in a computer memory; by choosing a selection of components, any combination of the characters can be assembled."

Keith Addison in *New Scientist*

Continued from Page One

New Laser Diagnostic Test Developed

the light. But just try putting your hand at the focal point of a magnifying glass using sunlight as the source, and you'll quite likely receive a nasty burn."

Laser welding uses pulses of very high power density. The pulses themselves aren't hot until they are focused onto the workpiece, which absorbs them and starts to melt.

"We can control the pulse length, pulse frequency, and the energy per pulse as well as the weld velocity and focus position," adds Larry. "Our diagnostic technique involves focusing a greatly attenuated laser beam onto a commercial sensor which is sensitive in the infrared region. This sensor consists of 10,000 photodiodes arranged on a quarter-inch, or six millimeter, square chip in a 100 by 100 matrix. In other words, the photodiodes are arranged in 100 rows with 100 photodiodes per row spaced 60 micrometers apart, thereby permitting a very fine resolution of the laser beam."

Photodiodes store the changing beam energy profile by converting the various numbers of photons hitting the sensor into discrete voltages which can be measured later. The photodiodes are then scanned electronically and examined individually with an oscilloscope.

"We must attenuate the laser beam to 10^{-13} of its original value," Larry continues, "so that the focused laser beam won't burn up the sensor. We do this by passing the laser beam through a series of up to seven mirrors coated to reflect various percentages of the beam. The first mirror, for example, reflects more than 99% of the laser beam, deflecting it off to the side allowing the remainder of the beam to pass through a second mirror. The process is repeated at each successive mirror until the desired attenuation is achieved. Our diagnostic technique provides data for a theoretical model of the laser pulse welding process. This helps minimize the time required for developing weld schedules for new materials and applications. Using our technique, we've already discovered why two identical welds won't necessarily be produced by two 'identical' lasers. At Sandia we may develop a weld schedule for stainless steel which in turn is used at a production facility, but they get different results from ours. We must then either make certain critical adjustments to their laser or change the weld schedule to duplicate our welds. Lasers made by the same manufacturer therefore are not always identical."

The original idea for the diagnostic program was conceived by Larry who also envisioned its development. "But," says Larry, "Tom's the guy who makes it all work. This laser diagnostic technique is about two years old. We began to assemble the prototype a year and a half ago. Our most notable welding job to date was the closure weld that Tom and I made on the insulin pump device which was recently implanted in a diabetic patient."

Adds Tom: "In order to minimize the patient's discomfort, and to ensure good hermetic seams, we decided that all closure welds on the insulin pump device be made prior to implantation in the patient."

Continued from Page One

Particle Microanalyzer Quick, Accurate

rescence. In Raman scattering, monochromatic light strikes a molecule whose atoms are vibrating at characteristic frequencies. Light, when it interacts with certain vibrations and bounces off the molecule, loses energy. This causes the frequency of the laser light to be changed by an amount that is the same as the corresponding vibration frequency of the scattering molecule. For each characteristic frequency, there will be a peak of scattered light close to but different from the laser frequency. The peaks identify the sample.

In fluorescence scattering, the molecule absorbs the laser light (or energy) and is raised to an excited state. The excited molecule relaxes to a lower energy level and re-emits light at a longer wavelength. The microanalyzer currently does not have a pulsed fluorescence scattering capability but will later this year.

"As a service organization, we do materials characterization—testing and identifying a wide variety of samples that other groups bring us." says Dave. "Once we received a strong-link switch contact that's used in the firing set of a nuclear weapon. This particular mechanism failed when contact was lost because of a microscopic particle on the tracks. When we identified the particle as an epoxy, the trouble could then be traced back to the manufacturing process. The switch contact consisted of a metallization impressed on an epoxy base. While polishing off the excess epoxy, the contractor had accidentally left a particle on the metallization."

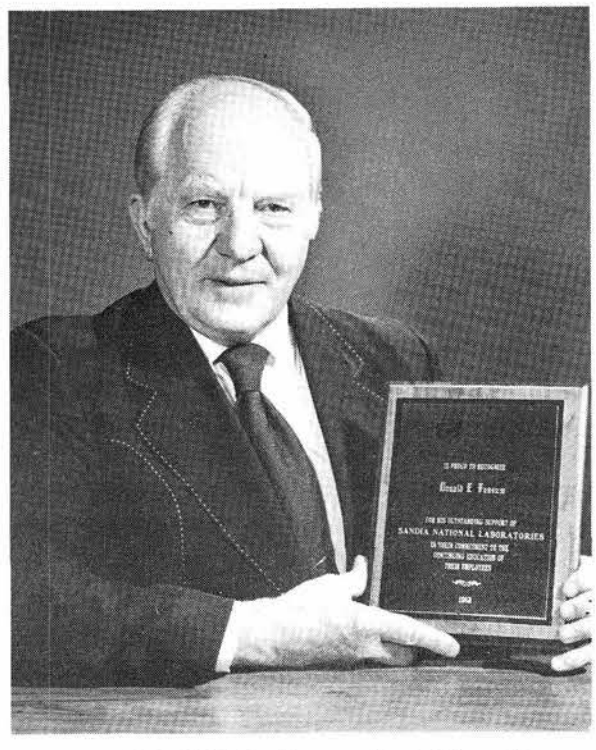
Addressing himself to Sandia's interest in developing glasses for glass-to-metal seals, Dave also does glass structure analysis using conventional Raman. He's working with Ceramics Development Division 5845 to see if there's a good correlation between what is put into glass and the structure and properties of the finished product. Using Raman spectroscopy, they look at various glass compositions to determine their structure so that physical properties and applicability to weapons components can be predicted. This makes it possible to estimate the glass' reliability and what the chances are of transferring the required tolerances to a contractor who might not have the capability to meet tight tolerances.

"We're also helping the people in Dept. 4550 who are working with a Japanese firm that's designing seals for transportation containers for radioactive materials," Dave continues. "A method of testing the integrity of the seals after crash or burn tests is needed to determine if any uranium has leaked out. We have shown a capability of detecting 10^{-10} gram of uranium and are working on lowering this to 10^{-12} gram. Incidentally, the 10^{-10} gram particle, being rather small, is dissolved in a larger amount of material which can then be handled more easily. The chemical preparation of samples, which requires great care to prevent contamination, is done by Suzanne Weissman of division 5821."

Dave began putting his microanalyzer together in January 1981 and by summer was analyzing samples. The test setup is under computer control which provides real-time results, analysis, and data storage. Karen Higgins (also 5823) is responsible for the day-to-day operation of the equipment.

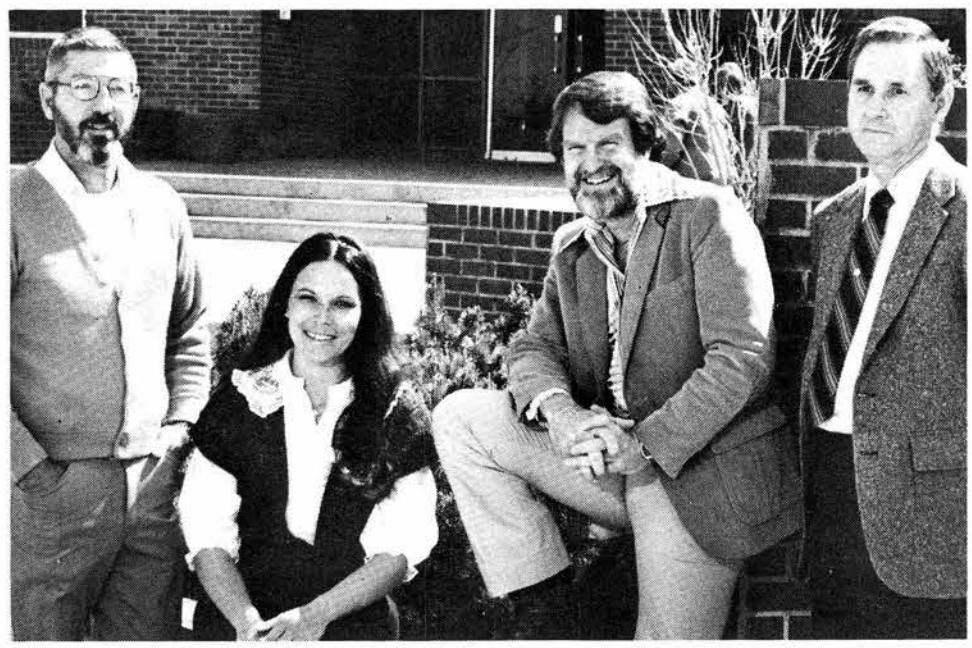
"In the future we'll have a rastering capability," concludes Dave. "This provides a two-dimensional profile of a given particle on a sample surface. Using this microprofiling process, we can set the microanalyzer at an expected wavelength to rapidly identify where the particles are on the sample."

Looking ahead, Jim Borders, head of division 5823, notes: "We've been addressing contamination problems using methods that gave only elemental information. But now, Dave's technique enables us to get direct chemical identification—this can be very important when tracking down the source of contamination."



HEWLETT-PACKARD likes what Don Fossum (3522) has done in designing courses for Sandia users of the many small stand-alone computers not part of the integrated network. Hence, the appreciatory plaque.

Conrad Carrington, Lou Tidwell and Greg Seymour (all 3435).



Tom Schultheis (2434), Terry Lovato (2432-1), Billy Thorne (5531) and John Justus (3730).

Supervisory Appointments

TERRY LOVATO to supervisor of Micrographics Section 2432-1, effective April 1.

Joining the Labs in 1976 as a part-time security inspector, Terry became a full-time employee in July 1977. She worked as a security inspector for a year before transferring to micrographics as a service clerk. For the past two years she has been a reprographics composer.

