

SANDIA CORPORATION
SANDIA BASE, ALBUQUERQUE, N. M.

S. P. SCHWARTZ
President

To all Employees:

Sandia Corporation is pleased to announce a program demonstrating its cooperation with the President's Committee on Equal Employment Opportunity in carrying out the policy of the President of the United States embodied in Executive Order 10925 that all qualified persons regardless of race, creed, color or national origin are entitled to equal employment opportunities.

This Committee, over the signature of President Lyndon B. Johnson, has accepted a Sandia "Plan for Progress" which identifies the course of action we will follow in implementing this program. Thus Sandia has joined hundreds of other leading businesses and educational institutions with an aggregate of several million employees in this most important activity, which President Johnson describes as a "fair chance and equal opportunity, not for some but for all people."

The responsibility falls on all of us to help to make this important goal come true. I encourage you to read the news article on this subject contained in this issue of the Lab News.

S. P. Schwartz

SANDIA
CORPORATION

LAB NEWS

PRIME CONTRACTOR TO THE ATOMIC ENERGY COMMISSION / ALBUQUERQUE, NEW MEXICO / LIVERMORE, CALIFORNIA

VOL. 16, NO. 21 / OCTOBER 9, 1964



Sandia Reaffirms Long Standing Policy of Equal Opportunity

The President's Committee on Equal Employment Opportunity has accepted the Company's Plan for Progress under which Sandia has voluntarily undertaken a program to demonstrate its continuing adherence to the principle of merit employment and the policy of nondiscrimination in employment.

President John F. Kennedy established the Committee by Executive Order 10925, dated March 6, 1961. President Johnson acts as Committee Chairman and Secretary of Labor, W. Willard Wirtz, is Vice-Chairman.

The Committee has 15 public members and 11 representatives of government departments and operates under the day-to-day direction of Executive Vice-Chairman Hobart Taylor, Jr.

The Company's Plan for Progress calls for a course of action whereby the Company and the President's Committee will work jointly toward achieving full equality of employment opportunity. Under the Plan the Company will undertake the following:

Recruiting and Placement—Qualified minority group members are considered for all job categories, including scientific, engineering, technician, administrative, skilled, semi-skilled and unskilled. High school and college recruiting programs include minority students.

Transfer and Promotion—Qualified minority group members receive equal consideration as opportunities for transfer, upgrading, or promotion occur.

Training—Qualified minority group employees will continue to have equal opportunity to participate in training programs. Where the Company has need for particular skills, it will support community vocational programs, and minority group employees will be en-

couraged to participate.

Facilities—Work areas, cafeterias, and recreation areas will continue to be maintained on a non-segregated basis.

Dissemination of Policy—Information concerning the Progress Plan will be distributed to people in employment, placement, and training. The Plan will be discussed with all supervision at Management conferences, training courses, new employee orientation, and in Company publications.

Implementation of the Plan for Progress and general administration of the program within Sandia will be a responsibility of the Vice-President, Personnel.

The purpose of the program undertaken by the President's Committee for Equal Employment Opportunity is to achieve progress toward—

Enriching our free society by advancing basic human rights

Providing equal job rights for all Americans

Reducing the costs to the nation of unemployment, underdevelopment, health and welfare programs, increasing crime and delinquency rates, and deterioration of urban areas

Improving the economic conditions necessary for continuing prosperity, thus increasing the gross national product by many billions of dollars and raising the standard of living

Promoting better community conditions in order to provide an environment for dignity and tranquility in our daily lives

Contributing through private endeavors toward solution of a major national problem.

Sandia Group Helps Interchange of Weapons Ideas

Much has been learned about nuclear weapons and their use since Trinity Test occurred 19 years ago. But a nuclear burst is still a rare event and much remains to be learned.

A large part of the work of the Nuclear Burst Physics and Mathematical Research Organization is devoted to the study of nuclear weapon systems, weapon effects, and nuclear burst phenomena.

Using mathematical tools, the organization is also studying possible or future nuclear weapon systems in order to assist in decisions concerning design characteristics. The interplay between the weapon effects physicist and the mathematical systems analyst is clear: no study of a potential nuclear weapon system can be made without knowledge of the effects to be expected from the nuclear yield.

Scientists in the organization are also performing basic research in many areas of physics and mathematics relevant to Sandia interests. Most of this work is published in professional journals and is an indication of Sandia's participation in extending the boundaries of scientific knowledge.

The Nuclear Burst Physics and Mathematical Research Organization thus embraces a large range of activity—from research in fundamental mathematics to the chemistry of fuels for satellite reactors. The common bond between the two departments, Nuclear Burst Physics

Department and Mathematical Research Department, is a consequence of the essential role weapon effects information plays in almost all of the weapon systems studies. In addition, both departments are distinguished and widely recognized for their unique contributions to their respective research fields.

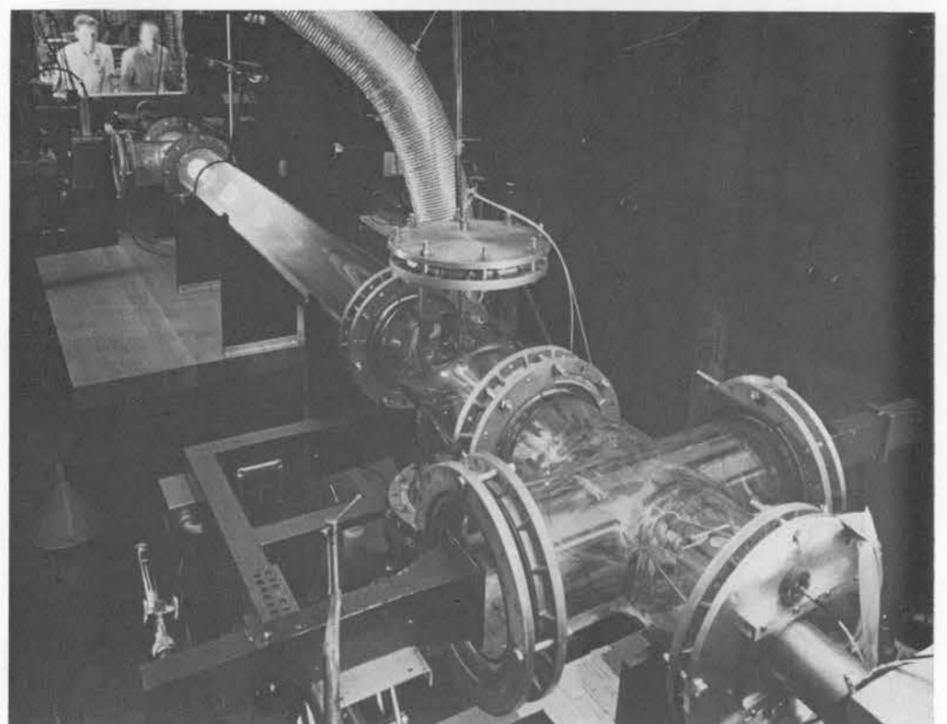
Director of the organization is Thomas B. Cook, Jr., whose own research and experience has resulted in his appointments as a consultant to the Director of Defense Research and Engineering, the Scientific Advisory Board of the Air Force, the Defense Atomic Support Agency, and to aerospace corporations.

Tom is also a member of a number of informal working groups, inter-agency project teams, and Military-Department of Defense-AEC committees.

He brings to these meetings an intimate knowledge of weapon effects and the resources of his organization. Using a double-barreled approach of physics research and mathematical analysis, the organization's staff can explore new weapon concepts in detail long before designs are drawn or hardware built.

"New ideas for weapons originate in many places," Tom Cook says. "One of the most fertile areas is in the interchange of ideas among the scientists and agencies involved in the weapons program. This

(Turn to Page 4, please)



PLASMA ACCELERATOR produces tremendous velocities in small masses of materials and enables study of the interaction of individual atoms with gases, with surface, and with magnetic fields. In the control room are D. M. Zagar, left, and R. L. Schellenbaum of Radiation Physics Division.

(Editorial Comment)

These Efforts Never End

This week—Oct. 4-10—has been reserved for giving special attention to fire prevention activities. This year's efforts toward prevention of fire losses have been bolstered by the President's order for elimination of waste in Federal establishments.

Past fire prevention efforts in AEC facilities have brought about an enviable record when compared to the experience of others. However, there is no complacency warranted when it is realized that the AEC's 18-year fire waste has exceeded \$10 million.

