

HYBRID CIRCUIT, enlarged here about four times normal size, reveals silicon integrated circuits (dark rectangles), transistors, capacitors, and diodes. Conductors and thin film resistors are formed directly on the substrates.

Hybrids, so-called because they incorporate several technologies, represent quantum advance in miniaturization. For story of Sandia's work with hybrid circuits, see article on page six.



CONGRESSMAN LUJAN MEETS CITIZEN CHAVEZ — The Congressman shook hands with John (7513) as he entered Sandia Labs. Later Mr. Lujan was briefed on Labs programs and talked to an audience of Sandians in theatre Bldg. 815.

LAB NEWS

VOL. 26, NO. 5

MARCH 1, 1974

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

Lujan Optimistic On Labs Future

Congressman Manuel Lujan looks to the future with optimism for both New Mexico and Sandia Labs. Speaking before a full house in theatre building 815, he stressed the Labs' primary mission in weapons work, but foresaw significant effort in energy projects and in the area of nuclear reactor safety. Included in the latter would be work on the burgeoning problem of radioactive waste disposal.

The JCAE (Joint Committee on Atomic Energy) member stated that the Committee has been preoccupied with energy matters in recent months and plans to support generous funding for, among others, fusion, geothermal, coal gasification, and energy storage and transmission projects. Given a vigorous R & D effort, supported by adequate funding, Mr. Lujan felt that this country could achieve self-sufficiency in energy in about 10 years.

The economy of New Mexico stands to benefit from this activity. Although

concerned about the immediate effects of the gasoline shortage on the state's tourist industry, Mr. Lujan noted that as many as 5000 jobs may be created by coal gasification and liquifaction projects near Farmington.

The Congressman especially noted the appropriateness of Sandia Labs being assigned work relating to nuclear reactors — safety studies, radioactive material transport, and radioactive waste disposal. Many years of Labs experience are directly applicable to such work.

In the discussion following his talk, Mr. Lujan anticipated ERDA's (Energy Research and Development Agency) establishment this year. Sandia Labs along with LASL and LLL would be under ERDA, and he stated his strong belief that there was little likelihood of a later transfer of the Labs to DOD.

The Congressman's presentation was taped and shown on closed circuit TV to employees last week.

Afterthoughts

Flash, A Bulletin--We have just learned that polar bear livers are likely to contain toxic concentrations of Vitamin A (honest). Remember... you saw it here first.

We've been remiss in publishing this column in recent issues, but owing to the outpouring by concerned readers over its absence (two called), we'll try to make up in quality of item for infrequency of publication. And you've already had a sample. Meanwhile, consider what we can all learn from the experience of the Albuquerque citizen (written up in the Journal) who "... suffered gunshot wounds in both legs Monday when a .38 caliber derringer he was carrying fell to the floor and discharged while he was dancing." Things have come to a pretty pass when a man can't exercise what we are repeatedly told is his constitutional right without getting a couple of sore legs. I think the problem really resides in today's dance form, a sort of flailing embellished by twitching, bound to dislodge all sorts of things. Out-law this dance form and thereby promote healthy legs. The corollary to this is that only outlaws will have sore legs, but I guess that's OK.

Bashful Types--There's a species abroad in the morning that you see, if you're lucky, on your way to work. They're still on standard time, apparently, because they just can't bring themselves to turn on their headlights, however dim the early morning light may be. Maybe this is their contribution to energy conservation, but somehow we wish they'd be conservative in a little healthier manner.

"A nation needs a common cause as a unifying element. War has sometimes served that purpose (but) surely there is a better rallying cause than war, and the energy crisis has many of the necessary ingredients. Project Apollo placed men on the moon, but Apollo was a spectator saga for most people. The energy crisis affects us all..." Morgan Sparks, describing an "optimistic possibility" arising from the energy crisis in an Engineers Week address.

Better Than Vitamins--"It keepeth the reason from stifling, the stomach from wambling and the heart from swelling, the bellie from wirtching, the guts from rumbling, the hands from shivering, and the sinews from shrinking, the veines from crumpling, the bones from aking and the marrow from soaking. And truly it is a sovereign liquor if it be orderlie taken."

An appraisal of Irish whiskey
written by Holinshed in 1577
(with thanks to AWRE News)
*js



Bill Yates Named 'Technician of Year'

Bill Yates (7633) was named Technician of the Year at the Engineering Week luncheon last week sponsored by the New Mexico Society of Professional Engineers. Over 500 people attended the event.

Bill was honored for his continuing contributions to the American Society of Certified Engineering Technicians (ASCET). He is a charter member of the national organization and has served as one of its national directors. He also helped organize the local chapter of ASCET.

He joined Sandia in 1950 as a draftsman after graduation from Albuquerque High School. Over the years he earned a Technical Institute equivalency certificate in Sandia's out-of-hours education program, completing 33 courses (over 1000 classroom hours) in Sandia programs and earning a tool design diploma from International Correspondence School, Scranton, Pa.

In 1956 he was promoted to Staff Assistant-Drafting and in 1966 was promoted to Design Staff Associate. He is now a project leader in Design Information Development Division 7633.

Bill is an ASCET Certified Engineering Technician, a Certified General Manufacturing Engineer, and a member of the Society of Manufacturing Engineers.

LAB NEWS

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SANDIA LABORATORIES

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as does Norma Taylor while
Bill Laskar takes/makes pictures
&

In Livermore Lorena Schneider does all

Events Calendar

March 1-2 — Jr. Achievement Trade Fair — arts and crafts for sale, Winrock Shopping Center.

March 2 — Albuquerque Youth Symphony, 8:15 p.m., Popejoy Hall.

March 3 — NM Mt. Club, volcanic formations on Rio Puerco, K-Mart, W Central at Atrisco, 9 a.m.

March 3 — Albuquerque Road Runners, running events for all skill levels, Highland High, 1:30 p.m.

March 5 — Travel-Adventure Film "Hong Kong & Macao," 7:30 p.m. Popejoy Hall.

March 5-10 — Disney On Parade, Tingley Coliseum.

March 7-16 — "Summer & Smoke" 8:15 p.m., Rodey Theater, UNM.

March 7-8 — Albuquerque Symphony Orchestra presents an All Beethoven

Evening w/Bruno Leonardo Gelber, pianist, 8:15 p.m., Popejoy Hall.

March 8 — NM Mt. Club, moonlight hike of 3-Gun Canyon, Western Skies, 7:30 p.m.

March 8-21 — ALT, "Relatively Speaking," Resv. 242-4750. Albuquerque Little Theater.

March 9 — Ski Touring Club, Mt. Taylor exploratory, John Z. 898-1622, meet at K-Mart on Carlisle, 7:30 a.m.

March 10 — NM Mt. Club, Cabezon, call Gary on 296-5103.

March 12 — Hector Garcia, guitar; Benefit performance, Keller Hall, UNM, 8:15 p.m.

March 14-6 — NM State High School Basketball Tournament, UNM Arena.

March 15-17 — ACLO presents "Hello Dolly" 8:15 p.m., Popejoy Hall.

SLL Hosts Second Gas Properties Conference

A second interagency conference and workshop on gas properties, held Feb. 11-13 and attended by some 75 people from within the AEC complex, was hosted by Sandia Laboratories Livermore. Marty Abrams (8111) and Stewart Keeton (8333) were co-chairmen for conference arrangements. Vice President Tom Cook (8000) opened the conference and made introductory remarks.

