

Magma Looking Good As Heat Source

Results of field tests conducted this year, combined with results of earlier research, indicate it is scientifically feasible to extract thermal energy directly from molten rock (magma) within 10 kilometers of the earth's surface.

The tests at Kilauea Iki Lava Lake in Hawaii represent the first successful drilling of a molten body hotter than 1000°C, the recovery of a complete core, and the maintaining of an open hole so that experiments could be conducted in the molten rock.

The experiments show that significant amounts of thermal energy can be extracted from magma and that materials used in energy extraction equipment can survive exposure to the magma. Seismic experiments produced the first measurements of acoustic velocities through a well-characterized magma body.

Extracting energy from magma calls for inserting a heat exchanger directly into the magma—nominally at 850°C to 1100°C—producing steam to generate electricity in a conventional manner.

Magma is regarded as a long-range energy source, but one of such magnitude that it merits careful investigation. U.S. Geological Survey scientists estimate that the energy content of magma bodies within 10 kilometers (six miles) of the earth's surface in the continental U.S. is 800 to 8000 times the present annual U.S. energy consumption. A number of major magma bodies are located in the western U.S.

Sandia has managed the DOE's Magma Energy Research Project since its inception in 1975. Major tasks have been (1) locating and defining buried magma bodies, (2) tapping and maintaining access to the source, (3) estimating the chemical and physical properties of magma bodies, (4) determining whether materials can survive in the magma, and (5) evaluating energy extraction concepts.

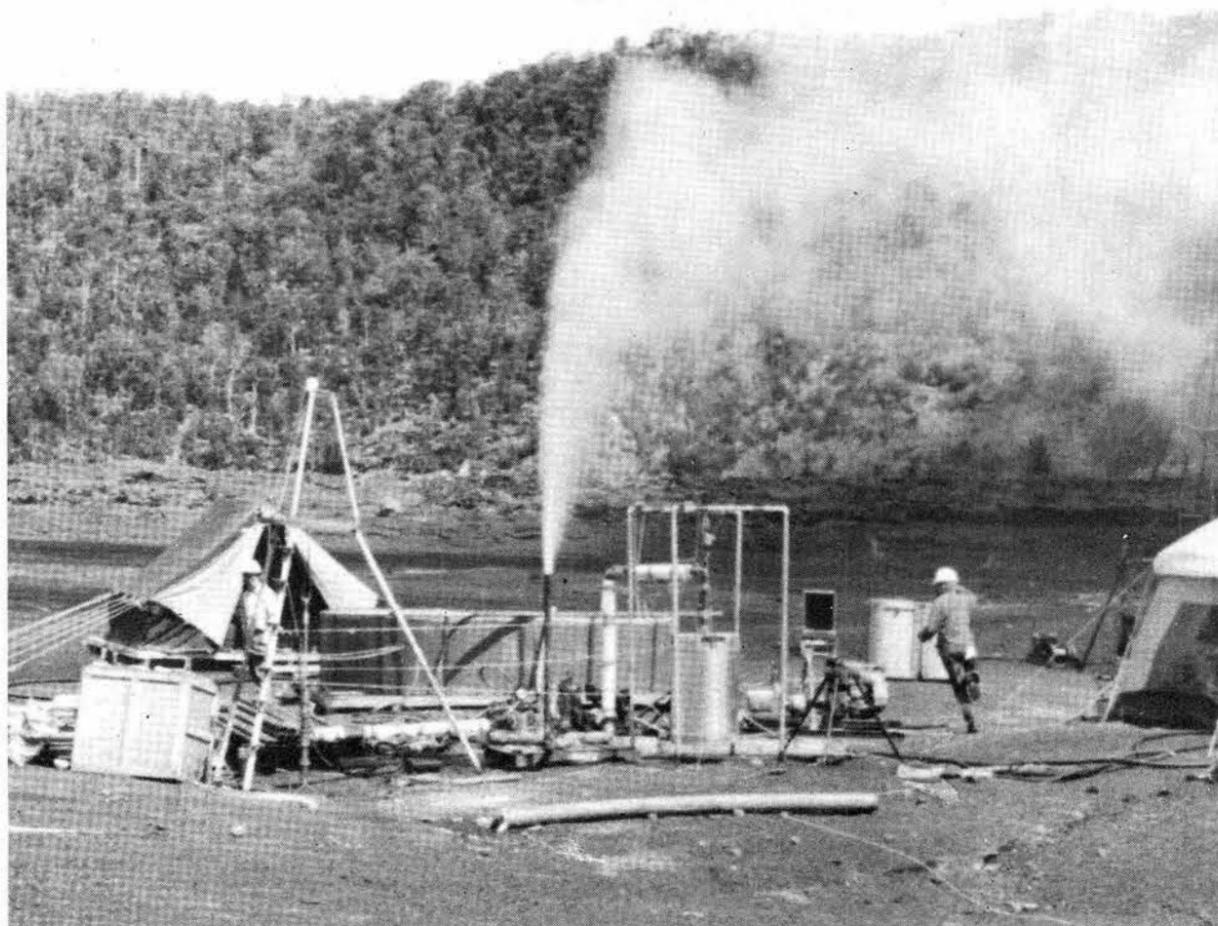
"The evidence accumulated over six years, culminating with this year's field tests in Hawaii, clearly demonstrate the scientific feasibility of all five tasks," says John Colp of Geothermal Research Division 4743.

"Now we need to begin emphasizing research about the detailed engineering aspects of magma energy, the economic realities, and the best location for a demonstration plant that could be operational in 10 to 20 years."

Two scientific review panels, the Sandia Magma Energy Research Advisory Panel and the Geothermal Coordinating Group, have followed the project's progress and agree that it is scientifically feasible; no fundamental or identifiable scientific reasons exist for the concept not to work.

In Sandia experiments at Kilauea Iki Lava Lake, conducted in April 1981, the 35-meter-thick molten zone of the lake was drilled and cored.

The bit used was a specially designed



THAT'S STEAM—Down on the floor of Kilauea Iki in Hawaii, scientists scurry as steam—generated from water contact with magma—broaches surface. Molten lava lake is at shallow depth here, approximately 50 metres, and is thus well suited for experimentation. Results showed that significant amounts of thermal energy can be extracted from magma.



LAVA LAKE and drilling operations (just above sign), as seen from the tourist overlook. Equipment and supplies were brought to the site by helicopter and jeep-run tram.

diamond coring bit fitted with nozzles that discharged water at a high rate. The water cooled the bit, removed the chips, and chilled the molten lava to a drillable consistency. Holes were kept open with a continuous flow of water.

Two energy extraction techniques were tested. A conventional closed heat exchanger was used and in the other method,

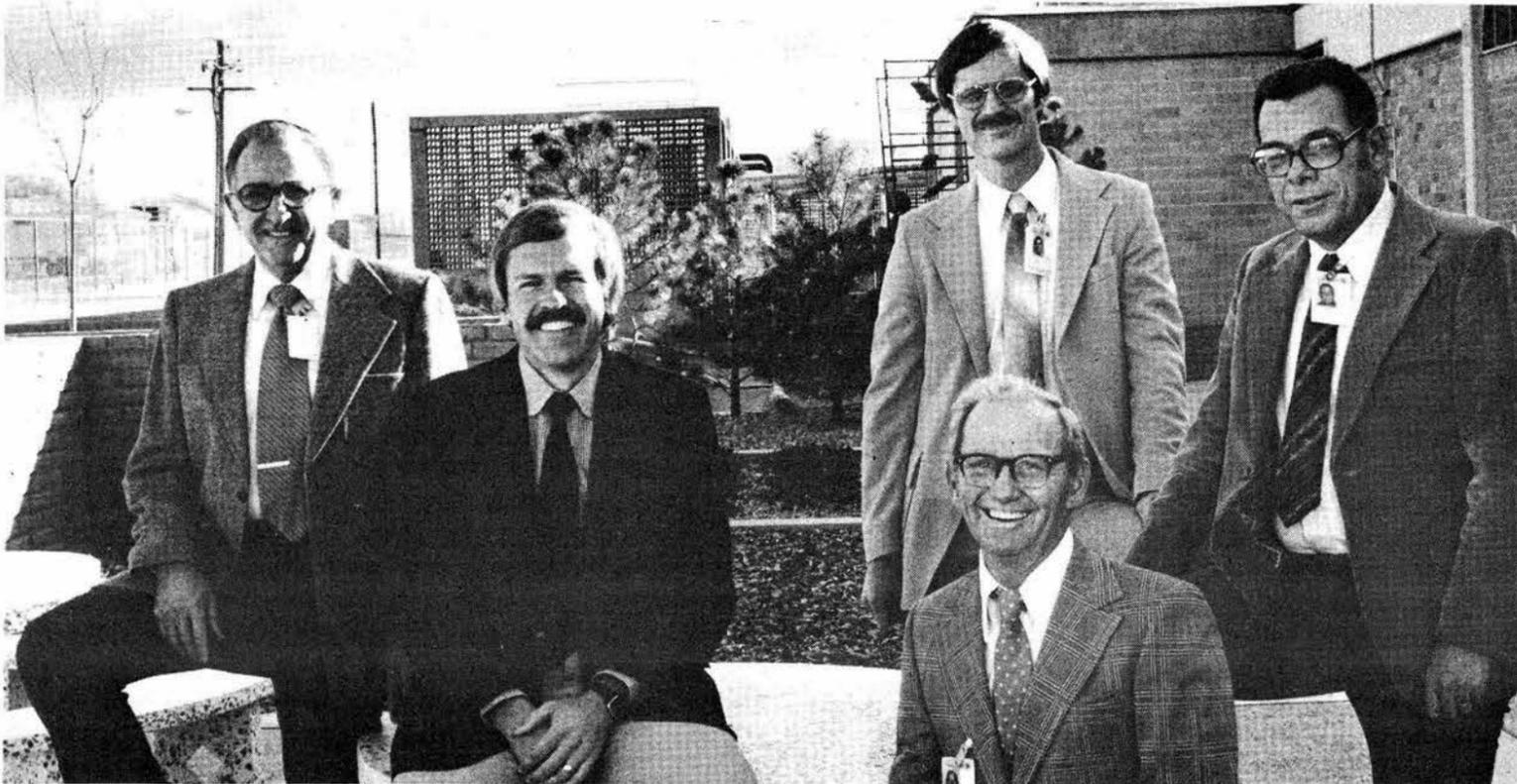


NEXT to drill rig are Dick Striker and Jim Dunn, staff members from Geothermal Research Division 4743 who, with John Colp, performed the magma experiments. Hand signal, they explain, is ancient Hawaiian gesture of indeterminate meaning.

water was injected directly into the molten rock.