Sandia and Livermore Laboratories have a superior record in prevention of fire. At Livermore Laboratory, fire losses the past 12 months have been \$10. In the past five years the losses at Livermore Laboratory have totalled only \$182. Sandia Laboratory fire losses for the same 12-month period have been \$220. Sandia Laboratory's five-year losses have been \$6400.

It's impossible for us here at Sandia Corporation to relax our efforts at preventing fire. There is always the danger of a costly blaze. There is always danger of loss of life in these fires.

Fire Prevention Week comes but once a year. Fire prevention efforts are always needed. This need never lessens.

Youngsters And Their Eyes

Adults don't have exclusive claim to accidents. The medical profession has long been concerned about youngsters' proneness to self-injury. Pediatricians report grim instances where the child at play has been maimed, in many cases permanently.

What can parents do about it other than train the children in the ways of safety and preach caution?

If your youngsters take wood or metal shop in school, if they play ball, go hunting, fishing, or just play as strenuously as any healthy youngster, they should be equipped with safety glasses.

Tests by the National Safety Council and the National Foundation for the Prevention of Blindness show that safety glasses withstand such things as impact of BB shot, arrows, rocks, baseballs, golf balls, or even steel marbles. They can be dropped on the floor, used as a hammer to drive nails, stepped on, and can even withstand small explosive charges. In these experiments, they broke only when placed flat on a table and hit solidly with a hammer. Even then, they did not shatter into sharp pieces.

Safety glasses cost only a little more than regular glasses. If they save sight of an eye, they are worth every cent, many thousand times over.

Death . . .



Walter M. Winfrey, Sr., a Sandia Corporation employee for 10 years, died in a Tonopah, Nev., hospital Sept. 29. He was 59.

Originally assigned to Storage Control Department at Sandia Laboratory, Mr. Winfrey transferred to Tonopah Test Range in May 1960. At the time of his death he was in the Rocket and Ordnance Section.

Survivors include his widow, and two children: Mrs. F. T. Hawes of Albuquerque and Walter Winfrey, Jr., of New Orleans, La.

Take Note . . .

The Polonaise Society of Albuquerque will hold its seventh annual benefit dinner-dance Oct. 17 at the F.O.P. Hall.

The dinner, served from 6:30-8:30 p.m., will feature traditional Polish dishes. Later, American dance music will be interspersed with Polish hops and waltzes.

Tickets may be obtained from the following Sandians: Nina Dziadulewicz, Joe Ozmina, Ted Stetz, Tom Sullivan, or Willa Urbanoski. Proceeds will go into a scholarship fund for students of Polish descent.

The Sandia Gun Club will sponsor a "sighting-in shoot" for all hunters from 8 a.m. to noon on Sunday, Oct. 11, at the Sandia Base carbine range. For additional information call Jim Caudell at 299-0646.

The Coronado Ski Club will meet Monday, Oct. 19, at 7:30 p.m. at the Coronado Club. Guest speaker will be Kolbet Schrieche, manager of the Nordic Inn at

Scientists Appearing On Program of Ohio Insulation Conference

Several of the technical papers to be presented at the forthcoming 33rd annual meeting of the National Academy of Sciences-National Research Council Conference on Electrical Insulation were originated by members of Sandia's Polymer Chemistry and Electrical Properties Division.

The meeting is scheduled for Oct. 12-14 in Cleveland, O. Osborne Milton will be chairman of the fifth technical paper session.

R. G. Fitzgerald will lead off the program with a paper entitled "Electric Conductivity as a Function of Pressure in Five Conjugated Aromatic Monomers."

Others to be presented include: "Dielectric Strength and Pulse Life of a Glass-Filled Epoxy Resin System" and "A Controlled Thermal Environment for Dielectric Strength Studies," by L. J. Seligman; "Application of the Pointed Electrode in Evaluating Pulse Life of Casting Resins" and "Field Analysis from a Flux Map with Notes on the Method of Drawing the Map," by Osborne Milton; "Correlation Between Electrical Pulse Resistance and Mechanical Shock Resistance in Plastics," by J. B. Allyn; and "Relationship Between Voltage and Current in Dielectrics Subjected to Electrical Pulses," by J. L. Wentz.

Crested Butte, Colo. He will discuss "Ski Attractions in Crested Butte."

Anyone interested in joining the Ski Club or in making a New Year's excursion to Crested Butte Dec. 31, is invited to attend the meeting. Group rates for the trip will be available.

W. K. Paulus of Data Systems Development Division has been appointed to the IEEE Systems Science Committee's Theory Working Group.

Fire Inspectors Advise on Proper Actions to Take If Home Burns

This week, during National Fire Prevention Week, Americans across the country should have become increasingly aware of the very real threat of fire, especially of fire in the home.

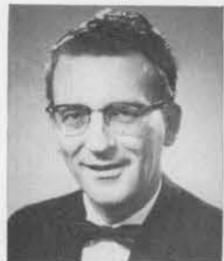
But simple awareness of a threat is not enough, Sandia's fire prevention plant inspectors warn; you must know how to meet it. What do you do if fire strikes your home? Here are some ways to meet the threat of fire, suggested by the National Fire Prevention Association:

- Get out of the house the minute you discover fire or smell smoke.
- Always be ready to use different escape routes from any room in your house.
- Test doors before opening them. If they're hot, block them with furniture or wet mattresses to keep out smoke

and gases. Then, get out another way. —Never jump from upper story windows except as a last resort. Wait for the firemen.

- Hold your breath if you have to make a dash through smoke and flames.
- Call the fire department at once. They know how to fight fire. Don't waste your time or your life trying to fight a fire unless it's so small you're sure you can control it with the right extinguisher.
- Don't ever go back into a burning building for any reason. Smoke and gases from even the smallest fire can be deadly.
- Get medical treatment at once if you're burned or exposed to fire and smoke. Seemingly minor burns or smoke inhalation can have fatal results.

**Service Awards
15 Years**

 Franklin W. Loomis 2564 Oct. 10, 1949	 James C. Gravin 3415 Oct. 10, 1949	 Richard E. Andros 2132 Oct. 11, 1949	 Robert L. Culley 7213 Oct. 11, 1949
 Charles A. Wells 2341 Oct. 12, 1949	 A. F. Cone 2110 Oct. 14, 1949	 William T. Ryan 8243 Oct. 14, 1949	 R. A. Vermillion 4224 Oct. 15, 1949
 H. W. Maglidt 3460 Oct. 16, 1949	 Edgar P. Frasher 2342 Oct. 17, 1949	 Kenneth G. Overbury 2411 Oct. 17, 1949	 Frank F. Francis 1113 Oct. 18, 1949
 John W. Hatcher 4511 Oct. 18, 1949	 Milan M. Lettrich 8243 Oct. 18, 1949	 Harold L. Rarrick 3312 Oct. 19, 1949	 Thomas E. Dadian 8115 Oct. 19, 1949
 H. C. Sealey, Jr. 3242 Oct. 20, 1949	 Robert D. Flaxbart 4510 Oct. 20, 1949		

**10 Years
Oct. 10 - 23**

Thomas T. Kirtley 4234, Stephen T. Taday 4252, George F. Miller 4412, Frank J. Suazo 4574, Joseph F. Calek 2123, Walter E. Myers 4254, J. Peter Wakeland 3419.
Tony Garcia 4221, Jesse C. Bozone 2124, James H. Brewer 2136, Jerome P. Rynders 2542, George W. Henfling 2642, Emilio Chavez 3242, John I. Malpas, Jr. 4251.
Lucille H. Long 2624, Marie B. Stone 3427, Henry R. Aira 4622, and Judith R. Klasson 4152.

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**LAB NEWS
OCTOBER 9, 1964**

SANDIA CORPORATION
LAB NEWS



ALBUQUERQUE, NEW MEXICO • LIVERMORE, CALIFORNIA

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Nuclear Radiation

— what is it?

This is the first of a series of three non-technical, easy-to-understand articles on the principle facts about nuclear radiation. The layman-level language used makes them especially appropriate for students.

Light is radiation that we can see. Heat is radiation that we can feel. Radio and television waves and x-rays are electromagnetic waves of radiation that we can neither see nor feel, but with whose usefulness we are well acquainted.

Now we are hearing more and more about another kind of radiation as a result of man's continuing scientific and engineering achievements.

This is nuclear radiation.

Nuclear radiation consists of a stream of fast-flying particles or waves originating in and coming from the nucleus, or heart, of an atom. It is a form of energy we have come to call atomic, or nuclear, energy.

