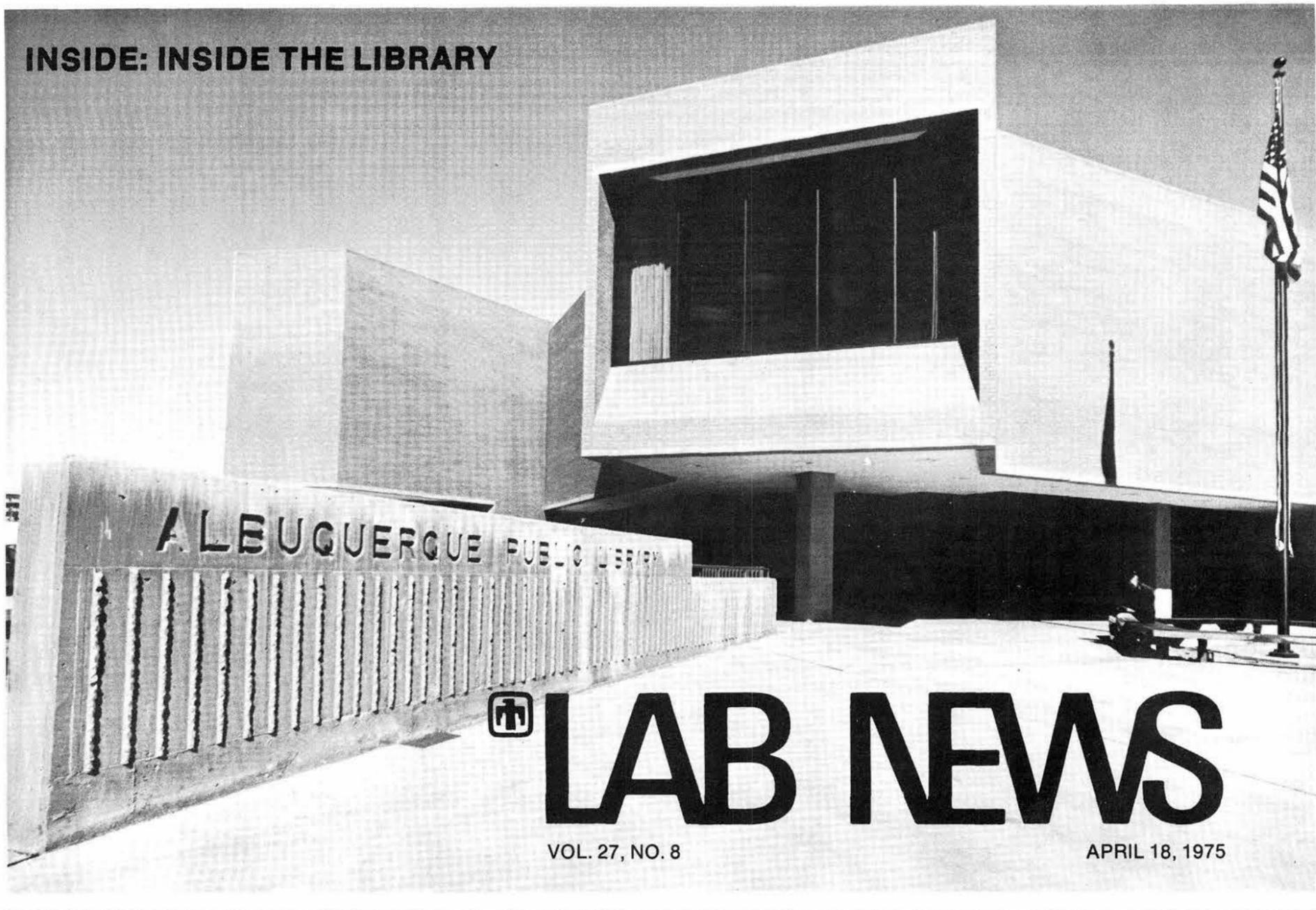
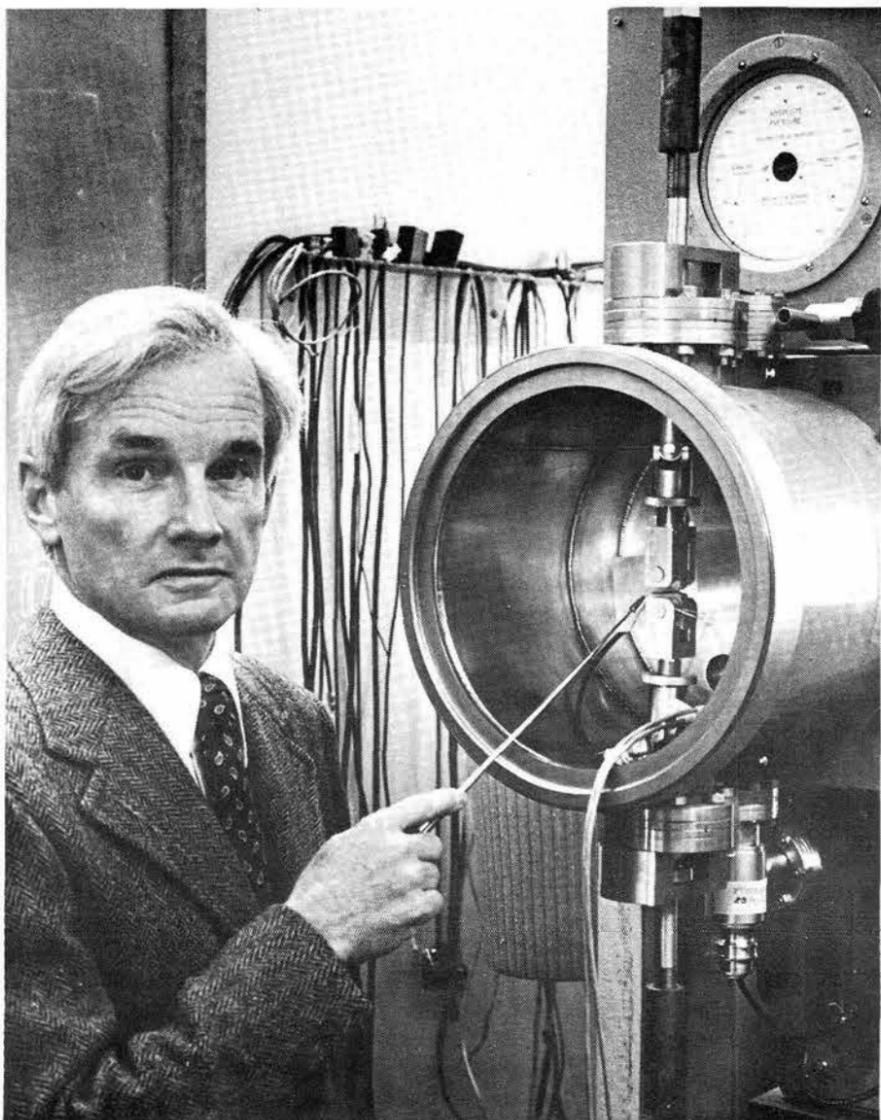


INSIDE: INSIDE THE LIBRARY



Materials Problems Cited In Energy Programs

SUCCESS of energy programs in the next decade depends to a large extent upon the country's ability to cope with materials-related problems. Dick Claassen (2400) was chairman of a National Research Council committee that published detailed report on subject. Here he points to metal sample that will undergo stress test in hydrogen atmosphere; if hydrogen is to gain wider use as a source of energy, new ways must be found to eliminate or reduce its embrittlement of metal.



"A little neglect may breed mischief: for want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost." Benjamin Franklin, Poor Richard's Almanac

If Ben were around today and studying the country's energy programs, he'd see some parallel between his axiom and the findings in a recently published report of the National Research Council, *Materials Technology in the Near-Term Energy Program*. For it points out that materials problems may be a significant constraint in the nation's energy programs in the next decade (the period to which the study addresses itself).

Sandia's Dick Claassen (2400) was chairman of the high-powered group that was convened by NRC to examine materials technology in the light of Project Independence, the federal program for the U.S. to achieve energy self-sufficiency by 1985. The group's findings reveal that the Achilles' heel in many energy programs may be a materials-related problem. For example:

— in coal gasification, severe service demands upon pressure vessels, pumps, valves, heat exchangers and other components used in the combustion environment will create difficulties. Hot erosion and corrosion arising from impurities in the coal are among the physical and chemical effects. Further progress will be

(Continued on Page Four)

Afterthoughts

Our tottering republic (cont.)--Last time we exclaimed about the grotesque salaries paid Las Vegas singers Dean Martin and Frank Sinatra, \$250,000 per week. George Horne (2634) lines up entertainers for the Coronado Club and called to report going rates for a one-night stand for two more pop singers: John Denver = \$75,000 and Roy Clark = \$90,000. George was pretty sure the C-Club audience wouldn't see much of either.

* * *

Geothermal falls from grace--Latest issue of New Mexico Wilderness Newsletter is critical of geothermal energy development because "exploration drilling... threatens many present and potential wilderness areas." Used to be that geothermal was one of the good guys--no smoke, no strip mines, no dams, but now the conservation party line decrees that those small holes in the ground are only conditionally acceptable. Somehow one gets the impression that the forces of conservation occasionally fasten upon trifles in their zeal; if geothermal is indeed a clean and feasible source of energy we are just going to have to accept the circumstance that it takes a hole in the ground for us to realize its benefits.

* * *

Lumps in Vietnam--In the shambles that is now Vietnam, one reads of angry natives excoriating America and any hapless Americans who happen to be in their vicinity. We get equally exercised about what we see as a lack of gratitude. After all, we've put 150 to 200 billion into the country, and that is indeed a great deal of money, not to mention our sacrifices in American lives. The psychology here is strikingly remindful of a parent-child relationship: the parent expects gratitude, the child expects more goodies, neither expectation is met, and both parties feel aggrieved. Our Vietnamese friends are now on the verge of delivering the punch line of that old joke, "But what have you done for us recently?" This time it's not so funny.

* * *

Have you had a Base visitor lately?--Our last one showed up to report with some indignation that he was required to supply, among other data, his social security number in order to get a visitor's pass. When he protested this requirement as an invasion of privacy, the guard turned to fill in another form on the visitor which was identified as a "Form 1046--Incident Report." In the face of the impasse, our visitor caved in and his SSN is now in the custody of the United States Air Force. *js



HOW'D you like to meet this character on a dark night? It's not likely unless you take up flying with the Air Force. He's wearing Sandia's thermal and flash protection goggles, whose lenses are made of PLZT ceramic. Goggles prevent blindness from flash of nuclear burst.

Sandia to Launch Rockets from Kauai In Mid-May

Sandia will launch four sounding rockets into the upper atmosphere from Barking Sands Test Facility on Kauai in mid-May. The series will be conducted by Upper Atmospheric Projects Department 1250 under John Eckhart.

Two of the rockets will carry LASL payloads — experiments relating to electromagnetic pulse propagation phenomena in the ionosphere and plasma physics instabilities related to striation formation mechanisms. Another is a reimbursable project for the Army's Ballistic Missile Defense Technology Center, and the fourth is a test of a new second-stage rocket motor system under development by Sandia, NASA, AFCRL, and Thiokol.

