



IKEYA-SEKI COMET appears to be rising out of Tijeras Canyon in the photo taken by Grover Hughes and a group from Range Optics Division 7224. The striking photograph was made at 5:22 a.m. Friday, Oct. 29, from Sandia's East Mesa facilities.

Ikeya-Seki Comet Takes Scientific Interest Skyward for Past Week

The Ikeya-Seki comet, visible here for the past week, has caused quite a stir among Sandians. A group in Range Optics Division 7224 made a number of spectacular pictures using the 24-inch tracking telescope on the East Mesa.

During the noon hour Oct. 20, Grover Hughes, Dan Fenstermacher, Bob Hughes, Joe Llamas, and Dale Fastle obtained a photo of the comet as it passed close to the sun. There was some speculation that the comet might be pulled into the sun on this day, but as far as can be determined, the comet passed around the sun at a distance of about 150,000 miles.

Ken Deller (5141) captured an image of both the sun and the comet on Polaroid film which clearly shows the comet less than one solar diameter (about 864,000 miles) away from the sun. Ken used a standard camera with the lens partially blocked.

From its discovery a few weeks ago by two amateur Japanese astronomers working separately, the Ikeya-Seki comet has been something of a mystery. Final calculations on its orbit, when it will return, and exactly how close it passed by the sun should be announced soon by various national observatories. Authoritative data is expected in the next issue of SKY AND TELESCOPE when all data from worldwide observers are compiled.

Comets generally are composed of loose pieces of rocky material, frozen particles, and other elemental material. Tails of comets are thought to be illuminated gaseous materials from the nucleus "boiled" off by the heat of the sun and pushed away, outward from the sun.

Passage of the Ikeya-Seki comet provided scientists with an ideal opportunity to study the sun's force fields. Tail of the Ikeya-Seki comet stretched for millions of miles across space with a peculiar curve and visible streaks within it. It was visible here for the past few days and resembled a giant searchlight beam pointing upward from Tijeras Canyon.

Several photos taken early in the morning before sunrise by the Range Optics group show these streaks clearly. In the past, the group has made other unique pictures with the East Mesa facilities and various cameras. A photo of two satellites crossing paths appeared as a double page spread in LIFE, Feb. 26, 1964.



POLAROID PICTURE taken by Ken Deller (5141) shows comet less than one diameter from the sun. Picture was taken Oct. 20 during the noon hour. Lens was partially shielded to block out about 90 per cent of the sun.

E. G. D. Paterson Here For QA Seminar; ASQC Meeting Monday, Nov. 8

About 25 AEC Chief Inspectors and other representatives of Quality Assurance organizations operating within the AEC-ALO QA program will attend a Quality Assurance Seminar Laboratory here Nov. 8-9. Featured speaker for the seminar will be E. G. D. Paterson, retired Director of Quality Assurance at Bell Telephone Laboratories and a member of the Secretariat, International Committee on Reliability of Electrical Components and Systems.

The seminar is sponsored by AEC/ALO/QA Division and Quality Assurance Department 2110. Attendees will also attend a meeting of the American Society for Quality Control Monday evening, Nov. 8, at the Coronado Club.

W. C. Kraft (2440), president of the local ASQC Section, invites all interested Sandians to attend the meeting. Mr. Paterson will be at the meeting and also attending will be AEC personnel from QA offices in Amarillo, Burlington, Dayton, Kansas City, Oak Ridge, Pinellas, Rocky Flats, South Albuquerque, San Antonio, Sandia Area Office, and the Albuquerque Operations Office.

Social hour starts at 6:30 p.m., dinner at 7:15, technical meeting at 8. Reservations may be made by calling W. A. Sherman (2114), tel. 264-3239.

Pre-Schooner II Crater Exploration Starting This Month in Idaho

The Nuclear Cratering Group (NCG) of the U.S. Army Corps of Engineers plans to begin excavation exploration of the Pre-Schooner II crater in southwestern Idaho late this month.

The crater was formed Sept. 30 when the NCG detonated approximately 85 tons of liquid nitromethane chemical high explosive in a lined spherical cavity in hard rock 71 feet below the desert surface 50 miles south of Mountain Home, Idaho. The experiment was conducted as part of the joint Corps of Engineers and Atomic Energy Commission research program in the development of nuclear excavation.

A Sandia Test Group headed by B. C. Benjamin, Supervisor of Blast and Earth Motion Division 7242, provided balloon-mounted and ground-stationed pressure sensing instrumentation for the Pre-Schooner II project. In addition, Sandians operated microbarograph stations, which detected minute changes in atmospheric pressure, during the experiment.

The explorations will add to the theoretical and experimental knowledge used in engineering feasibility studies for possible future nuclear cratering excavations.

Some 20,000 cubic yards of material will be excavated by a contractor working directly for the Corps of Engineers.

Aerial topographical map studies indicate the Pre-Schooner II detonation produced an apparent crater depth of 61 feet and a radius of 95 feet. The visible crater measured 78 feet in average depth and 114 feet in radius.

Visible crater dimensions include the lip around the crater. Apparent crater dimensions do not include the lip. The lip is the crater rim that was thrust upward but was not detached from surrounding ground, plus the throwout material that fell back around the crater rim. The average lip height of Pre-Schooner II is 17 feet as taken by ground survey.

Exploration measurements will include determination of the size of the throwout particles, the percentage amounts of each size, and the density of the throwout material. These measurements will be made in trenches cut through the lip, the crater, and the throwout material that fell in patterns around the crater like spokes extended from a wheel.

The excavations are expected to be completed by late February or early March.

Two Patents Issued on Gyroscopes Invented by New Sandia Employee

Two patents have recently been assigned to Western Electric Company in the name of Frank W. Christensen, now a Sandia employee.

For the past four months Mr. Christensen has been working in the ultrasonics field in Manufacturing Process Division 2565.

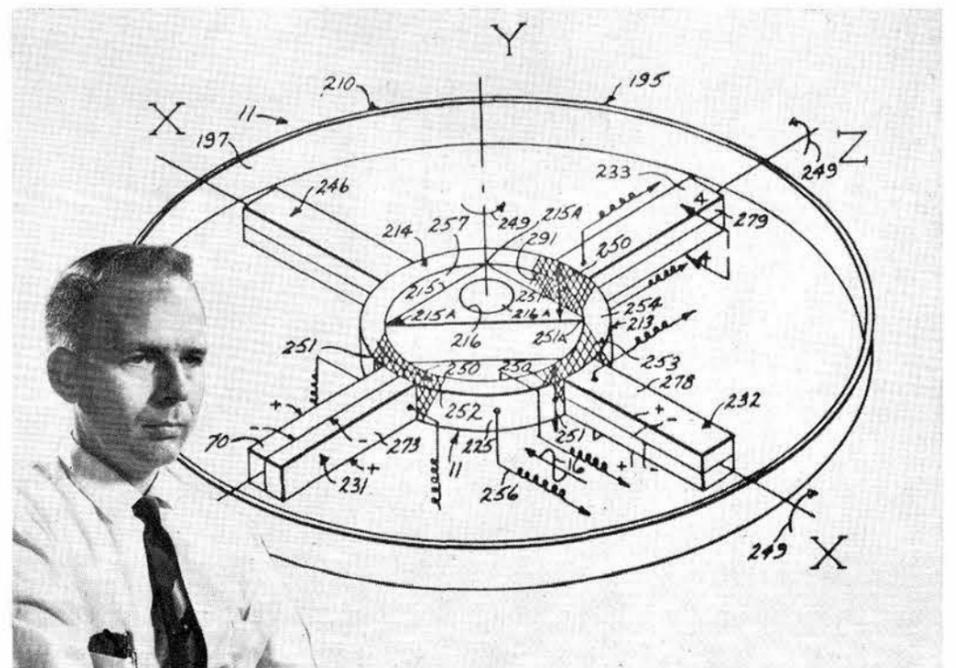
Patent No. 3,206,985 is for an "Apparatus for Simultaneously Sensing Movement of a Body around a Plurality of Mutually Perpendicular Axis." This device is unique in that it replaces three standard rate gyroscope. It has no conventional moving parts, however, a doughnut-shaped piece of ceramic material oscillates and expands when an electric current is applied.

The second patent, No. 3,206,986, is for an "Apparatus for Sensing Selected Movements of a Body." This device can be any size, is mechanically simple and easily produced in quantity. There are no bearings or sliding parts. This is a single axis

rate sensing device which uses a ceramic with unique electrical characteristics. The apparatus is rugged and can operate virtually indefinitely within a temperature range of -59° to $+230^{\circ}$ F.

"Both are special devices which I think will have space applications in the future," Mr. Christensen said.

Mr. Christensen received BS degrees in both metallurgical engineering and mining engineering from Texas Western College, and, after a year with Phillips Petroleum Company, joined Western Electric in 1956 in the field engineering force. He was associated with both Echo and Telstar projects and was a member of the original staff of the WE Engineering Research Center at Princeton, N. J., when that facility opened in 1960. At the time he left Western Electric, Mr. Christensen was in charge of a group involved with ultrasonic innovations and developments.



ONE OF TWO gyroscopes invented by Frank H. Christensen (2565) is greatly enlarged here as a background for his portrait.

Around the World Trip Only Way to See All Relatives

"Around the world in 38 days" is Ruth Wood's (4315) vacation story. Her family is scattered and this seemed the best way to visit her children.

Ruth spent a few days with relatives in Chicago, then on to New York, Paris, Geneva, and Rome where she toured the city and surrounding areas.



THIS MAY LOOK like a typical place in the U.S.A., but it's really Dar-es-Salaam, Tanzania, Africa, where Ruth Wood (4315) recently visited her son, Jack, who is in the Peace Corps.

Cairo, Egypt, and Nairobi, Kenya, were stops en route to Dar-es-Salaam, Tanzania, Africa, where she was met by her son Jack, a Highland High graduate who joined the Peace Corps after getting his Bachelor's and Master's degrees from the University of Minnesota.

"He has learned to speak Swahili fluently," Ruth says, "and is teaching mechanical engineering subjects in a college there."

The next three weeks the mother and son toured Tanzania, Kenya, and Uganda in East Africa. "We visited Mount Kilimanjaro, game preserves, and native open markets. Part of our travel was by local bus which enabled us to see first hand the modes and customs of the people," Ruth recalls.

From Africa she flew via Aden, Saudi Arabia, to Bombay, India, where she stayed overnight. "I was astounded to see so many people living in the streets and the amount of poverty and squalor," she says.

On to New Delhi, India, Bangkok, Thailand, and a few days in Hong Kong touring the new territories and the island.

Ruth's route took her via Tokyo and Wake Island to Honolulu, where she spent 10 days visiting her daughter and three grandchildren (her son-in-law was away on an Army tour of duty at the time). A visit with relatives in Los Angeles completed the circuit.

Ruth arrived in Albuquerque at 9 p. m. on a Monday, and was back at work the next morning.



THIS MARKET PLACE is typical of many seen by Ruth Wood during three weeks spent traveling in Tanzania, Kenya, and Uganda in East Africa.



CHECK THE SIZE of these tomatoes Jim Strascina (9224) has grown in his backyard. Each weighs more than two pounds.

Supervisory Appointments



PAUL D. SEWARD to supervisor of Logistics and Support Section 2551 - 3, Logistics and Support Division, effective Oct. 16.

