

Giller Discusses Present, Future Nuclear Weapons

Edward Giller, ERDA's Deputy AA for National Security, recently talked before an Air Force Association symposium about nuclear weapons technology. In an area that is traditionally unpublicized, his remarks on the subject are surprisingly candid and explicit and, for Sandians, they give an excellent overall perspective of where we — the Labs — and the nation stand with respect to nuclear weapons. Many Sandians are contributing to the programs discussed in the following article.

Why Improve Weapons?

For over a decade, the strategic balance of power has been moving steadily in the direction of the Soviet Union. Between 1965 and 1975, the Soviet Union erased most of the quantitative advantages of the United States in strategic nuclear weaponry. The Soviets

pulled ahead of the United States in numbers of deployed Intercontinental Ballistic Missiles and Submarine Launched Ballistic Missiles, in total missile throw weight, megatonnage, and megaton equivalents, and in the total number of strategic delivery vehicles. In numbers of warheads and in heavy strategic bombers, the United States maintained a quantitative lead.

While the Soviet thrust during 1965-1972 was primarily quantitative, their post-1972 qualitative advances are striking. They have introduced sophisticated Multiple Independently Targetable Reentry Vehicles (MIRV) systems and warheads. Soviet progress in accuracy has been very substantial and it seems there will be rapid progress in the near future. Their R&D program is extremely

aggressive and is beginning to pay substantial dividends in improved weapons performance.

The Defense Department now projects that by 1980 the Soviets will have eliminated the U.S. lead in the number of missile warheads. The average Soviet MIRV yield will be about three times the highest U.S. MIRV yield, resulting in an overall Soviet missile force equivalent megatonnage superiority of three to one.

Soviet Objectives

As the distinguished historian of the Soviet Union, Professor Richard Pipes, has observed:

"There is every reason to expect that the arming of the USSR on all fronts and in all the branches of the service will continue

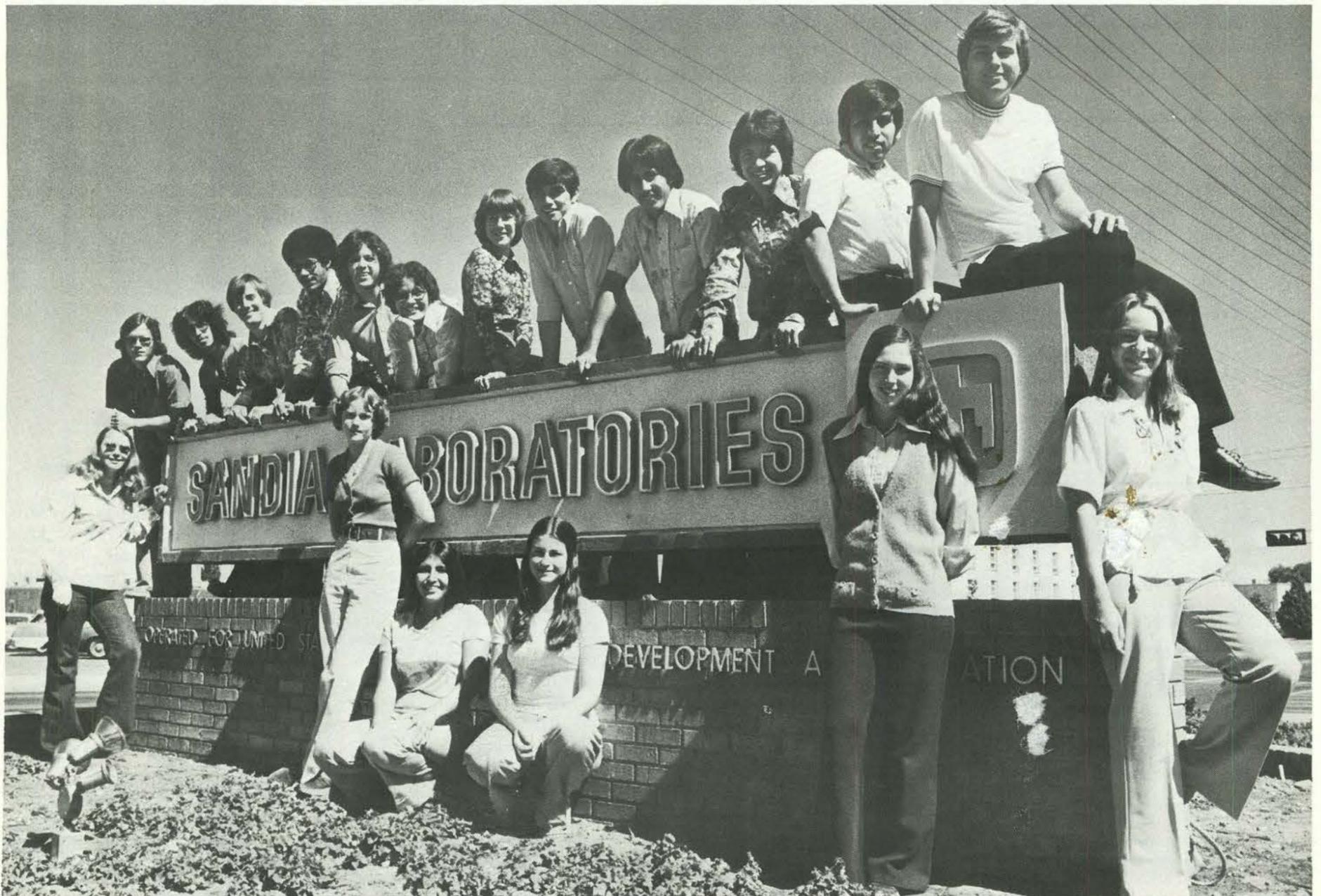
(Continued on Page Six)

LAB NEWS

VOL. 28, NO. 14

JULY 9, 1976

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



THESE SUMMER EMPLOYEES are part of a continuing program at the Labs — the Sandia Laboratories Work/Study Program. As participants they work on bachelor degrees under a sponsorship arrangement (tuition, books, fees, living expenses) and then are employed at the Labs during the summer. Selections, made from science and engineering students, are based on financial need, a good grade point average and a high ACT score (particularly in math). In the top row, from left, are Martin Bachicha (2112), Henry Abeyta (5111), Kevin Marbach

(5711), Bill Houston (9633), Mike Lash (2141), Rick Apodaca (2132), Debra Maloney (5831), Gil Quintana (2513), Martin Mercado (5734), Rod Dominguez (2116), Ab Chavez (1284) and Sim Romero (5442). In front are Judy Maloney (2532), Ingrid Hayden (9414), Sylvia Acevedo (9633), Mindy Edelman (9414), Pat Kearney (5742) and Kathy Peters (5822). The Program is administered by Education and Training Division 4231. Jack Hueter is coordinator.

Afterthoughts

Keeping up with the running dogs of imperialism--Irwin Janney (9412) sends us this item from Industrial Research: "Power-assisted boots have been designed in the Soviet Union by means of which the wearer could cover 22 to 25 km/hr (13 to 15 mph) with low fuel consumption. The boots are powered by small internal combustion engines mounted on either side. Ignition is controlled by pressure on the heels. About 100 strides would be made in a minute, each of 3 m (10 ft.) or more, and not higher than 25 cm (0.8 ft.) off the ground." Let's see. There's the chromosome test to confirm gender, the urine test to check for doping--you know, when those Russians show up at the Olympics wearing suspiciously bulky track shoes, we'd just better have our exhaust emission checker at the ready.

* * *

The \$2 bill and public caprice--Confronted with the task of selling its new \$2 bill (which doesn't seem to be selling too well), the Treasury Department apparently has turned to its copywriters. The latest release we've received from Treasury on the bill has the cloying tone of a deodorant ad. There's a certain shrillness too: "The Harvard study indicated that today's educated public will not be deterred by the colorful superstitions of folklore regarding the \$2 bill; if anything, they add to the mystique and charm of this bill." You don't say. It's clear that Treasury Secretary Simon, who has a reputation for directness, must have called in his top aides and said something like this: "Look--we've got three zillion of these things printed and we can't turn 'em into note pads. Now sell, repeat SELL!" Maybe if we hold out long enough we can get the bill at a discount?

* * *

"It has been said that superconducting magnets will be to electrical engineering what the ball bearing has been to mechanical engineering, and that indeed looks as though it is the case for future advanced electrical power systems." Robert Sachs, Director of Argonne Laboratory.

*js

Retiring



Murt McMullen (9550)



Fidel Zamora (3282)

Our Town

New Mexico Symphony 76-77 Season Announced

The New Mexico Symphony, formerly the Albuquerque Symphony, has announced its eight-concert series for the next season. Soloists include dancer Edward Villella, guest conductor Leon Fleisher, violinist Miriam Fried, basso Justino Diaz and pianist John Browning. The traditional

season finale for full orchestra, soloists, and chorus will be Beethoven's "Missa Solemnis."

Subscriptions to the eight concerts are now available and offer savings of up to 30% over single ticket costs. Minimum series price is \$25. Subscribers are guaranteed seating.

This year, each concert will be given twice -- on two successive dates -- so that concert-goers have, in effect, a choice of two series of eight concerts. All concert dates are on weekends, with three being offered on Sunday afternoons.

The Symphony audience is expected to reach 100,000 in 1977. Financial support for the orchestra comes from subscription buyers, individual donors, and gifts from local businesses. For subscription tickets, contact the Symphony office on 120 Madeira NE, telephone 265-3689.

Take Note

Cecil Tolbert (1334) is trying to contact former railroad employees who had more than 10 but less than 25 years service with any railroad and who have not been employed by a railroad since July '74. Purpose relates to railroad pensions and certain changes to these pensions as a consequence of recent legislation. You can reach Cecil at his home on 869-2729.

* * *

Pre-registration for T-VI's fall trimester runs from July 19 through Aug. 6, while registration itself takes place Aug. 25 and 26 for those accepted into classes.

Sandians may enroll in T-VI evening courses on a cost-free basis provided the course is job-related or relates to a job to which the employee may logically aspire.