The closed system used a heat exchanger inserted into a cased hole terminating about two meters above the lake's melt zone 58 meters below the surface. Under steady state conditions—water flow rates of

[Continued on Page Four]



PLANT ENGINEERING promotions—(l to r) Vern Easley (3630), Mike Nielsen (3651), Mike DeWitte (3643), John Snowdon (3632), seated, and Ken Harper (3640).

Supervisory Appointments

JOHN SNOWDON to supervisor of Buildings and Facilities Design Division 3632, effective Jan. 1.

With plant engineering since he joined the Labs in 1960, John has worked on the design of new buildings and facilities. Before coming to Sandia, he worked with several engineering firms.

John earned his BS in civil engineering from the University of Nebraska and completed work towards an MBA at UNM. He is treasurer of the Albuquerque Chapter of the Construction Specification Institute; he's also president of the Albuquerque Wildlife Federation. His interests include fishing, hunting and conservation activities.

John and his wife Bonnie have seven children and two grandchildren. They live in the NW valley.

* * *

VERN EASLEY to manager of Plant Engineering Design Department I 3630, effective Nov. 16.

Vern joined the Labs' plant engineering group in 1958 as a staff member. Promoted in 1960, he has headed the

operations and control division, operations engineering division and, most recently, a buildings and facilities design division.

He earned a BS degree in EE from UNM. Vern, a Senior Member of IEEE, is a registered professional engineer in the state of New Mexico. Off the job, he enjoys bird hunting and bicycling with his wife Betty. The Easleys have three daughters—all living in Albuquerque—and live in the NE heights.

* * *

MIKE NIELSEN to supervisor of Planning Division 3651, effective Jan. 1.

Mike has been with the plant engineering organization since coming to Sandia in July 1969 as a design engineer. His assignments have included design, operations and planning work. In addition, he worked for two years on the WIPP project. Most recently, he has been project leader for an automated plant control system.

Mike received his BS in EE from California Polytechnic State Univ., and has done graduate work in nuclear engineering at UNM.

He enjoys camping, fishing and working with youth athletic programs. Mike and his wife Susan have two children and live in NE Albuquerque.

* * *

KEN HARPER to manager of Plant Engineering Design Department II 3640, effective Nov. 16.

Ken joined the Labs' plant engineering organization in 1961 as a design engineer. He was promoted to division supervisor in 1973; his most recent assignment has been as supervisor of Building and Facilities Design Division 3643.

He earned his BS in civil engineering from Wichita State University (Kans.) and, under Sandia's Educational Aids Programs, his MS in civil engineering from UNM. Ken has been a member and officer in the Albuquerque Soaring Club for 15 years. He also enjoys hiking, fishing and camping. He and his wife Neleen have two sons and live in the NE heights.



NEW SUPERVISOR—Tom Donham (2364)

MIKE DeWITTE to supervisor of Buildings and Facilities Design Division 3643, effective Jan. 1.

Mike came to the Labs in January 1976 as a structural engineer in plant engineering. He transferred to the Waste Management and Geotechnical Projects Directorate 4500, where he worked for two years on the WIPP project. His most recent work has been with the uranium mill tailings remedial action program in division 4542.

Mike earned a BS in engineering from the U.S. Air Force Academy and his MS in civil engineering from the University of Illinois. He will complete work for his MBA from UNM in May. He is a registered professional engineer in the state of New Mexico. Mike plays soccer and coaches youth soccer. He and his wife Barbara have two sons and live in NE Albuquerque.

* * *

TOM DONHAM to supervisor of Advanced Firing Subsystems Division 2364, effective Jan. 1.

Since joining the Labs in 1957 as a staff member, Tom has worked with a production test equipment group and a division concerned with firing set development. He has been assigned to Sandia's deep steam project and, most recently, has been investigating magnetic bubble memories.

Tom earned his BS in EE from NMSU and his MS in EE and computer science from UNM, the latter under Sandia's Educational Aids Program. Off the job, he enjoys sports, both as a spectator and participant, and is active in his church. Tom and his wife Martha have two sons and live in the NE heights.

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CARS Helps Cars

By directing laser beams into an operating laboratory engine, two Sandia Livermore researchers are using a new diagnostic technique to measure accurately both temperatures and major species concentrations in the combustion gases of an internal-combustion engine.

Larry Rahn of Applied Physics Division 8342 and Sheridan Johnston of Combustion Applications Division 8522 have been working together for the past year to apply a technique appropriately called CARS (coherent anti-Stokes Raman spectroscopy) to engine combustion research. This technique, which was pioneered for combustion measurements in France, has since been under development in laboratories throughout the world, including Sandia Livermore. At Livermore, in an engine with a cylinder head specially adapted to provide maximum access as well as the simplest possible cylinder geometry, Larry and Sheridan are making instantaneous measurements of basic combustion processes.

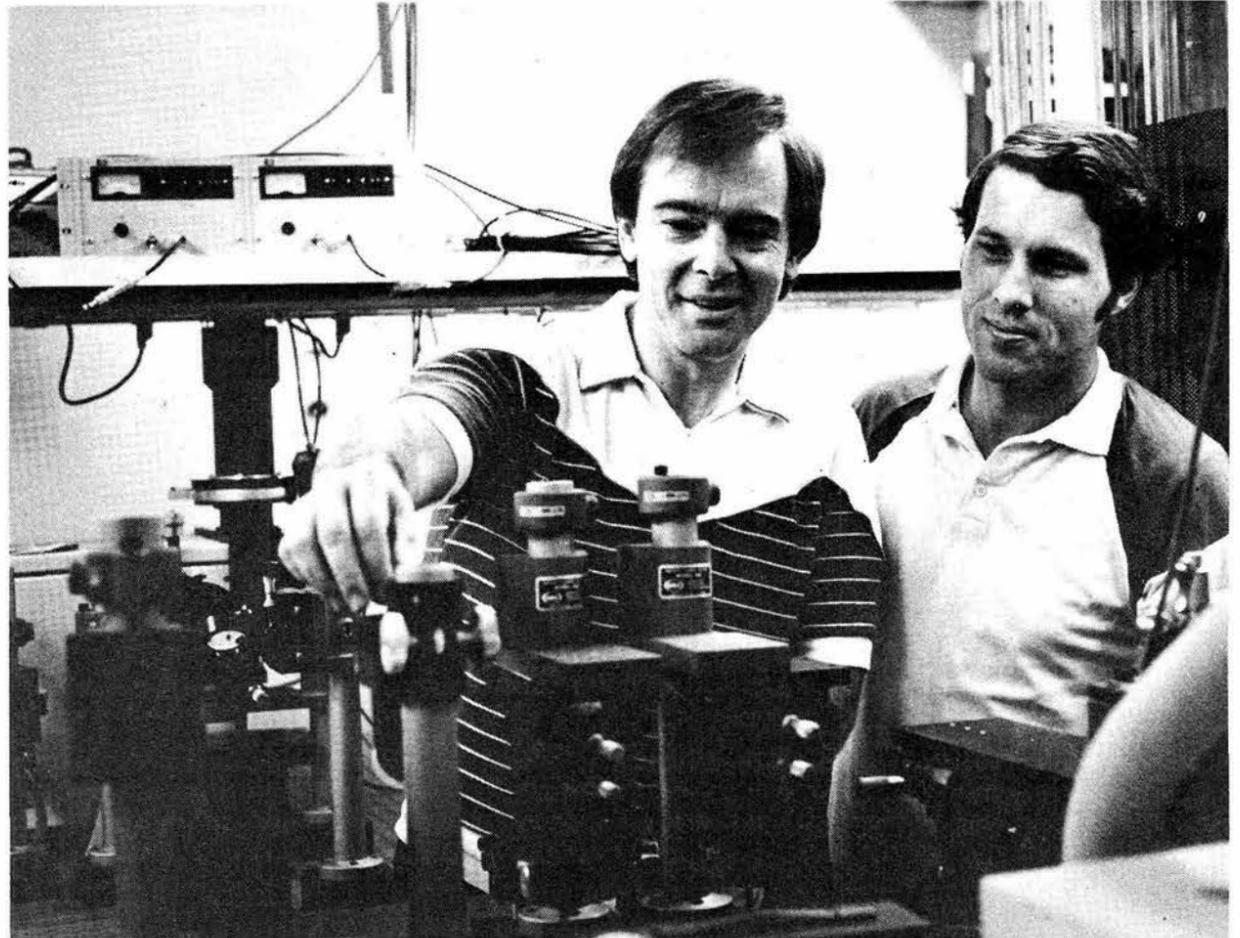
"We could just as well use the chamber of a commercial engine," says Sheridan, "but the trouble with that approach is that while our measurements would help to explain processes in that particular engine, we'd learn relatively little about generic combustion processes. And our charter is to develop basic data, not to troubleshoot production engines. With the CARS engine we can study fuel evaporation, flame propagation, and soot formation under controlled conditions—something we couldn't do with a production engine."

"In September," says Larry, "our year-long effort produced its first data, and the results were even better than we'd expected. CARS turns out to be one of the more powerful techniques available today. It enables us to study combustion processes inside the cylinder under very adverse conditions. Not only can we measure the temperature of the combustion gases, but we can also measure the concentrations of combustion products such as carbon monoxide.

"Physical probes, such as thermocouples, have limited usefulness inside the chamber," Larry continues. "But optically these processes are quite accessible. For instance, flow visualization movies of them are easy to make. Now, with CARS, we can make accurate, reliable measurements which will provide a data base for computer models."

The technique works like this. Three laser beams—two green and one red—are focused into the combustion chamber. At the focal point, a blue signal beam is generated by the interaction of the intense pulsed laser light with the gas molecules present. It is this blue beam that is analyzed to provide the temperatures and concentration data needed by researchers.

This signal light, though not readily visible to the eye, is much stronger than the combustion light produced at the same time and wavelength, and it can be analyzed with great accuracy by sensitive detectors. Thus, the CARS technique



ADJUSTING lasers they use to measure combustion processes in an operating engine are, left, Sheridan Johnston (8522) and Larry Rahn (8342). They employ a new technique, CARS, which is yielding accurate temperature measurements in the extreme combustion environment.

allows measurements to be made in extreme environments.

"Our experiments are set up," says Sheridan, "for real-time data analysis—that means we get the results instantaneously. Also, we want to see the conditions under which measurements can be made, and what possibilities this experimental setup has as a test bed for making measurements in a diesel engine—our next major objective."

Both Larry and Sheridan have been working in their fields for several years.

Larry, with the help of Roger Farrow (8342), has been developing the CARS diagnostic technique, while Sheridan and several others in organization 8522 have been applying a variety of laser-based diagnostics to engines. The present partnership builds on these earlier efforts. They have now demonstrated the feasibility and potency of the CARS technique as an engine diagnostic in this particular application, and the data-gathering phase is under way.