A basic technique of upper altitude research into geomagnetic fields and other phenomena consists of the injection of ionized barium into the strata of interest. The barium cloud, which photoionizes in the sunlight, disperses along the earth's magnetic force field and emits visible light. When the launch is made at sunset, the light is easily photographed, and the cloud may be tracked by radar. The BMD project will evaluate a new system designed to enhance barium ionization after injection.

The new rocket motor, a Malemute, will improve the performance of sounding rockets. With a Terrier first stage, it is designed to boost a payload weighing 90 kilograms (200 lbs.) to 720 kilometers (2 million ft.) altitude.

Al Hutters (1252) is Test Director for the series. Ed Hansen (1253) is responsible for payloads, and Jim Davis (1254) for carrier systems. Bill Barton (5624) provides aeroballistic support, and Dave McVey (5626) is responsible for payload recovery.

Death

Bill Mahaffey, chief film editor of Motion Picture and Video Services Division 3153, died suddenly April 5. He was 57.

He had worked at Sandia since June 1961.

Survivors include his widow, a daughter and two grandchildren.



Variable Annuity Unit Value

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|--------------------|-------|
| May | 1.288 |
| April 1975 | 1.257 |
| Average 1974 | 1.336 |

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don graham ass't. editor

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bill laskar does picture work
gerse martinez lends a hand
&

lorena schneider reports on livermore



LITERATURE SEARCH is part of solar energy storage study by Division 8184 for ERDA. From left are Dave Ottesen (8313), Taz Bramlette (8362), Bob Green (8111) and Al Skinroad (8184).

SLL Conducting Solar Energy Storage Study

Solar energy is feasible. To be useful in a modern economy, however, solar energy requires the proper location, an economically competitive collection system, an efficient energy storage system and a great deal of systems integration to address questions such as, "What do you do when the sun isn't shining?"

Al Skinroad, supervisor of Plowshare & Transducer Technology Division 8184, heads a \$75,000 study for ERDA's Assistant Administrator for Conservation which addresses itself to the question, "What is the most effective way to store collected solar energy?"

The study has the following objectives:

- Determine energy storage requirements of various solar energy conversion methods;
- Survey present energy storage techniques;
- Establish characteristics of each storage system and identify areas where additional development is required; and
- Make recommendations for future research based upon the potential for energy conservation.

Conclusions of the ERDA study (to be contained in a report due in July) will be reported in a future issue of LAB NEWS.

Not part of the ERDA study but included in the division's work is a project to develop a storage system for use in the Sandia Albuquerque solar community project. The heart of the system is a tank — six feet in diameter and 12 feet high — now being assembled in Area 8. It will store 2000 gallons of fluid at a working pressure of up to 450 psi. The tank will ultimately be installed adjacent to the project's solar collector field in Albuquerque.

Taz Bramlette (8362) is principal investigator. Team leader is Bob Green (8111). Others contributing include Cliff Schafer, Tom Brumleve (both 8184), Dave Ottesen and Jim Bartel (both 8313).

LIVERMORE NEWS

VOL. 27, NO. 8

LIVERMORE LABORATORIES

APRIL 18, 1975

Speakers

Rudy Johnson and Jack Dini (both 8312), "Plating Problems Associated with Aluminum Circuitry," Seventh Annual Electronic Connector Symposium, Cherry Hill, N.J., Oct. 23-24; and "A Test for Quantitatively Measuring the Adhesion of Plated Coatings Under Dynamic Loading Conditions," Electrochemical Society Annual Meeting, New York, N.Y., Oct. 14-17.

Walt Bauer, Peter Mattern and Ron Musket (all 8334), Bob Schmieder (8342), George Thomas (8313), and Errol EerNisse (5112), "Application of Neutral Beam Sources in Science and Technology," Symposium on Ion Sources and Formation of Ion Beams, Berkeley, Calif., Oct. 22-25.

Pete Mattern (8334), "Kinetics of Hydrogen-Deuterium Exchange in Glass," and Jim Shelby (also 8334) and Pete Mattern, "Hydrogen-Deuterium Exchange in Glass," Fall Meeting, American Ceramic Society, Bedford Springs, Penn., Oct. 9-13.

George Thomas (8313), "Helium and Hydrogen Re-emission and Microscopy Observations on Implanted Metals," Third Conference on Application of Small Accelerators, North Texas State University, Denton, Tex., Oct. 22.

Ron Musket (8334), "Proton-Induced Electron Emission from Characterized Niobium Surfaces," 21st National Symposium, American Vacuum Society, Anaheim, Calif., Oct. 8-11.

Larry Weirick (8312), "Oxide Stresses Effect on the Oxidation of Thorium"; John Brooks (8314), "Hydrogen Performance of Precipitation Strengthened Steel"; and Walt Bauer (8334) and George Thomas (8313), "Helium Re-emission and Aggregation Effects in CTR Components," Materials Science Symposium, American Society for Metals, Detroit, Mich., Oct. 21-24.

Sympathy

To Harold Malmquist (8257) on the death of his mother in Livermore, March 22.

To Frank Halasz (8266) on the death of his father-in-law in Los Angeles, Apr. 5.

To Stan Pickens (8161) on the death of his wife in Livermore, Jan. 30.

To Jack Bolen (8157) on the death of his mother in Spokane, Wash., Feb. 12.

To Jesse Watts (8256) on the death of his father in Oakland, Feb. 19.

Take Note

After three lengthy rounds of six games each, Sandia finished at the top in the LLL Basketball League's 1974-75 season. This is the first time in three years of participation in the 12-team B Division league that Sandia has taken the championship. On the team were coach and manager Mel LaGasca (8411), Cory Coll (8341), Fred Johnson (8423), Dennis Penington (8257), Adam Sandoval (8423), Bob Sandoval (8256), and Larry Watkins (8342).

Mel says that another 8-player team is needed if Sandia expects to retain the championship next year. Anyone interested in playing in the fall should contact him (2922) or Cory Coll (2341) between now and September.

Congratulations

Rocky Bouscal (8257) and Cindy Fragulia, married in Livermore, Feb. 8.

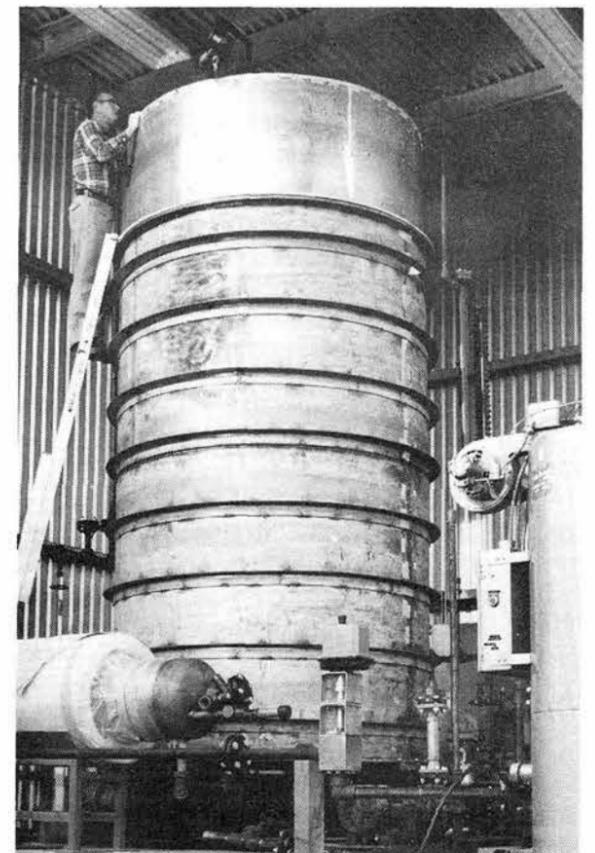
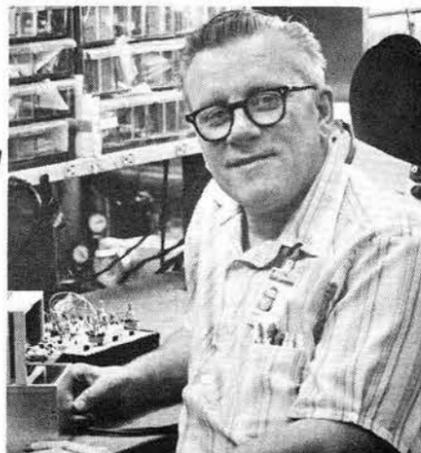
Tim Roudebush (8256) and Nancy Sanders, married in Carson City, Nev., March 24.

Mr. and Mrs. Danny Matchell (8432), a son, John Timothy, March 26.

Mr. and Mrs. Ron Dunivan (8256), a daughter, Brandy Lynell, March 21.

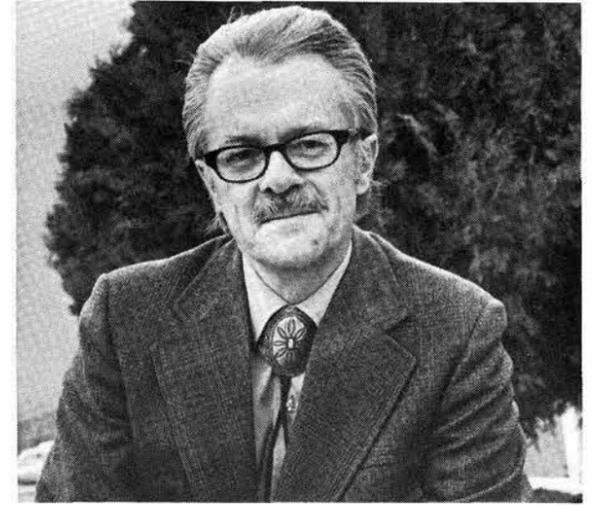
Retiring

Harry Olson (8344)



HUGE THERMOS BOTTLE — Bob Milby (8184) works on a 12-ft.-high, 2000 gal. heat storage system in Area 8. When testing is completed, tank will be moved to Albuquerque to provide heat storage in a solar energy project.

Supervisory Appointments



Lee Garner (3151)

LEE GARNER to supervisor of Technical Writing Division 3151, effective April 1. Lee's first Labs assignment, in 1958, was with this group where he was a tech writer and editor. He later worked with the advanced systems studies group. Lee helped establish the Audio-Visual Presentations Section and then joined the new 100 organization. Since 1973, Lee has been a member of the 4010 Management Staff.

For six years Lee taught communication skills and English literature at the University of Iowa. He earned a BA degree from Oberlin College, and MA and PhD from the University of Iowa.