Pre-registration forms and T-VI catalogs may be obtained from Ruth Brooks of Education and Training Division 4231, Bldg. 632. The T-VI forms as well as Sandia enrollment cards must be validated by Division 4231 if you wish to take the course at no cost. T-VI classes start Sept. 7.

LAB NEWS

Published every other Friday

SANDIA LABORATORIES

An Equal Opportunity Employer

ALBUQUERQUE, NEW MEXICO
LIVERMORE, CALIFORNIA
TONOPAH, NEVADA

Editorial offices in Albuquerque, N.M.
Area 505 264-1053
ZIP 87115

In Livermore Area 415 455-2111

john shunny is editor

&

don graham ass't. editor

bruce hawkinson & norma taylor write
bill laskar does picture work
so does russ smith

&

lorena schneider reports on livermore

PAGE TWO
LAB NEWS
JULY 9, 1976





YOUTH OPPORTUNITY TRAINEE Karen Dias, a data processing clerk in Computing Division 8323, was one of the winners in the Community Day Typing Contest sponsored recently by Chabot College, and in recognition received a certificate and handbook. Students from various Bay Area high schools competed in the first annual contest. A graduate of Livermore High School in June, Karen plans to major in political science at Chico State College this fall.

Take Note

Bob Tirnetta (8257) has received an AA degree in technical education (electrical) from San Joaquin Delta College in Stockton, Calif. A participant in Sandia Livermore's apprenticeship program for the past four years, Bob has an additional year of training before completing his plant technician electrical apprenticeship.

* * *

Congratulations to Don Gregson (8150) for his recent hole-in-one during SLL Twilight Golf League play. He sank his tee shot on the 150-yard, par 3, No. 2 hole at Las Positas Golf Course. "My first hole-in-one — but, hopefully, not my last," comments Don.

Speakers

Jack Dini (8312), "State of the Art—Electroplating," and Rudy Johnson (8312), "State of the Art—Electroforming and Electrochemical Joining," LLL Seminar on the Principles and State of the Art of Electrochemistry and Electrochemical Processes, Dec. 15, Livermore, Calif.

Gordon Ross (8212), "What is Sandia?" Pleasanton Rotary Club meeting, Jan. 22.

Bob Cattolica (8115), "The Interpretation of the Spectral Structure of Reyleigh of Scattered Light from Combustion Gases," 14th Aerospace Science Meeting, American Institute of Aeronautics and Astronautics, Jan. 26, Washington, D.C.

Authors

Steve Robinson (8314), C.M. Young (General Atomics) and O.D. Sherby (Stanford University), "Effect of Subgrain Size on the High Temperature Strength of Polycrystalline Aluminum as Determined by Constant Strain Rate Tests," ACTA METALLURGICA, Vol. 23, p. 633.

John Brooks (8314) and A.W. Thompson (Rockwell Int.), "Hydrogen Performance of Precipitation Strengthened Stainless Steels Based on A-286," METALLURGICAL TRANSACTIONS, Vol. 6A.

Rudy Johnson and Jack Dini (both 8312), "Etching and Plating of U-Ti and U-Nb Alloys," AMERICAN NUCLEAR SOCIETY TRANSACTIONS, Vol. 21, No. 160.

Sympathy

To Gerry Nerton (8323) on the death of her sister in Oakland, June 2.

LIVERMORE NEWS

VOL. 28, NO. 14

LIVERMORE LABORATORIES

JULY 9, 1976

Test Facility

SLL's Spinner: 40K RPM

When Sandia Livermore began work on a new nuclear artillery shell for the Army several years ago, it was clear that one overriding design consideration was the stress associated with the shell's being fired out of a gun barrel. The "set-back" load on the shell as it is propelled up the barrel is extreme but, additionally, there is centrifugal stress, a consequence of the shell's being spun by the gun barrel's rifling.

"That's the basis of our spin facility," says Bob Hargreaves, who heads Environmental Test Division 8413. "Shooting shells out of barrels as a test procedure is expensive and complicated. We needed something here at the Labs that would simulate the spin."

Hargreaves & Co. have come up with a spin facility that is unique in the ERDA complex. The high speed air turbine that is the principal element of the facility can drive a test specimen up to 40,000 RPM. Vertically suspended, the specimen spins within an underground chamber, 4 feet in diameter and 4 feet deep, whose construction is sufficiently sturdy to contain things should the specimen begin to rip apart under the tremendous

centrifugal loads. In fact, in one recent test, experimenters initiated an explosive device during spin and the test chamber successfully contained both the debris and the explosive force.

"The spinner has been especially useful in developing telemetry components for use in the shell during actual firings," says Bob. "If you go to Tonopah to fire a test round and fail to get the test data because the telemetry failed, then lots of people get unhappy. By giving us the capability to test the telemetry quickly and cheaply, the spinner has done much to prevent these failures."

Actual spin environment associated with the artillery shell is 12,500 RPM. Most tests are run at 10 to 20 RPM. The chamber can be evacuated if need be, to prevent air-loading effects. The air turbine driving the spinner receives air from a large holding tank which is pressurized to 110 psi.

Bob explains that an additional use has developed for the spinner. In one of Sandia's energy-related programs, composite flywheels are being studied as energy storage devices, and the spinner is being used to test fly wheels up to the spinner's limit of 40K RPM. •js



JOE BRADSHAW & HARRY OLSON (both 8413) adjust 8-inch test unit before high speed spin test.

PLUTONIUM ACCIDENT RESISTANT CONTAINER developed by John Andersen (3rd from left, 5433) is shown before accelerated impact test, one of a series. After test, outside shell of container was badly damaged but inside canister was intact. Bryan Joseph (5432), Mike Huerta (1282) and Mike Stone (5431) helped John in various aspects of container development.



Tough Shipper

Pu Container Survives Plane Crash

Sandia is now developing and testing a plutonium shipping container which can survive an aircraft crash and resulting fire.

The container, known as the Plutonium Accident-Resistant Container (PARC), closely resembles a commercial 65-gallon drum. It is about four feet high, two feet in diameter, constructed largely of stainless steel and scrap redwood, and weighs about 400 pounds. Its capacity is 2¼ kilograms of fissionable material. Such containers would be used to transport plutonium dioxide between fuel reprocessing plants, storage sites, and fabrication plants.

The development work began early this year at the request of the Fuel Cycle Research Branch of the Nuclear Regulatory Commission's (NRC) Office of Nuclear Regulatory Research. Heading the development is John Andersen (5433) of Nuclear Fuel Cycle Technology Department.

"PARC is being developed to withstand a sequence of 'worst possible accident conditions' so that it will be resistant to any and all transportation accident conditions that can occur," John says.

"Throughout that sequence of environments — crash, puncture, crush, fire, and deep water immersion — the inner container must not release any nuclear material."

The new container consists of a double-thick shell of stainless steel filled with laminated redwood whose grain is oriented perpendicular to the outer surfaces of the package. Sandwiched within the redwood is an aluminum layer which spreads impact loads throughout the wood. Within the innermost wood section is a high strength stainless steel vessel, closed by bolts and hermetically sealed.

Nested within this vessel is the stainless steel can in which the plutonium is carried.

Redwood has two characteristics that make it ideal for use in the PARC. It displays the highest specific energy absorption characteristics of any shock-mitigating material now known. "Nature has built redwood as an extremely fine, well-constructed microscopic honeycomb. Man has not yet been able to duplicate its energy-absorption qualities even with the most expensive aluminum or steel honeycomb," Andersen says. Also, when redwood burns, the char actually becomes a carbon insulation similar to the heat shield of a space vehicle.

PARC is being tested in Sandia's Coyote Canyon Test Area, southeast of Albuquerque. Preliminary test data indicate that it will be possible to develop a commercial package which meets NRC's requirements for survivability.

PARC is an outgrowth of Sandia's past work on development of accident resistant containers for transporting nuclear weapons in fixed-wing aircraft and helicopters. These containers, however, were designed to withstand quite different accident standards.

**PAGE FOUR
LAB NEWS
JULY 9, 1976**



Congratulations

Mr. and Mrs. Terry Lashley (2141), a son, Terry II, June 12.

Sympathy

To Erwin Bureta (3613) on the death of his father in Green Bay, Wis., June 23.

Recreation Notes

FUN & GAMES

Football — The Sandia Labs Flag Football Association will hold an organizational meeting on Tuesday, July 27 at 12 noon in Bldg. 632, room 14. Purpose: election of officers. Contact: Joe Maez, (3617), 4-5689.

* * *

Sandia Bicycle Assn. — A number of observant cyclists have observed that the Zia Park gate on Ridgecrest Blvd. has been closed. Actually, there was the customary notification. Following closing, we proposed to Colonel Simon of the Air Police that a pedestrian/bicycle gate be installed at that location which, like the Maxwell/Gibson gate of that type, could be unmanned. (The gate closing resulted when the National Guard could no longer furnish people to man the gate.) The Colonel was noticeably restrained in his enthusiasm for this proposal. Suggestion: use the Truman St. entrance (1 block west of San Mateo on Gibson) and proceed east on Kirtland Ave., which has a well-defined bike lane, to the Zia Park housing area, thence along the usual route to the Tech Area.

* * *

Golf — In the Sandia Golf Association's June tournament for women at Arroyo del Oso, Pat Anderson (9422) was low gross and Ann Michele (3100/9700) low gross runner-up. Pat Hefley (3141) was low net, while runner-up was Reba Garrison (1320). Earlene Brinegar (4252) gained the low putts honors.

* * *

Sandia Runners Assn. — We have a release from the city Parks & Recreation office announcing that weekly track meets are being held every Thursday from 6 to 8 p.m. at the Albuquerque High athletic field. The school is located a couple of blocks west of the intersection of Indian School and University NE. The meets are for all interested persons, age six to octogenarians, and there is no charge nor are AAU cards required.

* * *

Backpacking — John Southwick (9531) leads a show-and-tell on wilderness backpacking at the Coronado Club on Aug. 12 at 7:30. The Sandia/ERDA public is invited. Free.

* * *

Coronado Ski Club — It's July, so what could be more logical than to sign up for a ski trip? Aspen: Jan. 29 to Feb. 2, 4 days of skiing, 4 nights accommodations and transportation, \$116 to \$160 depending upon accommodations. Ed Harley (1285), ext. 5449, needs a \$50 deposit per person and hopes to get the trip wrapped up before the end of this month. That's not rushing it — the biggie ski areas now schedule that far in advance.

