

HF Laser Pulsed to New Peak Power Level

Using an intense beam of electrons, researchers at Sandia Laboratories have pulsed a hydrogen fluoride (HF) laser to record energy levels.

Excited by a 55-kilo-amp, 2-million-volt electron beam, the HF laser produced a 228-joule beam in a 55-nanosecond pulse — a power output of about 4-billion watts.

This output is some 45 times greater than the maximum energy level previously confirmed for an HF laser and makes the pulse one of the largest ever generated by a gas laser.

Experiments with the HF laser are a part of Sandia's research program using lasers and electron beams to simulate nuclear weapons effects and to explore the possibility of producing electrical power through laser fusion.

Sandia has in the past decade developed several of the nation's largest electron beam and x-ray machines, which it is now using in new laser excitation schemes.

The powerful HF laser beam was produced by firing a beam of electrons from the Labs' Relativistic Electron Beam Accelerator (REBA) into a 6-inch-diameter, 40-inch-long lucite tube containing a 10/1 mixture of sulfurhexafluoride (SF_6) and ethane (C_2H_6) held at slightly less than one atmosphere of pressure.

An axial magnetic field of 2000 gauss, applied through a solenoid, is used to improve propagation of the electron beam down the length of the tube.

When the electrons are directed into the end of the tube, they collide with the SF_6 molecules, detaching fluorine atoms. These highly-reactive free fluorine atoms then extract hydrogen atoms from the C_2H_6 molecules, forming highly-excited hydrogen-fluoride (HF) molecules possessing excess energy.

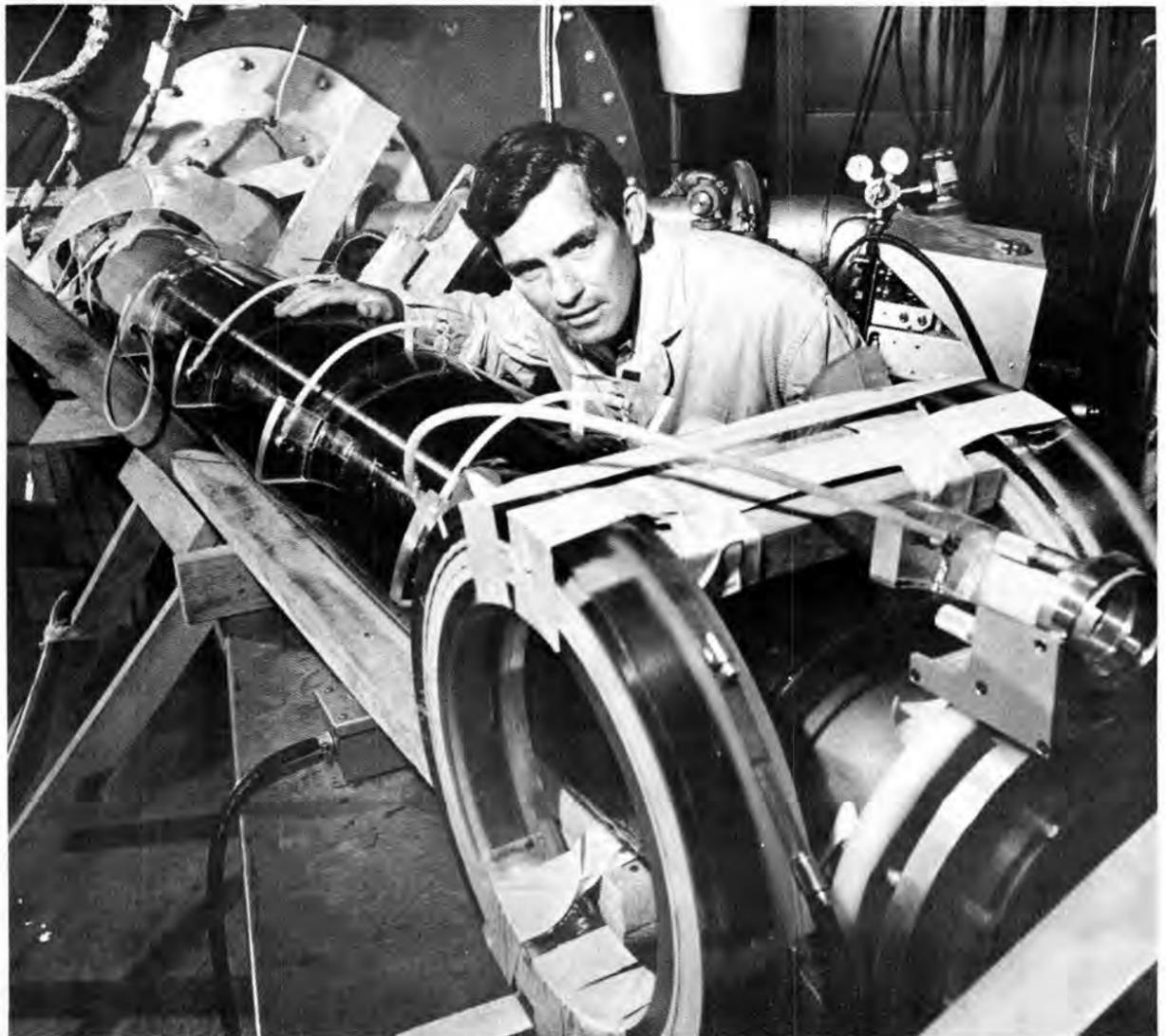
When these chemically-formed HF molecules decay back to the ground state, they emit their excess energy in the form of one or more photons which constitute the laser light.

The beam, which fills the entire interior of the tube, produces volume excitation of the gas and subsequently produces laser radiation in the infrared portion of the spectrum; the majority of the laser energy occurs in the wavelength region from 2.65 to 2.95 microns.

No effort has yet been made to focus this beam or to shorten the duration of the pulse. Both the beam diameter and pulse duration are quite large in comparison with those of some other pulsed lasers. Neodymium-glass lasers have, for example, produced outputs of 350 joules in very narrow beams with pulses lasting a nanosecond or less.

Sandia researchers feel the HF laser experiments are important in two respects: they further confirm the usefulness of electron beams in exciting laser action, and they demonstrate the efficiency of HF lasers themselves.

Electron beams have again proved during



HIGH-ENERGY HF laser at Sandia Laboratories, with end of electron beam accelerator in view in the background. Shown in the photo is Ed Patterson (5212), one of the principal investigators on the project.

LAB NEWS

VOL. 25, NO. 21

OCTOBER 19, 1973

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the experiments to be an efficient means of uniformly exciting large volumes of laser gases. The beams excite the gas without forming arcs, as is frequently the case with other excitation schemes.

Maximum efficiency of the HF laser in Sandia experiments to date is about eight percent — that is, eight percent of the beam energy deposited in the gas is converted to laser energy. This compares to about one-half of one percent or less for glass and iodine lasers, five percent for carbon dioxide lasers, and a potential of about 20 percent for xenon lasers.

Maximum theoretical efficiency of the HF system is approximately 24 percent, and the Sandia researchers are presently conducting experiments which they believe will bring the output of their device nearer to this efficiency.

