

"WORST KIND" of shipping accident will be simulated next week when a truck/trailer carrying a 200 metric ton spent nuclear fuel cask will be propelled at 60 mph down the rocket sled track in Area III to impact into a massive concrete barrier. Photo above shows a recent dry run to check

rocket propulsion, guidance and instrumentation systems. According to Richard Yoshimura (5432), project engineer, everything is set for the crash test on Jan. 18. The test demonstrates the integrity of the shipping cask.

LAB NEWS

VOL. 29, NO. 1

JANUARY 14, 1977

SANDIA LABORATORIES • ALBUQUERQUE NEW MEXICO • LIVERMORE CALIFORNIA • TONOPAH NEVADA

First Pershing II Penetrator Flight Tested

A milestone in the Pershing II program was reached recently with the recovery of a Sandia designed Pershing II earth penetrator from beneath its impact area at White Sands Missile Range (WSMR). The earth penetrator was the payload on a Pershing IA missile launched from Ft. Wingate, N.M. Upon impact it separated from the missile and traveled a total of 57 metres through the earth, coming to rest 33 metres beneath the surface. The first full scale design to be flight tested, the penetrator contained warhead electrical system components, a depth-of-burial fuzing component, and a telemetry package.

The Army is considering an earth penetrator as an option for Pershing II because maximum explosive coupling is achieved, i.e. large craters are produced with small payloads detonated beneath the surface. In addition, attendant side effects of nuclear weapons are reduced. To investigate the feasibility of an earth penetrator weapon for the missile, Sandia is providing the penetrator case as well as many of the interior components and associated electronics. The Army's Pershing Project Office at Redstone Arsenal is the contractor.

"We got good data from the recovered penetrator," says Ray Reynolds, supervisor of Pershing II Development Division 3242.

"We've taken it apart to see how the structure and components performed. It looks like some design rework is called for, but we look for rapid progress as we aim toward the next flight test."

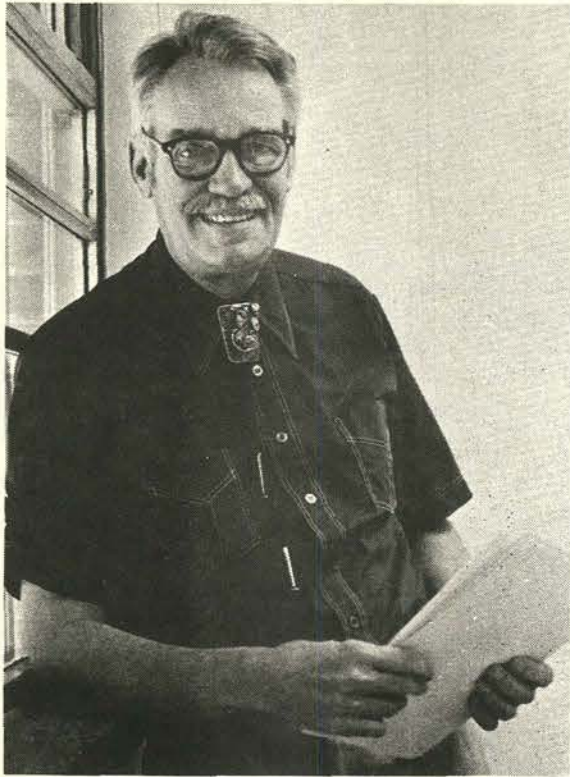
Penetrator recovery operations at White Sands, the responsibility of Gene Harty (4342), were complicated by quicksand-like material in the drill hole. Traditional drilling and casing techniques were not possible — the hole filled with fast-flowing sand as soon as any excavation was attempted. Using freeze probes, liquid nitrogen was pumped into the surrounding area to stabilize the material while the unit was mined (chipped) out. The penetrator was finally removed from the ground during a severe snow storm. Temperature at the bottom of the hole was around -20 degrees F.

"We had tremendous support from people at the Labs," Ray says. "We appreciate the effort, especially from people in Orgs. 1283 and -84, 1325, 2514, 9352 and 9414. Much of it went beyond the call of duty."

The next flight test series, to be conducted at Tonopah Test Range next spring, will be the last step before the major event — flight testing of six fully functional (non-nuclear) penetrators with telemetry packages at WSMR, starting in September 1977.



GENE HARTY (4342) displays prototype Pershing II earth penetrator unit recently recovered from 33 metres beneath the surface at White Sands Missile Range. A "quicksand" earth formation hampered recovery efforts. The unit was finally removed after stabilizing the surrounding material by freezing it with liquid nitrogen.



Russ Foster (3730)

Supervisory Appointment

RUSS FOSTER to manager of Purchasing Planning, Services, and Traffic Department 3730, effective Jan. 1. Russ has been at the Labs since September 1953. He worked as an auditor and as division supervisor of the auditing organization until 1961 when he transferred to the purchasing directorate. He was in the price and cost analysis group until 1968 when he became a senior buyer. Since February of last year he has been supervisor of Purchasing Planning Division 3732.

Before joining Sandia, Russ was the assistant controller at the University of Wisconsin, where he had earned his BBA degree. He is a Certified Public Accountant. Off the job, Russ enjoys hiking and golfing. He and his wife Jane have three married daughters and two grandchildren. They live at 3505 Stardust Dr. NE.

Sympathy

To Bob Brooks (1211) on the death of his wife in Albuquerque, Nov. 28.

To Bernard Brown (9573) on the death of his wife in Albuquerque, Jan. 6.

LAB NEWS

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bill laskar does picture work
so does russ smith

&

lorena schneider reports on livermore

TODAY

is the last day to sign up for Sandia's Out-of-Hours courses for the spring semester. Catalogs describing the wide variety of courses offered are available in the boxes near the gates. Classes begin Feb. 7.

Total Energy Symposium Scheduled Here Jan. 25

Sandia is sponsoring a "Solar Total Energy Symposium" on Jan. 25 at the Hilton Inn. The emphasis of the symposium is on the total energy aspect: how can energy usually wasted during the production of energy be utilized? Participants will include manufacturers, architects, A & E firms, utilities, and government groups.

In conjunction with the Symposium is a two-day (Jan. 26-27) semi-annual review of ERDA programs in thermal power, dispersed power, and distributed collectors. Sandians appearing on the program during the three days include: Bob Stromberg and Raymond Harrigan (both 5711), Dick Braasch (5715), Sig Thunborg and Tom Harrison (both 5712), and Dick Pettit (5842).

AVS Call for Papers

The 13th Annual Symposium of the New Mexico Chapter of the American Vacuum Society will be held April 19-21 at the Four Seasons Motor Inn in Albuquerque. Papers relating to vacuum and device technology and surface science are welcomed; one page abstracts should be submitted to Jerry Nelson (5825) by Feb. 15.

Other features of the conference include equipment exhibits and presentations on equipment developments. A three-day basic course in vacuum technology and four one-day specialized courses are being offered.

For further information on the symposium contact either Jerry Nelson (5825) or George Kominiak (5834).

Retiree Deaths

Oct. to Dec. 1976

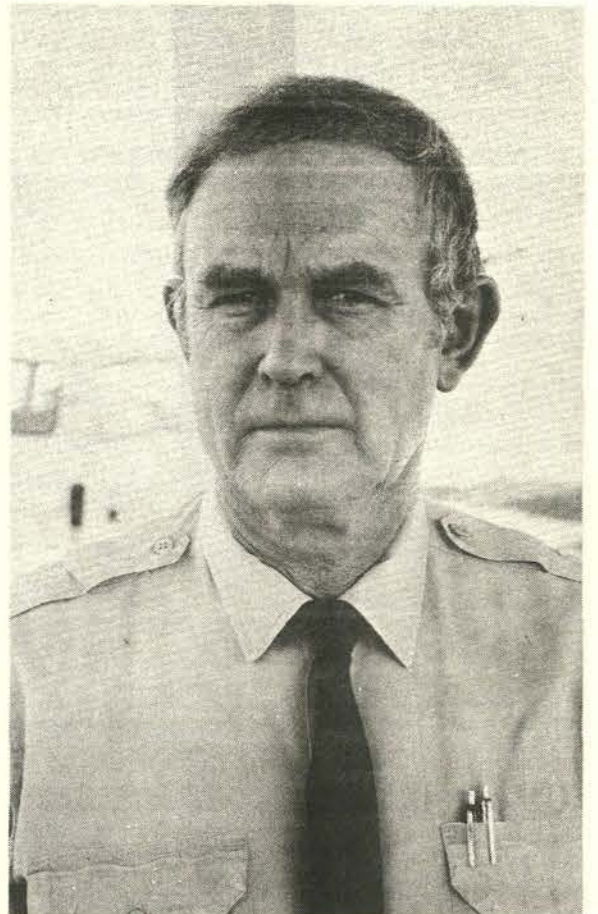
Chester Wolowicz	Oct. 16
Glen Wisher	Oct. 18
John Franklin	Oct. 20
John Maxon	Oct. 22
William Chapman	Oct. 30
Harold Kutzley	Nov. 24
Ralph Carmichael	Dec. 26

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LAB NEWS
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OPERATION IDENTIFICATION — Lucille Brown (3433) displays an engraving tool (one of six available) which Sandians may check out to mark possessions with their Social Security numbers. The Badge Office, Bldg. 801, also supplies forms for registering your number with the Albuquerque Police Department (to identify recovered stolen items) and display stickers to stick on your windows and doors to discourage burglars. The tools may be borrowed for 48 hours. If you want to find out if an engraver is available before going to the Badge Office, call 4-2531.

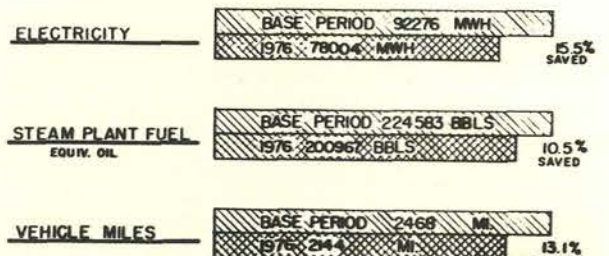
Retiring

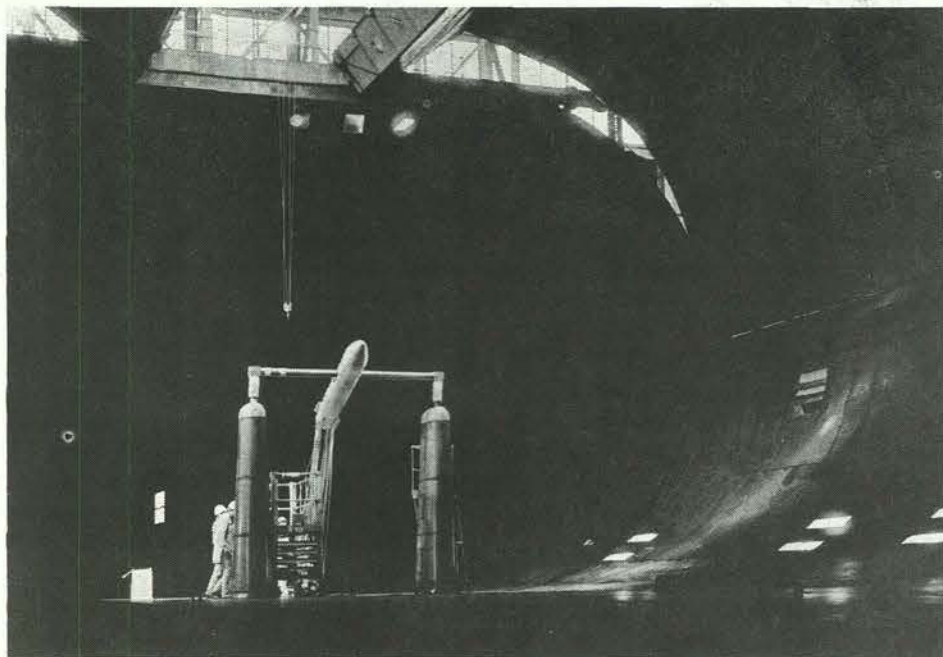


Willis Erwin (3430)

ENERGY SAVINGS

COMPARED WITH USAGE IN BASE PERIOD - JULY 1972 THRU JUNE 1973
CURRENT REPORTING PERIOD ENDING NOV '76





B77 AT AMES—Mounted in the 12 x 24 metre throat of the wind tunnel, a B77 and parachute are dwarfed in the cavern-like facility.



