

Bob Garcia Returning To Sandia Labs; Will Head New Department

Bob Garcia will return to Sandia Laboratories May 1 to head a newly-created department in the Industrial Relations directorate, 3200. Bob worked in the personnel organization 17 years at Sandia before leaving last year to join a management consulting firm.



He recently spent a year in Washington, D.C., as a loaned executive with the Plans for Progress program, a national industry-sponsored effort aimed at increasing job opportunities for minority groups.

Before joining the national program, Bob headed Sandia's Plans for Progress, equal employment opportunity and personnel placement programs.

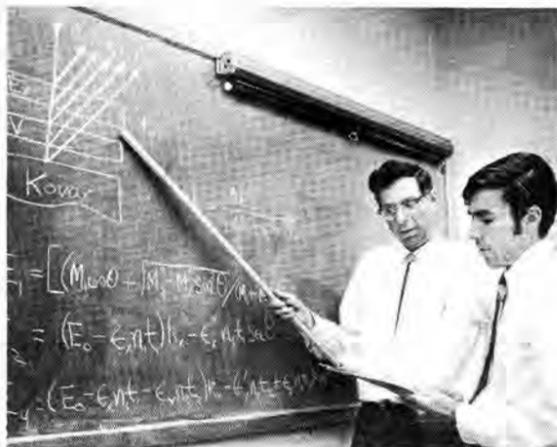
In his new role at Sandia Bob will continue with these activities and serve as special advisor to President Hornbeck and Small Staff in equal opportunity matters. As part of the Affirmative Action program, Sandia conducts an extensive out-of-hours education program, a summer employment program for students and faculty as well as various in-hours training and apprenticeship programs and participates in community efforts such as the National Alliance of Businessmen (NAB) program to promote employment opportunities for minorities.

Crystal Defects Studied

Ion Implantation Offers Custom Semiconductor Devices

A new way to alter the electrical properties of semiconductor devices is possible by ion implantation, which offers the advantages of fast reproduction and a high degree of control over the specific impurities added to solid materials.

"The most rapidly advancing application of ion implantation is in semiconductor device fabrication," says Fred Vook, supervisor of Crystal Lattice Defects Division 5111, "but the technique might also be suitable for changing other properties of solids such as



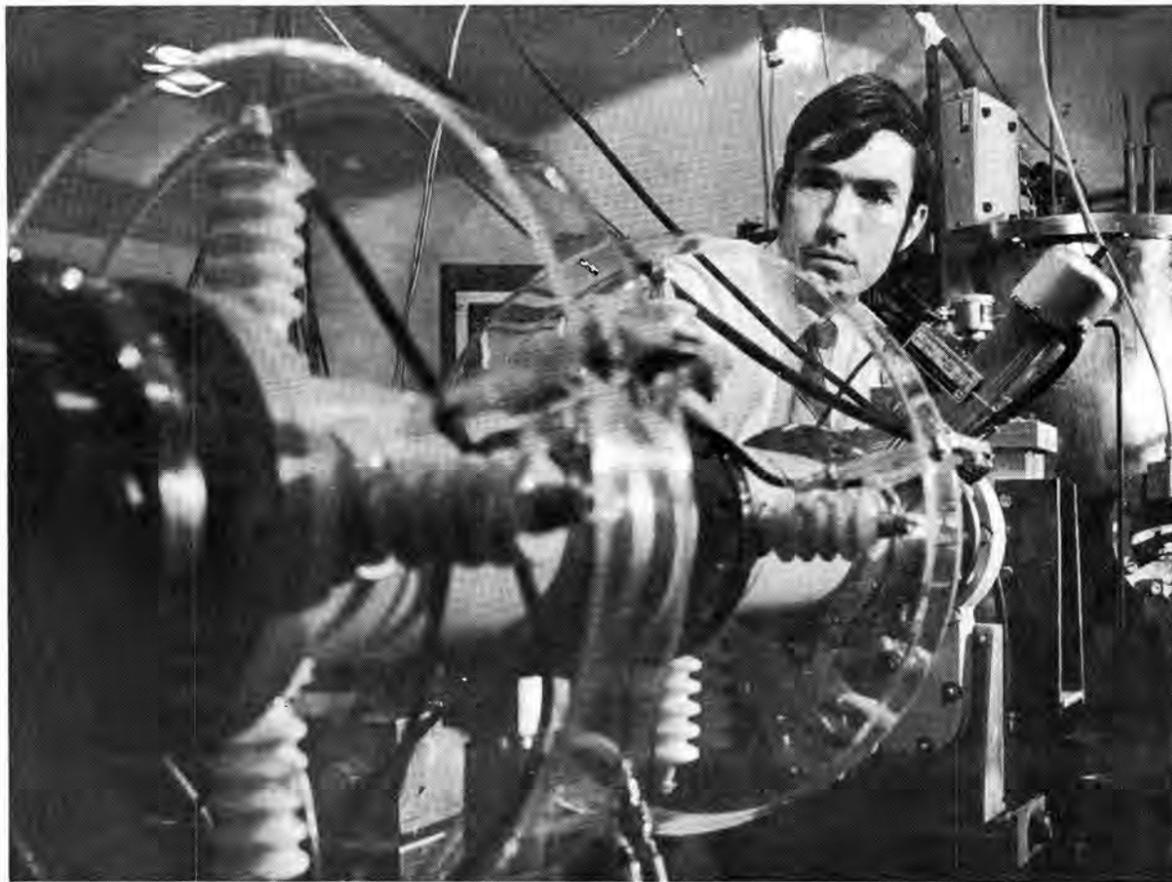
THEORY behind the Rutherford backscattering technique is discussed by Fred Vook (left) and Tom Picraux (both 5111). Lattice location and depth distribution of heavy ions implanted in a solid can be determined by this method.

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SANDIA LABORATORIES • ALBUQUERQUE NM • LIVERMORE CALIF • TONOPAH NEV



VAN DE GRAAFF ACCELERATOR BEAM is adjusted by Tom Picraux (5111) to send ions down a specific lattice channel in order to study the effects of ion implantation as a method of "doping" semiconductors.

magnetism, hardness, and optical transmission."

Scientists in Division 5111 had long been concerned with understanding electron and neutron irradiation-produced defects in semiconductors, but about two years ago they concentrated their efforts toward understanding the role of defects in the crystal lattice structure of ion implanted materials. Their theories and experiments have helped them to understand the damage in the lattice caused by ion implantation, and they have since presented results of their work at international conferences on the subject.

(All metals and other crystalline solids consist of a specific number of atoms, molecules, or ions distributed in a characteristic, symmetric pattern or lattice. Some properties of a solid—such as electrical conductivity—are extremely sensitive to even a minute number of defects or impurities within the crystal lattice.)

Nobel prize winner William Shockley first recognized the possible importance of ion implantation for semiconductor technology in the early 1950's, but initial attempts were unsuccessful, probably because the importance of disorder within the lattice caused by these high energy ions was not sufficiently well understood. "In recent years the science and technology of ion implantation have advanced rapidly because each of the separate disciplines involved is highly developed (accelerator design, physics

of atomic collisions, nuclear physics, solid state physics, and materials technology)," Fred explains.