These experiments involve bringing the electron beam into the side of the tube and then placing mirrors at both ends of the tube to form an optical resonator. The optical resonator should improve the quality of the laser radiation and make it possible to remove almost all of the available energy as laser light.

In laser fusion, efficiency of the laser will be of prime importance. As currently envisioned, laser fusion would involve irradiating a pellet of deuterium-tritium simultaneously with multiple laser beams, and

(Continued on Page Two)



JIM BUSHNELL (9532) checks out twin-coil magnetic detector on a 3000-lb. sample of highway concrete. The device helped resolve a controversy about the amount of rebar in a new stretch of I-25.

(See Article on Page Four.)

HF Laser Gains New Peak Power Level

imploding the pellet to 10,000 times liquid density. Large amounts of energy would be released when the heat of this action caused the nuclei to undergo fusion.

At present it is thought that 1000 to 10,000 joules of energy applied to a pellet in a pulse of one nanosecond or less would be sufficient to fuse enough deuterium nuclei to produce "laboratory breakeven power" — the amount of energy released by fusion equaling that deposited in the pellet by laser light.

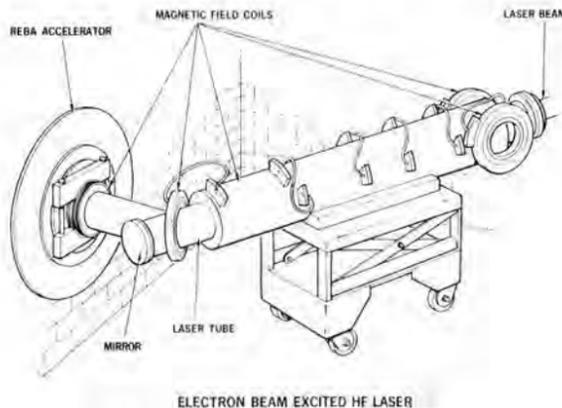
An actual laser-fusion power plant, using a laser of 10 percent efficiency, might require approximately 100,000 joules of laser energy in a properly shaped pulse to produce net output energy 10 percent greater than the input energy. Such a plant is thought to be several decades in the future, and laboratory breakeven to be five to 10 years away.

While Sandia researchers believe that the output of HF lasers can be scaled up to more than a 1000 joules by using one of the Labs' larger electron beam machines and by adding optical resonators, the laser is not regarded as one which will ultimately be involved in pellet irradiation. The beam lacks coherence, the pulse width is too broad, the wavelength is too long (0.3 to 0.5 microns is thought to be most effective for laser fusion), and the system has a high gain.

The high gain relates to the time the HF molecules remain in an excited state before decaying back to the neutral state. In the case of these particular molecules, this lifetime is short; the photons are emitted too soon to produce the energy buildup necessary to create a short, intense pulse of light.

The Sandia experimenters would like a low gain system in which the molecules remain excited for several hundred microseconds, instead of the few tens of nanoseconds in the high gain HF system.

The researchers believe that gas lasers with such low gain characteristics can be produced, and are presently evaluating several gases which show the greatest potential for laser fusion. Their ultimate objective is to produce a



short wavelength laser beam capable of delivering 10,000 joules of energy in a one-nanosecond pulse. They believe that high-energy electron beams may be the most promising excitation scheme for the high-energy gas lasers of the future.

Principal investigators on the HF system are Bob Gerber and Ed Patterson of the Laser Physics Research Department, 5210. Earlier work on the system was carried out in conjunction with R.J. Jensen and L.S. Blair, Los Alamos Scientific Laboratory. Joint investigations on excitation of mixtures of H₂ and F₂ with electron beams will be conducted with Los Alamos scientists this fall.

Take Note

The Sandia Search Team, a non-company sponsored ground search group, has openings for new members. The team is composed of persons, chiefly employees and former employees, with hiking/backpacking experience who are willing to be on call 24 hours per day to assist in searches for lost persons throughout the state.

If you are willing to donate your time to participate, call Bob Wemple, 4-6477; George Staller, 4-6663; or Bruce Varnado, 4-2031 for details.

* * * *

Herbert Sutherland (5163) will be the 5100 seminar speaker Tuesday, Oct. 23, Bldg. 806/201 at 8:30 a.m. He will present "Dispersion of Acoustic Waves by Fiber-Reinforced Viscoelastic Materials."

* * * *

The Institute for Certifying Secretaries, a department of the National Secretaries Association (International), has announced Nov. 15 as the application deadline for the Certified Professional Secretary (CPS) examination in May 1974.

The two-day examination, given annually, consists of six parts: environmental relationships in business, business and public policy, economics of management, financial analysis and the mathematics of business, communications and decision making, and office procedures.

For more information contact Helen Payne (2111), 264-2915.

* * * *

Enjoy making models? Like a place to display them? Albuquerque DOT is planning a "History of Transportation" exhibit for the Airport, and they need samples of all kinds of vehicular models — or a willingness to build some. Call Al Goodman at 766-7894 if you're interested.



THE FIRST ARMY OFFICER to join Sandia for a two-year stint is Maj. Nick Barron (right). Here discussing the new DOD Officer-Sandia MTS Program with Glenn Fowler (1000), Nick will work in the Systems Development Department 1530.

Mini-Invasion

Army Officer Joins Sandia

In a first-of-its-kind-at-Sandia arrangement, Maj. Nicholas Barron is beginning a two-year assignment as a member of Sandia's technical staff. He's working in Phase 1 and 2 Activities (Division 1531) under Ray Reynolds in the Systems Development Department. The program is designed to provide selected DOD officers "with scientific and laboratory experience at a level commensurate with their educational and professional qualifications."

It seems like a good match. Nick has completed all the course work toward a PhD in nuclear physics at Louisiana State University. "I'm working in an area," he says, "where I can use both my educational and my Army experience. I'm hoping to make a real contribution here, and I'm sure I'll be able to fulfill my responsibilities to the Army better when I go back."

Several Sandians were involved in the negotiations culminating in Nick's assignment. Jack Howard (2) suggested the program to the Services. Harlan Lenander (1600) signed the official agreement with Col. Roy Lounsbury, Commander of the Army's Nuclear Agency at Fort Bliss where Nick is officially assigned. Ivan Moore (1610) handled the necessary liaison.

Nick is the first but he may not be the only one for long. An agreement with the Navy was recently signed, and the Air Force is considering a similar arrangement.

Nick, welcome to Sandia.

Sympathy

To Laurence (7333) and J.A.C. Chavez (7212) on the death of their mother in Albuquerque, Sept. 26.

To Lloyd Merrell (1535) on the death of his mother in Albuquerque, Oct. 10.

To Cosme Lovato (7518-4) on the recent death of his brother in Phoenix.

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OCTOBER 19, 1973



LAB NEWS

Published every other Friday

SANDIA LABORATORIES

An Equal Opportunity Employer
ALBUQUERQUE, NEW MEXICO
LIVERMORE, CALIFORNIA
TONOPAH, NEVADA

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ZIP 87115

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as does norma taylor while
bill laskar takes/makes pictures
&

in livermore lorena schneider does all

LIVERMORE NEWS

VOL. 25, NO. 21

LIVERMORE LABORATORIES

OCTOBER 19, 1973

Sandian Awarded Commendation Medal



Glen Otey, supervisor of Systems Development Division 8362, was recently awarded the Navy Commendation Medal in ceremonies at the Alameda Naval Air Station.