Terry earned a BS in criminology from the U of A and has taken additional courses at UNM. She enjoys photography and plays on the Women's City Soccer League.

Terry and her husband Joseph have a six-month-old daughter, Danielle. They live in the south valley.

* * *

JOHN JUSTUS to manager of Purchasing Planning and Services Department 3730, effective April 1.

Since coming to Sandia in 1959 as a staff member in purchasing, John has held assignments in all areas of the department, including section supervisor and division supervisor; most recently, he headed the Purchasing Planning Division 3732.

John earned a BA from Western NM University and a Doctor of Law degree from UNM. He is a member of the NM Bar Association. For the past several years, most of John's time away from the Labs has been taken up with his building project—an adobe home in Peralta. John and his wife Lois have four children and three grandchildren.

* * *

LOU TIDWELL to section supervisor (lieutenant), Security Operation Division II 3455, effective April 15.

Lou became a full-time security inspector at the Labs in May 1976, after having worked part-time for several months. She attended Wayland Baptist College (Texas) and Eastern NM University. She served three years in the Army Reserve as an intelligence analyst.

Lou enjoys painting and gardening. She lives in the SE heights.

* * *

GREG SEYMOUR to section supervisor (lieutenant), Security Operation Division II 3455, effective April 15.

Greg first worked at the Labs as a part-time security inspector, becoming full-time in October 1979. He served four years in the Marine Corps and, before joining Sandia, was a police officer in Bernalillo.

He enjoys restoring antique automobiles. He and his wife Helen have two children and live in NE Albuquerque.

* * *

CONRAD CARRINGTON to section supervisor (lieutenant), Security Operation Division II 3455, effective April 15.

Joining the Labs in 1976 as a part-time security inspector, Conrad became a full-time employee in May 1980. He is currently attending the U of A, working on a degree in criminology and a degree in business administration.

Conrad enjoys hunting and camping, and he calls himself a handyman carpenter. He and his wife Dora have two daughters and live in the NE heights.

* * *

TOM SCHULTHEIS to supervisor of Equipment Engineering & Maintenance & Machine Plotting Division 2434, effective March 16.

Tom joined the Labs in 1957 and helped develop instrumentation and timers and controls at Salton Sea and at TTR. He worked in the Pacific on high resolution telemetering systems for Operations Hardtack and Dominic. Tom left the Labs to attend school and then joined Los Alamos where he helped design and develop the computer controls for the Meson Physics facilities. Since returning to Sandia, Tom has worked on computer control systems for a number of programs—coal gasification, oil shale, solar and weapons.

He earned an AAS degree from DeVry and a BS in EE from UNM. He has done graduate work on his MBA. Tom served four years in the Air Force as a combat crewman with SAC. He enjoys hunting, fishing, hiking, skiing, and flying. Tom and his wife Faye have three children and live in the NE heights.

* * *

BILLY THORNE to supervisor of Computational Physics and Mechanics Division I 5531, effective April 1.

Joining the Labs in 1961, Billy worked in the field test computer support program. He interrupted his Sandia career on two occasions to complete his education and to pursue other work. He returned to the Labs one year ago. After his initial assignment in field test, Billy's work has been with the solid dynamics department.

He received a BS from Phillips University, MS from Kansas State, and PhD from UNM—all in mathematics. His interests include bicycling and physical fitness. Billy and his wife Linda have four children and two grandchildren. They live in the NE heights.

Events Calendar

April 16—Folk Music Concert with U. Utah Phillips and Rosalie Sorrels, 8 p.m., Woodward Hall, UNM, advance tickets at The Bookstop, Nob Hill Center, 268-8898.

April 20-21—"Annie," Broadway musical, 8:15 p.m. both days, 3 p.m. on 20th, Popejoy.

April 21-25—"Sesame Street Live," Tingley Colisuem, 243-3208.

April 23-25—Spring Embroidery Fiesta, competition and exhibit by Embroiderers Guild of NM, Los Altos Park.

April 23-25—Southwest Arts & Crafts Show, Ag. Exhibit Hall, State Fairgrounds, opens 10 a.m.

April 24—"The Big Band Show," with Johnny Desmond, Connie Haines, New Ink Spots, Alvino Rey Orchestra, 8:15 p.m., Popejoy.

April 25—Fine Arts Music Series: Pianists Veri & Jamanis—The Gershwin Experience, 4 p.m., First United Methodist Church.

April 28—"Children of a Lesser God," play by Mark Medoff, 8:15 p.m., Popejoy.

April 28—"The Classic Maya Collapse," Maxwell Lecture Series, Maxwell Museum, 8 p.m.

April 30—NM Symphony Orchestra with guest guitarist Alexandre Lagoya, 8:15 p.m., Popejoy.

Data From Down Deep

SEMS Takes Sedimental Journey

What happens to an offshore drill rig when a "seismic event" like an earthquake occurs depends on what the ocean floor does. What the ocean floor does, it turns out, is not necessarily what dry land does.

That's one discovery of SEMS—Seafloor Earthquake Measurement System—developed by a Sandia team headed by Dave Ryerson, now in 1587, then in Geotechnical Engineering Division 4752.

"Data from SEMS suggest that the response of the ocean floor to nearby seismic activity is considerably more complex than the picture presented by land-based seismic stations or computer model," says Dave.

In operation, SEMS is lowered to the ocean floor where it gathers and stores information about seismic events. The data are then transmitted on command to a shipboard receiving station.

OFF THE SEAFLOOR comes a SEMS device after a year of collecting seismic data in the Santa Barbara Channel. Units provided new insight into seafloor behavior.

SEMS provides data allowing the design and construction of safe, cost-effective offshore oil production structures, primarily off the western coast of the continental U.S. and in Alaskan ocean areas. In addition, it should provide data needed by the federal government to certify these offshore structures.

The first strong motion data ever recorded directly on the ocean floor came from three of the SEMS units during a year of testing in the Santa Barbara Channel off the coast of southern California. The devices were installed in the vicinity of offshore drilling platforms in 165 to 500 feet of water, four to 10 miles from shore.

SEMS documented nine earthquakes in the region—the largest a 5.4 Richter scale event on Sept. 4, 1981, near Santa Barbara Island, 58 miles from the nearest SEMS.

"Although data from these tests are not conclusive, they were, on occasion, quite different from information provided by identical land-based monitoring equipment and computer models of expected sediment response to seismic events," says Dave.

"For instance, SEMS data of the Sept. 4 event showed considerably more movement parallel to the mudline than in an up-and-down direction. Data from the land-based monitor showed roughly equal response in all directions."

During another seismic event, data recorded by SEMS indicated much less sediment disturbance than predictions drawn from land data and existing models had indicated.

"Basically, these results show a need to better understand how seabed soils transmit earthquake motion," Dave says. "This will contribute significantly to the design of offshore platforms."

The mushroom-shaped SEMS device consists of a pressure vessel atop a seven-foot-long probe that is pushed into sediments as the unit comes to rest on the seafloor.

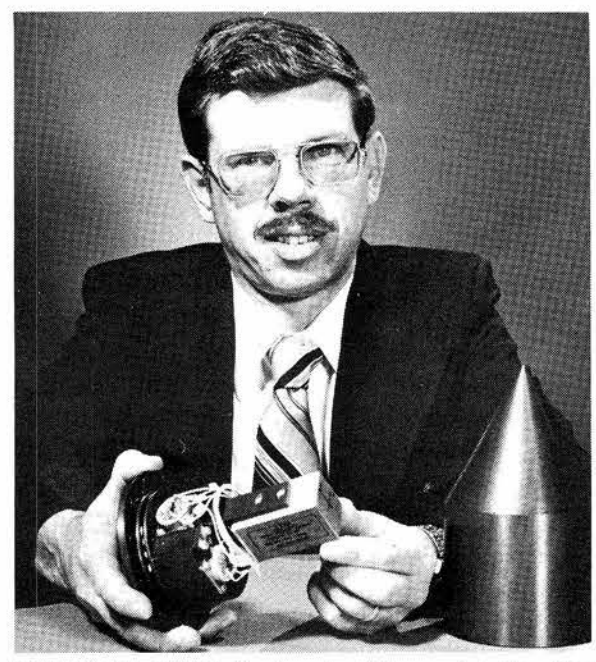
The exposed tip of the probe contains a three-axis accelerometer that responds to seismic activity in the dynamic range of 10^{-4} to 1 g and a two-axis magnetometer that determines direction of the seismic activity.

Data from the tip are transmitted through a transmission wire to the pressure vessel, which contains a microprocessor, solid-state memory, long-life batteries, and an acoustic telemetry system that transmits data to a portable command station aboard a ship.

The microprocessor monitors the accelerometer and magnetometer continuously, storing data if sediment movement reaches a level 50 percent above background motion. When a seismic event of this level occurs—about once a month off the coast of California—the probe's signals are digitized and stored in the vessel's one-million-bit memory, a capacity equal to about 218 seconds of seismic data.

If the memory bank is full and an earthquake occurs, the SEMS microprocessor determines the size of the event and erases earlier data on smaller events to accommodate the new data. SEMS can also be instructed by the command station to change its operating parameters.

Sandia developed SEMS as part of the Department of Energy/U.S. Geological Survey Offshore Technology Program, with supplemental funding by five oil companies—ARCO, Chevron, Gulf, Mobil and Shell. The system grew out of weapons technology, specifically, the terradynamics program.



HEART OF SEMS device is this probe tip that detects seismic tremors on the seafloor. Dave Ryerson headed the SEMS team.