Normally, the electrical properties of semiconductors are controlled by the introduction of specific impurities into the substrate of the material through a diffusion process requiring temperatures as high as 1100°C. In ion implantation, charged atoms of the specific impurity are accelerated to high speed to penetrate the substrate of a crystal (frequently silicon or gallium-arsenide). In this process, the ions leave a track of radiation damage (displacements and vacancies) and eventually come to rest within the lattice. This is one instance where damage creates a desired effect since a maximum number of vacant lattice sites provides more "resting" places for ions of the impurity (dopant) material.

The advantages of ion implantation for doping semiconductors are:

1. The depth, lateral position, and distribution of the implanted ions can be controlled and repeated to improve device performance. Penetration depths of 0.5 to 1 micron (1 to 2 wavelengths of visible light) are typical.

2. Since ion implantation is a low temperature process, the technique can be used to introduce impurities into materials that cannot withstand the high temperatures of the usual thermal diffusion methods.

3. Many of the fabrication steps can be

(continued on Page two)

Vista New Mexico

(Ed. Note—Charles Becknell, Ass't. Professor of Education and Director of Afro-American Studies at UNM, prepared this article.)

Estevanico: Black Explorer in the Southwest

New Mexicans are quick to emphasize, with pride, the three cultures of the Southwest. Yet they leave out one of the oldest minorities of this area, the Afro-American. The first non-Indian to discover New Mexico and Arizona was Estevanico or Esteban, a Black African explorer from Spain.

Blacks were not uncommon among early Spanish explorers. At least 30 Blacks were with Balboa when he discovered the Pacific in 1513. They were with Pizarro in Peru, Menendez in Florida, and Cortez during his conquest of Mexico. One of the Black explorers with Cortez planted and harvested the first wheat crop in the New World. Pedro Alonso Niño, a Black man, was the pilot on one of Columbus' ships.

Estevanico came to the New World on a voyage organized by Panfilo de Narvaez in 1527. Narvaez intended to conquer and govern Florida and the Gulf coasts. Also the search for gold was a major objective of the voyage. There were five ships and 600 men. Estevanico was on the voyage because he was the personal slave of Andres Dorantes de Carranca.

The voyage soon met with disaster. A large number of the crew deserted at the first port, San Domingo. Two ships were lost in a hurricane. The rest were lost and scattered in a storm off Florida. When the survivors managed to regroup and land, Narvaez split them up into two parties. One group was to go inland and the other to go north in search of gold.

The party heading inland was quickly destroyed by Indians. The party that headed north fell victim to Indians, starvation and diseases.

Only four survived. Among these was Estevanico. They were captured by the Indians, and for six years, Estevanico spent as much time as he could learning the language, customs and values of the Indians.

The four managed to escape and in the next year they went down in history as the first men to cross the American continent. They wandered west, then south into Mexico but did not cross New Mexico and Arizona. They ended up at the Gulf of California. It

was on this journey that they began to hear about the Seven Cities of Cibola.

When the men arrived at the capitol of New Spain, the Viceroy, Antonio de Mendoza, was extremely interested in the stories about the Seven Cities of Cibola and the riches to be found there.

De Mendoza asked the men to return and lead an expedition to find the Seven Cities of Cibola. After all the hardships the men had gone through they were not about to make another trip back and possibly endure the same hardships. They were very anxious to get back to Spain.

De Mendoza then offered to buy Estevanico. Dorantes refused. At this point de Mendoza offered to lease Estevanico for the duration of the expedition. He offered Dorantes a large sum of money and Dorantes accepted. Thus began the fabled journey to seek the riches of the Seven Cities of Cibola.

To lead the expedition de Mendoza chose Friar Marco de Niza. Estevanico was to be the guide and translator for the expedition.

Estevanico was a large and imposing figure. He was tall and strong—a fierce looking man with a long bushy black beard and curly, unruly hair. On the journey Estevanico decked himself out in Indian garments, bells and feathers.

He scouted ahead with instructions to wait for the rest of the party if he came upon an important discovery. His motives on the expedition were no better than the others. The possibility of glory, gold and conquest drove Estevanico to ignore his orders.

With two greyhounds at his side and decked out in his feathered regalia, Estevanico approached the gates of the first city of Cibola. The Indians of the Pueblo were less friendly and more suspicious than any Estevanico had dealt with before. They believed Estevanico to be an evil spirit and tried to wash the black from his body.

Estevanico was imprisoned by the Indians of the Zuni Pueblo. He was killed by the Zunis a little later and pieces of his body were distributed to all the chiefs of Cibola so that they could feel confident Estevanico was dead.

Friar Marco returned to Spain with the news that the city was bigger than Mexico City. De Mendoza hastily sent Coronado and an army to capture the first City of Cibola.

It is ironic that the Black slave who led a Spanish expedition into New Mexico is left out of New Mexican history and New Mexican festivals. In the minds of many, Estevanico has a definite place among those great men who have made the Southwest what it is today.



A 400keV Van de Graaff accelerator has been converted to a positive ion source to perform ion implantations. John Smalley (5111) is adjusting the equipment prior to an experiment.

Continued from Page One

Ion Implantation

performed in a single vacuum environment, minimizing the exposure of the semiconductor wafer to contamination.

Jim Borders and John Smalley have converted the 400 keV Van de Graaff to a positive ion accelerator to perform the implantations. "The work included development of ion sources as well as beam monitoring and control systems," Jim adds. Wendland Beezhold, Errol EerNisse (both 5112) and Walter Bauer (8331) are using an Accelerators, Inc., system in their ion implantation studies.

One of the initial problems was to predict both the depth distribution of the implanted ions and the depth distribution of the energy released in displacement collisions. Dave Brice developed a theoretical model for these problems which was supplemented by infrared absorption (IR) measurements by Herman Stein and Robert Baxter. In addition, electron paramagnetic resonance (EPR) measurements were made by Keith Brower and Norman Wing to obtain information about the location of implanted ions within the lattice structure. The combination of these two experimental approaches confirmed the theoretical predictions.

The converted Van de Graaff accelerator has been used extensively to measure the effect of implantation temperature upon the lattice disorder produced in silicon. Tom Picraux, assisted by Randy Swier, has achieved satisfactory results with the Rutherford backscattering technique in which light, positively charged ions emitted by the accelerator act as a probe to determine the location and depth distribution of heavy ions which have been implanted into a solid. Tom explains, "The probing ions from the accelerator are reflected with higher energy from the implanted atoms near the target surface than from the host atoms. This makes it possible to determine exactly the extent of the lattice disorder." The backscattering technique is also being applied at Sandia to the analysis of thin multilayer films.

The Second International Conference on Ion Implantation is scheduled for May in Munich, Germany. Sandia authored papers on new developments are expected to make a significant contribution at this conference.

Sympathy

To Antonio Garcia (4515-1) for the death of his father in Las Vegas, N.M., Feb. 21.

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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

Cherry Lou Burns, Staff Writer

Matt Connors & Lorena Schneider
Staff Writers in Livermore

Bill Laskar, Photographer
Norma Taylor/All The Rest

U of A Honors Sandians

The University of Albuquerque recently honored several Sandians for their work with the school's booster club which sponsors an annual invitational high school basketball tournament.

Dennis Cordova (4137) was formerly president of the club and now serves as secretary. Other directors include Mike Barela (4338) and Orelia Montoya (5333).

Invitations are extended to teams in Albuquerque, Los Lunas and Bernalillo to participate in the three-day tourney each January. The project was started 10 years ago in the hope of bringing basketball back to the school.