SANDIANS from Livermore and Albuquerque do some grunt work getting the vehicle and parachute ready for testing.

Authors

Leroy Haggmark (8341), "Beta-Induced X-Rays from Oxides on Metal Tritide Films: A Simple Theoretical Model," *JOURNAL OF APPLIED PHYSICS*, Vol. 47, No. 1, pp. 357-361.

Rudy Johnson and Jack Dini (both 8312), "How to Fabricate Thin Electroforms," *PRODUCTS FINISHING*, Vol. 40, p. 46.

Rand German (8312) and Z.A. Munir (UC/Davis), "Temperature Sensitivity in the Chemically Activated Sintering of Hafnium," *JOURNAL OF LESS COMMON METALS*, Vol. 4, p. 333.

Jack Dini and Rudy Johnson (both 8312), "Influence of Carbon on the Properties of Sulfamate Nickel Deposits," *SURFACE TECHNOLOGY*, Vol. 4, No. 3, pp. 217-222.

Rand German and Vic Ham (both 8312), "The Effect of Nickel and Palladium Additions on the Activated Sintering of Tungsten," *INTERNATIONAL JOURNAL OF POWDER METALLURGY AND TECHNOLOGY*, Vol. 12, pp. 115-125.

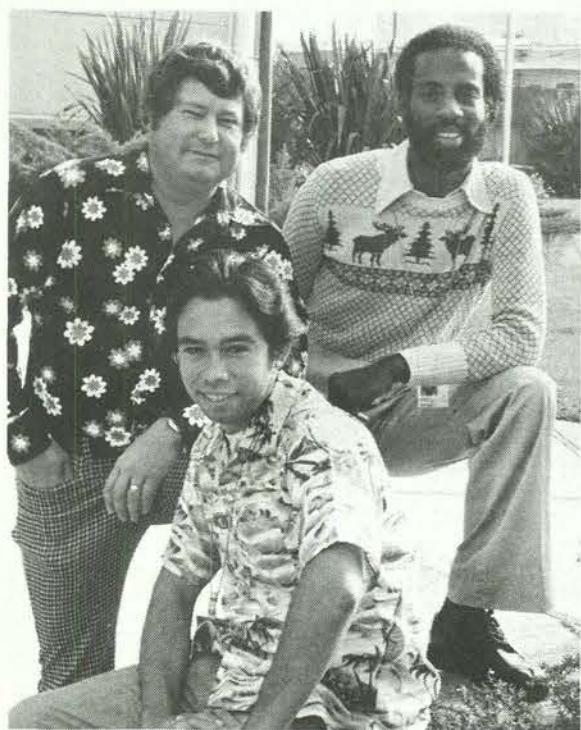
Dan Hartley (8115) and M. Lapp (GE), "Raman Scattering Studies of Combustion," *COMBUSTION SCIENCE AND TECHNOLOGY*, Aug. 1976 issue.

Sheridan Johnston (8116) and Prof. H.A. Dwyer (UC/Davis), "Thermal Instabilities in Discharging Gas Reservoirs," *JOURNAL OF HEAT TRANSFER*, Aug. 1976 issue.

Congratulations

Bert Barker (8322) and Nancy DeMello, married in Livermore, Dec. 31.

Karen Poor (8320) and Hanloy Quock (8323), married in Lake Tahoe, Nev., Dec. 20.



THREE SLL ENGINEERS were awarded MS degrees recently — Rocky Bridges (8159), right, and Tony Lucero (8183), seated, from Stanford under Sandia's OYOC Program and Cliff Skoog (also 8159) from U.C. at Davis, with most courses completed through ETV.

LIVERMORE NEWS

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B77 Chute Tests Run At Ames

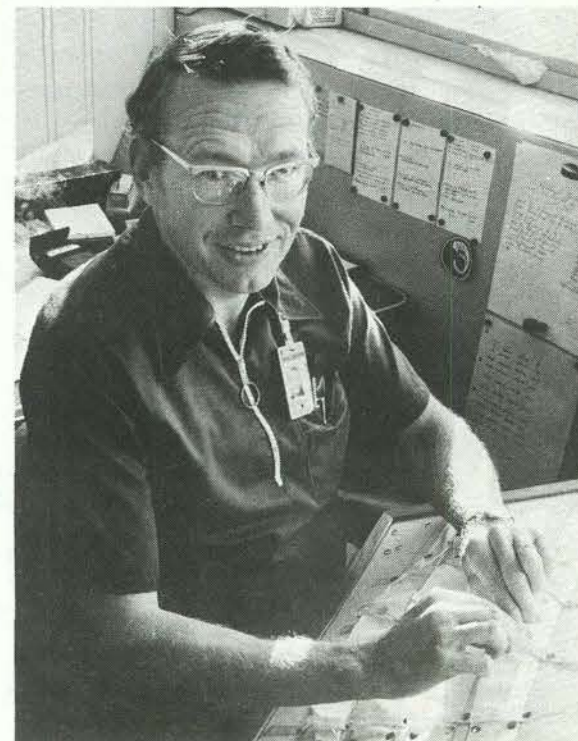
The NASA Ames Wind Tunnel is the world's largest. Engineers from Sandia Livermore and Albuquerque have for the past year been taking advantage of its size (its throat measures 40 by 80 feet) and its proximity, at the south end of San Francisco Bay, to run many developmental tests on the B77 first stage parachute.

"This is probably the Lab's most sophisticated parachute design," says Ray Rychnovsky (8158), retardation systems engineer for the B77. "It must go up before it goes down. It must withstand deployment at delivery speeds up to Mach 1.2 where opening shock loads approach 200,000 lbs. Such requirements mean a long and intensive development with lots of testing.

"A drop test at Tonopah runs around \$10 thousand per. At Ames we can check out chute coefficients and other characteristics in multiple tests that are relatively cheap and easy to set up."

Roger Everett (also 8158) works with Ray as wind tunnel test engineer. He's enthusiastic about the Ames tunnel: "It's as tall as a 10-story building and was built in 1943 to test a full size aircraft. When they're ready to start the six electric motors — each with a 12-metre propeller — that drive the air, the power demand is so high that they have to first check with the utility company to make sure the power is available."

Air velocity in the tunnel gets up to 370 km/h (230 mph), considerably lower than B77 delivery velocity but still high enough to determine coefficients of roll, lift, drag, pitch and yaw. These coefficients appear to remain unchanged at the higher subsonic velocities associated with an actual drop. Typically, a crew from both Sandia Livermore and Albuquerque runs a



Ray Rychnovsky (8158)

series of B77 chute tests in the Ames tunnel over a four day period. Ribbon parachutes of this type are more subtle in design than might at first appear, and factors such as porosity, inflation and collapse characteristics, and the number and spacing of ribbons must be determined. The full scale (4 metre diameter) lifting ribbon parachute is tested in the tunnel and, sometimes, modifications are made on the spot by riggers Dennis Cronin, Ken Ronquillo and Horace Lucero from the parachute lab in Sandia Albuquerque.

Others in Albuquerque from Department 1330 associated with the Ames tests are Jim Reed and Roger Tate, wind tunnel test engineers, Keith Taylor and Paul Klimas, parachute aerodynamicists, and Don Johnson, B77 parachute design engineer.

20,000 Feet Under the Sea

The red clay recently recovered from the north Pacific ocean floor could be called sedentary sediment — for as long as 60 million years, it has just sat there. That's good news for the joint team attempting to determine the technical and economic feasibility of providing terminal storage of high-level radioactive waste in canisters buried in geologic formations beneath the ocean floor (LAB NEWS, Feb. 20, 1976).

The sediments were recovered with a giant piston corer from beneath about 6 km (20,000 feet) of water. The corer is essentially a weighted tube which is lowered to between 3 and 15 m above the ocean floor. During descent a parachute retardation system developed by Sandia bore the weight of the 5400 kg (12,000 lb.) corer, thus eliminating line rebound during free-fall. The corer impacted the seabed and penetrated the sediment. It was then winched back to the surface where the undisturbed sediment sample was removed.

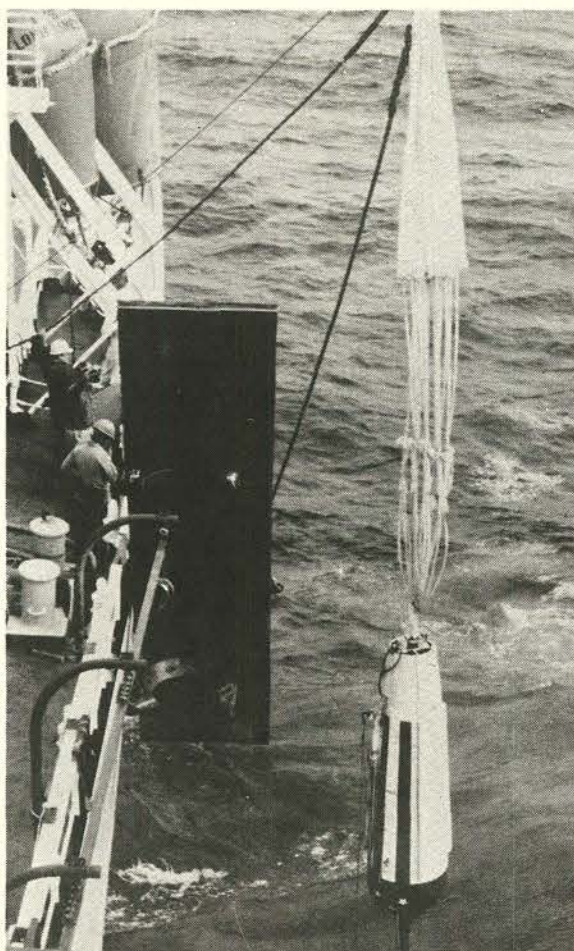
The recently recovered core is 24 m (80 feet) long — longer than any ever taken from that area of the ocean — and about 11.4 cm (4½ inches) in diameter. Preliminary observation of the core indicates that it is composed primarily of a typical pelagic (deep sea) red clay.

Dan Talbert (5444) leads the Sandia team that furnishes program direction for the joint Sandia/Woods Hole Oceanographic Institute/University of Rhode Island/Scripps Institute of Oceanography/University of Washington/Lamont-Doherty Geological Observatory effort. Says Dan, "Preliminary data on the core's age, stability, and apparent lack of disruptive influence by environmental changes such as ice ages and earthquakes indicate that mid-plate/mid-gyre regions, of which the north Pacific is one, exhibit many of the characteristics required for a safe disposal site. The region appears to contain little or no food or mineral resources. Sediments in the north Pacific accumulate at less than one millimetre every thousand years, and existing currents are relatively slow.

