

# LAB NEWS

VOL. 22, NO. 7

MARCH 26, 1970

SANDIA LABORATORIES • ALBUQUERQUE NEW MEXICO & LIVERMORE CALIFORNIA

## Rocket-powered Slingshot

# Novel Cable Facility Produces High Speed Impacts

A novel test facility capable of simulating impact conditions for a vehicle dropping at the rate of 800 feet per second has been designed and is now being used by the Coyote Test Field Division 7343. Called the Aerial Cable Site, the facility makes use of a couple of mountains, a mile or two of cable, some bent steel pipe, a short single rail rocket sled—and considerable imagination.

Concept for the facility was born after it became evident that existing methods for impact testing were inadequate. Drop towers, for instance, can be used for low speed impacts, but if forces sufficient to simulate high speed impact were used the tower might be damaged or destroyed. An alternative would be full scale drops from aircraft. However, since it is impossible to pinpoint the impact location in advance, photographic data is difficult to obtain.

The cable facility, however, manages to combine the best features of both methods: knowledge of the precise location of impact so that cameras or other recording equipment can be trained on the target, and velocities matching those of a unit dropped from high altitudes.

The aerial cable facility originally relied on gravity as the propelling force of a unit being tested. A cable was strung from the top of one mountain to the top of a

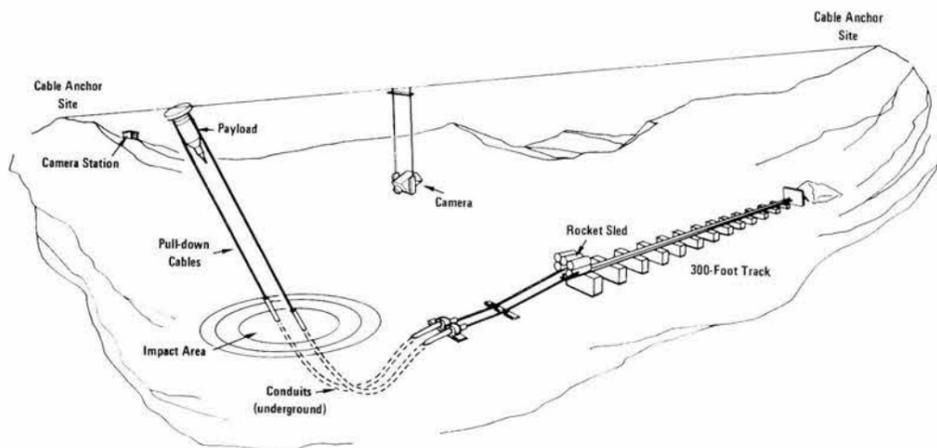
smaller peak. The unit was suspended from a trolley-like arrangement and dropped on to the target area.

As the testing program developed, it became evident that insufficient velocities were obtained this way. The Coyote Test Field people put their imaginations to work and came up with the idea for the present facility: cables from the unit, suspended some 280 feet above the ground, are run through curved guide pipes at ground level and then the cable ends are attached to a rocket sled. When the HVAR rocket-powered sled is fired on its 300-foot track, an explosive cable cutter releases the suspended unit at a point above the target and it is accelerated to the impact point at 800 feet per second. The thing works somewhat like a rocket-powered slingshot.

"We've had tremendous success with this facility," says Dave Bickel, supervisor of Division 7343. "A number of other agencies have learned of it and have requested information about its use."

The tests are relatively simple to set up and, since the facility is not damaged by tests, it is inexpensive to operate. But the biggest advantage, Dave says, is the ability to predict the exact point of impact and thus acquire the data needed.

Connie Coalsos is project engineer for the facility.



AERIAL CABLE SITE for High Speed Impact Tests

# Buchsbaum on Nixon's Science Group



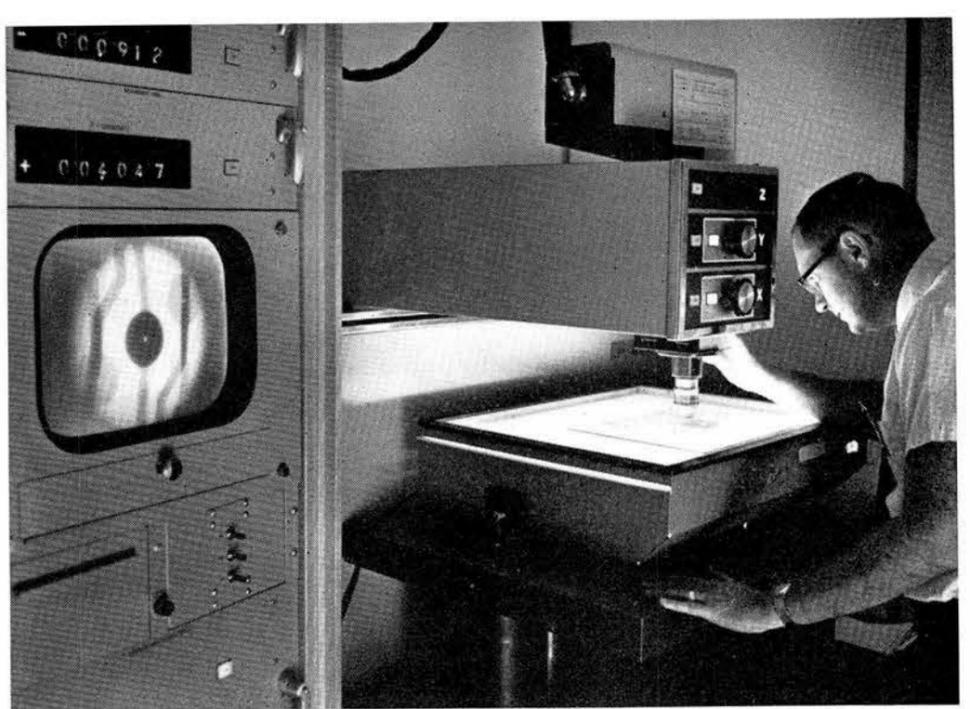
S. J. BUCHSBAUM (5000)  
President's Science Advisory Committee

Sandia Vice President Solomon Buchsbaum was in Washington March 16 to be sworn in as a member of the President's Science Advisory Committee. The ceremony was conducted by Dr. Lee A. DuBridge, the President's Science Adviser who also is chairman of the committee.

The committee consists of 18 outstanding scientists and engineers. Each appointed member serves a four-year term. "The scientists are from all different fields — not just the natural sciences," Mr. Buchsbaum explains. Others receiving appointments this year include an assistant research director for duPont, a professor in the Department of Social Relations at Johns Hopkins University, a physics professor from Princeton University, and the chairman of the Department of Medicine at the University of California's San Francisco Medical Center.