Fun & Games

YAP—School's soon out. If you don't want to watch your 6-18 year olds mope and mildew through the summer, check out the smorgasbord of delights available to them through the KAFB Youth Activities Program: parlor games; field trips; lessons in dance, gymnastics, piano, guitar, sewing, tennis, and weightlifting; and athletics—bowling, aquatics, girls' softball, wrestling, Little League, T-ball, basketball, soccer, football. LAB NEWS has a booklet on the program and its fee schedules; or call 4-9975.

* * *

Coronado Ski Club—New officers for 1982-83 are: president - Lynnie Grace (DOE), vice president - Jerry Letz (4443), secretary - Al Watts (1324), treasurer - Cliff Diem (2426), membership - Norma Carrier (2360), trips - Sharon Mackel (5620), equipment - Curt Moses (4335), area rep - Walt Westman (ret.), and board director - Milo Navratil (1584).

* * *

Running—Jack Tischhauser (2640) is race director for a five-mile and one-mile run Sunday, May 2, sponsored by the Women's American Organization for Rehabilitation Through Training. The events start at 9:30 a.m. at Kit Carson Park (near the Zoo). There are categories for men and women of all ages. LAB NEWS has entry forms.

feedback

Q. Why does the military schedule convoys during peak Base traffic periods—0730 to 0815, and 1545 to 1630? Also, why aim M-60 machine guns at stopped vehicles? Security or no security, I believe that the practice is dangerous.

A. The Air Force assures us they try to avoid scheduling convoys during rush hour periods. However, they are obliged to follow instructions from MAC headquarters. The problem you mention has been discussed with the Air Force authorities and consideration is being given to provision of alternate routes, where practical, for employees' use to avoid delays.

The M-60 machine guns are not supposed to be aimed at anyone, unless certain circumstances would dictate such a necessity. In the absence of any such necessity, these weapons are to be pointed in the air and all safety procedures followed to preclude accidental firing. If you observe otherwise, let us know and we will bring the matter to the attention of military officials.

D. S. Tarbox—3400

Q. One thing about the Credit Union's IRA publicity really puzzles me. Everything I've read on IRAs—in everything from the Wall Street Journal *to my J. K. Lasser monthly tax service—indicates that contributions to an IRA must be based on compensation, which is defined as wages, salaries and net earnings from self-employment.*

How, then, can the Credit Union continue to encourage people to borrow funds [from the CU] to put into an IRA? Borrowed money is not considered "earned income" any more than are stock dividends, capital gains, etc., from the IRS standpoint.

A. The new IRA law which was effective January 1, 1982, permits anyone who has earned income to establish an IRA. Earned income is defined as earnings received by performing work or personal services. An individual may annually deposit up to 100% of his/her earned income or $2000, whichever is less.

There is nothing in the regulations that prohibits an individual from depositing a rental check, interest check, dividend check or even borrowed money into an IRA. The regulations just prohibit an individual from considering those sources of funds for determining his/her yearly earned income; they do not restrict the individual from using those sources.

C. L. Turner, Credit Manager

Q. The air pump used by bicyclists at the corner of 9th and J Streets in Area I has been removed. Will there be a replacement?

A. Work is under way to provide an air pump at the west end of Bldg. 834.

In the meantime, there is an air pump in the self-service area of the motor pool.

R. W. Hunnicutt—3600

Labs Man Digs Hot House Atmosphere

What plant grows on air and water, produces handsome flowers, and thrives whether in the ground or perched upon a tree? And what flower causes you to gasp when you see the florist's bill for the corsage your teenager ordered for his prom date? By now, you know the answer: the orchid.

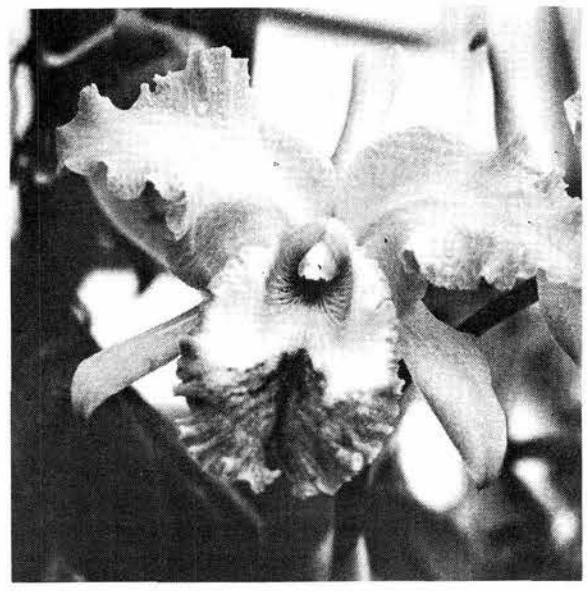
Ken Swanson (2544) just sends his boys out to the greenhouse to take their pick of numerous varieties of orchids. Actually, the orchids are the hobby of Ken's wife Sharon and their 16-year-old son Arrick.

Three years ago, the Swansons were discussing a swimming pool for their back yard. But with their interest in gardening, they opted instead for a greenhouse which would provide a year-around activity. Ken built the greenhouse from a kit. Eight feet wide and 34 feet long, the greenhouse is completely automatic with temperature and humidity controls. Arrick built benches to hold the potted plants and Ken installed an automatic misting system underneath the benches. Heaters, fans and automatic roof-edge vents keep the temperature between 45° and 85°, and the misting system assures a minimum 60% humidity.

The greenhouse is divided into two sections with a connecting door. "When we started," Ken says, "one room was for tropical plants and the other for vegetables. Eventually they both became tropical—we kept adding more orchids and they began to crowd the vegetables. I also discovered that insecticides for vegetables are not compatible with orchids."

Arrick and his mother are members of the Orchid Society and often buy or exchange plants with other members. Their collection now consists of 225 orchids, plus other tropical plants and Arrick's cacti.

Orchids take two forms: terrestrial,



KEN SWANSON (2544) and son Arrick admire one of the 225 orchid plants in their greenhouse. This plant is one of the more common varieties—the cattleya. The six-inch bloom runs from a pale lavender to a deep purple on the center petal.

which grow in the ground or, in cultivated plants, are potted in bark or scoria. The second group—epiphytic orchids—grow perched upon trees, deriving moisture and nutrients from air and water.

The back wall of the Swanson greenhouse is covered with chicken wire. Pieces of driftwood or chunks of moss, attached to the wire, are home to exotic varieties of epiphytic orchids. Some of these plants produce pinhead-size blooms which, upon close examination, exhibit the same distinctive features of the larger varieties. Arrick plans to exhibit one of these tiny plants in a show at the Classic Hotel this weekend.

"Plants and gardening are favorite hobbies for the family, except for our other son, Aaron. He's more interested in hunting," Ken says. Orchids aren't their only flower. Last summer, Ken's rose-adorned front yard was awarded first place in the mayor's summer garden contest.

Take Note

From Accountants to Wreckers & Towers, all kinds of where-to-find-info information is contained in a new directory from the Attorney General's office. It's called New Mexico Consumer Resource Guide, and LAB NEWS has a copy.

* * *

Nature does not abhor the American Vacuum Society. The New Mexico Chapter hosts its 18th Annual Symposium on May 4-6 at the Convention Center. The meeting includes a three-day technical program, a four-day program of educational courses related to vacuum technology, and a two-day vendor equipment exhibit. More information from Carol Ashby (5111), Raymond Berg (2564), or William Rogers (2516).

* * *

Spring is here—time for new beginnings. Make a new beginning—and someone happy—by deciding to join the Quit Smoking class sponsored by the Sandia Medical Department. The class will meet April 27 through May 20, noon to 1 p.m. on Tuesdays and Thursdays in the Solar Conference Room in Bldg. 832. For sign-up, please contact Arlene Price at 6-0021.

* * *

"Sexual Harassment and Discrimination for Both Male and Female" will be the topic of this month's meeting of the American Society of Women Accountants. The dinner meeting ($11) will be held April 21 at the Hilton Inn, 6:30 p.m. For reservations: Denise Krupka (3211), 987-1555.

* * *

New Mexico has discovered Day Care. The first conference on same takes place April 23-24 at the Albuquerque Christian Center. Though you're too late to register for the Friday workshops, come out on Friday evening (8 p.m.) and hear what the gubernatorial candidates have to say on the subject. And/or attend some of the 25 workshops offered on Saturday. (Lunch is $3.) More info from Phyllis Nye at 1/800/432-6217.

* * *

Mugging insurance—$20. That's the cost of a four-hour workshop on "Street Survival—Self-Defense" offered by Defensive Tactics Institute and sponsored by the APD tomorrow and April 24, with workshops beginning at 8 a.m. and 1 p.m. both days. You'll learn how to identify and avoid dangerous situations and how, if you fail at the preceding, to incapacitate and to escape an assailant. You'll also learn to use a Kubotan, a handy tool that will be your working souvenir of the class. For either of the April 24 workshops, make out and mail your $20 check to Street Survival—Self-Defense Workshop, 5200 Kircher NE, 87110. For info on whether there's room in tomorrow's workshops, call Sgt. Arnold Bernstein at 766-4841.

If you missed Donald Johanson's colloquium here, you can (for $5) hear him discuss the beginnings of mankind at the New Mexico Museum of Natural History's People-to-People Fund Raiser on April 23 at 8 p.m. at UNM's Woodward Hall. Johanson, discoverer of "Lucy," will present fossil hominid evidence for man's origins and evolution, and the basis for designating a new species of early primate.