"Pete" has been with Sandia since March 1954 and has been in logistics and support work the entire time. He has participated in most of the nuclear test series at both Nevada Test Site and in the Pacific.

Before joining Sandia, Pete was with a local clothing store for two years.

He attended the University of New Mexico, majoring in business administration.



DOUGLAS E. ROBERTSON to supervisor of Integrated Contractor Relations Section 2523-3, Integrated Contractor Relations Division, effective Nov. 1.

Doug has been with Sandia since June 1963 and has been assigned to Manufacturing Development organization the entire time.

He came to Sandia from Arizona State University where he received both Bachelor's and Master's degrees in business administration. He is a member of Phi Kappa Phi and Beta Gamma Sigma, honorary societies.

Family-Size Tomatoes Keep Coming on Vines

Talk about tomatoes! Jim Strascina (9224) and his wife Madalynne are rightfully proud of the jumbo-size crop on their vines.

They were so amazed at the size of several of the tomatoes that they weighed them on a grocer's scale: 2 lb. 4 oz. and 2 lb. 5 oz. Even the medium-size tomatoes are close to one-pounders.

Jim paid 97 cents postage to mail one of the large tomatoes to his father in Buffalo—now he's receiving letters from friends and strangers in Buffalo asking for "a few seeds."

The Strascinas attribute their luck to locating the plants in a sheltered northwest corner of their yard, flooding the area "a lot," and adding grass clippings and potato skins to the ground for several years. They only used commercial fertilizer once on the tomato plants. The plants were a gift from a friend who grew them from seed. The variety?—unknown.

Jim had to use 1" x 1" posts for plant stakes.

Congratulations

Mr. and Mrs. Frank Comisky (4153), a son, Gary Alan, Oct. 18.

Mr. and Mrs. J. M. Gallagher (2548), a daughter, Kathleen Frances, Oct. 23.

Mr. and Mrs. W. D. Lynch (4252), a daughter, Anne Elizabeth, Oct. 28.

Sympathy

To Bernice Sanders (3153) and L. C. Pearl (3242) for the death of their father Oct. 27 in Tome.

To Carl Cron (1122) for the death of his father Oct. 26 in Dayton, Ohio.

Sandia Health Care Plan Operates Efficiently with the Assistance of EDP

Bookkeeping involved in the handling of hospital and medical bills for 8000 employees and their families is by no means an easy task.

Back in the "good old days," the job was relatively simple. Medical insurance plans in industry were few and far between. A worker struck by non-occupational illness or injury had to face the expense by himself; he received little or no financial help from his boss. There was little paperwork.

Under the Sandia Health Care Plan, however, things are different. Individual coverage of \$15,000 per lifetime has been extended to more than 7200 employees and 18,000 dependents enrolled in the plan. Cost is borne by the employees and the Company and includes the amount of money necessary to pay off claims and the amount needed to meet the expenses of administering the program.

Ensuing paperwork, a comprehensive statistical analysis needed to keep track of how premium dollars are being spent, is "all in the cards." The cards, of course, are tabulating cards which play an integral part in electronic data processing. Stacks of them—each crammed with coded

information—are run through electronic equipment to furnish cost data quickly, efficiently, and impersonally.

The wealth of numerical information readily available allows Equitable Life Assurance Society, the insurance company underwriting the plan, to treat Sandia as a separate entity. Insurance premiums, reserves, and costs are based primarily on Sandia's own experience.

A brief resume of the procedure involved gives only a small hint of its overall complexity.

First step is the employee's own voluntary enrollment in the plan. Soon after he inks the dotted line, Employee Benefits Division 3122 sends half the completed enrollment card to Payroll and Disbursements Auditing Division 4131 so payroll deductions can be made. The other half is retained in the division and used as the basis for an IBM worksheet which is forwarded to Data Center and Operations Department 9410.

There, keypunch operators perforate such data as age, sex, and type of dependent onto tab cards, which, after sorting, are devoured by the computers. Cards then are processed through a machine

which prints desired information in sheet form, where it is only a fingertip away when needed.

Later, when a claim is filed—and about 1000 are submitted each month—Employee Benefits Division verifies the claim and arranges for payment. Then information again is transferred to tabulating cards, this time from claim sheets initiated by the enrollee and completed by Equitable.

It might be said the cards now bear the past, the present, and in some respects the medical future of Sandians—information that indicates changes that should be considered to improve the plan and to keep premiums at a minimum.

Without the computers, it would be necessary to maintain bulky files by hand. This would involve posting and filing of every change in an employee's family status and claims record.

In addition, it would be virtually impossible to issue the comprehensive statistical data. With computers it is issued quickly and efficiently.

In short, times have changed and Employee Benefits Division has adopted modern ways of keeping in step.

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LAB NEWS

NOVEMBER 5, 1965

SANDIA CORPORATION

LAB NEWS



ALBUQUERQUE, NEW MEXICO • LIVERMORE, CALIFORNIA

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PRETTY BETTY PARKER (8211) daydreams of dancing with her favorite "Santa Claus" at the Annual Employees' Christmas Dance set for Dec. 10, at the Castlewood Country Club in Pleasanton. (Art work by Evelyn Bachman, 8233-2.)

Employees' Christmas Dance Set For Castlewood on December 10

Tickets are on sale for the Annual Employees' Christmas Dance. The event will be held at the Castlewood Country Club, Pleasanton, Friday, Dec. 10, and is open to Sandia and LRL employees and their guests.

This year's fun-filled holiday party will begin at 9 p.m. in the Castlewood's Garden and Florentine Rooms with dancing to the music of Maury Wolohan and his orchestra.

At 1 a.m., following the dance, breakfast will be served—ham and eggs, sweet rolls,

juice, and coffee. "A delicious nightcap to a festive evening," said Mike Ferrario (8252-1), chairman of the Employees' Dance Committee.

In addition to dancing and breakfast, several valuable door prizes will be given to lucky ticket holders during the gala affair.

Tickets are on sale at \$3.75 per person through Dec. 3. Beginning Monday, Dec. 6, the price will be \$4. Tickets can be obtained from the following:

Doris Guntrum, Bldg. 911, Personnel
 Jim Henderson, Bldg. 912, Rm. 117
 Mike Ferrario, Bldg. 912, Rm. 212
 Vivian Lenz, Bldg. 913, Rm. 114
 Pat Tarp, Bldg. 914, Rm. 114
 Mary Lou Taylor, Bldg. 916, Rm. 105

Livermore Notes . . .

Al Alford (8223-5) was featured speaker at the recent meeting of the American Society of Tool and Manufacturing Engineers in Berkeley. He showed two Sandia-produced films, "Environmental Testing" and "Clean Air is a Breeze," as part of his talk on Sandia Corporation. Al, a senior member of the ASTME since 1955, is presently Education Committee Chairman for the Golden Gate Chapter No. 28.

Jim Rego (8115), president of the Del Valle Skilaufers Club, extends an invitation to all employees interested in skiing to attend the club's meetings. The group meets the second and fourth Tuesdays of each month at 7:30 p.m. at the East Avenue Elementary School in Livermore.

Jim says, "The club has just completed arrangements for renting a cabin at North Shore, Lake Tahoe, for the skiing season. And with the snow beginning to fly in the Sierras—there should be a lot of activity on the slopes very soon."

Noontime swimming for Sandia and LRL employees at the LRL pool has been extended for an indefinite period of time. The pool will remain open during the noon hour until the latter part of November, or until anticipated construction work on the building begins.

John Cordial (8161), has been cast as Philly Cullen, an Irish farmer, in the latest Livermore Cask and Mask presentation, "Playboy of the Western World."

The classic Irish comedy, written by J. M. Synge, will open Nov. 5 at 8:30 p.m. at the May School Theater in Livermore and play Friday through Sunday for three successive weekends.

Wedding

Mary Ellen Duvall and Bob Jacob were married Oct. 2, in a private ceremony at the First Presbyterian Church in Las Vegas, Nev. Following the ceremony, the couple left for a wedding trip to Mexico City. Mary Ellen, a librarian at Livermore Laboratory, joined Sandia Corporation in Albuquerque in February 1963, and transferred to Livermore in June 1964. Bob is employed by the IBM Corporation and is currently assigned to Livermore Laboratory as a consultant.

Events Calendar

Nov. 17—Fourth lecture, LRL Lecture Series, "Education in Pure and Applied Science," by Dr. Edward Teller, Professor of Physics at Large, University of California, Berkeley, LRL Auditorium, Bldg. 111, 8 p.m.

Congratulations

Mr. and Mrs. M. O. Robert (8222), a daughter, Michelle Annette, Oct. 10.

Sympathy

To Len Dighton (8121) for the death of his mother in Yakima, Wash., Sept. 16, and the death of his brother-in-law in Yakima, Wash., Oct. 2.

To John (8222) and Maria Jesse (8155) for the death of John's mother in Hartford, Conn., Sept. 13.

To Ed Healey (8121) for the death of his mother in Brownsville, Tex., Sept. 13.

LIVERMORE NEWS

Sandians Members Of Award-Winning Engineering Society

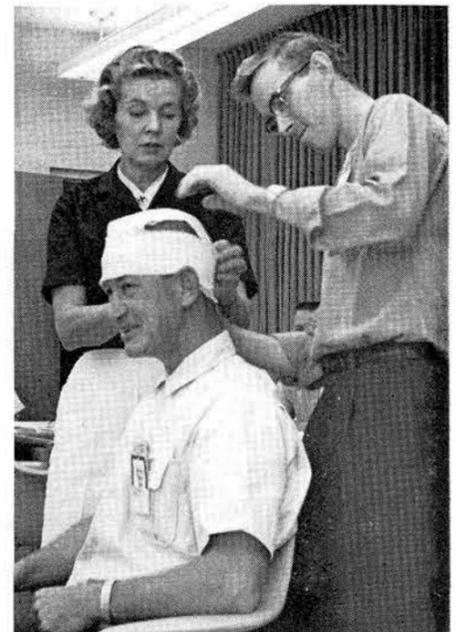
Livermore Valley Chapter No. 31 of the California Society of Professional Engineers (CSPE) has been judged the best small chapter in both California and the nation.

Sandians Bill Keltner and Dick White (both 8251), members of the local chapter, were present at a dinner meeting recently when Jack Todd, regional vice-president of the northern CSPE chapters, presented the state award. National honors will be conferred in January at the national society winter meeting in Miami, Fla.

Selection of the outstanding chapter of those with less than 100 members was made by the state society and Chapter Activities Committee of the National Society of Professional Engineers. The award is based on the range of activities of the Livermore chapter and their documentation. Basic activities included chapter administration, education, employment practices, ethical conduct, government liaison, inter-society relations, membership, meeting and programs, public relations, registration, and young engineers.

According to Bill, who is serving as chairman of the Chapter's Membership Committee this year, a membership drive will open in the near future. Those interested in joining may contact him on ext. 2633 for further information.

Other Sandia members of the honored CSPE chapter are George Dunbar (8146), Carl Furnberg (8117), Hugh Smith (8251), and Gerry Strandin (8154).



UNDER THE EXPERT GUIDANCE of Maida Henderson, Assistant Director, Safety Services, Oakland Office, American Red Cross, Will Vandermolen (8111), applies a head bandage to "Perk" Perkowski (8243) during a session of the First Aid Instructor Course underway at Livermore Laboratory.