Authors

P.H. Holloway (5825), "Chemical Shifts in Auger Electron Spectra From Silicon in Silicon Nitride," Vol. 54, No. 2, SURFACE SCIENCE.

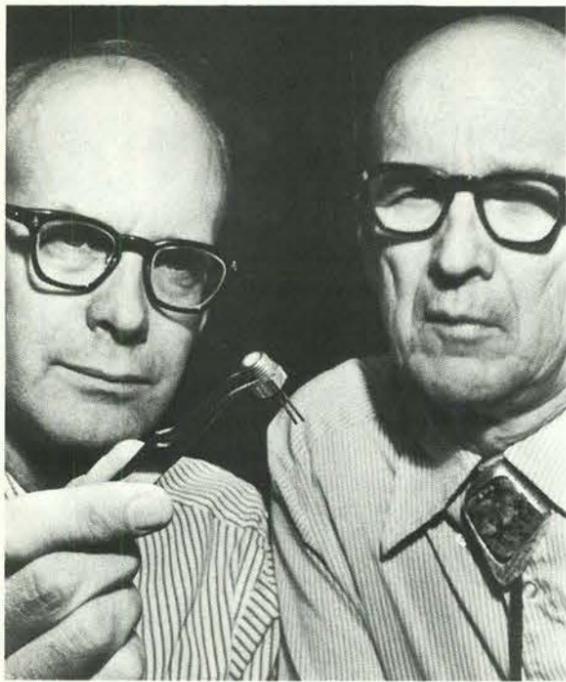
R.P. Sandoval (5214) and R.L. Armstrong (1212), "Rayleigh-Brillouin Spectra in Molecular Nitrogen," Vol. 13, No. 2, PHYSICAL REVIEW A.

L.F. Shampine (5122), "Concentration-Dependent Diffusion .3 Approximate Solution," Vol. 33, No. 4, QUARTERLY OF APPLIED MATHEMATICS.

J.B. Moreno (5261), "Computer Solution for the Traveling-Wave-Excited N₂ Laser," Vol. 12, No. 3, IEEE Journal of QUANTUM ELECTRONICS.

R.H. Ericksen (5844), J.C. Swearingen (5847) and R.E. Allred (5844), "Mechanical Properties of Plasma-Sprayed 1100 Aluminum as a Composite Matrix," Vol. 1, No. 1 (1975), SAMPE QUARTERLY I.

J.A. Borders (5111) and J.M. Poate (BTL), "Lattice-site Location of Ion-Implanted Impurities in Copper and Other fcc Metals," Vol. 13, No. 3, PHYSICAL REVIEW B.



INVENTORS Russ Dietzel and Bill Leslie (both 2514) display new explosive actuator recently awarded a patent.

New Actuator Awarded Patent

An explosive actuator invented by Bill Leslie and Russ Dietzel of Explosive Projects Division 2514 has resulted in a patent for ERDA.

The tiny device is stable at high temperatures (up to 520°C) and is resistant to initiation by static electricity.

Key to the actuator's unique properties is the chemical pyrotechnic material — a mixture of titanium hydride and potassium perchlorate.

A weapon component, the actuator could have other applications where high temperature/high pressure gasses could do useful work on command, for example to release springs, drive a piston or move a lever. Such a device can be used to separate rocket stages and to shear parachute shroud lines.

Bill holds seven other patents in the field of chemistry and explosive devices. He has worked at Sandia 25 years. Russ has worked on explosive devices at Sandia for 15 years.

Events Calendar

- July 9-11 — Santo Domingo Arts and Crafts Fair, Santo Domingo Pueblo.
- July 9-11, 15-17 — Corrales Adobe Theatre, "Rain," 898-3323.
- July 11 — NM Mt. Club, Nambe Ridge-Nambe Lake, wildflower hike, 268-4771, Gulfmart, 7:30 a.m.
- July 11-25 — American Bicentennial Mime Festival, The Mime Experiment, Inc., 842-1080.
- July 12 — Lecture Under The Stars, "Unearthing Our Heritage" by Cyrus Gordan, UNM Central Mall, 8 p.m.
- July 15 — An ensemble by the NM Symphony Orchestra at the Prospect Park Library, 7 p.m.
- July 15-18 — 24th annual Rio Grande Horse Show, State Fairgrounds Horse Arena, 7:30 a.m.
- July 16 — Navajo Rug Auction, Crownpoint, NM, McCauley, 786-5224.
- Continuous — Museum of Albuquerque, "A Star-Spangled History," bicentennial exhibit.

Break, Break

A New Kind of Radio Activity

We talked recently with Sandians Bobcat, Shortswing, Glowworm, Oklahoma Credit Card, Lucky 13, Two-Wheeled Roadrunner, Brown Scout, White Pine, Goatherder, and Tinkertoy.

That is to say, we talked with some of the Sandians who have citizen's band (CB) radios. Our goal: to discover the reason behind the phenomenal popularity of CB. The Sandians provided a clearcut answer: it's fun. That is, CB is a kind of here-and-now, unrehearsed, true-life soap opera — plotless, perhaps, but with a helluva cast of characters.

What you do is to put one in your car (or home) and, most of the time, just listen to the chatter. You haven't had eavesdropping so easy since eight-party phone lines. True, conversations often range from the insipid to the inane (and often you hear just one of the speakers), but it's still enjoyable. "Sure more fun to listen to than acne rock," says Bob Gall (3161) who commutes 120 miles each day.

The other two or three or five percent of the time, it's convenient, handy, a time-saver, even a life-saver. That's because CB'ers are the first to know about road hazards, drunken drivers, weather conditions, and (yes) radar traps.

The Village of Bosque Farms uses CB for police communication, reports Bob Fisher (5833). And the East Valencia County Citizens Patrol is held together with CB radio.

Paul Souder (4362) has a base and two mobile units — and a handheld one for his daughter to check in with when horseback riding in the Sandias. "And CB should be great during deerhunting," Paul adds.

Emergency situations remain primary motives for acquiring CB's. "I came on a serious accident outside of T or C in April," says Glenn Baker (9722). "With my CB, I was able to get help out there right away." Roy Allison (9514), Bruce Whittet (9651), and Bob Davis (5233) can also testify to CB's value in emergency situations.

Sound good? CB is easy enough to get into — buy a rig (a hundred bucks or two), then send in a license application and four dollars to the FCC and get on the air (with temporary call letters — K plus your initials plus your zip code until you get your permanent call letters).

But there are some perils. Specifically, theft. Each CB antenna is a sign saying "Get

your CB here, cheap." Sometimes thieves work with finesse, more often with crowbars. "Mine was stolen from the Labs parking lot west of Wyoming last month," says Chief Schwyzer (3253) to all who still believe Sandia/Kirtland types incorruptible. Josephine Arnold (1210) had two antennas stolen; she stores her new one in the trunk.

Not a peril but another problem — congestion on the channels, especially in the city. "Reception is fine all the way from my place in Moriarty to Western Skies," says Gene Predika (ERDA). "Then, chaos."

"And it's going to get worse," warns Russ Smith (3162). "More people using more units, of course, and more skip — the tendency of a signal to bounce off the ionosphere and return to earth hundreds, even thousands, of miles away from the point of origin. That's because sunspot activity will grow in intensity over the next seven or so years. You may be able to pick up a CB'er from Brisbane or Bonn but not Barelas."

Not a problem but something of an irritation to many — the tendency of CB'ers to affect an Oklahoma good-ol-boy drawl. As any sociology professor will tell you, a sub-culture (and CB is) usually develops its own version of the language to separate *us* from *them*. And it is, well, colorful.

Another problem: sometimes the language is more than colorful, it's downright profane. It's illegal, of course: the airwaves are public property and theoretically G-rated. But the anonymity of a handle (and the inability of the FCC to enforce call letter identification) means you can air your entire vocabulary with little fear of retribution.

As Bob Adams (2533) puts it, "You're listening to a cross-section of the country — good, bad, indifferent, and that's part of the appeal."

* * *

One official note: Bob Foster (9531) can send you a 555 (Application for Temporary License) or a 505 (Application for Permanent License). Call him on 4-8992. And all Sandians with the capability of transmitting on the Base should register with Sgt. Oliver in the southwest corner of Bldg. 20449 (south of the Museum on Wyoming). It's quick and painless — if you remember your license — and it keeps you legal. • bh



FOR JUST a few dollars more, you get variable squelch control and phased, center-loaded antennas.

Giller Discusses Present, Future Nuclear Weapons

unabated. Detente with the United States will have little if any bearing on this matter; it sets limits on certain types of weapons, perhaps, and calls perhaps for some caution, but it is most improbable that a single Soviet leader thinks relations with the U.S.A. could or should influence the rate or manner in which the USSR meets what it considers its defense needs. The idea of 'parity' remains entirely alien to them."

Soviet strategic objectives, as we now understand them, emphasize deterrence of conflict and, should this deterrence fail, victory through survival of the Soviet Union and destruction of the West.

The primary objective for U.S. strategic forces is the deterrence of nuclear attacks aimed at the destruction of the U.S. as a national entity. In the words of Secretary of Defense Donald Rumsfeld, this requires the capability to "strike back with devastating force at an enemy's economic and political assets. Such a force is essential not only as the basic deterrent, but also as a capability that can be withheld so as to deter any attack on the U.S. and its allies' cities and populations." The U.S. also requires the capability to strike selectively at a wide range of military targets and do so with low collateral damage. We do not rule out the capability to attack some elements of the Soviet strategic force posture on a second strike.

U.S. Technological Superiority

Even though the quantitative balance of strategic forces is shifting, the U.S. maintains its technological superiority, and its capabilities are well understood by any would-be adversary. The determination of the U.S. to ensure that we maintain this technological superiority is demonstrated in the FY 77 defense budget which for the first time in several years includes real increases in defense spending. The nuclear weapons program exemplifies the most successful type of technical development. Over the last three decades we have seen a hundred-fold reduction in weight and a thousand-fold increase in yield of weapons we have or could stockpile. In an era when almost every generation of weapons has become larger and substantially more expensive, nuclear weapons have become cheaper and lighter. The U.S. success in miniaturizing nuclear weapons allowed the development of smaller, cheaper missiles. Nuclear warhead costs represent on the average only about 10% of the cost of a weapons system over its life cycle and advanced nuclear design can result in very substantial cost savings in the future.