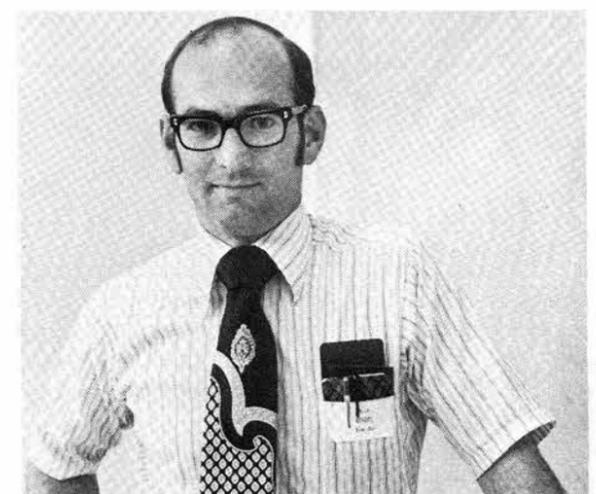
Lee's off-the-job interests include arts and crafts, PTA, collecting Indian artifacts, and books and records. He and his wife Helen have two children and live at 3016 Palo Alto NE.

* * * *

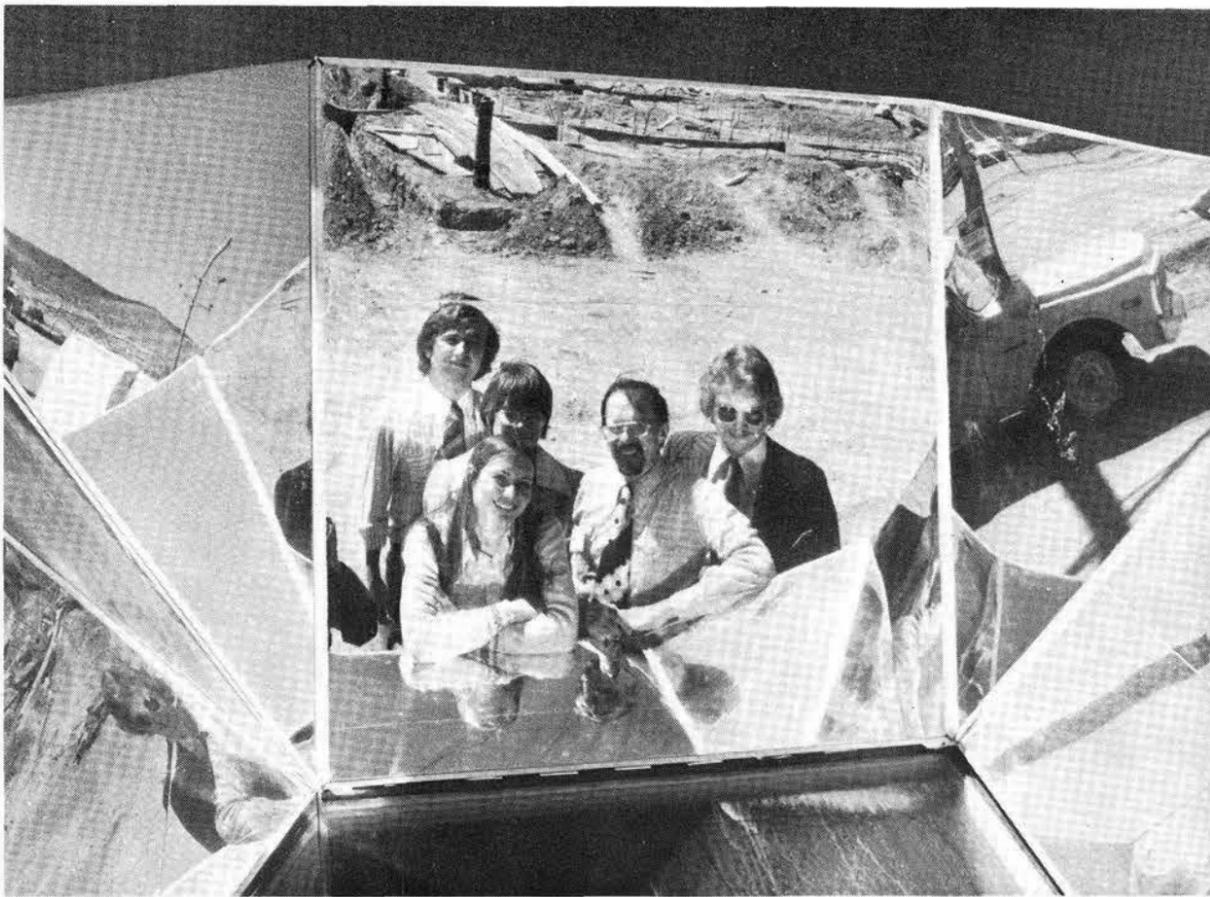
SAM VARNADO to supervisor of Systems Studies Division VI 4736, effective April 16. After graduation from Mississippi State University in 1963 with a BS in EE, Sam joined the Laboratories as a member of the Technical Development Program, earning his MS from UNM in 1965. He received his PhD in EE from the University of Texas, completing his work as one of the first participants of Sandia's DSP program.

His work at Sandia has included electromagnetic component development and laser research. Since 1973, Sam has worked in the systems studies group doing analyses of nuclear reactor systems. In his new position Sam will continue to work on analyses of energy systems.

Sam's professional memberships include IEEE and the Optical Society of America. His hobby is backpacking and he is a member of the Sandia Search and Rescue Team. He and his wife Mary have two daughters and live at 9125 Evangeline NE.



Sam Varnado (4736)



THESE YOUNG PEOPLE looking at their reflection in a solar apparatus are coming back this summer with some 300 more to participate in the Student Competition on Relevant Engineering (SCORE). Sandia will host the 51 student teams, from universities in this country and Canada, who will set up operating models of the teams' replies to this year's theme: energy resource alternatives. In front, arms folded, is Ginnie Shipman, MIT; behind her is Doreen Osowski, U. of Wisconsin and Mark Radtke, MIT. Glen Brandvold (5710) will be the Sandia host, and Doug Matzke from the U. of Wisconsin is just behind him. If you'd like to help in the competition, and Glen says help is needed, give him a call, 4-6866.

Continued from Page One

MATERIALS STUDY

limited by shortages in heavy steel plate, large steel forgings and castings, chromium and, not least, trained people.

— coal liquefaction is not expected to be unduly demanding of materials, but erosion/corrosion effects are significant here as well. Shortages in manpower, fabrication capability, and critical items such as stainless and chromium-molybdenum reactor steels threaten this program.

— the production of oil from oil shale, one of the major energy programs in this time period, is not expected to be hampered by technical difficulties in materials; however, schedules may be disrupted by long delivery lead times for large steel retorts and heavy equipment.

— gas turbines will increase in import in electric generating plants and in automobiles. In both, higher operating temperatures are desirable for efficiency, but these temperatures bring materials problems. Three approaches may solve these problems: (1) the metallurgical development of advanced alloys, protective coatings and composites; (2) the use of new high-temperature ceramics for stationary and rotating turbine blades; and (3) cooling of turbine blades by circulation of a fluid through blade ducts.

— nine elements and minerals are identified as "critical" in the energy effort: manganese, chromium, fluorspar, nickel, cobalt, aluminum, tungsten, platinum, and copper. Although none is a present problem, these substances — or their absence — could create severe difficulties, and steps should be taken quickly to mitigate the potential difficulties.

These examples pertain to those energy programs which the committee believed were likely to have greatest effect in the next 10 years. Nuclear power will also be a major energy contributor, but the materials picture is somewhat less clouded here because "... a large, competent, diverse community is

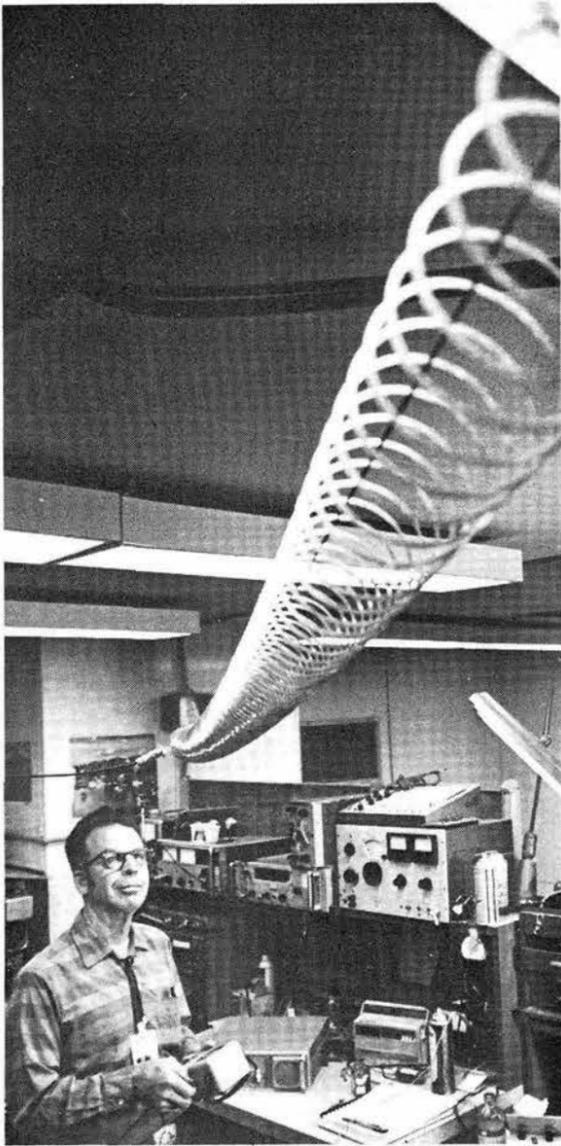
already involved with ... important materials problems." The group does single out stress corrosion and the plant downtime occasioned by this phenomenon as an area in which much greater understanding is essential.

Strangely, by far the greatest energy boost in the country could be realized without the addition of a single new facility. A systematic approach to conservation would bring this about. Unfortunately, the basic information needed in any concerted conservation drive is either non-existent or in disarray; for example, little is known of the energy amounts consumed in manufacturing processes, and methods for savings in the recovery of ore are not well established. Also, recycling efforts need to be considerably expanded.

Other energy programs were examined by the NRC Committee for their materials implications. Though subordinate to those mentioned above in terms of likely payoff in this time frame, their energy contributions could be significant. In this category, the group considered methods of extraction and processing of ore, the use of waste products for fuel, geothermal and solar energy, energy storage devices such as flywheels, fuel cells, and the isotopic separation of U-235 by means other than gaseous diffusion.

The Committee concludes on a hopeful note: "The materials community can solve the problems ... if given the challenge and opportunity. Thus, materials technology does not appear to be the limiting factor ... The serious near-term problem rather appears to be lead times for delivery of structural materials for large-scale plants ... Objectives may not be reached unless steel plate-making capacity is doubled promptly." And the need for more trained people, from craftsmen to scientists, is emphasized.

The complete report (136 pages) is available in the Technical Library.



GENE HANSEN (1733) is a Slinky sort. He's found that two of them make a continuously loaded dipole antenna. It's very portable, easily tunable, fairly efficient, and cheap.

Authors

E.P. EerNisse (5112), "Vacuum Applications of Quartz Resonators," Vol. 12, No. 1, THE JOURNAL OF VACUUM SCIENCE AND TECHNOLOGY.