A Commander in the Naval Air Reserve, Glen received the medal for meritorious service while serving as Commanding Officer of Helicopter Anti-Submarine Warfare Squadron 85. During Glen's 18-month tenure as Commanding Officer, the squadron participated in several International Operations with Canadian and French vessels, rescue fire operations and rescues of stranded mountain climbers in the Sierras. The squadron also received a Navy award for its Excellence in Safety.

Glen served in the Navy as a pilot from 1955-60 and subsequently has been in the Naval reserve. He has a BS degree in nuclear engineering from Mississippi State University and an MS in mechanical engineering from Tulane University. Since joining SLL in 1966, he has been involved primarily in vulnerability testing, preliminary design and systems development, and in 1969 was promoted to his present supervisory position.

Retiring



Frank Bacon (8257)

Funny, You Don't Look Livermorian

Where do all those people in the parking lots come from?

A recent Labs survey indicates that our population, not surprisingly, is scattered throughout the Bay Area and into the interior valley. Of 877 employees on roll, 717 or 81 percent live in the local area — 672 in Livermore and 45 in Pleasanton.

Of the remaining 160 employees, 36 (over 4%) reside in the Hayward/San Leandro area; 29 (3.3%) in the San Ramon/Danville area; and 13 (1 1/2%) in the Fremont/San Jose area. Twenty-eight (3.2%) live in Manteca, Stockton and Tracy; 16 (1.8%) in the Concord/Walnut Creek area; and 11 (1.2%) in Berkeley and Oakland. The other 27 hail from various outlying locations.

New Roll Control Capability Devised for Reentry Vehicles

After a three-year immersion in the diverse perplexities of reentry-vehicle roll control, John Kryvoruka and Jerry Henderson of Systems Development Division 8362 and former Sandian Jerry Weber came up for air surrounded by the sweet-smelling aura of success.

What they surfaced with is the first fully workable spin-fin roll control system, a system that stabilizes the roll rate, and thus the flight trajectory, of reentry vehicles. They also came up with the full analytical capability to predict flight performance and describe all the environmental factors that affect the in-flight behavior and survival of any movable-finned RV. It's not only a contribution to the technological community, but a considerable boost as well to Sandia's capabilities in RV systems design.

The roll control system consists of four small fins, two fixed and two movable, mounted on the aft surface of the cone, and powered by a driving mechanism inside the cone. The fixed fins improve aerodynamic stability, while the movable ones, actuated by the very centrifugal force that is produced by vehicle spin, rotate in unison to bring that spin under control at a prescribed rate. Any slowdown or speedup in that rate acts on internal sensing masses (movable weights) which immediately induce an opposing fin cant that returns the rate to normal.

Some spin is necessary to compensate for unavoidable asymmetries in weight distribution or slight deformities in shape; but now the hardware can be designed to get a particular rate decided upon beforehand.

Jerry Weber and Cliff Yokomizo were co-inventors of the system concept, while Jerry Henderson developed the necessary hardware. The analytical capability to predict the flight performance and describe the dynamics involved was the responsibility of John. In addition, John was lead engineer for one of the successful flight tests which proved the viability of the hardware and verified the analytical models.

"Agreement between the actual and the predicted flight performance was excellent," comments John, "and we now have the analytical tools needed to design for any future vehicles that may use movable fins. The analysis of hypersonic, movable-finned RV's, and the technique for describing them analytically is a brand-new capability. The techniques that already existed wouldn't have supplied the design information needed to build this system. For instance, they wouldn't have shown us that we needed the two fixed fins. Now we can model fully all of the non-linear aerodynamic effects involved, as well as the aerothermodynamic and flight-dynamic effects."

The basic problem which first gave rise to the program is that all RV's with small asymmetries suffer from irregular roll-rate behavior. That is, they show large variations in spin rate; and when the spin rate reaches the natural frequency, at which the vehicle tends to wobble in flight, a resonance occurs and the RV attains large angles of attack. This will cause the vehicle to go wide of its target or, if severe enough, even to break up in flight.

Sympathy

To Donald C. Beard (8312) on the death of his mother in Livermore, Sept. 23.

To Willard W. Irwin (8421) on the death of his stepfather-in-law in Livermore, Sept. 22.

To Gabe Gutierrez (8433-1) on the death of his father in Stockton, Sept. 25.

To Ferne Graves (8433-3) on the death of her mother-in-law in Detroit, Mich., Sept. 27.

To Kirby Hammond (8424) on the death of his father in Pana, Ill., Oct. 4.

Emergency Blood Bank

RESULTS — 118 PINTS

Our Sincere Thanks
to all those who
contributed to a
very worthy cause



VISITOR — New DOD Director of Defense Engineering and Research, Malcolm Currie (right), met recently with vice president Tom Cook (8000) during his first visit to LLL since being named to the DOD post formerly held by John Foster.

Sandia NDT Technology Helps State Highway Department

Recently, Sandians of the Nondestructive Testing Technology Division 9352 designed, built and tested a handy little device which enabled the State Highway Department to locate some controversial steel rods (rebar) in a 4½-mile section of I-25.

The problem that had stymied the State Highway inspectors using conventional metal detectors was the magnetic minerals in the aggregate of the concrete — not that the magnetic content was high, it wasn't, but there was a lot of aggregate in relation to the small amount of rebar. The small rebar signal in conventional detectors was overwhelmed by the large amount of background noise.

To overcome this problem, Jim Bushnell and Jerry Stoker of Division 9352 devised a twin-coil differential eddy current system.

After the request for assistance came from the State Highway Department, Division 9352 asked for a sample of the concrete containing rebar be made available to them. It was. The state delivered a 3000-lb., 3'x10'x8" slab to the NDT lab in Bldg. 860.

"We made preliminary magnetic and conductivity measurements of the sample," O'Neill Burchett, Division 9352 supervisor, says, "and the solution was immediately ap-

parent, well within established NDT technology."

The Sandians fabricated two 10-inch copper coils by hand and potted them in resin. The coils were balanced in a bridge circuit with four potentiometers, a phase shifter and detector. The device was incorporated into a little cart resembling a child's go cart. The system then was connected to a standard strip chart recorder.

The device worked perfectly. The aggregate was reasonably distributed beneath the two coils and, its magnetic effect was balanced out. The rebar, however, produced a large unbalance first in the leading coil and then again in the second coil as the cart passed over. The Highway Department took core samples from the concrete on several of the first rebar locations to check the system. The device was accurate within a fraction of an inch. The entire stretch of highway (nine miles down and back) was covered. The strip chart data is now being analyzed by the Highway Department.

"We were happy to provide the assistance," O'Neill says, "although we were careful not to get involved in the controversy about the rebar specifications. We just provided the technology."

For Sandia Draftsmen

TV Course Features Bill Sefcik

The TV program comes on with a swinging beat and jazzy titles. It's a split screen effect with the left side a montage of modern electronics hardware while the right side shows a hand swiftly and neatly drawing hieroglyphics.