Nuclear radiations come from only one kind of atoms—unstable atoms, or atoms in which sub-atomic particles called protons and neutrons, that make up their nuclei, are out of balance with one another.

Most atoms found in nature are stable. A few, such as those of radium and uranium are unstable.

Man, however, now has found a way to make unstable atoms out of many stable atoms by bombarding their nuclei in atomic reactors and particle accelerators, or "atom smashers."

Under this bombardment, the centers of the stable atoms pick up an extra particle or particles, thus upsetting their natural proton-neutron balance.

These newly unstable atoms immediately seek to become stable again by throwing off the extra mass, or energy, they have absorbed in their nuclei in the form of invisible particles and waves of radiation.

What is this nuclear radiation really like?

How does it benefit us?

How dangerous is it?

How do we control it?

Four Kinds of Radiation

There are four principal kinds of nuclear radiation—alpha particles, beta particles, gamma rays, and neutrons.

Understanding the basic principles concerning them and what they do is a reasonably simple matter.

Alpha particles are comparatively heavy particles given off by the nuclei of heavy radioactive materials such as uranium, thorium, and radium. They can travel about an inch in air and can be readily stopped by the skin or by a thin sheet of paper.

Beta particles are much lighter particles that come from many radioactive materials such as carbon 14 or strontium 90. They can travel a few feet in the air and penetrate up to a third of an inch, or more, of body tissue. They can be readily stopped by a thin sheet of aluminum or an inch of wood.

Gamma rays are invisible electromagnetic waves similar to x-rays and radio and television waves. They come from such materials as radioactive cobalt 60 or cesium 137, can travel hundreds of feet through the air and are highly penetrating. Thick barriers of lead, concrete or earth are needed to stop them.

Neutrons are electrically neutral particles which, like gamma rays, can travel long distances through the air and are highly penetrating. They can be stopped by several feet of water or special concrete.

Nuclear radiation, incidentally, is not a new phenomenon on this planet. From the beginning of time, man has always been subjected to natural, or background, radiation from radioactive elements such as uranium, thorium, radium, and other substances which are everywhere in the earth. This radiation is present in small amounts in the air we breathe, the food we eat, the water we drink, and the earth under our feet.

Cosmic rays are also part of this natural radiation to which everyone is constantly exposed. Cosmic rays are nuclear particles of very high energy which strike the earth from outer space.

In part because cosmic rays tend to be

stopped by the earth's atmosphere, the natural background radiation level varies with different locations in this country.

In sea-level New York City, for example, the annual exposure to background radiation is only a quarter of that in mile-high Denver. Neither exposure, of course, is enough to be a significant hazard to people.

Now man has learned not only to create, but to harness nuclear radiation and to use it in ways beneficial in many walks of life. This radiation, while highly beneficial, can be extremely dangerous if not used under careful control. But in this respect, radiation is not too different from electricity, a familiar and indispensable household and industrial servant for us all, but one which can be a formidable foe when out of control. One easy way to understand radiation and its place in our economy is to continue this comparison with electricity.

Nuclear radiation can neither be seen, heard, felt, tasted, nor smelled.

Electricity, though it can be felt, can neither be seen, heard, tasted, nor smelled under normal circumstances.

Nuclear radiation is now a new force in our daily life, much as electricity was less than a century ago.

Because it is still new and unfamiliar to many, radiation is a cause of considerable apprehension over its use and safety.

Electricity was in a similar position when it was first introduced. History, for example, tells of widespread public apprehension in New York in 1886 when the use of alternating current was proposed for the distribution of electric power. Newspapers headlined stories about "The Electric Murderer" and the mayor was urged to take the law into his own hands, if necessary to block the proposal. Eventually, of course, electricity won public acceptance because, despite the hazards associated with it, nothing else could do the things it was able to do. Now nuclear radiation is proving that, employed under constant and careful control, it, too, has uniquely useful capabilities.

How Radiation Does Its Work

The unstable atoms man has learned to make and put to work are called radioisotopes—meaning that they are radioactive forms of elements such as cobalt, iodine, carbon, gold, sulfur, iron, or whatever.

These radioisotopes are steady, dependable and, in many cases, longlasting sources of nuclear radiation.

The radiation they generate has four main types of uses:

1. To affect the properties of living and non-living things in various ways. For example, to destroy cancerous tissue; to change the molecular structure of various materials to pasteurize or sterilize food and other products; to eradicate insect pests.

2. To measure or test industrial products. For example, to penetrate solids for photographic purposes; to gauge and control the thickness of products manufactured in fast-rolling sheets; to gauge and regulate the amount of ingredients in various commodities; or to gauge the level of liquids in closed tanks or containers.

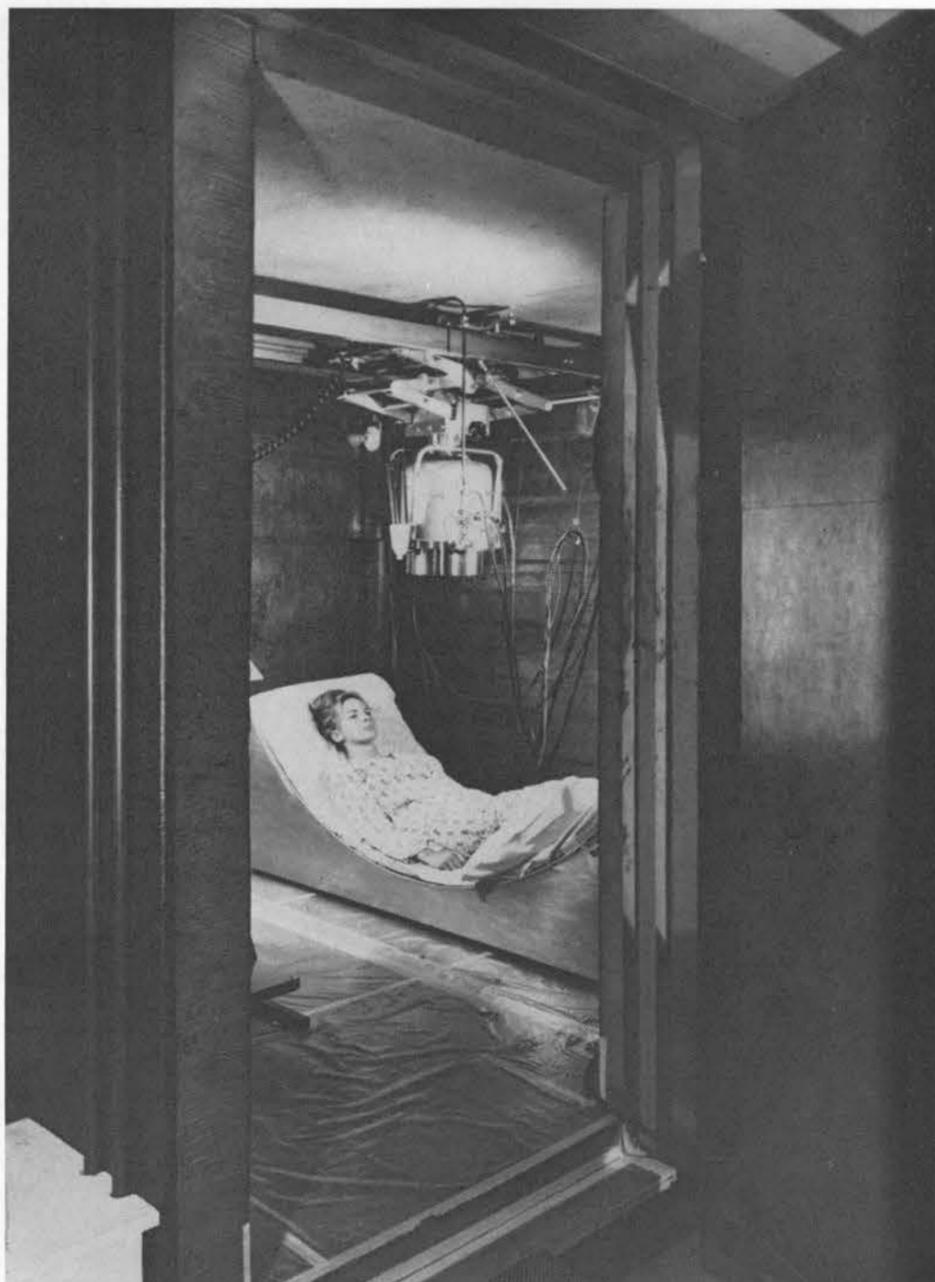
3. To trace processes in living and non-living things.