Call 'Connection' To Solve Problems, Get Information

"'Connection' is several things—a crisis call center, an action line, and a super information operator," says Jerry Jones (8164) who last summer along with Chip Chapin (LRL) organized the volunteer service in the Livermore Valley.

"Just as the name implies, we try to 'connect' people of the community who have needs or problems with someone who can help them. Calls range from those who are lonely, to those who can't speak English, to the man wanting the time and TV channel of the Super Bowl, to those contemplating taking their own lives."

Initially, Connection (phone 443-2123) got underway when the local organization ACCORD (A Coordinating Committee to Overcome Racial Division), of which Jerry and Chip are members, contributed funds for publicity and installation of a telephone switchboard. One of the Livermore churches supplies office space on a no-charge basis, while the telephone company provides a phone installation for training volunteers. Cost of the regular phone service is supported by private contributions.

Connection rules provide for no actual contact or other outside involvement with callers, and any information such as names, addresses and phone numbers are held in strict confidence. "We tell the volunteers they may use an assumed name, if they wish, but many go by their own nickname."

Jerry notes that "often calls are informational only, and although not exciting, still provide a real service. Other frequent calls are 'lonely talk calls' from people who feel the need to just talk or hear another human voice. Many in this category are repeaters. We find that some are not actually alone when they call—that there may be others nearby—but, nevertheless, the caller is lonely.

"Sometimes callers have a real problem that they are trying to get up enough nerve to tell us about, but they can't do it, so they simply talk.

"On the other hand," Jerry adds, "sometimes they don't say anything, then hang up. Some of these, no doubt, are nuisance calls, but I'm convinced that in most cases the person really wants to talk and just can't bring himself or herself to do it.

"A good number of calls involve personal problems, and these are always handled with the utmost seriousness. We are getting more suicide calls. Just the other evening I had a call from a woman who said she was at the very end of her rope and wanted to end it all, but didn't have the courage.

"In these cases, we attempt to get the caller to tell us what it is that brought him or her to this point, and then try to explore alternatives to what he is contemplating. If the person indicates some concern over children, we dwell on that aspect, asking him to stop and think about what effect his action would have on the children and making him aware of available professional counseling. Should he indicate an interest, usually by saying something similar to 'what have I got to lose?', we then give him a name and telephone number to call, with instructions to introduce himself as being referred by Connection.

"Most of our crisis calls, however, involve drug and alcohol problems and the teenage scene—not only calls from young people, but

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JERRY JONES (8164) assists a caller on Livermore's super telephone line—Connection. Trained volunteers "connect" people in the community who have requirements or problems with someone who can help them. Call diverter (in background) makes 24-hour service possible without an attendant in the office.

also from concerned parents. When a call comes in about someone on a 'trip', we try to keep the person on the phone until it is determined that either some help is on the way or chances are the person will come off of the trip safely. The closest clinic available to us for this type of case is in Oakland."

Jerry stresses the referral aspect of Connection. "To assist our volunteers in 'connecting' a caller we maintain a list of service agencies in the area, such as hospitals, churches, police departments, and various doctors, lawyers, psychiatrists, and ministers who also have volunteered assistance. When a call is referred, we try to follow up by asking the caller to phone back and let us know the outcome. This is done primarily for two reasons—to assure the caller of our concern and to test the effectiveness of our referrals.

"Other resources available for use by the volunteers include a large bulletin board in the Connection office which is updated continuously to keep track of what's going on in terms of meetings, entertainment, and events."

Connection volunteers are required to complete a training course to qualify. Sessions, starting with a Saturday workshop and including six evening sessions, are conducted by an instructor who previously did similar work at the Suicide Prevention Center in Reno, Nev. Mock calls and role playing are the basis of these sessions. Before qualifying, however, both the instructor and trainee must mutually agree that the trainee is ready to go on the line. To date, about 30 trainees have qualified as volunteers.

"Crises don't just occur between 6 and 11 o'clock at night—they can, and do, occur any time of the day or night—that's why we now operate on a 24-hour basis," comments Jerry. "The full-time service is also enabling us to reach more members of the community. Using a call diverter, incoming calls can be answered from any number on the exchange without an attendant in the office."

Take Note

Barney Goncher of Training and Benefits Division 8236 has been elected Secretary of the Greater East Bay Apprenticeship Council (GEBAC). The Council which is involved with apprenticeship programs in the East Bay establishes policy and procedures in coordinating a wide variety of apprenticeship skills.

* * * *

Jack Wilson (8121-1) was instructor for two first aid courses conducted in Livermore recently. The first—a Standard First Aid course—was sponsored by the American Red Cross and open to the public; the second—a Junior First Aid course—was presented to a local Girl Scout troop.

* * * *

Bruce Held of Safety Engineering and Environmental Health Division 8263 and a member of the State of California Environmental Quality Study Council was the featured speaker at a recent lecture sponsored by the Livermore/Amador Valley Ecology Center. He discussed "Air Pollution." The lecture was part of a credit course on Environmental Quality offered by Chabot College at Amador High School in Pleasanton.

* * * *

Marlin Pound, supervisor of Training and Benefits Division 8236, was elected to the board of directors of the California Association of Park and Recreation Commissioners and Board Members at the annual meeting held recently in Fresno. A member of the Association since its formation in 1969, he served on the Finance Committee last year. Marlin has been active with the Livermore Area Recreation and Park District (LARPD) for the past seven years and is currently chairman of the board of directors.

Sympathy

To John Brengle (8182) for the death of his brother in Lansing, Mich., Jan. 31.

To Lillian (8275) and Glen Funk (8172) for the death of her brother in Pittsburgh, Pa., Feb. 8.

To Tony Norwich (8271) for the death of his sister in Chicago, Feb. 19.

To Joe Thomas (8275) for the death of his brother in Mobile, Ala., Feb. 13.

To Ken Helmstadter (8153) for the death of his wife in Livermore, Feb. 14.

Congratulations

Evelyn Foote (8217) and Lurl Ostrander (8232) married in Mendocino, Ca., Feb. 27.

Take Note



Artist Dick Kishbaugh (7614)

Dick Kishbaugh, a draftsman in Division 7614, is the artist of a collection of realistic oil landscapes now on display in the elevator foyer of Bldg. 802. The paintings represent the major portion of Dick's leisure-time efforts of the past two years. Dick paints weekends and several evenings a week, primarily "for relaxation."

The work also represents his travel in the western states. Most of the paintings are based on scenes that Dick and his wife visited and photographed during summer vacations.

Dick has painted since he was a youngster and has studied art at the University of Syracuse and the University of New Mexico. His work has hung at the New Mexico State Fair. Right now he is working to put together a collection of 50 paintings for a gallery show.

* * * *

Jack Hueter (3134) was recently elected Second Vice President of the Kiwanis Club of Albuquerque. During his 19-year-membership in the club, Jack has served several terms on the Board of Directors and has held many committee assignments.

* * * *

Claire Haut (3412) has three acrylic paintings on exhibit this month in national painting shows. One painting was accepted for the third Washington and Jefferson College National Painting Show in Washington, Pa. The other two will be shown through March 17 in the Greater New Orleans National Exhibition.

Claire is also a designer-craftsman who shows her jewelry locally and national and her woven and printed fabrics have toured museums throughout the United States and six countries of Europe.