"Although we remain cautious, no serious technical reason has yet been found which indicates we should discontinue this feasibility study of waste disposal within geologic formations under the ocean."

In addition to Dan, the coordinator of the cruise, Sandians included Rip Anderson (5444), who headed the documentation and photography effort; Charley Karnes (5847), technical advisor on the chute retardation system; Ken Ronquillo (1332), chute rigger; and Gene Moore (3153), photographer.

Further studies with three other sediment types — siliceous, calcareous, and hemipelagic oozes — are planned for the future. At the same time, the current sample will be analyzed to obtain data on the mechanical and chemical characteristics of the red clay, on presence of any microbiology, and on the ability of the sediments to support microbial life. Studies will also determine the clay's ability to contain radioactive ions.



PARACHUTE AND PROBE. The corer extends 24 m below the probe unit. The chute supports the weight of the unit while it is lowered, thus preventing recovery line rebound during quick descent into ocean floor sediment. Charley Karnes designed the chute system; the cruise was its first successful test.



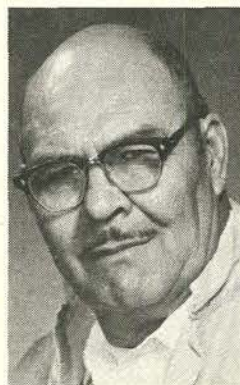
RIP ANDERSON and a student from the University of Rhode Island insert a small corer into the sediment held by the larger corer. Aim is to give maximum protection to the recovered sediment during transportation to the University for analysis.

Death

Jose Montoya of Stores Management Division 3727 died suddenly Dec. 28. He was 57.

He had worked at Sandia since November 1951.

Survivors include his widow, four daughters and two sons.



Speakers

G.V. Barton (5833), "Science and Engineering for Women," Nov. 9, West Mesa H.S. occupations seminar.

A.D. Swain (1222), "Motivating Chapter Members to Peak Performance," Nov. 9, Albuquerque Chapter, National Association of Accountants.

S.V. Asselin (5412), "Nuclear Power Plant Construction - Safety Features," Nov. 11, UNM Civil Engineering Club.

T.F. Marker (6010), "The Oil Industry: Fact and Fiction," Nov. 12, Men's Club, Monte Vista Christian Church.

W.H. McCulloch (5711), "Solar Energy Research," Nov. 15, Highland H.S. chemistry classes.

R.M. Jefferson (5430), "The Current Energy Crisis: Fact or Fiction?", Nov. 18, Northwest Optimist Club.

C.W. Dodd (5715), "Wind Energy Research," Nov. 19, Highland H.S. chemistry classes.

J.L. Colp (5731), "A Fine-Mesh Passive Seismic Survey of Kilauea Iki Lava Lake"; B.D. Zak (5443), "Long Distance Pollutant Transport and Transformation Experiments Using a Lagrangian Measurement Platform"; B.D. Zak and R.L. Schellenbaum (1757), "Solar Ultraviolet Irradiance and O₃ Densities up to 38 km Balloon Float Altitude Measured on STRATCOM VI"; D.E. Grady and R.E. Hollenbach (both 5163), "Dynamic Compression Tests at Varying Strain Rate in Rock"; D.E. Munson and E.G. Young (both 5163), "Application of a Rate Dependent Model to Stress Wave Propagation in Oil Shale"; K.W. Schuler (5163) and J.R. Tillerson (5162), "Stress Nonuniformities in Triaxial Tests of Bedded Rocks - A Preliminary Analysis"; C.W. Smith and J. Greenwell (both 1116), "Free Field Stress Measurements of the Penetration of a Projectile in Welded Tuff"; R.O. Woods (1757), "In-situ Wind Shear Measurements in the 20 to 40 Kilometre Altitude Range," American Geophysical Union Annual Meeting, Dec. 6-10, San Francisco.

A.F. Veneruso (5715), "Simulation and Operation of a Solar-Powered Organic Rankine Cycle Turbine"; J.H. Biffle (1281), "Use of Graphics in Three Dimensional Structural Analysis of Solids"; D.K. Gartling (1283), "Recent Developments in the Finite Element Methods in Fluid Dynamics"; W.H. McCulloch (5711), "Thermal Design Analysis of Parabolic Trough Solar Collectors," 1976 Winter Annual Meeting, ASME, Nov. 28-Dec. 10, New York City.

M.J. Beckett (5245), "What is an Engineer—Really?" Career Night Program, Dec. 1, Sandia H.S.

J.P. Hohimer (2541), "Intracavity Detector of Ultralow Atom and Molecular Concentrations"; G.W. Gobeli (2541), "Techniques of Trace Impurity Detection and Identification Utilizing Tuneable Laser Spectroscopy"; O.M. Stuetzer (2540), "The Sandia Tuneable Laser Program"; P.J. Hargis (2541), "Remote Measurement of Atmospheric Pollutants"; Hargis, "Ultralow Concentration Impurity Analysis of Laboratory Samples Via Tuneable Laser Spectroscopy," National Bureau of Standards, Dec. 7, Washington, D.C.

D.E. Berg (1334), "Surface Roughness Effects on the Hypersonic Turbulent Boundary Layer," Caltech Fluid Mechanics Seminar, Dec. 10, Pasadena.

D.A. Benson (5167), "Dynamic Vapor Pressure Measurements at Extreme Temperatures"; D.B. Hayes (2513), "A Method for Treating the Shock Compaction of a Distended Material as a Phase Change"; W.B. Benedick (5131) and J.R. Asay (5167), "High Pressure Ramp-Wave Generators"; R.A. Graham (5131), "An Accelerometer/Velocimeter with Time Resolution of a Few Nanoseconds"; M. Moss (5842), "Heat Capacity of Scandium Deuteride"; P.J. Chen (5131) and R.J. Lawrence (5162), "Electrical Responses of Nonlinear Piezoelectric Materials to Plane Waves of Uniaxial Strain"; J.E. Kennedy and J.W. Nunziato (both 5131), "Dynamic Stress-Strain Behavior of the Solid Explosive PBX-9404"; Nunziato, "On the Use of Acceleration Waves to Characterize the Dynamic Response of Materials"; W.T. Brown (5162) and R.A. Graham (5131), "Conductivity in Shock-Loaded X-Cut Quartz"; J.R. Asay (5167) and R.J. Lawrence (5162), "The Dynamic Response of Multiply Shocked Aluminum"; J.W. Swegle (5162), "Comparison of Two-Dimensional Rate-Dependent Calculations with Experiments in Al₂O₃-Epoxy Mixtures"; J.R. Asay (5167), "Ejection of Material from Shocked Surfaces of Aluminum and Lead"; P.C. Lysne (5131), "Shock-Induced Phase Transformation in PZT 95/5"; P.L. Stanton and R.A. Graham (both 5131), "The Electrical and Mechanical Response of Lithium Niobate to Shock Loading Above the Hugoniot Elastic Limit"; D.B. Hayes (2513), invited paper, "Kinetics of Shock-Induced, Polymorphic Phase Transitions"; P.C. Lysne (5131) and S.T. Montgomery (2315), "Dielectric Relaxation in Shock Wave Compressed PZT 95/5"; R.R. Boade (5734), D.E. Munson and K.W. Schuler (both 5163), "Modelling of the Dynamic Stress Response of Al₂O₃-Epoxy Mixtures," Winter Meeting of the American Physical Society, Dec. 20-22, Stanford University, Palo Alto, Calif.

Photovoltaics: Sunlight Equals Electricity

A photovoltaic optical concentrator array that converts solar energy to one kilowatt of electricity and about five kilowatts of thermal energy for space heating, air conditioning and domestic hot water is in operation at Sandia Laboratories.

Designed and built at Sandia, the prototype array has 135 plastic Fresnel lenses which focus high-intensity sunlight onto 135 specially-designed silicon solar cells. The 30 cm-square lenses, which resemble transparent phonograph records, concentrate the sunlight about 50 times. A tracking mount, controlled by a "sun-seeking" sensor, keeps the concentrator array pointed at the sun.

The high-intensity illumination causes each cell to produce a maximum output of 7.4 watts, about 50 times the output of a similar cell illuminated without such a lens. The concentrators thus permit the number of cells, which now cost about \$200 per square foot, to be greatly reduced.

Generally about 30 square metres of cell area is required to produce a peak output (solar noon) of one kilowatt. By comparison, the Sandia concentrator uses .9 sq. metres of cells and 41 sq. metres of Fresnel lenses.

A one-kilowatt array of conventional silicon cells would currently cost about \$15,000, compared to estimated costs of about \$3500 for the solar cell-Fresnel lens array. Substantial cost reductions are believed possible for both systems.

Built to evaluate its design and components, the Sandia experimental array will not be commercially available in the near future. The new solar cells, for example, must be subjected to long-term, high-temperature operating conditions to study their reliability and durability.

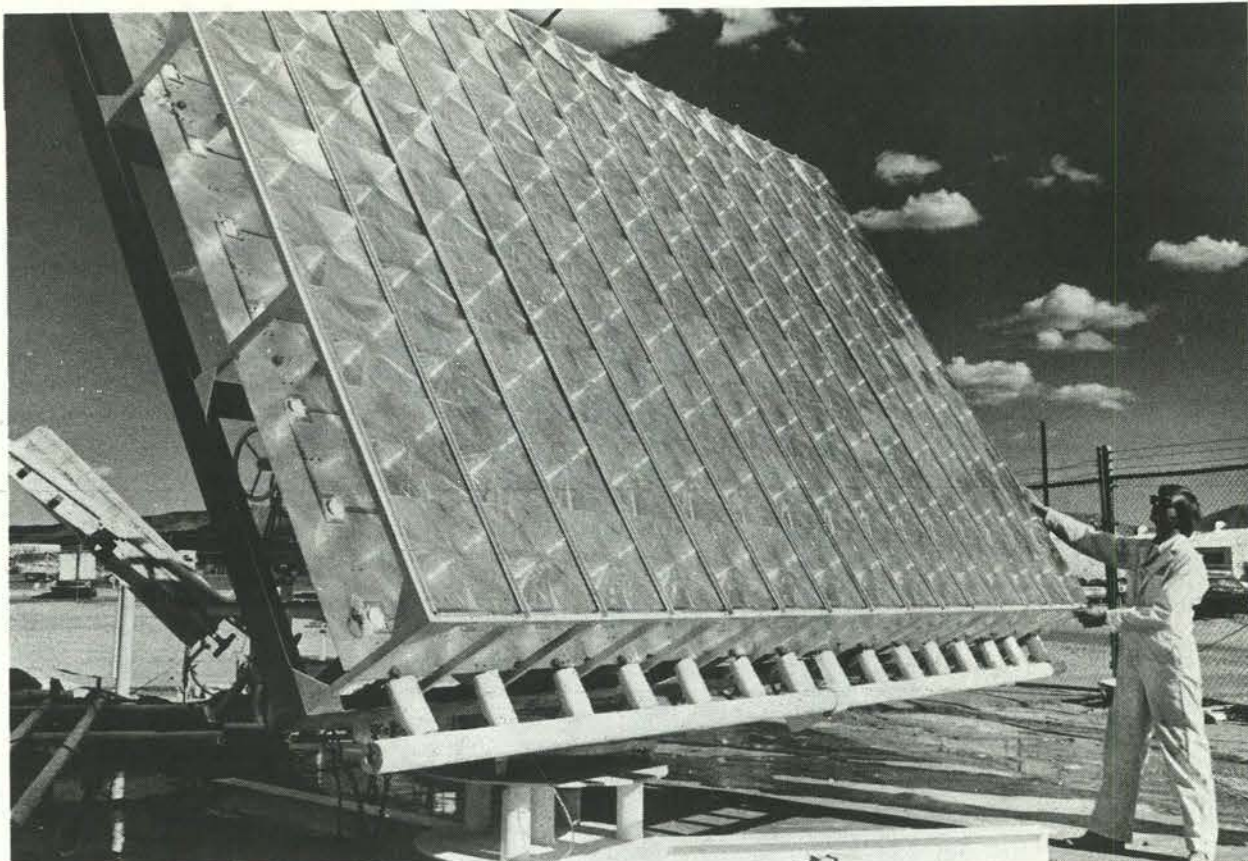
Solar cells, which are generally composed of thin (about 0.3 mm) semi-conducting wafers, absorb more than 80 percent of the solar energy, but convert only 10-20 percent to electrical energy. The excess energy occurs as heat and must be removed to prevent cell damage and to keep the cells operating efficiently.