K.L. Brower (5112), "Multiple-Scattering Xalpha Calculations on Al_2O_3 and Al_2O_3N ," Vol. 12, No. 1, JOURNAL OF VACUUM SCIENCE AND TECHNOLOGY.

H.J. Stein (5112), "Bonding and Thermal Stability of Implanted Hydrogen in Silicon," Vol. 4, No. 1, JOURNAL OF ELECTRONIC MATERIALS.

R.M. Jefferson (1724), "The Nuclear Alternative to the Energy Dilemma," Vol. 14, No. 2 (1973), NEW MEXICO ACADEMY OF SCIENCE BULLETIN (distributed in February 1975).

J.E. Schirber (5150), "Experimental Studies of the Fermi Surface Under Pressure," chapter in *Materials Under Pressure*, Honda Memorial Series on Materials Science No. 2, Maruzen Co., Ltd., Tokyo, 1974.

D.W. Ballard (9351), "An American View of Problems of Materials Conservation," Vol. 3, No. 1, ASTM STANDARDIZATION NEWS.

D.W. Braudaway, "A High-Resolution Prototype System for Automatic Measurement of Standard Cell Voltage," and "A Review of 12 Years of Performance of an Automatic Standard Cell Test Facility," Vol. IM-23, No. 14, IEEE Transactions on INSTRUMENTATION AND MEASUREMENT.

D. Emin (5155), "Transport Properties of Small Polarons," and "On the Energy Spectrum of a Carrier in a Deformable Lattice: A Mechanism for an Abrupt Conducting Transition," Vol. 12, No. 3-4, JOURNAL OF SOLID STATE CHEMISTRY.

H.J. Rack (5832), "Communication: Discussion of 'An Optimal Design of a High Strength, Ductile Metallic Material: Criteria and Application to a B-Titanium Alloy'," Vol. 6, No. 1, METALLURGICAL TRANSACTIONS.

W.D. Smith (5113), "Memory and Display Applications for PLZT Ceramics," Vol. 12, Nos. 3-4, JOURNAL OF SOLID STATE CHEMISTRY.

W.E. Warren (5121), "Low-Frequency Power Radiation from a Flat Plate Into an Acoustic Fluid," Vol. 56, No. 6, JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA.

W.E. Williamson (5625), "Square-Root Variable Metric Method for Function Minimization," Vol. 13, No. 1, AIAA JOURNAL.

Snow Job

Airport 75 and a Half

Remember the "Spring Blizzard Hits Chicago" headlines of a couple of weeks ago? Three Sandians (Joe Abbin, 2324, Sig Thunborg and Tony Veneruso, both 5712) were hit too.

"The weather turned bad as we left the supplier we were visiting in Rockford Wednesday morning," Tony recalls. "Blowing snow and icy roads. I stayed behind a truck and passed up a few hundred stalled cars. One car skidded into our lane, but I missed him. The front end of another crashed through the railing of an overpass above us, but the car stayed up there."

"We arrived at O'Hare Airport with a sigh of relief," says Sig. "But that was premature. Our 2:40 p.m. flight to Albuquerque was running 40 minutes late. We had lunch. The weather worsened. The '40 Minute Delay' became 'Ask Agent.' He didn't know."

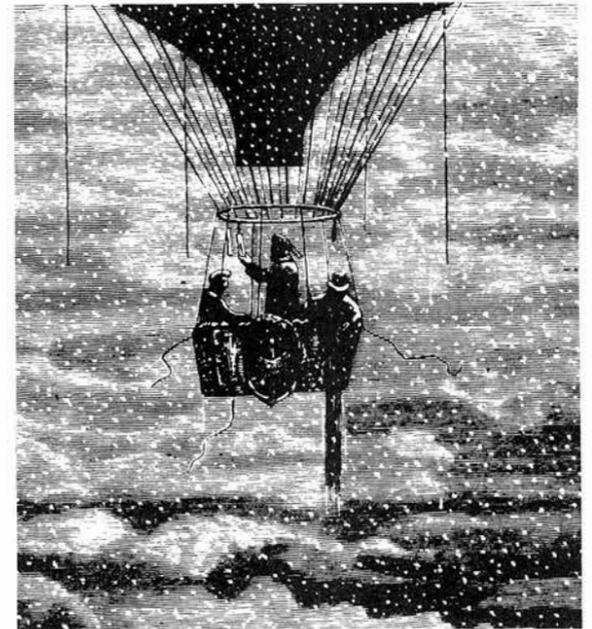
Then, for the second time in history, O'Hare closed down because of weather.

"So we'll take the train," said the resourceful Sandians. And they made reservations for a 6:30 p.m. departure from Union Station. At 4 p.m. they boarded the bus for the 45-minute ride downtown.

The trip took over seven hours. And the bus had no restroom. But the Palmer House did. It had rooms too (at \$40), but no meals. "Just desserts" for weary travelers — and some appetizers. Then to bed.

Back to O'Hare and its 5000 strandeers. "The snow removal trucks were finally out," says Joe. "You see, April 1 is the date that snow crews go to summer duties, the Weather Service ceases its snow warnings, and all studded snow tires have to be removed. Somebody up there hates Chicago."

"We spent Thursday afternoon at the TWA Ambassador Club waiting for our plane to arrive," Sig goes on. "One runway was open. Our plane made it to the stack over O'Hare twice but ran out of fuel and had to



TWA FINALLY got them out on a no-frills flight.

return to Indianapolis both times."

"The woman who ran the Club stayed cool," says Tony. "A cashmere-suited, ring-bedecked type demanded that he be flown out immediately. 'And I want first class seats, of course,' he insisted. 'I'm sorry, sir,' she replied. 'You see, our first class seats are bolted to the same floor as coach seats — and they're not going anywhere.'"

TWA put the group up at O'Hare Inn Thursday night. And they made it out at 10 a.m. on Friday.

"I learned a lot," says Tony. "Airlines won't provide lodging and meal chits unless you ask for them. Carry a credit card for when you run out of cash. FTS operators go home when the weather gets bad. And it's easy to tell veteran O'Hare-stranded travelers from new arrivals — it's that glazed look of desperation.

"Never, I hope, again." • bh



THE SENIOR REVIEWERS are a group of scientists who help establish classification policy for ERDA. They met at the Labs recently and are pictured here: (front left) J. Carson Mark and Gene Eyster from LASL, Dick Claassen (2400), and John Griffin, head of ERDA's Division of Classification. In back are William Lokke of LLL, Chairman Paul Vanstrum from Union Carbide in Oak Ridge, and Edward Creutz of the National Science Foundation.

Speakers

R.W. Weaver (3622), "Hazards of Burning Plastics in the Modern Home," Feb. 3, Albuquerque Breakfast Civitan Club.

H.R. Shelton (3132), "I'm OK, You're OK," Feb. 3, Caravan Shrine Club.

H.C. Monteith (9344), "Technology Changes in the Future," Feb. 3, Freedom High School class; and "Contributions of Eastern Religions," Feb. 24, Caravan Shrine Club.

L.W. McCollum (3621), "Glass Blowing" (demonstration), Feb. 4, Hoover Middle School Science Club.

B.K. Graham (3300), "Beyond the Myths of Marriage," Feb. 11, UNM Medical School, Psychiatry Grand Rounds.

T.B. Sherwin (3160), "Sandia Lab History," Feb. 19, Junior League of Albuquerque.

B.W. Marshall (5717), "Solar Energy Research," Feb. 20, Los Altos Kiwanis Club.

G.W. Hughes (9474), "The Metric System and the Citizen," Feb. 21, Women's Club of Albuquerque.

L.V. Feltz (5623), "Wind Energy," Feb. 27, Los Altos Kiwanis Club.

J.S. Pearlman (5214), "Fusion: Background and Prospects," Physics Dept. Seminar, Feb. 21, UNM.

P.S. Percy (5132), "Pressure Dependence of Inelastic Light Scattering from 'Soft' Phonon Modes," Physics Colloquium, Feb. 21, Colo. St. Univ., Ft. Collins.

H.M. Bivens (2415), P.L. Jacobs (2411), D.H. Jensen (2413) and G.W. Smith (2442), "Pulsed Neutron Uranium Borehold Logging," Symposium on Critical Resource Research in Rocky Mt. States, Feb. 27-28, Denver, Colo.

J.W. Nunziato (5131), "Thermodynamics and Wave Propagation in Nonlinear Viscoelastic Solids," March 3, Seminar, UNM.

W.G. Perkins (2413), "Use of Elastic Scattering Cross Section Anomalies for Depth Profiling Helium and Hydrogen Isotopes in Solids," Conf. on Nuclear Cross Sections & Technology, APS, AEC, ANS, March 3-7, Washington, D.C.

J.A. Cooper (2131), "Lightning Properties and Lightning Protection," IEEE Section Meeting, March 5, Albuquerque.

L.S. Nelson (5824) and L.D. Buxton (1722), "Steam Explosions," Tech Task Group Discussion, The Aluminum Association, March 6, Chicago.

B. Morosin (5154), "Structures of Million's and Becton's Salts," American Crystallographic Assoc. Meeting, March 10, Charlottesville, Va.

T.H. Martin (5245), "Recent Pulsed Power Research at Sandia Laboratories," Colloquium, Cornell Univ., March 11, Ithaca, NY.

R.E. Allred (5844) and F.P. Gerstle (5847), "Effect of Matrix Properties on the Mechanical Behavior of High-Performance Composites," SPI Reinforced Plastics/Composites Institute, 30th Technical and Management conference, February 1975, Washington, D.C.

G.J. Lockwood and G.H. Miller (both 5226), "Calorimetric Determination of Beam Energy"; K.R. Prestwich (5245), "HARP, A Short Pulse, High Current Electron Beam Accelerator"; J.P. Van Devender and T.H. Martin (both 5245), "Short Pulse Relativistic Electron Beam Accelerators Based on Untriggered Water Switching"; C.L. Olson (5241), "Collective Ion Acceleration with Intense Electron Beams," 1975 Particle Accelerator Conference, March 12-14, Washington, D.C.

R.L. O'Nan (2121), "The Use of OPSNAP in RF Design," ARFTG Meeting, March 17-18, Woburn, Mass.

H.D. Sivinski (5250), "Treatment of Sewage Sludge with Combination of Heat and Ionizing Radiation (Thermoradiation)," Symposium on the Use of High Level Radiation in Waste Treatment — Status and Prospects, sponsored by International Atomic Energy Agency, March 17-21, Munich, Germany.

W.B. Gauster (5111), "Vacancy Binding Energy in Alloys in Positron Annihilation," Meeting of the German Physical Society, March 17-22, Munster, Germany.