When your job specialty is predicting human behavior, should that knowledge carry over into private life? If so, Bob Webster (1644) should be red-faced about the notation he made on his week's activities: "prepared for trip to Panama when given news that wife's nine months of pregnancy was a fake (she is only eight months pregnant; never trust your doctor)."

Bob left town Feb. 25, the day after writing the above. His wife gave birth to a baby boy the following Monday. As one of his co-workers points out, "Our primary subject matter in 1644 is human errors."

* * * *

The more than 60 diversified arts and crafts to be exhibited and demonstrated Sunday during the Albuquerque Altrusa Club's Craft-o-Rama will include works by three Sandians.

Voris Hope (3417) will display her bread dough artistry; Tom Mickey (4232), his Western woodcarvings; and Bob Burgess (2346), his handmade silver jewelry.

The Craft-o-Rama will be held from 1-5 p.m. at the New Mexico Union ballroom on the UNM campus. Altrusa, a business and professional women's service club, will use the funds raised by the yearly event to support an intensive care unit for newborn babies at the Bernalillo County Medical Center. This is the only such care center in the state.

* * * *

Anyone desiring to play or coach summer softball in the City Women's Softball league as a member of the Sandia Laboratories team, contact Steve Ross (4361), tel. 265-4990. The team will practice on Sandia Base and Rio Grande Park two nights a week. The season will start in May.

* * * *

Last month Lester Lathrop (9221) and Milt Zimmerman (9223) were on a business trip in New Jersey. Then spent one night at a motel and next morning discovered that their rented, white, 1970 Pontiac was missing from the parking lot. They reported the theft to the local police and contacted the rental car agency which supplied them with another car.

After their return to Albuquerque, the Sandians were informed that it was really just a case of mistaken identity—and identical car keys. Another guest at the motel, who also had a rental car—same color, make and model—had driven off in the wrong car. His keys fit both the door and ignition locks of the Sandian's car, and it was several hours before he discovered his mistake and reported the switch.

Smokers' Spokesman Emerges

At long last LAB NEWS has heard from a species whose existence we were beginning to doubt—the Sandia smoker. Here's what he has to say about our anti-smoking campaign:

"There's been a lot of comment lately about the rights of the non-smoker. I feel that it is about time that someone says something about the rights of smokers. Smokers do have rights, don't they? Or has smoking been made illegal? Where in the Bill of Rights does it say that one American citizen has a more basic right than another? Please excuse me for not realizing that my smoking makes me a second class citizen. Next time I walk past your running automobile I'll take a deep breath of your clean fresh air. Maybe there should be separate drinking fountains, restrooms, sections on the bus, etc., for smokers. After all, it seems as if we are a different kind of citizen.

"Since we smokers are in the minority perhaps it is time we begin to act accordingly. Smokers, maybe it's time we unite. Radio, television, newspapers, all seem to be against us. So sit down and write to your favorite company newspaper and give them your opinion of their drive to take away another of your freedoms. Who knows, with enough responses maybe some people who don't smoke will realize that people who do can still claim membership in the human race.

Louis Sanchez (4233)

Puff Puff Puff"

But Louis, some of our best friends are smokers. Now for balance, an anti-smoker speaks:

"I say hurrah for the move against smoking. I, for one, would advocate limiting the places where smokers are free to puff their cigars, cigarettes, and pipes. Through no fault of my own, I happen to be allergic to many irritants to the nose and eyes, and cigar and cigarette smoke is one of the worst. A day spent in a smoky office or meeting room leaves me nearly exhausted, sneezing, eyes burning, suffering from a headache and hardly able to think.

". . . Why not prohibit smoking of all kinds in the Sandia office areas?"

Paul Souder (1532)

Right on, Paul, right on.

Artesia Marathon Results

Of the 200-plus contestants who entered, three Sandians who competed in the recent Artesia Marathon finished in positions 34, 35 and 36 completing the 26 mile, 385 yard race about a minute apart.

Bob Jeffrey (9231) finished in three hours and 32 minutes, Irv Hall (1643) in three hours and 33 minutes and Bob Lowrey, three hours and 35 minutes. Bob Gregory (2653) had planned to enter the race but had to cancel due to an illness in his family.

"We think we did pretty good for old guys," Irv Hall says, "but those last 385 yards were brutal."

A DISTINGUISHED GROUP of visitors, the General Advisory Committee of the Atomic Energy Commission, was briefed recently by President Hornbeck on Sandia programs. H.C. Donnelly (at far left), Manager AEC/ALO, accompanied the group.





SUPPOSE THEY GAVE A MEETING AND NOBODY CAME? Empty conference room and waiting host (in this case Harold Crass of Access Control Section 3521-1) illustrate what happens when you decide to hold a meeting within Sandia but fail to let Harold know well in advance (a) when the meeting will take place and (b) who is coming. Whether your guests have clearances or

not, paperwork takes as long as two to three weeks because approvals by other agencies are needed. The message: call Harold just as soon as you can about details of any meeting you plan at Sandia. He and the ladies in his group will help ensure that your guests are at the meeting.

Ornamental Iron

What Hath Hilman Frock Wrought?

Hilman Frock, a security inspector in Department 3550, in the past year has become an artisan in ornamental iron work.

His home is filled with beautiful benches, shelves, and tables. Windows feature intricate wrought iron guards. Gates in the back yard are both decorative and functional.

Hilman's newest hobby (he is an accomplished jewelry-maker and rockhound) stemmed from a request from Mrs. Frock for shelves to display her collection of antique silver and china. His solution is a sweeping piece from floor to ceiling resembling a spiral staircase. Hardwood shelves flow from center pole to outside curve making a fan-like pattern and providing ample space for the display.

"Years ago," Hilman says, "I did a little



HILMAN FROCK displays some of his wrought iron furniture made during the past year.

welding when I worked for a steel company, but I had never tried anything like this. In the beginning, the results were mostly by chance. It took a while before the finished pieces started resembling the sketches I made when working on the design."

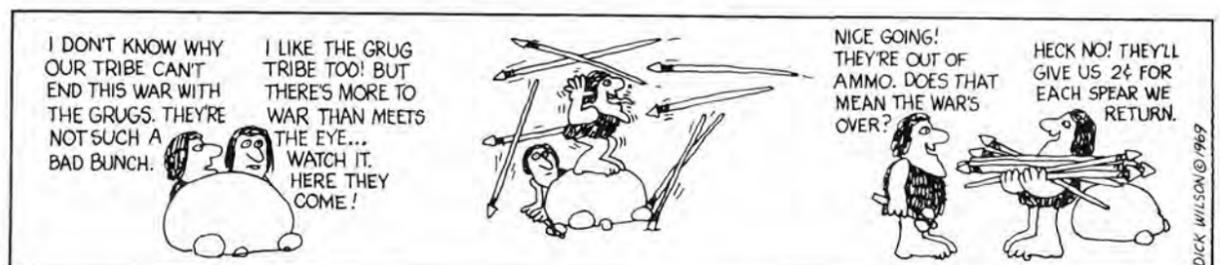
Except for the welding, Hilman works primarily with "cold" metal. He bends and twists the flat strips of iron with a tool he made out of a piece of pipe. "It's mostly muscle," he says, "and a lot of luck."