* * *

Have an urge to get to know the people rather than just play tourist in exotic foreign lands? Check out the Albuquerque Friendship Force, an international, nonprofit group chartered "to promote understanding in the world through the medium of adult exchanges with people of other nations." Sign up before Sunday and, if you're selected as an "ambassador," you'll spend July 1-14 living with host families in an Oriental island nation for $1080 (including air fare). Sign up later and you'll know exactly where you'll go but you'll pay an extra $50. Sandians Bert Lindsay and Dolly Dollahon are active in the group; in fact, Bert is the state director. For more info on this exchange (you'll be, or find, a host to visitors from the other country), call Pat Coonce at 296-1089 or the FF office at 243-6916 between 1 and 4 p.m.

* * *

If all those hard things look like just rocks to you, get enlightened, if not flouresced, at the Albuquerque Gem & Mineral Club's annual show tomorrow and Sunday at the Agricultural Exhibit Bldg. at the Fairgrounds from 10 to 7. Club president Paul Hlava (5822) has more info on the demos, displays, and how to convert unwanted diamonds into coal, America's energy for the future.

* * *

The YWCA sponsors several summer programs to help your youngsters survive till school reopens: for the grades 1-7 set, six 2-week sessions at their Blue Triangle Day Camp in the Manzanos; for the older kids, programs in backpacking, wilderness survival, and rock climbing; for the physically handicapped (6-17 years), Camp Reach Out; in the city (for 5-12 year olds), a series of all-day fine arts and recreation programs, Summer Venture. More info from the Y at 293-7400 (northeast) or 247-8841 (downtown).

* * *

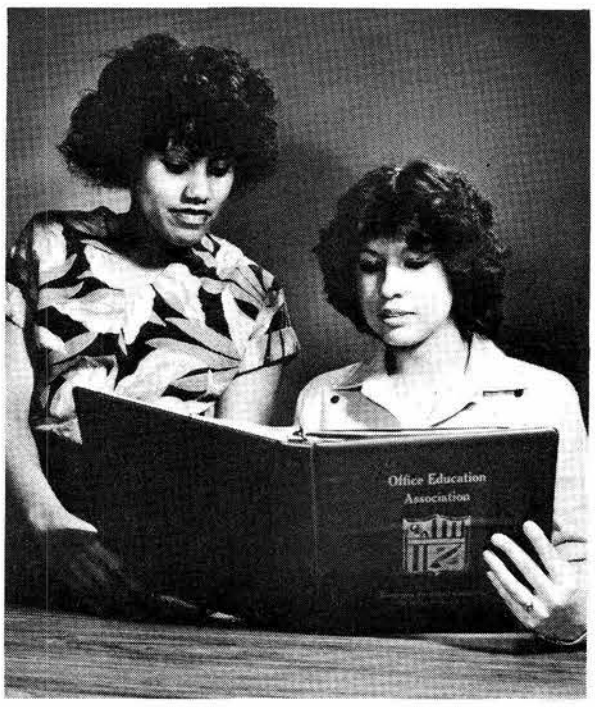
Chris Edwards of the Rutherford Appleton Labs in Oxford, England, will present a Window on Science lecture on April 19 at 1:30 in the AFWL conference room 4. His topic is "Annealing of Zns Using 308 nm Laser Radiation" and "Sprite—A 0.5 kJ KrF Eximer Laser System." More info from Vern Schlie, 4-0883.

* * *

The Classics Theatre Company, godchild of John Gardner (3142), will present Lillian Hellman's *The Little Foxes* at the Albuquerque Little Theatre tonight through April 17 and April 22 through 24 at 8 p.m. Matinees are at 2 p.m. on both Sundays. Kirk Thomas directs. Reservations at 242-4750 or 242-4315.

* * *

On a diet? Hungry? Avoid the Bldg. 802 lobby display of much-larger-than-lifesize photographs of sandwich interiors. It's fine fun photography by Joe Laval (3163), and it's up all this month.



OFF TO NASHVILLE and the national Office Education conference next week are Yvonda Jackson (2614) and Felice Sanchez (3533). Both seniors in Albuquerque High School's Office Ed program and both Sandia employees each afternoon, they won the Nashville trip for their projects: Yvonda this job manual, and Felice a bulletin board promoting Office Education.

Retiree Deaths

[Jan.—March]

Conroe Wyman (73)	Dec. 31
Arthur Brown (69)	Dec. 31
Bill Funk (71)	Jan. 2
Glenn Hastie (75)	Jan. 3
Clarence Lowry, Jr. (66)	Jan. 7
Anthony Parisi (74)	Jan. 8
Ramon Archibeque (80)	Jan. 19
Joseph Duffy (74)	Jan. 25
Jack Hammerstran (74)	Jan. 28
Hellmuth Woidtke (74)	Feb. 28
Solomon Apodaca (77)	March 22
Charles O'Connor (73)	March 23
Bob Creveling (76)	March 25
Edgar Cary (78)	March 30

Sympathy

To Paul Chavez (1482) on the death of his daughter and granddaughter in a car accident in Albuquerque, April 4.

To Jack Reynolds (3713) on the death of his mother in Albuquerque, March 24.

Japan has stepped up the tempo of its space program by setting apart US$763 million as their space budget for the year 1981, representing a 3% increase of the space budget of 1980. And, over the next 15 years, Japan is expected to invest around US$15 billion on its space program, covering the development and launch of a variety of application satellites and grandiose planetary probes.

—L-5 News

IFS

A Supermarket of Sorts

The Integrated File Store, a new, secure centralized storage system for the Central Computer Network, has been installed and should be in operation late this year. The project leader and network architect is Bill Hunteman of Scientific Network Design Division 2645.

"The Integrated File Store operates independently of any other network computer," says Bill, "and provides central storage of user programs and data from any computer in the network. It has a total on-line capacity of over 10 trillion bits. User data will be stored on one of three storage levels—disks, cartridges, and magnetic tapes. The disks are used for small, very active files, the cartridges for medium-sized, moderately active files, and the magnetic tapes for very large or generally inactive files.

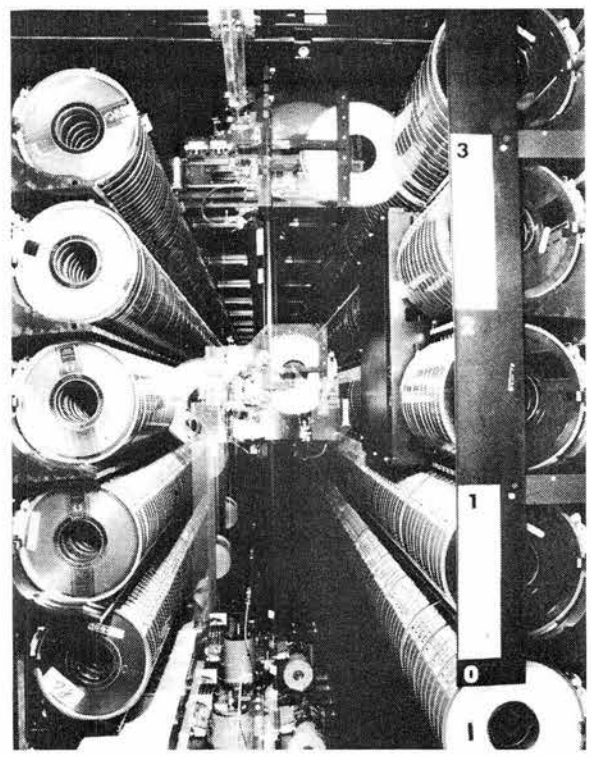
"Anyone visiting our facility might think that Artoo-Detoo is one of our new hires. The magnetic tapes are shelved on both sides of a 96-foot-long cabinet. A robot, officially called an accessor, runs back and forth on a rail busily retrieving and storing tapes.

"The user won't have to remember where his or her file is located since it will be found automatically and returned by software running in the IFS. This characteristic gives Sandia the ability to expand or change the file store without affecting users of the network."

The Integrated File Store will be connected to all computers via the network bus which contains four communications paths, each independently operated at a speed of 50 million bits a second. The large scientific computers will be connected to the file store with the distributed computers and the administrative systems connected later.

"Since the Integrated File Store will be a centralized file storage facility, we've stressed reliability and data availability during the procurement and software development activities," says Bill. "All critical hardware units in the file store are duplicated to ensure continued operation in the event of a hardware failure. Enhanced recovery techniques, such as making a permanent record of all operations and redundant recording of critical files, are used in the software to minimize the impact on the users of a hardware or software error."

THE NEW Integrated File Store provides central storage for user programs and data, and is accessible from any Sandia computer. Bill Hunteman (2645), who designed the facility, stands next to the 96-foot-long magnetic tape cabinet.



A MULTIPLE EXPOSURE PHOTOGRAPH captures the accessor robot's frenetic efficiency, something like a hyperactive Artoo-Detoo. The robot, traveling back and forth on a single rail, retrieves and stores magnetic tapes housed on shelves in a 96-foot-long cabinet.

Foreign Scientist

The Landscape is 'Magnifique'

[Ed. note—This is another in the LAB NEWS series of articles about foreign scientists working in Jack Walker's Advanced Reactor Research Department 4420 under various international agreements.]

"Gallic charm" is a phrase not wasted on Patrick Herter, a French nuclear engineer now working on a two-year assignment in Bill Camp's Advanced Reactor Safety Physics Division 4425.

Patrick came to Sandia in September as part of a technical exchange agreement between NRC and the *Commissariat à l'Énergie Atomique*. He is continuing his work in fast breeder reactor safety studies.

"France is a leader in the development of the fast breeder reactor," Patrick says, "since the Phénix, our prototype, has been operating almost 10 years and producing about 200 megawatts. It has also served as a research and development test stand for the 1200 megawatt Super Phénix, now several years into construction and scheduled to start in 1983.

"The Super Phénix site in southeast France was attacked last fall by an anti-nuclear terrorist group. They fired five anti-tank rockets into the containment building from about a half-mile away, across the river from the site. The damage was negligible."