Solar cells in the Sandia concentrator array are cooled by water circulated in tubing behind the cells. This water reaches temperatures of 90 degrees C. (200 degrees F) and could be piped to a residence for space heating, air conditioning and hot water.

Use of both electrical and thermal energy makes the cell-lens combination particularly attractive for use in residences and small buildings where two or three arrays would be sufficient to fill most energy requirements. Larger load centers, such as shopping centers, are also under consideration.

The silicon cells used in the Sandia array convert 14 percent of the sunlight to electricity and collect another 50 percent as heat so that a total of 64 percent of the incident solar energy can be utilized.

Development of the electric-thermal



ELECTRICITY is produced directly by this photovoltaic array. The square Fresnel lenses on the upper surface focus sunlight upon corresponding solar cells on the lower surface (the small illuminated disks which can be seen along left side of array). Use of lens results in cell output 50 times greater than without lens. Gene Hammons (5132) designed tracking system for array.

photovoltaic system was made possible by using Sandia-designed and fabricated silicon solar cells that maintain a high operating efficiency up to 100 degrees C (212 degrees F), when exposed to the concentrated solar energy of 50 suns.

The Sandia silicon solar cell is a 5 cm diameter circular design, providing a larger exposure area than the conventional 2 X 2 cm square cells used as long-term sources of power in space satellites. The metal conducting lines on the face of the cell are shaped like a wagon wheel. The spokes of this wheel feed electricity to the main electrode located around the perimeter of the cell. This design exposes more of the cell surface to the sun and provides better electrical contact.

The Sandia cell also has been improved by lowering the resistivity of the cell substrate to 0.3 ohm-centimetre from 1-2 ohm-centimetre. This helps to maintain the voltage at high temperatures. The back of the cell has also been treated so that it produces better ohmic contact for high currents.

Design of the solar cells to operate in multi-suns and elevated temperatures was greatly facilitated by use of a Sandia-developed numerical computer code for semiconductor device analysis. The code makes it possible to simulate the performance of new cells without having to build the cells.

Sandia researchers believe it possible to improve cell efficiency from its present 14 percent to 18 percent. This, they feel, is near the maximum practical efficiency for single crystal silicon cells.

Objective of the project is to demonstrate the feasibility of a photovoltaic-thermal solar energy system and to develop hardware to provide electrical and thermal energy for residential and small commercial applications at a competitive price.

The simplicity of solar cells — no moving parts — makes them attractive for power generation in many applications. Silicon cell technology is well developed but, unfortunately, cell cost (\$15 a watt) is

prohibitive for any practical, large scale use.

ERDA's National Photovoltaic Conversion Program is aimed at lowering the cost of photovoltaic converters, making them more reliable, and developing systems of solar cells panels that can be mounted on residences, shopping centers or in large solar farms to produce electricity from sunlight.

A specific ERDA goal is the establishment, by the year 1986, of an industrial capacity which can produce solar photovoltaic arrays with an annual total output of 500 million watts (megawatts) of electricity at a price of less than \$500 per peak kilowatt.

Such a price would bring the cost of electricity produced by photovoltaic systems more nearly in line with projected power costs from conventional generating plants, particularly in more remote regions.

Two parallel approaches are being pursued to gain the objective. One is to reduce the cost of silicon cells in solar arrays through improvements in cell processing and by large-scale production.

The second approach, which Sandia is directing, is to increase the output of the cells with solar concentrators. A major goal of the concentrator subsystems development program is to produce, by 1978, a system at a cost of \$2000 per kilowatt.

Sandia has already sought the assistance of commercial firms in the design, fabrication and testing of concentrator arrays with a peak electrical output in the 10 kilowatt range. This is another step toward operating a unit at a cost of \$1-\$2 per watt in 1978.

Sandia scientists now feel that it may be possible to produce photovoltaic concentrator arrays capable of producing electrical energy at a cost of \$500 per peak kilowatt — equivalent to about \$.05 per kilowatt hour — by the early 1980's.

The Labs' photovoltaic effort is headed by Don Schueler, supervisor of Photovoltaic Systems Division, 5719.

FIRE PROTECTION ENGINEER SAYS:

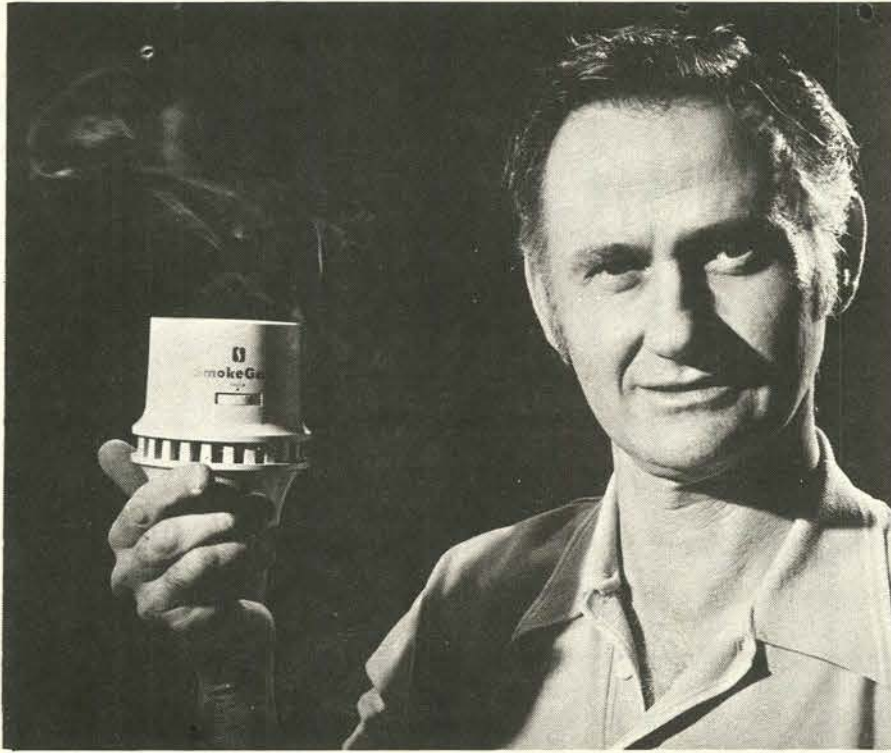
'Install a Smoke Detector in Your Home'

"Each day 33 people die and 820 are seriously burned in fires in the United States," Vern Duke (9751) says. "More than half of the deaths result from fires which occur in the home. The greatest danger exists when the family is asleep. Smoke kills most victims before the heat or flames reach them.

residential fires are reported in the U.S. annually," Vern continues. "This means that your chances of suffering a fire is about one in 50. The chance of a fatality is one in 10 thousand. In case of a fire in your home, an alarm from a smoke detector would provide those vital seconds needed to save your family."

A wide selection of smoke detector devices is now on the market, some as inexpensive as \$28.

"You can't afford not to have at least one detector in the hallway near the bedrooms," Vern says. "If the bedrooms are widely separated or if there are small



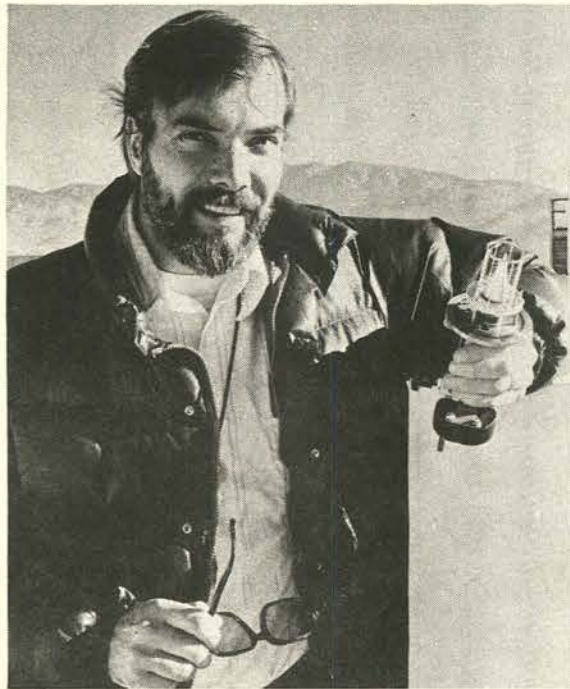
SMOKE DETECTOR DEVICES provide vital seconds in which to save your family in case of fire in your home. Vern Duke (9751), Sandia fire protection engineer, urges all Sandians to install one or several in their homes.

children or handicapped persons in the home, then additional detectors would be a wise investment."

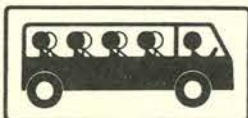
A *Consumers Report* article is available at the circulation desk in the Tech Library, Bldg. 804. The article rates various detectors and discusses criteria for selection. Vern is available to answer specific questions. Call 4-1958.

SLA 1977 Holidays

Memorial Day	Monday, May 30
Independence Day	Monday, July 4
Labor Day	Monday, Sept. 5
Thanksgiving Day	Thursday, Nov. 24
Christmas Holiday (six days)	Monday, Dec. 26 through Monday, Jan. 2



JAY BENSON, supervisor of Recording Systems Development Division 1115, displays a recently-patented electromagnetic radiation detector. Co-inventor is Gordon Hansen (1115), now on assignment at General Dynamics, Orlando. The device detects x-ray or gamma ray pulses. Response time is less than one nanosecond. It has been used in tests at Nevada Test Site.



Bus Notes

Sometime riders of the Sanchez buses should check with the appropriate bus honcho (Dale Pipher for Belen/Los Lunas, Bob Shuman for Peralta, Dave Shank for Bosque/South Valley) or with Commuter Info (4-RIDE) for information on new fare and pass changes effective Jan. 10. Regular riders have already been notified.

Labs Group To Study Weapons Safety, Security, Survivability

A major study has been undertaken by the Labs concerning the safety, security, and survivability of deployed nuclear weapons in the 1980's. Requested by the Department of Defense, the study will be performed over the next two years and has been assigned to Bill Roherty's Systems Studies Division I 1311. The study, named "Forward Look," will be the principal task of the division during that time. Many other Sandia organizations are contributing, and some are loaning people to 1311 to assist in the study.

Object of the study is to provide the DOD, by October of 1978, a range of options relating to enhanced safety, security, and survivability for the weapons under the conditions that may exist during that decade. Much of the study will be based on technology already in hand or in development at Sandia. In addition, technological innovations that evolve during the study will be used, where appropriate. A key aspect is to assure that the three elements - safety, security, and survivability - are addressed as a single system rather than on a piecemeal basis, since improvements to one element can often act to the detriment of others.