Huff 'n Puff Brigade

The host of Sandia joggers who daily put in their one or two or three miles will be edified to learn that the Department of Health, Education, and Welfare has lined up a dozen monkeys and put half of them on a regimen of jogging four miles per day. Purpose is to determine the effects of exercise on the coronary arteries.

The interesting thing is what the medical researchers do with the other six monkeys who make up the control group. The six jogging monkeys run on an exercise wheel. It's driven electrically so that the hapless six *have* to keep moving—two hours a day, five days a week. Either jog or tumble in a heap at the bottom of the wheel. But the other six are placed in pens near the exercise wheel so that they can watch the running types. The researchers believe that just watching the runners produces psychological stress in the viewers (and stress is a factor in the development of atherosclerosis). Maybe a guilty feeling as they lie there in indolence?

The project has been running 18 months, not long enough for the researchers to come up with definitive results. However, the HEW report notes that "... the jogging monkeys have maintained lower body weight, have higher packed cell volumes, and tend to have longer blood clotting times." No report is given of the monkeys' opinion of the exercise wheel.



'Administrative Softball' For Ex-Pitcher

What can a softball pitcher do when his arm gives out but his interest still remains?

If the sportsman is Cliff Taylor (4252), you know he'll find a way to stay close to the game. He was recently appointed New Mexico State Commissioner for the Amateur Softball Association and is now selecting commissioners for the five areas of the state (Bill Weinbecker, also 4252, is the Albuquerque area commissioner and Everett Massey, 7414, is the state director of umpires).

Cliff "retired" last year after 32 years on the diamond. He started playing in Detroit as a teenager, advanced to semi-pro hardball in Michigan, and later pitched for state championship teams in New Mexico as well as Sandia championship teams. He chalked up four no-hitters in his career.

"One big change," Cliff says, "is that fast pitch is dying throughout the country, although it is still popular in New Mexico. There is a tremendous increase in interest in slow pitch softball among both men and women and all age groups. The reasons are that slow pitch gives the average player a chance to participate rather than sit on the bench the whole game, and an individual can chalk up lots of home runs."

At a recent ASA Commissioners Council Meeting in Tucson, the equipment display included bats of aluminum and balls for slow pitch ranging from 12-16 inches in diameter. During the same meeting, Cliff was appointed to the Industrial Softball Committee.

Cliff sees his job as commissioner as an opportunity to work with the 47 member teams in the state and the 68 registered umpires. He will assist communities and schools interested in holding softball clinics and programs and will help in scheduling tournaments. "I see it mainly as a chance to talk to people and coordinate their efforts," he says.

First Aid Training, Intuition Help Avert Carbon Monoxide Tragedy

George Ingram (5133) is a believer in feminine intuition. He also believes in first aid training and awareness of possible dangers. It's all related to a scary true story.

Last month his 15-year-old daughter Linda was invited to a classmate's home for a slumber party. The classmate's family consisted of parents, a year-old-baby, two teenage girls, and two older boys. There were two other guests. All 10 persons could have been dead the next day but for an "uneasy" feeling on the part of George's wife.

The slumber party started Friday evening. Saturday mornings Linda usually goes bowling and she had made arrangements to ride to the bowling alley with one of the older girls at the party. But Mrs. Ingram felt uneasy about the arrangement. About 8 a.m. she and their 12-year-old son drove to the house. The boy rang the doorbell and knocked at the door. There was no answer.

She drove the boy over to the bowling alley—then returned to the house as she felt something was wrong. Still no answer to the doorbell, so she looked in a window. There was Linda crawling on the living room floor. She tried the front door and it was unlocked.

Linda was awake but incoherent; another teenager had been vomiting on the floor and was semi-conscious; one of the older boys was sitting on the couch partially incoherent but Mrs. Ingram was finally able to get him to check on his parents.

Mrs. Ingram called George, the police rescue squad, and the mother of one of the other girls.

When George arrived he pulled two of the girls outside and gave one of the boys mouth-to-mouth resuscitation. After three to four minutes the young man began to breathe again.

The rescue squad arrived and immediately gave all occupants of the house large amounts of oxygen.

At the hospital, George and his wife learned that the family and the slumber party guests had suffered carbon monoxide poisoning. All were released from the hospital later in the day.

It had been a frightful night. The girls had awakened about 3 a.m. and thought they had a severe and sudden case of the flu. They tried to phone home, but felt so weak and nauseated they were unable to do so. Their sense of balance also seemed to be affected. Several had severe headaches.

George had taken a first aid course back in 1955 when he was an engineering student at Oklahoma State University and has since read about the proper procedure for administering mouth-to-mouth resuscitation.

Death

Harold Courtney, a helper in Semiconductors and Radar Testing Division 7532, died Feb. 19. He was 44.

He had worked at Sandia Laboratories since June 1958 first as a security inspector until August 1969.

Survivors include his widow, two daughters, a son and three grandchildren.



"I read the FAMILY SAFETY magazine that is sent to employee's homes and often pass along items of interest to my wife and children," George says, "but in this case, neither of us recognized the problem."

Carbon monoxide gas has no odor and no color and therefore is difficult to detect. Periodic maintenance of a gas furnace and hot water heater plus a check by the gas company for proper operation if any problem is suspected are probably a home owner's best protection. Another hint: don't use your furnace closet as a storage area. A furnace needs a proper draft of fresh air.

In this particular case, investigation disclosed that faulty installation of the central heating system had been responsible for a lack of insufficient fresh air for the furnace.

"I have inquired," George says, "and am unable to find any reliable, cheap (less than \$80) carbon monoxide detector suitable for home use. Anyone have any ideas?"



PROTOTYPE of a cold cathode gauge suitable for use in a small sounding rocket and a manufactured model (right) are held by inventor Robert Woods (5235).

Cold Cathode Gauge Awarded Patent

To make atmospheric density measurements from a small sounding rocket, a cold (as opposed to hot) cathode gauge is superior in terms of ruggedness and magnitude of signal produced. But the considerable weight and size of the magnet required for operation of the cold cathode gauge has, up to now, militated against use of this gauge in this application. Recently, a patent was issued to Robert Woods (5235) which describes a cold cathode gauge whose magnet is significantly lighter and smaller.

Bob's approach was to create an unusual magnetic circuit by combining electrical cathodes with magnetic pole pieces, in effect making magnetic armatures out of a part of the gauge which would otherwise be purely electrical in function. The pole pieces are in a donut configuration which confines the magnetic field to the central cavity of the gauge where it will not interfere with adjacent experiments.

The result is an 80 to 90 percent reduction in the weight of magnetic material required to provide a given field strength, making the gauge more suitable for small rocket applications.



Tony Veneruso



Tom Crites

Doctoral Degrees Completed By Tom Crites, Tony Veneruso

Tom Crites (3311) and Anthony Veneruso (1223) recently completed requirements for doctoral degrees.

Tom completed most of his course work at the University of Oklahoma during a year-long educational leave of absence. His dissertation was entitled "Backscatter of Normally Incident Intermediate Energy Bremsstrahlung from Semi-Infinite Media of Varying Atomic Number."

He has a BS in chemistry and mathematics and a BA in physics from Southeastern Missouri State College, and a MS degree in public health and sanitary science from the University of Oklahoma.

Tony will receive his PhD in electrical engineering from the University of New Mexico. Although he spent one year in Sandia's Doctoral Study Program, most of his course work was completed under the Educational Aids Program. The title of his dissertation is "Realization of Near Time Optimal Feedback Control."