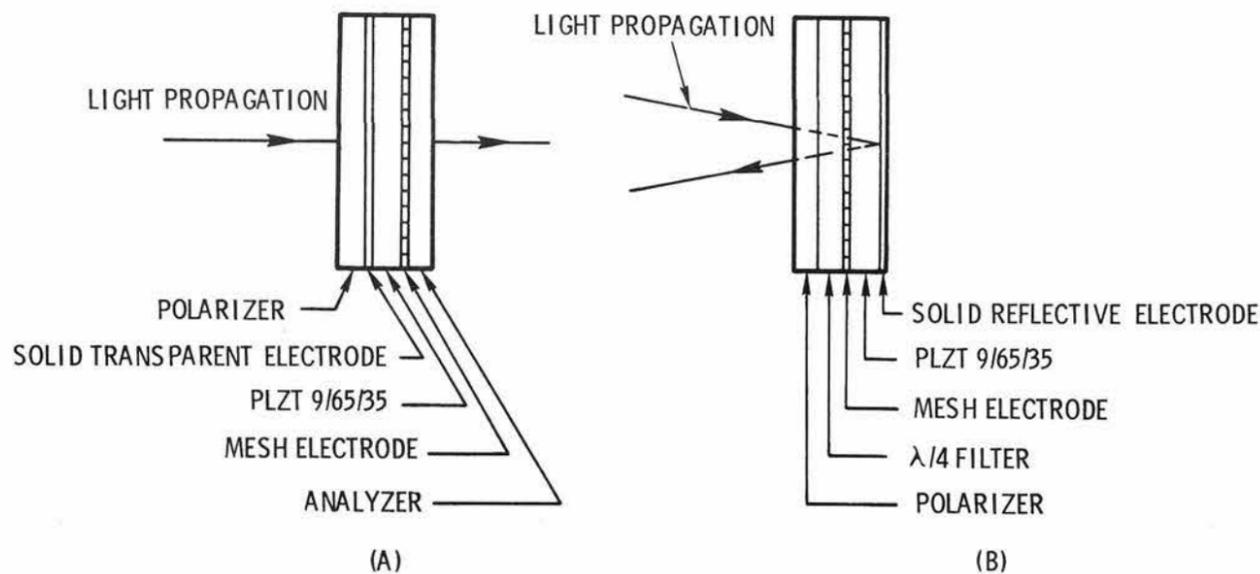
G.C. Nelson (5825), "What Can Low Energy Ion Scattering Spectroscopy Tell You About Your Surface Problems?" invited talk, ASTM Committee D-14 meeting, March 19, Albuquerque.

E.C. Boes (5717), "Estimation of Direct Normal Radiation," Terrestrial Photovoltaic Measurements Workshop, March 19-21, Cleveland.

R.E. Nickell (1541), "Applications of the Finite Element Method in Solid Mechanics, Fluid Mechanics and Heat Transfer"; S.W. Key (1541), "Impulsively Loading Simple Structures with Pulsed Electron Beams," Midwestern Mechanics Conference, Univ. of Okla., March 24-26, Norman.

C.S. Johnson (9421), "People, People and More People," March 10, Manzano H.S. history class.

H.H. Patterson (1730), "Alaska and the Arctic," March 11, Sandia Kiwanis Club.



DEVICE CONFIGURATIONS: (A) TRANSMISSION MODE DEVICE; (B) REFLECTIVE MODE DEVICE

New Numeric Display Uses Ceramic

Two Sandia Laboratories researchers have developed a method of producing numeric displays from PLZT ceramic, a transparent electrooptic material developed at the Labs in 1970. They are Cecil Land, principal investigator, and Willis Smith (both 5113). Willis is now on leave from the Labs serving as an IEEE Congressional Fellow in Washington, D.C.

High contrast ratios, relatively low power requirements, fast switching speeds and long lifetimes make the PLZT displays potentially competitive in a number of applications, perhaps even in such low-power consumer products as wrist watches and hand-held calculators.

The solid state, seven-segment displays utilize a fringe-field effect created in a thin plate of the ceramic. The effect, produced by applying a voltage between electrodes on opposite surfaces of the plate, enables use of the PLZT devices in both the transmission and reflective modes.

The transmission mode devices, for use where backlighting is possible, consist of a polarizer, solid transparent electrode, PLZT plate, seven-segment numeric mesh electrode and a second polarizer (analyzer) crossed at 90° to the first polarizer. The analyzer serves as the viewing face of the thin sandwich.

The reflective mode devices consist of a polarizer, 1/4-wave retarder, mesh electrode, PLZT plate and a solid metal reflective electrode. Ambient light passes through the sandwich and is reflected back to the surface by the metal electrode, obviating need for backlighting.

The prototype devices which have been fabricated to date have five-mil-wide mesh electrodes separated by five-mil gaps. The electrodes are sputter-deposited metal or indium-tin oxide. The transparent electrode in the transmission mode device is indium-tin oxide while the metal electrode in the reflective mode device is an aluminum film.

PLZT is produced by hot-pressing a mixture of the oxides of lead, lanthanum, zirconium and titanium. Application of voltages to thin, transparent plates of the ceramic permits control of its optical properties, enabling the fabrication of shutters, modulators, spectral filters, and image storage and display devices.

The PLZT used in the numeric displays is the so-called "slim-loop" variety, a 9-65-35 solid solution (9 atom percent lanthanum, 65/35 zirconate/titanate ratio), which is characterized by a low or zero remanence (memory) and by a transverse quadratic electro-optic effect (Kerr effect).

In prototypes using three-mil-thick plates, contrast ratios of nearly 100 to 1 have been achieved with 90 volts applied for about 50 microseconds. Contrast ratios measured at various plate thicknesses imply that future prototypes using one-mil-thick plates should produce similar contrast ratios with application of lower voltages.

While the turn-on voltage of PLZT displays is still relatively high in comparison to liquid crystal and light emitting diode (LED) displays, the PLZT displays do not require any sustaining power.

The resistance of a PLZT display segment is typically 10^{12} to 10^{14} ohms, so there is essentially no leakage in the ceramic, and thus no power is required to keep the display activated, as is the case with liquid crystals and LED's. Overall power requirements of PLZT displays should thus be competitive with several of the conventional types of numeric displays.

PLZT displays have the additional advantages of long life — the slim-loop PLZT has been cycled up to 100-billion times without degradation; fast switching (10-50 microseconds at 16 kV/cm); high contrast ratios; and stability over a broad range of temperature.

T.F. Marker (6010), "What is the Oil Industry," March 11, Valley H.S. consumer affairs class and March 24, Rio Grande Kiwanis Club.

J.W. Reed (5644), "Uncertainty and Hazards in Weather Modification," March 12, Northwest Kiwanis Club.

H.C. Monteith (9344), "Influence of Ethnic Background on Success," March 12, Rio Grande H.S. Assembly; "Nuclear Energy," March 13, Belen Elementary School class; "ESP Research in Russia, England and America," March 24, Zonta Club International and March 25, Essenes Group; "Contributions of Eastern Religions," March 26, Del Norte H.S. humanities class.

D.P. Peterson (9624), "Artificial Intelligence," March 14, Rio Grande Lions Club.

J.L. Jellison (5833), "Susceptibility of Microwelds in Hybrid Microcircuits to Corrosion Degradation"; R.E. Cuthrell (5834), "Contact Resistance Measurement - A Destructive Test," 1975 International Reliability Physics Symposium, April 1-3, Las Vegas, Nev.

L.W. Davison (5131), "Spall Fracture in Ductile Metals," Cornell University Seminar, April 2.

M.L. Lieberman (5825), "Coal Chemistry," Chemical & Nuclear Engineering Seminar, April 4, UNM.

J.O. Harris (2521), "Advanced Development in PLZT Shutter Devices at Sandia Laboratories," Minnesota Chapter of the American Ceramic Society, March 26, Minneapolis.

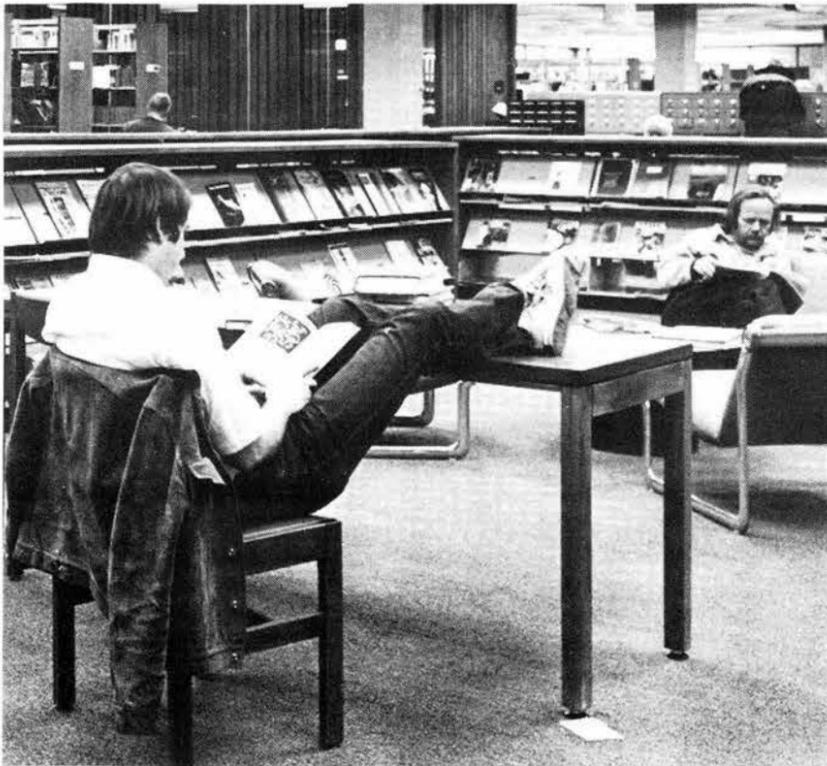
H.D. Corbin (9654), "Rolamite" (slide presentation & informal discussion), March 21, Inez Grade School, Albuquerque.



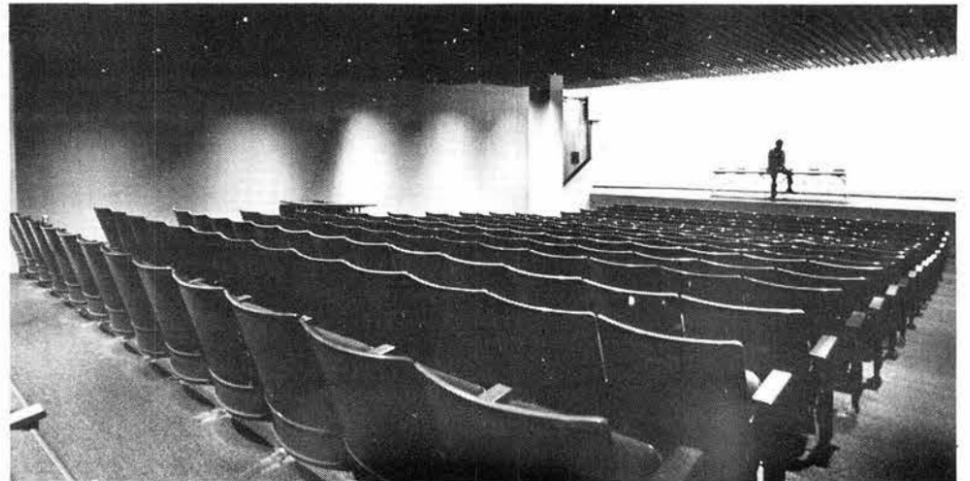
Our Town

Albuquerque's New Library

ABOVE: Main Reading Room is spacious, light, quiet and without threatening signs. Cubicles allow complete privacy for serious studiers.