For Forward Look purposes, safety is defined as resistance to the undesired consequences of accidentally or inadvertently caused environments. Security is resistance to the actions of hostile persons, and survivability denotes resistance to attrition or damage of weapons by enemy action prior to their employment.

Within DOD, Forward Look originated in the office of the Assistant to the Secretary of Defense for Atomic Energy, headed by Don Cotter, who is also Chairman of the Military Liaison Committee to ERDA.

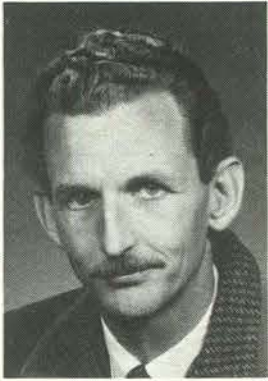


NEW 250 kV deuterium ion accelerator is complete and installed in an underground laboratory in Bldg. 807. Division 2354 will use the new machine to bombard scandium and erbium hydride films to create neutrons; the neutrons offer a promising new way to treat cancer victims. The program, financed at \$500,000 by the National Cancer Institute, will explore the upper limits of neutron production using solid target neutron generators. Ultimate aim of the program is to develop design parameters for a clinically useful machine. Preparing the new accelerator for gradually increasing power output tests are Al Riedel (2354), standing, and Frank Bacon (2354), project engineer.

Take Note



Snyder



Gregory

Two Sandians Among Three Men Named IEEE Fellows

A first for a small Institute of Electrical and Electronics Engineers (IEEE) chapter such as the local one — three members were recently named Fellows. Two, Bill Snyder, Director of Nuclear Fuel Cycle Programs 5400, and Bob Gregory, Manager of Integrated Circuit Process Department 2140, are Sandians; the third, Peter Dorato, is chairman of UNM's EE and Computer Science Department.

Says Dick Adams (2531), president of the chapter, "It's a major honor to be chosen a Fellow. The awards, based on accomplishments in the field, are limited to 0.6 of 1 percent of the senior members of the Institute, and only 20 percent of those nominated are successful. The screening process is rigorous."

Award certificates will be presented at the IEEE meeting on Jan. 20 at the KAFB-East Officers Club. Contact Dick for reservations.

Need tax help? Barbara Rush (3500) reports that once again the Animal Humane Association is offering tax assistance with the services of John Chambers, tax consultant and former manager of H. & R. Block. After John gets you straightened out, his nominal fee goes directly to the Humane Association. Call him on the Association's number, 255-5523, if you're interested.

* * *

Popejoy Hall has announced subscription sales to their annual Cultural Entertainment Series. The package includes these professional touring companies: Absurd Person Singular, the Osipov Balalaika Orchestra, Sherlock Holmes, the Eliot Feld Ballet, the History of Jazz in America, and Love's Labour's Lost. The events run through March. A subscription offers significant savings over the series cost on a single ticket basis. Call 277-3121.

* * *

The Albuquerque Montessori Society is having an open house Sunday, Jan. 16 at 1334 Wyoming NE from 2 to 4 p.m. Persons interested in learning about the Montessori method of education of small children is invited. Additional information is available from Bill Brown (5162), 4-8957.



MEET FRANK PRANGE, Sandia's new director of Financial Planning 4100. Frank has been comptroller at Western Electric plants in Shreveport, Denver, and Kearny. He heads a new directorate which includes the Compensation and Benefits, Auditing, and Financial Departments.

Robert Biefeld (5154) will present "Solid Electrolyte Research" at the 5100 Seminar Tuesday, Jan. 25, at 3:15 p.m. The seminar meets in Bldg. 806, Rm. 201.

* * *

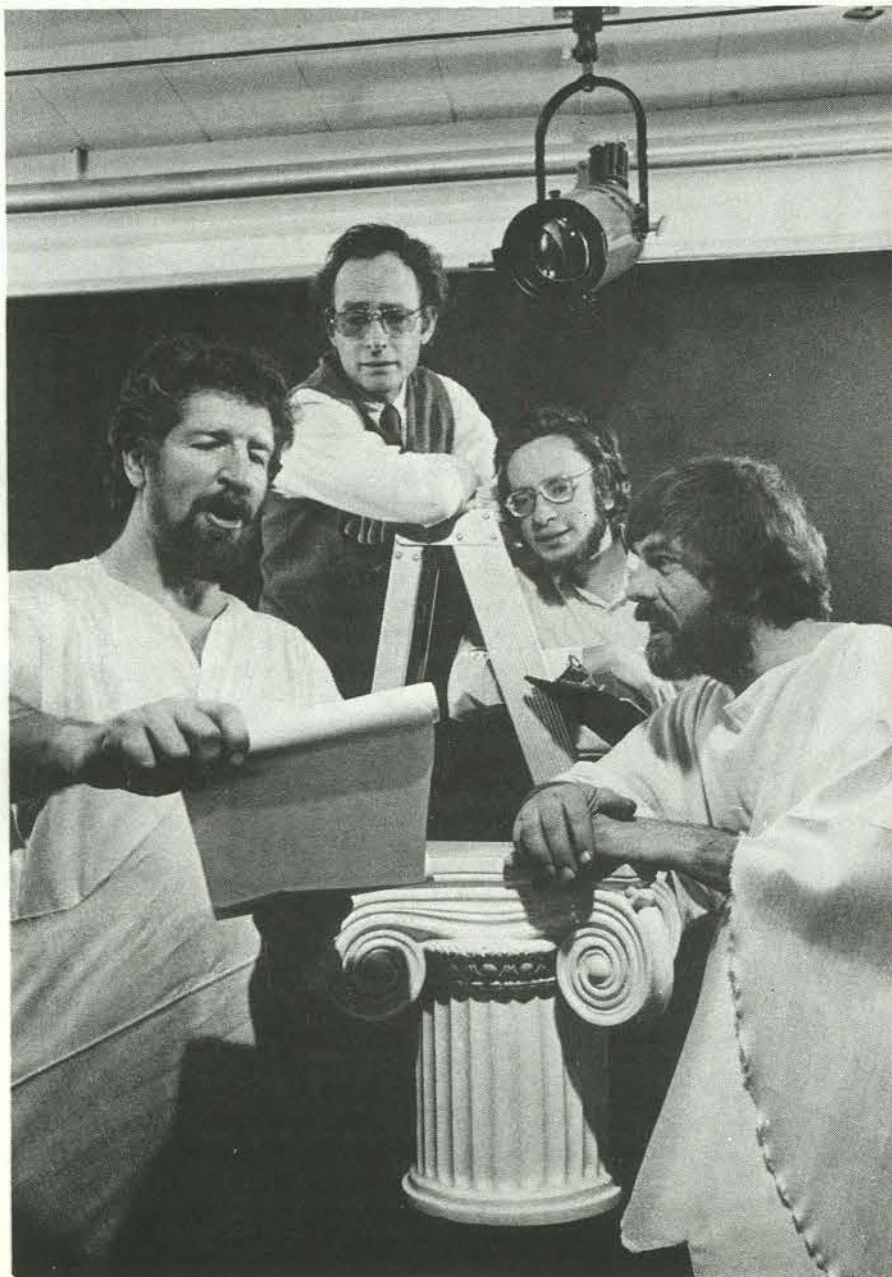
Dick Hodges (3171) will instruct a basic and an advanced course in photography this semester. The advanced class meets on Tuesday evenings starting Jan. 18, while the basic class meets on Thursdays starting Jan. 20. Both 12-week classes are held from 7 to 9 p.m. at 2115 Menaul N.E. Enrollment information is available from Dick; call 296-6897.

* * *

An NBC-TV News special will include a section about Sandia's site investigation work for a Waste Isolation Pilot Plant. The program will appear on KOB-TV Channel 4 from 9 to 10 p.m., Jan. 26 (at Livermore, KRON-TV Channel 4 from 10 to 11 p.m.).

During production of the special, "Danger, Radioactive Waste," NBC-TV news correspondents visited Sandia Albuquerque and the pilot study site about 30 miles east of Carlsbad. Wendell Weart, manager of Waste Management Systems Department 1140, was interviewed and appears on the program.

THE IDES OF MARCH this year is Jan. 20-23. That's when Julius Caesar (played by Gene Ives, lower left and 4360) gets his, thanks to conspirator Decius Brutus (Bruce Hawkinson, lower right and 3162) and his cohorts. John Gardner (upper left and 3144) directs Classics Theatre's production at Popejoy Hall; Lou Baker (5241) is stage manager. Not shown, John Olsen (5244).



Credit Union REPORTER

by Clarence Sandy,
President, Board of Directors

Credit Unions, by law, are run by volunteers. In the Sandia Laboratory Federal Credit Union these positions are filled by volunteers who are elected by the membership at our annual meetings:

11 Directors
3 Credit Committee Members

In addition, four appointive volunteers serve on the Supervisory Committee. All of these positions are part-time, and the work they entail is usually done at lunch or after hours. The full-time staff of the Credit Union operates with most of the same procedures and benefits as the full-time staff of the Laboratories.

Perhaps believing we are like a commercial organization, Sandians often ask about the pay and benefits of directors. In a word, there are none. By National Credit Union Administration regulations, and by the Credit Union Act of 1934, directors and other volunteers may not receive compensation or benefits in kind for their work. This policy extends also to loans. By law, it is more difficult for a director to obtain a loan than it is for a regular member of the Credit Union. For other than share-secured loans, directors must have the normal approvals of the Loan Officer or Credit Committee and the further approval of the Board of Directors. Interest rates are those which apply to all members.

Travel to board meetings or to Livermore is not reimbursable. Any out-of-town travel is normally done incidental to necessary Laboratories business trips. Any extra time and expense comes out of the volunteer's pocket and vacation schedule. There are exceptions to this general policy, but only in specific cases with prior board approval.

These policies and practices of the Credit Union are well known, I believe, to the majority of the membership. Newer members, however, may question the volunteer aspects of the Credit Union. Credit Unions were established as cooperative associations organized "to promote thrift among credit union members and to provide low cost credit to members for provident and productive purposes." The "pay" for the volunteer comes from the achievement of these goals. Oh yes — all the Credit Union people, volunteer and full-time alike, get a free dinner once a year at our Credit Union banquet!

* * *

Annual Meeting, the 29th, of the Credit Union is slated for Thursday, Jan. 20, at the Coronado Club. At the meeting, which starts at 5 pm, four board members and two credit committee members will be elected. Refreshments will be served and door prizes distributed. First prize in the drawing is a \$500 share deposit; two \$250 share deposits will also be awarded.



Sandia Laboratories Statement of Policy

Employment of the Handicapped, Disabled and Vietnam Era Veterans

In a continuing effort to treat qualified handicapped individuals and disabled and Vietnam era veterans without discrimination in employment, training, job placement and advancement, Sandia Laboratories reaffirms its policy of equal opportunity for all of its employees and applicants. We are committed to full compliance with the Rehabilitation Act of 1973, as amended, and the revised Vietnam Era Veterans Readjustment Assistance Act of 1974. We will foster a general understanding of and sensitivity to the problems of the handicapped and veterans to assure that as openings become available for which they are qualified, we may be better prepared to provide meaningful employment and advancement opportunities.