Since the first gas properties conference in May 1971, considerable advances have been made in measuring and predicting the physical properties of helium and hydrogen and in developing new experimental techniques and facilities for working with these gases. The various AEC laboratories reported and presented papers on their new developments.

Sandians presenting papers included Bill Ashurst (8364), "Transport Properties of Binary Gas Mixtures"; Walter Shimmel (1543) and Howard Stephens (5823), "Current Status of the Calorimetry Error Analysis"; Ray Smith (8154), "The Measurement of Temperature by Laser Raman Scattering"; Sheridan Johnston (8364), "The SLL Gas Dynamics Facility"; Charles Hartwig (8342), "Trace Gas Effects in Ionization Gauges"; and Lutz Dahlke (8344), "The Radiography of Gases." Alec Willis (8111) and Stewart Keeton also chaired conference sessions.

Following the session presentations, Dan Hartley (8364) and Sheridan Johnston conducted a tour through SLL's gas dynamics facilities.

Take Note

Twenty-eight players competed during Sandia's recent bridge tournament held at Sunol Valley Golf Club. Trophies were presented to Mike Baskes (8314) and Jack Dini (8312), the east/west winning pair, and to Pat Leary (8441) and her husband (LLL), north/south pair winners. Door prizes were won by Jane Cupps (wife of Frank Cupps, 8441), Jack Dini, John Liebenberg (8184), and Marie Tarne (wife of Chet Tarne, 8184).

Bill Jamieson (8218) was one of eight individuals who received Community Development Awards from the Pleasanton Chamber of Commerce for outstanding service to the City during 1973. The awards were presented recently during the Chamber's annual banquet at Castlewood Country Club.

The Committee Against a Garbage Environment (CAGE) was formed about two years ago by opponents of a proposal to fill 775 acres of gravel pits under the Bay Area's garbage. Under Bill's leadership, CAGE maintained a campaign of resistance to the landfill plan until last December when the State Water Resources Control Board turned the proposal down.

Sympathy

To Ray Leri (8265) on the death of his father-in-law in Albion, Calif., Jan. 25.

Congratulations

Mr. and Mrs. John Kryvoruka (8362), a daughter, Mary Winter, Jan. 29.



RECYCLING OF COMPUTER CARDS — A program to recycle unclassified computer cards has been inaugurated at Sandia/Livermore thanks to the efforts of Roger Everett (8364), Bob Crow (8261), Jim Harter (8254), and Bill Jamieson (8218). Carole Celoni of Computing Division 8442 is first depositor in one of the new receptacles, each of which is near the passenger elevator in Bldg. 912.

LIVERMORE NEWS

VOL. 26, NO. 5

LIVERMORE LABORATORIES

MARCH 1, 1974

50K-PSI

Mini Explosive Valve Developed

A miniaturized, explosively-actuated valve has been developed by Dick Jones of Engineering Division 8332 for use with high-pressure fluid transfer systems. The mini valve is the culmination of design work begun in 1972 by Dick, Harvey Pouliot (8322) and former Sandian Bruce Nappi.

The valve weighs approximately 75 grams, including the explosive, and helium pressures from 5 to 50,000 pounds per square inch have been successfully contained. To withstand pressures of such magnitude is unique for a valve its size.

Recently, the valve was tested on the successful flight of an MTV-II (maneuvering test vehicle) launched from Tonopah Test Range; and it was also used on first tests of the TCNT (transpiration-cooled nosetip) program. TCNT is one of the nosetip designs to be carried on Sandia's TATER missile.

In both cases, the mini valve opened charged helium tanks to provide energy for onboard system functions.

Housing for the valve is machined from beryllium-copper. A tool steel plunger is explosively driven through pressurized tubing, and is then wedged in place to prevent restroke from internal fluid pressure.

Dick says the mini valve is one of several new designs, in some of which the valve weighs less than 10 grams and can handle fluid pressures as high as 20,000 psi.



DICK JONES (8332) displays new miniature explosive valve for application to high-pressure fluid transfer systems.

Vista New Mexico

A Different Kind of Memorial



If you drive east from Taos towards Eagle Nest, you cross Palo Flechado Pass and drop down to one of the loveliest valleys in our state. Its wide, grassy floor rises on the east to meet the Sangre de Cristo range, and for much of the year snow on the ridge lines contrasts with the dark green of the forested hillsides.

On a knoll in this valley, silhouetted against the skyline, is a structure that compels the eye's attention. It is dramatic, it is at one with its natural setting, it is not obtrusive, yet you will observe it if you pass by even though it lies some distance from the highway. And this remarkable structure — the Vietnam Veterans Memorial — has a remarkable history.

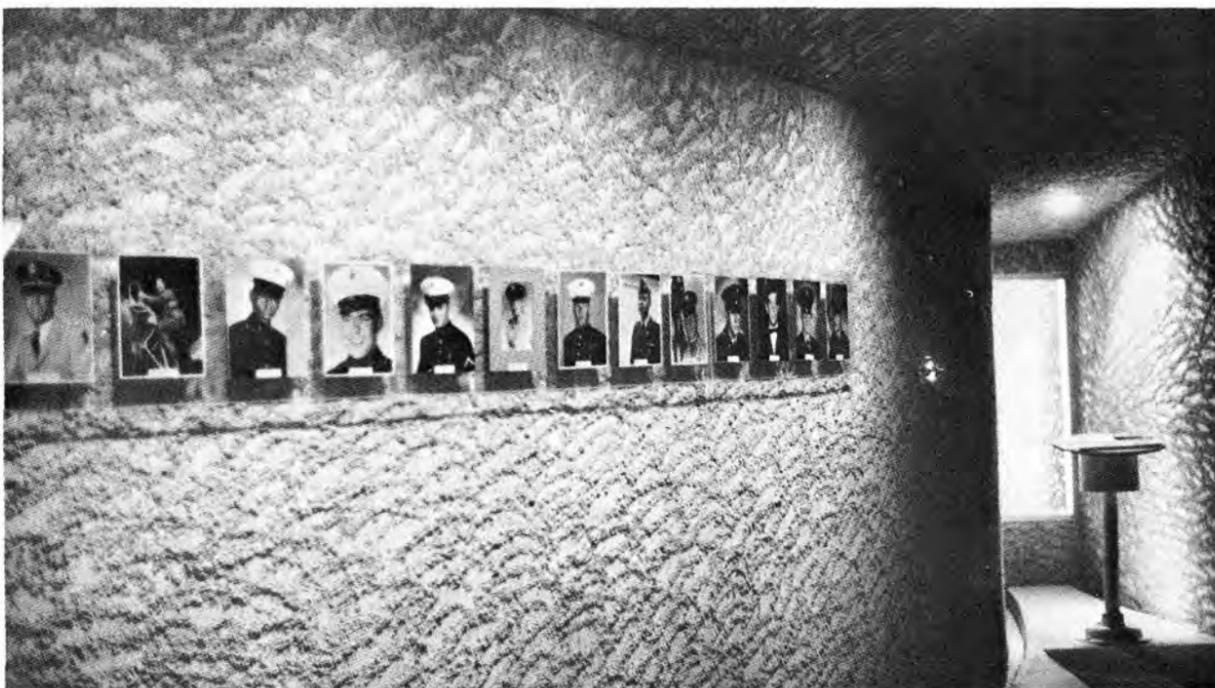
In 1968 a young marine named Victor Westphall was killed in the war in Vietnam.