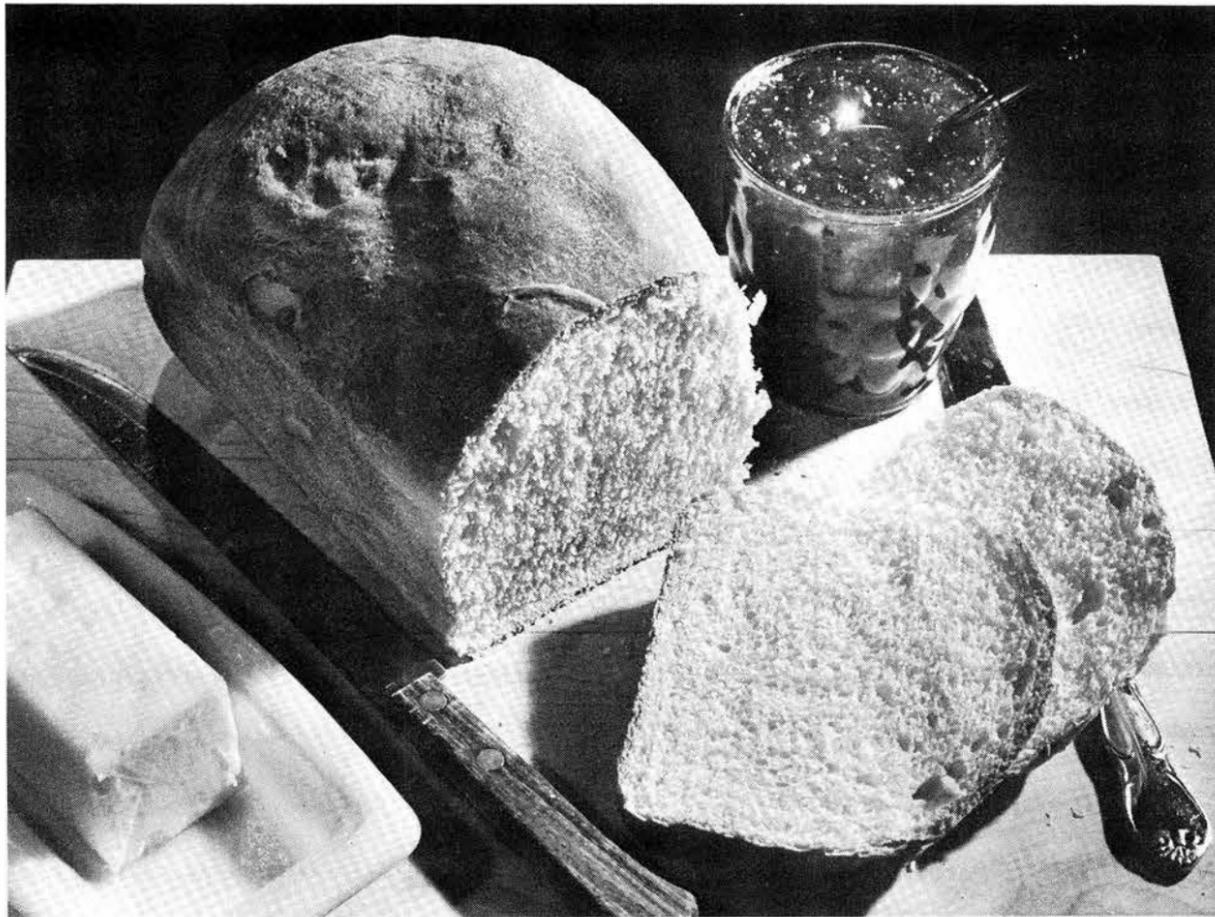
ABOVE: Director Alan Clark in the Auditorium. Like the Community Room, it's available to outside groups.



The Community Meeting Room
WHERE WE:
 Will hold: Public Meetings
 • Group Discussions
 • Exhibitions
 • Book Fairs
WHERE YOU:
 • May hold non-profit organizational meetings or programs
 for details call 766-7883

ABOVE: Lots of comfortable reading places. BELOW: Second floor houses Southwest and Fine Arts Collections. Paintings can be checked out.





The Bread Line Forms to the Right

"Who hath not met with home-made bread,

A heavy compound of putty and lead—"
Thomas Hood
(1798 - 1845)

Obviously Tom was not the cook or he might have been more sympathetic — he's described the results of my first effort at bread making. (I quietly disposed of the remains and only Mr. Hood and I know what happened.)

Making bread is a personal thing because making *good* bread is a satisfying achievement. Most cooks have a favorite recipe, but I believe the only "secret" is practice. The first few attempts may end up in the garbage but the ultimate goal — a perfect, golden, crusty, fragrant, tender loaf — leads you to try again. You're really hooked when the aroma of baking bread draws a crowd, and while they wait for that first slice of warm bread, they argue about who gets the crusty heel.

Without a leavening agent, a flour mixture bakes into a heavy flat mass. Yeast — the leavening agent — grows with moisture and warmth, producing bubbles of gas that cause the dough to rise. Sugar is the raw material from which yeast manufactures the gas; sugar also adds flavor and aids in browning. Salt flavors the bread and helps control fermentation. Bread made with milk browns better, keeps fresh longer and is more nutritious than that made with water. Shortening makes bread tender and adds to the flavor. Especially rich dough is made with extra shortening and eggs; however, these ingredients slow the action of the yeast and the process takes longer.

Here are a few tips, picked up through trial and error:

— Use flour sparingly, just enough to keep the dough from sticking to your hands.

— Smooth, firm kneading comes with practice; here again, don't use excessive flour if you want a light bread with fine texture. Knead the dough until it's smooth, satiny and elastic — about five or six minutes should do it.

— Before shaping into loaves, let the dough rest to regain elasticity.



"Those who knead seldom want for dough." — A.E. Schylus

— Overrising causes a yeasty taste and large air bubbles appear in the baked bread.

— For a fine grained bread, punch the dough down and let it rise a second time (about one hour) before shaping into loaves.

— Most recipes make two loaves. It's a lot of work, so why expend so much time and energy for so little? Double or triple the recipe and, besides the regular loaves, bake some cinnamon bread, raisin bread, cinnamon rolls, or dinner rolls; store the excess in the freezer. Reheat before serving and they'll taste fresh-baked. • nt

Credit Union Bulletin Board

Consumer Affairs — The U.S. Government has compiled a free list of some 200 publications which answer questions about financial planning, automobiles, home maintenance, building, repairs, how to buy and care for products, consumer protection and more. Write to Office of Consumer Affairs, Room 3310, Department of Health, Education and Welfare, 330 Independence Ave. SW, Washington, D.C. 20210.

Recreation Notes

FUN & GAMES

Sandia Runners Ass'n. — Charter meeting of the Southwest Masters Running Club is set for April 30 at 7:30 p.m. in the hospitality room of the Albuquerque Federal Savings and Loan building at Central and Quincy NE. Organizers Mark Percival (2411) and Pete Richards (5132) urge all runners/joggers to attend, whether your interest lies in running for competition, fun, or health.

* * * *

Trail Biking — More than 250 motorcycles are registered to Sandians and it seems safe to assume that many do trail biking on weekends, i.e., off-the-paved-road travel. We'll report here occasionally on interesting courses that people tell us about. A favorite among riders is the 13-mile circuit on BLM land near Jemez Dam. It's a winding, hilly, sandy course that takes a fair amount of skill to negotiate. And there's a genuine sand dune and a couple of super hills that some braver types attempt to top. To get there, cross the Rio Grande on Rt. 44 out of Bernalillo, and take the paved Jemez Dam road about a mile beyond the river. It heads northward. Stay on this road for another mile or so, watching for the microwave tower off to the left. A dirt road leads to a parking area below the tower, and the circuit takes off from there. It's a well established trail and you'd have to work at it to get lost.

If you have a favorite trail biking course that could be described here, send it to the LAB NEWS editor and we'll check it out.

* * * *

Africa — A small group of Sandians is planning a one-month trip to Kenya and Uganda in July and August. Object: some mountain climbing, some game-watching, and fun. If 10 (or more) people join forces for the air travel portion of the expedition, going and coming back, then a reduced rate can be obtained. If you think you might be interested, call LAB NEWS on 4-1053.

Museum of Albuquerque Seeking New Members

The Museum of Albuquerque, temporarily located in the old airport building, is conducting its annual membership drive. Bill Paulus (9426), past president and a member of the museum's Board of Trustees, says support of the museum and its goals is especially important now because the City Council will shortly decide upon a permanent museum location and whether museum funding will appear on fall bond issues.

Membership dues, \$5 for an individual or \$10 per family, are used to acquire a permanent collection of art, artifacts and other items of historical interest. Members have free admission at all times, receive a newsletter and invitations to exhibit openings, are granted discounts on museum giftshop purchases, and have use of the research library.



feed *back*

To get a response to your comments and questions about Sandia Labs, complete a Feedback form (available near bulletin boards) and return it to the Feedback administrator. The substance of questions and responses of wide interest is published in LAB NEWS.

Q. Can the film "Breath of Life" be shown to all Sandians? It has to do with saving lives, and we believe it would benefit all.

A. For a long time the film "Breath of Life" has been available for loan from Medical for use in organizational safety meetings. Perhaps this fact is not well known and needs to be better advertised.

S. P. Bliss, M.D. - 3300

Q. With passage of the Employee Retirement Income Security Act of 1974, what, if any, retirement benefits does the survivor of a Sandia employee receive in the event the employee dies before reaching retirement age.

A. The spouse's benefits of Sandia's pension plan at this time are the same as in the past, and have not been changed since January 1967. Basically, a spouse's benefit of one-third of the accrued normal annuity is payable to an eligible (married to participant for at least one year prior to participant's death) spouse at age 50. The participant must have been 55 or older and have had 15 years of continuous employment at the time of death. If the above requirements are not fulfilled, or if the participant had given written notice not to pay a spouse's benefit, the beneficiary, whether spouse or other, would receive the employee's accumulations (contributions plus interest).

It is not clear at this time whether our present provisions will have to be changed due to the Employee Retirement Income Security Act of 1974. When guidelines become available from the U.S. Department of Labor pertaining to Joint and Survivor annuities, we will then know what changes, if any, to our present provisions will have to be made and all employees will be advised.

R. J. Edelman - 4200

Q. There is considerable confusion among employees as to how the money in the Sandia retirement fund is managed. The standard reply to any inquiry seems to be something like this " - - - Sandia makes lump sum payments from time to time as required."

My question to Feedback is this: Are the bonuses offered to encourage early retirement last December to be paid from "surplus" money already in the retirement fund?

A. The Special Early Retirement Program to which you referred provided that those eligible for the program would receive up to a maximum of one year's salary, paid over a period of up to five years.

These funds come from Sandia's annual budget, and have not been and will not be funded from our Pension Plan.