Retiring



Doris Brown (8265)



Bert Folks (8443)



Dr. H. McLeod Patterson
(Consulting Physician)

Magma Looking Good

0.25 to 0.35 liters a second—this system extracted heat at a rate of 17 kW/m² of exposed surface area of the heat exchanger. This is equivalent to the typical 30-year performance average for a commercial geothermal electrical generating plant: 25 kW per drilled well.

The open heat exchanger consisted of a hole extending about 16 meters into the molten zone, the last six meters of which was uncased. Injection of water into the magma in the uncased portion of the hole solidified and fractured the magma, creating an expanded heat exchange area.

Controlled injection of water into the hot (greater than 700°C), solidified magma produced a steady flow of steam at the surface or a cyclic, geysering action.

Injecting water at 0.04 liters a second for 24 hours produced a continuous flow of steam at an energy extraction rate of 93 kW/m². Using the commercial plant unit of measure, this is equivalent to 85 kW/well.

In a typical cyclic injection operation, 19 liters of water were pumped into the molten region within a minute. As pressures downhole quickly increased to 0.7 MPa (100 psi), a valve opened and steam flowed to the surface. Instantaneous heat extraction rates as high as 980 kW/m² were measured.

To perform the seismic experiments, conducted by Sandia and the University of Texas at Dallas, downhole explosives were set off and surface geophones measured the speed of acoustic waves through different zones of the lava lake.

This work showed that fractures in the solid part of the lava lake had a more pronounced effect on seismic velocity than in the molten zone. These findings will be helpful in locating magma bodies beneath the earth's surface.

John Colp presented an overview of the magma energy project earlier this month at the American Geophysical Union meeting in San Francisco. Other papers on the project were also presented.

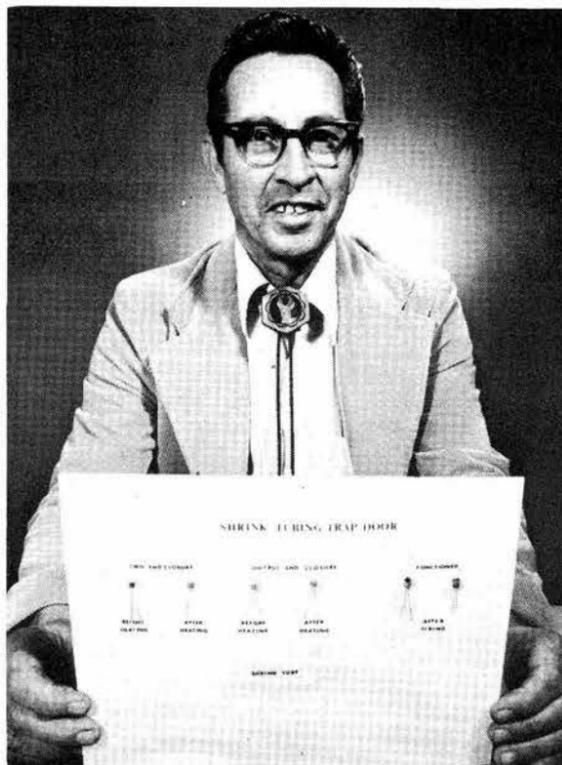
Novel Solution to Electric Match Ignition Problem Awarded Patent

A novel way to solve "resistance-after-fire" problems in an electric match used to ignite thermal batteries has resulted in a patent for DOE. Inventor is Arsenio Montoya of Initiating and Pyrotechnic Components Division 2515.

All electrically actuated, pyrotechnic, fire-starting devices (known as electric matches, squibs, igniters or initiators) function through the electrical heating of a bridgewire to ignite the pyrotechnic charge. After ignition, the bridgewire and pyrotechnic "disappear" to give an open electrical circuit which serves to indicate that the unit has functioned.

A problem develops when conductive materials are retained between the match leads (pin surfaces) after the match has been fired so that a significant current continues to flow. The current thus needlessly drawn tends to deplete the energy in the power supply or imposes demand loads which prevent performance of required functions. When this resistance-after-fire problem is intermittent, the pulsations are capable of inducing unwanted fluctuations in other electrical components.

Arsenio solved these problems with the addition of a piece of shrink tubing, made of a plastic material which shrinks when heated, on the outside of the match and extending about 4 mm past the match face. Heat of ignition causes the tube to shrink and effectively block the accumulation of resistive material in the match cavity. Residue deposition is greatly decreased, and the transfer of heat into the cavity is blocked so that the electrical



ARSENIO MONTOYA (2515), inventor of a new way to solve resistance-after-fire problems in pyrotechnic initiating devices, displays a chart with tested samples showing the effectiveness of the method.

conductivity of the burned residue remains low.

Other methods of solving the resistance-after-fire problem were tried, including vapor deposited coatings, but the shrink tube proved to be the most effective—and the cheapest. The tubing costs about five cents.

An ESA at the Labs for 33 years, Arsenio has worked the entire time on explosive components.

Fun & Games

Congratulations—To Bonnie Roudabush (1223) upon the completion of her first marathon, in Hawaii last month. Bonnie becomes the fourth woman from the Labs to complete a 26-miler.

* * *

Biking—Safety calls to report a hazardous practice: sideling up to a stop light on the right-hand side of cars awaiting the signal change. When it does change and the car(s) turn right, the biker may be in peril. What to do? We don't know—any bright ideas?

* * *

Skiing—A few openings are left in the cross country ski clinics for beginners and intermediates being offered this month at Sandia Peak. The clinics are sponsored by the Sandia Labs Recreation Program. Spouses and dependents may participate. Contact: Tom Lenz on 4-8486.

As in other worldly pursuits, your mind set largely determines the excellence of your skiing. So if you quiver . . . with fright, not joyous anticipation . . . when confronted with that mogul field, chances are you'll blow it. That's the thesis of Joe Schenkel, Chief of Psychology Service at the VA Medical Center and himself a certified ski instructor. Joe's talk, "The Head Counts Too!" is featured at the Jan. 19 meeting of Coronado Ski Club. It all starts at 7 p.m. and freebies and films are also on the bill.

Tomorrow, Jan. 9, John Southwick (ret'd.) leads a cross country ski trip along the Sandia Crest Survey Trail. Meet him at the Aladin parking lot at 8 a.m. if you're interested. (This item prepared before snow—no snow, no trip.)

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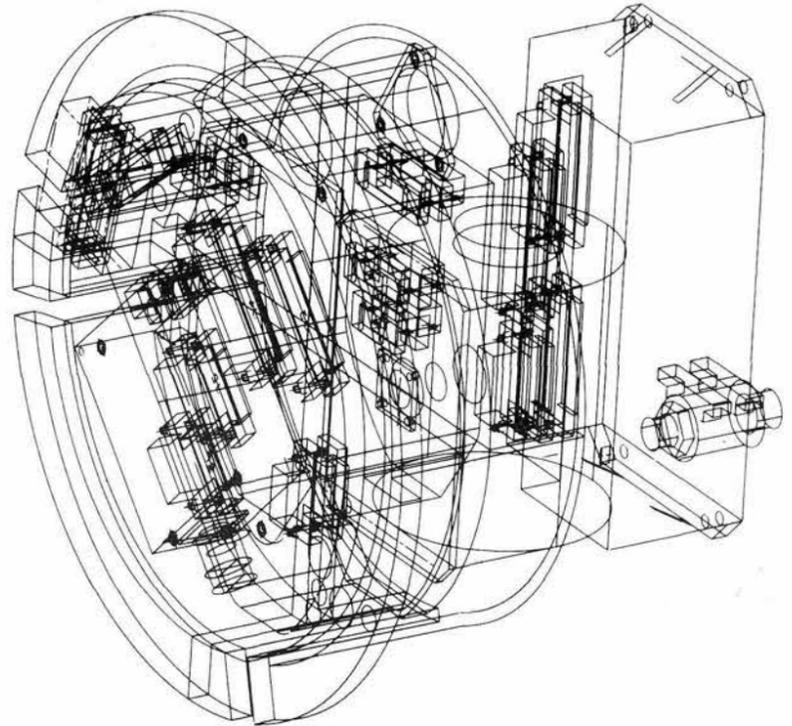
Pumping iron—Three Sandians placed last month in the Cibola Open Powerlifting Meet in Grants. Richard Cernosek (1254) took first place in the 220-lb. class, Joe Schofield (2627) a third in the 181-lb. class, and Hamp Richardson (4218) a first in the 165-lb. class. In a powerlifting meet, the total weight lifted in three different lifts determines ranking—the squat, bench press and dead lift. Rich lifted 1585 pounds, Joe 1150 pounds, and Hamp 1100 pounds.

Events Calendar

- Jan. 8-10—Albuquerque Opera's annual Chamber Opera, two baroque masterpieces sung in English, 8-9, 8:15 p.m., 10th, 3 p.m., Stage One, U of A.
- Jan. 15—Navajo rug auction, Crownpoint Elementary School, 7 p.m.
- Jan. 15-16—4th annual Journal International Gymnastics Invitational, 7:30 p.m., UNM Arena.
- Jan. 15-16—NM Symphony Orchestra: Raymond Leppard, guest conductor, 8:15 p.m., Popejoy.
- Jan. 20—"Festas Acoreanas: The Aesthetics of Religious Ritual in the Azores, Portugal," illustrated lecture by Mari Lyn Salvador, Maxwell Museum of Anthropology, UNM, 8 p.m.
- Jan. 22-Feb. 7—"The Hostage," Albuquerque Little Theater, 242-4750.



WADE ADKINS (2454) calls up a model of the W85 Joint Assembly from the CAD graphics files. The complete system or any component may be displayed, from any angle and to various scales. CAD is particularly valuable in the early stages of design and is now the first link in the automated production of machined parts.



GRAPHICS FILE of Sandia's CAD (Computer Aided Design) system contains design information needed for Bendix's CAM (Computer Aided Manufacturing) system to produce tapes to drive numerically controlled lathes, milling machines and drill presses to machine finished parts. Computer produced drawing above is a three-dimensional "wire-frame" drawing of the unclassified Joint Test Assembly and telemetry system for the W85. Portions of the unit were recently produced by the Sandia CAD and Bendix CAM systems, foretelling the expanding role of automation in future design and production.

From Sandia to Bendix

New CAD-CAM Systems Link Produces Machined Parts

One of the first steps representing almost total automation in the design and production of weapon parts was completed recently in an experiment between Sandia and Bendix Kansas City.