Hieroglyphics? No, on second glance those are circuit symbols and that friendly gentleman there is not Walter Cronkite but Bill Sefcik of Project Design Definition Division 7614.

Bill and Motion Pictures-Video Services Division 3153 have recently completed videotaping in color some 28 lectures, a course called "Electrical and Electronics Drawing" specifically designed for Sandia draftsmen. The taped lectures are supplemented with a workbook with references and exercises which Bill also prepared. In all, it's quite a package — the complete Sandia system of electrical and electronics drawing preparation, symbols, standards and uses.

Bill has been teaching the basic course in Sandia in-hours and out-of-hours educational programs periodically since 1959. He's had a lot of experience as a draftsman. He transferred to Sandia in 1957 after working many years with Bell Laboratories.

The 28 lectures were taped over a period of several months using the facilities of Division 3153 in Bldg. 863. George Skinner was director of the program.

"It was quite an experience," Bill says. "Talking to a TV camera is not the same as talking with students. We covered a tremendous amount of material with supplementary visual aids, illustrations, charts, figures and sample components. Here, the camera was a distinct advantage over the classroom because of the closeup views that were possible."



BILL SEFCIK (7614) with Bill Sefcik.

Currently some 15 students are taking the in-hours course using the TV monitors and tape cassette systems of the training organization in Bldg. 632. The tapes are also available to individuals who may schedule a session at their convenience.

Now that the lengthy project is completed, there's just one thing that bothers Bill.

"Wish my 11 grandchildren could see me on TV," he says.

100%-Plus for United Way — Sandians at Las Vegas Set New Contribution Record

The highest per-employee contributions for any employee group in Las Vegas have been reported for Sandians supporting the Southern Nevada United Way campaign by payroll deduction.

With over 100% participation (one of the 43 employees giving the United Way lives in Tonopah instead of Las Vegas) the Sandians pledged an average of \$78 for a total of \$3,380.

Sam Moore, Tonopah Test Range department manager, was jubilant.

"It took a little doing to top the 100% participation reported by the Sandians at Pantex," he said, "but we managed." The Amarillo group still claims a slight edge in per employee giving, however, at just over \$80 each.

Albuquerque and Livermore reports for ECP and LEAP participation will be reported in the next issue of Lab News.

Authors

M.E. Riley (5211), "Strong-Coupling Semiclassical Methods. The Average Approximation for Atom-Atom Collisions," Vol. 8, No. 2, PHYSICAL REVIEW A.

R.W. Rohde and T.V. Nordstrom (both 5531), "Stress Relaxation of a Copper-1.87 wt. % Beryllium Alloy," Vol. 12, Nos. 3-4, MATERIALS SCIENCE AND ENGINEERING.

Congratulations

Mr. and Mrs. Tom Picraux (5111), a daughter, Jeanine Irena, Sept. 26.

Mr. and Mrs. Dennis Schalles (7146), a son, Kelly Scott, Oct. 6.

Mr. and Mrs. Robert Cox (7146), a daughter, Deann Lorraine, Sept. 8.

Recreation Notes

FUN & GAMES

4200 Golf

Ernie Peterson (4220) was the low net winner of the recently held 2nd Annual 4200 Fall Golf Classic. Ernie edged out Duane Hughes (4232) by one stroke. Emma Hollingsworth (4256) won the low gross/low net in the women's division.

* * * *

Free Movies

Hockey, skiing or football fans should note the dates of these color films to be shown in Bldg. 887, rm. 121, 12:20 p.m.:

Oct. 24 — "Ski Boom," 28 minutes — A visit to some of the largest ski areas in the Rocky Mountains.

Oct. 31 — "The Name of the Game Is . . . Hockey," 28 minutes — 15 NHL stars demonstrate and explain some of hockey's basic skills. Includes exciting NHL game action sequences.

Nov. 14 — "Super Bowl VII," 27 minutes — Super highlights of Miami over Washington in the Super Bowl at Los Angeles.

Films obtained and shown by Bill Stamm (7543).



feed *back*

To get a response to your comments and questions about Sandia Labs, complete a Feedback form (available near bulletin boards) and return it to the Feedback administrator. Answers to topics of general interest are published in LAB NEWS.

Thus far, 189 questions have been submitted to the program. Here are the first few topics chosen for their wide interest.

Q. Western Electric, after many years of involvement with defense work, chose not to renew its contract for work on the Sprint-Spartan Safeguard system. When does Western's contract with the AEC to operate Sandia expire? Is Western likely to renew it?

A. It expires Dec. 31, 1973. All parties have indicated an interest in continuing the contract. Negotiations of the terms and conditions of the renewal are now being carried on by AEC, Western, and Sandia.

—C. T. Ross, Jr. (6000)

* * * *

Q. Eastbound traffic on F Street approaching Wyoming forms two lanes. But only the left-turn lane has a sensor to change the traffic light from red to green; the straight-ahead/right-turn lane can wait all day. Why not a sensor in both lanes?

A. After a discussion with Sandia Security, KAFB Security Police placed the necessary work order last spring. The work is now scheduled for October or early November.

—L. J. Heilman (9500)

* * * *

Q. Why are the buses parked at Gate 1 at 5 p.m. allowed to keep their motors running? The fumes are so bad I can hardly breathe.

A. City buses are old and would lose the air pressure necessary to operate the brakes if the engines were shut off; it would take several minutes of idling to build up pressure again. The chartered buses do kill their engines if air conditioning or heating systems are not required.

—K. A. Smith (3100)

* * * *

Q. A lot of people are apparently ignoring the "car pool parking only" signs. I was told there was no use reporting habitual violators as nothing would be done anyway. Fix the system or forget it.

A. Admittedly the system is imperfect, but efforts are being made to improve it. The honor system is still regarded as most appropriate for this operation, but spot checks are being made to see whether additional controls are needed. Meanwhile, the employee transportation committee which has been looking into ways of encouraging more car pooling and other ways of reducing pollution is working on a better system of matching potential ride sharers. They are considering a car pool registration system, including a numbered card which would be clipped to the sun visor, visible to anyone monitoring reserved spaces. The committee welcomes practical suggestions for improvement of the plan. As mentioned in the Sandia Bulletin announcing the plan (Aug. 8), employees may call the Security Lieutenant, ext. 3155, to report habitual abusers of the reserved parking areas. Give the decal number and location of the vehicle and a warning notice will be sent to the violator.

—K. A. Smith (3100)

Q. In spite of the campaign to reduce electrical power, I've occasionally noticed that the street lights between Bldg. 840 and the library are on during the noon hours. Why?

A. Once a month, the maintenance organization operates the diesel-powered standby generators under full load for eight hours in order to prove the reliability of the equipment in case commercial power is interrupted. For security reasons all fence and street lighting is connected to the standby power plant. (Occasionally too, the pole lights are turned on to permit maintenance personnel to check for burned-out bulbs.) Plant Engineering hopes to reduce the number of hours these lights must burn during test period from eight hours to one per month. At the same time we are working with Security to reduce the total number of lights burning each night. Expect a decision in 30 days or so.

—R. E. Hopper (7500)

* * * *

Q. I don't have an account with the Credit Union so they won't sell me a bus pass. How can I get one so I won't have to continue driving my car or looking for correct change?