President Nixon, in his letter to Mr. Buchsbaum announcing the appointment, said: "I look to the Science Advisory Committee to provide me with evaluations and advice on scientific and technological matters at the policy-making level, giving particular attention to opportunities afforded by advances in science and technology."

The committee meets two days a month in Washington to deal with questions posed



COCOMS, an automated optical measuring system, has been developed by Product Acceptance Equipment Design II Division 2425 as a more efficient and faster method of inspecting printed circuit masters. Karl Svensson (7653) sets up a master for inspection. The TV zoom lens has magnification power up to 138X. Blown-up image of lands and pathways are displayed on monitor at left.

# Circuit Inspection Made Easier With Sandia Developed COCOMS

Computer aided techniques in the design and fabrication of printed circuit masters have been a boon to systems engineering. Denser and more complex circuit masters are now possible, and they are being produced at a faster pace. But the success of this development is not without complication — the task of inspection of masters has also increased many fold. Inspection consists of checking the spacing of circuits and the location of lands (contact points).

Product Acceptance Equipment Design II Division 2425 has come up with an answer to the backlog of inspection work — the Computerized Coordinate Measuring System (COCOMS). The system, developed by Charlie Stoner, consists of the marriage of commercially available components: X-Y measuring machine, a computer, closed circuit television, double image prism assembly, and associated optics. The closed circuit TV along with the prism and optical assembly — previously developed by Charlie and John Weinlein (now 2654) — are the basis for the system's unique method of operation.

Heart of the optics is a double image prism — similar to the range finder on some cameras — which eliminates the need for reticles with cross hairs or circles for determining the location of a feature. By means of a beam splitter and optical roofs (mirror system), the prism produces two images of a feature with one image completely reversed. Each image, projected onto the TV monitor, is light gray. When the images are only partly superimposed, that portion superimposed becomes a contrasting, easily discernible, dark gray. When the images are completely superimposed and no light gray is visible, the reference point (or

centerline) of the measuring device is coincident with the centerline of the feature and location is established.

Before COCOMS, the inspection of circuit masters was performed with a microscope mounted on a coordinate measuring machine. Considerable setup time was required for aligning the datum points of the circuit master with the axes of the machine. And long periods of microscope examination caused operator fatigue, reducing efficiency and accuracy.

COCOMS eliminates the tedious setup task because the computer automatically compensates for any misalignment error. The computer further provides a large selection of data output formats, including true position of a feature and bilateral or polar deviation printout.

Use of TV reduces operator fatigue and, by using a zoom lens, the TV image of a feature can be enlarged by the flick of a switch. System magnification ranges from 13.8 to 138 power.

The inspection program is fed into the computer by means of a teletypewriter. As each circuit feature is examined, its location is pinpointed and recorded, and any variation from the standard is measured and recorded. Measurement data also is visually displayed.

Early tests of COCOMS indicate that inspection time on circuit masters can be reduced by about 75 percent. "But saving time is not the only important advantage," says Charlie. "Accuracy is greatly improved and we expect to be able to verify printed circuit master features to plus or minus three ten-thousandths of an inch." With but minimum instruction, even a novice can operate the system and maintain reasonable accuracy, he says.

COCOMS is in the final stages of check-out and will shortly be turned over to the Precision Graphic & Programming Division 7653 for use in verifying the accuracy of the computer generated circuit masters.



BRUCE HAWKINSON (4135-1) has been given a leave of absence from Sandia Laboratories to be a program coordinator for HEW's Office of Education Division of Educational Laboratories in Washington, D.C. He will be concerned with goals, priorities, and budgeting for the 15 laboratories located throughout the country.

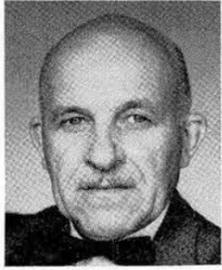
# LIVERMORE NEWS

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SANDIA LABORATORIES

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## Sandian Holds Vocational Posts At State, County, Local Levels



Over the past several months Les Rowe, manager of Plant Services Department 8220, has been elected or appointed to a number of posts associated with the development of apprentice and other state vocational training.

Most recently, he was elected to a one-year term as chairman of the California Machinist Statewide Joint Apprenticeship (JAC) Committee. Membership is composed of union and management officials as well as advisers from the State Department of Education and the Division of Apprenticeship Standards.

The committee reviews applications from firms seeking State approval to establish apprenticeship programs. Recommendations are then made to the State's Division of Apprenticeship Standards based on the committee's evaluation of the program standards, training, and personnel selection procedures.

Earlier, Les had been elected treasurer of the Greater East Bay Joint Apprenticeship Council (GEBAC). GEBAC is more closely concerned with apprenticeship programs in the East Bay Area and is now involved in a wide variety of apprenticeship skills — some 49 at last count.

Last month, Les was appointed a member of the Recommendations Committee to the Governor's California Apprenticeship Council. This council reviews recommended changes to the State's administrative code regarding apprenticeship. Changes approved by the Committee will be debated at sessions of the California Apprenticeship Conference to be held in Los Angeles the end of April.

In addition to these new posts, Les serves as chairman of the Alameda/Contra Costa JAC and as a member of the vocational advisory committees at Laney College in Oakland, Chabot College in Hayward, and Contra Costa College in San Pablo. For the past six years, he has been a member of the Livermore Unified School District ad hoc curriculum committee for vocational subjects and is this year's chairman.

Les feels strongly about the development of vocational and crafts training. "There's a lot of emphasis on college prep in our high schools, but only 30 percent or so of the graduates go on to college. So we need to give the other 70 percent some degree of skill so that they can get a job," he explains.

### Take Note

Ray Ng (8174) and Al Reichmuth (8252-4) were first and second place trophy winners, respectively, in the second annual Juan Doyen Memorial Chess Tournament at Sandia Laboratories Livermore. Jim Dremalas (8252-2) won the third place chess set.

The noon-time tourney is held each year in memory of Juan Doyen, a former draftsman in the Electronic Design Drafting Section and one of the early transferees from Albuquerque when the Livermore laboratory was formed. He died shortly after starting the first tourney in 1968.

This year about 40 employees participated over a four-month period. Following standard chess rules, the tourney was played on the basis of modified double elimination. Gene Lopp (8252-3), one of the coordinators of the tourney, presented the prizes to the winners.

Jack Dini and John Helms of Metallurgy Division 8312 were coauthors of an article appearing in the February 1970 issue of *ELECTROCHEMICAL TECHNOLOGY*, the Journal of the Electrochemical Society. Title of their work was "Electrodeposition of Lead-Antimony Alloys."