In a pilot project, Sandia computer-generated data bases, which incorporate product design and definition data, were transferred electronically (via a secure SACNET link) from Sandia, the design agency, to Bendix, the production agency. At Bendix, the data bases were used to produce punched tapes to drive numerically controlled machine tools that turn out finished parts.

The process is a significant step beyond the traditional methods of design and production. In the pilot project, no manually prepared drawings were used or needed.

At Sandia, computer-aided design (CAD) systems are used to create the graphics data base which includes design and fabrication requirements. From this graphics data base, traditional engineering drawings may be generated—beautiful precision drawings produced by computer-controlled plotters. With CAD, it's easy to produce such output or, if needed, three-dimensional model drawings from any angle which are of great assistance in the conceptual stages of design.

CAD techniques allow designers to investigate design options more efficiently as well as complete tasks that were considered impractical with traditional methods.

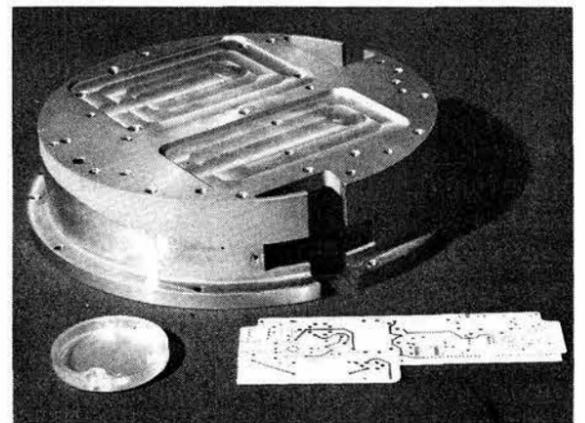
Within the Design Information Directorate 2400, more than 25 percent of the product design and definition graphics output is now produced using CAD methods. At SNLA, CAD equipment is also being used by organizations 2110, 1540/1580, 3650 and 4530. Bendix has identical CAD equipment which permits graphics files to be easily exchanged between locations.

Rather than mailing drawings, the

product definition in computer graphics file format can be transmitted electronically between locations in a short time. At Bendix, manufacturing elements of the Sandia graphics file are transferred to an internal computer-aided manufacturing (CAM) system to produce the tape required to drive the numerically controlled machine selected to make the product. At Bendix, NC part programmers add information to the graphics file such as cutting speed, feed rate, etc.

To develop the link between CAD and Sandia and CAM at Bendix, Division 2454 under George Urish and Division 1545 under Don Williams proposed the pilot project as a joint effort with Bendix. They worked closely with Bendix organizations CAD/CAM, NC Machining, Design Definition, Telemetry System Development and PWB Processing.

Purpose of the project was to produce parts at Bendix using CAM methods from graphics data files created at Sandia. Some mechanical and electronic parts from the W85-JTA telemetry system were selected by Bendix as the items to be produced by this experiment.



IN THE PILOT STUDY of the CAD/CAM system, these elements of the W85 Joint Test Assembly were produced. The CAD graphics file was electronically transferred to Bendix's CAM system where the parts were produced by numerically controlled machines.

George Urish reports, "The parts have been produced with no major problems, and this experiment has provided valuable feedback on ways to improve the CAD and CAM transfer. Our success is the basis for a series of additional CAD/CAM projects with Bendix, planned for this year." The results of this project have been summarized in a report prepared by George Urish and Bill Sprague of Bendix.

Security Tackles Wild Goose

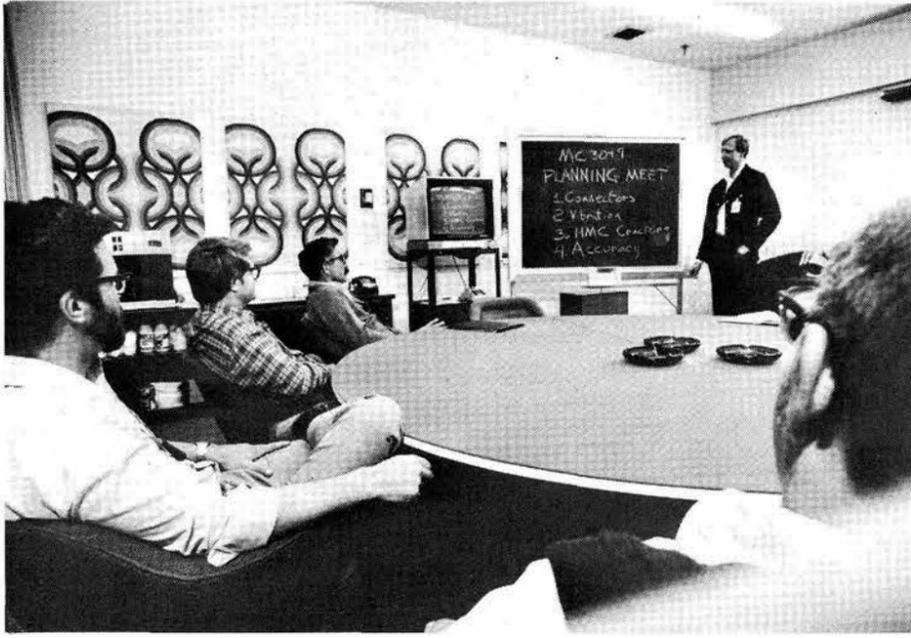
If you're a security inspector at Sandia, you occasionally wind up with a strange assignment.

Inspector Al Cherino was having a routine morning recently when word came to check out the entry road into Area III. Seems that an injured wild goose was making a commotion, trying to take off but not quite making it.

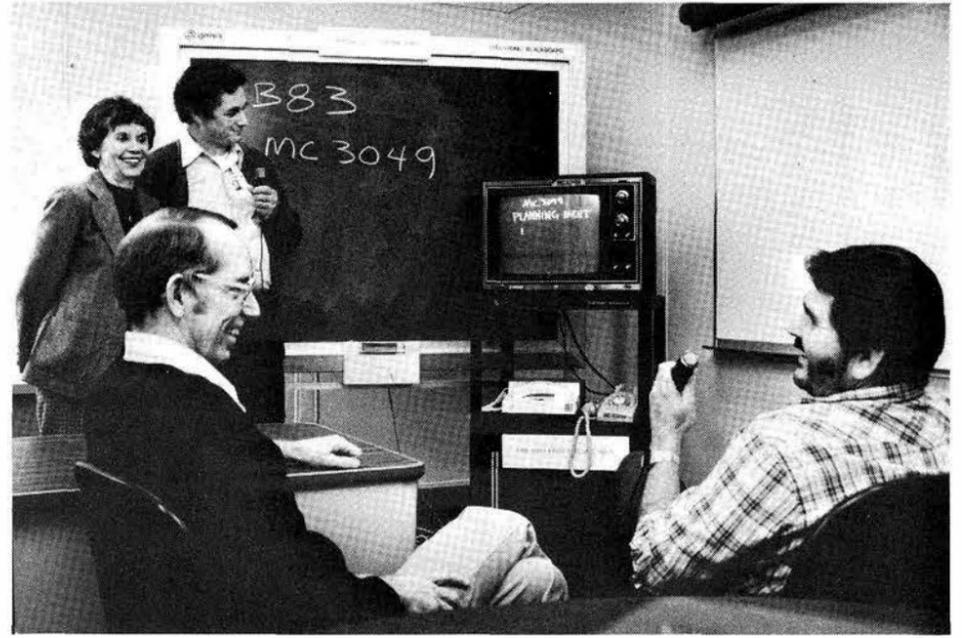
Upon arriving at the scene, Al surveyed the situation and quickly concluded that you don't just walk up to an injured wild goose and lead it away—even the domesticated ones can be a handful. What to do? A man of parts, Al did what had to be done.

He unlimbered his lariat (which he just happened to have along) and lassoed the critter.

Once in custody, it was determined that the goose had a laceration across the head, probably from having flown into a power wire, not serious but not trivial either. Cherino's compassion was stirred. The goose is now convalescing nicely at the Cherino farm. "I put him in with the chickens," Al reports, "but the rooster took exception. So now he has a pen to himself. After he recovers, we'll let him continue on his way."



TELECONFERENCING facilities provide convenient communications between Albuquerque and Livermore. At left, a group in the Bldg. 802 conference room gets down to business; as they write on the electronic blackboard,



their counterparts in Livermore (right) receive the same information simultaneously on their TV monitor.

Livermore Meeting? Consider Teleconference Facility

Do you have frequent business at Livermore? That usually means hopping a plane in the afternoon, arriving at San Francisco, driving a rental car 40 miles to Livermore and arriving too late to conduct business. So the next day you have your meetings, drive back to San Francisco, and catch an afternoon flight back to Albuquerque—an expensive and wearisome routine.

Well, despair not—there's a better way. The new teleconferencing facility in room 236 of Bldg. 802 features a Western Electric Gemini electronic blackboard, four ceiling-mounted speakers, and eight microphones connected to a telephone line. And just a few steps from the conference room is high-speed facsimile equipment whereby memos, charts, diagrams, and drawings can be exchanged during the discussion.

"Since these teleconferencing facilities are in the executive area, some Sandians might think they're not for everyone," says Hank Willis (400). "But the facility is available for everyone—all you have to do to reserve space is to call us.

"This system has been in operation between Albuquerque and Livermore for two months. There's also a connection to DOE headquarters in Washington. We're projecting hookups to Bendix and Pantex.

As more people begin to use the teleconference rooms, we think they will find it an effective substitute for travel. In time, we may set up another teleconferencing facility elsewhere in the Tech Area, but not until the existing one is fully utilized."

At present, the teleconferencing facility is only for unclassified subjects, but in the future it may be possible to encrypt meetings for classified communications. Other future options are slow-scan TV which transmits a picture every 30 seconds and, if the demand justifies it, full-motion TV.

The teleconferencing system was designed by Jim Porter; he and Ken Purtee (both 2611) installed it. Anyone needing information relating to teleconferencing can get in touch with Jim at 4-7640.