His parents resolved to undertake a memorial, for their son but also dedicated to other Vietnam veterans and, especially, to those who lost their lives in that war. Since that time, they have brought this graceful memorial to near completion, almost entirely with their own funds (over \$50,000) and their own labor.

A chapel is contained within the memorial, striking in its curved walls, subdued lighting and air of peacefulness. In this remote valley, you generally are the only visitor at the memorial, and its solitude and the absence of monumental panoply seems particularly fitting. A Vietnam memorial should not be attended by marching men.

Visit the Memorial some day. It's a moving kind of place. •js

ALL CURVES and sweeping lines, the Vietnam Veterans Memorial perches on a windswept knoll in the valley near Eagle Nest.



ONE WALL inside the chapel carries photos of young men who died in the conflict.



Can a Missile Miss?

Of course. An air-to-air missile will miss a maneuvering target occasionally. The question is "How often and under what conditions can a missile be expected to hit its target?"

"We're designing a test program which will answer the question," says Dave Denton (1251), who is Technical Coordinator for the Air Force and Navy AIRVAL (AIR to-air-missile eVALuation) project. "We knew it wouldn't be feasible to get enough planes and missiles to run a full series of operational tests. Instead we're looking at each missile subsystem — the warhead, fuze, and guidance system, and the target aircraft characteristics — signature, flight capability, and vulnerability. We'll quantify each of these on the basis of present knowledge and then develop a simulation of a missile/target aircraft encounter."

The initial simulation of each sub-system will be checked operationally. In these tests, the performance of each sub-system will be monitored in order to gather data upon which to validate the simulation. As each sub-system simulation is validated, it is incorporated into a total system program used for evaluation of specific missile/aircraft encounters and for extrapolation of test results to predict the outcome of engagements against potential threat aircraft. The validation of the total system prediction capability is verified through a joint Air Force/Navy firing program pitting operational missiles against drone targets.

This cycle of predict, test, and revise will go on until the simulated event is a very close predictor of the actual event. Says Denton, "It's a complex problem involving interactions of aircraft systems, missiles and maneuvering targets. We're shooting for FY '75 to bring all the pieces together."

"By then we should have precise enough data — and a valid computer simulation code — which will work on our Sidewinder and Sparrow missiles for evaluation of their performance against high-G targets."

The code should be applicable, moreover, to future air-to-air weapons systems, hence its importance to planners in the Air Force and Navy. The program is directed by the Defense Department Deputy Director for Test and Evaluation of weapons systems, Lt. Gen. Alfred D. Starbird (retired).

Tom Latta is project engineer on the Sidewinder portion of the program, Stan Reynolds on the Sparrow portion. Other



ENCOUNTER of a drone F-4 aircraft and an air-to-air missile for the AIRVAL series at the Pacific Missile Range. Al Watts (1255) did the tracking, Terry Leighley (9412) the camera operating.

Sandians working on the program are J.J. Miller, in charge of test and operational coordination and Everett Dow, who is coordinating the various sub-system measurement programs. All are in Div. 1251. •bh

Eric Jones Named Fellow in APS



Eric Jones, supervisor of Laser Development Division 5214, was recently notified of his election to Fellow in the American Physical Society. The Fellowship honor is for "a significant number of outstanding contributions to the field of physics."

In April 1965, after two years with Bell Telephone Labs in Murray Hill, N.J., Eric joined Sandia as a staff member in the solid state physics department. He was promoted to his present position in 1968.

Eric earned a BS degree in physics in 1957 from Oregon State University. His MS and PhD degrees, also in physics, were awarded by the University of Washington in 1959 and 1962, respectively.

He is the author of 48 journal papers and is a member of Sigma Pi Sigma, national honorary society. Eric is also a member of the American Diving Coaches Association and holds a state office in the Amateur Athletic Union.

CU Bulletin Board

To rid the print and broadcast media of advertising that depicts unsafe practices is the goal of a new effort by the National Safety Council and the National Advertising Review Board. To succeed, the organizations need your help.

If you see an advertisement which shows an unsafe act, you are urged to report it to the Public Information Department, National Safety Council, 425 N. Michigan Avenue, Chicago, Ill., 60611. If it was an ad on TV, please note date, time and channel in addition to a description of the act.

Should the ad clearly tend to foster unsafe practices, the organization responsible will be notified and asked to immediately correct the situation. If the organization fails to respond to the request, the Safety Council will begin proceedings with the National Advertising Review Board and the Broadcast Standards and Practices Committees to institute corrective measures.

Help Wanted

Do you think areas along the Rio Grande should be preserved in a natural state or allowed to develop with houses and businesses? How about housing in new residential areas — should it be designed around trails and offer areas for pedestrians and recreation?

There are 17 questions like these that you can — and should — answer in *The Comprehensive Plan — A New View of Albuquerque*, a 12-page brochure that makes a thoughtful presentation of the alternatives we can select in the development of our city. The brochures will be placed in the baskets at Tech Area gates next week. Pick one up; the questionnaire is on the final page and should be returned by March 15.

Variable Annuity Unit Value

March	1.516
February	1.531
Average 1973	1.752

Death



Hermond Lacey of Advanced Radar and Product Control Division 2122 died Feb. 11. He was 59.

He had worked at Sandia since August 1958.

Survivors include his widow, a son and daughter, and five grandchildren.



DEMONSTRATION of a Sandia-proposed spark gap oil drilling technique is demonstrated by Robert Alvis (5724) during Feb. 22nd meeting at Sandia of the Governor's Energy Task Force. In addition to the regular business, the committee heard several presentations on other Sandia proposals relating to energy.

Bigger & Better But Smaller And Smaller

Nowadays it is not uncommon in the supermarket keeping a running account of their bill with pocket calculators. These miniature computers perform all of the functions of the old desk calculators. Operating on tiny batteries, the machines are small, quick and efficient. They replace slower, larger and heavier machines.

Pocket calculators are only one illustration of the latest quantum advance in the science of microelectronics. In the past 30 years electronic packaging has shrunk by giant steps — from cabinets of vacuum tubes and racks of printed circuit boards to the tiny (1/8th-inch-square or less) silicon integrated circuits. Numbers of these incredibly complex circuits are combined on a ceramic wafer typically less than one-inch square to form a hybrid circuit.

Except for the display screen, all functions of a large color television set could be easily combined into several one-inch hybrid circuits. Exploration of space, the Apollo space craft, Skylab and the planetary probes could not have been possible without hybrid circuits.

In the weapons business at Sandia Labs, component size and reliability are prime concerns, and the hybrid circuits are replacing many larger components.

We discussed microelectronics with Don Sharp, supervisor of Hybrid Engineering Division 2432, and asked him about reliability.

He reports that reliabilities of 0.999999 per hybrid interconnection typifies the level of circuit integrity that can be achieved.

The required reliability can only be achieved with a thorough understanding of the physics, materials and techniques involved in producing hybrid circuits plus unusual care and attention to detail during each step of production.



SPECIALIZED ASSEMBLY EQUIPMENT is used in fabricating hybrid microcircuits. Eliseo Chavez (2432) uses the system shown here for precise placement and bonding of active semiconductor devices on hybrid circuits.