Some look at the success of continued nuclear weapons development as a horror story. They argue that despite the ever increasing costs of our military programs and the growing destructiveness of our nuclear arsenal, we are really less secure.

This view in many respects is built on a series of myths. The resources that have been invested in U.S. nuclear systems have been on the decline for over 15 years. Current U.S. population vulnerability is in at least a significant part the result of the policies we have followed de-emphasizing strategic defenses and civil defense. Mutual population vulnerability would have resulted even if nuclear weapons technology had never developed beyond World War II devices. The

major difference is that this development would have involved vastly greater delivery systems expenditures for both sides and the forces involved would be far more vulnerable to surprise attack.

Without the progress we have made in nuclear weapons design, ballistic missile submarines would not have been feasible. Hence the net effect of technological progress in nuclear weapons design since World War II has been far cheaper and more survivable strategic deterrence forces and a nuclear arsenal that can make a major contribution to the security of U.S. and its allies.

Five ERDA Weapons

ERDA has five weapons, four of them strategic, under active development today. They are improved warheads for the Minuteman III and Trident strategic missiles, two strategic bombs — the improved B-61 and the new B-77 — and the new 8-inch shell. Preliminary engineering development has been completed on a Hi-Yield MIRV suitable for deployment on Trident or M-X (a new ICBM). Development is also underway on low collateral damage warheads for the Pershing II, a warhead for future air to surface or cruise missiles, the MK-500 evader Maneuverable Reentry Vehicle (MaRV) and low collateral damage bombs.

Both the Trident and Minuteman MIRV will greatly increase the yield of existing alternative systems. In the case of Trident, the improved yield of the warhead will mean large savings compared to the cost of replacing the Polaris/Poseidon force with an equally capable Trident force carrying the older Poseidon MIRV. The improved yield of the Mark 12A for the Minuteman III, combined with the improvements being made to the guidance system, will prevent a major disparity in counterforce capabilities developing in the Soviet favor, at least in the near term. The Mark 12A and the Hi-Yield MIRV are potential candidates for the M-X (ICBM).

The new variants of the B-61 bomb now under development will have improved safety/security devices including non-violent command disablement. The B-77 Full Fuzing Option (FUFO) bomb was designed to provide the Air Force with a weapon in the high yield range with the flexibility of the lower yield B-61. It will provide delivery capabilities consistent with 1980 penetration requirements and at the same time incorporates advanced safety features such as insensitive material scatter in the event of a crash. The weapon also minimizes the nuclear material costs.

New Weapons Designs

A number of ERDA programs in conjunction with DOD delivery systems in early developmental stages could provide the U.S. greatly improved penetration capabilities against advanced Soviet defenses.

The proposed Threshold Test Ban Treaty will limit the further development of higher yield strategic bombs and warheads. As a result of the accelerated test program, we feel we can meet our strategic weapons requirements for the foreseeable future.

The most important advancement in weapons design in the next decade is likely to come in areas other than simple yield-to-weight ratios. These areas include:



THE B61, one of several weapons discussed by Gen. Giller, is shown with engineers Jim Lindell, Howard Lehman and Charley Burks, who heads the 61-3,4 Development Division. Another Sandia division concerned with the B61, the 61-2,5 Development Division, is headed by Heinz Schmitt.

—Development of a variety of low collateral damage weapons with controlled output of radiation, lower fission content, or earth penetrators.

—Still smaller and lighter weapons that can be adapted to a greater variety of delivery systems, including precision delivery systems.

—Crash proof weapons that will not scatter radioactive material after an impact.

—Cheaper weapons utilizing less special nuclear material.

—Further development of more advanced variable yield and insertable capsule weapons that might permit reduction of stockpile numbers without loss of military effectiveness.

—Improvements in weapons safety and security.

In the tactical area, controlled output devices combined with precision guidance can drastically improve our capabilities to destroy a variety of military, economic and logistic targets with low collateral damage. In many cases the yield required for target destruction can be reduced by a factor of several hundred. The combination of yield reduction and controlled output can improve military effectiveness by allowing attacks on enemy troops closer to the forward edge of the battle area without endangering friendly troops. Reduced collateral damage makes the U.S. nuclear guarantee more credible and hence improves the capabilities of our forces to deter.

Use of Weapons

It is sometimes argued that the development of low yield, low collateral damage weapons will increase the likelihood that these weapons will be used. Yet low yield nuclear weapons have been in the stockpile for about 20 years. They have never been used despite the fact that the risks associated with their use in the 1950s and 1960s — an era of massive U.S. superiority in both strategic and tactical nuclear systems — was probably

substantially less than the risk would be today. The only conceivable use of U.S. tactical nuclear weapons is in response to aggression of sufficient magnitude to change the international balance of power.

The Soviet Union regards tactical nuclear weapons as a fundamental part of their war-fighting capability. The Soviets have traditionally stressed the importance of preemptive, massive, in-depth surprise nuclear attacks which can be exploited by their highly mobile armored and mechanized infantry divisions.

Early Soviet tactical nuclear systems were apparently high yield weapons. We are much less certain about the systems they have introduced in recent years. Those who argue that U.S. introduction of low collateral damage tactical nuclear weapons is meaningless as long as the Soviets maintain high yield systems, ignore the possibility that the Soviets have already moved toward lower yield systems or will do so in response to the U.S. initiative.

The new eight-inch shell will be the first U.S. weapon specially designed to reduce collateral damage from blast and radioactivity.

There is little room for complacency in assessing the continuing Soviet drive for technical superiority in military technology. As Dr. Currie, Director of Defense Research and Engineering, notes,

"... I would suggest that all of us, in examining the current technology balance and its dynamics, would agree that the Soviet Union has a large and determined effort and that the Soviets are inexorably increasing their level of technology relative to ours and are, in fact, seizing the initiative in important areas. This technological development is molding future Soviet strategy... The Soviet effort is dominated by their often-stated national goal of surpassing the U.S. in science and technology."

D.H. Jensen (2355), "Analytical Modeling of the Prompt Fission Neutron Uranium Logging Technique"; G.W. Smith, D.H. Jensen, H.M. Bivens and E.L. Jacobs (all 2355), "Preliminary Results of Uranium Borehole Logging by Prompt Fission Neutrons Using Pulsed Neutron Generators," Annual meeting of Rocky Mountain Section of the American Geological Society, May 20-21, UNM.

K.J. Touryan (5260), "Entrainment of Slag in MHD Boundary Layers"; R.D. Klett (5742), "Effects of Electrode Degradation on MHD Power Plant Costs and Efficiencies"; W.K. Tucker (5233), "PULSAR, An Unconventional MHD Topping Stage," 15th Symposium on Engineering Aspects of Magnetohydrodynamics, May 24-26, University of Pennsylvania, Philadelphia.

D.W. Palmer (2151), "Tutorial Lecture on Hybrid Microcircuits," given as class notes, Tutorial Institute on Hybrid Microcircuits, May 24-26, University of Pittsburgh.

K.D. Bergeron (5241), "Magnetic Effects on Insulator Flashover in High Voltage Vacuum Transmission Lines"; M.J. Clauser, M.A. Sweeney and A.V. Farnsworth (all 5241), "Electron Beam Requirements for Target Implosion Experiments"; F.M. Bacon (2352), "Deuterium Ion Mass, Energy and Current Density Distributions from a Duoplasmatron Ion Source"; L.P. Mix (5242), "Holographic Interferometry of Electron Beam Irradiated Pellets"; T.H. Martin (5245), "Pulsed Power Requirements for Electron Beam Fusion"; D.L. Johnson, R.S. Clark (both 5245), and J.C. Bagg (5212), "LILL, A Long Pulse Electron Beam Accelerator," IEEE International Conference on Plasma Science, May 24-26, Austin Texas.

C.S. Johnson (9421), "An Introduction to Telemetry Data Systems"; H.L. Webster (9531), "Precision Shock Accelerometer Calibrator" and "30,000 g Shock Accelerometer Calibrator"; R.E. Sheldahl and G.F. Wright (both 1333), "The Effect of Fabric Orientation on the Ablation Performance of Carbon Phenolic"; R.P. Reed (1116), "Branched Thermocouple Circuits in Underground Coal Gasification Experiments"; H.O. Jeske (9421), "Performance Characteristics of Telemetry

Soviet Delivery Systems

While there is much uncertainty concerning Soviet nuclear weapon technology since the end of atmospheric testing in 1963, we are certain that the Soviet nuclear weapons development program is vigorous. Over ten Soviet tests since 1970 have been in the megaton or multimegaton range, presumably related to the development of efficient nuclear warheads for their new strategic weapons systems. Parity probably exists in the field of high yield strategic warhead technology. While we know comparatively little in the area of Soviet tactical nuclear weapons, the variety of their nuclear capable tactical delivery systems is visibly increasing.

A superior technical base is critical for the national security of the U.S. U.S. technical superiority is being rapidly eroded by current Soviet efforts. In the nuclear weapons area the threat is particularly severe because of the larger scale of Soviet efforts, the reduced funding for U.S. nuclear weapons research, development and production over the last decade and because of the physical aging of the stockpile.

Above all we must not allow the nuclear weapons development and production complex to erode. In many respects this complex is unique and some of the assets are irreplaceable. The weapons laboratories represent a combination of trained manpower and physical resources that is available nowhere else in the West. The laboratories also make a major contribution to U.S. energy programs and to basic scientific research in general. It would be extremely difficult if not impossible to reassemble this complex in a crisis situation.

Transmission Systems"; H.M. Stoller (5730), "The Status of Instrumentation and Process Control Techniques," International Instrumentation Symposium, May 25-27, San Diego.