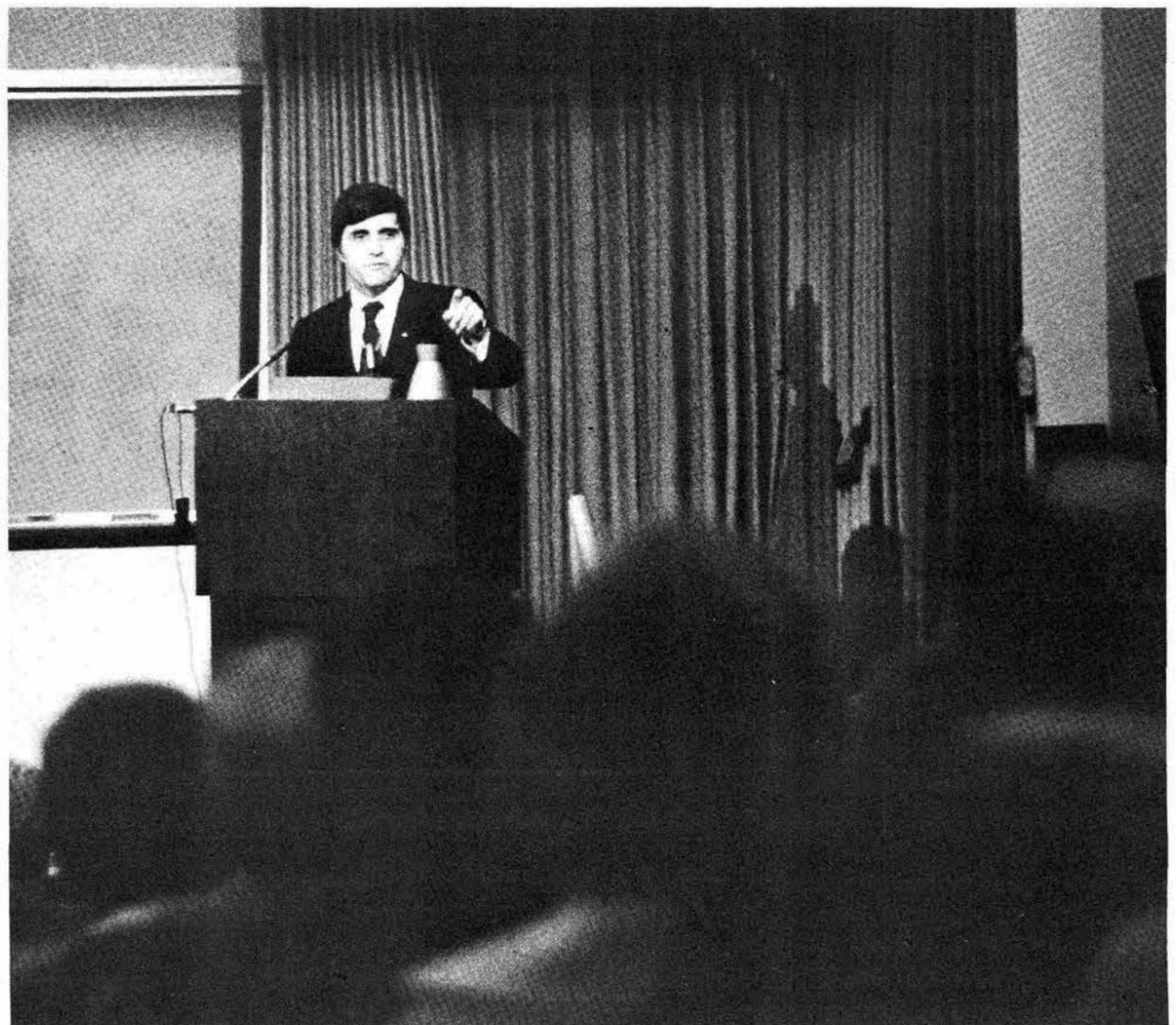
"The conference room also has the standard equipment such as a vugraph projector, a screen, and a coffeepot—we supply the coffee," says Hank.

To reserve space, call Eve Baughman, 4-4584, or Virginia Dalin, 4-4562. In Livermore, contact Betty Barnhouse, 2-2039 (the teleconferencing facility is in room 173, Bldg. 912).

Retiree Deaths

[Oct.-Dec.]

| | |
|-----------------------|----------|
| Howard Thomas (71) | Sept. 30 |
| John Hahn (72) | Oct. 3 |
| Flaviano Sanchez (71) | Oct. 4 |
| Mary Davis (73) | Oct. 21 |
| Charles Romano (67) | Oct. 22 |
| Milton Lew (82) | Oct. 24 |
| Florence Smythe (68) | Oct. 31 |
| Hubert Hacker (63) | Nov. 1 |
| Margaret Taylor (72) | Nov. 16 |
| Eugene Smith (71) | Nov. 20 |
| Richard Michaels (54) | Dec. 6 |
| Edward Hodyke (61) | Dec. 11 |
| Alfred Laneville (73) | Dec. 11 |
| Eulogio Sanchez (68) | Dec. 19 |
| Vincent Curran (69) | Dec. 21 |



SENATOR Jack Schmitt of New Mexico fields a question from the audience during his visit to the Labs this week. Before the question/answer period, the senator told the colloquium audience about his view of the future of DOE (he favors an ERDA-like agency to handle R&D). He also discussed the strategic mineral vulnerability of the US; and he favors a "surface propulsion" program in which high technology would be applied to various forms of surface transport, including rail and marine vehicles.



THE SIGN welcomes Glenn Kuswa (4240) and Gerry Yonas (4200) to the Laser Institute in Peking where the Sandians presented several lectures to Chinese scientists.



GLENN KUSWA (4240) with a group of Chinese students in Peking. The Chinese were friendly, many spoke English, and they liked to exchange business cards.

Gerry Yonas and Glenn Kuswa Lecture in China

Gerry Yonas (4200) and Glenn Kuswa (4240) returned recently from a 10-day journey to China where, at the invitation of the Chinese Atomic Energy Commission, they presented lectures at science institutes in Peking and Shanghai and attended informal seminars with Chinese scientists. Arrangements were coordinated by the U.S. government.

The lectures, primarily on Sandia's early pulsed E-beam work, were well received, according to Glenn, and the Chinese were "extremely curious, extremely polite, very gracious hosts."

Other observations:

The Chinese have no operating power-generating nuclear reactors but are determined to get one on-line soon.

The cadre of Chinese senior scientists is getting old. The younger, home-trained scientists lack scientific sophistication, a lack recognized with a determination to send more Chinese students to universities in the West.

Chinese technology generally is 20 years behind the U.S., particularly in instrumentation. They make up for this deficiency by applying a lot of manpower.

Their concern for industrial safety is less than ours—no radiation badges in reactor areas, for instance. Also, general air pollution in cities is high, probably the result of burning high-sulphur-content coal.

There is an obvious and unbounded optimism in the Chinese people. Since the demise of the "Cultural Revolution" there is a program of "incentives"—not capitalism but a kind of free enterprise. Farmers may now market at least some of their own produce. Small entrepreneur businesses such as restaurants operate freely.

China is no longer compelled to import food, possibly as a result of "incentives" and the new emphasis on population control. For example, a couple with one child is guaranteed a college education for the child. If there is more than one child, the couple is penalized with a loss of living space and higher education for the children is not guaranteed.

The population of China is 900 million.

There is no private ownership of automobiles. The Chinese use bicycles—thousands of them on city streets. Use of public transportation—buses, trains and aircraft—is limited. Workers at the Laser Institute, some 35 miles from Peking, live during the week at the agency and visit their families in Peking on weekends, traveling on Institute-provided buses.

Travel, however, in a state-owned automobile driven by a chauffeur is "frightening." Motor car drivers use their horns instead of the brakes; full-throttle is about the only operating mode. Resulting traffic patterns are "chaos."

The Chinese are encouraged to learn the English language. Voice of America broadcasts are not jammed. An English-language daily newspaper, *China Daily*, is freely distributed, is surprisingly accurate in international news, and is remarkably unbiased.

China plans to import Western technology as rapidly as their economic base and foreign trade credits allow. For instance, imported technology has made their oil industry very modern. China exports oil to Japan.

In appearance, Chinese society is classless, with everyone, men and women, in dark blue tunics and trousers. Even military uniforms carry no obvious badge of rank.

Their national character is marked by courtesy and honesty. The government deals harshly and quickly with criminals. This policy was emphasized in the confiscation of dogs. "There are no nighttime bandits; therefore dogs are unnecessary."

The Chinese universally were friendly. They were curious about Americans and American ways. Lots of smiles for the visiting Sandians.

Their Chinese hosts (Gerry and Glenn were escorted everywhere) provided several sightseeing opportunities. They visited the Great Wall, attended an opera performance, took a boat ride and went shopping on several occasions.

China is encouraging tourism. The Sandians saw tourist groups everywhere,

and many fine shops cater to the tourist trade, offering fine silks, silk handcrafted tapestries, jade carvings, jewelry, sculpture and cloisonne—handpainted enamel on metal with elaborate and colorful patterns. Tourist facilities are used to the maximum and more are being built. The Chinese people think all traveling Americans are "rich doctors."

And, of course, the food was great.

"There was one banquet," Glenn says, "where we had web of duck foot soup. As guests of honor, Gerry and I shared the tongue of the duck. Not bad. All of the food was outstanding. We were offered forks but Gerry and I are adroit with chopsticks. That made everyone more comfortable."

Credit Union Annual Meeting

The 34th annual meeting of the Credit Union will be held on Thursday, Jan. 21, in the Coronado ballroom beginning at 5:15 p.m. Following the regular business meeting, free refreshments will be offered and drawings made for cash prizes. First prize is \$500, second \$300 and third \$200. All individuals who are members of the Credit Union as of Dec. 31, 1981, and who still have an account at the Credit Union on the date of the annual meeting are eligible for the prize drawings and do not have to be present to win.

Sympathy

To Laudente Montoya (3618) on the death of his mother in Albuquerque, Dec. 16.

To Charles Mika (3544) on the death of his father in Texas, Nov. 12.

To Ben Lucero (2154) on the death of his mother in Albuquerque, Dec. 20.

To Bruce Van Domelen (2514) on the death of his mother-in-law in Florida, Jan. 2.



TED SHERWIN, manager of Information Department 3160, retires at the end of this month. He is shown here with Tom Clark (left), Deputy Manager of DOE/ALO, who presented him with DOE's Outstanding Achievement Award. The accompanying citation reads, in part, "In your 32 years of service as a Sandia Public Affairs Director, you have established a standard of professionalism that is respected throughout the weapons complex . . ." and is signed by Herm Roser, Assistant Secretary for Defense Programs.



HONORED—Mel McCutchan (3164) picked up a passel of awards recently for his work as local director of the National Alliance of Businessmen. In the 12 years Mel has been associated with NAB, the agency has found jobs for more than 32,000 unemployed—people with problems, including parolees, ex-offenders and the disadvantaged. Mel is a former state chairman for vocational education and regional and national board member for the Manpower Development and Training Act. The city honored him when then-Mayor David Rusk proclaimed "Mel McCutchan Day" on Nov. 11. Governor King honored Mel with a state citation and President Reagan with a presidential citation. Mel retires from Sandia and the NAB on Jan. 31.