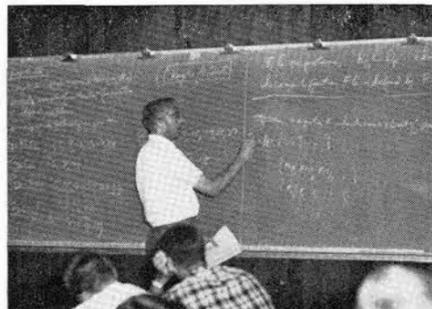
Intensive First Aid Course Begins at Livermore Laboratory

Eighteen selected Sandians at Livermore Laboratory recently began an intensive 36-hour Instructor's Course in first aid. The in-hours course will qualify these employees to instruct others in all phases of emergency first aid.

The class, which meets Mondays and Wednesdays for six weeks, is conducted by Maida Henderson, assistant director, Safety Services, Oakland Chapter of the American Red Cross.

According to R. O. Campbell (8215), coordinator of the first aid training program, "After completing their training, these employees will instruct supervisors and employees in first aid techniques during noon hour classes to be scheduled in the near future. In this way, we will be able to train more employees quickly and efficiently."

Employees enrolled in the Instructor's Course are: W. B. Vandermolen and W. R. Wall (8111), F. J. Maloney and L. R. Myers (8122), J. L. Wilson (8122), J. E. Vanderpooten and L. A. Wright, Jr. (8124), E. E. Skidgel and G. E. Overturf (8126), H. V. McNabney and R. O. Campbell (8215), E. R. Newton and W. E. Townes (8222), W. T. Schmeding (8233), and J. R. Perkowski (8241).



INSTRUCTOR BOB DeZUR of Livermore Lab's Numerical Applications Division 8144 demonstrates problem solution to employees enrolled in Advanced Math Refresher Course.

Advanced Math Refresher Course at Livermore Lab

Approximately 60 employees are enrolled in an advanced mathematics refresher course being conducted at Livermore Laboratory. The classes began Sept. 20.

Sessions are held on Monday and Thursday from 3:15 to 5:15 p.m., and then repeated the following Monday and Thursday to take care of students who were away from the Laboratory the previous week.

According to Barney Goncher of the SCLL training organization, the course is offered to increase the technical vitality of personnel through a review in the field of mathematics. This type of course is not available elsewhere in the Livermore area. It is not designed for the individual working toward a degree and would not be considered part of a degree program.

Bob DeZur and Jim Rogers, both of Numerical Applications Division 8144, are the instructors, assisted by Jack Almstad, Bob Heinz, and Jim Lathrop (all 8144), who review, evaluate, and comment on written papers and assignments.

Noted Speakers Set For Chabot College Lecture Series

"Man and World in Crisis" is the topic for the 1965-66 Chabot College Lecture Series. Several well-known speakers will be featured during the series.

Alan Drury, author of "Advise and Consent" and "A Shade of Difference," opens the series Nov. 15 at 8 p.m. in the gymnasium at the new Chabot Campus in Hayward.

Other speakers scheduled for the series are: Rollo May, internationally known in the fields of mental hygiene and psychiatry, Nov. 29; Cary McWilliams, editor of THE NATION, Jan. 31; Dr. Nicholas Goncharoff, Russian-born political scientist, who is now an American citizen, Feb. 14; Dr. Bruno Bettelheim, authority in child psychology, Feb. 16; Hans Morgenthau, internationally-known authority on political science, Mar. 14; and Reed Benson, eldest son of Ezra Taft Benson, who is the Utah-Southern Idaho coordinator of the John Birch Society, Apr. 11.

Season tickets can be purchased by sending \$3.50 to the Office of Community Services, Chabot College, 25555 Hesperian Blvd., Hayward, Calif.

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LAB NEWS

NOVEMBER 5, 1965

Unmanned Seismic Observatory Project Now Going into Prototype Production

After one year of work, Sandia Laboratory's Seismic Systems Division 9233 has completed design and is moving into assembly of prototype units for an unmanned seismic observatory (USO). The first unit is scheduled for installation in January near the Coast and Geodetic Survey seismic laboratory at the south end of Sandia Base. Testing and evaluation of the system will require a number of months.

Sandia's USO program was initiated last year following the outstanding success of the Vela Detection Satellites program. The Advanced Research Projects Agency (ARPA) of the Department of Defense authorized Sandia to perform a three-phase effort aimed at the design, construction, test and evaluation of a prototype USO capable of continuous recording and unattended operation for 120 days.

The Vela program for seismological detection of nuclear detonations stems from discussions and negotiations concerning a full nuclear test ban treaty. Although studies have not yet established that a nuclear detonation can be positively identified in the normal seismic background, they have indicated that any such detection system will probably require seismic stations in many remote locations. Sandia's unattended seismological observatory is designed for such applications.

Design Considerations

The accompanying illustration shows the basic USO design configuration as now planned. It will permit flexible installation arrangements under wide variations of climatic and geographical conditions. The combination of a small shelter to house the tape recorder and electronic systems, with a borehole to contain seismometers, should be adaptable to most locations.

A sealed locked shelter buried a few feet underground will protect the station from weather, animals, or tampering. The earth cover will also provide temperature stabilization for the tape recorder and electronics. A 12-inch diameter borehole is required to accept the complete seismometer system. The depth of the borehole will depend on local seismic conditions and terrain. Two hundred feet should be the maximum required.

Design considerations for the USO included the following:

Unattended operation—120 days with sufficient accuracy to permit correlation of recorded events within 0.1 second of world time for any period during the 120 days.

Construction—light, simple, and rugged enough to withstand shipping to installations in remote areas.

Maintainability—suitable for operation, support, and servicing in remote areas.

Sensitivity—maximum sensitivity commensurate with background noise and maximum dynamic range.

Data recording—data tapes in Vela format.

Two Seismic Systems

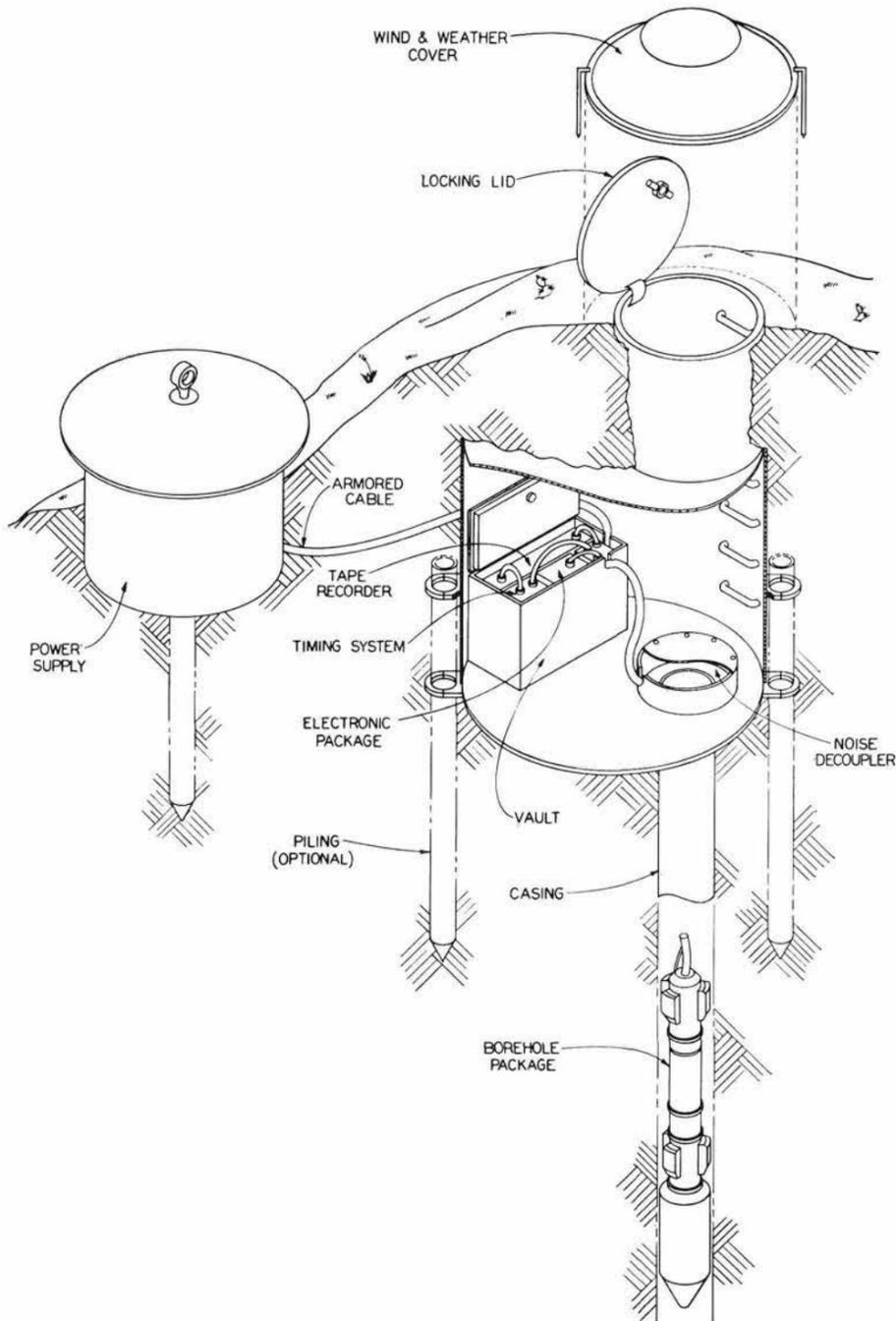
Earth motion, or seismic signals, will be detected and recorded by two systems. A short period seismometer will provide a good signal-to-background noise ratio over a wide range of amplitudes and provide accurate arrival times of earth motion waves. The system will record signals as low as 2.7 millimicrons on frequencies ranging from 0.1 to 10 cycles per second.

The second seismometer system responds to earth motions ranging from 30-seconds to less than eight seconds in duration.

Other major subsystems of the USO include a modularized seismometer electronic system with all amplifiers and filters as well as an automatic gain control for the short-period seismometers; a time code generator provides timing signals to be recorded with the seismometer data; a slow speed magnetic tape recorder capable of continuous recording for 120 days; and a thermoelectric power supply using either radioisotopes or propane for fuel.

Much of the electronics of these subsystems have been proved in the Vela Detection satellites which have been operating two years in space without a failure. The short period seismometer was developed initially for the Ranger moon probe under a NASA contract by the California Institute of Technology. Only minor modifications were required for use in Sandia's USO.

A major effort of Division 9233 has been the development of a tape playback station which will convert the 120-day data tape into the standard format used by the Vela Data Center in Arlington, Va. This



UNMANNED SEISMIC OBSERVATORY as designed by Division 9233 is shown in a typical underground installation. Borehole package is positioned inside the pipe by a gyro unit and mechanically locked in place. Center section of the package rotates to align short period seismometers to compass points. Long period seismometers are in lower section with stabilizing weight.

center now processes data from a world-wide network of seismological stations.

The USO playback system re-records each 120-day tape onto 40 tapes in the Vela format. The system will make time corrections when necessary and reformat the corrected timing information into the standard Vela time code.

Many of the components of the USO have undergone rigid testing by Sandia's Environmental Testing organization.