ONE METHOD of miniaturizing components is to eliminate bulky containers. Here a standard transistor bestrides several hundred transistor chips. A single chip in a hybrid circuit typically performs the same function as the large transistor in the container.

As in the case for conventional printed wiring board circuits, a hybrid begins as a schematic drawing. This drawing is then drafted or layed out in accord with hybrid circuit guidelines established within Sandia. This layout is then digitized for computer aided production of a master photographic mask on the Gerber Plotter. The pattern, which initially measures about 20 by 20 inches, is reduced to about the size of a postage stamp. This mask will later be used to photographically engrave the tiny circuit patterns of thin metal films on ceramic substrates.

Layers of tantalum nitride, chromium and gold are used to form resistor and conductor networks. Each of the thin film materials is vacuum deposited by either evaporation or sputtering and may be as thin as 0.000001 inch. These are measured and checked during each processing step.

Before exposure of the mask onto the ceramic, a thin layer of light-sensitive material called photoresist is applied to the surface of the thin film deposits which makes possible the photographic transfer of the design.

Baked onto the surface, the photoresist protects various portions of gold, chromium and tantalum nitride layers. After etching away unwanted material, the gold and chromium become the conductor paths and the tantalum nitride becomes resistors. Function of the chromium is to allow the gold to adhere to the tantalum nitride.

Next, the microscopically small integrated circuits and other devices such as transistors and capacitors are bonded and wired to the substrates. Highly sophisticated tools are used which allow the operators precise control over microscopic movements. Sandia hybrid designs use gold-to-gold bonding in order to achieve the highest reliability. The fine gold wire used for some connections is half the thickness of a human hair. Under precision application of heat and pressure, the two gold surfaces to be bonded merge into a solid interconnect.

Upon completion of the bonding, a protective cover is added. The hybrid can now be hermetically sealed in a larger system.

"The technology becomes more complex

almost daily," Don Sharp says. "Currently we are working with conductive lines on our substrates about the width of a human hair (1/1000 inch). More recently the research organization has shown that electron beam patterning techniques can be used to generate conductor patterns smaller than 1/25000 of an inch. It is hoped that developments such as these will result in additional significant reductions in overall size and bulk." Don expects to have a facility using an electron beam and computer generated circuit pattern system in operation in mid-summer.

"The trend is clearly toward continuing miniaturization. The future will bring in, for example, a totally new computer technology using extraordinarily dense fine line patterns where a 'bubble' of magnetic energy floats like a raft over a substrate ocean. These bubbles will be controlled and manipulated to function as memory systems and other logic devices. All of this will occupy an incredibly small volume. You might say we are looking forward to bigger and better things getting smaller and smaller." • dg

ENERGY SAVINGS

Compared with Last Year's Usage
Reporting Period - Sept. 73-Jan. 74

	Quantity Saved	% Saved
Electrical	5,550,000 K.W.H.	13.8%
Steam Plant Fuel	10,900 Equivalent Barrels of Oil	11.2%
Vehicle Mileage	167,000 Miles	16.0%



SPEAKERS at the opening session of the Rocky Mt. States Symposium on Energy Research, held Feb. 15 at the Airport Marina Hotel, were Senator Joseph Montoya, at left with Pres. Sparks and Dick Claassen (2400), and Senator Pete Domenici, at right with VP Al Narath (5000). Dick Claassen was chairman of the Symposium.

Devices Invented By Don Sharp Awarded Patents

Two patents were recently awarded to Western Electric Company for devices invented by Don Sharp, supervisor of Hybrid Engineering Division 2432. Don came to Sandia in August 1971 from WE's Research Center at Princeton, N.J.

Both patents cover innovations in thin film technology.

The first is for a bistable optical device, basically a silver electrode encased in a small windowed cell. When a voltage is applied, the silver becomes non-reflective because of the instantaneous formation of a non-reflective oxide on the silver surface. Removal of the voltage returns the silver to a reflective state and, thus, information (either on or off) is optically displayed in the cell window.

The second patent covers a method Don developed for contact printing of a circuit photo mask upon complex surfaces. The method makes it possible to project light over these surfaces without shadows by using a light dispersive liquid behind the mask. The liquid diffuses the light in such a way as to insure uniform radiation upon the surface.



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The Ice Diver Creature

CREATURE is an ice diver, one of six students of Dennis Schalles and Doug Cox (both 7147-1), both members of the Professional Association of Diving Instructors. Dennis and Doug cut a hole in the ten-inch ice of Bluewater Lake last month and sent their charges into the depths to get experience with underwater compass reading, line tending, and timer and depth indicator use — all, obviously, in very cool water. Diver is wearing two depth indicators and watch on left wrist, compass on right. Light meter for his camera is just above his right hand. He's breathing through a single hose regulator from "twin 50's" (each tank on his back holds 50 cubic feet of very pure dry air at 3000 psi). The flex hose above left hand is his buoyancy compensator — he can blow air into it to gain neutral buoyancy at various depths.



TWO BELOW — These two diving students, both Green Berets, emerge into 30° temperatures, 30 mph winds (a chill factor of -2°F) one hundred feet away from the main hole. They used a compass and flashlight (upper right) to chart their underwater course. Ice cover improves visibility by eliminating surface turbulence. Snorkels can be useful in breathing through a hole in the ice — divers don't always find the safety hole.



STUDENTS at what Doug (center) calls the Ice Diving Seminar. Fully equipped diver (kneeling) is holding the "mainline," — a nylon rope fastened to wrist, arm, and tank of a diver below. Knives strapped to calves are useful for cutting through snarled fishing lines — or ice.

If your teeth aren't chattering at this point, you may well want to join the Desert Divers — see Dennis or Doug.

Speakers

James Muir (5644), B. Bulmer (5628) and R. Maydew (5620), "Boundary-Layer Transition on the SAMAST-01 Series Reentry Vehicles," Joint Strategic Sciences Meeting, Jan. 7-9, San Diego.

N. Boling (Owens Illinois), A.J. Glass (LLL) and A. Owyong (5214), "Calculation of Third Order Susceptibilities from Index of Refraction Data," Gordon Conference on Nonlinear Optics, Jan. 7-11, Santa Barbara, Calif.

R.J. Baughman (5154), "Single Crystal Technology," Eldorado High School, Jan. 23, Albuquerque.

D.W. Schaefer (5814), G. Banks and S.S. Alpert (both UNM), "Temperature Dependence of Bacterial Motility," Feb. Meeting of APS, Feb. 4-7, Chicago.

G. Yonas (5240), "Electron Beam Induced Fusion," Topical Conference on Physics Opportunities in Energy Problems, APS, Feb. 7, Chicago.

B.R. Steele (2515) and A.C. Strasburg (2516), "New Methodology for Transient Pulse Testing"; E.A. Kjeldgaard, D.J. Gould and D.E. Bennett (all 2515), "Thermal Ignition of Pyrotechnics Thru a Metal Bulkhead"; F.J. Villa (2514), "Short Duration-Low Energy Pulse Initiated Non-Primary Igniter"; J.R. Craig (2514), "A Miniature Jet Flame Igniter and Interconnecting Cable Assembly"; A.C. Schwarz (2516) and J.E. Kennedy (5131), "Detonation Transfer by

Flyer Plate Impact"; A.C. Strasburg (2516), "Nondestructive Testing of Electro-Explosive Components," 8th symposium on Explosives and Pyrotechnics, Feb. 6-7, Los Angeles.