G.J. Hochrein (1323) and J.K. Cole (5432), "Particulate Erosion of Nosteps and Heatshields: Summary and Analysis of the SAMS Program Data"; L.F. Miller (1323) and B.M. Bulmer (1333), "Recent Carbon-Carbon Reentry Vehicle Flight Test Results," AIAA Joint Strategic Sciences Meeting, June 2-4, San Diego.

E.P. EerNisse (5112), "Calculations of the Stress Compensated (SC-Cut) Quartz Resonator," 30th Annual Frequency Control Symposium, June 2-4, Atlantic City, N.J.

J.R. Asay (5167), "Shock Induced Melting in Bismuth," High Pressure Symposium, June 2-4, Rensselaerville, N.Y.

J.A. Borders (5111), "Surface Analysis Using Energetic Ion Beams," ACS Summer Symposium on Surface Analysis, June 3-5, ASU, Tempe.

H.D. Sivinski (5440), "Animal Feeding of Irradiated Food Sludge," Institute of Food Technologists annual meeting, June 6-9, Anaheim, Calif.

R.E. Allred (5844), "Ceramics and Flywheel Energy Storage," Symposium on Ceramics in the Service of Man, June 7-9, Washington, D.C.

H.R. Spahr (1331), R.N. Everett and J.K. Kryvoruka (both 8158), "A Multifaceted Store Separation Analysis"; W.E. Williamson (1335), "An Automated Scheme to Determine Design Parameters for a Recoverable Reentry Vehicle," AIAA Joint 9th Aerodynamic Testing and 3rd Atmospheric Flight Mechanics Conference, June 7-9, Arlington, Texas.

P.J. Feibelman (5151), "The Independent-Particle Picture in Surface Spectroscopies," invited paper; H.H. Madden (5114), "Deconvolution of the AES-Conduction Band Spectrum of Lithium," 36th annual Physical Electronics Conference, June 7-9, Madison, Wis.

J.F. Ney (1754), "Nuclear Safeguards," Energy in Perspective: An Orientation Conference for Educators, June 7-11, ASU, Tempe.

C. Tapp (2150), "Hybrid Microcircuit Applications for the Energy Research and Development Administration Nuclear Weapon Program," ECOM Hybrid Microcircuit Symposium, June 8-9, Fort Monmouth, N.J.

D.H. Jensen (2355), "Calculated Thermal Neutron Populations in Different Rock Media for Various Rock Densities," Society of Professional Well Log Analysts Annual Meeting, June 9-12, Denver, Colo.

D.A. McArthur (5423), "Development of the Fission-Fragment-Excited CO Laser Towards Higher Power," Princeton University Conference on Partially Ionized Plasmas including the Third Symposium on Uranium Plasmas, June 10-12, Princeton, N.J.

C.J. Dickey (1716), "Transient Choking in an MHD Generator," International Conference on Plasma Science, May 24-26, Austin, Texas.

R.J. Lawrence (5162), "Practical Applications for Wave Propagation Calculations," "Theoretical Investigations of Spark Drill Phenomenology," and "The Wondy Computer Program," The Technion, June 2-11, Haifa, Israel.

F.A. Leckman (3171), "Marine Biology," First Grade Classes, Comanche School, May 28.

R. Champion (5712), "Sandia's Solar Total Energy Program," ASSM meeting, June 8, Albuquerque.

S.E. Benzley (1282), "An Engineering Approach to Three Dimensional Elastic Plastic Fracture Mechanics," Workshop on Three Dimensional Fracture Mechanics, April 26, Columbus, Ohio.

L.O. Seamons (9336), "Solar Thermal Electric Power," May 4, Albuquerque Academy class.

A.F. Veneruso (5715), "Wind Energy Research," Host Lions Club, May 11, Albuquerque.

T.F. Marker (6010), "The Oil Industry: Fact and Fiction," Los Altos Civic Club, May 13, Albuquerque.

M.A. Butler (5154), "Hydrogen Production From Solar Energy by Photoelectrolysis of Water," Seminar at the University of Puerto Rico, June 7-11, San Juan/Rio Piedras, Puerto Rico.

D.A. McArthur (5423), "Development of a Higher Power Fission-Fragment-Excited CO Laser," Princeton Univ. conference on Partially Ionized Plasmas including the Third Symposium on Uranium Plasmas, June 10-12, Princeton, N.J.

D.K. Gartling (1283), "Finite Element Analysis of Incompressible Fluid Flows," Finite Element Method Seminar, June 11, Univ. of Calif., Berkeley.

J.W. Braithwaite (5831), "Simulated Deep Solution Mining of Copper Sulfide Ores," American Chemical Society NW Regional Meeting, June 14-15, Univ. of Nev., Reno.