R. J. Edelman - 4200

Q. Sandia Labs has not had a "Family Day" since May 1972. These events are

expensive, but I believe that most employees appreciate them. Why can't we have a "Family Day" at least every two years?

A. Another Family Day program is planned for 1976, in conjunction with the National Bicentennial Celebration. Once every five years is considered often enough because of the current low turnover in personnel and, as you mentioned, the cost of such a program. If sufficient new facilities or projects are added in the future to warrant more frequent Family Days, we will certainly give some thought to shortening the interval.

K. A. Smith - 3100

Q. (From SLL) What are Sandia plans for the upcoming Bicentennial Celebration?

A. As of February 19, the only firm plans Sandia had concerning celebrating the Bicentennial year were to have Family Days at both SLL and SLA. Some additional activity is being discussed, so if you have something specific in mind, now is a good time to write up your suggestion and forward it to Don Wagner, 8212.

C. H. DeSelm - 8200

Q. As a member of the Administrative Staff (MAS), I have some questions about the new salary system. I understand that we administrative types are now to be rank-ordered in each vice presidency according to our "overall value and contribution to the Labs."

Assuming that final rank-order decisions are made by the VP and his directors, the system is questionable, to say the very least. Those farthest removed from individual staff members and their work will have the final say on where those staff members appear on "the list." Please comment.

A. Social scientists and administrators have been trying to develop an objective performance evaluation or value ranking system for many years, but no one has succeeded. The best we can do is approach objectively as nearly as we can.

We believe that our new system maximizes objectivity and minimizes any influence of "personality" in two ways: first, through concentration upon the contribution and value of the employee's work, and second, through multiple judgments of first and second level supervision familiar with the employee's work and successive list mergings based upon combined judgments up the organizational levels.

Higher levels of supervision must of necessity have the final say in the ranking just as they normally do in other important management decisions. They are in the best position to arbitrate possible disagreements and make decisions of value which arise when lists are merged. This is a responsibility which they do not take lightly.

I encourage you to discuss your concern with your supervisor. He or she would appreciate any specific ideas you may have on improving our approach to value-ranking.

R. J. Edelman - 4200



Bill Carstens

Labs Prepares AA Program For Handicapped

Bill Carstens has moved from Technical Writing Division 3151 to join the staff of Affirmative Action Division 211, where he will assist in the development of affirmative action programs. At the outset, Bill will concentrate on development of a program for the handicapped. Sandia has had no formal program in this area up to now, but recent legislation makes such a program mandatory. Besides work in this area, he will participate in the other activities of the organization.

He brings wide and successful experience in writing to the job. After teaching the subject at the Univ. of Iowa, and gaining his PhD there, he came to the Labs in 1955 to work in the technical writing group and has since been associated with that group. For many years he taught writing courses after hours at UNM, and he has also been active as a teacher of English-related courses in Sandia's in-hours and out-of-hours training program. His background in teaching will find application in the courses being offered by Org. 200 to staff people on equal employment opportunity and affirmative action.

Sympathy

To Bob Pedersen (9533) on the death of his father in Chicago, April 4.

To Victor Schaeffer (3644) on the death of his son in California, April 9.

ENERGY SAVINGS

COMPARED WITH USAGE IN BASE PERIOD - JULY 1972 THRU JUNE 1973
CURRENT REPORTING PERIOD ENDING MAR '75

| | | |
|--------------------------------|---|----------------|
| ELECTRICITY | BASE PERIOD 70224 MWH 1975 55196 MWH | 21.4% SAVED |
| STEAM PLANT FUEL EQUIV. OIL | BASE PERIOD 173974 BBLs 1975 150036 BBLs | 13.8% SAVED |
| VEHICLE MILES | BASE PERIOD 1898000 MI 1975 1392000 MI | 26.6% SAVED |

sandia PEOPLE Report



PETE GALLEGOS (2336), Coronado Club president, reports that the Board plans a week-long 25th Anniversary Celebration July 21-27. Special events include a 1950's nostalgia dance, old fashioned Bingo Night, a sports night, patio party and Birthday Ball. The Club will be spruced up with a new paint job, many decorations and many surprises.



PHYLLIS WILSON (3161), Feedback Coordinator, reports that 1299 queries have been answered since the program began in October 1973.



SPREAD YOUR WINGS is the theme of the Secretarial Workshop on April 26 at the Four Seasons, reports Chairman Helen Walsh (5800). Featured is a seminar, by Clay Hardesty, on "Management for Women in Industry." Sign up with Sue Kline (345-3361, ext. 2201) today. Secretaries Day is April 23 and that evening is a good time for secretaries to attend a social hour in their honor at the Convention Center (5:30 - 7:30). Sponsor is the National Secretaries Ass'n. and food and drink are being donated by the new Albuquerque Inn.



CYCLIST DON BLISS (9623) warms up for the Century Tour of the Rio Grande Valley. Event takes place Sunday the 27th, you can bike 50 or 100 miles, and entry blanks are available from Don or the LAB NEWS office.



MARY BETH BROWN (6021) reports that Financial Division clerks cash some 3500 personal checks monthly for employees. Occasionally one bounces, but for some reason or other Sandia has never suffered a loss.

Events Calendar

April 19 — Metropolitan Opera Broadcast: Rossini's "L'Assadio de Corinto," KZIA (1580 AM), 12 noon.
April 19 — KHFM, Judy Garland at Carnegie Hall, 6:40 p.m.
April 19 — NM Mt. Club, Embudito Clean-Up (bring a trash bag), 4-6 miles hike, 9 a.m., Eastdale.
April 20 — Channel 5, Solar Energy, "Power," 7 p.m.
April 20 — Keller Hall, UNM: Donna McRae, soprano, Lois McCleod, piano, 4 p.m.
April 20 — KHFM, Verdi's "Il Trovatore," 6:40 p.m.
April 21 — Channel 5, The Romantic

Rebellion: Auguste Rodin, 9:30 p.m.
April 23 — Channel 5, Bernstein's Mass, 9 p.m.
April 24 — Rodey Theater, UNM: Mark Medoff's "When You Comin' Back, Red Ryder?" 8 p.m.
April 24-25 — Players Inc. presents "Who's Afraid of Virginia Woolf?", 8:15 p.m. Popejoy.
April 25 — KHFM, concert, Grieg, Brahms & Bach, 6:40 p.m.
April 26 — All Spanish Program, Symphony Orchestra of Madrid, 8:15 p.m., Popejoy.
April 26-27 — Albq. Gem & Mineral Show, Industrial Bldg., State Fairgrounds, 9-9, adm. 50¢.

April 27 — 6th Annual Doggie Derby, 1 p.m., Horse Arena, State Fairgrounds.
April 27 — NM Mt. Club, Sutin's Scotch Ascent, 6-7 miles hike, 8:30 a.m., Eastdale.
April 28 — Edward Vilella in Concert, 8:15 p.m., Popejoy.
April 29 — Channel 5, Solar Energy, "The Solar Decision," 8 p.m.
April 29 — Casa Linda School For Retarded Children: Film, "Rumpelstiltskin," New Albq. High School, 7 p.m., Tickets \$2.50.
April 29 — Folk Singer, Theodore Bikel, 8:30 p.m., Popejoy.
April 30 — Speaker Series, Herbert Marcuse, 8 p.m., Popejoy.

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.

RULES

1. Limit 20 words.
2. One ad per issue per category.
3. Must be submitted in writing.
4. Use home telephone numbers.
5. For Sandia Laboratories and ERDA employees only.
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

FLEXSTEEL couch, chairs, cocktail tables, end tables, clean full-size box spring & mattress. Newman, 299-2729.
CHAISE lounge, white upholstered, \$100. Hill, 299-3772.
PONY saddle, bridle, blanket, \$62; swing set, \$10; end table, \$8; antique watch, \$85. Zimmerman, 296-1058.
PHOTOGRAPHIC equip. Richardson, 18" dia. print washer, \$25; B&W & color analyzer Health Kit, Colorval II, completely assembled & works, \$50. Duvall, 255-3326.
SEARS hand lawnmower, \$10; Waste King garbage grinder & dbl sink, \$15; Royal portable typewriter, Custom II w/case, \$60. Philgreen, 256-1956.
WESTERN saddle w/monkey nose tapaderos, \$125. Predika, 832-4275.
OLD GRAFONOLA, Columbia, oak, 43", floor model, \$50; end table-cabinet, Spanish style, 27" square, pecan wood, \$35. Dalphin, 265-4029.
VOIGTLANDER 35mm. 3 lenses, electronic flash, exp. meter, filters, close up lenses, instructions, gadget bag. Copeland, 298-7073.
UPHOLSTERED chair, \$40; stroller, \$10; sewing cabinet, fits 15" x 7" machine, walnut, 6 drawers, \$65. Rogers, 881-4721.
WILLIAMSCRAFT 8-1/2' camper shell, sleeps 5-6, refrigerator, stove, 5 yrs. old, \$750. Lieberman, 299-7739.
CAR TOP carrier, too big for my Datsun, sell or trade for smaller carrier. Oberst, 299-1224.
RABBITS & hutches, 3 bucks, breeding stock, \$4 ea; 8 bunnies, \$2 ea; 4 hutches. Schallert, 298-8942.
BLACK & Decker saw w/8" radial

arm & stand, carbide tip blade, \$125; Duncan Phye drop-leaf table, buffet to match, \$100. Eads, 293-7871.
10 GAL. aquarium w/lid, equipment & food, good home for gerbils or hamsters, \$7. Sektan, 293-7961.
TOY poodles, AKC registered, black, 7 wks. old. Schreiner, 281-3546.
20" GIRL'S bike, Schwinn, 1-spd., \$20. Hickman, 298-3804.
GARDEN plants, tomatoes, chile, eggplant, bell peppers, strawberries, also hardy succulents, many house plants. Manhart, 268-3017.
MUELLER Climatrol oil furnace, 88,000 BTU, 300 gal. tank, \$75. Neilsen, 299-0198.
CHEVY Superior mags on multi-mile tires L-60 on 15x10, 800x15 on 15x7, \$100; '27 Ford glass body, \$50. Martinez, 883-0493.
SERVEL gas refrigerator, converted to LP gas for country home, \$60. Stueber, 299-2414.
SEARS 10" radial arm saw w/3 blades & dado head, steel cabinet w/retractable casters, blade stabilizers, anti-kickback pawls, \$150. Kyger, 299-6398.
BDR. SET, full size bed w/mattress & box spring; 9 drawer dresser w/mirror; 4 drawer chest, \$275. Wilson, 268-6287.
SCREENS, fiberglass w/alum. frames, 18" x 23-1/2" & 24" x 31-1/2"; 18 airquip metal slide trays, \$1.75 ea; 1/3 hp cellar pump. Glaser, 293-8110.
LADY'S Wilson golf clubs, 2 woods, 4 irons, putter, bag, balls, cart, \$30; Sears reel lawn mower, \$25. Carlson, 299-7253.
14 X 70 MOBILE home, 2-bdr., 2 bath, gold appliances, carpeting, drapes. Terrace Adult Park. Tyson, 298-8224.
HUMIDIFIER, 10 gal. capacity, 3-spd., \$25; Decca full stereo, high fidelity, portable, auto, phonograph w/stand, \$25. Robertson, 255-6707.
TEXAN 20 ga., model-FW w/auto. primer feed, \$45 or trade for .410 ga. loader; Remington model-1100, \$150. Benson, 268-9727.
COMPLETE drum set, \$175. Clark, 293-7598.
STROLLER, \$15; battery powered cars, \$5; pedal car, \$2; car seats, \$7; small