From the Division 9233 "breadboard" circuits and designs, Manufacturing Develop-

ment Divisions 2547 and 2543 adapt the designs to Vela packaging format and arrange for manufacture of the components including modules, "mother" boards, and housing. After fabrication, Manufacturing Development personnel arrange for 100 per cent inspection and testing of the completed circuits.

Following evaluation of the first observatory, another prototype unit will be installed in Alaska for cold climate testing.

R. S. Reynolds (9233) is project leader for the USO.

Sandia Speakers

J. C. Moody (2411), "The Control of Thermal Effects in the Metrology Laboratory," Annual Meeting of the American Society of Mechanical Engineers, Production Engineering Division, Nov. 10, Chicago.

Albert Narath (5150) and J. E. Schirber (5151), "Effect of Hydrostatic Pressure on the Metamagnetic Transitions in $Fe_2Cl_2 \cdot 2H_2O$, $CoCl_2 \cdot 2H_2O$, and $FeCl_2$," 11th Annual Conference on Magnetism and Magnetic Materials, Nov. 16-19, San Francisco.

E. D. Jones (5151) and J. I. Budnick of Fordham University, "27₁₁ Knight Shift and Hyperfine Interaction in $GdAl_2$," 11th Annual Conference on Magnetism and Magnetic Materials, Nov. 16-19, San Francisco.

R. R. Boade (5232), "Ultrasonic Absorption Measurements in Halomethane-Inert Gas Mixtures Using a Pierce Interferometer," physics seminar, University of Denver, Oct. 20, Denver, Colo.

C. W. Harrison, Jr., and C. D. Taylor (both 1425), "A Preliminary Report on the Interaction of an Electromagnetic Field with a Missile Having an Ionized Trail," meeting on effect of rocket exhaust on EMP coupling, Nov. 1, San Bernardino, Calif.

A. F. Cone (2510), "Planning and Managing a Quality Control Data Program," local ASQC section, Nov. 9, Wichita, Kan.

R. E. Berry (9312), "Aerospace Safety Results from a Nerva Post-Operational Destruct Test," American Nuclear Society Annual Meeting, Nov. 15-18, Washington, D.C.

A. J. Clark, Jr. (9312), "Aero Heating Results from the RFD-2 Flight Test," American Nuclear Society Annual Meeting, Nov. 15-18, Washington, D.C.

G. J. Lockwood and G. L. Cano (both 5241), "Response of $CsI(Tl)$ Crystals to Low-Energy Heavy Ions," IEEE Nuclear Science Symposium, Oct. 18-20, San Francisco.

R. H. Plumlee (5142), "Pulse Poling and Switching of Polycrystalline Ferroelectrics and $BaTiO_3$ Crystals," American Physical Society, Oct. 28-30, Chicago.

R. A. Hill (5122), "Electron Density Measurements in Transient Plasmas by Rapid-Scan Spectroscopy," Seventh Annual Meeting, American Physical Society's Division of Plasma Physics, Nov. 8-11, San Francisco.

E. H. Beckner (5142), "Radiation Cooling Studies in a Coaxial Shock Tube," Seventh Annual Meeting, American Physical Society's Division of Plasma Physics, Nov. 8-11, San Francisco.

J. R. Banister (5120) and R. A. Hill (5122), "Spectroscopic Studies of the Impulse Tube," Seventh Annual Meeting, American Physical Society's Division of Plasma Physics, Nov. 8-11, San Francisco.

A. C. Switendick (5213), "Effect of Assumed Electronic Configuration on the Electronic Band Structure of Nickel," 11th Annual Conference on Magnetism and Magnetic Materials, Nov. 16-19, San Francisco.

J. D. Kennedy and W. B. Benedick (both 5133), "Shock Induced Polymorphic Phase Transformation in InSb," American Physical Society, Oct. 28-30, Chicago.

C. A. Trauth, Jr. and R. E. Woolsey (both 5256), "Practice Methods in Integer Linear Programming," 28th National Meeting, Operations Research Society of America, Nov. 4, Houston, Tex.

Former Sandian John McLay Works on World's Longest Communications Cable to Continental Europe

A former Sandian, John McLay, contributed to a new transatlantic cable linking the United States to Europe. Mr. McLay, who was manager of Electronic Systems Department 1420 at Sandia, now heads Submarine Cable Repeater Department, Bell Telephone Laboratories, Murray Hill, N. J.

The cable, completed Sept. 15, is the longest single span of cable in the world—3600 nautical miles stretching from Tuckerton, N. J., to St. Hilaire-de-Riez, France. It is the first cable that links the United States directly to the European continent.

Mr. McLay's department had responsibility for the design integrity of the repeaters and equalizers used in the cable. The work is similar to the electronic systems design and development he

performed at Sandia from 1953 to 1962. Reliability is the primary consideration.

The new communications link is the fourth transatlantic cable (TAT-4), and it has a capacity for handling 128 simultaneous voice conversations. It will help meet increasing demands for additional communications circuits between the United States and Western Europe. Of the 6,400,000 overseas calls made last year, 30 per cent, or 1,836,000, were transatlantic calls.

The \$50-million cable system is owned jointly by the Long Lines Department of AT&T and the French and German Ministries of Posts and Telecommunications. AT&T shares its ownership with three other U. S. international carriers: ITT World Communications, Inc.; RCA Communications, Inc.; and Western Union

International, Inc. Ownership is proportional to circuit usage. AT&T is authorized to own up to 64 circuits; ITT World Communications up to 25; RCA Communications up to 21; and Western Union International up to 16. In addition, two circuits will be made available to the French Cable Company, but without provision for ownership.

Laying operations for TAT-4 began on June 18 when the end of the deep-sea cable was brought ashore from the Bell System cable ship, C. S. Long Lines, and spliced to a land cable running to a terminal station in Tuckerton, N. J. The ship completed the undersea operations on Sept. 9.

The first transatlantic telephone cable was opened for service between North America and the United Kingdom in 1956.

Former Sandia Personnel Director Retires From Western Electric Company



Harold W. Sharp, head of the Personnel and Public Relations organization at Sandia in the early 1950s, retired from Western Electric Company Nov. 1. He was Superintendent of the Burlington Shops of Western Electric,

Burlington, N. C.

Mr. and Mrs. Sharp and their sons, George 14 and David 13, have lived in Greensboro, N.C., since early 1957 and expect to maintain their home there for the foreseeable future.

Retirement activities for Mr. Sharp will include a wide variety of pursuits. He plans to undertake many home projects, increase his activities in tournament contract bridge, follow closely the school careers of his athletically inclined sons, and, as time permits, further explore his adopted state of North Carolina.

Mr. Sharp is a native of Rensselaer, Ind. He started his Western Electric career in Chicago in 1923. He was assigned to Sandia in November 1949, from Western's Kearny (N.J.) Works. At Sandia he first headed the Business Methods organization. In August 1950, he was named Superintendent of Personnel and Public Relations.

In 1954, Mr. Sharp was transferred to North Carolina as Superintendent of Industrial and Labor Relations, and assumed his position as Superintendent of the Burlington Shops in 1956.

Sandia Authors

C. J. McGarr (4600), "A Simplified Dollar Formula for Work Measurement Labor Cost," October issue, ADMINISTRATIVE MANAGEMENT.

W. B. Benedick (5133), "A Nitroguanidine Explosive Plane-Wave Generator for Producing Low Amplitude Shock Waves," September issue, REVIEW OF SCIENTIFIC INSTRUMENTS.

R. G. Kepler and A. C. Switendick (both 5213), "Diffusion of Triplet Excitons in Anthracene," July 12 issue, PHYSICAL REVIEW LETTERS.

T. A. Green (5121), "A Proof of Detailed Balancing for the Impact Parameter Method," November issue, PROCEEDINGS OF THE PHYSICAL SOCIETY.

Western Electric Company Functions As Manufacturing Arm of Bell System

Editor's Note: The following is the second in a series of articles describing the agencies and organizations related to Sandia Corporation in the performance of nuclear weapons engineering ordnance. Last issue featured the Bell Telephone Laboratories. This article describes Western Electric Company. Future issues will discuss the Atomic Energy Commission ALOO operations and contractors.

Western Electric began operations in a Cleveland loft in 1869 as the firm of Gray and Barton. Its founders were Elisha Gray, a physics professor and inventor; Enos Barton, a former telegrapher; and General Anson Stager, who had been chief of military telegraphy for the Union forces in the Civil War.

The firm moved from Cleveland to Chicago, and in 1872 changed its name to Western Electric Manufacturing Company.

After the telephone was invented in 1876, Western Electric became one of a half-dozen firms competing for the production of telephone equipment. But in 1882, the fast-growing Bell Company acquired controlling interest in the Western Electric Manufacturing Company and shortened the name to its present form.

In the intervening years, telephony has moved from a wooden telephone with a crank to nation-wide direct distance dialing, and WE has grown and changed in many ways. When WE began work for the Bell System in 1882, there were 90,000 phones in the country. About the turn of the century there were 1,300,000 and many millions more to come. So in 1903 WE built its first modern factory, Hawthorne, in Chicago. The Kearny (N.J.) and Baltimore Works went up in the Twenties. In recent years Western Electric has carried out a major construction and expansion program to meet the demand for telephone equipment and national defense communications systems.

To the Western Electric manufacturing job was added, early in the century, the work of purchasing and distribution for the Bell System. WE signed a supply contract with a Bell operating company in 1901 and that year established the first of its distributing houses to serve the

telephone companies. The relationship thus formed has remained one of the most unusual in modern industry: WE's relationship with the Bell operating telephone companies does not require them to buy Western Electric products; business can be retained only by virtue of the quality of WE products and services and low prices.

The period since World War II has been one of further dynamic change for Western Electric, which now ranks among the top companies in the nation in terms of number of employees and dollar volume of sales.

Telephone Technology

In the science of communication, rapid and startling changes have followed each other closely, particularly in recent years. In telephony, for example, some two-thirds of the products Western Electric makes for the telephone companies were introduced or substantially modified after 1950.

To produce them, Western Electric has constantly improved its processes, methods and equipment to take full advantage of the developments which have flowed from Bell Laboratories. With the development of thin film circuits by Bell Laboratories, for example, WE engineers found a way to mass produce these precise circuits to extremely high standards of reliability, using an unusual production line passing through a vacuum.

Other advances in the electronic manufacturing arts at WE have included such achievements as the artificial growing of quartz crystals and the development of electron tubes designed to work faultlessly in underseas repeaters for a minimum of 20 years.

Western Electric fulfills its function as an integral part of the Bell System in three principal ways.

Manufacture and Supply: Western Electric manufactures to uniform standards of design and quality hundreds of communications products and many types of equipment for the Bell System network. WE purchases from thousands of large and small companies the supplies, equipment, and materials needed by the Bell Telephone companies as well as for its own manufacturing operations.

Services: Western Electric's Service Di-

vision brings together the once separate functions of Systems Equipment Engineering, Installation, and Distribution into a single organization. Operating regionally, it provides the Bell companies with full service in these areas.

Defense and Space Activities: WE contributes to the nation's defense and space efforts by providing the U. S. Government with planning, management services, and manufacturing abilities on projects requiring communications skills.

Western Electric's long experience in the communications field and its access to the engineering and management resources of the various Bell System companies have led the U. S. Government to call upon WE for assistance on a number of challenging defense and space activities, including operation of Sandia Corporation which began in November 1949.