4. To produce heat for the generation of electric power.

The great value of this radiation lies in the fact that in many applications it either does the job better than conventional methods can do it or does tasks that couldn't be done at all by conventional means.

Take x-rays for example. For many years x-rays have been used to treat some types of cancer.

High-level radiation from a conventional x-ray tube, however, is accompanied by low energy radiation that cannot penetrate the body to destroy deep-seated cancerous growths. This low-level radia-



RADIATION IN MEDICINE. Radiation has come to be of special value in medical diagnosis and research. Small amounts of radioactive materials injected into the body can be traced by means of such a facility as this whole-body radiation counter. Such tracer studies have been used to determine iron absorption by the body and its relation to health; the assimilation of calcium as related to bone diseases; the life span of red cells in leukemia patients and facts about other body processes and functions.

tion is absorbed by over-lying healthy tissue in which it can cause painful radiation burns.

Radioactive cobalt or cesium, on the other hand, has very little accompanying low-energy radiation. Its uniformly high energy delivers a maximum beneficial dose to deep-seated cancer without radiation burns of overlying healthy tissue.

The benefits of this improved method have been demonstrated conclusively with many hospital patients.

In addition to their well-known applications in medical and dental examinations, x-rays have long been used in industrial radiography to find defects in welds, castings, airplane parts and other metal objects. But x-ray machines must be connected to a source of electrical power in order to operate.

Compact and powerful radioisotopes, on the other hand, can produce gamma rays that will do an equivalent x-ray job in industry.

And, since they do not have to be connected to a source of electric power to be operated, as x-ray machines do, they can be used almost anywhere—inside pipes and castings, in tight places in ship and submarine hulls, along miles of outdoor pipeline and elsewhere—for valuable industrial photographs impossible to obtain by conventional x-ray equipment.

Radiation-activated gauges employing beta or gamma-emitting radioisotopes now are used to control the thickness of virtually all sheet materials manufactured in large production lots. Even the tiniest variations in the strength of the radiation beam being passed through or reflected from a given material will signal a variation in its thickness.

Such gauges, monitoring constantly moving flows of different products, avoid actual mechanical contact with the material, thus eliminating rips and tears. They give accurate and uninterrupted readings, no matter how fast the sheet flows, and gauge readings can be fed automatically into a device for continuous and automatic adjustment of the process machine's rollers.

Products gauged in this manner include paper, rubber, tire fabric, aluminum, asbestos, and many other materials.

Radiation density gauges perform with the same effectiveness and reliability to measure and control the amounts of material going into other manufactured products such as tobacco into cigarettes, meat into soups, etc., or to keep track of the levels of corrosive or other hard-to-handle liquids in closed tanks or containers in important industrial processes.

The next article on nuclear radiation tells of batteries that won't wear out, radioactive detectives, and discusses how nuclear radiation helped bring about the speculation that Napoleon was murdered.

Dialogues on Democracy LP Album Available

The LP albums, "Dialogues on Democracy," mentioned in the *Lab News* of Sept. 25 are now on hand at Sandia and Livermore Laboratories.

The non-partisan album brings to life again some of the campaign sounds of the 1892-1960 period including voices of former Presidents, and also offers a brief appraisal of some of the issues and problems Americans have encountered and must continue to face as a people and a nation.

The albums may be purchased at Employee Services Division in Bldg. 610 during the noon hour.

At Livermore Laboratory the albums may be secured at Classification and Public Information Division office, Rm. 142, Bldg. 912, during the noon hour and for 30 minutes after work.

The package of three 12-in. 33 RPM records is priced at cost—\$1.25.

Conference on Industrial Survival Has Several Sandians on Program

A number of Sandians participated in the Governor's Conference on Industrial Survival, held at the Western Skies Hotel on Oct. 7.

The conference, presented for the benefit of individuals concerned with safeguarding business and industry in the event of a nuclear attack or other emergency, was sponsored by local, county, region and state Civil Defense offices; ACF Industries, Inc.; the Albuquerque Chamber of Commerce; the Atomic Energy Commission; Los Alamos Scientific Laboratory; Sandia Corporation; the New

Mexico Banker's Association; and the University of New Mexico.

The opening address of the conference was presented by Governor Jack M. Campbell. Archie Westfall, Mayor Ex-Officio of Albuquerque, presented the welcoming address.

Byron F. Murphey, manager of Sandia's Nuclear Burst Physics Department, discussed "The Effects of Nuclear Weapons."

H. M. Willis, manager of Systems Programming and Administration Department, serves on the State advisory committee for industrial survival and has also served on the planning committee for the Conference.

Take Note . . .

The Southwest Conference of Industrial Editors has presented an Award of Excellence to the Sandia Lab News. The award was made for "exceptional accomplishment, achievement of purpose, excellence of editorial content, and effectiveness of design."

The Lab News Award of Excellence was the only such award made to newspaper-style publications. More than 100 publications were judged in the competition.

Los Gitanos Camper Coach Club, a recently established organization for camper coach owners, is open for new members.

One business meeting and one weekend campout are held each month. Sandians who are members include Chester Morterud, president; Carl Klecotka, first vice president; and Robert Lefever, second vice president. Other Sandia members include Harry Fisher, Mr. and Mrs. William Ingram, Donald Lloyd, Richard McKee, Julio Pardo, Harry Passmore, Robert Sylvester, and Lloyd Terry.

Additional information is available from Mr. Morterud, home tel. 256-0620.

Medical Notes . . .

A couple of medical notes have been passed on to the Lab News by the Sandia Corporation Medical Organization.

Today's Death League All Stars are tetanus, diphtheria, poliomyelitis, and pertussis (whooping cough). Here's their record:

	"Batting Average"
Tetanus (two out of three died)666
Diphtheria (one out of nine died)111
Poliomyelitis (one out of 15 died)067
Pertussis (one out of 151, but still too many)007

Physicians and scientists are working hard at eventual elimination of these diseases. In the meantime, it is the responsibility of all persons to help conquer them by being immunized.

For the overweight persons, the Medical Organization has the following words: It has been estimated that if all the blood vessels in a pound of fat were straightened out they would total five-sixths of a mile; therefore, 30 pounds of excess fat add 25 miles to the circulation system.

Supervisory Appointments



DUANE C. WALLACE to supervisor of Crystal Physics Research Division 5155.

Duane has been at Sandia since January 1961 and has been working in theoretical solid state physics in the Physical Sciences

Research Department.

Previously he did research for a short period for Space Technology Laboratories in Los Angeles.

He has a BA degree in chemistry and mathematics from Simpson College, Indianola, Ia., and MS and PhD degrees in physics from Iowa State University, Ames. He was a staff associate at Iowa State for a year and a half after receiving his doctorate.

Duane is a member of the American Physical Society and Sigma Xi, honorary society.



CRAIG SUMMERS to supervisor of Procurement and Local Services Division 2553.

Craig has been at Sandia Laboratory for 16 years, working first in what was then Production Control organization.

He was promoted to supervisor in 1950, and has headed a section in Program Administration for the past six years.

He was graduated from the University of New Mexico with a Bachelor of Arts Degree.

During World War II, he worked two years for Douglas Aircraft in Santa Monica, Calif., and Chicago, as a production expediter.