He received his BS degree from the Polytechnic Institute of Brooklyn and his MS from UNM. Both degrees were in electrical engineering.

Speakers

A.R. Phillips (5223), "A Time Shared On Line Computer with Background Batch Processing Capability, and Its Use in Radiation Research," Albuquerque Chapters, Society for Experimental Stress Analysis and Albuquerque Digital Equipment Users Society, Jan. 13.

J.M. McKenzie (2653), "Tentative Method for Expressing Neutron Radiation Hardness," American Society for Testing and Materials Meeting, Jan. 14, Ft. Lauderdale, Fla.

A.C. Switendick (5151), "Metal Hydrides—Structure and Band Structure," International Symposium on Atomic, Molecular, and Solid-State Theory and Quantum Biology, Jan. 18-23, Sanibel Island, Fla.

O.M. Stuetzer (7210), "Instrumentation of a Reentry Vehicle," Albuquerque Section of the IEEE, Jan. 21.

Osborne Milton (5333), "Pulsed Flashover of Insulators in Vacuum," 1971 Winter Meeting of the IEEE Power Engineering Society, Feb. 4, New York.

H.O. Pierson (5314), "Mechanical Properties of Carbon Felt, Carbon Matrix Composites"; D.M. Schuster (5314), "The Effect of Fiber Content on the Mechanical Properties of Carbon Felt-Carbon-Matrix Composites" and "The Impact Strength (Notched Charpy) of Discontinuously-Reinforced Composites," International Conference of Graphite Fibers, Plastics Institute, Feb. 2-4, London, England.

T.J. Tucker, D.L. Allensworth, and J.E. Kennedy (all 5133), "Secondary Explosive Spark Detonators," Nuclear Survivability Working Group on Ordnance and Propulsion, Feb. 10-11, San Bernardino, Calif.

C.W. Harrison (2627), "Electromagnetic Compatibility of Rockets," Mississippi State University, Feb. 16; "Transients in Antennas and Shields," University of Mississippi, Feb. 18.

Lewis Bartel (5132), "The Estimation of Correlation Effects in Transition Metals from Pressure Experiments," Solid State Physics Conference, Jan. 5-7, Manchester, England.

R.G. Easterling and I.J. Hall (both 1643), "Prediction Intervals for Life Testing," 1971 Annual Symposium on Reliability, Jan. 12-14, Washington.

B.F. Blackwell (9328), "Numerical Solution of Laminar Boundary Layer Problems by Finite Differences," graduate fluid mechanics course, Jan. 18 and 20, Stanford University.

Service Awards

March 12-25

25 YEARS

Phillip Owens 7616, James Jones 7450, Billy Hickerson 1526, Paul Taylor 7424, Leo Jercinovic 7630, and John Michnovicz 7632.

20 YEARS

Everett Gourley 3520, Joe Mahboub 3520, Richard Jones 9214, Melvin Pliner 1517, Willard Clark 2610, Donald Harrison 4137, F. Archibeque 4512, Gene Romero 3520, Ben Jajola 4337, Ralph Gustin 7633, Phillip Bircher 7414, Thomas Mead 3520, Ruth Schooley 7400, Leroy Ramsey 4612, Daniel Yarbrough 7616, Allen Dale 7625, Richard Claassen 2600, Eugene Monahan 4614, Mary Schwartz 6021, Bertha Kay 4131, Allen Williams 4513, Carmen Gabriel 2323, John Colwell 9224, and Violet Barela 7631.

15 YEARS

Cid Dalin 3452, Charles Drummond 8274, Elizabeth Tucker 3255, Dennis Adkins 7325, S.A. Ravenbyrne 7361, Doreen Buck 7633, Alan Skinrod 8172, Harlan Morris 1553, and Lynn Barker 5161.

10 YEARS

Robert Bedford 8181, Bill Childers 8139, and Earl Deno 8257.

No Business Like Publishing Business

A group of Sandians has come up with a novel means of raising money for a junior organization. The juniors (sons and daughters of the Sandians) are active in the Duke City Dashers, a track club for boys and girls, and money is needed to help the runners make trips to tournaments outside the city.

Selling cookies, greeting cards, and the like has limited potential nowadays as a means of raising funds. So, taking a deep, deep breath, the Sandians have plunged into the business of publishing a monthly magazine—the N.M. JUNIOR SPORTS REVIEW, Joe Newton (2614), business manager of the enterprise, explains:

"The city papers carry little news about junior sporting activities. When was the last time you saw anything about, say, junior golf? We think kids and their parents will want to subscribe to a magazine that tells what Johnny or Suzy did out on the playing field."

Annual subscription is five dollars, but Joe states that any organized junior activity can sell subscriptions or individual copies and pocket half the proceeds. Joe adds, "Now that we're underway, we hope all the junior sports



MAIDEN ISSUE of magazine devoted to news about junior sports activities is held by Lou Trumble (2613), who helped get publishing venture underway. Review aims to include sections on all organized junior sports in state.

groups will keep us posted with news and photos about their activities."

Other Sandians involved are Keevin Moriarty (4121), Lou Trumble (2613), Jim Bear (7250), and Joe Lackey (7654).

• SHOPPING CENTER •

CLASSIFIED ADVERTISING
Deadline: Friday noon prior to week of publication unless changed by holiday.
A maximum of 125 ads will be accepted for each issue.

RULES

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

FOR SALE MISCELLANEOUS

ALUMINUM sun screens for 4-dr. station wagon, set of 7 designed for Plymouth, may be adaptable to others, \$15. Joseph, 299-6989.

AQUARIUM, Pemco 16 & 17 gal., pump, filter, hood w/light, \$25 & \$30; dbl. roll-a-way bed, \$25. Cover, 268-0921.

COMPUTER CONSULTANT stock, several small blocks, \$1.25 per share. Grant, 255-0576

65 YDS. lt. green shag carpet. Robert, 299-2624.

NAVAJO RUG, \$50; Oriental rug, \$35; Japanese sword & rifle, .31 cal.; Arvin elec. heater, \$7.50; hunting rifle, 7.7mm, \$25. Smitha, 299-1096.

TWIN 2-bbl. manifold w/carbs, fits '40-'48 Ford or Mercury, \$10; Carter 4-bbl. carb. for small block Chevrolet. Bureta, 256-1833.

TENT TRAILER, Quick-Camper, sleeps 4 plus: 8'x8' living area, 2 mattresses, wood floor, spare wheel, license plates. \$295. Vandi, 255-0685.

SET of Great Books of the Western World, 54 vol. w/ bookcase, make offer. Neiswander, 344-4745.

STEREO speakers, solid walnut trim, \$50 for pair. Stirbis, 299-5363.

WILSON staff golf clubs, 4 woods, 9 irons, used 3 yrs., \$100; '68 1st flt. irons, used 1 season, \$95; monster iron, \$7.50. Stang, 256-7793.

MOTORCYCLE, Sear's (Austrian Steyr-Daimler-Puch), 50cc, 117 mpg, 24% climbing ability, 1500 miles, \$90. Moss, 298-2643.

8 YR.-OLD-MARE w/6 mo. colt. Salas, 865-7636 after 6.

JEEP SEATS, 3/4-1/4 type, \$15; bumper mount trailer hitch, \$5; 55-gal. drum, \$5; tool box, \$5. Frasier, 299-6933.