Two Sandians presented technical papers at the Beryllium Symposium sponsored by the National Materials Advisory Board of the National Academy of Sciences March 23-25 in Washington, D. C. Glen Funk (8172) discussed "Design of a Beryllium Shell for Impulse Loading," and Cliff Yokomizo (8162) spoke on "A Study of the Design of a Hermetically Sealed Beryllium Container." In addition, a Sandia movie, "Shearforming of Beryllium," filmed at Sandia's contractor facility Aeronautics Division of Ford-Philco, was shown by Phil Lindsay (8312).



**THE LINE FORMS HERE!** discovered employees at Livermore when word got around that a representative of the League of Women Voters would be at Sandia to register voters. Although you're too late to register for the City of Livermore election April 14, California voters not already registered have until April 9 to register to vote in the June 2 primary election and until Sept. 17 for the general election on Nov. 10.

### Retiring . . .



**JOHN KANE**  
Environmental Test Division 8125

### Congratulations

Mr. and Mrs. Kirby Hammond (8182), a son, Kirby James, Jr., Feb. 18.  
Mr. and Mrs. Lowell Jones (8312), a daughter, Deborah Yvonne, Feb. 14.  
Mr. and Mrs. Cyril Moy (8234), a son, Daniel John, March 5.  
Mr. and Mrs. John Totten (8121), a daughter, Deborah Jean, Feb. 22.

### IMOG Environmental Testing Subgroup Meets at Livermore

The Environmental Testing subgroup of the Interagency Mechanical Operations Group (IMOG) met recently at Sandia Laboratories Livermore. Bob Hargreaves (8125) hosted the 18th meeting of the subgroup.

Included on the agenda were presentations on "Digital Processing of Vibration Data," by Dave Hillyer (LRL); "Low Cost Random Vibration Testing," and "Use of Video Tape in Environmental Testing," by George McClellan (GE); "Updated Information on Disk Recorders," by Duane Arlowe (7345); "Torsion Testing with a Digital Computer," by Michael Poore (Y-12); "Vibration Data Acquisition System," by Donald Gerig (LRL); "Hydraulic Vibration Facility," by Richard Scudero (LRL); "Spectral Analyses of Random Process," by Bob Humphrey (8133); "Digital Vibration Control," by Dennis Nelson (8125); "Electrostatic Recorder," by Phillip LaPoint (7524); and "System Calibration with Complex Step Response Analysis," by Dave Darsey (7524).

Of special interest was Mike Shannon's (LRL) video tape presentation on "Vibration Method for Nondestructive Testing of Spartan Specimen." A tour of the Laboratory's environmental test facilities concluded the two-day meeting.

IMOG coordinates information exchange within the AEC complex to improve the fabrication and physical inspection of weapon components and assemblies.

### Sympathy

To Jack Renaud (8234) for the death of his father-in-law in Albuquerque, Feb. 28.  
To Pat Caywood (8312) for the death of his mother in Denver, Colo., March 4.

### Speakers

A. C. Switendick (5151), "Energy Band Calculations for Metallic Compounds," University of Colorado Seminar, March 5, Boulder.

J. E. Schirber (5150), "The Effect of Pressure on the Fermi Surface of Sb," Conference on the Physics of Semimetals and Narrow Gap Semiconductors, March 20-21, Dallas.

B. T. Kenna (5525), "Studies in Fast

Neutron Activation Analysis," Second ORAU Conference on the Use of Small Accelerators for Teaching and Research, March 23-25, Oak Ridge.

R. I. Ewing (5235), "Condensation of Indium on Refractory Metals," 13th Annual Conference on Physical Electronics, March 30-April 1, Milwaukee.

L. S. Nelson (5224), "Combustion of Zirconium Droplets in Oxygen-Rare Gas Mixtures," Westinghouse Research and Development Laboratories, March 5, Pittsburgh.

J. M. Hueter (3134), "Creativity in Value Engineering," Purchasing Management Association, March 12, Dayton.

J. A. Reuscher (5222), "Coupled Kinetic-Elasticity Calculations of Pulsed Reactor Performance," University of Arizona Symposium on Dynamics of Nuclear Systems, March 23-25, Tucson.

M. R. Scott (5222), "Numerical Solution of Linear Boundary Value Problems Via Invariant Imbedding," Southwestern Section, Mathematical Association of America, March 27-28, El Paso.

R. H. Erickson (5321), "Strengthening of Metals," Corona High School, March 24, Corona, N.M. (Part of Visiting Scientists Program.)

### Congratulations

Mr. and Mrs. Bob Tomlinson (2334), a daughter, Khristy Kay, March 15.

## Protection for Juveniles Purpose of P-TA Committee

Smoking pot, burglary, car stealing, creating a disturbance. When a juvenile is picked up by authorities and suspected of these violations (or many others), the treatment he receives can vary widely.

The P-TA Juvenile Protection Committee is interested in determining which agencies or offices actually deal with juveniles, and how better protection can be guaranteed youngsters.

When the group reorganized about five months ago, Sandians Frank Ross (2444), Harry Morris (2444), and Frank Rebarchik (5332) were among the P-TA representatives who took an active interest. Darryl Harrell, executive assistant to the Albuquerque Public Schools superintendent, heads the committee.

First action of the county-wide group is to interview various individuals and agencies to determine how juvenile problems are handled. This includes the police department and sheriff's office, detention home, girl's home, community agencies, probation office, district attorney's office, etc.

When the interviews are completed, the committee will review the reports and the published findings will be distributed to all P-TA's in Bernalillo County.

This activity is tied in with proposed changes in the state Juvenile Code. A revised code, submitted to the State Legislature in 1969, did not get out of a Senate committee. The three Sandians and two other residents are working with State Rep.

Tom Hoover (1222) in reviewing the code and determining necessary action.

The P-TA committee also plans to hold a panel discussion with high school students on the drug problem. The committee hopes to gather information for distribution to both students and parents.

Interested parents or teachers are invited to attend the committee's monthly meetings. Any of the three Sandians can provide additional information about the time and date.

### Supervisory Appointment



**SAM KEY** to supervisor, Analytical Division 1541, effective April 1.

Sam joined Sandia in 1966 and was assigned to the Deformation of Structures Division (now Dynamic Analysis Division) where he has been doing structural analysis of reentry vehicles.

He has a BS in aeronautical engineering and MS and PhD degrees in engineering mechanics from the University of Washington.

Sam, his wife Virginia, and their two children live at 6708 Arroyo del Oso NE.