Take Note

It's a new year . . . maybe it's time to quit smoking. Medical is offering its Quit Smoking class again, Jan. 19 through Feb. 12. Classes are held on Tuesdays and Thursdays, noon to 1 p.m., in the conference room in the Personnel Building. Call Arlene Price, 6-0021, to sign up. Enrollment is limited.

* * *

U-turns, beloved and respectable in the rest of the world, are illegal on KAFB. So says an item in the *KAFB Bulletin*. It sternly cites, "IAW AFR 125-14 . . . If you are caught . . . you could be cited and assessed traffic points . . . U (sic) could be the cause of an accident." OK, and they also don't want you to make a right turn while the light is red at Wyoming and Gibson. Signs to this effect are posted at the intersection.

* * *

On January 9, the United Negro College Fund will broadcast its first "Lou Rawls Parade of Stars" television and fund-raising special. It will be aired on KGGM from 10:30 p.m. to 1:30 a.m. Sandians are invited to assist in the telethon by manning the telephones and, of course, by making contributions to the Fund. If you would like to help with the telephones, call 268-3303.

* * *

Retiree Alan Pope writes concerning our recent criticism of diesels and the rebuttal thereto by Charles Karnes (5835). To the question, "Would we be better off with more diesels?" Alan has this reply: "Not so, Charlie. One gets 21 to 26 gallons of gas from a 42-gallon barrel of oil, but only SEVEN gallons of diesel fuel. Had we scads more diesels, we would have far greater requirements for crude oil." He asks for information: "How come diesels burning fuel at higher compression and, hence,

higher temperatures than gasoline engines, apparently produce less nitrides?"

President George Dacey and Bond Drive Chairman Art Eiffert (2450) represented Sandia as they accepted an award from the Treasury Department recognizing the Labs' participation in the Savings Bond program. Bud Davis, president of UNM and 1981 chairman of the Savings Bond committee, made the presentation, noting that 94 percent of Sandians are enrolled in the Savings Bond program.

* * *

Gary Shepherd (2614), writer/producer/director of the Neighborhood Drama Project, sends LAB NEWS this word: "As you may recall, my drama group works out of the Baptist Neighborhood Center on South Edith. The BNC also has a clothing bank which aids neighborhood families in need. I found out yesterday that the bank is in desperate need of clothing of all kinds. But especially baby and toddler clothing is in great demand. Any help you can give in publicizing this need will be greatly appreciated."

Anyone who has items to donate can contact Gary on 296-1238 after 6 to arrange for pickup.

* * *

Chaparral Girl Scout Council needs volunteers to work with young people and adults. The Council offers leadership training for all volunteer troop leaders, with sessions arranged to accommodate the working person. For more information, contact the Council: 500 Tijeras NW, 87102, or call 243-9581.

* * *

Over the holidays many of us gained a few pounds that we'd like to lose. On Tuesday, Jan. 19, Susan Harris, R.D., nutritionist in Sandia Medical, will present a talk in Bldg. 815 (outside the Tech Area)

from 12:00-12:30 p.m. on how to lose weight and keep it off.

Several common myths regarding weight control will be discussed. Myth 1: Dieting is easy. This is obviously not true or everyone would be slim. Weight control requires a serious and sustained effort. Myth 2: Calories don't count. Unfortunately, calories do count and to be successful at long-term weight control it's important to have an understanding of the relative caloric values of foods you eat. Myth 3: Exercise is relatively unimportant in weight control. The reverse is true; regular physical activity can make a tremendous difference. Exercise burns up calories, and there are indications that appetite is better regulated in people who are active.

Today's successful weight control programs use behavior modification. The premise of a behavior modification program is that the way we eat is a learned habit; learned habits can be unlearned and, therefore, we can change our eating habits and lose weight for keeps.

Death



Marvin Barrett of Nondestructive Testing Division 1551 died suddenly Dec. 12 while on a company business trip in England. He was 62.

He had worked at the Labs since February 1952.

Survivors include his widow, a son and a grandchild.