The Super Phénix is important to France, Patrick notes, in achieving that nation's goal of energy independence. Operation of the new fast breeder will increase the amount of available nuclear reactor fuel in France. Some 25 percent of France's electricity is already generated by nuclear reactors.

"The breeder is important," Patrick says, "because it will produce more fuel than it burns. We also have nuclear fuel reprocessing plants and are investigating several schemes for nuclear waste isolation."

In addition to the Super Phénix, France is also constructing several light water cooled reactor plants.

An avid bicyclist, Patrick is looking forward to summer weather and the purchase of a bike for local sightseeing. He likes skiing and hiking. He also plans traveling in the Southwest—the landscape is *"magnifique."*

In the meantime, he is participating in the activities of *L'École de L'Alliance Française,* a local school teaching the French language.

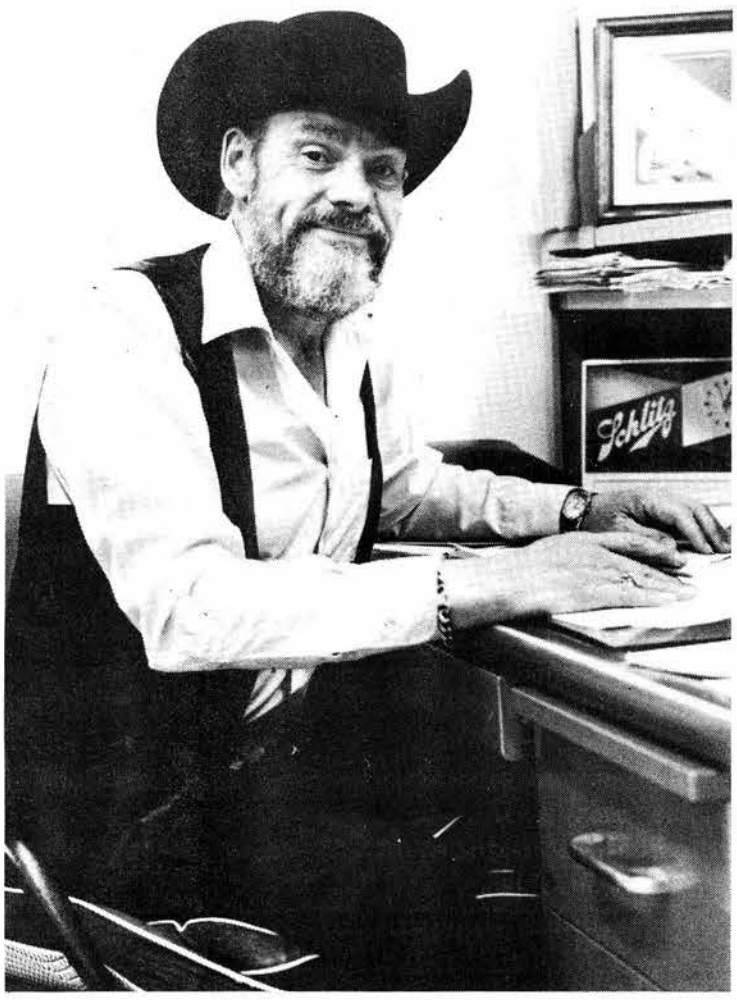
PATRICK HERTER of the French *Commissariat à l'Énergie Atomique*, now on a two-year assignment in Division 4425.