The Acts cover individuals with physical or mental impairments which could affect their ability to secure, retain or advance in employment, whether or not they had previously been identified as handicapped. The Readjustment Assistance Act assures the Vietnam era veterans that employers will offer them employment opportunities with the likelihood for advancement.

Therefore, employees who believe themselves covered by the regulations and who wish to receive consideration under our affirmative action program are invited, at their own discretion, to identify themselves through their Supervisors, Personnel Representatives, or Equal Opportunity Staff. The information submitted will be considered confidential and will be used only as required to meet the provisions of the Act.

To assure the success of our policy and our continued compliance with applicable laws and regulations, supervisors are reminded that it is the responsibility of each of us to provide equal opportunities for the qualified mentally or physically handicapped individual, and the disabled and Vietnam era veteran. Overall administration and monitoring of the program has been delegated to J. R. Garcia, Director of Personnel and Special Assistant to the President on Equal Opportunity, and his staff.



Morgan Sparks

POLICY STATEMENT— Sandia's affirmative action program for the handicapped, for disabled veterans and for Vietnam era veterans will be distributed to the Large Staff later this month. The Labs' first affirmative action plan for handicapped individuals was issued in August of 1975. That plan was recently revised to include disabled and Vietnam era veterans. Copies of the full plan can be obtained from directors' offices, personnel representatives, or the Equal Opportunity Office (Bldg. 832).

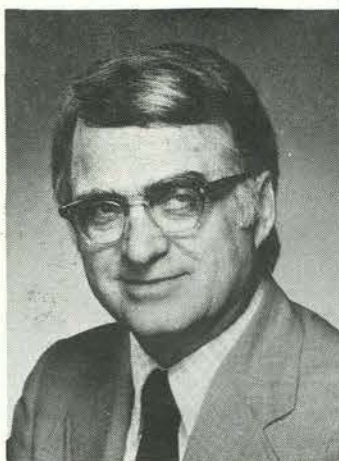


THE GREAT BLIZZARD of '77 produced a few inches of snow, early morning fog, happy boys, exuberant skiers, and a chance for LAB NEWS photographer Bill Laskar to go artistic. Plant Maintenance men from Orgs. 9713 and 9718 reported early to clear sidewalks and streets.