Western Electric led an industrial team which built the world-wide communications and tracking network for Project Mercury to give America's astronauts a voice in space. Other assignments have included the construction of the DEW Line across the frozen Arctic; the White Alice communications network in Alaska; the SAGE System of continental air defense; and the rearward communications network for the Ballistic Missile Early Warning System (BMEWS), which links detection stations in Alaska, Greenland, and the United Kingdom with NORAD Headquarters in Colorado.

Missile Systems

Western Electric was prime contractor for the development and production of the Army's Nike Ajax and Nike Hercules guided missile systems. In 1955, the Army asked WE and Bell Telephone Laboratories to undertake the development of an anti-missile missile system, which led to the Nike Zeus and then to the more advanced anti-ICBM system, Nike X.

Western Electric also supplies the Navy with weapons direction equipment for missile ships, missile impact locating equipment for the missile ranges, radars and anti-submarine warfare gear, along with many items of communications equipment. Installation, maintenance and operating assistance are furnished for much of this equipment by Western Electric field engineers.

Bell Telephone Laboratories - Western Electric command guidance equipment, designed for the Air Force Titan I ICBM, has successfully guided many ballistic missiles and space satellites, including the Telstar communications satellites, into precise orbits.

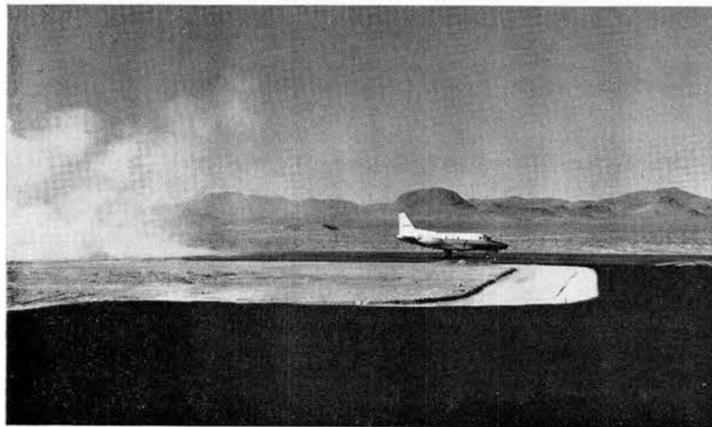
At the request of the National Aeronautics and Space Administration, the Bell System established Bellcomm Inc. Owned jointly by AT&T and Western Electric, Bellcomm will provide planning and systems engineering support in the manned space flight program to land men on the moon and return them safely.

Trio of Sandians Now Planning 1966 Telemetry Meet

Three Sandians—T. J. Hoban (7212), J. E. Hinde (7213), and A. E. Bentz (9313)—have important roles in the 1966 International Telemetry Conference sponsored by the International Foundation for Telemetry. The conference will be held next October in Los Angeles, and the trio is currently involved in the planning, promotion, and calling for technical papers for the event.

Mr. Hoban is general chairman for the event; Mr. Hinde is program chairman; and Mr. Bentz, who was chairman of the conference this year in Washington, D.C., is president of the Board of Directors of the Foundation.

The International Foundation for Telemetry is an outgrowth of an activity formerly sponsored by five national technical societies. Its purpose is to advance the theory and practice of telemetry and allied arts and sciences. Primary activity of the Foundation is sponsorship of the annual International Telemetry Conference. More than 1200 scientists and engineers attended the 1965 conference in Washington.



FIRST JET ON TONAPAH TEST RANGE—Visitors from SAC Headquarters, Omaha, Nebr., are greeted by Margaret Perchetti and Charles Pappas, representing Sandia Corporation and the Tonopah Range Operations Department 7230. The jet aircraft landed near the Control

Point of the Tonopah Test Range Oct. 14. The newly-surfaced 5600-foot runway on the Range makes it convenient for such visits. From left, the Air Force personnel are Capt. Jim Glover, Maj. Bob Byrom, Maj. Harold Moore, Maj. Joe Morgan, and Maj. Harry Pepin.



PLAN MEETING—Members of the Project 60 conference committee work on details of the forthcoming Nov. 13 event. From left are LCDR S. F. Sandoval, FC/DASA; J. R. Holpp (2512), conference chairman; Jim Sweeney, Special Weapons Center, KAFB; and Bill Donohoe, Spartan Southwest. The meeting is sponsored by ASQC, UNM, and the Dallas Defense Contracts Administration Service Region.

'Project 60' Conference Set by ASQC Nov. 13 at University

"Project 60—Quality Control and You" is the title of a one-day conference scheduled Nov. 13 at the New Mexico Union Building, University of New Mexico. The conference will explore the effect of the recent consolidation of Department of Defense procurement activities on manufacturers and suppliers.

Sponsored by the Albuquerque Chapter of the American Society for Quality Control, Technology Applications Center of the University of New Mexico, and the Dallas Defense Contracts Administration Service Region, the conference is expected to attract about 200 delegates from throughout the Southwest.

J. R. Holpp, supervisor of Product Data Control Division 2512, is conference chairman. W. C. Kraft, supervisor of Systems Test Equipment Development Department

2440, is chairman of the Albuquerque Section of ASQC. Jean Gillette of Employee Training and Education Division 3122 is assisting with conference arrangements.

Speakers will include representatives of the Defense Department, NASA, military, Defense Atomic Support Agency, and local industry. They will discuss the Project 60 goal of optimum administration of all DOD and NASA contracts from a single local office using uniform procedures and requirements with minimal government controls or surveys. Stability and economy for government and contractor should be achieved under the new program.

Registration fee is \$8. Programs and additional information are available from B. W. Bell (2113).

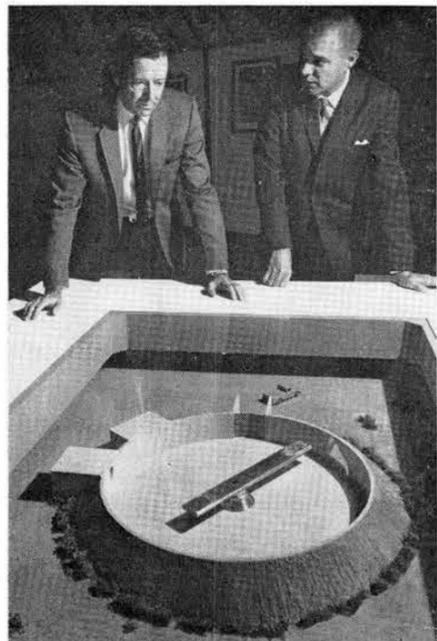
Sphere of Science Open To Employees During Noon Hours Nov. 8-12

The Sphere of Science, featuring a new Area III display, will be open to employees during noon hours next week. In addition to regular science, mathematics, and physics exhibits, the Sphere now has working models of Area III's centrifuge, water jet catapult, and drop tower.

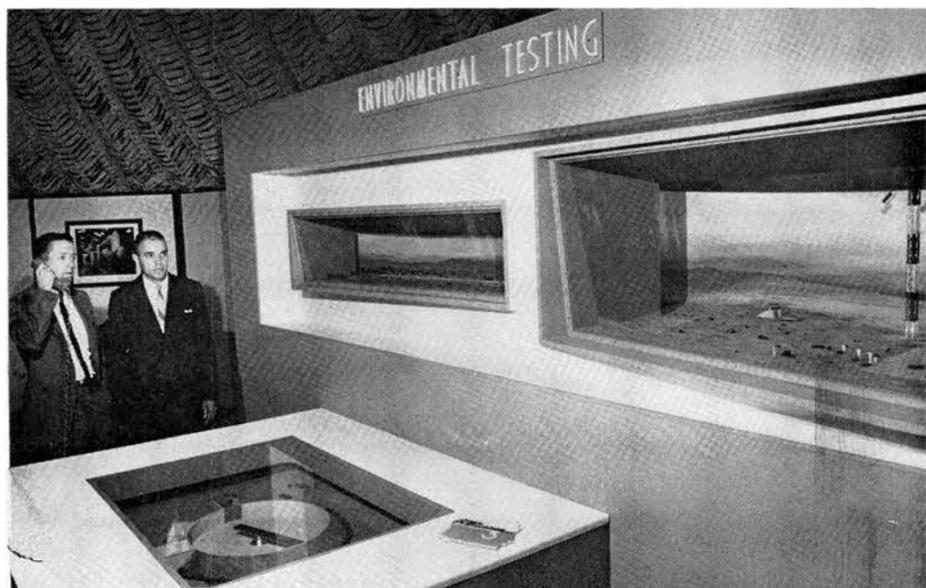
The Sphere will be open from 12:10 to 12:50 Monday through Friday of next week. The Sphere of Science is the blue geodesic dome located north of Sandia Laboratory's motor pool.

The Area III exhibit was prepared by Community Relations Division 3433 with the assistance of Don Williams and personnel of Facility Engineering Division 7311.

CLOSE-UP VIEW of the Centrifuge model shows detail of the new Environmental Testing display in the Sphere. A taped narrative tells of Sandia's testing activities while the models simulate tests.



NEW AREA III display in the Sphere of Science will be featured during an Open House for employees next week. The Sphere will be open during noon hours Monday through Friday. Previewing the display are Paul Adams (left), supervisor of Radiant Heat Division 7323, and Austin Glover of Community Relations Division 3433.



Take Note . . .

These words from Berenice Henry (3411): "I wish to thank you all for your generosity in helping defray my expenses to Michigan that I might train for another Leader dog, a female German Shepherd by the name of Modgie. I am sure after we learn our way around better that her eyes will guide my footsteps in the right direction."

New industrial representative of the Rocky Mountain College Placement Association to the College Placement Council is J. K. Merrillat, supervisor of Employment Division 3151. He was elected recently at a meeting of the Rocky Mountain group in Provo, Utah. The Council is the executive organization for eight regional associations of college placement officials in the United States and Canada.

W. F. Carstens, manager of Technical Information Department 3410, spoke on "Timely Trends in Letter Writing" during a workshop session of the Santa Fe Chapter of the National Secretaries Association, Saturday, Oct. 30. Theme of the workshop was "In Tune with the Times."

The 1965 issue of MAGNETIC MATERIALS DIGEST includes chapters by two Sandians—Albert Narath (5150) and R. A. Lefever (5154). Mr. Narath's chapter is on "Nuclear Magnetism" and Mr. Lefever's contribution is on "Magnetic Materials: Chemistry, Structure and Crystal Growth."

The chapters in the book are brief discussions on the subjects based on technical papers contributed in the preceding year.

Sandia women employees, whose husbands are attending University of New Mexico or St. Joseph's College, are invited to become members of the Kappa Chapter of University Dames.

Club president Barbara Rothwell (2412) reports that meetings are held the first and third Thursdays of each month at Mesa Lounge, New Mexico Student Union, at 8 p.m. A wide variety of programs are offered.

For further information, call Barbara during the evening at tel. 265-4505.

Two Sandians won prizes in a recent circuit design contest which promoted use of rotary stepping switches in novel or unique ways. The contest was sponsored by the manufacturer of the switches.

D. A. Branscombe (2422) submitted a design for a printed circuit card tester, and Robert Creveling (1421) sent in a timer-program circuit. The designs had to be based on original scientific, engineering, or design concepts, or ingenious applications of existing ones.