## LAB NEWS

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### SANDIA LABORATORIES

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Cherry Lou Burns & Don Wolfe are Staff Writers

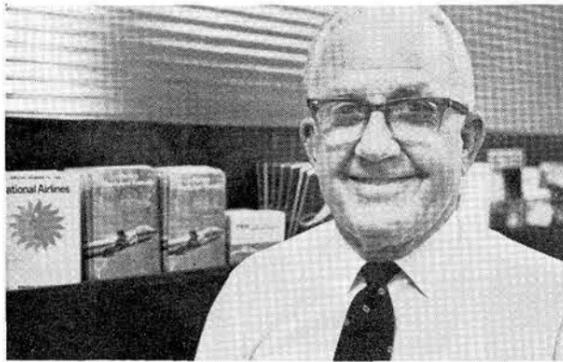
Matt Connors & Lorena Schneider

are Staff Writers in Livermore

Bill Laskar is Photographer

Norma Taylor / All The Rest

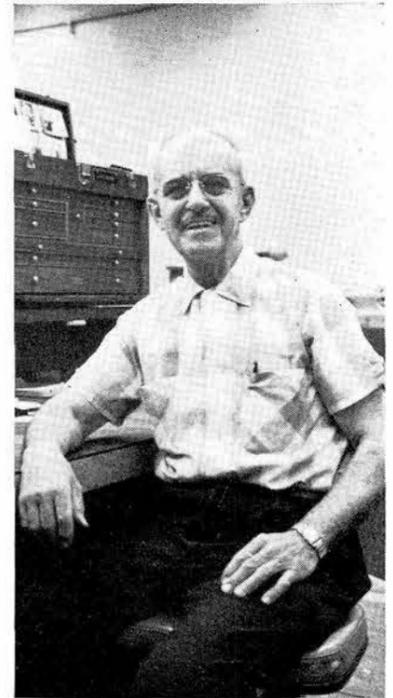
# Retiring



**JACK SPENCE**  
Supervisor, Traffic 4363



**NICK TARNAWSKY**  
Supervisor, Mail Services 3428-3



**JOSEPH SYLVESTRE**  
Machine Shop 4253



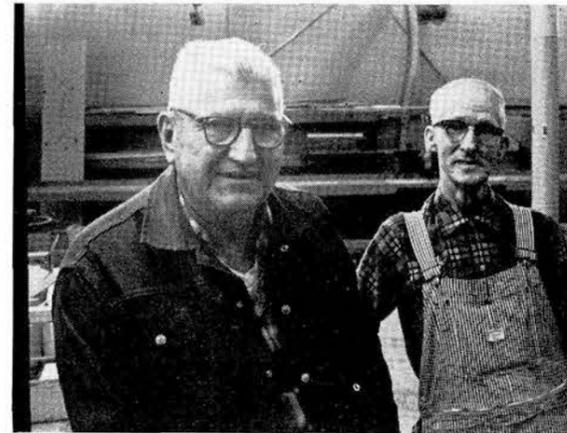
**BARNEY HUSSEY**  
Patrol Division 3524



**CONNIE TAYLOR**  
Transducer Evaluation & Calibration 7511



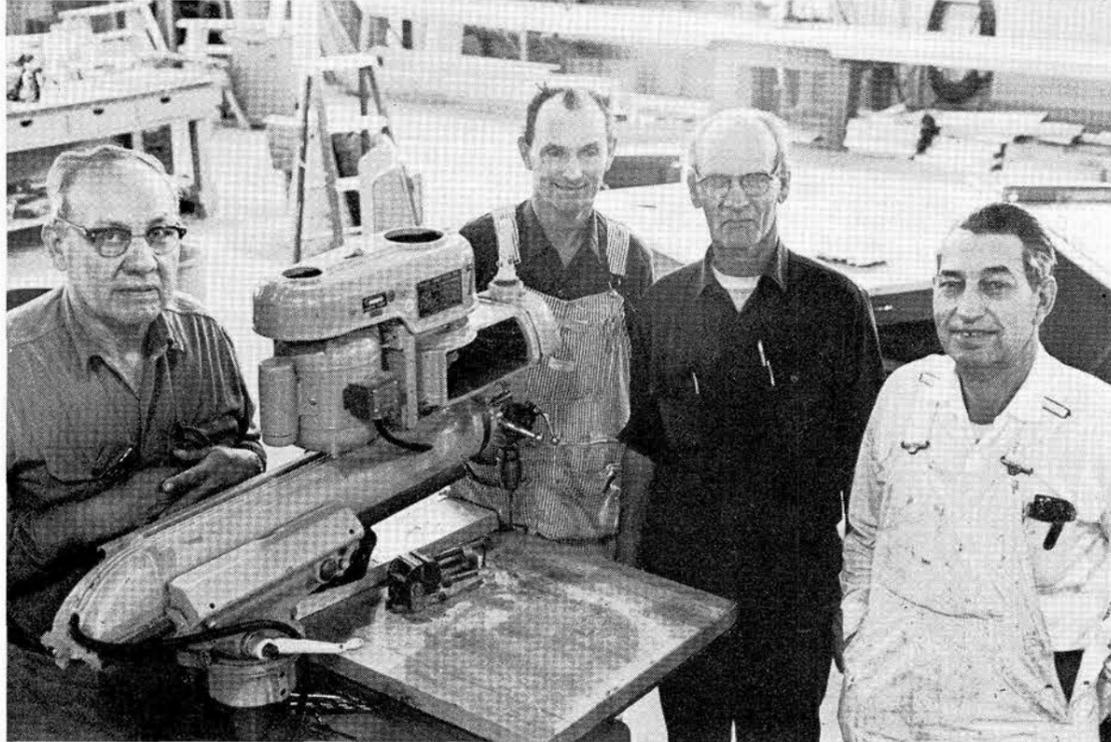
**BEULAH HANSEN**  
Data Center 9413



**ROSCOE BRYANT      LONNIE SKINNER**  
Plant Modification 4513



**ORVALLE GRAHAM**  
Safety Engineering 3351



**CHIEF ALEXANDER      LOY ROBINSON      CHARLES WEIDMAN      HERALD KINGSBURY**  
Plant Modification 4513



**CLOY KNOCK**  
Design Information 7631



**ERMA HATFIELD**  
Secretarial Services 3256



**JEAN NAUGHTON**  
Technical Libraries Operations 3424



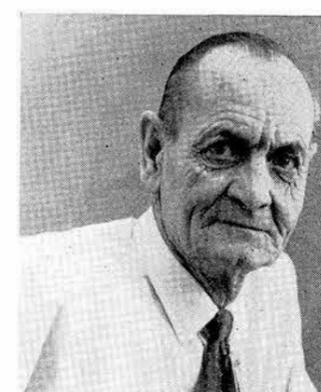
**DOROTHY MATLACK**  
Technical Information 3412