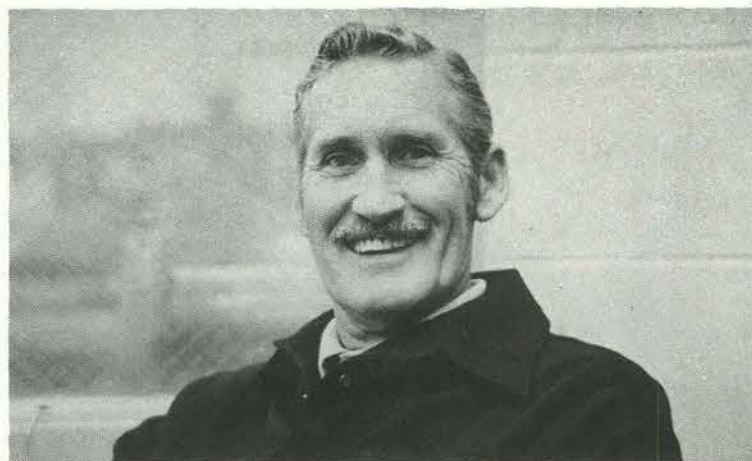
MILEPOSTS

LAB NEWS

JANUARY 1977



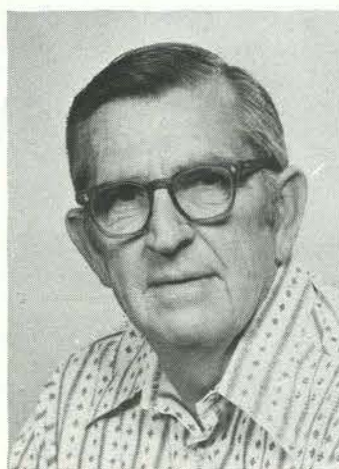
Ken Smith-3100 25



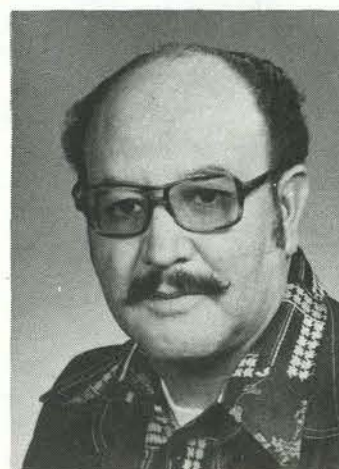
Bernard Brown-9573 30



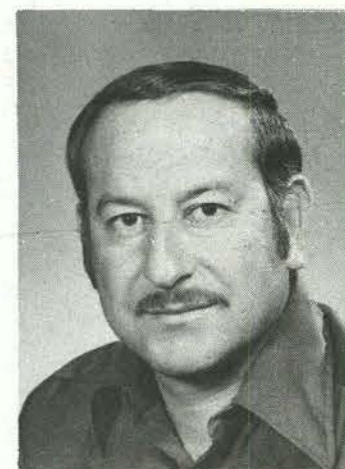
Dollie Harris-3141 15



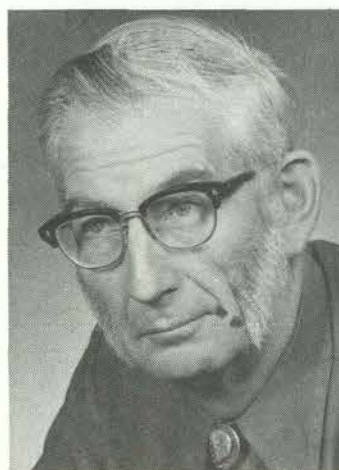
Donald Tyler-3171 15



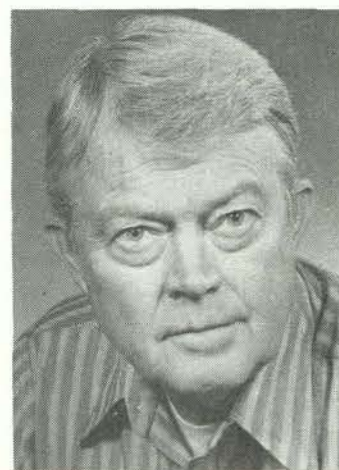
L.C. Trujillo-9414 25



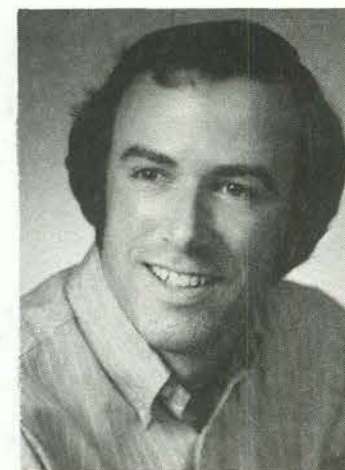
Adelico Cordova-3623 10



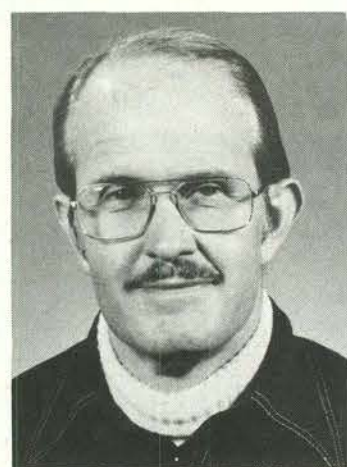
Arnold Draper-9531 25



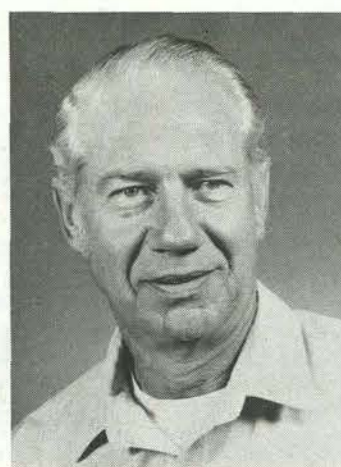
A.E. Randall-3732 25



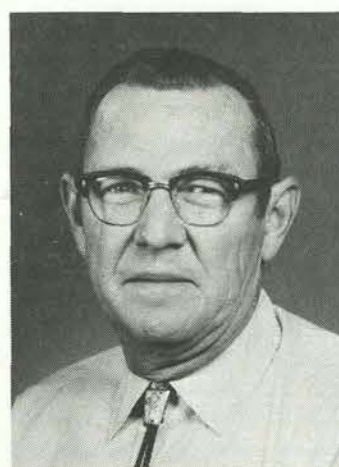
Tim Marino-8423 10



Robert Woods-1757 10



George Neufeld-9718 25



Wallace Mitcham-9743 25



Mary O'Neal-9631 15



Don Odell-3411 25



Harvey Miller-1123 20



Lillian Balfour-3141 20



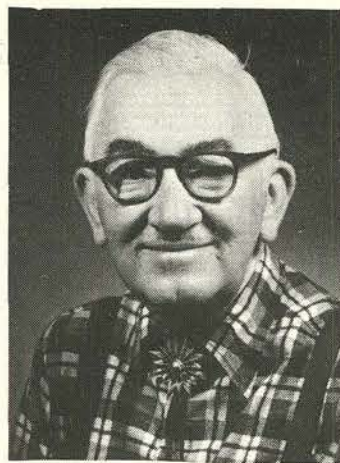
Dallas Sasser-5741 20



Glenn Haycock-9718 20



Pete Klemm-3421 15



William Anderson-2317 20



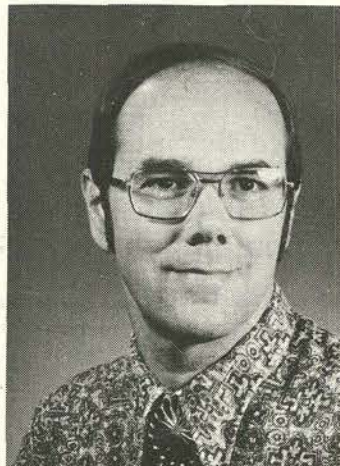
Rose Griffin-3621 15



Ray Reed-1116 15



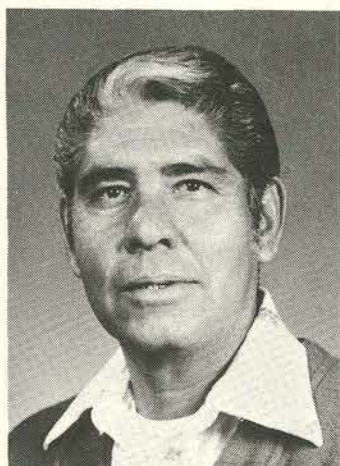
Rosa Steele-2627 15



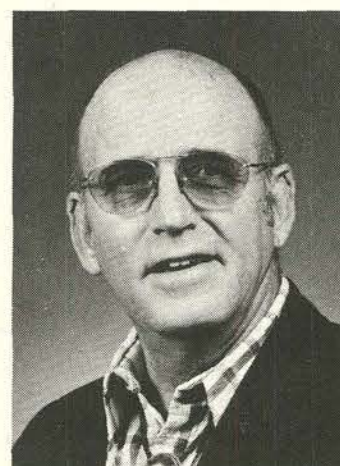
Robert Clark-2523 15



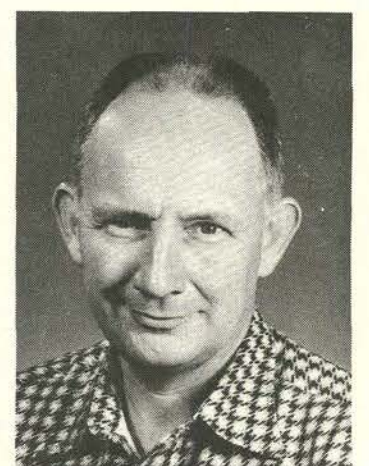
Louis Gallegos-3430 15



Martin Gonzales-9718 10



Joseph McDowell-2323 20



Bill Leisher-5233 10



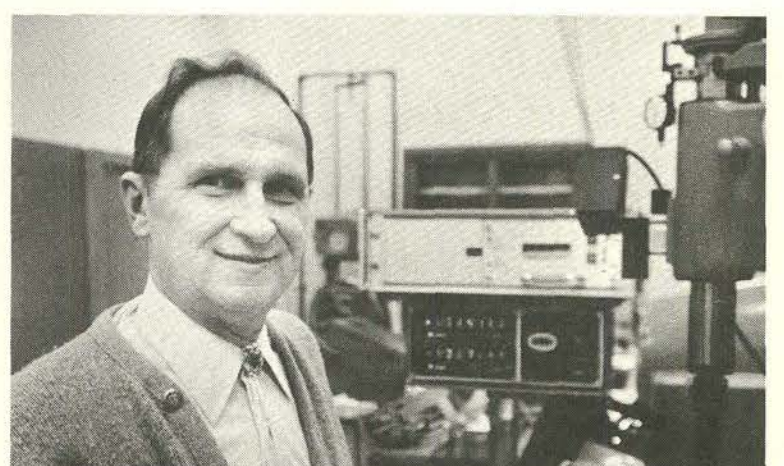
Milton George-9713 10



Procopio Lopez-3644 25



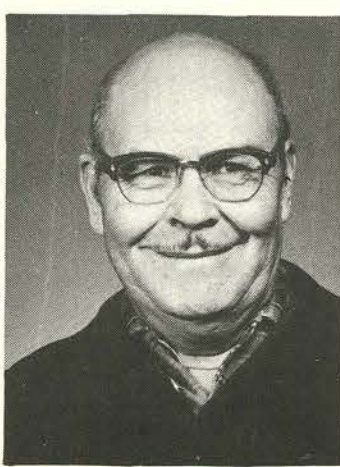
James Barnett-2627 10



Ervin Bureta-3613 25



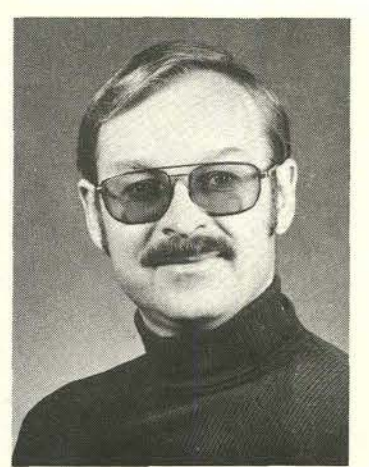
Al Trujillo-3616 20



Jose Montoya-3727 25



Dorothy Wall-9631 25



Stanley Roeske-1242 15

Authors

D.A. Benson (5167), "Vapor Properties of Gold at Extreme Temperatures by Pulsed-Electron-Beam Measurement," Vol. 47, No. 11, JOURNAL OF APPLIED PHYSICS.

P.J. Chen, L. Davison (both 5131) and M.F. McCarthy, "Electrical Responses of Nonlinear Piezoelectric Materials to Plane Waves of Uniaxial Strain," Vol. 47, No. 11, JOURNAL OF APPLIED PHYSICS; P.J. Chen, "Thermal Instability in Rigid Heat Conductors with Nonlinear Heat Generation," Vol. 34, No. 3, QUARTERLY OF APPLIED MATHEMATICS.

R.S. Claassen (5800), "Role of Crystallography," Vol. 29, No. 11, PHYSICS TODAY.

K.K. Murata (5151), "Critical Growth and Saturation Effects in Order-Parameter Fluctuations with Two Time Scales," Vol. 37, No. 21, PHYSICAL REVIEW LETTERS.

T.D. Padrick (5215) and R.E. Palmer (5216), "Use of Titanium-Doped Quartz to Eliminate Carbon Deposits in an Atomic Iodine Photodissociation Laser," Vol. 47, No. 11, JOURNAL OF APPLIED PHYSICS.

H.J. Rack (5832), "Residual Strength of Shock Loaded RMI 38644," Vol. 7, No. 10, METALLURGICAL TRANSACTIONS A.

L.A. Bertram (2642), "Analytical Solutions for Ulrich's Spherical Thermal," Vol. 1, No. 1, DYNAMICS OF ATMOSPHERES AND OCEANS.

G.W. Brown and B.W. Lindsay (both 2142), "The Numerical Solution of Poisson's Equation for Two-Dimensional Semiconductor Devices," Vol. 19, No. 12, SOLID STATE ELECTRONICS.

W.J. Camp and J.P. Van Dyke (both 5151), "Series Analysis of Corrections to Scaling for the Spin-Pair Correlations of the Spin-S Ising Model: Confluent Singularities, Universality, and Hyperscaling," Vol. 14, No. 9, PHYSICAL REVIEW B.

D.M. Follstaedt (5151) and A. Narath (5000), "High-Field Nuclear Relaxation of ^{173}Yb in Dilute AuYb Alloys: Evidence for Anisotropic Conduction-Electron Exchange," Vol. 37, No. 22, PHYSICAL REVIEW LETTERS. D.M. Follstaedt and P.M. Richards (5152), "NMR Relaxation in the Superionic Conductor B-LiAlSiO₄," Vol. 37, No. 23, PHYSICAL REVIEW LETTERS.

M.M. Widner and J.W. Poukey (both 5241), "Ion Sheath Motion in Plasma-filled Diodes," Vol. 19, No. 11, THE PHYSICS OF FLUIDS.

FIREPLACES

Cozy or Costly?

If you have a plain old fireplace (no recirculation of heated air, no outside source of air to heat), it starts losing more heat than it's producing below about 16 degrees F. If you use your fireplace in the evening and let it smoulder till midnight, then close the flue at 7 a.m., you've lost more heat than you've gained. And fireplaces are a major cause of pollution in the winter.

If you're intrigued by statements like these, you may want to attend a conference on fireplaces sponsored by Albuquerque's Environmental Health Department at the Convention Center on Jan. 27 from 1:30 to 5 p.m.

The Department has invited dealers, builders, contractors, and the interested public to discuss problems associated with what most of us naively believe a source of "natural," and therefore efficient, heating. You'll hear discussions on the need for glass fireplace doors and the right size chimney (those on most homes built here in the 50's and 60's create too much draft); you'll find out about the difficulties of woodburning



The realities aren't as rosy as the glow.

in a "smart" (super-insulated, tightly sealed) home; and you'll learn about retrofitting an existing fireplace to make it a more efficient heat producer.

PAGE ELEVEN
LAB NEWS
JANUARY 14, 1977



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 hold-day.

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 ERDA employees.
6. No commercial ads, please.
7. Include name and organization.
8. Housing listed here for rent or sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

RUG, 9 1/2 x 12, beige shag w/pad, \$40. Smith, 242-9576.
LADIES solitaire diamond ring, 1/2 carat in 14K gold mounting, have appraisal, make offer. Randall, 821-0388.
MICRO-NIKKOR lens, aut. 55 mm, F3.5, focusing range normal to 1:1, \$125. Laval, 898-0518.
SEARS elec. range, 30", \$40. Hansen, 869-2716.
DIAPHRAGM compressor, Sears, belt-driven w/ 1/4 HP motor, 15' of hose, \$25. Joseph, 299-6989.
MICROWAVE OVEN, Ward's Signature model, \$125. Shepherd, 296-1238 after 6.
MOBILE HOME, 14' x 64', skirted, 2-bdr., in nice park. Martinez, 345-7288 evenings.
MUD/SNOW tires, 7.75 x 14 4 ply rim mounted; snow chains. Carli, 298-9271.
ELECTRIC GUITAR, Tokai, black, 2 P/V's, 2 tone & vol. controls pick-up select switch, solid body, \$100. Ingram, 255-0592.
BROILER, infrared w/rotisserie, temp. time controls, grill, baking unit, spit, skewers & grill spit, chrome. Rainhart, 821-3690 after 5.
FOUR 6' patio doors & frame sets w/screens, 3/16 tempered glass,

\$125 ea., \$450 for all. Randall, 821-9297.
TIRE CHAINS, finish nails; #s 6, 8, & 16 wallboard nails; roofing nails; gas hotplate; power lawnmower, reel type. Gallegos, 898-1839.
REMINGTON MK IV rechargeable shaver, \$15; Sunbeam Vista mixmaster, chrome, \$25; Sunbeam thin line auto. toaster, \$10; Osterizer blender, single speed, \$7. Bear, 881-7128.
HAM GEAR: Mosley TA33 JR beam, PA 400 linear amp, TR-44 antenna rotor & 40' tower, \$35 ea. Berg, 299-5640.
NEW MEXICO MAGAZINES: complete from June '69 through Dec. '76, \$25. Shane, 296-4430.
RANGE, elec. Tappan Renaissance II dbl. oven, self-cleaning main oven, \$250. Smathers, 298-0613.
TYPEWRITER, std., manual, wide carriage, \$45. Dillon, 881-3843 after 5:30.
PIANO, upright, \$550. DeVargas, 299-0477.
BASKETBALL backboard, hoop & post; AM/FM radio-phon console. Anderson, 299-5727.
COMPLETE GERBIL pet center: activity cage w/wheel, climbing tower food apt. & habit trail, gerbils, \$15. Cole 293-6122.
GERMAN SHEPHERD puppies, 10 wks. old, AKC reg., \$50 & up. Abbin 296-7678 or 256-0188.
LARGE SPIDER PLANT w/numerous plantlets, \$15. Rigby 298-1767.
TELESCOPE (variable power to 1000), \$20; baby car seat; baby walker; baby backpacker. Falacy, 881-1802.
TRUMPET w/case, music stand & accessories, \$40. Rozelle, 298-0396.
SOFA, 3-piece sectional, lt. beige, Danish modern, walnut legs, center section is curved, \$95. Greenwood, 298-5268.
BLACK TUXEDO (shawl collar), white dinner jacket, coat size 40L, trousers 32/31, all accessories, \$100. De-Werff, 298-1029 after 5:30.
WHIRLPOOL port. dishwasher, \$65; braided rug, burnt orange, 5 1/2' x 7', \$12; 2 hanging lamps, \$5 ea. Watterberg, 294-6759.

8MM FILM EDITOR, \$20; heavy thermal pants, 36R, \$20; H.D. Sportster shocks, \$60/pr. Anthes, 877-7805.
'72 MOBILE HOME, 14 x 70', set up & skirted, Four Hills Park, many extras, \$7000, finance through Credit Union. Cabasier, 293-3615.
LENS SET, Vivitar, auxiliary telephoto & wide angle, 49 mm thread, \$25. Booker, 299-3554.
NAVAJO RUG, very large Two Grey Hills, professionally appraised, \$1800. Marder, 256-7805.
TENT, Coleman Oasis, 8' x 10' w/canopy & rain fly, used 3 times, \$95 or best offer. Kramer, 898-7149.
SLIDE IN CAMPER, 8', stove, ice box, storage space, hook-up for 110 AC or 12 V, \$500. Cherino, 865-9588.
ELEVEN HOUSE PLANTS, all for \$15 or \$2.50 each. Carpenter, 299-4312.
'73 PONTIAC service manual, \$5. Dippold, 821-5750.
CRAFTSMAN sander, almost new, linear orbital motion, regular catalog price, \$30, sell for \$20; consider trade for tools. Orear, 256-1941.
TRUCK mirrors, low mount, stainless steel, \$25/pr. Kohut, 296-8537.
SLEEPING BAG, Western Mt. 3 1/2 lbs. down, cost \$160 Jan. '76, sell for \$100. Robert, 265-1620.