A. Only about 200 employees are not members of the Credit Union, so we did not anticipate your problem. Unfortunately, federal regulations do prohibit the Credit Union from providing services to non-members. However, two of the bus companies assure us that you may purchase passes from their drivers. The Albuquerque Transit Co. will sell you a pass at their office at 619 Yale SE.

—D. S. Tarbox (4200)

Events Calendar

- Oct. 19-21 — Ski Swap, Sandia Peak Ski Patrol, State Fair Grounds.
- Oct. 19-20 — Albuquerque Symphony Orchestra presents "Fiesta Espanola" with Jose Greco, Popejoy Hall, 8:15 p.m.
- Oct. 19-21, 23-28, 30-31 — Albuquerque Little Theater, "Send Me No Flowers," 8 p.m.
- Oct. 20 — Garage Sale and Neighborhood Arts Festival at the ANB parking lot, 6th & Lomas; 10 a.m. - 5 p.m., co-sponsored by the Albuquerque Arts Council.
- Oct. 20 — Football, UNM vs. UTEP, 1:30 p.m., UNM Stadium.
- Oct. 21 — Travel Adventure Films, "Soul of India," Popejoy Hall, 7:30 p.m.
- Oct. 21 — KHFM Opera of the Week: "Prince Igor," Oct. 28 — "Carmen," 6:40 p.m.
- Oct. 21 — ASUNM Lecture Series: Senator William Proxmire, SUB Ballroom, 8 p.m.
- Oct. 23 — Cultural Entertainment Series: Broadway musical "Grease"; Oct. 26 — Budapest Symphony, Popejoy Hall, 8:15 p.m.
- Oct. 25 — Audubon Wildlife Films: "The Living Jungle," Popejoy Hall, 7:30 p.m.
- Oct. 31 through Dec. 2 — Museum of Albuquerque and Albuquerque Designer-Craftsmen present "CRAFTS 5".
- Nov. 1-2 — Holiday Idea Show, Flower and Industrial Bldg., State Fair Grounds, 9 a.m.

REMINDER

Daylight Saving Time ends at 2 a.m., Sunday, Oct. 28. Turn your clock back one hour.



PSYCHO-CYCLIST — The hairy hazard doesn't believe in stop signs or common sense or Sharon Erickson (5112). She knows better — stop signs are for stopping.

Credit Union Reporter

by Bill Prekker

The Credit Union brochure covers real estate and mobile home loan policies only in broad terms, and I've been asked several questions on the subject. Here is more details about these loans.

FIRST MORTGAGE LOANS are made on improved property up to the legal maximum repayment period of 120 months. The minimum loan amount is \$400, and the maximum loan amount is 75% of the appraised value. The annual rate of interest on these loans is 7.2%. Fire and extended coverage insurance is required for no less than the amount of the loan with the Credit Union as loss payee; proof of insurance must be furnished. The policy on unimproved property is the same except that the maximum repayment period, as currently established by the Board of Directors, is 84 months.

SECOND MORTGAGE LOANS are restricted to residential property, and the maximum loan value is the difference between the first mortgage balance and 75% of the appraised value. Again, minimum loan amount is \$400; the annual rate of interest is 8.4%, with a maximum repayment period, as established by the Board of Directors, of 60 months. Fire and extended coverage insurance is required for no less than the total of the first and second mortgages. The Credit Union must be shown as the second loss payee, and proof of insurance must be furnished. If the first mortgage is held by the Credit Union, the terms and conditions for first mortgage loans will apply. All second mortgage loans must be submitted to the Credit Committee for action.

FHA TITLE I LOANS are granted for the purpose of property improvements. Limits imposed by law are a maximum repayment period of 84 months and a maximum loan amount of \$5000. The minimum loan is \$500. Annual rate of interest on these loans is 8.4%, which includes the FHA insurance factor. It should be pointed out that an FHA Title I loan can be made as quickly as any other loan under our immediate loan service, as these loans do not require approval of the FHA. Generally speaking, the Credit Union's security on these loans is the FHA guarantee; however, additional mortgage security may be required at the discretion of the Loan Officer or Credit Committee.

MOBILE HOME LOANS are made up to the legal maximum repayment period of 120 months. The minimum loan amount is \$400, and the maximum loan amount is 75% of the list price on new units and Blue Book loan value on used units. The annual rate of interest on these loans is 8.4%. Proof of insurance or an insurance agreement signed by the borrower may be required at the discretion of the Credit Committee.



We Do Business in Accordance With the Federal Fair Housing Law

IT IS ILLEGAL, BECAUSE OF RACE, COLOR, RELIGION, OR NATIONAL ORIGIN, TO:

Deny a loan for the purpose of purchasing, constructing, improving, repairing or maintaining a dwelling or discriminate in fixing of the amount, interest rate, duration, application procedures or other terms or conditions of such a loan.

IF YOU BELIEVE YOU HAVE BEEN DISCRIMINATED AGAINST, YOU MAY SEND A COMPLAINT TO:

Assistant Secretary for Equal Opportunity,
Department of Housing and Urban Development,
Washington, D. C. 20410
or call your local HUD Area or Insuring Office



Essex Test Series

Explosions Are For Monitoring

Detonate a 20-ton nuclear explosive 40 feet underground and you leave a crater. That's easy. But how big? What shape? How much blast and radioactivity gets out? What's the difference whether the hole is unstemmed (left open), stemmed (filled in), or partially stemmed (as it would be if the charge were delivered via earth penetrator)?

Because nuclear tests of this sort are precluded by the Limited Test Ban Treaty, these questions must be answered by calculations using hydrodynamic computer codes available at Sandia (and elsewhere). The codes provide a mathematical model of a portion of the ground in which a high deformation, high velocity event — like an explosion — occurs. How well the code models the real world is determined by calculating a high explosive detonation, then comparing those results with measurements made on a real high explosive burst.

Verifying the accuracy of the code calculations is the principal purpose of the Essex test series, located on Peason Ridge within Camp Polk in the north central part of southwest Louisiana. Here the Army's Explosive Excavation Research Lab, a part of the Engineers Waterways Experiment Station, is detonating four underground shots, each with 20,000 pounds of gelled nitromethane which simulates a 20-ton nuclear charge. Sandia sponsored the second shot and, on a reimbursable basis, is handling most of the instrumentation for the three DNA-sponsored shots as well.

While the other shots in the series were either stemmed or unstemmed, the Sandia-sponsored one was partially stemmed — an eight-inch hole was left open from the 10-foot diameter cavern housing the explosive to the surface. This configuration provided an opportunity for Max Newsom's Exploratory Systems people (5724) to ascertain the feasibility of earth penetrators as delivery vehicles. Curt Moses was the technical project

WHAT'S THIS got to do with computer codes? Blast effects and crater shape and size were first simulated on computer, then checked against the real thing — a 20,000 lb. high explosive shot, part of the Essex test series in Louisiana.

liaison man involved. He replaced Jim Rupley (who left the Labs last spring and was recently killed in a freak accident while piloting a high-speed experimental train in Colorado).