R.S. Berg, G.J. Kominiak and D.M. Mattox (all 5834), "Effect of Thin Film Geometry on Helium Incorporated into Gold Films"; D.M. Mattox, "Clean Surface Technology," Southeastern Section Meeting of AVS, Feb. 6-8, Tampa, Fla.

R.A. Langley (5111), invited paper, "Application of Ion Beams to the Study of Thin Films," AVS Symposium on Applied Vacuum Science and Technology, Feb. 7-8, Tampa, Fla.

N.J. Magnani (5831), "Stress Corrosion Cracking of Uranium Alloys"; K.H. Eckelmeyer (5832), "Aging Phenomena in Dilute Uranium Alloys," Conference on Physical Metallurgy of Uranium Alloys, Feb. 12-14, Vail, Colo.

H.R. Shelton (3132), "I'm OK, You're OK," Jan. 11, Sandia Civitan Club, and Jan. 18, Downtown Optimist Club.

R.P. Stromberg (5712), "Solar Energy Research," Jan. 14, Caravan Club, Albuquerque.

H.C. Monteith (9344), "Kirlian Effect in Acupuncture," Jan. 15, Agriculture-Bioscience Division, LASL; and "The Great Pyramid of Egypt," Jan. 17, English class, Van Buren Jr. High School.

C.S. Johnson (9421), "Did They Understand What You Said?" Jan. 18, Sandia Civitan Club.

G.W. Hughes (9474), "Artificial Satellites," Jan. 23,

Eldorado High School; and "The Metric System and the Citizen," Jan. 30, N.W. Albuquerque Kiwanis Club.

G.B. Varnado (9353), "Computer Models for the Response of Aerospace Systems to High Frequency Electromagnetic Environments," Air Force Intra System Electromagnetic Analysis Conference, Jan. 29-30, Santa Monica, Calif.

C.E. Roehrig (2646), "Structuring a Data Base for Engineering Test Data"; J. Crompton (2645), "Self-Correcting Run Streams"; C.B. Bailey and R.E. Jones (both 2642), "Usage and Argument Monitoring of Mathematical Library Routines," Rio Grande Chapter winter meeting, Association for Computing Machinery, Feb. 4, LASL.

B.K. Graham (3300), "Medical Marriages," Symposium on the Health of the Health Professionals, Feb. 9-10, Univ. of Nevada Medical School, Reno; "Marriage, Careers, and the Professional Women - Do They Mix?" panel discussion Association of Medical Women, Feb. 21, UNM.

G.E. Brandvold (5710), "Experimental Resistivity Electrode Emplacement for the Hawaiian Geothermal Project," US/Japan Seminar on the Utilization of Volcano Energy, Feb. 4-8, Hilo, Hawaii; "Solar Energy — A Perspective," ASME 23rd Annual Technical Division Conference on Energy and Our Environment, Feb. 21, San Mateo, Calif.

W. Beezhold (5112), "Surface Layer Analysis Using Ion-Induced Characteristic X Rays," Seminar at NMSU, Feb. 14, Las Cruces.

Retiring



Glenn Morehouse (9343)



Willard Farness (7543)

**commuting
information
DIAL 4-RIDE**



PSYCHO-CYCLIST — That car is trying to turn right onto F Street (near Medical, north of Gate 4). The berserk biker is bent on going straight across. He may survive. But don't bet on it. And don't imitate him; stay in the middle of the right-hand lane until you're first in line before crossing the street.



Take Note

The KAFB Officers Wives' Club will award six \$500 scholarships to unmarried dependents of KAFB military, Sandia and AEC employees. The scholarships will be awarded on the basis of academic achievement, participation in extracurricular activities, faculty recommendations, and financial need.

Applications will be available from both branches of the Bank of New Mexico located on KAFB. The forms must be completed and returned by April 1. Send them to Mrs. L.R. Sparks, scholarship chairman, 12220 Cedar Ridge Dr. NE, Albuquerque, 87112.

The Sandians, an organization of wives of employees, will meet Monday, March 4, at 7:30 p.m. at the home of Judy Beckmann, 4101 Camino De La Sierra. Reita Jordan and Jan Parker will demonstrate loom weaving. The group is seeking new members. Call Mary Thompson, 296-2235, for additional information.

George Bradley (1641) is Sandia's newest state-licensed Professional Engineer. He passed the eight-hour Engineer-in-Training exam last April and recently completed the Professional Engineer exam, also an eight-hour test. "I recommend taking the refresher course at UNM first," says George, "then take both tests back-to-back."

A general meeting of Chicanos Unidos is scheduled for Thursday, March 14 at 8 p.m. Location has not yet been determined but will be announced before the meeting.



Car Pool Notes

Car pool lists are now out, thanks to Bill Busby (4116) and Phil Thacher (9532) and their respective supervisors. Lists went to 1765 Sandians and should make forming or adding to a car pool reasonably simple. Once you have your list, go ahead and call your neighbors. Don't wait until someone on your list calls you: no one will get anywhere — together — that way.

New car pools may well wish to register for reserved parking slots. Forms are available through Div. 9551 in Bldg. 801.

If your doorbell rings anytime in the next couple of weeks, chances are it's a Girl Scout type, a member of the Chaparral Girl Scout Council, out to sell you a box (or several) of cookies. If she sells 150 boxes, the Scout will earn a free session at camp. There are more than 7500 Brownies, Junior, Cadette and Senior Scouts in the Council.

Friends of the Albuquerque Public Library are holding their 4th annual book sale at the Civic Auditorium March 21 to 23. Hard and soft cover books of all kinds will be offered.

If you're one of those plan ahead demons, then a release from the 21st Olympiad Summer Olympic games (1976) committee will be of interest. Seems the '76 games will be held in Montreal and, believe it or not, they're taking hotel reservations now. To get information about hotels, motels, and guest houses during the games, send your name and address to: J.B. Brown & Co., Public Info., 640 Cathcart St., Montreal, 111, Quebec, Canada.

If you want your very own computer terminal, we have received information from an outfit in Dallas that is selling, for \$900, reconditioned terminals that sold new for \$3K. They are Datapoint 3300 CRT type terminals with refresh memory for the 25 lines of 80 characters each. Give Dave Caskey (1125) a call, ext. 1001, if interested — he bought one in the past.



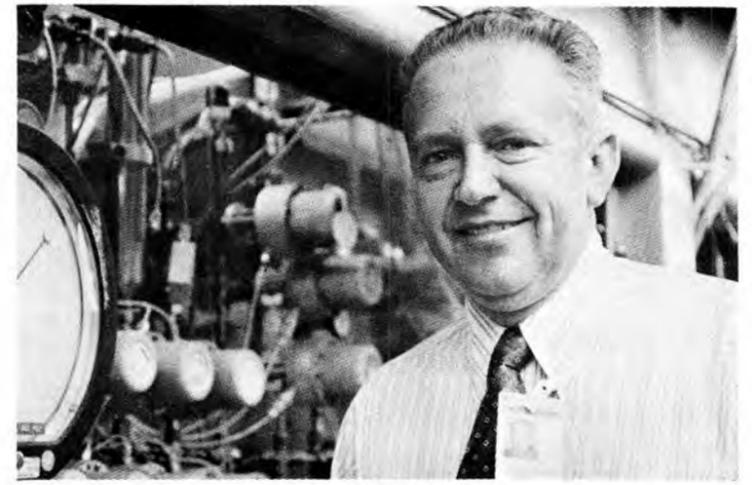
DR. JACK FITZPATRICK joined Sandia Laboratories medical organization 3300 last month. No stranger to Sandia, Dr. Fitzpatrick was stationed at Sandia Base in 1950-52 and in 1967-70. He retired from the Army Medical Service in 1970 and was in private practice at San Benito, Tex., until joining Sandia. His specialties are nuclear medicine and internal medicine.