MILEPOSTS
LAB NEWS

APRIL 1982

Jimmy Lee - 1124 15

Paul Gammill - 1247 25

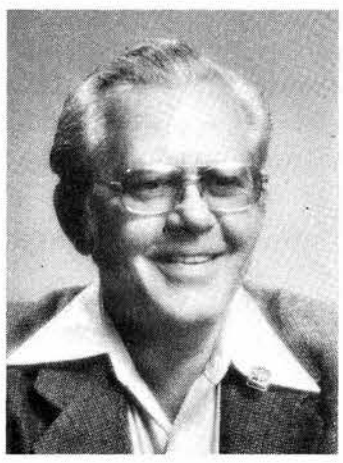


Otto Simon - 2422 15

Chuck Thomas - 8112 25

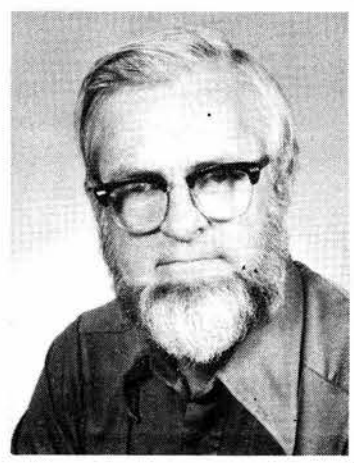
Bruce Affeldt - 8414 20

Richard Dye - 1131 25

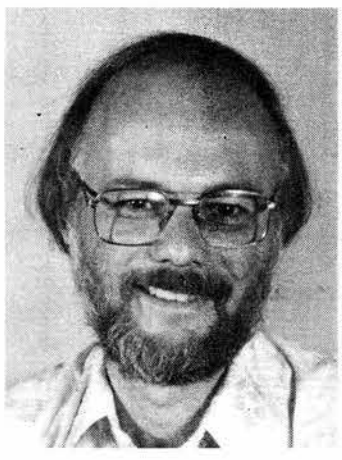


Del Houser - 8414 20

Johnny Ulibarri - 1313 15

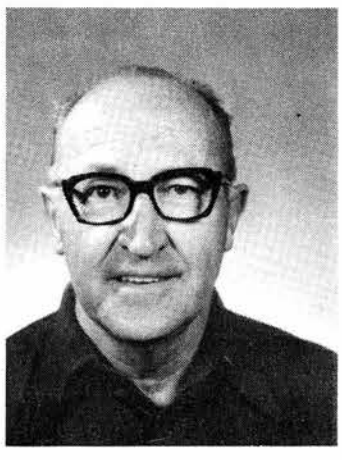


Clarence Huddle - 4753 25

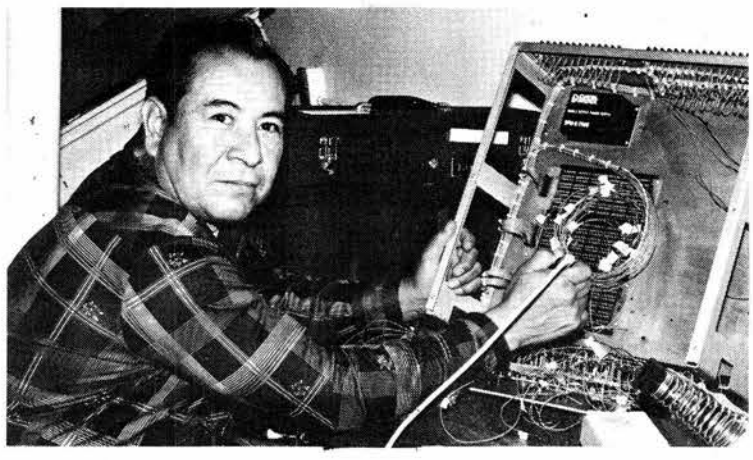


Grayson Garrett - 4253 15

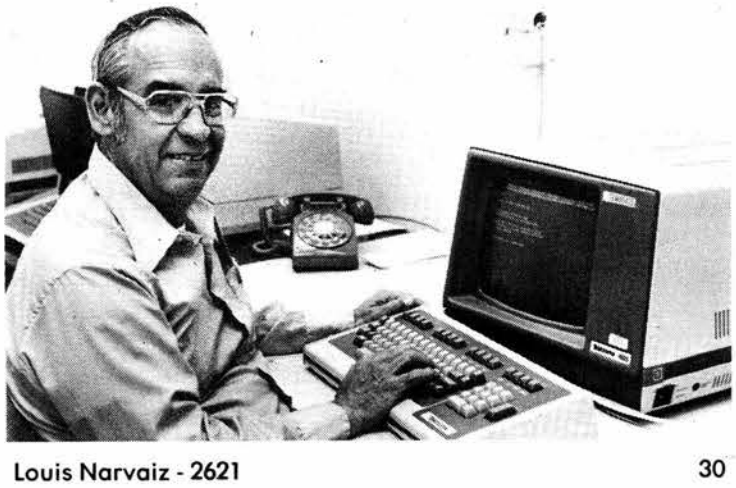
Bob Neel - 1134 25



Delfin Salazar - 1474 30

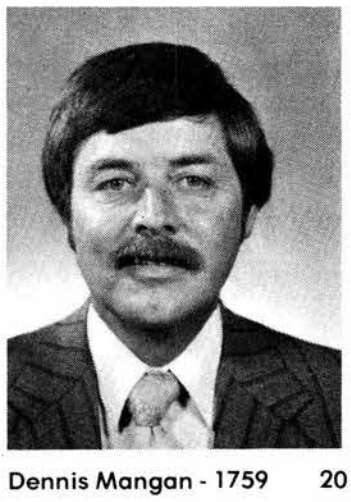


Gilbert Leyba - 1474 30

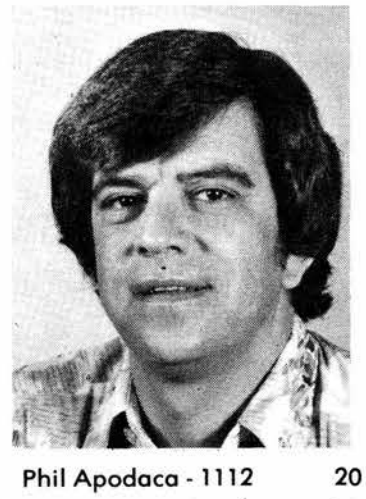


Louis Narvaiz - 2621 30

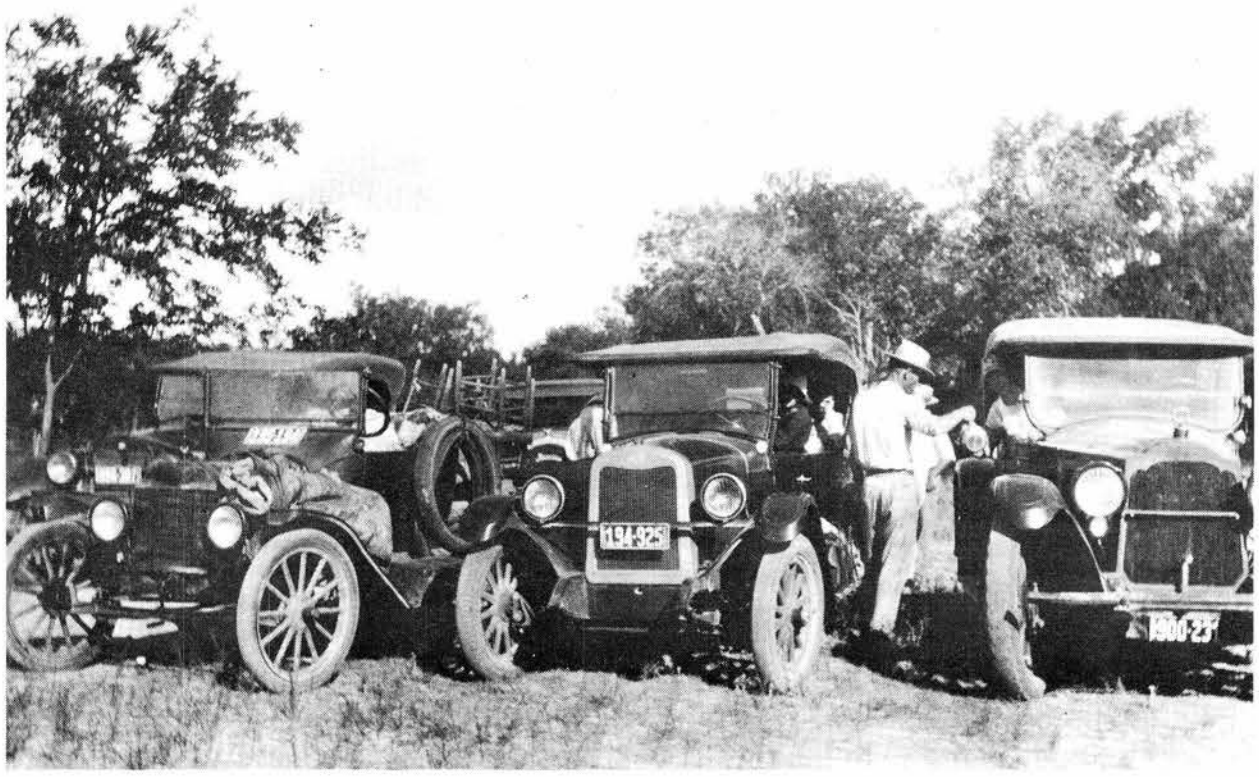
Joseph Daveney - 4552 25



Dennis Mangan - 1759 20



Phil Apodaca - 1112 20



Favorite Old Photo

The Subletts have been having family reunions every year since 1923 (except during WWII), and this photo was taken in 1929, at our gathering near the Santa Elena Canyon on the Rio Grande a few miles west of Castolon, Texas. The area is now part of the Big Bend National Park. For my family, getting to this reunion was an adventure because we drove some 100 miles south from Alpine along a so-called road neither marked or maintained. Dad's '29 Chrysler was one of the first autos to have hydraulic brakes. They failed on the trip, and we drove back home using only the emergency brake. I'm the present family historian, and we've been able to trace our ancestors back to the early 1600s in France. (Jack Sublett—1480)

JUNK•GOODIES•TRASH•ANTIQUES•KLUNKERS•CREAM PUFFS•HOUSES•HOVELS•LOST•FOUND•WANTED•& THINGS

CLASSIFIED ADVERTISING

Deadline: Friday noon prior to week of publication unless changed by holiday. Mail to: Div. 3162 (M0125).

RULES

1. Limit 20 words.
2. One ad per issue per category.
3. Submit in writing. No phone-ins.
4. Use home telephone numbers.
5. For active and retired Sandians and DOE employees.
6. No commercial ads, please.
7. No more than two insertions of same ad.
8. Include name & organization.
9. Housing listed here for rent or sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

FREE to good home, 1-yr.-old German Shepherd mix puppy, spayed, has all shots & boosters. Smith, 293-3296.

WESTINGHOUSE stackable washer/dryer. Jacobs, 265-4385.

1.5 HP B&S gas engine, horizontal shaft, $35. Stromberg, 255-6131.

21" COLOR TV console, $100 firm. Montoya, 881-6898 after 5.

TWIN size Simmons innerspring mattress, $20. Robertson, 299-7561.

50-EGG round incubator, $50; 1200-egg redwood incubator, $350; will trade for hay or grain; pigeons, 75 cents ea. Lackey, 898-6638.

TRAVEL TRAILER, 17' 1972 Rover, self contained, sleeps 6, $2200. Garcia, 898-8919.

CRAFTSMAN 10" radial arm saw, seldom used, $245. Whiting, 293-8266.

ANTIQUE RCA Victrola, elec., w/78 antique records, wood cabinet, $295 or best offer; wanted: AC/DC color or B&W TV for RV. Garcia, 888-4735.

STEREO components: BSR 610 turntable, $40; Electrovoice speakers, 24hx18wx12d, high efficiency, $125, good for low power amp. Boyes, 265-6357.

SEW-UPS: complete set-up, 27" alloy wheels laced to alloy lg. flange hubs, front & rear w/2 tires, English THD hub, $45. Healer, 298-6967.

BACKPACK, Mountain Equipment expedition pack, external frame, $75. Kovacic, 281-1754.

DINING SET w/4 chairs, $200. Curtis, 821-3522.

OLD-FASHIONED baby pram, $25; Fender super reverb, $250; Yamaha guitar w/case, $50. Todd, 255-3463.

HERCULON queensize sleeper sofa & loveseat, contemporary design, $395. Pedro, 345-6157 or 344-2104.

KITCHEN SET: white & gold formica table w/leaf, 4 swivel bucket chairs on rollers, $55. Gross, 821-3761.

MALAMUTE puppies, $50 ea.; pop-up camper, '71 Jayco, sleeps 6, ice box & stove, $1850. Humberstone, 281-1120 after 6.

AMES shelving, complete 8-shelf units, $15; also parts sold separately. Davie, 296-3950.

WORM-DRIVE saw, 7¼", Black & Decker, $100; backpacking shelter, Goretex Burrow, 1 lb., 9 oz., used once, $80. Shunny, 265-1620.

FRENCH naval pistol, 1842; Atisaka 7.7mm rifle; Nambu 9mm pistol; Belgian pinfire revolver & gallery rifle; Japanese sword. Harley, 898-6035.

BASEBALL UMPIRE GEAR: 2 metal counters, $4; face mask, $20; shoes (12D), $15. Brower, 298-2254.

ALL electric built-in wall oven, counter-top stove w/range hood, colortone, 36" wide, $100. Herrera, 299-0031.

UNITREX model 1200 4-function desk calculator, $10; Ford 15" wheel, 5-hole hub w/tire, $10. Moyer, 881-3879.

VETTER ROOSTER fairing, $95, paid $130; 3/8" variable speed drill press, paid $55, asking $40. Smith, 298-2704.

2 STORM/SCREEN doors, 36" alum., $40 for both; Remington power hammer, charges, nails, $30; sprinkler timer, 3-station, $20. Falacy, 293-2517.

1934 KIMBALL studio piano, walnut finish, $1395. Magruder, 266-1006.

10-PIECE modular set, earthtones, w/matching coffee table, end table & lamp, $300. Vargas, 247-3103 or 766-7275.

8 X 10 WALL TENT, Penney's, used once, $50. MacInnis, 898-1628.

WATER SOFTENER, Lindsay, manual, timer, type you recharge each month, $75. Stang, 256-7793.

BMW motorcycle exhaust flange wrench, heavy duty Webco model, used once, $15; windjammer bracket for Kawasaki KZ650. Barnard, 831-4114.

FREE, Frigidaire washer for parts, you haul (good motor). O'brien, 298-4008.

RANGE HOOD w/fan & light, yellow, 2 yrs. old, $25. Burgess, 345-2369.

MINI-MAC chain saw, completely overhauled, $100. Mason, 281-3052.

JAYCO fold-down camper, 10', 1981 model, fully self contained, paid $6000, asking $4000. Demmel, 898-1778.

CAMPER SHELL for short wide bed, $300 or best offer. Zamora, 898-1295.

BURGLAR ALARM: control unit, key arm, switch delay option, loop test, & arm switches, $25. Rainhart, 821-3690.

TWO TIRES, H-78-15 Town & Country, used 6100 miles, cost $50 ea., sell $30 ea. or both for $55. Fisher, 298-0526.

PIANO, Wurlitzer console w/bench. Summers, 881-7765.

ANTIQUE solid oak DR set, rectangular table w/leaf, 5 chairs, including captain's, large buffet, $850. Sanchez, 344-8733.

HIDE-A-BED, Herculon covering, $60. James, 294-6837.

STEREO cabinet w/glass doors, new, sell for $50. Kelly, 299-7190.

CHEVROLET ENGINE, professional rebuilt, 327 cu. in., 1000 miles since new, $375. Esch, 292-0754.