Promotions

- James R. Rozell (4213) to Service Clerk
- Doris L. Guntrum (8212) to Service Clerk
- Geraldine S. Nerton (8144) to Senior Clerk
- Kip A. Stanley (4413) to Draftsman
- Violet A. Donaldson (1530) to Secretary
- Jean M. Schuster (5130) to Secretary
- Lester C. Harris (7255) to Staff Assistant Technical
- Steve Drago (2525) to Staff Assistant Administrative
- Maurice S. Chavez (7614) to Staff Assistant Administrative
- Ruth M. Farmer (4233) to Wireman
- Eugene Lewis (4613) to Stockkeeper
- Paul A. Leonard (4614) to Utility Operator
- Mario P. Otero (4613) to Stockkeeper
- Evelyn Sue Mordka (3411) to Typist Clerk
- Tony I. Lucero (3413) to Messenger
- Ruth P. Saffle (4517) to Record Clerk
- Irene R. McGrew (7614) to Data Processing Clerk
- Celso Z. Sanchez (4613) to Service Clerk
- Mickel D. Campbell (2130) to Staff Associate Administrative
- P. M. Hinrichsen (8232) to Staff Associate Administrative
- Leo A. Doyal (7241) to Staff Assistant Technical
- Clifford M. Elson (7241) to Staff Assistant Technical
- Warren B. Miller (7241) to Staff Assistant Technical
- Leon B. Strauch (2642) to Staff Assistant Administrative
- Joseph A. Ruggles (4411) to Staff Assistant Draftsman
- Erwin G. Stewart (4512) to Refrigeration and Air Conditioning Mechanic
- Margaret M. Boyd (4333) to Record Clerk
- Scotty B. Wallace (4333) to Record Clerk
- F. Edward Martinez (3413) to Messenger
- Ann M. Krahe (3126) to Secretarial Steno
- Linda K. Morris (3126) to Secretarial Steno
- Evelyn E. Ratcliff (3126) to Secretarial Steno
- Frederick D. Leach (3413) to Messenger Center Equipment Operator
- Mildred E. Garber (3411) to Service Clerk
- Esther E. Martinez (4613) to Service Clerk
- Maximo Martinez (7611) to Computer Facility Operator
- Augustine A. Apodaca (7241) to Math Analyst
- Broward J. Moss (8232) to Reproduction Service Clerk
- Judith A. Jackson (8232) to Library Assistant
- Laura B. Stone (4411) to Draftsman
- Lorna F. Peterson (3000) to Secretary
- Hector Delgado (7325) to Laboratory Assistant
- Kenneth R. Anderson (7324) to Laboratory Assistant



JOHN R. BANISTER to manager of Molecular and Plasma Physics Research Dept. 5120.

John has been at Sandia since 1953, first in Nuclear Burst Physics Department, and later in Physical Sciences Research Department. He has been supervisor of Plasma Physics and Chemical Kinetics Division for four years.

His research has been in the fields of magnetohydrodynamics, particulate dynamics, neutron absorption, and plasma physics.

Both Bachelor's and PhD degrees in physics were conferred on him at Iowa State University, and he worked part-time in the school's low temperature physics lab while a graduate student.

John served three years in the Army Signal Corps.

He is a fellow of the American Physical Society, and a member of Sigma Xi, Lambda Delta Lambda, Pi Mu Epsilon, Kappa Mu Epsilon, and Phi Kappa Phi, honorary societies.

ECP Drive Closes With Top Results

The 1964 Employees' Contribution Plan Campaign ends today, and preliminary results of the drive have been tabulated. "They look encouraging," comments R. W. Devore, chairman of the 1964 ECP Committee. "As of mid-morning, Oct. 7, a total of \$150,959 had been pledged or paid in cash."

This year's campaign went smoothly, according to members of the ECP Committee. "During the campaign so far, many Sandians increased their contributions; they deserve special thanks," Mr. Devore continues. "And thanks are due, not only to Sandia employees for their support of ECP through contributions, but also to all of those who participated in conducting the campaign; the committee members, the schedulers, speakers, projectionists, and all of the others who contributed their time and talents to make this year's campaign a success. This year's response shows that Sandians are vitally concerned with the need of others."

This year, the following Sandia employees participated in solicitation for the ECP Campaign:

Schedulers

W. B. Converse, E. W. Shepherd, W. C. Schaefer, L. N. Umble, J. L. Landrum, R. W. Higgins, J. D. Rex, W. T. Huntsman, F. H. Johnson, Mrs. F. G. Bliss, M. L. Coon, D. D. Wader.

G. T. Kupper, Miss D. L. White, S. L. Johnson, E. L. Jolly, J. C. Gravin, H. E. Harling, R. E. Gaedert, H. V. Catt, J. R. Hanna, M. D. Campbell, J. P. Wakeland, Miss S. A. Milligan.

Projectionists

S. C. Carrillo, R. R. Bailey, J. C. Mashburn, W. C. Garcia, P. T. Mathews, R. B. Barwick, T. R. Lopez, Jr., C. D. Boxx, E. M. Hopkins, L. R. Hassebroek.

Mrs. Bernice Umland, W. R. Randall, R. E. Burken, Mrs. J. G. Rush, Roger Aden,



BILLIE ROGERS of Sandia's Maintenance Section A (right) spent his vacation at the New Mexico State Fair, where he exhibited his talents as a silversmith for Fair visitors. He appears here in Navajo costume with his supervisor, V. L. Brockway.

N. S. Perea, E. L. Johnson, George Skinner, H. D. Hayden.

Speakers

C. H. Maak, L. W. Hake, Jr., R. S. Nelson, Richard Kidd, H. D. Bickelman, R. P. Lambert, M. G. Young, I. H. Gillett, L. W. Platt, R. E. Quinlan, R. E. Brian, J. F. McDowell, D. L. Hughes, G. B. Ross.

M. A. Martegane, C. F. Hiner, C. L. Hines, J. S. Todd, L. C. Baldwin, J. G. Wallace, C. F. Lumpkin, W. C. Busby, L. D. Shoemaker, G. T. Mancuso, R. I. Couzin.

W. B. Miniser, R. K. McIntire, G. B. Roberts, Mrs. J. M. Sharp, G. M. Haycock, C. H. Weidman, K. D. Harper, F. G. Galdon, B. M. Garcia.

B. A. Coleman, Gilbert Cordova, R. E. Hendrix, A. N. Chaves, R. D. Eiler, R. L. Schwoebel, J. H. Smalley, R. H. Bishop, H. G. Moore, D. K. Buchanan, E. L. Harley, R. K. Vokes, F. A. Gross.

QA Activities to Be Relocated to Pantex Facility at Amarillo, Tex.

Although the move isn't scheduled to start until July 1965, plans are well under way to relocate Sandia Corporation's Quality Assurance activities at Clarksville, Tenn., and San Antonio, Tex., to the Pantex facility near Amarillo, Tex.

Involved are 22 Sandia employees currently located at Clarksville and another 35 at the Medina facility at San Antonio. All are members of QA Operations Department.

The move is a result of the Atomic Energy Commission's decision to close its weapon facilities at Clarksville and San Antonio and transfer the operations to AEC facilities at Burlington, Ia., and Amarillo.

The action follows a two and one-half year study of the future new weapons production workload assignable to Burlington and Amarillo, and of weapons workload assignable to San Antonio and Clarksville. It was determined that under the present projections, the weapons work can be performed in the Burlington and Amarillo facilities with greater efficiency and significant cost savings.

Annual savings resulting from the consolidation program are estimated by the AEC at about \$3 million. Of this, some \$2 million will be in reduced personnel costs. The one-time costs of the transfer, including construction at Amarillo and Burlington and moving costs, are estimated at \$4.5 million.

The Burlington and Amarillo plants now operate as chemical explosive component manufacturing and weapon assembly plants. The AEC's Burlington plant facility was activated in 1947 on the grounds of what is now the Iowa Army Ammunition Plant. Mason & Hanger-Silas Mason Co., Inc., AEC contractor operating all four weapon facilities, employs about 900 on AEC work at Burlington. The AEC has an Area Office there with about 56 employees.

The Pantex facility is located 17 miles from Amarillo on 10,000 acres of the World War II Pantex Ordnance Plant. The facility was opened in 1951. Mason & Hanger employs 1055 and the AEC Branch Office there employs 44.

The Medina Facility at San Antonio, previously known as Medina Base, was

activated in June 1955 as a joint AEC-Department of Defense installation. The AEC opened a modification center there in 1958 and in early 1961 the military withdrew from the base. Mason & Hanger has about 680 employees and the AEC Area Office has 18.

The Clarksville Facility is located within Fort Campbell, 18 miles from Clarksville. It has been in operation since September 1960. Mason & Hanger has 221 employees and the AEC Branch Office has 14.

Sandia's plans call for establishing an office at the Pantex plant in June 1965 to handle the logistics of the move, to accept material, to provide an accountability station, and to provide liaison with Mason & Hanger and the AEC.

Sandia personnel will occupy a 20,000 sq. ft. addition now under construction at the Pantex facility.

Sandia's Clarksville operations will be phased out first. The transfer timetable calls for a scheduled phase out of operations at both Clarksville and Medina which will allow the QA work to continue without interruptions. As the capabilities are established at Pantex, the operations will end at the other facilities.

All staff employees at the two locations have been extended the opportunity to relocate and continue employment with the company. The majority will establish the QA activities at Pantex. Several have already filled vacancies at Sandia Laboratory and several more are scheduled to move to Albuquerque.

All moves should be completed by July 1, 1966.