MILEPOSTS

LAB NEWS

JULY 1976



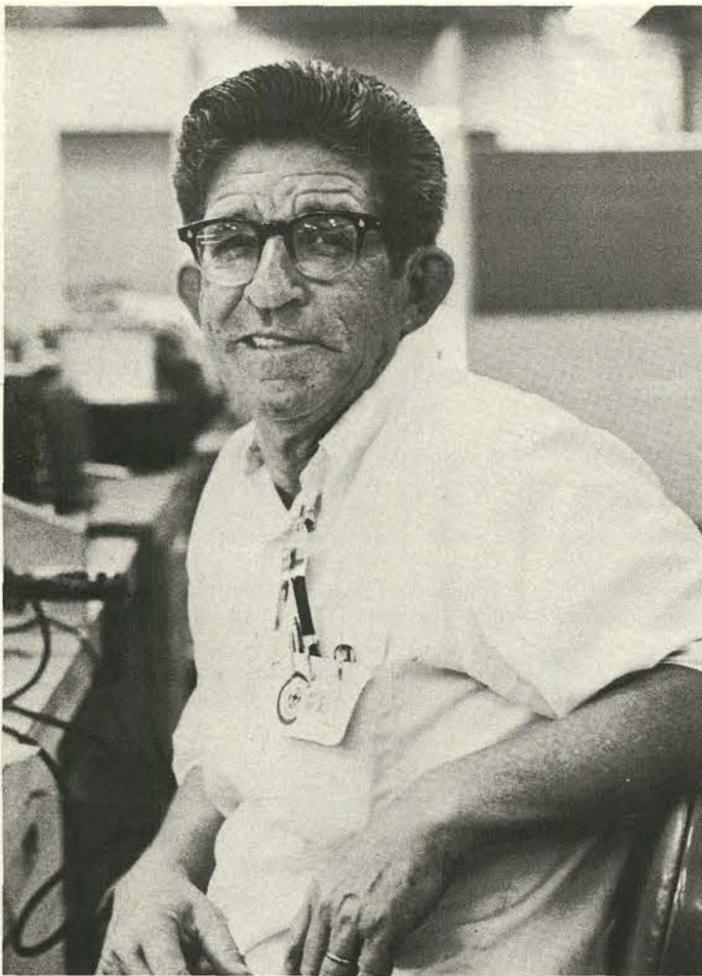
Peter Rand - 5813

15



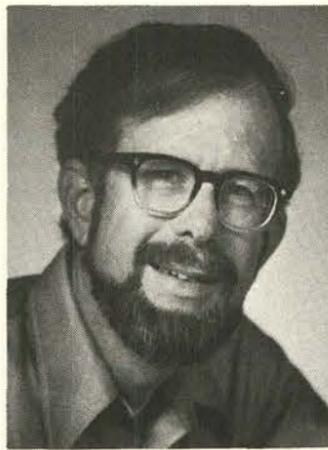
Bill Walton - 9535

20



Adolfo Sanchez - 3616

25



Jim Lathrop - 8322

10



Dan Ross - 8413

10



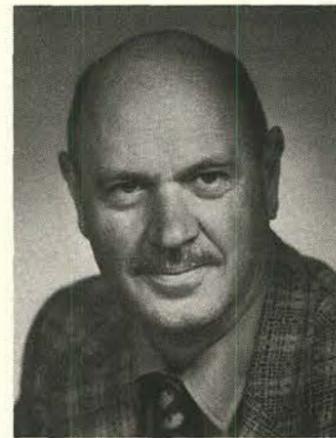
Cliff Yokomizo - 8184

10



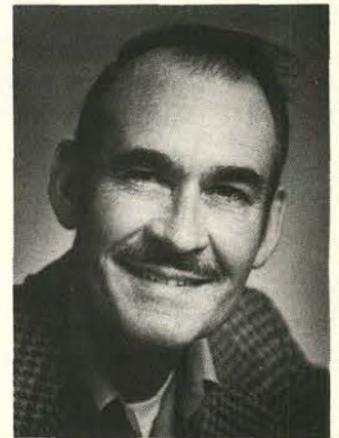
Ray Gabaldon - 9721

20



Bill Little - 8430

25



Dick Wilhite - 8254

15



Dick Ballard - 8212

25



Willie Montano - 9721

20



Kenneth Harper - 9743

15



Tom Covert - 4336

15



Roy Lambert - 1231

25



Lowell Watkins - 1751

20



Stewart Ingham - 9481

20



Adela Bowen - 3254

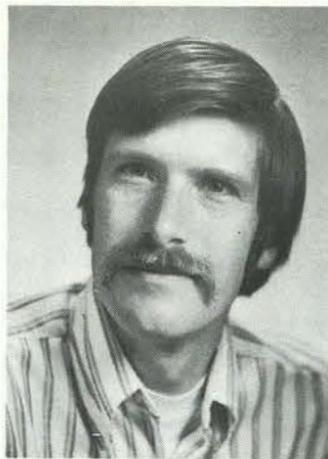
15



Rodger Page - 8157 15



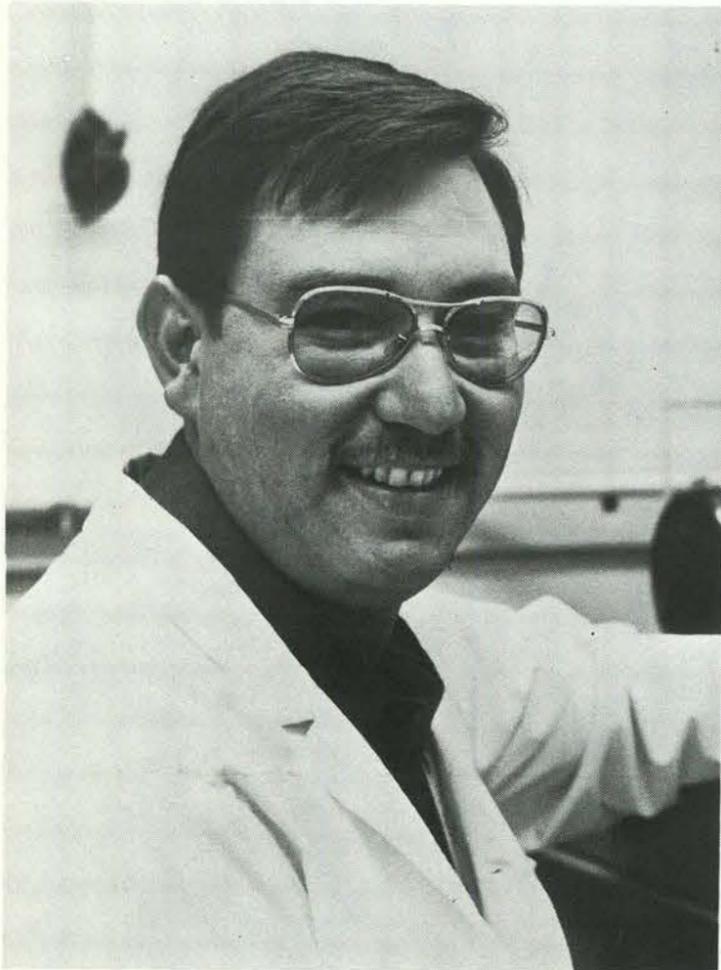
Jerry Cashen - 8159 10



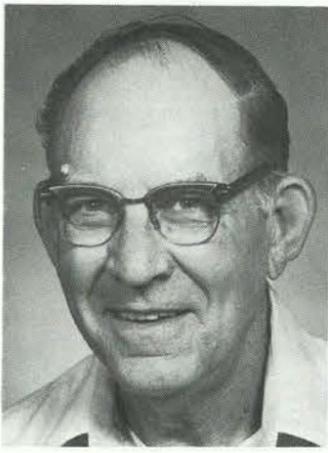
Ralph Clark - 8362 10



Carl Smith - 9655 15



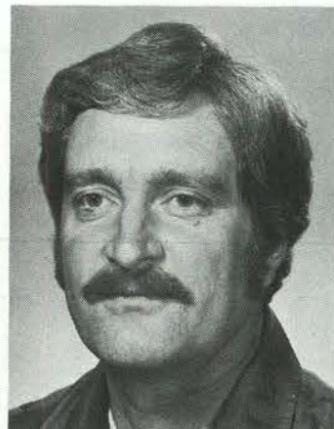
Martin Gonzales - 5813 10



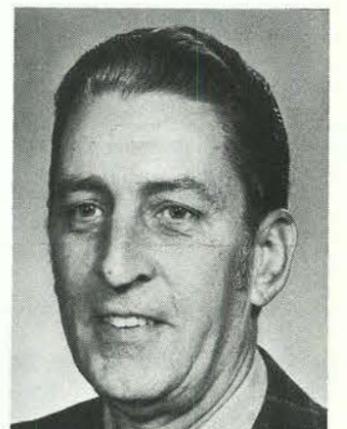
Merritt Hummer - 3616 20



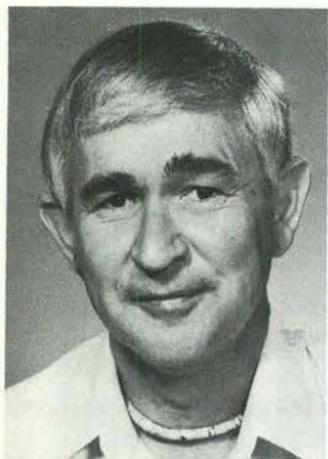
Edward Lane - 2132 20



Ed Graeber - 5822 20



Charles Selby - 4322 25



Bruce Ercole - 9483 20



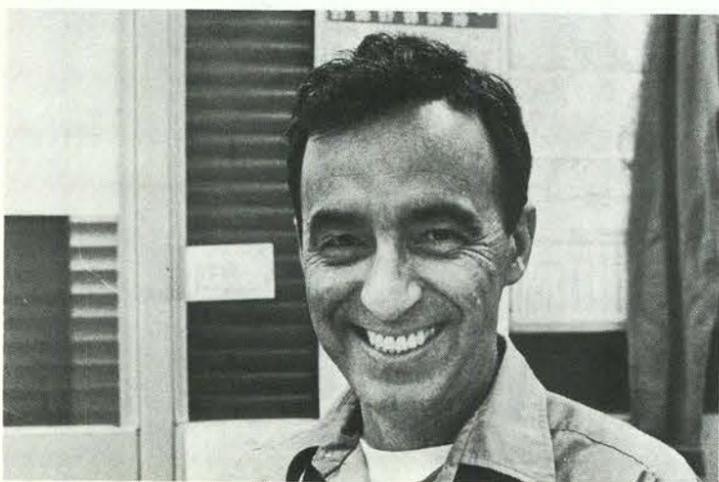
Fred Duimstra - 2321 20



Warren Windle - 2136 15



Julie Rhoden - 3733 10



Cal Rogers - 9424 20



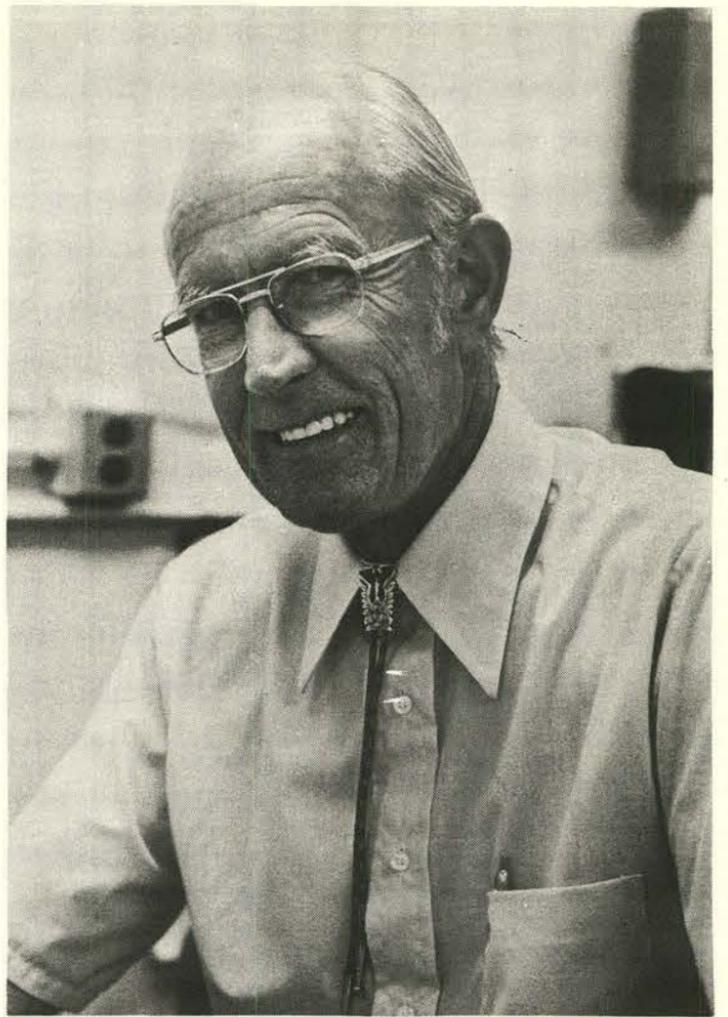
Earl Gruer - 9742 15



Craig Jones - 2647 15



Jerry Long - 1111 20



Joseph Boyd - 9351 25



Vi Salas - 3252 20



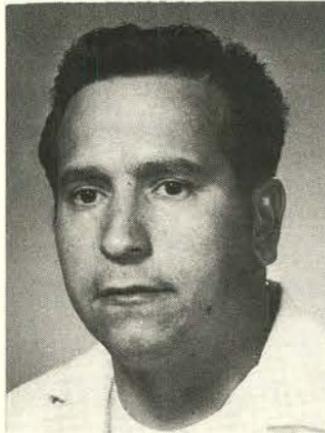
Keith Smith - 1735 20



Frankie Crutcher - 1243 15



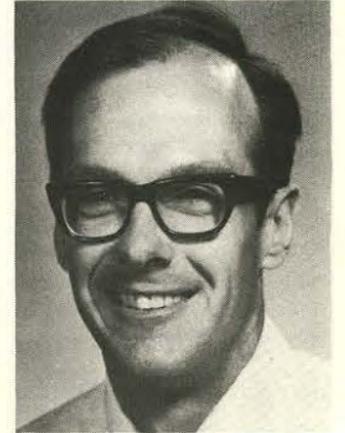
Ronald Haid - 9651 10



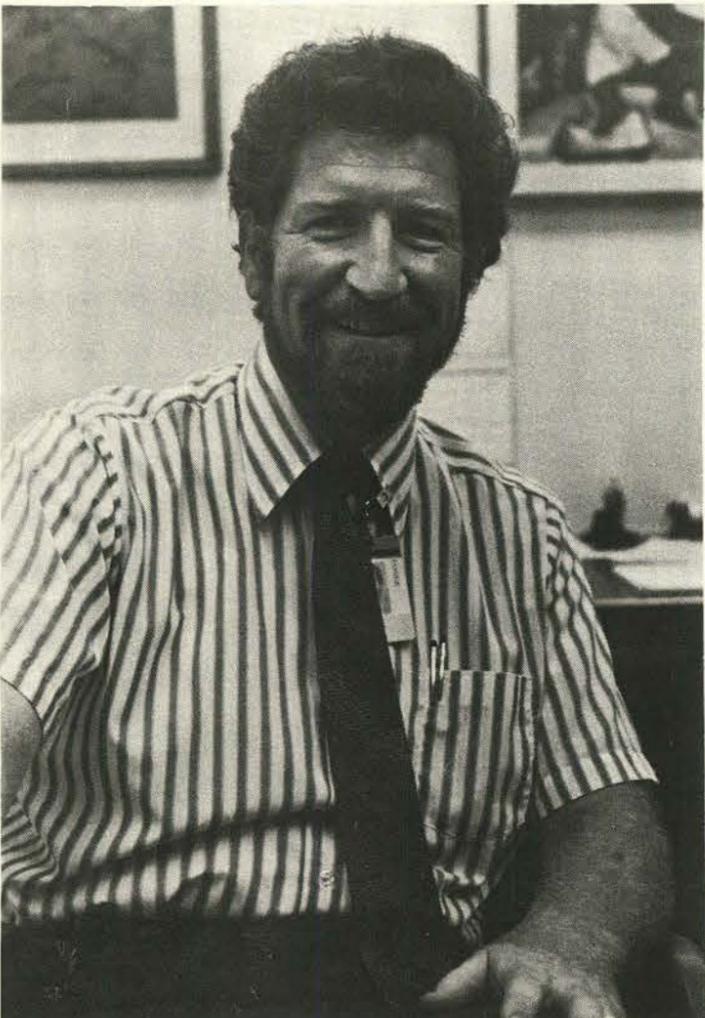
Pedro Armijo - 9718 10



Ivan Waddoups - 1754 10



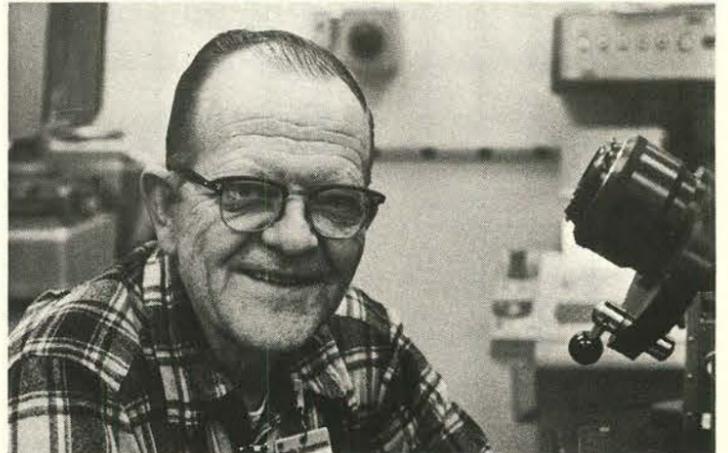
Stewart Kohler - 2326 10



Gene Ives - 4360 20



Samuel Martin - 2325 15



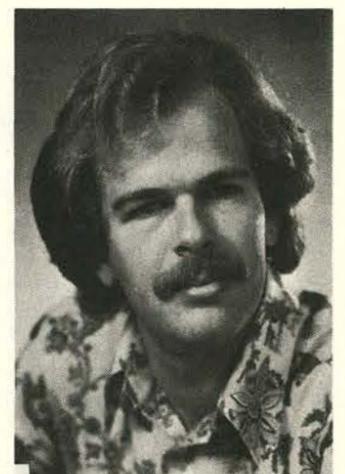
Dan Fenstermacher - 2541 25



George Rafal - 8257 10



Al Reichmuth - 8115 10



Bob Anderson - 8314 10

Glass Ceramic Work Subject of Patent

A new glass ceramic which seals to molybdenum has resulted in a patent for ERDA and a new long-lived vacuum tube component for the weapons program. Inventor is Bob Eagan of Ceramics Development Division 5846.

"The tube had some very strict requirements," Bob says. "The insulator had to hold off high voltage, keep its integrity during tremendous temperature changes, provide a hermetic seal, and particularly provide low gas permeability. Glass ceramic was ideal for this application because the material can be formulated to have specific properties, such as a thermal expansion which closely matches that of molybdenum."

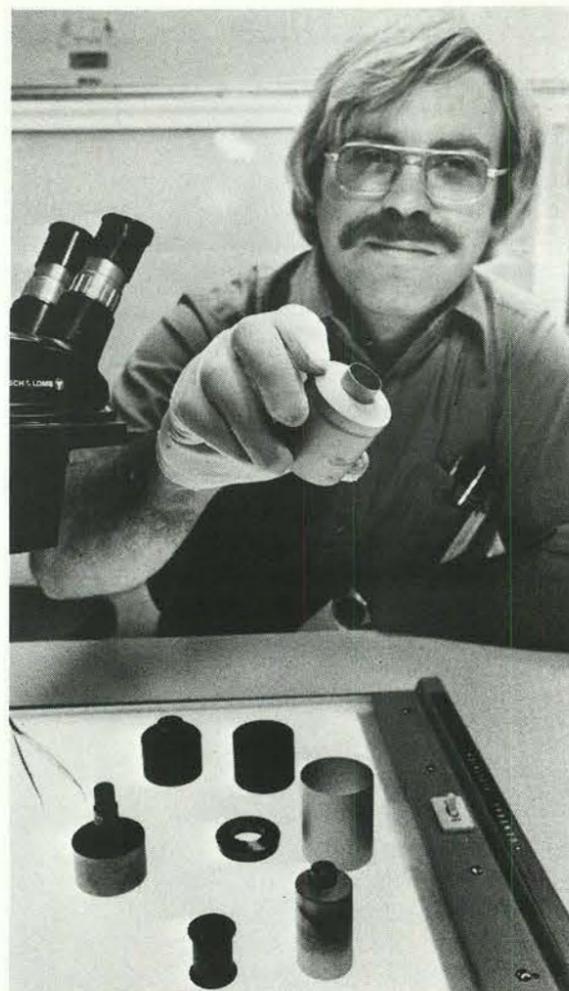
Tubes are fabricated by assembling glass preforms, molybdenum components and graphite molds. Heat treatment at 950° C allows the preform to flow and conform to the shape of the molds. At the same time crystals grow in the glass matrix, thus forming a glass ceramic. This material is stronger, more refractory than the glass, and matches the thermal expansion of molybdenum. Fabrication is much less complex than using conventional methods and alumina ceramics.

"Currently glass ceramic technology is not widely used," Bob says, "but as people learn about its advantages, applications are increasing."

John Crawford (2350) and Bruce Barnaby (2354) of the Vacuum Tube Department, have supported the glass-ceramic development work. Glass Formulation and Fabrication Section 3621-4 under Ron Snidow has developed an advanced glass melting and formulation facility, unique in the ERDA laboratories, which provides process development support.