Awards program for the Sandia Employees Golf Association will be held tonight during a buffet at the Coronado Club. C. W. Campbell, Vice President 4000, will make the presentations. Social hour begins at 6 p.m., dinner at 7:30.

Election of officers for the 1966 season will be held Tuesday, Nov. 9, at 5:15 p.m. in the Eldorado Room of the Coronado Club. All SEGA members are urged to attend. Refreshments will be served.



RECENT WINNERS in the Sandia Lab Women's Golf Association fall tournaments were (l to r) Rose Hainlen (4152), Ann Michele (4510), and Kay Ogden (AEC/Sandia Area Office). Both tournaments were played at Los Altos.

Sandia Women Golfers Conclude Successful 1965 Season of Play

The Sandia Lab Women's Golf Association concluded its official 1965 season recently with a banquet, presentation of golf trophies, and election of new officers.

The awards were made for two tournaments played on the Los Altos courses and outgoing president Ann Michele (4510) won low gross honors in both tournaments. Rose Hainlen (4152) won the low net trophy for 36-hole play on the regulation course, and Kay Ogden (AEC/Sandia Area Office) won the low net trophy for 36-hole play on the short course.

During the 1965 season, tournaments were scheduled at golf courses in Belen, Socorro, and Los Alamos in addition to the above mentioned competitions. Pairings were regularly scheduled for play on the Los Altos short course after work-hours once a week and the regular 18-hole course on Saturdays every other week.

An "unofficial" tournament is planned for Thursday, Nov. 11 at the San Mateo Golf Course.

New officers elected during the annual banquet were Eleanor Kelly (3151), president; Tess Reis (3154), vice president; and Marion Jacot (3153), secretary-treasurer. Board members appointed were: Barbara Vandenberg (7334), tournament chairman; Cecilia Candelaria (3126), handicap chairman; Cherry Lou Burns (3432), Emma Hollingsworth (5232), Eileen Zemka (2213), and Ann Michele.

The group's annual membership drive is in late January. Any woman employee of Sandia Corporation or AEC/ALO with an interest in golfing is eligible for membership.

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LAB NEWS

NOVEMBER 5, 1965

Employees Invited to Participate in Diabetes Detection Program

Sandia Laboratory's Diabetes Detection Program starts Nov. 15 and will continue through Nov. 26. During this period, all employees may visit a Medical station and leave a urine specimen. This will be analyzed and the employee will be notified if he has a positive reaction. Further testing will then be conducted.

To more evenly distribute the case load through all Medical stations, it is requested that employees from Bldgs. 836, 800, 801, 802, 805, and 806 report to Bldg. 831. All other employees are urged to visit the Medical station nearest their work locations.

All employees who participate in the program are asked to keep their sugar intake at a minimum on the day they submit a specimen.

W. H. Kingsley Heads Industrial Hygienists

W. H. Kingsley, manager of Environmental Health Department 3310, was elected president of the Rocky Mountain Section of the American Industrial Hygiene Association at the organization's annual meeting here recently. Held in conjunction with the Rio Grande Chapter of the Health Physics Society, the meeting was attended by 75 scientists and health representatives from throughout the state.

Two Sandians presented technical papers during the program. D. R. Parker (3311) presented "Evaluation of Microscopic Size Graphite Aerosol from a Rover Reactor Destruction Test" and J. P. Grillo (3311) discussed "Health Hazards Associated with Selenium Rectifiers."

In Local Theater for 25 Years

Another Curtain Opens for Margaret Wetzel Tonight in Showmakers Play

Theater has been the avocation of Margaret Wetzel (3428) for 25 years. She joined the Albuquerque Little Theater right after graduation from high school and has participated in many productions as actress, director, stage manager, property manager, makeup, and what-have-you.



Margaret's latest activity is directing "Lo and Behold!" a three-act comedy which opens tonight, and plays tomorrow, Nov. 12, and Nov. 13. Curtain opens at 8:30 p.m. in Bldg. 204 on Sandia Base. The production is the first effort of the recently organized Sandia Showmakers, a dramatic group with membership open to all persons, military and civilian, who are employed on Sandia and Manzano Base. Dependents are also eligible.

Margaret shudders to remember (time does fly) but she played the ingenue role in the same play when it was produced by the Albuquerque Little Theater in the Fall of 1954. Rebecca Luker, daughter of Carlstan Barsica (3415-3), performs the part in the current production.

Humor in the play stems from a set of improbable characters: four ghosts — a Nobel Prize winner, an Indian maiden whose lover pushed her off a cliff, a Southern belle, and a frustrated music composer — plus a pretty cook, a young doctor, and a bookie-blackmailer. John Patrick is the author of the play.

Pat Horne (wife of George Horne, 9414) performs the role of the ghostly Southern belle with an exaggerated accent and a liberal attitude.

Bertha Grant (2563) is house manager for the production. Assisting with makeup are Cynthia Harris (2232) and Sue Williams (5252).

Dick Strome (3463) and his wife Elaine are helping with props and set design.

"It's a funny show," Margaret says. "And the Sandia Showmakers are justifiably proud of their first production. After this show, the group will work on a special Christmas program written by one of our

members. Other productions are planned for the rest of the season."

In addition to staging plays, the organization conducts workshops in all aspects of theater-playwriting, acting, directing, staging, makeup, etc.

"Membership is open to all Sandia employees," Margaret says, "and new members are welcome. But first, come and see the show. I think you will understand some of the excitement and part of the fun the players and production people enjoy."

Tickets are on sale by members of the Showmakers, at the box office in Bldg. 204, at the Coronado Club, and at Sandia Base service clubs.

Mass Properties Lab To Occupy New Addition to Bldg. 892

A 3850-square-foot addition to Bldg. 892 is planned for Sandia Laboratory, according to an announcement by the Atomic Energy Commission. The addition will house the mass properties laboratory operated by Mechanical Support Division 7214 under R. N. Browne.

Several large instruments will be consolidated into the new area and a new vertical balancing machine will be installed. The equipment to be moved into the new addition includes a torsion bar tower, a variety of trifilar pendulums, two horizontal balancing machines, and several weight and center of gravity instruments.

Division 7214 performs moment of inertia (distribution of mass around a given axis) studies, dynamic and static balancing, and weight and center of gravity analysis of various test units.

C. M. Morrisett (4543) is the Plant Engineering Department project engineer.

Service Awards

10 Years

Nov. 5-18

Z. V. Wilson 3462, E. D. Holbrook 8111, G. E. Tucker, Jr. 3313, Maxine D. Stephens 3126, J. J. Bradshaw 7324, R. A. Randall 1323, L. W. Jamme 2212, and R. P. Demmel 4137.

15 Years



J. N. Ballentine 4232, O. D. Belden 2513, E. I. Bruce 1525, Clarence Carrell 3242, J. E. Church 4254, W. R. Erwin 3242, J. W. Galbreath 3430, L. C. Goodrich 8124, L. W. Hake, Jr. 1331, W. R. Hojland 1544, A. J. Kint 4232, A. W. Kuntz 4254, Margaret Lewis 3321, Mary Lafrenz 3413, S. T. Landrith 4212, L. S. Meissen 4253, P. R. Morgan 2534, Reginald Ostlund 2551, P. G. Sanchez 3242, L. G. Stewart 2134, N. V. Tarnawsky 3415

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 Corporation 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

'64 VOLKSWAGEN, 6200 miles, has side windows in rear that open, radio, cost \$1900, sell for \$1600. Cox, 299-0480.

WASHING MACHINES: at least two; small refrigerator; used TV sets and misc. Dunaway, 299-1422.

KENMORE electric range, 30" wide, full size oven, \$35. Coalson, 298-8074.

LAUNDRY SINK, complete; medicine chest w/ mirror; electric wall heater; 5 HP Cushman Husky engine; want butane bottle w/regulator. Piiner, 256-1907.

RCA TV, hand rubbed walnut cabinet, \$50; B-Flat clarinet w/case, \$50, 3637 Georgia NE. Schafer, 299-4634 after 5.

PONY, (Shelton), w/saddle, paint, \$95. Garcia, 243-5117 or 247-9645.

GE AUTOMATIC WASHER; studio couch; 2 chest of drawers; 3 blond tables—1 coffee, 2 step; 2 lamps. Gardiner, 298-0116.

KEYSTONE MODEL K-45 magazine load 8mm movie camera w/standard f1.5 lens and telephoto lens, \$30 complete. Busby, 299-6450.

55 WATT HEATHKIT amplifier and preamp., make offer. Wenz, 299-5488.

FREE KITTENS, 9619 Morrow Rd. NE. McFall.

'65 TRIUMPH Spitfire HT, soft top tonneau cover, OD, 3000 miles, see at Chevron Station 5601 Lomas NE. Troy, 268-9079.

BRANDT RANCH OAK twin bed set, Sealy mattresses and springs, half price; Sear's washer, \$35. Risk, 299-7205.

RECEIVER, UHF 10 channel crystal controlled, 12-volt DC or 115 v. AC, \$20. Laskar, 299-1024.

'59 OPAL MOTOR, complete; '56 Cushman motor scooter w/buddy seat; 2 steel casement windows 38 1/2 x 52 1/2 double opening, 37 x 38 1/2 single opening. Fackelman, 299-8258.

CHAIN SAW. Remin-ton 18", used one winter, original cost \$169, price \$100. Poore, 282-3610.

FOOTBALL HELMET, shoulder pads, jersey, all for \$3; Chinese Chippendale couch, \$40; Sear's reel lawnmower, \$25. Butler, 299-5626.

'59 FORD PU, 4-speed, 6' wide bed, \$625. Stronach, 5500 Arvilla NE.

'55 CHEVROLET 4-dr. V-8, AT, \$195. Bauer, 255-7774.

872A and 304TL tubes, make offer. Sisneros, 344-4326.

FREE PUP, has all shots, 8 months, 1/2 Basenji, 1/2 shepherd. Dewferf, 298-1029.

40" MAYTAG DUTCH OVEN, gas, \$30. Delnick, 298-5276.

BRICK 3-bdr., 2 blocks from base, 1 3/4 baths, hw/floors, AC, landscaped, \$15,900; FHA value \$16,500. Schatz, 299-4585.

'63 CHEVROLET Super Sport, AC, PB, PS, AT, 250HP, V-8, R&H, Howell, 298-4001.

4-BDR., family rm., AC, garage, workshop, carpeting, drapes, landscaped, covered patio, below FHA, nothing down, \$13,000, 224 Gen. Marshall NE. Johnson, 298-8514.

ENGLANDER '54" foam rubber mattress and matching box springs, walnut bookcase headboard, 9 x 12 wool rug, all for \$45. Martin, 256-6785.

'62 FORD Ranchwagon V-8, 4-dr., R&H, luggage rack, \$1200 or best offer. McClure, 264-7333.

GUITAR, Gibson electric, hollow body, single pickup case, amplifier, \$125. Reed, 255-2010.

KOLLSMAN ALTIMETER, \$15; maple coffee table, \$10. Johnson, 255-5427.

VW TRANSISTOR RADIO. McCoach, 298-5960.

LAMBRETTA motor scooter, '56 model, will consider trade for tuner or what have you. Rose, 298-6238.

WELSH PEMBROOK CORGI, spayed, 1 yr. old, housebroken, shots, \$75 or best offer. Greenwood, 298-5268.

ENCYCLOPEDIA AMERICANA w/yearbooks, 2-volume dictionary and bookcase, \$100. Smith, 10109 Maya Court NE, 299-6873.