When the consolidation program is complete, the Clarksville Facility will be returned to the military and the Medina Facility will be declared excess to AEC needs.

Post Office People Meet Acid Test With Flying Colors

Turn in your Anti-Digit Dialing League badge. Your cause is lost.

You might have suspected it back in your military days when you were a serial number. Or back when you got your social security number. Or maybe when you got your auto license number, bank account number, or charge account number.

The United States Post Office has made it official.

A card addressed only with numbers was mailed from Kansas City on Thursday and received by Dick Davis at Sandia Laboratory on Monday.

The card was addressed exactly this way:

5646
1432-1
87115

The first number is Dick's Sandia Corporation E-number. The second is the organization number for Capacitors, Delay Lines and Transformers Development Section. The third number is the Sandia Base zip code number.

At first, the Post Office clerk stamped the card with "Insufficient Address" but changed his mind, probably, after reading the short message and looking at the other side.

The card said:

"Dick: Assuming the Post Office people do what the guy on the other side of this card is doing, we may get this through. Nagel."

Bob Nagel of the Section had mailed the card as an experiment from Kansas City, Kans.

It was a picture post card depicting Rodin's statue of "The Thinker."

Sandia Papers to Be Presented at DOD Vibration Symposium

Four Sandia-originated technical papers will be presented at the 34th Symposium on Shock, Vibration, and Associated Environments, to be held Oct. 13-15 in Monterey, Calif. The symposium is sponsored by the Department of Defense.

The Sandia offerings are:

"Acquisition, Reduction, and Analysis of Transient Data," by E. H. Copeland, J. Arnold, and T. E. Smart, all of System Test Division. Mr. Copeland will make the presentation.

"Force Controlled Vibration Tests: A Step Toward the Practical Application of Mechanical Impedance," by J. V. Otts of Vibration Division.

"Shock Testing with Explosive Gases," by W. M. Sigmon of Shock Division.

"Test Techniques for Increasing the Acceleration and Velocity Capabilities of an 18-in. Pneumatic Actuator," by F. H. Matthews of Shock Division.

Congratulations

Mr. and Mrs. David M. Davis (1121-1), a son, Glenn Austin, Sept. 7.

Mr. and Mrs. Lee J. Seligman (1113-2), a son, Douglas, Sept. 20.

Mr. and Mrs. Marvin Bauder (7241-2), a daughter, Heidi Leigh, Sept. 8.

Mr. and Mrs. Dean K. Yearout (1422-1), a son, Mark Andrew, Aug. 30.

Mr. and Mrs. David E. Merewether (1531), a son, David Evan Jr., Aug. 28.

Mr. and Mrs. David C. Bickel (7223-1), a son, Stephen Dineen, Sept. 8.

Mr. and Mrs. J. M. Sena (4432), a daughter, Maria Elena, Sept. 11.

Mr. and Mrs. John C. Elbert (7254-2), a son, Stephen Paul, Sept. 17.

Mr. and Mrs. J. E. Lohkamp (7246-1), a son, Donald John, Sept. 18.

Mr. and Mrs. W. J. Villanueva (4224-2), a son, Timothy, Sept. 19.

Mr. and Mrs. J. E. Truskowski (7255), a son, Michael Craig, Sept. 17.

Mr. and Mrs. M. M. Newsom (1532-2), a son, Thomas Cody, Sept. 4.

Mr. and Mrs. Donald O. Gunderson (1442-2), a son, Thomas Russell, Sept. 21.

Mr. and Mrs. Richard V. Foster (3465-2), a son, James Sherwood, Sept. 28.



New Cafeteria In Bldg. 839 Nears Completion

Remodeling of Sandia's Area I Cafeteria, located in Bldg. 839, is nearing completion, and the new cafeteria equipment and appointments will soon be installed.

Even at this stage of its construction, the new cafeteria is bright and inviting. The walls are finished in gold and white, the ceilings are finished with white acoustical tile, and the east wall of the dining room is opened by a row of windows. A series of gabled screens will be used to separate the serving area from the dining room.

An entrance lobby will lead to the serving area, where portable refrigeration and hot-food tables will eliminate long waiting lines. The dining room will be further enhanced by deep blue decor. Several sizes of tables will be used to provide seating for 240 customers.

T. C. Morgan of Benefits and Services Division has coordinated activities connected with the new cafeteria. G. R. Sharp of Planning Division designed the facility.

SANDIA MEMBERS of Fifth Force Reconnaissance Company, USMC, attended a two-week training session at the Mountain Warfare Training Center in the Sierras recently, where they received training in technical mountain climbing. The Company, stationed in Albuquerque, is one of four similar units in the United States, and is trained to perform pre-assault reconnaissance using parachute, submarine, and amphibian techniques. Major Paul C. House (pointing) is Commanding Officer of the Unit and supervisor of Sandia's Technical Illustration Section. Other Sandians are (l to r) Capt. G. T. Kupper, L/Cpl. G. F. Padilla, L/Cpl. R. H. Shaw, HM2 J. D. Aragon, and Sgt. B. H. Moss. Not pictured: Cpl. M. Gallegos.

Sandia Drivers Win Club Class in Nat'l Sports Car Rally

Jim Phillips and Dave Nokes, both of Electronic Device Test Division, won first place in the Club Class at the Rolling High National Sports Car Rally, held Sept. 26-27 in Las Cruces.

This event was one of 12 national rallies this year sponsored by the Sports Car Club of America. The 500-mile route extended through the Gila Wilderness and El Paso.

Other Sandians participating in the event were Darrell Munson, Ron Malpass, Ron Ewing, Earl Gruer, and Ken Grant.

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LAB NEWS

OCTOBER 9, 1964

SHOPPING CENTER

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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

BICYCLE, 26" girl's, needs tires, \$10. Svensson, 344-7700.

MATERNITY clothes, size 14, 2-piece corduroy jumper, 1 top, 2 pair slacks, \$10 for all. Nelson, AX 9-0884.

REFRIGERATOR, 9 cu. ft. Admiral, \$35, size 28x28x57" high. Edwards, 299-5578.

'56 OLDSMOBILE Holiday 88, all power, new tires and seat covers. Martell, 299-0833.

EXERCYCLE, single speed, \$50. Hunagete, 299-8302.

ELECTRIC RANGE, 30" Gibson, timer, clock, see-thru oven door, \$55. Fox, AX 9-9332.

CLARINET, B-flat wood, used one season, case and lyre included, cost \$140, will sell for \$90. Stoever, 256-2439.

5 hp OUTBOARD motor, ideal for fishing boat. Schaefer, 299-6217.

CORNER LOT, 3-bdr, large den, fireplace, AC, carpeted, draperies, huge workshop, close to Queen of Heaven. Below appraisal, \$13,900. Vasquez, 243-3664.

YARDMAN reel type push lawn mower, \$18; Scotts fertilizer spreader, \$6; light duty wheelbarrow, \$5. All for \$25. Carnicom, BU 2-3421.

TENT-TRAILER, sleeps 6 adults, includes hitch, spare tire, jack, foam mattress, 3-burner camp stove, double-mantel lantern, folding table, \$300. Thayer, 299-3127.

30-06 SPRINGFIELD w/4x Weaver scope, range finder reticule, sporter stock, \$100. Kingsley, AX 9-1226.

NORGE GAS range, \$30; Hollywood frame w/dbl mattress, box springs, \$20; 1958 Studebaker Commander, 4-dr., OD, \$550. Barefoot, 298-4122.

SQUIRREL cage blower, \$12.50; Win. Model 61 22 w.r.f. 300 rds. ammo, \$25. Will trade. Scott, 298-1554.

GAS STOVE, 4 burners and oven, \$10. Proulx, AX 9-6066.

SOFA, turquoise, upholstered, one year old, best offer. Strausberg, 255-7770 after 5.

4-BDR and den, 1 1/2 baths, double garage, carpets, drapes, etc. \$500 down. Fimple, 256-0290.

FREEZER, chest-type, 14 cu. ft., \$85. Candelaria, 344-9028.

MAYTAG washing machine, wringer type. Pitti, 256-1629.

ANTIQUE cap/ball double barrel; automatic ironer; bowling ball w/bag; picnic iceboxes. Will trade for .357, .44, .41 Magnum, or 2-way radio. Flowers, 256-1656.

'63 TRIUMPH TR-4, black, R&H, wire wheels, tonneau cover, returning to school, must sell, \$2150. Durgin, 298-3581.

STEREO preamplifier, self-powered, remote balance control, \$20. Domres, 265-0443.