Leslie Cole - 7116 25

MILEPOSTS

LAB NEWS March 1974



Albert Heckes - 2515 15



William Brady - 7212 20



Gus Miller - 3148



Leroy Paulson - 9412 25



Bess Roach - 8266 20



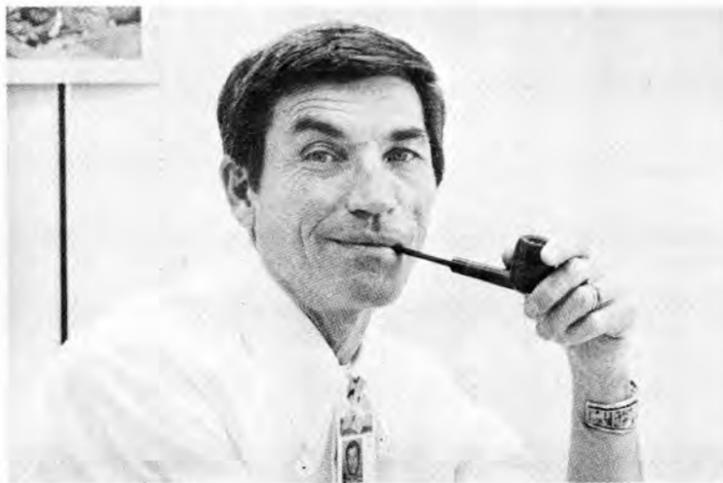
Lorraine Stamer - 8266 10



David Anderson - 2510 15



Evaristo Gonzales - 7515 10



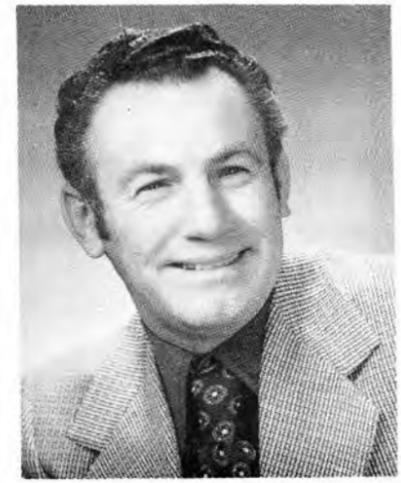
Ernest Hall - 5623



Arsenio Baca - 7221 15



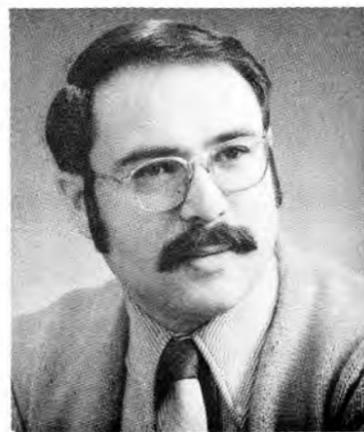
Clarence Carter - 9512 20



R. Siebenforcher - 4152 15



Wayne Crisman - 8334 10



Ronald Amaral - 8155 10



Darlene Welch - 7222 10



Roy Diesing - 5725 15

Coronado Ski Club — A one-day bus trip to Taos is scheduled for Sunday the 3rd. It leaves Gulf Mart at 7 a.m., costs \$7.25/head, and sure beats driving. Call Jim Kelsey, ext. 6739, to confirm.

Sandia Labs Rifle & Pistol Club — Practice for the NRA/NIRA Postal Matches is on Wednesday evenings, beginning at 7 p.m. The range is located in the basement of Bldg. 202B (south side of Gibson, half a block west of Wyoming). Call Dave Bennett, ext. 3119 or 298-1142, for further information.

Sandia Bicycle Ass'n. — A local salesman has contacted us about an interesting item — "Bike Lokr" — essentially a well constructed box with a lock in which a bike may be totally contained. They're used in considerable number in San Francisco's BART stations, where they are leased to commuters. A coin operated model is used in shopping centers and similar installations. The box is quite heavy and, because a potential thief can't be sure of what his labors to break into the box will produce, if anything, the container would seem to offer good security.

Tom Flanagan (1116) has gained the enviable distinction of being the first SBA'er to be hailed down by the police, flashing lights and all, for speeding — 30 mph in a 25 mph zone. He plans to frame the citation.

Sandia Runners Ass'n. — Pete Richards (5132) reports that some University runners — not students — are interested in fun type competition with SRA'ers — setting up a number of events on a pleasant Sunday afternoon with due concern for the age and skill level of the competitors. If interested, call Pete or John Shunny (ext. 1053) so that they can determine if enough wish to compete to pursue the matter.

Golf — SGA(W)'s Washington's Birthday Tournament results: First Flight low gross winner was Betty Chappell (AEC), and Ann Michele (3100/7500) was runner-up. Sandy Blose (9515) was the low net winner and Pat Anderson (9415) finished second. Second Flight low gross honors went to Kay Ogdon (retired) and Joan Gillon (5700) was runner-up. Kathy Pitts (2331) won the low net while Edwina Kiro (5623) finished second. The

tournament was played on the Sunport Golf Course.

Bowling — Sandia Labs bowlers competed in a Singles, Doubles and 4-Member Team Handicap Tournament held last month at the Holiday Bowl, with these winners:

Singles - Scratch: Alvin Kaping (7332), 616 series; Singles-Handicap: Floren Gabaldon (1511), 672 series; Doubles - Scratch: Bob James (2634) and Chuck Looney (1244), 1145 series; Doubles - Handicap: Pauline and Floren Gabaldon, 1309 series; All Events - Scratch: Barry Hansen (5154), 1711; All Events - Handicap: Floren Gabaldon, 1944; Team Event: Barry and Kathy Hansen, Basil Herrera (7511), and Stan McCammon (retired), 2439 total score.

Sports Car Club of America — The local region of SCCA is sponsoring an autocross on Sunday, March 3. The event is open to all four-wheeled vehicles and will be held on the Manzano High School parking lot (east of Juan Tabo and Lomas). Registration will open at 10 a.m. with competition beginning at 11. Fees are \$3 to affiliated car club members; all others \$4. For more information call Ralph Goekler (2312) on 298-8931.

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.
A maximum of 125 ads will be accepted for each issue.