tricycle, \$5; Gerry carriers, \$7. Arlowe, 298-1770.
LIGHT duty bumper hitch, small grease gun, single handle kitchen faucet, 2 handle lavatory faucet, all for \$2.50 ea. Baxter, 344-7601.
POCKET calculator, Texas Instrument Exactra 20, used about 7 mos. Miller, 255-7716.
ELECTRONIC garage sale, large collection, new & used parts, old equipment, April 19, 10 a.m.-4 p.m., 11612 Morenci NE. Williams, 296-1088 or 299-9150.
CULLIGAN water softener, \$50. Benton, 877-2473.
DOUBLE bed, head & footboards, rails, chest of drawers, desk, \$100; kitchen set, table, 5 chairs, \$35. Filusch, 299-5932.
STEEL frame twin size bed & mattress, \$10. Nelson, 881-0148.
AKC English Springer Spaniel puppies, good temperament, champion bloodlines. Rogers, 293-5726.
BLACK metal bookcase, 8-1/2" x 31" x 93", \$8; kitchen table, 24" x 36", \$10; Samsonite card table, \$3. Rowe, 296-6295.
WASTE KING dishwasher, working order, needs minor attention. Fisher, 881-8072.
MEMBERSHIP in Roadrunner Flying Club, Cherokee 180, '65 model, 1-FR panel, licensed pilot or student, currently 7 members. Randall, 299-3935.
GLASS for table top, 22" wide, 65" long; golf pull cart; strawberry & flower plants; radio & camera. Hasenkamp, 255-8946.
FREE: white toy poodle, female, to right home. Campbell, 268-8445.
SEARS 6 & 12 volt solid state AM/radio, 2 new speakers, \$30. Vallejos, 296-7292.
DINETTE, 35" x 60", 4 chairs, beige, \$25; gas dryer, Norge, white, \$20; broiler oven, Wards, \$20; 2 carpets, 9' x 12', \$20 ea. Hurford, 299-9477.
15' CAMPING trailer, stove, oven, sink, icebox, dual gas bottles, sleeps 5. Miller, 293-0958.
THERMOFAX copier for reproduction of letter size copies, w/generous supply of copy paper, make offer. Schubeck, 266-2780.
LANE walnut cocktail table, \$50. Valtierra, 243-5318 after 5.
LAWN MOWER, gasoline-powered Jacobsen, 18" reel type, \$28. Reynolds, 299-5157.

VIOLA, Roth, 14" with case, bow, chin rest, \$225 new, asking \$160. Church, 299-2175.
MEDITERRANEAN love seat; twin size box spring & mattress, clean, make offer, will deliver. Chaves, 255-6155 or 831-1205.
TRANSPORTATION
'74 VW Bug, AM/radio, snow tires, gold, \$1850. Chacon, 294-0065.
'72 MG Midget, 21,000 miles, luggage rack, radial tires, new battery, \$2075 or best offer. Nunez, 247-2877 or 268-3605.
68 VW Van, 9-pass., approx. 300 miles on rebuilt engine. Fenimore, 298-8052.
'72 YAMAHA 250 DT-2, 2400 miles, extras, \$650. Bisbee, 293-0356 after 5.
72 PINTO Runabout, 122 CID 4-cyl., AT. Clem, 296-5204.
'65 FORD Mustang, 6-cyl., AT, \$350. Sanchez, 344-8212 after 5:30.
3-SPEED boy's bike, 26" wheels, \$20. Claassen, 255-4347.
3-SPEED Daimler-Benz touring bike, 27" lugged frame, Sturmey Archer hub & side pull brakes, \$25. Dauphinee, 255-6367.
'61 CORVAIR Greenbrier, runs well, body needs work, make offer. Bliss, 881-0272.
'65 FORD LTD, 4-dr., PS, PB, AT, AC, 4 new Sears steel belt tires, asking \$750. Souther, 842-9630.
'72 YAMAHA 350, maintenance record available, extras, \$540. Gallo, 296-0112.
'71 CHARGER, AT, PS, PB, AC, vinyl top, 43,000 miles, new shocks & tires, \$1900 or best offer. Ron, 265-5246.
'74 HONDA Elsinore, 125cc, fully equipped, dirt & street, 1800 miles, 76 mpg, helmet included. Alger, 294-6259.
'68 FORD 1/2-ton pickup, 4-spd., 300cc, 6-cyl., Winnebago shell, \$1300 or trade for small or medium size car. Mattox, 296-4149.
HONDA Trail 90, '68 model, '75 tags, \$225. Wilkinson, 299-8327.
SCHWINN girl's 20" bike w/banana seat, \$20. Peterson, 256-7514.
'69 PLYMOUTH, PS, AT, AC, \$850. Deely, 344-5486.

'74 DATSUN 710, 2-dr. sedan, AT, radio, 10,000 miles, warranty. LeRoy, 296-2953.
'68 CADILLAC Fleetwood Brougham, all accessories, factory air, AM/FM stereo, radials, vinyl top, \$150 under book, \$1575. Benson, 299-3315.

WANTED

POTS & PANS for poor families on So. Hiway 10. Used but usable is fine. Drop at LAB NEWS, Bldg. 832.
MY favorite toy. A small pearl handle pocket knife lost in Area I or the parking lot near Medical. Reward. Quigley, 299-7325.
OLD or unusual cartridges, military or commercial. Edgerly, 898-2983.
USED 4-rung boat ladder. Harris, 255-6577.
COPY of article, "Lady On A River Of Rocks," from Oct. 21, 1963 issue of *Sports Illustrated*. Mattox, 296-4149.
USED MEAT grinder (hand-crank). Boes, 256-0166.
3-POINT hitch, single plow, reasonable price. Barton, 281-3349.

WORK WANTED

HIGH school boy available for any type work, gardening to baby sitting, after 2:30 p.m., has transportation. Jolly, 877-9144.

REAL ESTATE

3-BDR., new carpet & paint, AC, immediate possession, price \$19,000, present payment \$82, 6% MTGE, down payment negotiable with REC. DeHerder, 881-3209.
LARGE ADOBE, huge vigas and carved doors, hot water heat, HW floors, custom cabinets, 2-3/4 baths, stream, Jemez area. Gall, 834-7307.

LOST AND FOUND

LOST — 5 keys on gold colored ring; black rim safety glasses, bi-focals; small turquoise & silver bracelet; tie tack w/toastmasters' emblem; turquoise & ivory choker.
FOUND — Silver & turquoise earring; lipstick brush. **LOST AND FOUND**, Bldg. 832, tel. 4-3441.

| FRIDAY | SATURDAY |
|---|--|
| 18 — HAPPY HOUR NEW ORLEANS STYLE SEAFOOD Adults \$2.95 Under 12 1.95 Glad Rags on Stage UP COUNTRY | 19 — LAS VEGAS NIGHT Games 8-12 Dancing 8-12 ELTON TRAVIS Mbrs \$1 Guests \$2 Sandwiches Available |
| 25 — HAPPY HOUR HAND-CARVED HAM AND BEEF Adults \$3.00 Under 12 2.00 Denny On Stage SHALAKO | 26 — TEEN DANCE CAPTAIN WHO 7:30-10:30 Members 25¢ Guests 50¢ |

SPRING — is the time to gambol, right? And Las Vegas Night is the place to gambol — in every way. Trade your dollar admission fee (\$2 for guests) for \$10,000 and head for a gaming table. Free instruction in each of the Casino Arts. Win or lose, it's great fun. Cavort too. Music all evening.

IN — just three more days, you've lost your chance for the Big Bad Bus Bash to Vegas (the real one). A couple of couples are all that's needed. Guests are welcome — bring your broker, banker, or bookmaker. \$99 the package.

THE — Happy Hour menu tonight includes shrimp jambalaya, beef Burgundy, chicken gumbo. Glad Rags are fun to listen to, Up Country to dance to. All this and corn fritters. Come fritter with us.

AIR — of elegance in a casual mood. That's the Sanado Ball May 3. Complement the patriotic decorations in your best red, white, and blue outfit. Listen to the UNM Collegiate Singers. Dance to Up Country. The Ball begins with a punch at 6:45. *Reservations (Anne Tapp, 7433 El Morro NE) by the 30th.*

SHE — is intelligent, graceful, fun, and six? But she can't swim? Sign her up for swim



LAS VEGAS comes to Albuquerque tomorrow night.

lessons at the Club on April 26 from 9 till noon. (Late registrations on future Saturdays from 1 to 5 if vacancies exist.) Girls from 6 up are eligible for beginning, intermediate, and advanced swimming, diving, other watery wonders (4 up for Pre-Beginner course). First session begins June 9.

SAID — Summer Swim Season starts soon. Just \$5 single, \$10 family for continuous or new members. Buy tickets April 26 or thereafter. *Incidentally*, the gala South Pool Clean-up begins at 9 tomorrow. Come one, come all.

SO — if you can't make it to tonight's Happy Hour, plan for next week: hand-carved ham, hand-carved beef (amazing —

most chefs use knives). Denny and His Genuine Guitar hold the stage first. Then it's Shalako Dance time.

HE — is jealous that his sister is getting swim instruction? Relent. Sign him up too — same courses available, same good (Red Cross approved) instruction, same cheap deal.

DID — you know that May 15 is the Switzerland trip deadline? Sign up soon. Or else you'll miss Lake Thun — and the furniture (Geneva Conventional) and police investigations in the capital (third degree, Berne) and the chance to say "A lot of Alp you are." You wouldn't want to do that.

MORE INFO — 265-6791.

ELTON TRAVIS • \$10,000 • SWIM LESSONS • WHO

Take Note

A free course in air traffic control, known as Operation Rain Check, will be offered to general aviation pilots and student pilots by the FAA. Conducted at the Traffic Control Center near Coronado Airport, the course begins April 29 for three evenings, 7 to 10 p.m. A new class will begin each Tuesday, following the first class, until all applicants have attended. Applications for Operation Rain Check may be obtained at most airports and FAA flight service stations in New Mexico, or by calling the Traffic Control Center, 296-0511, ext. 236.

Sandians (and others) who don't have season tickets for Lobo basketball should

apply in person at the UNM Athletic Ticket Office (southwest corner of the stadium) on May 1. Any seats resulting from the Arena expansion or from movements among current ticket holders will go on sale to the general public at 8 a.m. on that date. Previous experience indicates that the line will form early in the morning. Bring a sleeping bag — and Good Luck!

Don't forget that the deadline for ordering the new service awards is the end of this month. By now (if you have 10 years of service) you should have received your letter and order blanks giving prices and other details — if you haven't, give Tom Morgan a call on 4-6037.