'46 CHEVROLET 1/2 ton pickup, \$85. Sanchez, 864-8494.

TWIN SIZE inner spring mattress, mattress cover and springs, \$20; Sentry power mower, \$25. Cotter, 298-3820.

15" BUICK rims w/8:20x15 ww tires—two green candied, \$25 each, \$45 pair; two red reversed, \$30 each, \$55 pair. Bassett, 898-1840.

SECTIONAL, 2-pc white vinyl; tangerine swivel chair; walnut formica corner table, metal legs, \$40. Ferguson, 299-1501 after 5.

REGISTERED quarterhorse, 16 year old mare, well trained, good temperament, excellent pleasure horse or brood mare. Bushmire, 256-7321.

REYNOLDS flute, silver plated w/case, reasonably priced. Also music stand. Brown, AL 5-0566.

GAS FURNACE Navent 35,000 BTU, blower, \$325 new, now \$150 or best offer. Gillespie, 4212 Sunningdale NE, 255-6421.

FREE KITTENS, free delivery. Tatum, 877-0997.

'63 CHEVROLET Bel Air, Powerglide, PS, factory air, best offer. Benson, 268-9727.

BELL & HOWELL Robomatic 35mm slide projector w/timer, 36 slide trays and 2 storage cases for trays, \$65. Goodwin, 256-2216.

CLARINET w/case and music stand. Kohl, 344-8729 after 5.

SOLID OAK blond bedroom set—double bed, mattress, springs, 5-drawer chest, kneehole desk, 2 step tables, \$75. Treibel, 256-0482.

BLOND CONSOLE RCA radio-phonograph, \$20. Reinman, 256-9737.

GE REFRIGERATOR, 9 cu. ft. Huff, 898-2730.

KENMORE vacuum cleaner and powermate, both for \$45; crib w/mattress, \$15. Villa, 268-0568.

8" CRAFTSMAN bench saw on stand, but no motor, \$45. Steck, 299-2313.

'54 STUDEBAKER 1/2 ton, R&H, OD. Wittwer, AX 9-0311.

EQUALIZER hitch for camp trailer, new. Cummings, 298-5173.

303 TRACER ammo, will sell at 6c a round or trade for "non-tracer." Have about 500 rounds. Wilson, 298-1566.

CAMELHAIR coat, size 10, \$10; grey carcoat w/hood, size 10, \$5; lady's light blue lace dress, size 16, \$12. Duvall, 299-8744.

KENMORE washer-dryer combination, 220 outlet; Crosley TV-radio-phonograph console; Amana upright freezer, 12 cu. ft. Johnson, AL 5-0262.

GREY MARE, 3 year old, gentle with children, \$150. May be seen at 2409 Pajarito Rd. SW. Shock, 877-3728.

BOOK OF KNOWLEDGE, Lands & People, Grolier Science Encyclopedia, sell all or part. Wolcott, 255-0663.

3-BDR HOME, large living room w/fireplace, den w/bar, patio, landscaped, low down. Stark, 243-3110 after 5:30.

'62 INTERNATIONAL Scout pickup, 4wd, Warn hubs, low mileage, tow bar and trailer hitch, make offer. Nixon, AL 5-4118.

3-BDR, 1 1/2 baths, DR, heated shop/utility room, carpet, drapes, AC, stove, refrigerator, washer, dryer, dishwasher, below FHA, \$13,900. Neiman, 298-0223.

'56 FORD Fairlane V-8, AT, PS, new tires and AT seals, \$425. Sektan, AX 8-0373.

'60 TRIUMPH Tiger Cub, new 16hp engine, Big Bear cam, ported polished head, Amal monoblock carb., \$250. Tarbell, AL 6-1322.

'61 VW delivery van, original owner, \$800. Thompson, 344-0415 after 3 p.m.

'58 FORD 1/2-ton pickup, 6 cyl., 4-speed trans., 6:50x16 6-ply tires, recent paint and mechanical work. Nagzer, 299-2492.

'63 CAMPER, sleeps 4, 3-burner stove, oven, 75 lb. icebox, large cabinet storage, 2 alum. stack jacks, 12v separate battery for lights. Kilmartin, 299-9237 after 5.

MAPLE double bed, \$10. Everett, 299-6057.

BOY'S MAPLE bedroom set, bed, dresser, chest, mattress, spring, Miziker, 255-4177 after 5.

GE WASHER and dryer, both yellow, \$100 for pair. Shoemaker, 255-8820.

CORNET and mutes, \$75. Hayes, 298-4682.

FM RECEIVER, crystal controlled for KHFM, built-in 67 kc sub-carrier discriminator, \$100. Mauldin, 298-3164 after 6 p.m.

'61 CHEVROLET station wagon, V-8, PS, PB, extras. Capaldi, 318 Mesilla NE.

GAS RANGE, Norge, white, \$25. Williams, 300 General Patch NE, 298-0536.

9 FT. PHILCO refrigerator, \$35. Chavez 243-0646.

'62 VOLKSWAGEN, one owner, 17,000 miles, white, sedan, \$1350. Thorp, 298-6030.

3/4 VIOLIN, good tone, \$50. Minser, 299-1364.

BRICK, 3-bdr., double garage, fireplace, drapes and carpeting throughout, electric kitchen, large utility room, immediate occupancy, 1404 Georgia NE. Seay, 298-7227.

DINETTE SET, table, 4 chairs, wrought iron legs, formica top, padded chairs, \$25. Hayes, 265-4385.

LARGE 4-bdr., dining room, 1 1/2 baths, approx. 1500 sq. ft., perimeter heating, corner, walled yard, \$16,300. Schaefer, 298-1041.

CORRALES HOME on one acre, 3 fireplaces, 3-bdr., electric kitchen, corral, double garage, independent efficiency apts. Swiss, 898-2083.

WESTINGHOUSE washer and dryer, white finish, can be stacked, five years old, \$40 each or best offer. Gutscher, 298-6563.

'63 CORVAIR, 5 new tires, below NADA. Seelbach, 299-5489.

'50 OLDS 98, 4-dr., R&H, Hydramatic, V-8 rock-er engine and drive train, \$75. Moody, 282-3466.

'63 OLDSMOBILE 8-passenger station wagon, AC, many extras. Vivian, 299-1785.

SCUBA—new and used tanks, regulators, accessories; championship slalom water ski, \$25; ski boots, Rupp, size 10, 1 yr. old, \$55. McNabb, 282-3664.

FENDER Princeton guitar amplifier, Tremol unit, \$65. Norris, 242-2159.

DRYER, Norge electric, \$30; flute, Bundy, key of C. Moore, 299-8200.

ARMY SHIRTS, khaki and poplin, 14 1/2x32; khaki and green serge trousers, 28x31; combat boots, 8 1/2 D, and low quarter shoes, 9R, all new. Williams, 298-2671.

2-BDR. HOUSE, walled yard, near Base—Hawthorne school, assume existing FHA w/terms on equity or refinance. Baker, 313 Gen. Somervell NE, 298-0664 evenings.

'57 FORD 4-dr. V-8, will take \$175. Jacobs, 877-2701.

CAMPING TRAILER, raises 6 ft. inside, sleeps four, mounted on two-wheel trailer 4'x8", license and lights. Taylor, 298-0426.

RCA 45 RPM record changer, new cartridge, \$5; 2 venetian blinds, 35" wide, \$3 for the pair. Cobb, 299-1995.

1964 YAMAHA YDS-2, 2500 miles, must sell, make offer. Stoker, 268-2650.

TWO REDWOOD garage doors, complete w/hardware; wagon; RCA 45 RPM record player. Muchow, 299-1813.

CRIB, Storkline 6-yr. w/extra firm mattress, \$15; snowsuit, boy's sz. large, zippered front, aqua, \$3. Dyckes, 299-7280.

'58 GMC 1/2-ton pickup, 4-w., 4-spd., 8' box w/wood cover, 20,000 mi., \$900. Arnett, 299-7723.

3-BDR., den, 1-3/4 baths, lots of closets, fireplace, near Winrock and schools, low down, FHA. Welsh, 299-3555.

36" WESTINGHOUSE electric range w/30" oven, \$75. Siebenforcher, 256-7562 after 4:45.

3-BDR., carpet, large walled yard, \$12,300 cash to 61 loan or \$400 down FHA. Sisson, 299-4217.

3-BDR. HOUSE, 1370 sq. ft., 1 1/2 bath, double garage, fa/heat, a/c, hw/floors, pitched roof, large lot, \$15,500. Wilkinson, 344-9610.