**WILLARD CONVERSE**  
Administrative Assistant 5300-5500



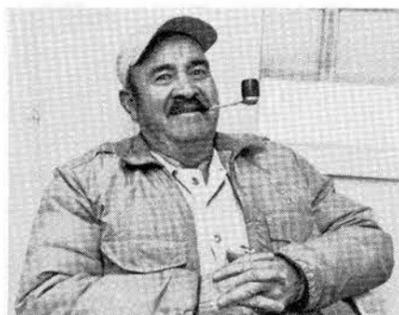
**BEA ALLEN**  
Supervisor, Technical Libraries 3422



**DAN WOOD**  
Fire Sets 2313



**H. B. YOUNG**  
Product Acceptance 7411



**JUAN SANCHEZ**  
Patrol Division 3522



**HUNTER HANNA**  
Budget Division 4142

# Retiring



**BENJAMIN MARTINEZ**  
*Receiving and Shipping 4623*

**SAM APODACA**



**JOHN STAMM**  
*Acceptance Equipment Design Definition 7615*



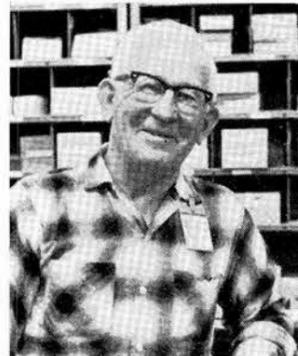
**JOE JOHANNESSEN**  
*Electromechanical 2324*



**DOROTHY DOUGLASS**  
*Secretarial Services 3255*



**ROBERT RUTLEDGE**  
*General Stores 4613*



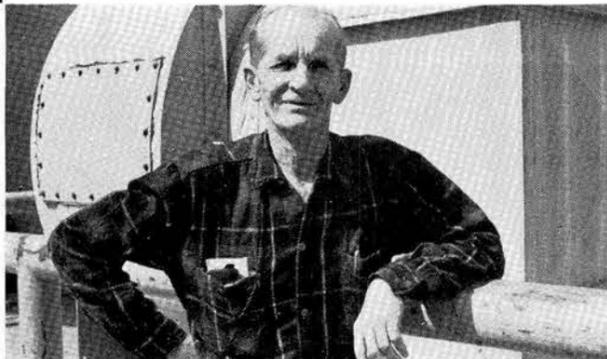
**JOSEPH COMISKY**  
*General Stores 4613*



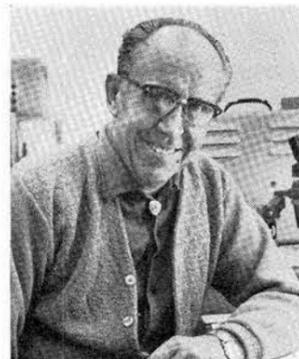
**ELZIE GREENE**  
*Data Operations 7412*



**JOHN PLATERO**  
*Remote Areas Maintenance 4518*



**SHIRLEY MILLER**  
*Plant Modification 4513*



**TRAVIS SANDERS**  
*Inspection Calibration 4213*



**OSCAR SCHROLL**  
*Explosive Components 2342*



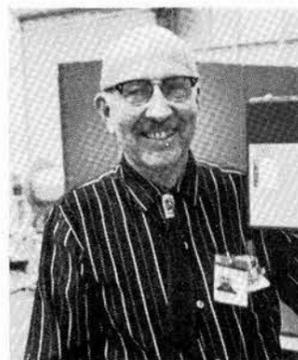
**E. J. DADIAN**  
*Buyer 4364*



**HERMAN GOWER**  
*Remote Areas Maintenance 4518*



**JACK BABB**  
*Electromechanical Components 7433*



**ED DAVIS**  
*Inspection Calibration 4213*



**GEORGE COOPER**  
*Administrative Systems 4117*



**WALT SMITH**  
*Plant Engineering 4551*



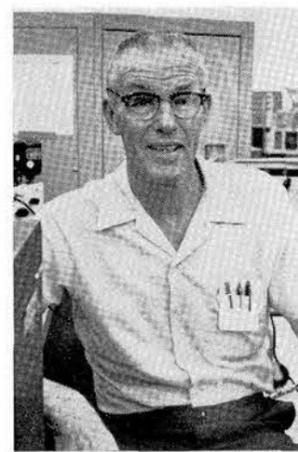
**ERMA CAMPBELL**  
*Micrographics 7632*



**FILOMENO CHAVEZ**  
*Motor Pool 4573*



**FRANCIS PATTERSON**  
*Data Planning & Reports 7415*



**BILL HESS**  
*Instrument Repair & Calibration 7512*



**R. E. IRVIN**  
*Weapon Materiel & Evaluation 1611*

# Service Awards

## 20 Years



Roseanne Bascom  
4516

Dora Dyer  
6021

Juanita Fidler  
3428

## 15 Years



Robert Allison  
9232

Mahlon Baker  
7451

Mary Beth Brown  
6021



William Carman  
2632

James Gibbons  
7452

Helen Hutton  
3417



Edward Krapf  
4383

Robert Leslie  
2444

James Pennington  
3455

## 10 Years

Barbara Netherton 8256, Dorothy Fones 8252, Liveo Olivotti 8153, Betty Wolf 7631, Catherine Tinsmith 9415, Gary Willingham 1212, Robert May 5163, and Richard Com 9223.



MATTOX and Steve Schum, a student at UNM, pause to admire view of San Luis Valley in background.

WIND kicks up snow as climbers approach ridge line leading to summit.



# Some Like It Cold

WHY CLIMB a mountain in summer when you can do it in the winter? Sandians Don Mattox (5332), Bill Fulcher and John Davenport (both 2334) spent a recent weekend testing the challenge of Blanca Peak in southern Colorado. At 14,317 feet, it is that state's fifth highest. Thin snow and good weather made climb relatively uneventful, but crampons, ice axes and belay ropes were essential on upper reaches.



BLANCA PEAK, farthest to right, looms above Fulcher and Mattox as they cross snow field at 13,000 foot level.



ROOM AT THE TOP, lots of it, awaited successful climbers (from left) Don Mattox, Bill Fulcher and Steve Schum, sitting John Davenport and Dick Meleski, UNM staff photographer. Convenient sky hook was used to take picture.

## LAB NEWS

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### 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

MEMBERSHIP to Albuquerque Athletic Club, save \$50 over new price w/additional savings on dues, good this year. Schulze, 299-0152.  
POWER MOWER, reel-type, \$10; 40-gal. water heater, \$10. Holloway, 255-6938.  
BLACK WIGLET w/stand & case. Wickham, 268-8805.  
'68 500cc Triumph Daytona, low milage. Lewis, 268-4488.  
SELL OR TRADE: 2 passenger carry-all type seat, good for back of pickup, carry-all or jeep type vehicle. Stuart, 299-9190.  
INDIAN artifacts: small antique glass display case, \$25; old glassware, decanters, vases, pitcher & glasses. Smith, 299-1096.  
MAG WHEELS, 1-pc. cast aluminum, set of 4: Sun Super B tachometer & case. Puls, 298-8097.  
STARCRAFT 12' aluminum cartop boat, w/2 oars, cartop carrier & life jackets. Finlayson, 296-4538.  
FENDER CONCERT AMP, four 10" speakers, suitable for guitar or bass; complete set Kroyden left-handed clubs, bag, cart. Ezell, 268-4845.  
WESTERN SADDLE. \$65. Haskell, 344-0355.