COMPLETE FORD MOTOR, 200 cu. in., $250; radiator for Mustang, $45. Jaramillo, 864-8491.

20" girl's bike, $25; small port. water air conditioner, $10. Boling, 298-8141.

1 PAIR L60x14 tires on white spoke wheels, $57; roll bar, $60. Nelson, 881-0148.

GARAGE SALE: 3325 Britt St. NE, Sat. 4/17, 10-4, Sun. 4/18, 12-3. Moulton, 293-0373.

GOLD BRACELET, 14K, ladies, flexible, dbl. safety lock, new, $260; music box, $22.50. Schmidt, 299-7305.

FAIRING mounting bracket for Suzuki GS550, 750, 1000 up to 1980, $25; sissy bar w/pad for Honda 750, $15. Schmale, 293-0784.

AIR COMPRESSOR PUMP, 2 cyl., 1½" diameter w/1½" stroke, $40. Martin, 869-2049.

TRUCK TIRES: 800x16.5, $15 up; 12-string acoustic guitar. Martin, 299-3004.

DRAPES & bedspread, "Winnie the Pooh" design. Drotning, 294-4807.

100 RED TINTED patio paving concrete blocks, 12x12x2", $65 or best offer. Owyoung, 294-1884.

OSTER juice extractor, $30; large dog house, $35. Hoff, 298-2248.

VW BUS PARTS, trailer hitch 1972-79, spare tire carrier, dual carb, balance adjust kit, repair manual. Garcia, 293-3937.

REMINDER

LAB NEWS does not accept rental ads except from those employees who are taking a leave of absence or are on temporary leave to another location.

UPRIGHT FREEZER, 16 cu. ft., frost free, Admiral, $150. Garner, 298-2562.

STORY & CLARK spinet piano, $350. Ma, 883-4438.

COMPUTER PRINTER, Radio Shack (Centronics) line printer I, w/extra paper & cover, $125. Vaughn, 298-5919.

TRANSPORTATION

'68 SKYLARK Buick, AC, PS, tiltaway steering wheel, new tires, 50,000 miles, $800. Sheaffer, 255-9473.

'81 KAWASAKI, red, under 5000 miles, 2 helmets, $1350. Clark, 884-9512 after 3:30.

'75 CORVETTE conv., two tops, low mileage, $9100. Perryman, 281-3020.

'65 MUSTANG, V8, new trans., balanced motor, mags, new tires, new metallic blue paint, orig. wheels available. Himes, 869-2856 or 869-6559.

'72 AUDI LS100, needs work, $750. Brockway, 344-1901.

'75 CUSTOMIZED Dodge Tradesman van, 56K miles, AC, PS, PB, AM-FM radio. Stuart, 265-7315.

'78 JEEP CJ7, PS, PB, 6-cyl., 4-spd., AM, FM, tinted windows, $5200. Garcia, 898-8919.

CYCLE PRO motocross bicycle, $75. Garcia, 281-5490.

'72 VEGA stn. wgn., AC, $850. Cooper, 881-4503.

'69 YAMAHA 305 street bike, $299. Roeschke, 298-0365.

'81 KAWASAKI CSR 305, black, low mileage, $1250. Hudson, 821-3968.

HONDA 750 K-model, many extras, $1500. Slutz, 898-9462.

'75 OPEN ROAD mini-home, 4980 miles, $9500. Moulds, 247-8433.

'81 HONDA 750 custom w/fairing, rack, backrest, trunk & case-saver, make offer. Webb, 294-8341.

'80 MUSTANG, 6-cyl., 4-spd., flip-top, PS, PB, custom seats, tilt wheel, cruise control, $5200. Calvin, 293-8523.

'72 CADILLAC sedan de Ville, 1973 Cadillac engine, $500. Miller, 281-3189 after 6.

'75 YAMAHA RD350, 2-stk., 2-cyl., 6 spd., new tires & top end, 15.3K miles, $750. Shapnek, 293-6558.

'69 CHEVY Impala convert., new top & paint, $3000. Hymes, 243-4198.

'79 KZ400, custom seat, half shield, 9500 miles, $1000. Scott, 294-8627.

BICYCLE, Peugeot PRN-10, 25" frame, 531 Reynolds Simplex De Railer, MaFac racers brakes, Stronglight crank, extras, $300. Wright, 296-3850.

'72 VOLKSWAGEN 411, AC, 4 spd., 2-dr., $1100. Tyner, 294-5289.

GIRLS' 20" bicycle; convertible 20" boys' or girls' bicycle, $35 ea. Westfall, 881-3386.

'80 FORD Mustang 2-dr. coupe, 4-cyl., AT, 19K miles, AM-FM-tape, BB, $5175, sell $4500. Stang, 256-7793 after 5.

'81 OLDSMOBILE Delta 88 Royale, white, grey-green fabric, split seat, AC, OD, 11K miles, $8500. Ashmore, 881-4653.

'79 YAMAHA 650cc, black & chrome special, $1300. Hund, 281-5297.

'79 FORD Mustang, 6-cyl., AT, PS, PB, AM-FM-8TK, will consider trade. Carter, 296-8709.

'80 TOYOTA Corolla, AC, AT, vinyl top, $4200. Banach, 299-3064.

BICYCLE, Schwinn 10-spd., 26", yellow, $100. Harris, 299-6664.

MEN'S 27" 10-spd. bicycle, Motobecane 21" frame, Huret deRailleur, Dia-compe brakes, Normandy hubs, $85. Tullar, 881-1854.

'72 FORD Galaxie 500, 34,000 miles, 2-dr. HT, all power, AC, AT, reg. gas, 390 engine, $2000. Stevens, 299-6086.

'75 MUSTANG hatchback, stick, AM/FM/8TK, AC, low miles, new tires & battery, $2200 firm. Holmes, 292-0898.

'81 MAZDA 626, 5-spd., AC, AM/FM stereo, 30 mpg/city, 15K miles, March NADA $7425, asking $6800. Crenshaw, 296-8948.

'78 YAMAHA XS400, 12K miles, mag wheels, disc brakes, $895 or best offer. Reese, 299-0866.

PEUGEOT UO-10 bicycle, 10-spd., rear rack, alloy wheels & components, extra tires, tubes & pedals, $175. Hufnagel, 294-5949.

'78 DODGE Omni, radials, 4-spd., 30/35 mpg, reg. gas, below NADA, $2800. Martin, 869-2049.

SCHWINN Continental II 10-spd. Clement, 299-1501.

'73 DODGE Dart, slant 6, $600; '73 Ford Stn. wgn., $500, will negotiate. Robles, 298-2456.

'77 MONTE CARLO, AC, PS, PB, AM/FM, red w/white vinyl top, $3100. Garner, 298-2562.

REAL ESTATE

TRADE nice 4-Hills home for smaller residence. Hymer, 293-6029.

4-PLEX APT. BLDG., NE hits., 2-bdr. apts. plus 1700 sq. ft. owners' unit w/fp, skylights. Wiczer, 296-4496.

'78 NASHUA mobile home, 14x70, 2-bdr., 2 bath, refrig., gas range, $4000 down, assume 12¾% loan. Jones, 281-1186 after 6.

'81 MOBILE HOME, 14x70, 2-bdr., 2 bath, skirted & set up in Silver City, NM, $1500 equity (negotiable), take over payments. Dytzel, 881-4973.

WANTED

3.5 HP or greater gasoline engine. Stromberg, 255-6131.

APPLIQUE PATTERN (perhaps quilt top) depicting the Calico Cat & the Gingham Dog. O'Nell, 892-6754.

PHOTO ENLARGER, good quality 35mm or 2¼. Laval, 898-9112.

POLAROID CAMERA Model 110; 4x5 view camera back; stereo camera equip. Mattox, 821-3945.

CAMERA, medium format (120 film), good condition. Luette, 292-5328.

TRAVEL TRAILER equalizing hitch. MacInnis, 898-1628.

RETIRED electro mech. designer needed to teach part-time, 4 hrs. per day. Segrist, 294-3591.

100 or more six-foot steel fence posts, must be in good condition. Hansen, 869-2716.

ABOVE GROUND swimming pool, 3 to 5 feet deep. Falacy, 293-2517.

NON-SMOKING rider to Chicago, split gas & driving, leaving July 24. O'brien, 298-4008.

YAMAHA RD350/400, should have good engine & trans., not fussy about looks. Barnard, 831-4114.

SHREDDER-GRINDER for mulch. Hansche, 281-5623.

STOCK BMW two passenger seat, R100S or R100RS, any color tail piece. Kovacic, 281-1754.

WATER SKIS, vests, in good condition. Cook, 869-6921.

ELEC. WINCH, 12v, to mount on front of truck. Colp, 255-0228.

ROWING MACHINE & economical car w/auto. trans. for less than $1000. Prevender, 299-5253.