'61 BUICK Special station wagon, R&H, automatic, one owner. Ewing, 255-1958 evenings.

COUNTRY HOME in Besque Farms, 3-bdr., DR, family rm., play rm., built-in range oven, dishwasher, carpet, AC, dbl. garage on landscaped 1/2 acre. Gay, 112-636-2781.

TYPEWRITER, Royal Futura deluxe portable w/case. Bircher, 268-0726.

DAVENPORT, large 84" x 36", brown, loose down filled back cushions, custom made. Fosno, 268-8563.

'59 CHEVROLET 8, 1/2-ton pickup, \$595; '52 Chevrolet 1/2-ton pickup, 4-speed w/homemade camper, \$295. Cherry, 877-3403.

FREEZER, National upright, 23 cu. ft., \$150. Riley, 299-3163.

'54 CHEV.: washing machine; 12 x 15' rug w/pad; root feeder w/cartridges; laundry cart; door w/glass; 60-61 GMC manual. Fisher, 299-9235.

3-BDR., 1 3/4 bath, lg. family rm., dbl. garage, dbl. fireplace, built-in stove, dishwasher, AC, carpet, landscaped, \$16,200, move in for \$650. McClelland, 299-0372.

35mm slide projector and screen; 2 4:50/4:00x8 trailer tires and tubes; hi-fi record player and radio. Smith, 268-2141.

POODLE PUPPIES, AKC registered miniature, apricot or silver, Hempen, 7716 Palo Duro NE, 298-4962.

3-BDR. MOSSMAN, 1 3/4 bath, fireplace, cathedral ceilings, carpets, disposal, near Zuni and Queen of Heaven schools, low down, terms to suit. Carriere, 268-8614.

'57 CHEVROLET, 4-dr. HT, 2-tone green, V-8, stick, recently overhauled. Hopper, 299-5515.

EICO 460 oscilloscope; Zenth 17" TV; EICO FM stereo adapter. Ingram, 298-0390.

'62 CORVAIR MONZA 4-speed coupe, small equity and take over loan \$40/mo. File, 344-8853.

'64 CHEV. IMPALA 4-dr. HT sedan, big engine, factory air, loaded, white walls, bronze color, below NADA book. Morgan, 299-2850.

3-BDR., 1 3/4 bath, den w/fp, dbl. garage 1700 sq. ft., equity \$2800, take over payments, balance under \$17,500, Watkins, 516 Hillview Ct. NE, 298-3667.

UMBRELLA TENT 9 x 9, sewn in floor, 1/2 price \$20. West, 299-6695.

12 CU. FT. GE refrigerator; 15 cu. ft. freezer; Roper gas stove. Gonzales, 296-1144 after 5.

TV, 21" deluxe Admiral table model w/remot control, \$60. Holloway, 255-6938.

TV SETS: Philco 21" console, \$40; Silvertone 17" thin-line portable, \$60. Hunter, 299-1089.

GRETSCH electric steel guitar w/amplifier, \$100. Neubauer, 298-5275.

'62 FORD Fairlane, one owner, 6 cyl., manual shift, 34,000 miles, \$950. Duncan, 299-2415.

CLARINET, cost \$150, will sell for \$50 or trade for typewriter. Ortega, 243-2687.

'58 CHEV WAGON, AT, 348 V-8, with or without equalizer hitch, one owner, \$575. Harvey, 256-2666.

'56 PONTIAC 4-dr. PS, ready for winter. Kemp, 299-6325, 9647 Towner NE.

8MM MAUSER RIFLE, model 98, \$30 or best offer. Geilenfeldt, 265-0294.

DRESSING TABLE, limed oak w/40x40" mirror, includes bench w/padded interchangeable upholstered top. Nichols, 247-2564.

POODLE PUPPY, 8 wks. old, AKC, Champion blood line, pure white Toy. Clay, 299-8807.

COMPLETE AMATEUR radio rig, all band, NC-303 receiver, globe DSB-100 sideband xmitter, VFO vox, blond ash rolltop desk, \$325. Bauer, 255-7774.

RIFLE, 30-30 Marlin, lever action, mod. 336 w/4-power scope, \$75. Scott, 299-3412.

3-PIECE BEDROOM set, dresser, chest, and bookcase bed w/mattress and springs, 5 yrs. old, \$75. Marshall, 298-4206.

NEW 2-bdr. mountain home, excellent deep well, 16 miles from Sandia Corp., \$12,500 Lumpkin, 255-8411.

AKC COLLIES, quality, healthy, show potential, terms to suit, Lotz, 298-6116.

PORTABLE AIR COOLER; mattress, springs; RCA portable hi-fi. Bennett, 299-5105.

DEER RIFLE 30.06 Springfield sporterized, 4-power scope and sling, hand made stock, \$125. Miller, 298-1514 after 5.

REVOLVER, .44/40 Frontier, \$45; Remington .41 derring, \$45; Winchester 30/30 take-down rifle, burled walnut stocks, \$68. Smith, 299-1096.

EICO Citizens band transceiver w/squelch, for 12 volt and 110 volt, \$45. Stueber, 299-2414.

LOOP THE LOOP road race set installed on 4 x 8 board, \$15. Harper, 298-0146 after 5.

'65 BARRACUDA, 235 HP, 4-speed, Positraction, new tires, valid factory warranty, \$2350. Wise, 268-2701.

'64 PONTIAC GTO HT, bucket seats, console, 4-speed, 11,000 miles, \$2375. Zagar, 268-2701.

LADIES HEAD SKIS, poles, boots, size 6N. Sena, 265-4990 after 5.

'58 PLYMOUTH Belvedere 4-dr. V-8, PS, \$395; Remington standard typewriter, \$40; new size 8 girl's ice skates, \$6.50. Chaves, 255-6155.

'60 CHEVROLET Biscayne, 4-dr., 6-cyl., ST, R&H, new overhaul/brakes/clutch, \$750; '58 Rambler American 2-dr., 6-cyl., AT, R&H, \$185. Guzman, 344-9287.

ONE-WHEELED metal trailer w/frame, canvas cover, new tire and hitch, \$45; tire chains, \$5. Nelson, 298-9290.

MEN'S SKIS, safety bindings, poles, boots, boot trees, and wax, \$30. Klett, 344-9021.

MAMIYAFLEX twin lens 1 sunshade handle, pararameter \$135; Bernina sewing machine, \$379 new, 2 yrs. old, \$75. Scott, 298-1554.

2 12 gauge shot guns; Jap rifle; antique Winchester; .45 BB; .32 auto Savage. Balfour, 265-4677.

UTILITY TRAILER, 4' x 8' metal box, running lights, spare wheel and tire, \$50. Kleotcka, 299-8198.

1 PAIR G11" skis w/poles and men's size 8 1/2 boots, \$25; 3 7:50x14 Ford wheels w/tires \$4 ea.; Olds Ambassador B-flat trombone, \$75. Erdman, 298-3097.

RCA 21" TV, blond floor model, \$50. Nogle, 299-3863.

SEALYHAM TERRIER puppies, small, white, registered, have shots. McLachlan, 298-0409.

AIRPLANE, open cockpit acrobatic biplane. Reynolds, 299-0709.

FRIGIDAIRE refrigerator, 9 cu. ft., 15 yrs. old. Burke, 209 Hermosa SE, 255-9169.

BOXER PUPPIES, excellent bloodlines, AKC reg. Bewley, 298-5728.

FRENCH HORN, Conn double, \$120; flute, Conn student, \$80; concert snare drum, 7 1/2 Ludwig, pearlized, \$40. Spatz, 299-0410.

GARRARD 3-speed changer, \$35; Bogen 15 watt amplifier, \$30; Knight F.M. tuner, \$10; Carlson enclosure, 15" wolver, tweeter, crossover, \$70. Erne, 299-0565.

'60 FORD convertible, PS, PB, R&H, four barrel carb, AT, \$600. 500 Kentucky SE, Cassidy, 255-5940.

DOUBLE BEDS, two, one has bookcase headboard, want twin or bunk beds. Chandler, 298-5069.

HAM TOWER; rattan coffee table; mangle iron; console TV; misc. Tilley, 299-9611.

'57 RAMBLER Classic 4-dr., automatic, 6-cyl., original owner, 50,000 miles, light blue, \$300. Weir, 299-1160.

GE BUILT-IN oven and range, yellow, '59 model Ruggles, 268-4003.

MOTORCYCLE, '64 Honda Dream, 305cc, 2000 miles, black and chrome, \$445. Kafauer, 255-8270.

FLOOR FURNACE, complete \$45, furnace LP w/controls, \$35; garage door, \$30; trade for 45 automatic, 30-06, 6-8" grinder, adding machine. Aaron, 282-3803.

'54 PLYMOUTH, AT, Crawford, 344-7890.

WANTED

BABYSITTING in my home, any time, or age. Cannon, 11704 Rosemont NE, 298-4545.

RIDERS from area 57th NW to Rio Grande Bridge or Central-Country Club area and Coal to Bldg. 840. Checchio, 243-6351.

FEMALE ROOMMATE to share nice apartment with one other girl, move in Dec. 1. Montgomery, 298-8698.

TRADE alfalfa hay for salt water fishing tackle, used motor for small boat or 14' car top boat. Shafer, 898-0132.

BABY SITTING in your home, 35c per hour. Pierce, 255-7923.

.38 CAL. Weberly pistol. Bailey, 298-4678.

RIDE from Grand and Madison NE to Bldg. 880. Cosstick, 268-3515.

TO FORM car pool from vicinity Comanche and Wyoming to parking 802 or 880. Bemis, 296-1305.

FOR RENT

3-BDR., carpeting, drapes, landscaped, sprinklers/ front and back, heated garage, AC, yard access for trailer, 11400 San Jacinto NE, \$125/mo. James, 299-0709.

1-BDR. APT., Southwest valley, handy to Rio Bravo Freeway, \$57.50, 2628 Del Sur SW. Law, 877-9201.

2-BDR. unfurnished duplex, 8322 Trumbull SE, \$70/mo., no pets, special 12-month price. Rogers, 268-4731.

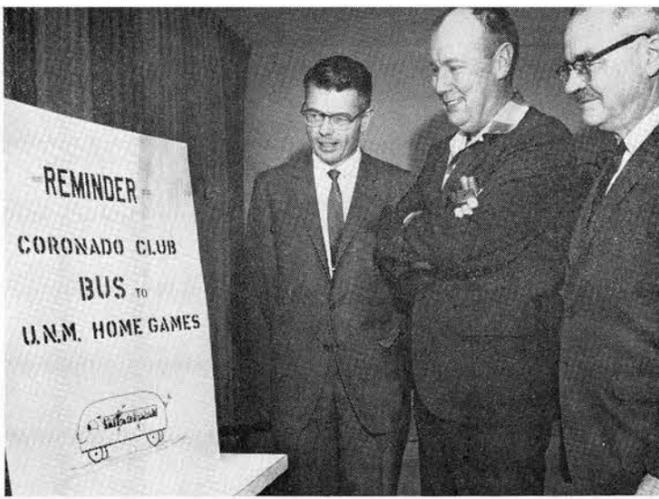
LOST AND FOUND

LOST—15-yr. tie clip w/pendant, small maroon memo book, ladies wrist watch (Movado) w/ initials MPS, key on ring w/toy gun, pr. ladies black knit gloves. LOST AND FOUND, tel. 264-2757.