HERITAGE MOBILE HOME, 12x65, carport, lg. awning, skirting & water conditioning. Magruder, 298-9119.  
305 HONDA Superhawk, low mileage, partial fairing, saddle bags, \$375. Peoples, 877-3942.  
TWO MALE BASSETT hounds, AKC reg. Loucks, 296-6001.  
BICYCLE, boy's 26" 3-spd. w/hand brakes, light & generator, \$20. Fox, 299-9031.  
HORSES, 5-yr.-old paint, gelding, \$150; 9-yr.-old Palomino, reg. quarter horse mare, \$300. Keller, 282-3490.  
5 HP OUTBOARD MOTOR, \$40; 12" wood planer, Boice-Crane. Waldorf, 344-1017.  
HAMMOND CHORD ORGAN. Davis, 298-6944.  
BOGEN 20-watt mono amplifier; 6-lug truck wheel w/good 6.50x16 6-ply tire. Cave, 299-5066.  
TWO NAVAJO RUGS; squash blossom necklace; concho belt; old apache water jug. Luna, 265-5462.  
EICO FM MLPX tuner & stereo amplifier, needs repair, \$25. Foster, 282-3975.  
MOBILE HOME, 12'x60' Namco 1967, 2-bdr., washer & AC. Shelby, 842-3611 8-5 or 898-2019 after 6.  
TROMBONE, \$45; pair of boy's size 5 ice skates w/guards, \$7. Blakely, 299-5249.  
ROSSIGNOL STRATO SKIS & bindings, \$100; Rosemont boots, \$70; Head ski poles, \$10; Kawasaki 100cc Green Streak, \$545. Otero, 299-7954.  
ELECTRIC STOVE, 30", stainless steel top, \$75. Jacobs, 296-4522.  
SOLID hard-rock maple Early American 4-dwr. chest & matching dbl. bed, springs & mattress, \$110 or best offer. O'Bryant, 268-9049.  
PHYSICS & math books, approx. \$1 per book. Brower, 298-2254.  
EXERSIZER, Slim Gym, \$35; small Murray chain drive tricycle, \$6. Corll, 255-1186.  
USED WOOD SKIS, 210cm, multi-laminated, w/ Micro safety bindings & tapered metal ski poles, \$20. Plummer, 243-6833.  
TABLE SET, 2 step tables, 1 end table, mahogany finish, \$20; end table, mahogany finish, \$5; trunk, 34"l, 23 1/2" h, 20" d, \$10. Stark, 299-5953.

PORTABLE DISHWASHER, RCA Whirlpool, deluxe model, formica top, consider trade. Rose, 298-4849.  
VIOLIN & CASE, \$39; Ampex speakers w/fidelity controls, \$55 ea.; antiques: Telephone, \$40, rocking chair, \$25. Graves, 344-3008.  
DUAL KING quilted bedspread, 1 yr. old, blue, aqua floral print, \$15. Westfahl, 298-5087.  
LEG powered lawn mower, \$8; fertilizer spreader, \$3. Laskar, 299-1024.  
FRIGIDARE electric range, 4-burner w/deep well cooker, side storage drawer & bottom storage drawer, \$75. Hurst, 265-9405.  
ROYAL DOULTON CHINA, Desert Star, service for 8 plus soups, creamer, sugar, salads, veg. bowl, 2 platters, \$100. Allen, 243-7085.  
STEREO CONSOLE, dark wood, \$65; room cooler w/stand, portable, \$25. Ready, 255-8238 after 5.  
GIRL'S 24" standard & 20" spider type bicycles, \$15/ea.; reel power mower, 18", \$25; outside rear view mirrors, \$10 for pair. Gray, 265-1883.  
BANDSAW, Boice-Crane floor model, 14" dia. wheels, 8" max. saw depth, 13 1/2" throat, 8-speed, 3/4 hp motor, \$175. Gubbels, 299-8089.  
PUPPIES: AKC Toy Poodles, excellent pedigrees, 2 females, 9 wks. old. Davis, 298-1957.  
8 X 12 bronze-olive acrilon plush rug, used 2 mos., \$50. Wilson, 299-7503.  
BICYCLE, girl's 26", \$8. Shirey, 298-6362.  
RABBIT HUTCHES (2), 1 yr. old, lg. enough for singles or litters, best offer. Forsythe, 299-2785.  
DOUBLE BED, bookcase headboard, beige dupont finish, \$16. Guilford, 344-6463.  
TRUMPET, Getson "Capri", used 2 semesters, cost \$199, asking \$150. Merrilat, 242-4873.  
WIG, lt. blonde, human hair, hand tied - porous, very lt. weight, cost \$325, best offer. Hall, 268-6387.  
SCHOOL DESK, modern, formica top, tubular steel body & lens, 18x24x29 inches high, \$12. Fisher, 268-6633.  
TRAVEL QUEEN model 105 camper, side dinette, dbl. sink, furnace, w/ or w/o '64 3/4-ton 4-spd. GMC. Prohaska, 298-8497.

SEAR'S 8000 BTU refrigeration air conditioner, \$150 or best offer; '65 Mustang 3.50 ring & pinion gear (V8), \$30 or best offer. Bouma, 265-9653 after 5:30.  
AKC Silver Toy Poodles, championship blood lines, 2 males, \$75 ea., 1 female, \$100. Horning, 296-2488.

#### CARS AND TRUCKS

'62 FORD 1/2-ton pickup, short, wide bed, V8, 3-spd., plus camper shell, \$975. Urist, 296-8846.  
'69 MERCURY Cyclone, red w/GT option, 390 cu. in. engine, PS, PB, Polyglas tires, deluxe interior. Boyes, 282-3602 weekends.  
'67 CAMARO Rally Sport, 327 V8, AT, AC, PS, disc brakes, Positraction, Polyglas tires, conc. headlights, fold down rear seat. Carnicom, 282-3421.  
'62 CADILLAC sedan, one owner, 82,000 miles, to settle estate, \$950 or best offer. Hueter, 242-1620.  
'64 MERCURY Comet, 2-dr., 6-cyl., \$250. Lee, 268-7172 after 5:30.  
'67 FORD 4-dr. HT Galaxie 500, air, AT, PB, PS, \$1675; Datsun Moon hubcaps. Chandler, 296-3323.  
'59 CHEVROLET station wagon, \$400, needs absolutely no work, new tires, other extras. Kahn, 255-3870.