Luke Vortman, assisted by Jerry Long (both 1111), and Bob Beyatte (9425), is in charge of analyzing the data so that it can be compared with Lynn Tyler's computer code simulation of the Sandia shot. Related calculations are also being done by Marshall Berman (1112). The Army and the AEC are interested in underground nuclear explosive shots as a possible means of damaging targets while minimizing collateral effects of blast and radioactivity. "We're interested," says Luke, "because it gives us a chance to test, and if necessary modify, our codes." One of the codes, CSQ, was originated by Sam Thompson (5162); the other, Dorf-9, was adapted to Sandia needs by Tyler and Harvey Ogden (1111).

"Preliminary data on the first two shots show reasonably good correspondence between our predictions and the actual shot effects," says Luke. "And this in spite of the lack of uniformity in the soil we were working with. It's much easier, of course, to make accurate predictions when the event occurs in homogeneous soil; the Louisiana site is a mixture of clays, sands, and shales that are not stratified in the usual horizontal layers."

Deciding, therefore, where the various gages should be placed around ground zero to provide an accurate picture of above and below ground results was a challenging task. The Sandians who made these decisions and recorded the signals during each shot include Jack Beyeler, John Birdsong, Dick Oliveira, Steve Winters (all 1115), Cliff Kinabrew, Bob Morris (both 1116), Bobby Holt (1232), and Brad Shaw (9443). The photograph here was taken by Bill Foy; Dale Fastle and Gene Moore (all 9412) also were involved in documentation photography. • bh

Speakers

R.A. Benham (9321) and T.A. Duffey (1544) "Experimental Theoretical Correlation on the Containment of Explosives in Closed Cylindrical Vessels," International Conference of the Center for High Energy Forming, July 9-13, Vail, Colo.

G.A. Samara (5130), "Recent Studies on the Effect of Pressure on Ferroelectric Properties," New York University, Sept. 5; Oxford University, England, Sept. 7; and Univ. of Ljubljana, Ljubljana, Yugoslavia, Sept. 20.

D.B. Longcope (5722), "Pulse Propagation in an Inhomogeneous Medium," (PhD thesis, obtained at Stanford Univ. through DSP), Sandia Labs, Bldg. 802, Rm. 229, Sept. 5.

M.L. Knotek (5155), M. Pollak (U. of Calif.), T.M. Donovan (Michelson Labs), "The Structure of the Pseudogap of a-Ge"; Knotek, Donovan and J.E. Fischer (U. of Penn), "Absorption and Transport Studies of Amorphous Ge," Fifth International Conference on Amorphous and Liquid Semiconductors, Sept. 3-8, Garmisch-Partenkirchen, West Germany.

R.J. Baughman (5154), "The World of Synthetic Crystals," Eldorado High School, Sept. 19, Albuquerque.

J.M. Hueter (3131), "Creativity-Choice or Chance?" New Mexico Personnel Association, Sept. 20, Albuquerque.

J.L. Jellison (5533), "Liquid Metal Embrittlement of Plated Parts," IMOG Sub Joining Group meeting, Sept. 18-19, LASL.

R.K. Byers (5166) and S.L. Gordon (Naval Air Dev. Center), "Analysis of a Multi-Layered Spherical Head Impact Model," National Conference on Mechanical Vibrations, September 1973, Cincinnati, Ohio.

J. Chang, P.A. Miller and G.W. Kuswa (all 5242), "Laser Plasma Aided Electron Beam Concentration," JOWOG-6 Meeting, Sept. 10-14, Sandia Labs.

A. Owyong (5214), "Nonlinear Refractive Index Measurements in Laser Host Media," L-2 Division Symposium, Sept. 11, LASL.

L.S. Nelson and C.J. Northrup, Jr. (both 5324), "The Effect of Increasing Oxygen Pressure on the Luminosity of the Metal Photoflash Reaction," University of Poitiers seminar, Sept. 24, Poitiers, France, and Phillips Research Laboratory, Sept. 28.

C.W. Peterson (5645), "Mean Flow Measurements in Hypersonic Turbulent Nozzle Wall Boundary Layers," and "Modernization of Sandia Laboratories' Trisonic and Hypersonic Wind Tunnels," Supersonic Tunnel Association meeting, Sept. 24-26, Bedford, England.

G.C. Nelson (5526), "Classical Scattering Cross Sections for Olab=90°," 1973 ISS Users Conference, Sept. 24-26, Brainerd, Minn.

J.E. Houston (5114), Invited Paper, "Dynamic Background Subtraction and Its Application to Soft X-Ray Appearance Potential Spectroscopy"; G.E.

Laramore (5151), "Atomic Structure of Adsorbed Overlayers," Third National Vacuum Meeting International Conference on Surface Phenomena, Sept. 24-29, Madrid, Spain.

J.A. Copper (2126), "The Sandia Laboratories/AFWL In-Flight EMP Handbook"; D.A. Dahlgren (4712) and C.N. Vittitoe (5223), "A Model of the EMP Environment Seen by a Satellite"; R.D. Jones (9353), "Diffraction of Planar Electromagnetic Waves by a Slot," Joint Electromagnetic Pulse Technical Meeting, Sept. 25-27, AFWL, KAFB.

R.H. Marion (5165) "X-Ray Determination of Residual Stresses - Types and Anomalies," invited paper at the 1973 Materials Engineering Congress, Oct. 1-4, Chicago.

J.E. Houston (5114), R.D. Bland and D.M. Mattox (both 5526), "The Role of Surface Cleanliness on the Properties of Films Deposited by Ion Plating techniques," International Conference on Sputtering and Its Applications, Oct. 2-5, Montpellier, France.

W.P. Schimmel, Jr. (1543), "A Vector Analysis of the Solar Energy Reflection and Collection Process"; W.H. McCulloch, R.B. Pope and D.O. Lee (all 1543), "A Solar/Hydrogen Energy System," Annual Meeting of the U.S. Section of the International Solar Energy Society, Oct. 3-4, Cleveland, Ohio.

T.B. Sherwin (3160), "Private Sector Fight Against Cancer," Albuquerque Rotary Club, Sept. 6.

A.D. Swain (1642), "Motivation of the Volunteer Worker," Sandia Civitan Club, Sept. 7.

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Deadline: Friday noon prior to week of publication unless changed by holiday.
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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 AEC 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

4 EA NEW Appliance Industries 14x7 machined wire mag wheels, 5 1/2" RH lugs, \$130. Asturias, 299-1175.

BEDROOM SUITE, Bassett, black lacquer w/white grain, jointed wood construction, dust proof, bed, 2 dressers, bookcase headboard, \$150. Anderson, 299-7782.

O'KEEFE & MERRITT built-in dishwasher, \$25. Bonzon, 296-3022 after 6.

.45 CALIBER AUTOMATIC pistol, 300 rounds of match quality ammo, lots of .45 cal. brass, \$75. Driscoll, 296-6730.

KELVINATOR refrigerator, \$30. Chavez, 444 San Pablo SE, 265-2242.

WASHER & DRYER, Westinghouse model L124, \$75. Komarek, 281-3826.

AIR MATTRESS; thermos jug; elec. motor & grinder. Snelling, 268-5895.