TRANSPORTATION

61 FORD 1/2-ton pickup, 6-cyl., cream exterior, new: kingpins, clutch, battery, shocks, regulator, points; 85,000 miles, \$500 firm. Davis, 292-2266.
VW Baja bug, 1700 cc eng., balanced, added acc. Sanchez, 255-4844.
'75 MAVERICK, 2-dr. sedan, blue, \$200 below book, \$800 down & take over payments or refinance. Klemm, 821-0769.
'67 DODGE Dart, 4-dr., slant six, best offer over \$100. Orear, 296-1941.
'75 PONTIAC stn. wgn. AT, AC, PS, 20 mpg town, \$3000. Cooper 298-5841.
HORSE: dbl. registered AQHA, IBHA, top barrel horse in N.M. for '76, 11-yr-old red dun gelding, \$750. Morrison, 877-7425.

'74 DART Sport, 19,000 miles, PS, hatch back, new tires, 6-cyl., priced below NADA book. Cummings, 292-0524.
'55 CHEV. Bel Air, 283 engine, new: brakes, clutch, rear tires, vertical gate shifter. Norris, 281-3891.
'73 JEEP Wagoneer, 258 CID, 6-cyl., AC, AT, PS, radial tires, 54,000 miles, \$3500. Lauson, 298-2769.
3-SPEED BICYCLES, one man's, one lady's. Anderson, 299-5727.
SCHWINN, 26" girl's bike, 3 spd., \$35; baby crib, \$10. Beller, 881-4047.
'73 CADILLAC, Sedan de Ville, 51,000 miles, radial tires, power extras. Hollingsworth, 299-8171.
'76 MAZDA Mizer, overhead cam engine, warranty, 4-spd., low mileage. E.P.A. 42/32. Korak, 265-2307 or 266-7445.
'72 FORD Courier pickup, 43,000 miles, H.D. bumper, steel radial tires, CDI & racing stripes; will consider trade, \$1775. Lackey, 898-6638.
'73 VEGA GT hatchback, AC, 4-spd., radial tires, deluxe interior, radio & sport stripes. \$1400. Cleveland, 298-0218.
MOPAR 4-spd. transmission: everything from flywheel to end of trans. including Hurst Super Shifter, \$350 Jones, 881-1918.
'68 YAMAHA 250, \$200. Ellingson, 299-4056.

REAL ESTATE

3-BDR. house w/garage, carpeting throughout, near school & Princess Jeanne Park, \$31,900, will move out in March. Martinez, 294-0311 after 5.
SEVEN ACRES, Bosque Farms, \$7500/acre. Baca, 869-6637 after 3:30.
4-BDR., 2150 sq. ft., lg. FR, custom decorated, 4-yr. old, terms, \$52,500. Tyson, 294-4200, 10516 Arvilla NE.
ONE-ACRE LOT w/lg. workshop, NW Valley, Gallegos, 898-1839.
HOFFMAN BRICK, near Coronado & Winrock, 1660 sq. ft., 3 bdr., den 1 1/2 bath, fp, auto. sprinklers front & rear, \$39,900. Bradley, 265-2981.

FOR RENT

CONDOMINIUM, Purgatory Ski Basin, sleeps 6, linens, fully equipped kitchen, fireplace, reservations. Smatana, 299-6278.
2-BDR. apartment, unfurnished, washer & dryer, dishwasher, fireplace, carpeted, garage, swimming pool. Caruthers, 821-4035.

WANTED

YOUNG GERMAN SHEPHERD to protect Valley home on 5 acres. Roth, 877-4997.
LOT to build house on. McKeever, 299-2777.
TANK crewmen, WWII, for LAB NEWS story. Call John, 4-1053.
CAR POOL riders from Westgate Heights area to share driving. Bernard, 831-4114.
LARGE living room mirror. Falacy, 881-1802.
SKI RACK for Volkswagen. Cropp, 296-1877.
MOVING CARTONS, all sizes, preferably disassembled. Matter, 296-2777.
ELECTRIC DRYER, preferably gold, in good condition. Sanchez, 296-5795.
DIAL GUAGE for motorcycle timing. McConnell, 255-2488.
GERMAN STUDENT, touring US, seeks handyman work, painting, and cleaning, etc. Shunny, 265-1620.

LOST AND FOUND

LOST - Silver heishi w/4 or 5 turquoise nuggets, gold earring w/ orange flowers, Rx safety glasses.
FOUND - Silver & turquoise ring, silver rim grey tint glasses, Rx glasses w/black case, multi-colored wool cap, screw-type earring w/turquoise & 2 silver beads, gold-colored cross necklace - "Trifari", man's Timex watch w/stretch band. LOST AND FOUND, Bldg. 832, tel. 4-1657.

FRIDAY	SATURDAY
14— HAPPY HOUR MEXICAN BUFFET Adults \$3.25 Under 12 1.92 LA ULTIMA	15— SOUL SESSION 9-1 BROWN SUGAR Mbrs Free Guests \$1 (6:55-Lobo Bus)
21— HAPPY HOUR POT ROAST BUFFET Adults \$3.25 Under 12 1.92 JEANNE RICH & HER FRIENDS	22— TEEN DANCE 7:30 - 10:30 GHOST ROSE Mbrs \$.50 Guests \$1 (6:55 - Lobo Bus)

THE — Ultimate, The Latest, or *La Ultima*. Whether you prefer the English or el Español, they're a great group led by old friend Yolanda and they do it for your 61 centimetres (2 feet) from 8:30 to 11:30 tonight. Get in the mood from 6 to 8 with carne adovada, chili rellenos, beef enchiladas with green chili, Spanish rice, guacamole, tostados. A dance demonstration too — see "nervous" below.

FORMULA — for fantastic frolics: Add one well-seasoned *Watermelon Mountain Jug Band* to a miscellaneous array of barbequed (spare ribs, chicken, beef) and non-barbequed good stuff. Then add lots of people in Western garb suitable for stomping any dust out of the dancefloor cracks. And that's what we'll dance till — the dancefloor cracks. Pick up your tickets now (\$5.50 members, \$6.50 guests); don't wait till the 22nd deadline. It's the Country Hoedown on the 29th.

FOR — next week's Happy Hour, it's *Jeanne and Her Rich Friends* or some such making the music flow. Making your mouth water is pot roast, baked lasagna, and lots of optional extras at no extra cost in the buffet line.



SUCCESS — of a Soul Session depends on who's there. One group will be there for sure — *Brown Sugar*. You and your friends be there for sure too. It's tomorrow night.

CLOSELY — guarded secrets of Russia's military-industrial complex pose certain problems for American photographers. Which is why Max Newsom's slides of Russia and Siberia tend toward the tourist — but they furnish a fascinating view of the country, the people, the places. See them at Travelogue Night, 7:30 on the 19th.

PARALLELS — snowplows, christies, geländesprunges: you skiers may think that you do them in the snow. "Not so," says Tom Long, Sandia Peak Ski School Director, "you do them in your head. Sort of *Inner Tennis* on the slopes." It must get a bit crowded in your cranium, but what's in your head is important if you're a novice intent on achieving occasional verticality; it's even more important if you're an intermediate frustrated by the slow progress toward expert. Come out for the Ski Club meeting at 7 on the 18th, hear Tom (who's planning to open a new area in Roosevelt Park next year; not much snow, but he'll call it Witha Prose and cash in on all the types who want to be able to say they Ski Witha Prose), watch a couple of inspirational films (*Skiing Pro Style* and *Invitation to Skiing*), and maybe win a door prize.

THE — biggest news on the travel front is that the front is down under — Australia, New Zealand, and the Fiji Islands, to be exact. Twenty-three days beginning in late March with 8 nights in Australia (Brisbane, Surfer's Paradise, Sidney), 9 nights in New Zealand (Christchurch, Queenstown, Rotorua, Auckland, and others), and 3 days in the Fijis including a daylong voyage on an 83' topsail schooner to Malolo Lai Lai. Travel from place to place in your own rental car with unlimited mileage (you buy the gas). RT airfare, lodging, rental car and more for \$1598 (assuming four people per car). Start planning — March isn't far away.

Pre-trip meeting: Jan. 25 at 7:30.

ONE — other new trip package takes you and your kidlets to Disneyland during four days of the APS Easter vacation (April 3-10). Time for Universal Studios and Marineland too.

FOR — a different Easter vacation, how about Yucatan? It's one of the greatest places in Central America for turistaing. P.S. The Rio trip is a go — get a brochure from the Office or talk to Ed Neidel about it (or any of the other travel packages) any Friday Happy Hour between 6 and 7 in the Lobby.

A — great band is the surest way to get the teen crowd out for a great time. Cancelled because of the Nov. 27 storm, *Ghost Rose* returns! Parents: tickets before the date or at the gate, please.

NERVOUS — about your dancing even when you're alone in your living room? Terrified when you're next to a crowded dance floor for fear some naive friend will expect you to accompany him/her? What to do? Learn! That is, take lessons from the pros. A new 1977 series of dance lessons will begin Feb. 17 — at 1976 prices! \$20 per single member, \$35 per couple member. TONIGHT Mike and a partner will demonstrate some dancing between 8 and 8:30; it's a good chance to ask questions, get inspired, and sign up.

BREAKDOWN — snowstorm, traffic jam: these are the things you don't have to worry about when you ride a Lobo bus to the Lobo games on the 15th, the 18th, and the 22nd. Get your ticket (\$.50 members, \$1 guests) early. Then plan to celebrate after the game at Fifth Quarter: special drinks at special prices in very special new glasses that you get to keep. Each glass has four logos: C-Club, Sandia, ERDA, and the Wolfpack — sip from the side that makes your special drink taste best. On the 15th the special drink is a Sundevil Sling, on the 18th a Rabbit (for outdistancing Greyhounds), and on the 22nd a Miner Discrepancy. Salut!

MORE INFO — 265-6791

YOLANDA • YUCATAN • JEANNE RICH • JUG BAND • VERTICALITY

EVENTS CALENDAR

- Jan. 16 — Maxwell Museum of Anthropology-UNM, opening "Renovated Man," 1-5 p.m.
- Jan. 17, 26 — Chaparrals home games, Tingley Coliseum, 265-1791.
- Jan. 19 — Parks Dept. cross country skiing meeting, 7 p.m., 5221 Palo Duro N.E.
- Jan. 22, 23 — cross country skiing, Jemez Mts., 766-7138.
- Jan. 19-23 — Holiday on Ice, Tingley Coliseum, 265-1791.
- Jan. 20-23 — "Julius Caesar," Classics

- Theatre, Popejoy Hall, 277-3121.
- Jan. 23 — Benefit concert for the Albuquerque Youth Symphony by the Albuquerque String Quartet, Simms Fine Arts Center, Albuquerque Academy, 4 p.m., 299-8571.
- Jan. 25—Feb. 20 — "Marriage-Go-Round," Ole Henry's Dinner Theatre, 293-5060.
- Jan. 26 — "Throne of Blood," Japan's film version of Macbeth, Popejoy Hall, 7:30 p.m.