RULES

1. Limit: 20 words
2. One ad per issue per person
3. Must be submitted in writing
4. Use home telephone numbers
5. For Sandia Laboratories and AEG 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

- ICE SKATES, lady's Hyde figure skates, size 5-1/2, w/runner guards, \$10. Converse, 247-4568.
- MARANTZ MODEL 8B dual 35 watt stereophonic power amplifier, dual channel, built by Marantz, not Japanese imitation. Harrison, 299-2154.
- SEARS best single bed, complete — base, box springs & mattress; elec. blanket. Hunt, 298-8194 after 4:30.
- CRAFTSMAN ride-on lawn mower, model 1316161, needs work. Barnaby, 265-4353.
- TWO J78-15 Firestone white, 2-ply polyester, 2-ply fiberglass, \$70; 4 roll-up blinds, outdoor patio, 4x6, 2 never used, \$15; blue Kohler wash basin w/fixtures, \$80. Benedict, 869-2949 after 6.
- LARGE oil painting of Geronimo by Indian artist Shipshee, sell or trade for knives or daggers. Smitha, 293-1177.
- NEW, unfired Sand W M39, 9mm, \$100; Browning Challenger 22L.R. 4" bbl., \$95. Snodgrass, 268-8820.
- '64 REFRIG., frostless Coldspot, bottom freezer holds 150 lbs., make offer. Mason, 298-4623.
- SOFA, contemporary, covered in lt. green nylon; Stratolounger reclining chair in dk. brown vinyl. Savitt, 268-0158.

- HOTPOINT frost-free refrig.-freezer, bottom freezer, RH door, 15.2 cu. ft., deluxe model, \$190. Bower, 299-5765.
- PLAYTOWER, w/elevated playhouse & ladder, 2 swings, adj. trapeze bar, climbing rope, redwood, 12' high x 14' long x 6' wide, bolted together. Stevens, 296-6326.
- BARKLESS puppies, pure bred Basenji, 7 wks. old. Kross, 255-3088.
- TROPICAL FISH TANKS, 8 gal. or 10 gal., w/reflectors & all accessories, \$25 ea. Crompton, 299-5569.
- SCREEN DOOR, wood frame, \$5. Rakoczy, 256-0433.
- CONCRETE MIXER, Sears, complete w/motor, 2 wheels. Cihak, 344-5084 after 5.
- RANCH OAK twin bed frame & off-white carved head/foot board, \$100, open stock at American. Kenna, 298-6059.
- RABBITS, 3 mo.-old-fryers or pets; 10-wk. old bunnies for pets or breeding, brown & blacks. Bassett, 898-1840.
- CRIB, playpen, high chair, Navajo rugs, \$25 to \$140. Luna, 298-7337.
- SEWING MACHINE, 1 yr. old, used twice, cost \$125, sell for \$90. Finley, 266-3152 or 299-0739.
- SEALY mattress & box springs, \$40; w/walnut bookcase headboard, \$50; Hoover Dial-a-matic w/attachments, \$25. Lane, 298-3366.
- CABIN TENT, 8x10, straight walls, vinyl floor, \$45; catalytic heater, \$10; camp stove, \$10; baby car bed, \$4. Wickesberg, 298-3593.
- SIGNATURE elec. range w/2 continuous cleaning ovens, new \$311, used 6 mos., \$200; Telefunken 4-band rec/phono/tape stereo console, \$75. Yingst, 293-7980.
- '73 ALUM. Grumman Shoekeel 17' canoe, used once, \$275. Silva, 255-1710.

- TIRES: 4 size 6.45x14 polyester whitewall, removed from '74 Toyota, retail \$95, sell for \$65. Burgess, 296-4254.
- TWO 7:50-16 8-ply truck tires, almost new. Davis, 298-2078.
- CRIB w/mattress; playpen; deluxe stroller; swing-bouncer combination; lamp; wing chair; 8x10' rug; wall clock. Lang, 299-8934.
- SAIL BOAT PLANS for 18' Seacat & 16' Kitty Cat Catamarans w/50 pieces pre-cut plywood parts; 2 antique wheels w/tubes for 17" w/6 holes, best offer. Harris, 255-6577.
- TWO air conditioners: refrigerative window type, 110v, 220v, best offer takes either or both. Kubiak, 265-6525.
- LARGE, old walnut picture frame; rollaway bed; 2 stretched artist's canvasses; G.E. elec. blanket w/dual controls. Wheeler, 265-2187.
- HEATER, Janatrol, ceiling mount, natural gas w/blower & thermostat, 24,000 BTU, \$45. Maxwell, 299-2027.

TRANSPORTATION

- '65 VOLVO, model 122S, new clutch & generator, AC, new steel-belted radial tires, \$600. Meyer, 898-5224.
- '72 PINTO 2-dr., AT, 2000 engine, radio, deluxe trim. Workhoven, 281-3246.
- '72 WINNEBAGO, 20', power plant, refrig. air, full self-contained. Osborne, 821-0736 after 5:30.
- '70 OPEL wagon, yellow, new tires. Rose, 298-4849.
- '70 FORD XL, loaded, low mileage, \$1395; '69 Fairlane, 6-cyl., new tires, \$495. Buchanan, 898-2461.
- '73 MONTE CARLO, dark blue, 27,000 miles, PB, PS, AC, \$3500. Hurt, 299-8857.
- '64 JEEP Wagoneer, 4-wd, AT, PB, PS, runs but needs work, \$600. Duke, 298-4427.

- '68 FORD Country sedan stn. wgn., R&H, AT, PS, PB, AC, NADA wholesale. Ellingson, 299-4056.
- '69 INTERNATIONAL Travelall, 4-wd, AT, PS, PB, AC, V8, new radial tires, \$2100 cash or trade for late model VW bus. Rea, 299-9315.
- '56 PONTIAC, 4-dr., low mileage, \$275 or trade for pickup. Arning, 256-9229.
- '70 BLAZER 307 V8, AT, hubs, limited slip, HD suspension & electrical, hitch, 40,000 miles. Stone, 298-4641.
- '73 NOVA SS Hatchback, 350 cu. in., 4-spd., bucket seats, gauges, tape deck, big tires & mags, Positrac, \$2500. Clark, 255-6933.
- '72 YAMAHA 250, 2500 miles, \$595. Randolph, 299-2057.
- '56 HEMI ENGINE: racing trans., 4-spd. Posimatic band M hydro; '64 Ford, 2-dr. sedan, XL, 390 engine. Munden, 9533 Claremont NE, 296-6724.
- '66 CHEV. 1/2-ton pickup, LWB, PB, PS, AC, 327 V8, new tires, many other extras, \$950. Chapman, 292-1198.
- '72 HONDA SL-350, 4000 miles, \$595. Buchanan, 898-9242.
- '63 CORVAIR-SPYDER, just rebuilt. King, 281-3186.
- INTERNATIONAL Travelall, 4-spd., AC, PS, PB, aux. tank, trailer pkg., \$900. Kepler, 298-5652.
- MINI BIKE, 6 HP, \$60. Spencer, 296-6250.

REAL ESTATE

- 3-BDR., lg. den, 1-3/4 baths, assume low interest loan, open house on weekends, 817 Quincy NE. Ross, 265-4990.
- SELL my equity, \$3000 down on 2 rental homes w/business on front, 203 Isleta SW. Sanchez, 877-0326 after 5.
- 4-BDR., 1-3/4 baths, FR w/fp, newly carpeted, Eubank-Commanche area, priced in mid-30's. James, 296-2582.
- 3-BDR., SE Heights, FHA, VA or

Conventional loan, all-around walled yard, sprinklers, lawn, \$24,800. Chavez, 255-1585.