AMPEX STEREO SYSTEM, recorder/reproducer model 2000 series w/2 wide range frequency 1000 series speakers, 14 rolls of tape, \$225. Felzman, 344-2029.

SKIS, Innsbruck, 77"; Cubco bindings; Henke lady's boots, 8 1/2B; never used, \$75 the package. Turner, 299-0704.

SEARS 10" table saw w/20" table extension, 3/4HP motor, on stand, \$100. Snyder, 268-0679.

TENT, 9x12, new; Coleman stove; playpen; misc. baby items; several types traverse rods; camp heater; camp lights. Otts, 299-3423.

HIGH CHAIR, \$7; folding wooden playpen, \$15. Caffey, 296-3320.

BACKPACK, \$5; flight bag type suitcase, \$5. May, 299-2624.

LAMPS, glass bases, 1 amber, 1 avocado, 39" high, \$20 ea. Stewart, 299-3679.

ALUM. SCREEN DOOR, 36"x80" w/auto. closure & hardware, \$10. Neeley, 294-6372 after 6.

MAPLE furniture: desk, \$40; coffee table, \$25; end table, \$20; night stand, \$30; kitchen table, maple-grain formica, leaf, \$45. Owens, 256-0606.

ELECTRIC WINCH w/roller guides & 200' cable on drum, 3000-lb.-pull, reversing switch & brake, \$175. Szymanski, 256-1708.

AMMO: .38 spec. 148gr W.C. match, \$5/box; 158gr RN std., \$4.50/box; 148gr W.C. reloads, \$2.25/box; match brass .308, 2 cents each. Ristine, 298-8383.

115 VOLT, 1/2 HP elec. motor, multi-speed 8.5 amp, 60 cycle rpm, 1725/1140 thermally protected, \$35. Griffin, 298-1174.

7-17.5 TIRES mounted on Ford 8 stud wheels, 3 highway treads, 2 snow, \$15 ea. Hartwigsen, 298-1071.

LYMAN POWDER MEASURE, \$13.95 (new \$21); Pacific oil damped powder scale, \$12 (new \$18.50). Baxter, 1610 Bayita Lane NW, 344-7601.

SKI BOOTS, Lange std. 1969-70 model, man's 9M, \$30; warm-up pants, Obermeyer, floral pattern, man's M/woman's L, \$15. Keeling, 268-2275.

REFRIGERATOR, Frigidaire, med. size. Champion, 299-0163.

TRASH COMPACTOR, used only once, sell for \$85 or best offer. Holmes, 898-8146.

CHAIN SAW, 36" McCulloch commercial, \$100; 14" rims for Chev.; 16-gal. powder can. \$2.75. Dean, 299-3281.

CAMPER OVER CAB w/new boot-passage to cab, sink, stove, oven, ice box, butane & water tanks, sleeps 4, \$675. Placek, 898-4625.

SYLVANIA stereo/AM-FM radio in cabinet, stereo needs minor repair, \$50; push lawn mower, misc. lawn equip. Peters, 898-1238 after 5.

TIRE CHAINS, fits 8.25-14, 7.50-15 plus other alpha-numeric codes, \$10. Stirbis, 299-5363.

LAPIDARY OUTFIT, horizontal, 10" diamond saw & cast iron lap, 8" sanding, polishing wheels, many accessories, \$170 value, sell for \$120. Womelsduff, 299-6269.

STATIONARY bicycle exercisor,

\$25; Johnson's floor polisher, \$5. Grant, 255-6105.

BABY CRIB w/mattress, \$25. Loukota, 294-7353.

LADY'S RING, diamond weight 0.41 points, \$100; full height living room curtains, Indian motif, cover approx. 25' wall, \$50. Swaerengen, 255-5881.

RADIO-PHONO comb. console, Crosley, \$50. Kent, 4613 Burton SE, 256-1221.

CHAIN SAW, McCulloch Mini Mac 6, auto., new, \$125. Toya, 898-0491.

HUMANIC foamed ski boots, size 8, used 1 season. Sundberg, 299-2134.

TRANSPORTATION

DUNE BUGGY, sell or trade for 125cc dirt bike, buggy is modified Plymouth & needs some work. Wright, 298-1789.

'69 BUICK Riviera, power & air, \$2200. Dalby, 345-6796 after 5.

'67 CUTLASS Supreme, PS, PB. Greenway, 299-8540.

'66 JET-88 2-dr., all power, 2 new belted tires, \$700 or best offer. Perea, 255-6902.

'70 CHEVELLE Malibu, AC, PS, AT, vinyl top. Quinlan, 296-1852.

YAMAHA 250MX, compression release, fork brace, undercut gears, new tires. Cyrus, 345-3182.

'67 MERCURY Caliente 2-dr. sport, AC, PS, PB, \$995. Rugh, 2122 Oxford SE, 242-9774.

'65 DODGE POLARA, 383 engine, R&H, AC, new tires. Sanchez, 898-4166 after 5.

'71 OPEL Sport Coupe, AT, below book; '65 Chrysler 300, bucket seats, loaded, \$595. Winblad, 344-3109.

VOLKSWAGEN CHASSIS, 4-hole wheel hubs, master cylinder & brake lines intact, \$50; or trade for apt. size refrigerator. Hardin, 299-8654.

'62 FORD str. wgn., new tires, recent brake job, \$300; boy's 5-spd. bike, banana seat, high-rise handlebars, PP tires, \$45; girl's std. bike, \$25. Villa, 298-0435.

'61 CHEV. 4-dr., 6-cyl., std. trans., \$75 or best offer. Latta, 299-9330.

'69 CHEVROLET 3/4-ton Suburban, 396V8, AC, PS, AT. Davis, 298-3277.

'66 DODGE Monaco, AT, PS, PB, AC, \$595 firm. Hillman, 299-

8438 evenings.

'68 OLDSMOBILE Delmont 88, one-owner, selling below book. Hudson, 296-3484.

BICYCLE, girl's std. 26" Schwinn, \$30. Ouellette, 299-9266.

'67 CHRYSLER 9-pass. str. wgn., AT, AC, PS, PB, PW, steel radials. Brace, 299-6755.

'72 FORD Mustang, Mach I, 351-V8, AT, PS, mag wheels, air shocks, R&H, tape deck. Baca, 877-1136.

'62 CHEV. Carryall, V8, R&H, AC, \$250. Arterburn, 299-3620 after 5:30, Mon.-Thurs.

'59 FORD pickup, 4-spd., 1/2-ton, SWB, \$525. Johnson, 255-2846.

'69 CORVETTE, 350, 4-spd., 2 tops, new paint, mags. Fenimore, 298-8052.

'71 CHEVELLE SS-454, 4-spd., factory air, AM-8-track, new tires, low mileage. LeRoy, 296-2953.

'71 FORD F-100 pickup, deluxe camper snell, AC, AT, PS, PB, PT, Explorer pkg., 360 CID, 21,200 miles, \$3000. Hart, 266-6811.

'67 MERCURY Cougar, black w/white vinyl top, needs some work, \$750, negotiable. Schubeck, 298-6697.

'64 PONTIAC 2-dr. HT, Catalina. Vigil, 298-0022.