CLOCK, pendulum type, 8-day wind, 14"x24", hangs on wall, serviced, \$24. Archuleta, 255-6781.

FENDER jazz bass guitar, \$275; Fender solid state bassman amp, \$300. Mikkelsen, 268-1485.

TENT-CAMPER, Starcraft, sleeps 6, ice-box, stove, water, sink, dinette, lots of extra storage, \$900. Burnett, 299-6770.

ELECTRIC guitar & amplifier, \$40; Yashica-A camera, paid \$85, sell for \$20. Hart, 265-8604.

GE white port. dishwasher w/ chopping block top, 2 yrs. old, \$125. Poetzel, 299-4039 after 5:30.

STEREO AMP, 80 watt, 8-track tape player, turn table, 2 big speakers, \$200. Babcock, 256-2705.

'69 TRIUMPH 500 motorcycle, \$725, will consider car trade. Rufsvold, 268-5970.

GEBRUDER MERKEL shotgun, over-under, 16 gauge magnum, pre WW II, engraved, silvered, action auto ejectors, \$450. Roth, 877-4997.

TEXTBOOKS: math, thermodynamics, numerical analysis, computer science. Miller, 299-4350.

WASHER, Kenmore, \$35. Wright, 298-2940 after 6.

LARGE, handblown glass & wrought iron Mexican light fixture, 3 units, blue, red, & amber, \$25 ea. McDonald, 299-9269.

DISHWASHER, GE top loading, \$70; gas stove, \$50; lined drapes, \$50; frost-free ice box, \$140; typewriter, \$20. Kelsey, 842-8263.

40" ELEC. range, 2 ovens—one of them auto., 1 auto. burner. Chacon, 344-6540.

TIMER for dark room enlarger, times 1 to 120 seconds, \$10. Henry, 256-2467.

PIANO, upright, \$125, you move. Lewis, 299-3170 after 6.

TORO power mower, reel-type, hand mower; one-wheel mower (edger); Toastmaster oven & broiler. Campbell, 299-4830.

AKC REG. poodle puppies, silver miniature female, silver toy male, excellent breeding & quality, \$75 ea. Reynolds, 296-9370.

FRIGIDAIRE frostless refrig., \$40 or best offer; Sear's best hand mower w/basket, \$10. Kepler, 298-5652.

CRYSTAL CHANDELIER, 5-bulb fixture, w/bulbs & mounting hardware,

approx. half retail price at \$35. Eagle, 265-7128.

SECTIONAL, 2-pc. green; Hot Point range; brown sofa-bed. Chavez, 255-9006.

PUPPIES, German shorthair, perm. shots, \$12; reg. Arabian gelding, 6-yr.-old. Sharp, Placitas, 867-2815.

TRAVEL WHEELS w/8:45x15 snow tread tires; 2 for \$25; size 9 hip wader boots, \$6; knee-high rubber laced boots, \$4. Shepherd, 299-9066.

NEW—Institute for Language Study album of Russian Language Records plus vol. of Treasury of Russian literature. Savitt, 268-0158 after 6.

FREEZER, frostless, 17 cu. ft. 595-lb. capacity, upright, avocado green, never used, sell for \$245. Herman, 298-8116.

GARAGE SALE: Duke City Dashers Track Club, many families donating items: sofa, TV, bikes, chairs and much more. 2909 Charleston NE, March 12-13-14. Newton.

INSTANT hairsetter, Kindness 20 by Clairol. Oberst, 299-1224.

MOTORCYCLE, '68 Suzuki, 80cc, street or trail, 3000 miles, \$150. Stanley, 268-9537.

'59 TRAVEL TRAILER, sleeps 5, heater, elec. brakes, will take boat, trailer in trade. Tolbert, 1-636-2729.

120,000 BTU Carrier furnace, 4 yrs. old, \$95. Constant, 296-1431.

ADMIRAL stereo record player w/AM-FM stereo receiver, solid state, \$75; LP albums, 1/2 price; factory built 2000-lb. trailer axel, \$40. Campbell, 268-8445.

'68 ARISTOCRAT Land Commander camping trailer, 15', sleeps 6, \$1550. Sarason, 299-2443.

TWO handcarved wooden chairs, suitable for den or patio, \$25 ea.; children's clothes. Marsh, 243-2767.

STEEL STORAGE sheds; hand mower; 2 bikes, 20" girls, 24" boys; many other odds and ends. Luna, 1842 Betts NE.

MKI SPRITE competition head, polished, ported, cc'd, milled, 1 1/4" carburetors, new valves, guides, and seats. LaBarre, 299-3569.

WANTED

SERVICE Manual for '60 Ford F100 truck. Watkins, 298-7567.

BABYSIT 3-4 yr. old week days only, \$17/wk. includes hot lunches, fenced yard, supervised care, near bases, SE area. Stuart, 265-7315.

3-SPEED or 5-speed lightweight bike, boys or girls. Baxter, 344-7601.

OUTBOARD MOTOR, small electric or gas. Westman, 255-6048.

HEATER-DEFROSTER unit to fit '57 Chevrolet station wagon. Marsh, 243-2767.

MGA FRONT coil springs, Chevy II Nova rims. LaBarre, 299-3569.

SHOTGUNS, prefer old double barrel guns. Will buy guns with broken or missing stocks and rusty barrels. Svensson, 344-7700.

FOR SALE

CARS AND TRUCKS

'62 CORVAIR Monza, 2-dr. Kelly, 255-7226.

'63 FORD Galaxie 2-dr. sedan, 6-cyl., std. shift, \$300. Skelley, Star Rt. 2, Box 328-D, Los Lunas.

'64 MERCURY station wagon, AC, PS, PB, R&H, AT. Sample, 296-1771.

CORVETTE Stingray Fastback w/fuel injection, headers, Koni shocks, sway bars, 4-spd. & Hurst shifter, 4:11 rear, CD ignition. Snelling, 268-5895.

'66 CHEV. II Nova 4-dr. sedan, one owner, low mileage, \$800. Valencia, 877-2595.

DUNE BUGGY, '69 fuel injection engine, complete w/doors & top, R&H, many safety features, less than 20,000 miles. Gabriel, 298-3353.

'62 CORVAIR Monza 4-dr. sedan, \$325 or make offer. Hughes, 299-6674.

'67 CAMARO 350SS, disc brakes, positraction, 4-spd., custom (factory) interior, all instruments, chrome engine, \$1700. Kirchmeier, 255-0222.

'69 CAMARO 350-SS, 4-spd., new brakes & tune up, book \$2075, price \$1600. Brass, 299-6016.

'63 CORVAIR Monza 900, 4-dr., 4-spd. Marchi, 268-6237.

'66 PLYMOUTH Fury III, PS, PB, AC, \$1150. Sterk, 296-3453.

'65 MERCURY Comet convertible, 289 V-8, 4-spd., recent new top, starter, valve job, battery. \$600. Roberts, 242-2026 evenings.

'68 PLYMOUTH wagon, air, PS, R&H, needs tires, best offer over wholesale. Copeland, 344-1133.

'60 MERCEDES-BENZ 190SL convertible w/tonneau cover, Becker-Mexico AM-FM radio, low mileage, \$1500. Knox, 255-3145.

'65 VOLKSWAGEN, radio, air, vents, reliable, inexpensive, transportation, priced below book at \$750. Smith, 298-9092.