FOR RENT

- SHARE new NE 3-bdr. home, washer-dryer, many extras, \$110/month; New furnished 2-bdr., 2-bath, refrig. air, dbl. garage, overlooks Elephant Butte Lake, monthly or weekly. Gallo, 296-0112.
- FURNISHED 2-bdr. apt., \$125/mo., plus cleaning deposit, Pennsylvania NE. Heidrich, 268-1391 after 5.
- 3-BDR., garage, carpeted, walled yard, water paid, near schools & Labs, \$170/mo., \$100 damage deposit. Shaut, 299-8569.

WANTED

- BABYSITTING, my home, day time, preschool \$20/week, Menaul & Eubank. Johnson, 9705 Euclid Ave. NE, 294-2840 after 5.
- '59 CHEV. Impala 2-dr. HT. Hindi, 299-8996.
- OLD MAGAZINES, old sheet music, will buy Arizona Highway and New Mexico Magazine. Sander, 299-5761.

LOST AND FOUND

- LOST — Set of 8-10 keys, man's black glove, lady's bi-focal glasses, tie-tac w/City of London seal, red earphones, lady's Rx dark grey glasses. LOST AND FOUND, Bldg. 832, tel. 264-3441.
- FOUND — Large gold button, small black pocketknife, Rx safety glasses, black leather gloves, Rx tinted glasses w/screened side shades & case, Ford car key. LOST AND FOUND, Bldg. 832, te. 264-3441.

ALPS • ONE MILE AHEAD

FRIDAY	SATURDAY
1 — HAPPY HOUR VEAL CORDON BLEU Adults \$2.50 Under 12 1.50 SOL CHAVEZ Lounge Yolanda	2 — FAMILY VAUDEVILLE <i>Little Wheels Unicycle</i> <i>Swiss Family Robinson</i> (see below) Food Available 6 p.m. Showtime 7 p.m.
8 — HAPPY HOUR CHICKEN FRIED STEAK Adults \$2.50 Under 12 1.50 SHILOH Lounge Yolanda	9 — SOUL SESSION 8:30 - 12:30 <i>One Mile Ahead</i> Members Free Guests \$1.00 Happy Hour Bar

Cycles—

The Little Wheels Unicycle Show is, of course, nicely balanced. Unicycle riders, clown acts, and magic — family fun at its finest. The movie, *Swiss Family Robinson*, is a classic romanticized survival-after-shipwreck epic. Add a John Wayne serial and charge absolutely nothing for the whole package and it's quite a bargain. Members only.

Austria—

Come to the sign-up party on March 12 at 7 p.m. See slides and a movie on the Tyrolian Alps, destination for the trip next August. Seven nights, eight days, all the trimmings, \$417 (\$467 single). Sign up for the trip at the party (bring your checkbook) or do it before 8 p.m. on March 29 and be eligible for a free trip (non-transferable). Drawing will be March 29 after 8. Trip is open to members & families only.

Rafters—

Trip No. 1 down the Grand Canyon is sold out, but there's still room on No. 2. Mark Percival, the trip honcho, will show slides and answer questions on March 7 at 7:30 p.m. It's a rapid presentation.

RESERVATIONS for St. Pat's celebration on March 16 due March 9.

MORE INFO — 265-6791.

JOHN WAYNE • C-CLUB



New Gauge Delivers Potent Signal

A simple new gauge which uses the electric current produced when lithium niobate (LiNbO_3) crystals are compressed has been developed at the Labs to measure high pressure shock waves.

The gauge can measure pressures up to 250,000 psi (about 17 kilobars) created by shock waves lasting only a few billionths of a second. It is used in studies of solid materials subjected to shocks from impacts, explosions or pulses of radiation.

Lithium niobate is a piezoelectric material, meaning that it emits a charge of electricity when compressed.

The gauge is relatively simple, consisting basically of a disk of lithium niobate with electrodes on both faces. The front of the disk is placed flush against the back of the test object, and the electrodes are then connected to electronic circuitry.

When a shock wave strikes the test object, the wave passes through it and into the gauge, compressing the lithium niobate and causing a charge to flow between the two electrodes. The charge varies directly with the amount of compression, and compression varies directly with the intensity of the pressure.

The lithium niobate gauge is the third Sandia-developed gauge which uses special properties of crystals to measure shock wave pressures. The other two gauges use quartz and sapphire, respectively, as the active element.

The quartz gauge, developed at Sandia in 1961, is now widely used for measuring pressures up to 600,000 psi (40 kilobars). The synthetic sapphire gauge measures pressures up to about one million psi (70 kilobars); unlike the other two gauges, it is not self-powered, but requires that a voltage be applied to the crystal.

Although it does not have the range of the quartz and sapphire gauge, the lithium niobate gauge does have one major advantage: it produces a much larger electrical signal than do the other two gauges. The signal of the gauge is directly proportional to its size — the larger the crystal, the greater the flow of electric current between the electrodes.

When it becomes necessary to use a very small gauge, such as in measuring the pressure of shock waves from an intense, but small-diameter source of pulsed radiation, the other gauges are not satisfactory because their weaker signals are obscured by the electrical noise present in all such systems.

The new gauge produces a clear signal in such situations, and it is also useful in experiments where the test object is too small to accommodate the mounting of a larger gauge.

In addition to the three crystal gauges, Sandia has also developed three optical interferometers to measure very rapid motions produced by shock waves. The interferometers and gauges have thus extended man's senses so that stress-intensity or motion events can be recorded in terms of time, providing a better understanding of how solids respond to ultrahigh pressure loadings.

Bob Graham (5132) has been the principal investigator in development of the crystal gauges. The lithium niobate gauge was developed in collaboration with Ron Jacobson (5132), and Ray Reed (1116) developed the laboratory prototypes into rugged devices suitable for field measurements. Collaborators on the other gauges were Bill Benedick (5131), Frank Neilson (9350) and George Ingram (2442).



Bob Graham (left) and Ron Jacobson (both 5132) examine the new lithium-niobate gauge they developed to measure shock wave pressures up to 250,000 pounds per square inch. Shown in the foreground are (l to r) quartz, sapphire and lithium niobate crystals which Bob and his collaborators at Sandia have used to make three different gauges. The gauges utilize the special properties of crystals to measure shock wave pressure.

Congratulations

Mr. and Mrs. Don Hardesty (5131), a son, Colin, Feb. 7.

Mr. and Mrs. Dave Benson (5167), a son, Andrew, Feb. 9.

Mr. and Mrs. Robbie Smith (7651), a daughter, Shannon Tasha, Jan. 25.



Bus Notes

City legal people have delivered us a setback in our attempt to gain an OK for private carriers to operate commuter buses within the city. A letter from the Assistant City Attorney to Clyde Sharrer, Director of the DOT, says, in part: "I have discussed the matter with Mr. Frank Horan, Acting City Manager, and it was decided that, in view of the fact that a technical study of the transit system is currently being made coupled with the fact that there is an application for the acquisition of new equipment for the Transportation Department, the proposal has legal implications that are, or could be, of such impact that said agreement should not be signed by you at this time."

The City can't provide service, but apparently isn't ready to permit stopgap service by the private carriers.

The newest addition to the commuter bus family, the Corrales bus, is alive and reasonably healthy, given its tender age. It could be strengthened by some more solid food — like a greater number of commuting Sandians. Honcho Alan Beattie (9352) has information at 4-8937; so does 4-RIDE.