'69 BUICK Skylark, PS, AC, AT, \$1275 or offer. Wallace, 296-6556.

'69 SUZUKI T305 motorcycle, \$350. Basham, 266-2642.

'64 CHEV. Impala str. wgn. w/new tires, good body, broken window glass, engine needs work, \$100; '62 Chrysler convert. for parts, \$80. Puariea, 299-6377.

20" BICYCLE, high-rise handlebars, banana seat, chromed fenders, chain guard, \$15. Joseph, 299-6989, 9713 Morrow Rd. NE.

DUNE BUGGY, fiberglass, convertible top, plexiglass doors, skid plate, special bucket seats, tow bar, chrome wheels, spec. exhaust, \$700. Martinez, 293-2301 after 5.

'51 CHEVY coupe, one owner, will take best offer. Campbell, 256-1015.

REAL ESTATE

4-BDR., 1-3/4 bath, lg. lot & 25x-32 bldg. for business or residence, 125 ft. Coors front-

age, \$17,500. Sanchez, 242-3625.

BRICK 4-bdr., DR, den, 1-3/4 bath, carpet, wood floors, 1660 sq. ft., 6 1/2% FHA, moderate equity. Veneruso, 268-5805.

BRAZOS, 1-acre cabin site, \$3600, 20% down, balance REC or \$3200 cash, 1/2-mile from river. Lassiter, 298-2461.

5 ACRE LOTS, North Edgewood, water, elec. & telephones available to property, will consider low down. Liguori, 256-3613.

WANTED

OLD UPRIGHT PIANO, pin-ball machine, Nickelodean, and any kind of old coin-operated amusement machine. Sander, 299-5761.

BASKETBALL GOAL w/steel pole mounting. Gendreau, 268-3436 after 5.

SHOP MANUAL for 1956 Pontiac. Arning, 256-9229.

SHARE RIDE to 880, 892 or 806 area from vicinity Montgomery & Pennsylvania. Devor, 264-1462.

BABY CARRIAGE. Picraux, 265-4192.

USED PIANO, prefer spinet or console, will consider good condition upright. Schamaun, 298-5192.

USED popular brand, 12-16hp, garden tractor. Bontrager, 281-3427 after 6.

DRAWING instruments & board. Stevens, 299-6086.

FOR RENT

MOUNTAIN HOME, spacious, built-ins, fp, 2 1/2 baths, children, pets acceptable, 2150 sq. ft., \$250/mo. to qualified parties. McCampbell, 298-8211.

LOST AND FOUND

LOST — Man's Bulova watch, man's gold wedding band w/black lines. LOST AND FOUND, Bldg. 832, tel. 264-3441.

FOUND — Silver dangle earring, small screwdriver, sun glasses, small blue button-type earring, silver/turquoise ring. LOST AND FOUND, Bldg. 832, tel. 264-3441.

Heavy Happenings Scheduled

TONIGHT Mexican food is the Happy Hour buffet feature while Frank Chewiwie plays for dancing. During the dinner hour, Kay Kay Baca, lovely singer with guitar, will entertain. Later, from 9:30 to 12:30, Denny Gallegos will entertain onstage in the dining area.

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TOMORROW some 400 Club members will enjoy Oktoberfest which includes a fantastic German food spread by Club manager Jim Schultz, entertainment by a group of clowns called the Hungry Five and dancing to the MBC Trio. Tickets were sold out last week.

* * * *

NEXT TUESDAY, Oct. 23, (mark it on your calendar now) there will be another noon hour fashion show from Omar's Boutique featuring our own Sandia and AEC models — Soila Candelaria, Sandy Silva, Frances Fejer, Nadine Ortiz, Rosie Jennings, Archie Pearlman and Gina Herrera. Yolanda Adent will play piano.

* * * *

HAPPY HOUR Friday, Oct. 26, will feature oriental food, Wildman Bob Banks on the bandstand, and Barbara Clark in the main lounge. On Friday, Nov. 2, the Rhythmaires will play for dancing, German food will be spread for the buffet, and Denny returns to entertain in the late hours.

* * * *

DON'T CREATE UNSAFE CONDITIONS



THIS IS ONE WAY to make it to Soul Session Saturday, Oct. 27, according to Joyce Sanchez (4711) and Neil Gholson (2645). Something called "3 of Us" will be wired into the bandstand from 8:30 to 12:30 while Happy Hour prices prevail. (Tandem courtesy of Dick Hallet rentals.)

HALLOWEEN PARTY FOR KIDS is set, naturally, for Halloween, Oct. 31, starting at 6:30 p.m. There will be prizes for costumes, a House of Horrors guaranteed to scare the daylights out of kids and adults alike, lots of goodies and treats, plus a movie — "House of Frankenstein" — and other fun and games. Everyone had a ball last year, should be a repeat this time. It's free to members, but members only, please.

* * * *

THE FOOTBALL BUS will leave the Club for the stadium at 12:45 (note 45 minutes before game time) on Saturday, Oct. 20 for the Lobo/UTEP game, will return after. Members ride free, guests pay \$1.

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THE CARIBBEAN sea/air cruise signup deadline has been extended to Nov. 2. This is a great vacation buy at \$503 for a nine day package cruising the Caribbean on board the RHMS Amerikanis. Four meals a day, exotic ports of call, plus fun and games on deck and all around. The Club has the complete scoop. Check it out. It's open to members and guests.

* * * *

HONG KONG is the destination of Club travelers April 7-17. The 11-day package includes jet travel, luxurious accommodations, dining in Hong Kong's finest restaurants, a couple of cocktail parties, all tips, transfers, etc. The package costs \$671 (double occupancy) and deadline for signup is Jan. 3.

Audubon Wildlife Films

Next week the Audubon Wildlife Film Series begins its fourth season at Popejoy Hall on the UNM campus. The series of five motion pictures, in color and narrated by outstanding nature photographers, is sponsored by the Central New Mexico Audubon Society, New Mexico Mountain Club, New Mexico Ornithological Society and the Rio Grande Chapter of the Sierra Club.

Proceeds from past years have been used to purchase conservation education films for Albuquerque Public Schools and ecology books for schools and public libraries. Future plans include the establishment of scholarships to summer conservation camps for public school students.

The 1973-74 program follows:

Oct. 25 — "The Living Jungle" — films of nature on an island in Gatun Lake, Panama Canal Zone, presented by Greg McMillan.

Dec. 7 — "Hawaii-Paradise of the Pacific" — natural life and scenic wonders on Oahu, Kauai, Maui and Hawaii, Walter H. Berlet.

Feb. 15 — "Australia-Then and Now" — the Aborigines ask "What have you done with my country?" by Frank Heimans.

March 27 — "Queen of the Cascades" — Mount Rainier and the Cascade Range, Charles T. Hotchkiss.

April 16 — "Scandinavian Saga" — scenery, birds, and animals from Norway, Finland, Sweden and Denmark, John D. Bulger.

Tickets can be purchased at Popejoy Hall box office, series tickets (good for five admissions, single or in any combination of showings) are \$5.50 for adults and \$3 for students. Single tickets, available at the door on the night of the show, are \$1.50 for adults and \$1, students. Films are shown at 7:30 p.m.