#### REAL ESTATE

LR, DR, step-down den, 3-bdrs., 1 1/4 baths, dbl. garage, lg. corner lot, landscaped, view. Johansen, 898-2398.  
8 ACRES irrigated land, Peralta area, home site. Shuman, 636-2618.  
4-BDRS., built-ins, carpeted, AC, new roof, fp, near schools & Sandia Base, 5 1/4% FHA, total price, \$17,900. McFall, 298-1552.

#### FOR RENT

COMPLETELY FURNISHED 3-bdr. ranch style home, NE Heights, summer only, June 6 to Aug. 26, must commit by April 15. Blossom, 299-6709.  
2-BDR. furnished duplex, water & garbage paid, near University, \$95. Plummer, 243-6833.

#### WANTED

'38 SPECIAL revolver in very good condition. Maak, 282-3482.  
HELMETS, motorcycle type, adult size, need two. Hueter, 242-1620.  
BLUEBIRD uniform, size 7. McMillan, 268-6327.  
WANTED TO RENT: A motor mobile home or a pickup camper for four adults & two children — April 17, 18, 19. Parsont, 299-1621.  
GIRL'S used spider bike. Hagan, 282-3696.  
WOODEN PLAYHOUSE or storage shed. Eldredge, 268-7396.  
RUBBER LIFE RAFT, paddles, life vests. Corll, 255-1186.  
RETIRED COUPLE WANTED: Rent free, 2 bdr. house, 52 mi. So. of Albuquerque, in exchange for maintenance. Louis, 256-9446.

#### LOST & FOUND

LOST—Plain gold "Monet" earring, black record book notebook; mortgage co. amortization book, yellow gold scarf ring w/ADM engraved, yellow gold cross pen, yellow gold rope necklace, brown leather glass case, cuff link made from SC service award, man's white Timex watch w/metal band, dangling red ball earring. LOST AND FOUND, tel. 264-2757, Bldg. 832.  
FOUND—Gold necklace, gold earring, BOOK RADAR SYSTEMS FUNDAMENTALS, necktie. LOST AND FOUND, tel. 264-2757, Bldg. 832.

**NEXT DEADLINE FOR SHOPPING CENTER ADS 12 NOON APRIL 3**

# Taxpayers Bawl Scheduled April 11



Big event on the Club's April calendar is the Taxpayers Bawl scheduled Saturday, April 11. This one is designed to make you forget Form 1040 and the surtax. It will start with cocktails at 6:30 p.m., a tremendous Chinese food buffet will be spread from 7 to 8:30 p.m., and dancing to Phil Graham's orchestra will follow.

The Chinese food buffet will include assorted salads, chicken chow mein, egg rolls, sweet and sour ribs, ham fried rice, and fortune cookies. Tickets are \$3 for members (\$4 for guests) and should be picked up by April 6.

### Social Hours

Because of the holiday tomorrow, social hour at the Club this evening (Thursday) will be from 5 to 9 p.m. in the main lounge only.

On Friday, April 3, seafood will be the social hour buffet feature while Sol Chavez and the mighty Duke City Brass will play for dancing.

Frank Chewiwie will return to the bandstand on Friday, April 10. Southern fried chicken will top the buffet menu.

### Kid's Easter Egg Roll

Prizes and surprises await the youngsters under six Saturday morning from 10 a.m. when the Club throws an Easter party. The eggs will be hidden on the patio and when the whistle blows, look out! It's free to members' children.

### Teen Go Go

A group called the Forthcomings will be wired into the bandstand for the teenagers to enjoy Saturday, April 4. Member parents should pick up tickets (members 25 cents, guests 50 cents) by Friday, April 3.

## 1970 Census Gets Underway Saturday

Saturday (March 28) householders will receive in the mail "short form" census questionnaires that will provide the basis for the 1970 census — estimated to account for about 250 million people in the U.S.

In Albuquerque, census takers will call at homes during the month of April to pick up completed questionnaires and in every fifth home to ask additional information. As in the past, many people will ponder and puzzle over the questions and will request further assistance in filling out the forms.

Lee Amador, who is on leave from Sandia to serve as census director for northern New Mexico, reports that his office is ready to help. "We'll try to answer every question," he says. The office is at 1712 San Pedro NE and the number to call with your query is 843-3181.

Lee has had a busy time touring the 17 counties in his district to acquaint residents with the purpose of the census and the importance of every individual being included in the official count. His office also tested 1500 persons for the 600 census-taker positions available.

Enumerators are reported to have adopted the slogan "door to door for Amador."

## Take Note

Darrell Munson (5163) will present "Hugonit Predictions in Laminated Composites and Mechanical Mixtures" at a meeting of the 5100 Staff Seminar March 31. "Study of Lattice Disorder Created by Sb Implantations into Si by Means of Channeling Effect Measurements" will be discussed by Sam Picreux (5111) April 7.

The 5100 Staff Seminar meets on Tuesday mornings at 8:30 in Rm. 201 of Bldg. 806.

### Credit Union Statements

As part of its normal audit procedure, the Supervisory Committee of the Sandia Laboratory Credit Union recently mailed statements to members with account numbers from 6000 through 6999, and from 9000 to 9999. If your account number is in either of these series and you have not received your statement, please notify Karl Waibel (4117), Committee Chairman.



CONGRATULATIONS are offered by Bob Flaxbart (4510), speaker, to 13 men of Plant Maintenance Department 4510 who recently completed one year of skills improvement training to achieve the rank of Plant Technician. The men are Filberto Archibeque, Edward Gonzales, Andrew Lunsford, Eusebio Montano, Clemente Valencia, Geoffrey Haycraft, Wesley Kimbrel, Jose Garcia, Doomas Easton, James Wolfe, Roy Hay, Patricio Lerma and Franklin Myers. Bob Hopper (4500), seated at end of table, also congratulated the men.

## Labs Solid State Activities Reported at APS Meeting

The American Physical Society meeting which is combined with a meeting of the Solid State Division, is always of high interest to many Sandians.

This year the meeting was held from March 23 to 26 in Dallas, and numerous Sandians presented papers.