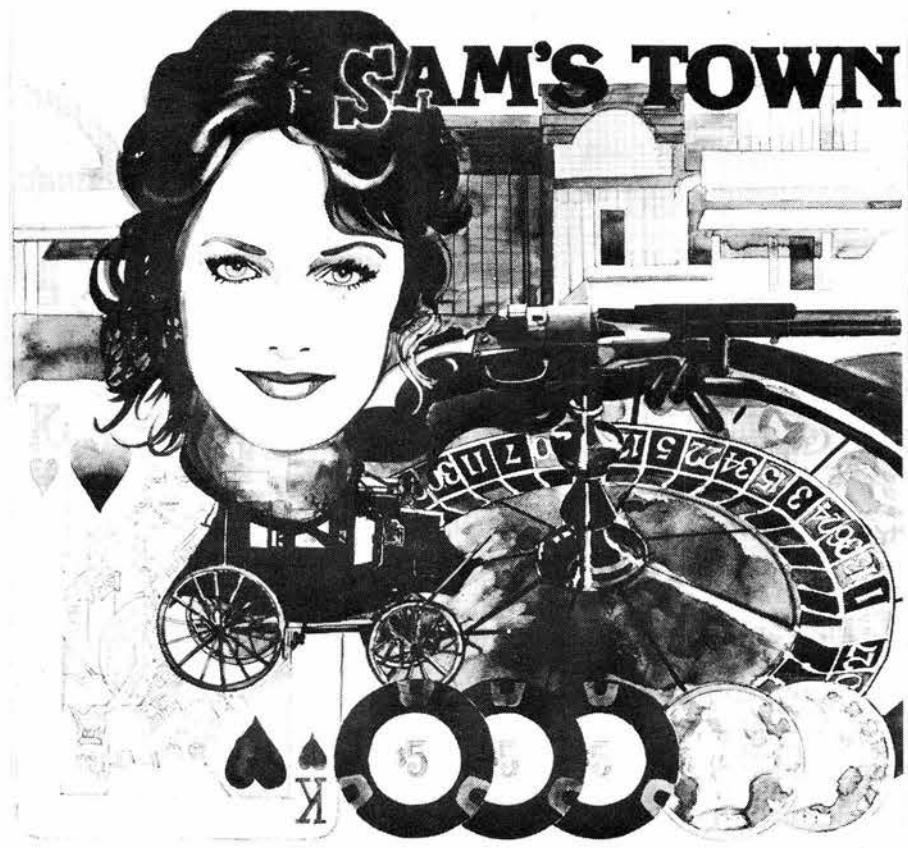
SHOP MANUAL for '77 Ford E150 van; one-two acre building lot in Bosque Farms area. Garcia, 293-3937.

Casino Action Tomorrow

TONIGHT at Happy Hour, Youngblood starts at 5 and holds the bandstand until midnight playing country-western, '50s rock and variety tunes. Tune in early and stay late enjoying special prices. In addition to fine steaks and seafood, the dining room features a couple of chef's specials—beef spare ribs, $4.75, and chicken teriyaki with rice, $4.95, including soup and salad bar.

TOMORROW is the big one—Las Vegas Night on the Rio Grande. The C-Club is converted to casino action from 7 until midnight with 50 volunteers manning crap tables, blackjack, poker, chuckaluck, wheel of fortune devices and like that. Elton Travis and the Westernaires play for dancing while green chili stew and French dip sandwiches are available. You pay $2 admission which buys a bundle of play money and chances on the big door prize drawings—a free weekend in Las Vegas for two at Sam's Town Gambling Hall and Hotel, transportation by Western Airlines. Other prizes are a black and white portable TV, an AM/FM radio, and a toaster.

NEXT FRIDAY, April 23, Country Capers play from 5 to 7:30, then Jeanne Rich and Friends take over the bandstand until midnight. The dining room offers *a la carte* dining. Chef's specials are beef spare ribs, $4.75, and spaghetti and meatballs, $4.50, including soup and salad bar. Special bar prices are in effect all evening. At Happy Hour April 30, Tom Black and the Fugitives hold the bandstand from 5 until midnight while the chef's special is barbequed beef and pinto



A WEEKEND (three days, two nights) for two in Las Vegas at Sam's Town Gambling Hall and Hotel, transportation by Western Airlines, is the grand prize offered tomorrow at the C-Club's Las Vegas Night event. Casino action (with play money) starts at 7 p.m. Music by Elton Travis and the Westernaires. Admission is $2.

beans. This is a "dress Western" evening with prizes for the best Western outfit for a man and a woman. The prizes are tickets to the Club's upcoming and fabulous . . .

LUAU, a Polynesian festival scheduled June 26. That's a long time away but preparations are already under way to turn the old C-Club patio and pool area into a South Sea paradise. Mark your calendar now—it will be one of the year's great parties with dancing, dancing and singing entertainers, roast pigs on spits in the patio fireplaces, oriental goodies, special drinks in coconuts and more.

THURSDAY NIGHT TV movies on the Club's big screen include *Dirty Dozen* April 22 combined with a Weller bourbon bar promotion with special prices and door prizes, including cowboy hats. On April 29, the movie is *Magnum Force* starring Clint Eastwood in a Dirty Harry role.

UPCOMING EVENTS in early May include another C-Club Singles Mingle on Friday, May 7, and (according to manager Tom Ross) a "fantastic Mother's Day buffet" on Sunday, May 9. "It will be elegant and elaborate," Tom says. "I'm bringing mama and the kids."

SWIMMING LESSONS and Red Cross lifesaving and water safety classes start in the Club's twin pools June 7. Registration for the classes (which are offered in two-week sessions at various levels from beginning to advanced) for swimmers and divers takes place Saturday, May 8, from 9 to noon. It would help speed registration if pool and patio passes were purchased before enrollment. Season passes go on sale at the Club office April 22.

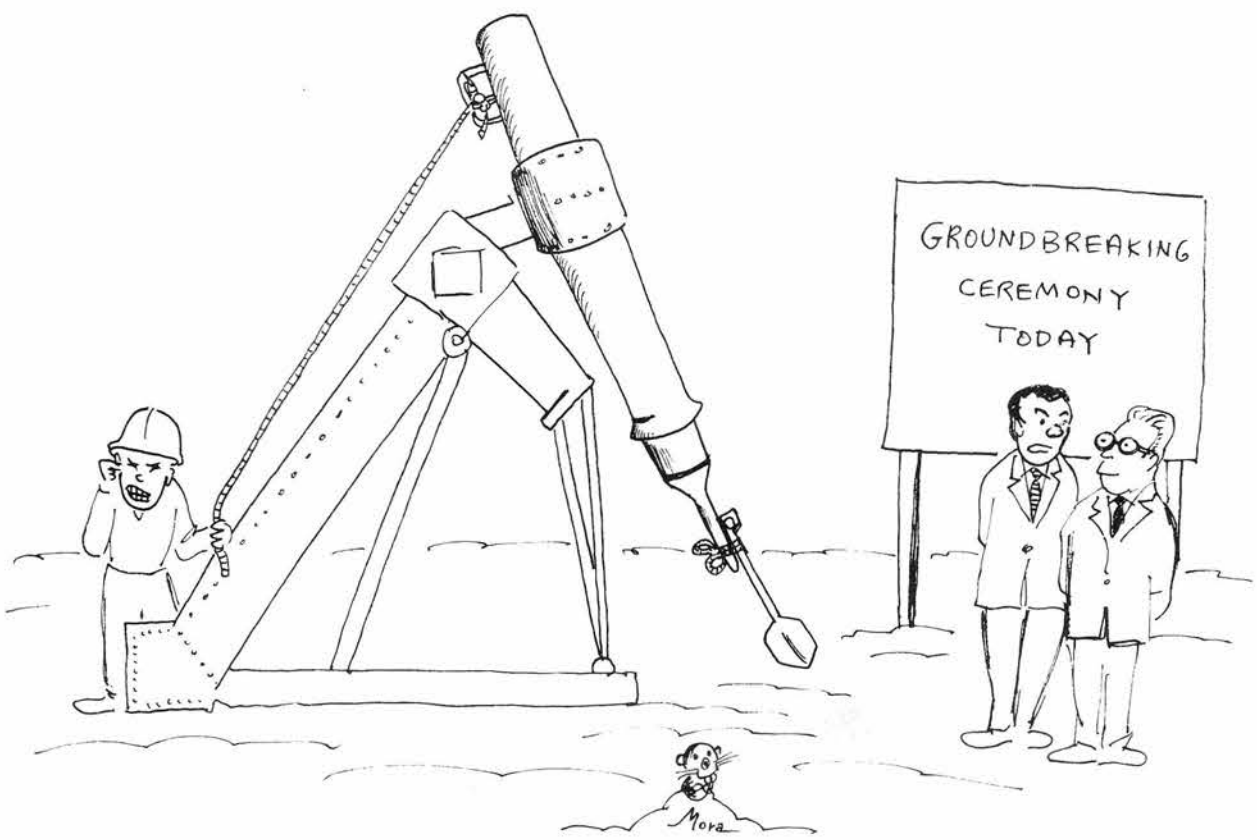
TRAVEL DIRECTOR Frank Biggs (4231) reports adding another activity to the May 30-June 2 Las Vegas trip without increasing the price. Touring Hoover Dam is the option. Travel to Las Vegas by bus for $130 or by air for $185. Either way, lodging is at the luxurious Maxim Hotel.

"We have two unique trainride bargains to choose from," Frank says, "a one-day Cumbres-Toltec tour (June 26, $42 adult and $30 children 11 and under) which includes charter bus from the Club with snacks and refreshments while on board and the train ride (all the way across). Or a two-day trip which includes charter bus with snacks, refreshments, and meal while on board, lodging in Durango, a tour of the Aztec Ruins, Durango to Silverton trainride, and the Purgatory Alpine Slide. The price is $88 (adult) and for children in the room with adults, $68 (ages 12 to 16), $58 (5 to 11) and $48 (under 5)."

The Chaco Canyon (April 24, $20) pre-trip meeting is scheduled April 22, 7 p.m.

Spend a week in Cozumel for $459 before May 15 or for $409 thereafter.

See Frank in the lobby tonight between 5 and 7 for more information.



Sometimes I wish New Mexico had somewhat loamier soil.

In a . . . survey of 500 secretaries, "57% of the respondents said that their boss's handwriting was either difficult or impossible to read. Most of the respondents said that they spent from two to three hours a week redoing work because of misread handwritten messages, notes, or reports."

—Christian Science Monitor