Further glass-ceramic studies are currently being performed by Bob and Cliff Ballard (5846). Under development are prototypes which use glass ceramics as high voltage insulators, dielectric barriers and seals to other metals in various weapon components. Glass ceramics are also being considered as insulator components in CTR devices.

Bob has been at Sandia five years, joining the Labs after earning a PhD in ceramic engineering from the University of Illinois in 1971.



GLASS CERAMIC seal to molybdenum, part of a high voltage vacuum tube, was awarded a patent recently. Inventor is Bob Eagan (5846).

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

- '72 TRAVEL TRAILER, 24 ft. Coachman Crusader, self contained, many extras, refrigerated air, central heating. Ferketich, 299-3061.
- SADDLE, junior size plus some tack, \$50. Crutcher, 268-0342.
- BUCKET SEATS for '65 Ford Mustang, \$25. Armijo, 268-7645.
- CHEVY PARTS: automatic transmission; headers; '56 new mufflers and tailpipes; '71 Impala radiator; alternator, distributor, headlights, other parts. Silva, 255-3723.
- COCKER SPANIEL mix, small, 2 year old, needs a home with one-dog family, has all shots. West, 281-3460.
- ROTH VIOLA, case and bow, new cost \$900, sell \$650. Houston, 344-9004, after 5.
- 120 BASS ACCORDION with case; sewing machine. Johnson, 344-9369.
- TWIN BEDS with springs & mattresses, French provincial, two desks, two chairs, nightstand, triple dresser, \$400. Gillon, 255-9162.
- SIMMONS SOFA, mint green, \$250; maple corner desk, \$25; 5-light wrought iron chandelier, \$20. Haines, 293-1371.
- SOUND EQUIPMENT, Sony 230 tape deck, Sony tapes, \$120; Garrard 90 turntable, \$20;

- Panasonic clock-radio, digital, alarm, \$10. Reynolds, 299-5157.
- 2 BOX FANS, Sears 3 spd., 20 in., used one season, \$15 each. Holmes, 292-0898.
- AQUARIUM, 20 gal., stand, hood, light, other accessories, \$40. Martinez, 294-2846.
- CLOSET DOORS, two sets, bifold, wood, 6'8" X 3'11" opening, unpainted, never used, both sets for \$45. Hayes, 296-3909.
- '72 ASPEN TRAILER, 18', self contained, sleeps 6, butane/electric refrigerator, 40 gal. water tank. Gonzales, 344-9832, after 5.
- ROLLER SKATES, shoe type, ladies size 7, \$10; black show derby, 6 5/8, \$8. Lambert, 344-9012.
- AUTO AIR CONDITIONER for Ford 6 cyl. engine, \$35; 16 ft. 5" dia. double wall, type B gas vent, \$15. Murphy, 881-1520.
- 2 BEAN BAG CHAIRS, foam rubber filled, 1 large, \$50; 1 huge, \$100. Paul, 299-6387.
- HONEYWELL PENTAX Spotmatic 35mm, case, Strobonor flash, \$225; Servus rubber hip waders, felt soles, size 8-9, \$10. Sheives, 821-9285.
- SHELL for 8 1/2 ft. Longhorn truck bed, lights, paneled, Sunday only. Denton, 298-0566.
- GAS DRYER, GE, white, \$75; double bed with box springs and mattress, price negotiable. Stewart, 265-0860.
- HEATHKIT AD1013 audioscope, assembled, \$200; Lafayette 20W peak stereo amplifier, \$15; Garrard Zero-100 turntable minus tone arm, \$40. Steele, 877-1225.
- CAMPER SHELL, Admiral, for long wide pickup, removable carpeted floor, base cabinet, double bed, best offer over \$220. Akerstrom, 281-3162.
- SINK, Eljer, porcelain, iron, wall

- hung, faucets, \$15. Trump, 299-5162.
- AUTO AIR CONDITIONER, \$50; dining room pulley lamps, \$15. Rakoczy, 881-1372.
- BABY CRIB, mattress, white, \$20. Rentzsch, 281-5017.
- REFRIGERATOR, small, suitable for office or den, \$95. Christopher, 299-5712.
- FREE neutered cats and neutered labrador dog. Salazar, 877-8628.
- STEREO CABINET, handcrafted, 8' high, 10' wide, artwork, Akai tape, complete stereo sound system, \$980. Cyrus, 265-1396.
- HAIG-ULTRA IRONS, 3 through pitching wedge, \$60; brown and white Dutch rabbits born 5/29/76. Meyer, 821-0123.
- DUTCH DOOR, \$20; 9'2 1/2" x 4'5 1/2" metal sash picture window, \$60; 62 sq. yds. gold shag carpet, \$150. Touryan, 265-2284.
- UPRIGHT PIANO, Hamilton, recently tuned, \$175. Coons, D 132 Casa del Sol Apts, 6230 Indian School NE.