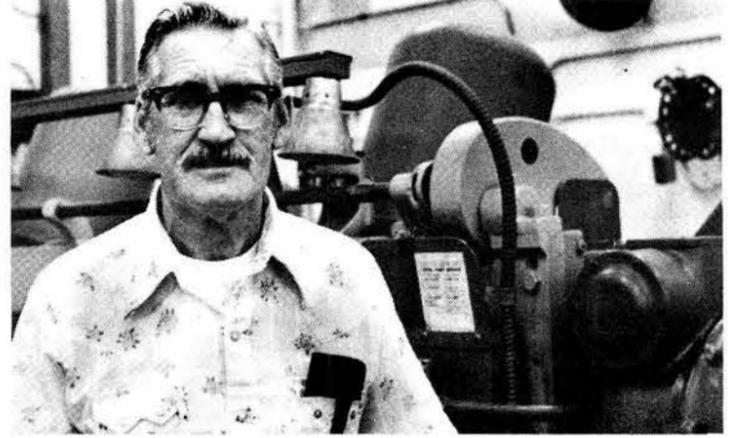
MILEPOSTS

LAB NEWS

JANUARY 1982



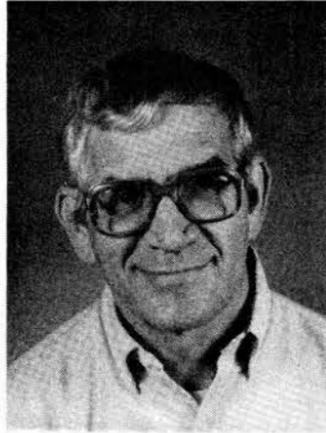
Al Faychak - 1172 10



Bernard Brown - 1485 35



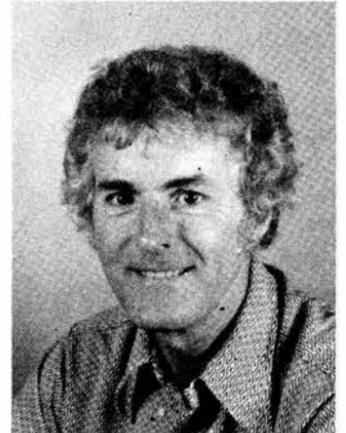
Bob Fueger - 3435 25



George Martin - 2451 30



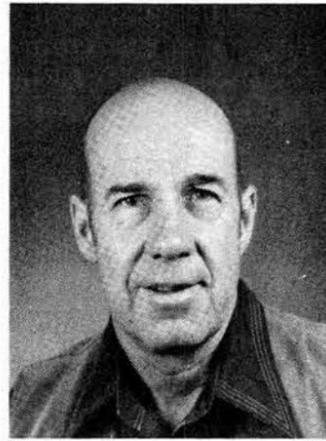
Leroy Perea - 1535 10



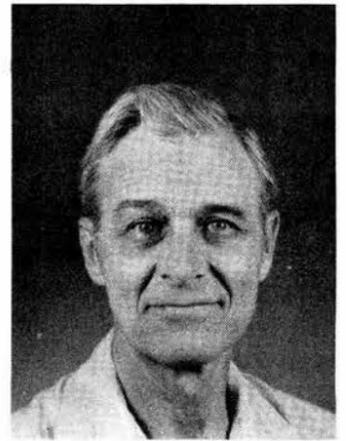
Richard Spalding - 1320 20



Procopio Lopez - 1485 30



Louis Lindsay - 1716 25



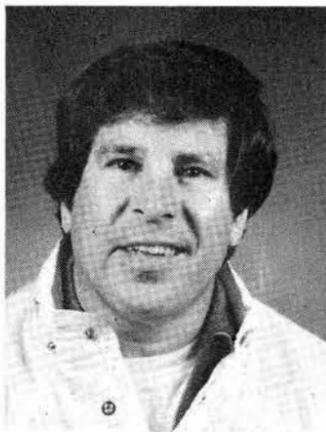
Bill Seaburn - 1482 25



Ken Wischmann - 5811 15



John Risse - 1713 25



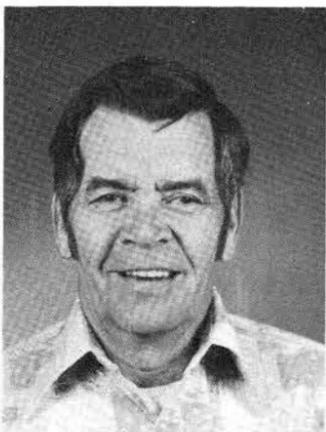
Leo Chavez - 3411 25



Ted Huebner - 3723 25



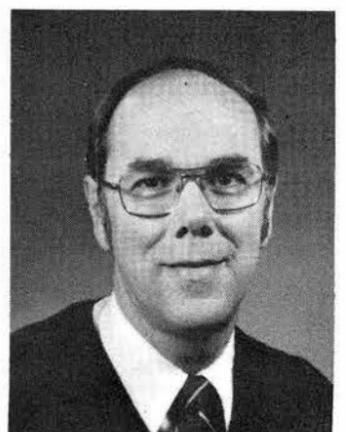
Dorothy Wall - 2431 30



Don Hoffheins - 3418 25



Russell Acton - 1537 25



Bob Clark - 2525 20



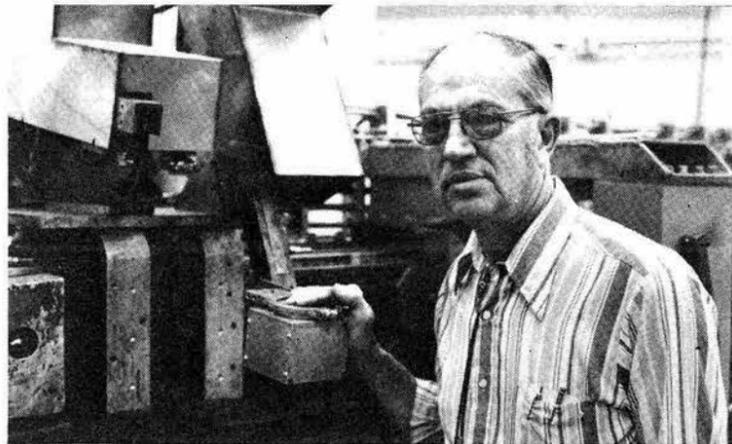
Pro Padilla - 3743 15



Richard Eifert - 4741 25



Rosa Steele - 2625 20



Ralph Rayner - 1472 25



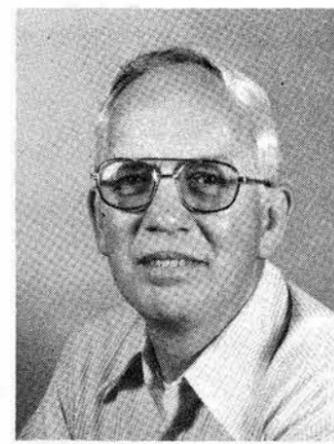
Candelario Garcia - 3423 30



Jim Barnett - 3734 15



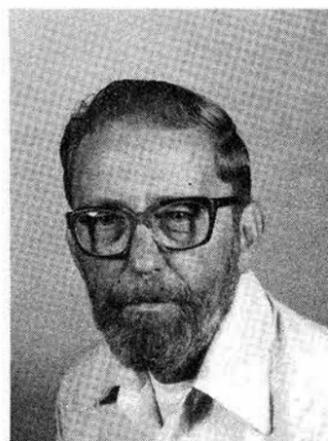
Glen Heston - 1483 15



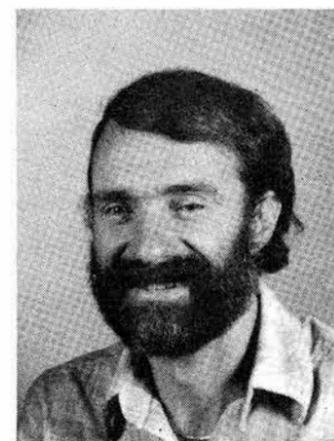
Glenn Riggins - 1522 25



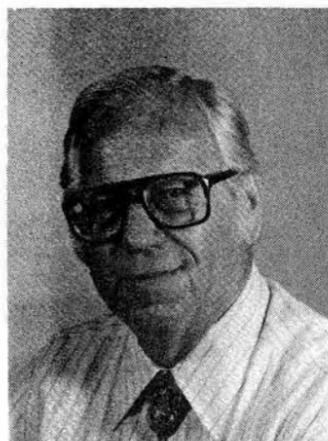
Alfonzo Trujillo - 2565 25



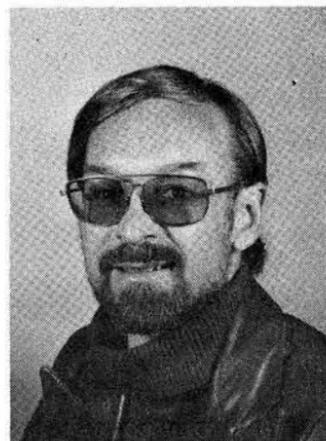
Dallas Sasser - 4416 25



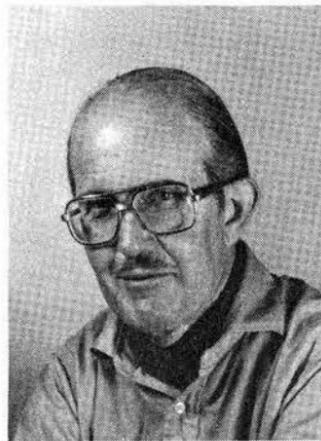
Larry Rollstin - 5635 15



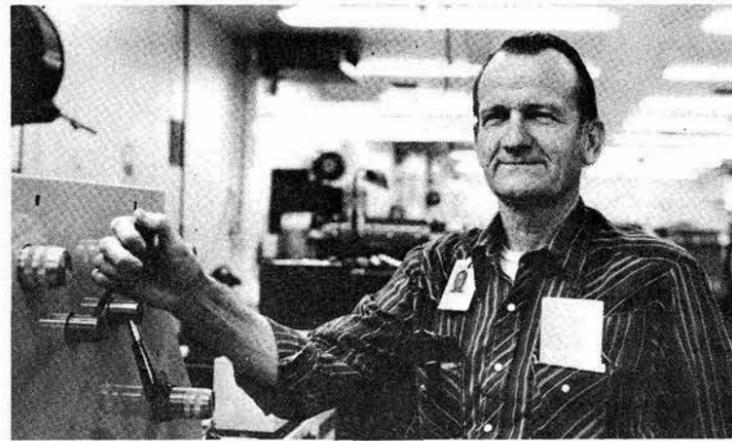
Ted Smart - 1524 30



Stanley Roeske - 1442 20



Robert Woods - 4544 15



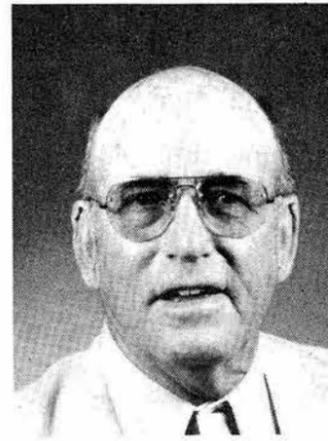
Vernon Smith - 3154 25



Jim Yoder - 2426 15



Arthur Randall - 3733 30



Joe McDowell - 2541 25



Ray Reed - 1116 20

New Device Measures Dirty Mirrors

One problem with solar collectors—be they troughs or heliostats—is that they have to be outdoors. When a mirror is exposed to the elements, it is subjected to wind, rain, dust, and whatever else might be floating around. The result is that solar collector surfaces get dirty and this affects their reflectance. If reflectivity is significantly down, then it's time to clean the mirrors—a considerable task.

"The solar people in 4700 had been bringing small, soiled mirrors to us to measure reflectivity in the lab," says Jim Freese, until recently working in Thermo-physical Properties Division 5824 (now with Storage Batteries Division 2525). "But it was impossible to bring the large collector mirrors to the lab for these measurements. What was needed was a portable reflectometer to measure the specular reflectance properties of mirrors in the field. When we determined there wasn't such a device, our division took on the responsibility of developing one.

"I designed the prototype reflectometer and patterned it after the lab instrument developed by Richard Pettit. The prototype utilized both commercial parts and parts custom-made at Sandia. It's a hand-held instrument that you place on a flat or curved surface to measure how the reflectance of the mirror is affected by soiling.

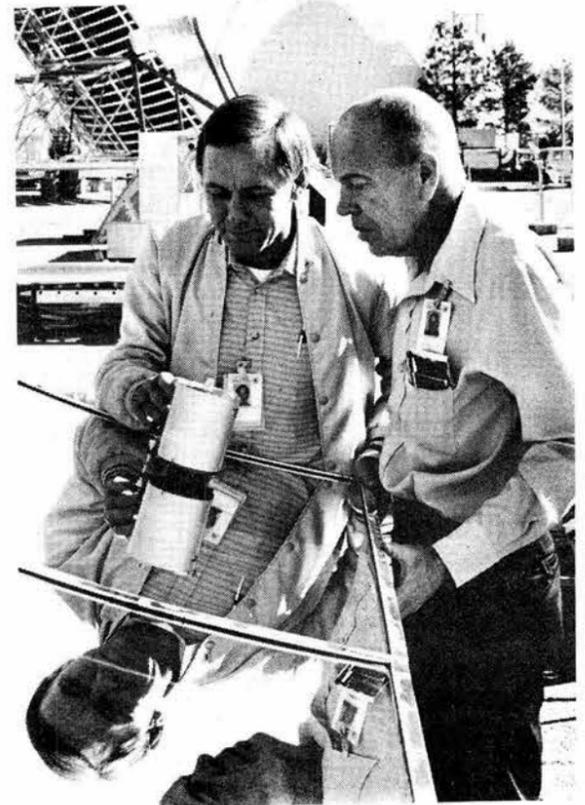
"The prototype model did the job but it had some drawbacks. Together with Howard Seltzer of Design and Drafting Division 2452, we designed a much-improved Mod 2 reflectometer that incorporated a separate data acquisition system to store the reflectance readings. Both the prototype and Mod 2 units need a power supply which, together with the separate data acquisition unit, made the reflectometer somewhat cumbersome. Incidentally, the devices were built by the apprenticeship shops, and their fabrication gave the students some good machining experience."

There was a significant demand for the Mod 2 reflectometer. Six were made at Sandia and the instruments were used at

the solar test facilities at SNLA; the solar irrigation projects at Coolidge, Ariz., and Willard, N.M.; the central receiver "Solar One" project at Barstow, Calif.; and at an international solar facility built at Almería, Spain.

Low Larsen of Solar Collector Technology Division 4716 took the steps to issue a competitive contract for the development of a portable specular reflectometer. Low approached several divisions in 4700 and Livermore to obtain backing for the project. Devices & Services, Inc., a Dallas firm, won the contract and recently delivered 13 reflectometers to Sandia.

"The D&S reflectometers are battery operated and much more compact than our Mod 2 device," says Jim Sweet, head of Division 5824. "Other improved features of the commercial instrument include sensitivity to operation in direct sunlight, a built-in viewing eyepiece for monitoring of the reflected beam image, and three interchangeable collection apertures. D&S has enough confidence in its reflectometer to sell it commercially at a retail price of \$4500. This project is an example of successful technology transfer."

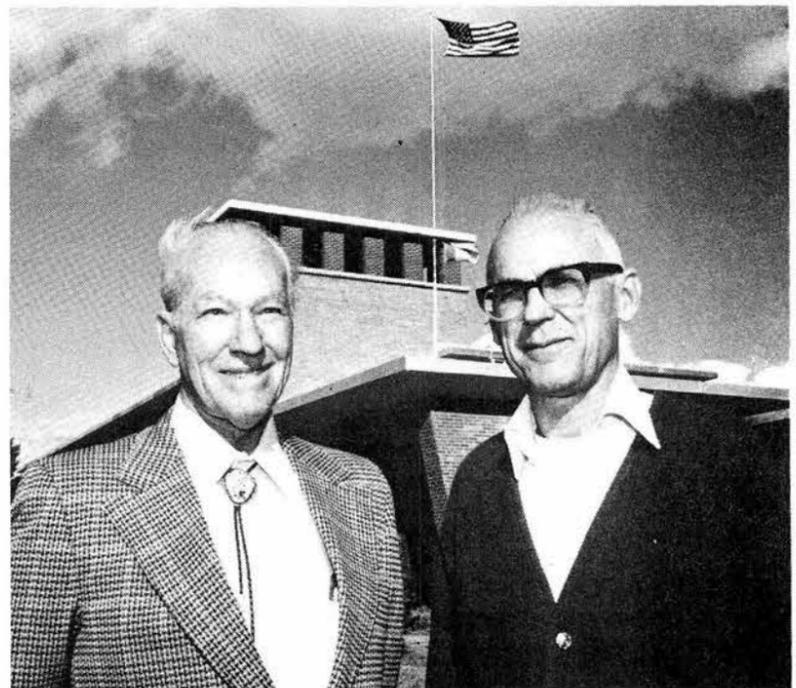


TAKING THE MEASURE of a solar collector mirror are, from left, Jim Freese (2525) and Low Larsen (4716). They're using the new portable specular reflectometer developed by a Dallas firm under a Sandia contract. The device measures how the reflectance of a mirror surface is affected by soiling.