FOUND—Schaeffers pencil, black and silver ear clip, pr. ladies black gloves, 3 keys on ring, Ford key. LOST AND FOUND, tel. 264-2757.



CORONADO CLUB FACILITIES are available to Sandia's out-of-town employees if they stop at the Club office for honorary membership cards. Looking at the November calendar of activities are Livermore Laboratory visitors (l to r) C. H. DeSelm (8200), J. F. Jones (8156), and D. E. Gregson (8110).



NEW MEXICO FOOTBALL—and the Coronado Club's bus to the home games—sounds good to these visitors (l to r) A. W. McKinney (8144), E. F. Ingledue (8166), and W. L. Miller (8212). Visitors may also attend buffets and special events.

New Lawrence Radiation Laboratory Director Named

Dr. Michael M. May is the new Director of the University of California's Lawrence Radiation Laboratory, Livermore. Dr. May, 39, replaces Dr. John S. Foster, Jr., who was recently named by President Johnson to the position of Director of Defense Research and Engineering for the U.S. Department of Defense.



Dr. May received a BA degree in physics and mathematics in 1944 from Whitman College, Walla Walla, Wash. After graduation, he joined the U. S. Army serving as a paratrooper. After completing his service, he began graduate work at the University of Washington, and in 1947 transferred to the Berkeley campus of the University of California. He received his PhD in theoretical physics in 1952.

In September 1952, Dr. May became a member of the original staff at Livermore in the Theoretical Physics Division. His early work was concerned with theoretical calculations and the development of mathematical codes used with computers for the design of thermonuclear weapons. He became a group leader, and subsequently, an alternate Division head of the Theoretical Physics Division.

Beginning in 1954 he undertook an important program of an experimental, rather than a purely theoretical, nature. While most of his work remains classified, he has made significant contributions, in particular, to the development of thermonuclear weapons and of devices with reduced relative yields of radioactivity.

In May 1962, he became the Associate Director for Nuclear Design.

While continuing to supervise the device program, Dr. May taught a course in electricity and magnetism. Deciding that he wanted to make more of a contribution to the academic program and knowing that the device program required full-time leadership, he resigned his position as Associate Director in May 1964.

Since then he has spent half his time as a member of the Livermore Laboratory and half his time as a lecturer in the Department of Applied Science, teaching courses and seminars. As part of his research work since assuming the teaching role, Dr. May has carried out theoretical calculations in astrophysics and general relativity. In addition to this research, Dr. May continued to undertake special assignments in the Livermore Laboratory.

Turkey and Trimming Featured at Club's Final Dinner Dance of 1965

Roast turkey with all the trimmings. A special fashion show with Christmas present ideas galore. Dining to the Lamplighters. All this at the Coronado Club Saturday, Nov. 20.

Dinner will be served starting at 6 p.m. Reservations are requested and tickets should be picked up at the Club office by Nov. 17. The cost: \$3 for members, \$3.50 for guests.

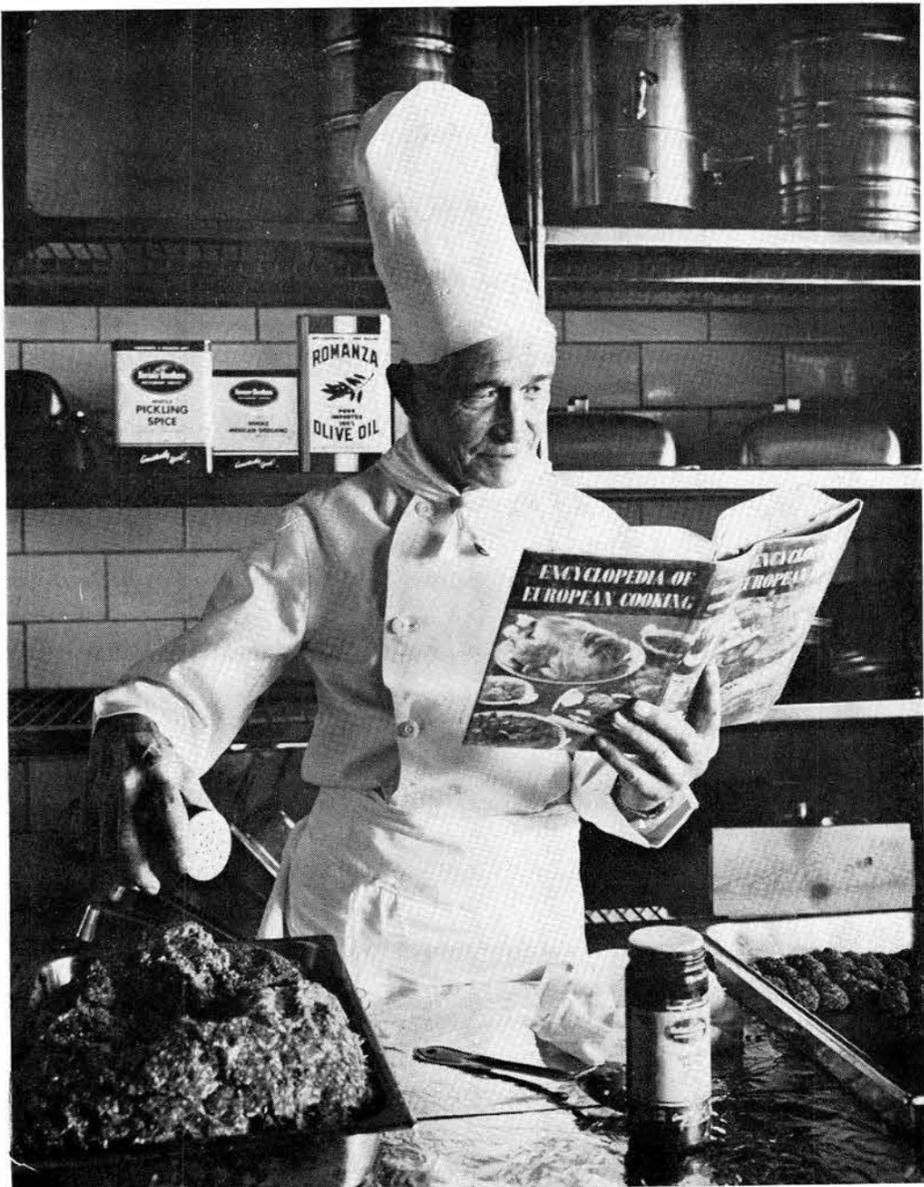
This will be the last big dinner dance before the annual organizational Christmas parties start.

Food a la Scandinavia At Club Party Saturday

In case you had wondered about the menu for tomorrow's Evening in Scandinavia at the Coronado Club, here is a rough translation of the dishes to be offered at the smorgasbord: Kod Boller, meatballs in a mushroom sauce; Benelose Fugle, boneless stuffed beef rolls; Fleskesteg, roast pork; Banke Kod, beef stew; Risengrod, boiled rice; Earter og Guberoden, creamed peas and carrots; Rodbeden Salat, pickled beet salad; Rodkaal, sweet-sour red cabbage; Agurk Salat, cucumber salad; and Able Kage, Danish apple cake.

Tickets for the evening's entertainment are \$3 for members and \$3.50 for guests and include the smorgasbord from 7-9 p.m., followed by dancing to the Arlen Asher Orchestra.

CORONADO CLUB CHEF Rudy Adams seeks a little advice on Swedish meat balls in preparing the smorgasbord for tomorrow's Evening in Scandinavia.



Other Activities . . .

Social Hours

The Club's popular chuckwagon roast beef and shrimp buffet will be served tonight following Social Hour. Max Madrid's Combo will be providing background music. The price: \$1.75 for adults, \$1.50 for children. Friday, Nov. 12, the reasonably-priced seafood buffet will be featured and music by the Sol Chavez Combo. Buffet tickets are \$1.25 for adults, \$1 for children.

Bridge Club

The monthly Bridge Club dinner will be Monday, Nov. 15, at 6 p.m. Reservations are requested. Next Monday, duplicate bridge play will start at 7 p.m.

Sanado Club

"Fashions por los Tiempos Dorados" is the theme of the style show to be presented during a Sanado Club tea on Tuesday, Nov. 9 at 1:30 p.m. Included will be ensembles for the important holiday events. Mrs. A. F. Cone is the program chairman and will be the commentator. The Coronado Club ballroom will be decorated in gold for the occasion and the stage will resemble an exclusive dress salon. Reservations should be made with Mrs. S. D. Brooks, tel, 298-5133.

Save Money on Swimming; Join Coronado Club Now

Prospective members are reminded that if they join the Coronado Club this month, they will be eligible for the reduced-price season swimming tickets next summer (only \$5 per family or \$2.50 per individual).

Ski Club

Skiers—and prospective skiers—will meet Monday, Nov. 15 at 7:30 p.m. in the Coronado Club dining room. There will be a fashion show of ski clothes and equipment as well as a movie on the National Ski Patrol. Members will discuss arrangements for the club's annual trip to a ski area.

Coronado Ski Club members will have their first party of the season Saturday, Nov. 13, in the Eldorado Room starting at 9 p.m. The Ski a Go Go evening will feature music and entertainment by the Yachtsmen and special rates for refreshments. Casual dress is in order and members are urged to bring along any musical instrument they might play. Tickets, which will be sold at the door, are \$1 each for members and guests.

Coyote Test Field Headquarters to Get New Lab Addition

Construction will start soon on a new laboratory and assembly area for the Coyote Test Field headquarters Bldg. 9925, the Atomic Energy Commission has announced. The new addition—about 3100 square feet—will be built on the north side of the present Bldg. 9925. Jack B. Henderson Construction Company of Albuquerque is the apparent low bidder for the project at \$65,498.

Bldg. 9925 now serves as administrative and maintenance headquarters for Coyote Test Field activities. The new addition will provide more space for the assembly of test units and installation of instrumentation.

Personnel of Coyote Test Field and Thunder Section 7325-1 under W. L. Hyde will occupy the new addition.

R. F. Armstrong (4543) is the Plant Engineering Department project engineer for the construction project.

Events Calendar

- Nov. 6—Football, UNM vs. Wyoming, 1:30 p.m., tel. 277-0111.
 - Nov. 6—Jemez Falls, N. M. Mountain Club, leader Ethel Ringer, tel. 256-2038.
 - Nov. 6-7—White Sands, N. M. Mountain Club, leader Don Mattox, tel. 268-5554.
 - Nov. 11—Tom Krause, baritone, Community Concert series, Civic Auditorium.
 - Nov. 11—Veterans Day parade followed by 11 a.m. observance at grounds of VA Hospital.
 - Nov. 13-14—Canyon de Chelly, N. M. Mountain Club, leader Ellen Hippeli, tel. 255-8295.
 - Thru November—Kachina Doll Exhibit, UNM Anthropology Museum.
 - Now Open—New Arroyo del Oso Municipal Golf Course, on Louisiana ½-mile north of Montgomery NE.
- This listing is for the convenience of employees. No endorsement is implied.

Sandia's Safety Scoreboard

Sandia Laboratory:
130 DAYS
4,550,000 MAN HOURS
WITHOUT A
DISABLING INJURY

Livermore Laboratory:
141 DAYS
703,000 MAN HOURS
WITHOUT A
DISABLING INJURY