FOR RENT

- 3 BDR MOBILE HOME, furnished, at Conchas Lake, one block to water, mooring and sandy beach. Getz, 299-4865.

TRANSPORTATION

- '71 VW Super Beetle, new engine, battery and paint, \$1750. Potter, 256-1169, after 5.
- '71 VEGA 2300; '72 Opel 1900, \$200 under book or best offer. West, 281-3460.
- '60 FORD Starliner, \$100. Thatcher, 294-2731.
- '72 FORD Ranchero, 351 Cleveland, 4 spd transmission, 39,000 miles, \$1500. Prevender, 299-5253.
- '74 YAMAHA 650, cash or trade

- for approx. 100 cc bike plus cash difference. Dusenbery, 344-8003.
- '56 JEEP C-J5, full metal cab, snowplow. Babich, 268-5348.
- '40 CHEVY Special Deluxe "54", Corvette six cyl. engine, \$2000. Armijo, 268-7645.
- '62 OLDS Dynamic 88 2-dr. sedan, \$195. Barth, 345-0172.
- '62 FORD Country sedan, \$95. Rakoczy, 881-1372.
- '64 CADILLAC, all extras, \$275. Petterson, 299-0164.
- '75 HONDA 350XL dirt bike, gold, 1,000 miles, two helmets, \$900. Johnston, 296-8459.
- '74 YAMAHA 360 Enduro, rebuilt engine, \$725. Boyer, 243-0493.
- '74 VEGA, GT package. Lyon, 821-9823, after 5.
- '73 XLH, less than 5000 miles, balanced engine, headers, much chrome. Baca, 842-6411.
- LARSEN I/O 17', 155 hp Buick V-6, deep V hull, carpeted, stereo, \$3750; '72 125 cc Puch dirt bike, \$375. Lassiter, 298-2461.
- '71 CHEVY Malibu, 4 dr hardtop, PS, AT, AC, 50,000 miles, \$1500. Laskar, 266-4864.
- '73 HONDA CL 175, stripped of street equipment, \$300. Opland, 869-2012.
- '64 VW. Vonderheide, 843-6148.

REAL ESTATE

- 9 ACRES, irrigated, first left after Socorro County line on old south 85, all needs, peace, quiet. Montoya,
- 5 ACRES, irrigation, just off access road to I-25 north of Belen. Causey, 881-7534.
- MOUNTAIN CABIN, Platoro, Colorado, 2-story, 2-bdr. modern, furnished, with 5 lots. Shively, 867-5439.
- 10 ACRES bordering national forest, 5 miles south 14 then 5 miles into national forest,

- \$6500. Cyrus, 265-1396.
- TRAILER LOT, 65' x 200', Meadow Lake, 30 min. from Albuquerque, \$1200 cash, balance \$19.74/mo. Owens, 298-6951.

WANTED

- N.M. MAGAZINE, one copy of Feb. 76, will pay \$2. Voelker, 296-0991, after 5:30.
- STUDIO UPRIGHT PIANO, to be donated to an Albuquerque Senior Citizens Service organization, will buy or accept as donation. Rios, 299-8188.
- CB RADIO, 23 channel mobile. Coleman, 299-2377.
- 8 FT POOL TABLE, will trade custom made turquoise jewelry. Wasmund, 262-1045.
- TO EXCHANGE, house or apt. in Cincinnati for home in Albuquerque, mid Sept. to mid Oct, couple only. Krahling, 268-8126.
- '64 or '65 PONTIAC GTO, 67-69 Barracuda 340. Prevender, 299-5253.

WORK WANTED

- TUTORING in Chemistry, Biology, and Math, high school or college level. Christopher, 299-5712 or 256-1121.

LOST AND FOUND

- LOST — Pencil holder w/Sandia pen & Eversharp; turquoise & silver white shell earring; Gold Cross 14K gold pen; Man's turquoise ring, inlaid 9 squares; check; Gold Cross pen.
- FOUND — One dollar bill; Rx glasses w/shades, case, brown frames. LOST AND FOUND, Bldg. 832, Tel. 4-1657.

● COMMONWEALTH ● COLT 45 ● CASEY ● WILDERNESS ● LOBOS ● BACKPACK ●

THE — nation's birthday is past. In honor of surviving it, the Club had planned to have a celebration of sorts. But we found we were out of sorts. So it'll be a regular (special) Happy Hour instead: roast beef, potatoes *au gratin*, other good stuff. And good stuff to dance to, like *Sol Chavez*. Then later in the lounge, it's Al McCahon.

REASON — that 2407 members and guests have taken 44 trips to 21 places in the last six years is simply that Club trip packages are good deals. Try one and find out for yourself. Now "boarding" for the Caribbean, Greece, Mazatlan, and the Canary Islands. Sign up for Greece by July 16.

POLITICIANS — that they are, the NM Lobo people have recognized the highly successful season ticket sales by granting a \$5 discount to all buyers. Pay \$20 per ticket (before the 15th — the earlier you pay, the better your seat) and get a \$5 rebate when the tickets are distributed in mid-August. (Yes, those who bought tickets through the Club earlier will get rebated too.)

GET — into wilderness right. That's what you'll learn to do at Outdoors Indoors at 7:30 on the 12th when Backpacker *par excellence* John Southwick describes (and shows slides of) the places he's been and the lack of people he's seen. He'll be joined by Kathy and Dave Holland and by Doug Drumheller and his kids. So bring your kids too — backpacking is a family sport. Open to all, free to all.

SUCH — a sight, smell, and TASTE next Friday at Happy Hour! *Steak*. Ten-ounce New York strip steak. Or for the kids or for more petite appetites, eight-ounce chopped sirloin. Either way, baked potatoes, sour cream, green beans, varieties of salads. Only 300 of the New York strips ordered, so don't wait till 7:55 to hit the buffet line. \$3.75 or \$2.25 depending on steak choice. For dancing, *Charley B*. Later in the lounge, Tim and Paul.

FRIDAY	SATURDAY
9 — HAPPY HOUR ROAST BEEF BUFFET Adults \$3.25 Under 12 1.92 SOL CHAVEZ Al McCahon in Lounge	10 — VARIETY NIGHT <i>Puppets by Ron & Mary Kay</i> Disney's MAKE MINE MUSIC Food @ 6 Show @ 7 Free to Members
16 — HAPPY HOUR STEAK BUFFET \$3.75 or \$2.25 CHARLEY B Tim & Paul in Lounge	17 — SOUL SESSION 9 - 1 MIDNIGHT SPECIAL Members Free Guests \$1

STRANGE — new sight in the patio is a ping-pong/bandstand/whatever shelter (anything but tax) that measures 40' and 20' and 20' and 20' and you've got to see it to appreciate it.

BEDFELLOWS — (legally, of course) and their offspring are in for another fine Variety Night tomorrow. Ron and Mary Kay and their Populace of Puppets. A full-length, animated, vintage Disney movie, *Make Mine Music* too: see the feud of the Hatfields and the Coys, "Casey at the Bat," "Peter and the Wolf," and Willie, the operatic whale. For children up to seventy or so.

IS — a trip to Fiji and New Zealand beyond your means at the moment? Then try the next best: a Travelogue Night featuring those exotic locales as seen through the eyes and the camera lenses of Ed Neidel, Bob Donahue, the Carnicoms, and the Rainharts. At 7:30 on the 21st.

THEY — last from 9 to 1, they cost members nothing, and they feature groups such as *Midnight Special*. Soul Session is on the 17th.

ALL — you teenagers: come watch the *SUNSET* (not Kick) on the 22nd at 7:30 and make beautiful music together (not *that* together, you two in the corner). We're

kidding, really — kissing is something teenagers pay only lip service to. Tickets beforehand, parents.

USE — the patio for picnics every Wednesday. Finest grass around. Lowest ant density too. Come as cozy couple or cavorting crowd.

THE — D.O.W.'s are: Colt 45 next week, Heineken the week following. Try a new brew.

SAME — good deal this six months on Commonwealth movie tickets: \$1.75 for \$2.50 admissions. Eleven screens to choose from.

BUNK — is what we say to those members who feel Club Annual Meetings aren't important. Come on out and help to control the destiny of the Club. How? By voting for the Board member of your choice. Nominated so far: Louie Sisneros, Nancy Sanchez, Marv Plugge, Max Newson, and Ed Neidel (Sandia), Bob Monson (ERDA), and Frank Loomis (retirees). Other nominations from the floor if you wish. At 7:30 on August 2nd.

MORE INFO — 265-6791.



HAVE A PET PROJECT?
CALL US LAB NEWS
X-1053

● PUPPETS ● C-CLUB ● CANARIES ● CHARLEY ●



STAR SPANGLED B61, a "flyaround" unit prepared for aircraft compatibility and vibration testing, is displayed in the Coatings Lab, org. 3622-3, where the decorative paint job was the work of Bill Palmer. Unit will undergo flight tests in the F-111 at Tonopah Test Range and Eglin AFB. Test project group is (l to r) Bob Martin (4312), flight testing; Leland Stone (9481), telemetry; Dale Buchanan (4312), project engineer; Jim Lohkamp (4312), flight testing; Dale Massey (9411), aircraft coordinator; Pete Hernandez (9422), data reduction; Phil Young (4312), flight testing; and Larry Johnson (4323), aircraft compatibility.