Retiring



Frieda Salazar (2431)



Martin Wempe (3641) and Dale Haskins (4726)

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

GIRLS' 20" bike; 30" stove, dbl. oven, copper tone; 30" green hood; wrought iron fp screen (24x32"); 8' windmill; wrought iron table lamp. Cole, 293-6122.

FIREPLACE WOOD, over a cord, you pick up, \$45. Dobias, 256-7476.

BATHROOM ARTICLES: 42x32" medicine cabinet w/mirror, \$25; swag lights, \$12; chrome accessories, shower curtain, window beads, etc. Trump, 299-5162.

NIKON FM 35mm camera w/case, 1.8 50mm lens, port. tripod, \$300 for everything; Kodak carousel slide projector, 1 yr. old, \$100. Adriaance, 292-7471.

CHANDELIER, wagonwheel type, 24" dia., w/antique copper trim, \$30. Anderson, 296-0892.

COMPLETE WARDS vacuum cleaner, \$75; Sears Forecast elec. typewriter w/12" carriage, \$80. Pope, 255-6702. JEEP TOP, will fit '75-'81 CJ5; factory stock blue denim, 2 tops. Bedeaux, 345-1456.

ATARI 400/800 computer game cartridges: Star Raiders, \$35; basketball, \$20; video easel, \$20; several others. Gregory, 821-1429. DISHWASHER, undercounter, auto., 2-cycle, GE, avocado color. Minor, 865-5117.

MICROWAVE OVEN, 1.3 cu. ft., w/meat probe, \$195; 30" wide drop-in elec. range w/vented hood, \$75. Hale, 298-1545.

SOFA, 72", \$100; 72" hide-a-bed sofa, \$80; floor freezer, \$80. McDaniel, 294-3000 after 5:30.

RONALD McDONALD wall clock, \$8; African wood mask, \$10. Simons, 821-9343.

USED PATIO COVER, white aluminum w/wrought iron posts, enough sections to cover 10'x30', \$50. Smith, 292-3117.

NATIONAL GEOGRAPHIC, Jan. '67-Dec. '75, year set, \$3. Erickson, 299-6824.

GOODRICH TIRES, used, G70-15, tubeless, white letters, Poly-Glass, 4 for \$5 ea. O'Bryant, 268-9049.

LIGHT FIXTURE, interior, contemporary: chandelier, \$100; kitchen, \$20; entrance hall, \$30; BR's, \$15; fireplace screen & grates. Crowther, 821-0172.

SKIS, Rossignol Equipe 185cm w/Cubcos, Salomon 444 bindings, San Marco boots (11); Moonboots (10-11); wine bota; hooded anorak windbreaker (M). Bailey, 294-4218.

HIGH-LIFT JACK, "Hired Hand" brand, for 4-wd vehicles & trucks, capacity: 7000#, new at K-W, \$50, sell for \$35. Stevens, 299-6086.

SET of 1974 Ford shop manuals, \$5;

2-piece sofa set, green tones, \$100. Roberts, 255-9527.

BAR, decorative wood carved panels, polished top, wine racks, foot rail, drawer, 5x2', rich mahogany color, \$210. Thomas, 256-1921.

TRANSPORTATION

'81 KAWASAKI KX420 dirt bike, \$1050. Lifke, 296-3814.

'76 CUTLASS S, 250 L6, AT, PS, PB, AC, AM/FM, Michelins, new windshield, battery, plugs, tuned, 68,000 miles, \$3500. Irvin, 884-8551.

'80 CITATION 2-dr. sedan, AT, AC, PB, PS, 22 mpg city, 28 hwy., \$5750 or best offer. Pershall, 822-0814.

'77 COURIER, long bed, 14,000 miles on rebuilt engine, AM/FM stereo cassette, chrome wheels, 5-spd., \$2495. Fisher, 298-0526.

'67 OLDSMOBILE 98 convertible, 75,000 miles, new extra top, power seats-windows-antenna, etc., AM/FM/8TR, \$2750 or make offer. Hughes, 299-6674.

'77 KAWASAKI KZ400, windshield, trunk, spare sissy-bar & crash bars, \$1050. Miller, 299-6067.

1977 Yamaha XT-500, less than 4000

miles, adult ridden, \$995. McConnell, 268-3109.

REAL ESTATE

1.24 ACRES, Durango area, water paid, other utilities available, assume 8% mtg., \$12,500 before May 1. Kramer, 294-5453.

LAND, 9 acres at McIntosh, weather roads on 3 sides, power-telephone services, \$15,000, terms. Eglinton, 256-1921.

WANTED

BLACKSMITHING TOOLS: anvils, hammers, tongs, triphammer, etc. Baca, 299-2036.

BIKE needs ride to Houston, car-top rack will be furnished. Harris, 255-6577.

SHOP MANUAL for 1954 Chev. sedan, 6-cyl. Lujan, 299-4820.

BABYSITTING jobs for 12-yr.-old student, references, weekends only, \$1/hr. Cole, 293-6122.

TWIN baby stroller, good condition. Krahleng, 268-8126.

Singles Mingle Set Jan. 15

HAPPY HOUR TONIGHT sees special prices in effect all evening, *a la carte* service in the dining room from 5:30 until 9, and Youngblood playing for dancing from 8 to 12. Discount tickets from your January calendar are good for \$2.50 off the top of your dining room tab.

TOMORROW is Variety Night for family fun. Hamburgers, hot dogs and French dip sandwiches are available starting at 5. Six o'clock is movie time and it's a classic Walt Disney comedy, *Aristocats*, which is about a family of felines who inherit a fortune. Admission is free to members and families.

NEXT FRIDAY, Jan. 15, is a biggie. First, there's standard Happy Hour which starts right after work and runs until midnight or so with special prices, *a la carte* dining room service and a band for dancing from 8 to 12. The group this Friday is Tom Black and the Fugitives playing country and western. Then there's the . . .

SINGLES MINGLE in a reserved section of the ballroom. Board member Bob Manhart (3151), C-Club PR man, says it works this way: volunteer hosts and hostesses will meet singles in the lobby, issue a name tag and escort the person to a section of the ballroom reserved for the mingle, introducing him/her to everybody. A special treat will be the appearance of Pres and the 66 Trio. This group of swingers held the old International Club together. With Pres on the big mellow tenor sax, accompanied by piano, bass, drums and vocals, the group should keep everyone dancing from 5:30 until 7:30. The dining room will feature a couple of chef's specials that night (in honor of singles)—an Italian platter with spaghetti and meatballs, chicken cacciatore, garlic bread, salad bar and other goodies, or an Oriental platter with sweet and sour chicken and beef, Chinese noodles, Oriental vegetables, rice and salad bar for \$5.95. Club membership is not required for this evening.

NO RESERVATIONS are required for the giant shrimp peel event scheduled



AMONG THE NUMEROUS hosts and hostesses welcoming singles to the Club next Friday, Jan. 15, are (standing) Lisa Polito (3434) and Mike Apodaca (3255), and Mabel Hurley (3152), Don Hosterman (4542) and Luetta Tidwell (3435). The C-Club Singles Mingle is back in business, bigger and better in 1982. Club membership is not required this evening.

Saturday, Jan. 16, starting at 6 p.m. Dinner features a large boat of shrimp with the works for \$7.95. Marci and the Talkabouts play for dancing starting at 8.

DURING THE WEEK, enjoy Happy Hour on Tuesdays with reduced prices and a free spread of munchies and goodies at 5:30. On Wednesdays, it's three for one in the main lounge.

CORONADO GRANDSQUARES are offering a refresher course starting Monday, Jan. 11. Cost is \$30 per couple for the 15-week course. Call the Club office, 265-6791, for more info.

TRAVEL DIRECTOR Frank Biggs (4231) announces a new Las Vegas charter bus trip for March 14-17 at a price of \$137. The package includes transportation with lunch, snacks and refreshments on the bus, lodging, and optional group dinners and shows. Deposit \$50 now and pay the balance by Feb. 12.

Frank also reminds members of the

Chaco Canyon trip, April 24, cost \$20. The package includes transportation, refreshments and snacks on the bus.

"The Washington, D.C., area is beautiful in April," Frank says. "The Club trip goes April 3-10 at a price of \$300 plus airfare. We will tour the monuments, historical sites and other interesting places."

For literature and information, see Frank in the lobby tonight.

Congratulations

John (1485) and Stephanie Zich, a daughter, Amanda Christine, Dec. 14.

Bob (1125) and Sharon Longoria, a daughter, Erin Michelle, Dec. 9.

Tommy (2451) and Kimberly Teague, a son, Michael Phillip, Nov. 24.

Donald (2432) and Clarice Honeycutt, a daughter, Emily Clarice, Dec. 13.

John (4425) and Sue Kelly (2625), a daughter, Julie Ann, Dec. 1.

Catharine Hildebrandt (1473) and Nathan Sifford, married at Bosque Farms, Dec. 19.

1982 Holidays

Sandians will observe the following 1982 holidays.

Memorial Day . . . Monday, May 31

Independence Day Monday,
July 5

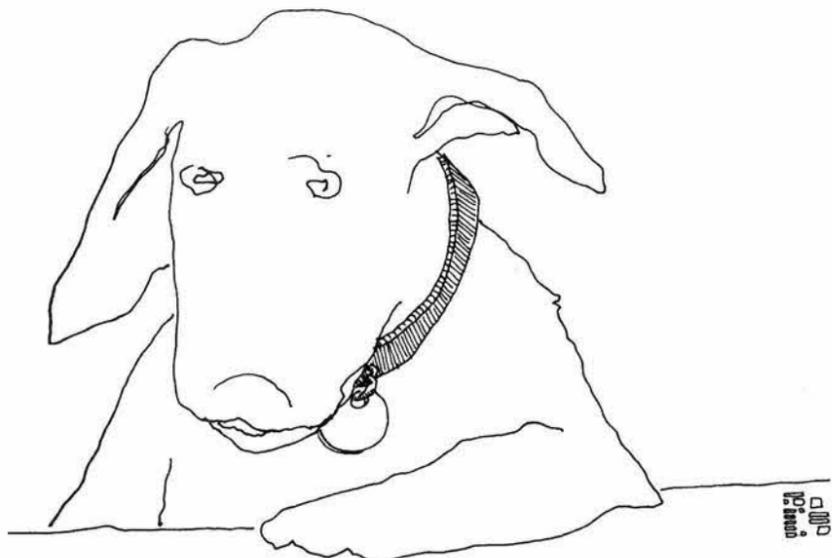
Labor Day Monday, Sept. 6

Thanksgiving . . Thursday, Nov. 25

Energy Conservation Day Friday,
Nov. 26

Christmas and New Year

Shutdown Friday, Dec. 24,
through Sunday, Jan. 2



"Proust! Cats like Proust.
Give me Hemingway!"