FOR SALE REAL ESTATE

6% LOAN, custom brick, NE Heights, FHA \$29,150, 3-bdr., 1 1/2 baths, carpeting, drapes, fireplace, Frigidaire kitchen, immed. possession. Stenger, 299-4776.

HOLIDAY PARK 4-bdr., tri-level, landscaped, carpeted, custom drapes, cash to 5 3/4% loan, \$171 mo. Lee, 298-7702.

PANORAMIC VIEW from this lot in Sandia Heights North (subdivision northwest of tram station). Reasonably priced. McBride, 299-4347.

LOST AND FOUND

LOST—Pearl and silver drop earring, gold necklace w/drop pearl, Datsun keys in case, SL intercom radio, gold Bulova Accutron, Rx bifocal safety glasses in black case, ignition key, goggle-type sunglasses, white & colored bead earring piece, black carrying case, man's Benrus watch w/silver expansion band, pipe, check book, pocket size slide rule in case, brown pigskin gloves, white pigskin gloves, black case for glasses. LOST AND FOUND, tel. 264-2757, Bldg. 832.

FOUND

Neptune cuff link, gas key on ring, ladies' right-hand black glove, Mac-Gregor zipper tab, silver chain bracelet, ladies glasses w/black rims, "Sargent" key, necklace w/heart-prayer coin, Lourdes HS '67 ring, silver Cross pen w/initials, ring w/5 keys, silver tie tack w/initials, ladies' black glove, man's black glove, glasses w/black frames, black coat button. LOST AND FOUND, tel. 264-2757, Bldg. 832.



There are those who do not believe that Bob Banks is a wildman. They know him as an efficient administrative assistant to the 5100 directorate. Obviously they have never seen him behind the crazy red Yamaha electronic organ on the bandstand at the Coronado Club. We planned to use a picture of Bob in this issue of the LAB NEWS up in a tree, naturally, in a wildman suit and surrounded by a bevy of wildwomen in wildwomen suits, naturally.

Some guys will go to any length to protect their image. Bob wound up in the hospital with acute appendicitis. Anything to keep from having his picture taken.

Bob has recovered and will be making Happy Hour music at the Club tonight. If he doesn't look too much like a wildman, remember that he just had an operation. (However, his nurses say that he's wild.)

* * * *

TOMORROW NIGHT, 300 Club members will enjoy a New England seafood dinner with Maine lobsters and the works including a wine taste. The affair starts at 6 p.m., winds up with dancing to the Top Hats until midnight.

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CORONADO SKI CLUB will meet at 7:30 p.m., Tuesday, March 16.

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DUPLICATE BRIDGE meets Tuesdays at 7 p.m. Coronado ladies bridge will meet Thursday, March 18, at 1 p.m.

* * * *

EASTER FASHIONS will be presented by Rosario Ayres at a noon hour style show next Thursday, March 18.

Events Calendar

March 12-14—YMCA charter bus trip to Juarez.

March 13-14—Musical "1776." UNM Popejoy Hall.

March 13—Climb up old road on La Bajada Hill. N.M. Mountain Club, leader Dorothy Clark, tel. 247-9741.

March 14—Altrusa Club's "Craft-O-Rama." UNM Student Union Ballroom. 1-5 p.m.

March 17-21—"The Trial." UNM Drama Department.

March 19—Fiesta Day, Laguna Pueblo.

March 21—UNM Chamber Orchestra, 4 p.m., Fine Arts Bldg. recital hall.

March 21—Cabezon Peak. N.M. Mountain Club, leader Bill Trebilcock, tel. 296-1418.

SOL CHAVEZ and the mighty Duke City Brass will be on the bandstand for Happy Hour Friday, March 19. Smiling Jim Noonan, Club manager, will spread veal cutlets and accompanying goodies for the buffet. Happy Hours start right after work on Friday evenings with special prices in effect until 9 p.m. The band plays for dancing from 6 to 9 p.m. and then the troops move into the main lounge to join the north end crew and Yolanda Adent for a sing-along around the piano.

On Friday, March 26, the Club's famous chuckwagon roast beef buffet will be the menu feature while Phil Graham makes the happy music.

Minicomputers Make Field Testing Life Easier

Minicomputers installed in field test trailers are now being used by Sandia to simplify prelaunch monitoring of test missile systems.

In an actual prelaunch situation, it is difficult for the telemetry engineer to monitor 50 to 200 channels to make certain there are no problems or failures in the missile's nose cone. While many digital-to-analog converters may be used to drive oscillographs, one person is generally unable to monitor more than 10 channels efficiently to catch problems as they develop. However, repetitious monitoring is perfect for a computer since it will tirelessly monitor every channel in nearly real time.

The plan was made workable by a Sandia-developed program which limits the peripherals to a Teletype. In addition, Teletype printing is kept to a minimum because of its relatively slow speed of some 10 characters a second.

One mode of operation is simply that of printing out data from a pulse code modulator (PCM) encoder in the missile on the launch pad near the trailer. Aside from minimizing the typing, data are also compressed so that various samples of the channel that are of equal value are not all printed.

This method of data presentation achieves several desirable ends. By indicating the channel with a four-character alpha-numeric name, the user can use a name that is meaningful to him, making it easy for him to examine data and determine those characteristics which are important. In addition, compression of data minimizes not only the typing time but also the data the user must examine.

In the few minutes before launch, the program can also be used in a second monitoring mode. Using this mode, the program prints only those channels which are outside of the prescribed limits. Nothing will be typed if all channels are within the prescribed limits. To assure the engineer that everything is going well and that the computer is functioning, the Teletype will print "OK"

Ecology Notes

From the U.S. Department of Commerce, this statement by its National Oceanic and Atmospheric Administration:

"Coal- and oil-fired electric generating plants are second only to motor vehicles in degrading the air environment of the United States. Since total elimination of effluents at the stacks is unlikely, the anticipated 3- to 5-fold increase in this type of power production over the next 30 years will result in the release of additional millions of tons of chemicals directly harmful to both animals and plants. Indirectly, the addition of carbon dioxide, sulfur, and nitrogen products; water vapor from cooling towers; and waste heat may cause changes in the earth's climate. The capacity of the atmosphere to safely disperse and absorb these materials and its ability to transform the additional loads into less harmful products are factors being seriously questioned by environmental scientists of the industrialized nations, especially in cases where plants are located in proximity to major population centers. Siting of such plants, as in the case of nuclear reactors, should give greater consideration to meteorological and climatological factors, since an increasingly degraded atmosphere is involved."



SWITCHES ON THE FRONT PANEL of a minicomputer installed in a trailer are checked by Alan Campbell (7281), who developed the computer program for Sandia's field test operations.

at the end of a present period in which all channels have been within limits.

Should a channel appear out of limits, the telemetry engineer will notice the channel, its value and previously set limits. If the channel is a crucial one that is actually out of limits, he may have to cancel the flight. However, should the channel not be crucial or should its having gone out of limits be understandable, he must then alter the limits stored in the computer's memory to preserve the real-time monitoring characteristics of the scheme. This simple adjustment can be made on the front panel of the computer in less than a minute.

In operation for over a year, the system has been used successfully in support of several launches.

The program was developed by Alan Campbell (7281). Hardware includes a PCM bit synchronizer and format synchronizer, a small computer, a Teletype and an interface device to tie the computer to the PCM decommutator.