From Radiation Effects in Solids Research Department 5110: K. L. Brower, "EPR of Ion-Implanted Donors in Si"; H. J. Stein, F. L. Vook, and D. K. Brice, "Infrared Measurements of 400 KeV B<sup>11</sup> and Sb<sup>121</sup> Implanted Si"; F. L. Vook and H. J. Stein, "Analysis of B Implantation Temperature Dependence of Lattice Dam-

age in Si"; A. C. Saxman, "Picosecond Structure in a Gigawatt Nd: Glass Laser System"; P. S. Peercy, "Raman Scattering of NaH<sub>3</sub> (SeO<sub>3</sub>)<sub>2</sub>"; E. D. Jones, "Ultrafast Laser Induced Waves in Solids"; and M. J. Clauser, "General Stochastic Theory of Line Shape in Nuclear Resonance."

From Physics of Solids Research Division 5132: G. A. Samara, "Pressure and Temperature Dependence of the Dielectric Properties and Phase Transition in Antiferroelectric PbZrO<sub>3</sub>"; L. R. Edwards, "Effect of Pressure on the Resistivity of Ag-Au Alloys"; L. C. Bartel, "Calculation of Near Neighbor Spin Correlation Functions in MnO and a-MnS for TcT<sub>N</sub>"; W. A. Abel and G. A. Samara, "Pressure Dependence of the Electrical Resistivity of AuGa<sub>2</sub> and AuIn<sub>2</sub>."

From Solid-State Research Department 5150: J. E. Schirber, "Effect of Hydrostatic Pressure on the Fermi Surface of Zr"; A. G. Beattie, "Pressure Dependence of Elastic Constants of SrTiO<sub>3</sub>"; D. Emin, "A Perturbative Calculation of Small Polaron Hall-Mobility in a Two-Dimensional Square Lattice"; R. C. Knauer, "The Effect of the Vacancy Mechanism of Diffusion on Mossbauer Line Broadening"; R. E. Nettleton, "Interactions between Proton Tunneling and Optical Phonons in KH<sub>2</sub>PO<sub>4</sub>"; G. E. Pike, "Voltage Jumps in Weak-Link Josephson Junctions"; C. H. Seager and D. Emin, "Measurements of the Temperature Dependence of the Hall Mobility of Electrons in the Alkali Halides"; A. C. Switendick, "Band Structure of Yttrium Hydride"; J. P. Van Dyke, "Relativistic Energy Band Models for Arsenic, Antimony, and Bismuth"; P. D. Thacher, "Electro-optical g Coefficients of Pb-Containing Oxygen-Octahedra Ferroelectrics"; R. R. Bartkowski, "Spin Wave Relaxation in EuS."

From Organic Materials Research and Development Department 5510: R. G. Kepler, "Radiation Induced Conductivity in Polyethylene Terephthalate and Polystyrene"; R. C. Powell, "Temperature Dependence of Energy Transfer in Tetracene Doped Anthracene"; R. C. Hughes, "EPR of CO<sub>2</sub> Defects in Calcite: Motional and Non-secular Contributions."

## IEEE Symposium Here March 31

The Albuquerque-Los Alamos section of IEEE will sponsor a day-long symposium at Sandia Laboratories on Tuesday, March 31. This will be an unclassified symposium and open to the public. All sessions will be in the Theater Bldg. 815, outside of the tech area.

The symposium will be videotaped for later presentation at Sandia Livermore. Topic for the day is "Microelectronics."

The day's sessions include:

9 a.m. — "Microelectronics - An Overview," Glen Madiand, Integrated Circuit Engineering Corporation.

10 — "Beam Lead Technology," D. S. Peck, Bell Telephone Laboratories.

11 — "Beam Lead Attachment for High Reliability Applications," Frank Howland, Bell Telephone Laboratories.

2 p.m. — "Flip-Chip Technology," David Richardson, Fairchild Semiconductor.

3 — "Circuit Analysis and Design by Digital Computer," Allan Malmberg, Brad-dock, Dunn & McDonald, Inc.

4 — "The Computer's Roll in the Design of Custom LSI," Lester Hazlett, Motorola.

## Events Calendar

March 28—Pre-Easter stroll in the Sandia foothills. N.M. Mountain Club, leader Marge Lenth, tel. 256-0282.

March 29—Easter sunrise services, Paradise Hills.

March 29—Easter dances at most Indian Pueblos and for several days afterwards.

April 2-5—Albuquerque Civic Light Opera presents "The Sound of Music." Popejoy Hall.

April 4—Volcanic rock formation and mineral springs in Penasco Springs area. N.M. Mountain Club, leader Norm Bullard, tel. 268-1812.

April 5—Hike in Ladrones area. N.M. Mountain Club, leader Bill Stamm, tel. 255-2640.

April 5—National Park Service series of films on environmental awareness. Museum of Albuquerque, south end of Yale Blvd., 2 p.m., free.

April 6—Community Concert series presents violinist Jaime Laredo, Popejoy Hall.

April 9—UNM Opera Studio, Popejoy Hall. April 9-12 — Shakespeare's "Cymbeline." Old Town Studio, tel. 242-4602.

April 11—YWCA charter bus trip to Santa Fe, Santo Domingo Pueblo, Tesuque Pueblo. Reservations, tel. 247-8841.

## Death



James Reid, Jr.

James Reid, Jr., of Project Management Division V 1512 died March 9 after a short illness. He was 48.

He had worked at Sandia Laboratories since May 1957.

Survivors include his widow and three children.

## Impossible Projects Theme Of Bell TV Special April 2

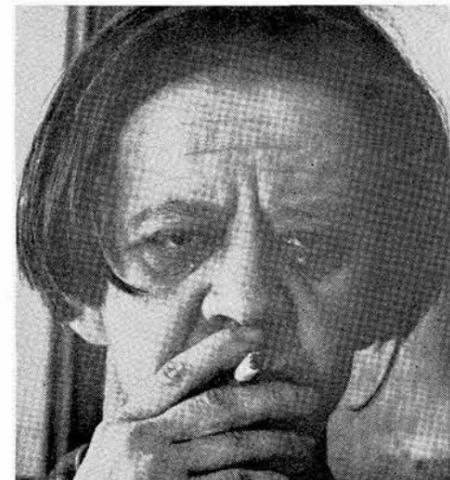
"Impossible" is the theme for the Bell System televised special "It Couldn't Be Done," which will be shown locally on April 2 from 6:30 to 7:30 p.m. on KOB-TV.

The special program salutes the builders of "impossible" projects such as Mt. Rushmore, the Panama Canal, Golden Gate Bridge, and many other past, present, and future feats of American ingenuity and perseverance.

Highlights of the program include interviews with some very outspoken architects and workmen who actually worked on the projects described. Rare films taken by Thomas Edison during construction of the Brooklyn Bridge will also be shown. Host-narrator will be Lee Marvin.

### Variable Annuity Unit Value

March 1970	1.445
February 1970	1.571
Average 1969	1.697



**SMOKING IS VERY GLAMOROUS**

AMERICAN CANCER SOCIETY