NEW CUSTOM DRAPES, white background, green predominating, 3 large pair; 9x15 wool twist carpet, rose beige. Williams, 256-6008.

'51 CHEVY station wagon, plywood floor behind front seat, used as camper, 1933 Truman NE. Henry, 255-2536.

'59 FORD V8, auto., heater, \$595; '57 Ford Ranchero, R&H, standard, camper cover, \$650; 21" TV console, Admiral. Otero, 256-6597.

BONA ALLEN SADDLE, 15" tree, hand tooled, leather covered stirrups, \$90. Taylor, 256-3774.

FREE—5 puppies, 6 weeks old. Trujillo, 242-3827.

FORD TRACTOR 8N w/loader and plows. Patterson, 877-3158.

SCOUT MASTERS UNIFORM, \$5; square dance dresses, sizes 14-16, \$5; red 3-piece straight sectional, \$25. Coalson, 298-8074.

BICYCLE, \$3; 20" convertible bike, \$7; 6' luggage rack, \$7; 30" electric range w/clock and oven timer, \$33. Post, 298-0481.

LARGE CABIN SITE at Vallecito Lake, Colorado, water and electricity. Tucker, 877-1140.

GUITARS—electric w/amp and steel, both new; complete set Ency. Americana, current edition, take over payments. Simon, 265-0967.

'57 FORD Ranch wagon, completely rebuilt motor, \$350. Bewley, 877-4877.

SELL OR TRADE '63 Rambler 330 wgn., ST, OD, R&H; 2 dressers; new double mattress; 8" table saw w/motor. Naumann, 299-5576.

PORTABLE SINGER SEWING MACHINE 99K w/attachments, \$30. Chapman, 298-6123.

15-GAL. AQUARIUM outfit complete w/fish, pump, filter, \$25; 2 Melanesian kittens. Cope, 298-1674.

GIRL'S 24" bicycle, \$15; 2 8:50x14 whitewall tires, \$8; tire chains 6:00x16 thru 7:50x14, \$5; Reverse movie camera, \$5. Frye, 255-8364.

'62 HARLEY SPORTSTER XLCH, 9200 miles, \$950. Sutton, 298-7036.

WESTINGHOUSE automatic clothes washer, \$35. McIntire, 298-6145.

STRAPLESS FORMAL, floor length, champagne color, size 12. Ezell, 268-4686.

RIFLE, 300 Savage, model 99, takedown type, Marvel sight, leather fitted case, cleaning rod, shells, \$85. Schreiner, 298-4501.

2-TON '53 cab-over White truck, rigged as trailer puller; 45lb. fiberglass bow; complete tubecaddy, 180 tubes. Ernst, 268-9414.

15' TRAVELEZE vacation trailer, equalizing hitch, hydraulic brakes, one owner, under 2500 miles, \$1050. Probst, 256-9101.

CABIN SITE, full acre in pines, Deer Lake Estates. Abego, 298-2498.

3-BDR. ROBERSON, den, carpeted, landscaped, sprinklers, a/c, built-in range and oven, re-decorated, 3120 Blume NE. Martin, 299-1748.

2 MOBILE HOME WHEELS, 6-lug, and 1 Armstrong, 10-ply tire, 7:14x5, to fit wheels. Southwick, 255-3312.

GE REFRIGERATOR, 11 cu. ft., used 4 years. Renken, 256-6459.

WANTED

HOMES for housebroken kittens. Johnson, 255-8851.

TDP to share 3-bdr. furnished house w/2 other TDP's, \$50/mo. 1040 Wade Cir. NE. Bodhaine, 298-1566.

V8 ENGINE w/manual transmission 1955 and up, Buick, Olds, Pontiac, Studebaker, must be running or repairable and reasonable; arc or gas welding rig. Bassett 898-1840 after 5:30.

CONSTRUCTION MANUAL for Eico No. 221 VTVM and modification info. for Corvairs. Gobeli, 242-5463.

WOMAN to share home, own bdrm. and bath, kitchen privileges, garage. Stickle, 298-3017 after 5.

BOWLER w/165 or better average to bowl in Sandia Majors scratch league at 6:30 Wednesday nights. Marmon, 255-4515.

HOME for white kitten, male, housebroken. Reilly, 344-8215.

USED DRUM SET. Nelson, 298-5761.

LARGE EAST HEIGHTS LOT, zoned R-2 or R-3. Heavirland, 256-3918.

FOR RENT

2-BDR. APT., unfurnished stove and refrig., carpet, drapes, a/c, 601 Valencia SE. Ross, 255-0486.

LOST AND FOUND

LOST—Turquoise earring, ladies black banlon sweater w/white buttons, man's prescription glasses in brown case, prescription safety glasses in case. LOST AND FOUND, tel. 264-2757.

FOUND—GM car keys, prescription bifocal safety glasses. LOST AND FOUND, tel. 264-2757.



DIAGNOSTIC AIRCRAFT—A C-135 jet transport assigned to Sandia Corporation will carry data-gathering instrumentation during forthcoming test readiness exercise in the Pacific. The aircraft is one of three "flying diagnostic laboratories" outfitted with instrumentation normally mounted in ground installations. One of the purposes of the exercise is to test airborne diagnostic techniques.

Sandia Personnel to Take Part in Pacific Test Readiness Exercise

About 110 Sandians will participate in a testing readiness exercise, without nuclear explosions, in the vicinity of Johnston Island in the Pacific starting in mid-October. In announcing the exercise recently, the Department of Defense and Atomic Energy Commission released the following statement:

"Over a year ago (Aug. 23, 1963) the Atomic Energy Commission and the Department of Defense outlined to the U.S. Senate safeguards to the Limited Nuclear Test Ban Treaty. These included: 'The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the Treaty or any of its terms be abrogated by the Soviet Union.'

"Early this year it was decided to have, by Jan. 1, 1965, the capability to proceed with tests of nuclear weapons within two or three months from the date of any abrogation of the Test Ban Treaty.

"While such readiness is necessary in the interest of national security, the U.S. position has always been that it earnestly hopes there will never be an abrogation of the Treaty, and that its capability to resume such testing will not have to be exercised.

"In this spirit, measures have been taken to implement the safeguards described to the Senate a year ago. These include air to sea exercises, without nuclear explosion, to be carried out about mid-October in the vicinity of Johnston Island in the Pacific. The exercises are expected to be concluded in early November."

Purposes of the exercise are to evaluate current capability of the DOD-AEC to conduct atmospheric tests using airborne diagnostic techniques and to assess the adequacy of preparations and plans for the attainment of the prescribed readiness posture.

Three C-135 "flying diagnostic laboratories" will carry the instrumentation required for gathering data—instrumentation that was previously mounted in ground stations during nuclear testing. The aircraft are assigned to Sandia Laboratory, Los Alamos Scientific Laboratory and Lawrence Radiation Laboratory.

Among Sandia Corporation's responsibilities in the exercises are several diagnostic instrumentation systems in the C-135 aircraft, and the design and development of the ballistic containers to be dropped. The three diagnostic aircraft and the B-52 assigned to drop the ballistic containers will operate out of military bases in the Honolulu area during the upcoming exercise.

L. E. Hollingsworth, Director of Field Testing, is the Commander of Sandia Corporation's Task Unit. J. C. Eckhart, manager of Nuclear Test Department, is the Deputy Commander of Sandia's Task Unit.

W. T. Smith, supervisor of Diagnostic Aircraft Operations Division is project officer in charge of Sandia's instrumentation for the aircraft. A. B. Cole, supervisor of Test Vehicle Operations Division, is in charge of staging support operations at one location. Paul Syroid, supervisor of Operations Support Division, is in charge of Sandia's administrative staff.

Sandia Speakers

Following is a list of speakers, titles, and places of presentation for recent talks by members of Sandia Corporation.

L. S. Nelson of Aerospace Physics Division, "Spectra of Transient High Temperature Species Produced by Flash Heating," Conference on Spectroscopy, Instrumentation, and Chemistry, Oct. 22, San Francisco, Calif.

J. W. Guthrie of Tube Development Division, "Mass Spectroscopy of Solids Applied to Special Problems," 3rd National Meeting of the Society for Applied Spectroscopy, Sept. 28-Oct. 2, Cleveland, O.

J. M. Peek of Atomic Interactions Research Division, "The Dissociation of the Hydrogen Molecule Ion by Protons and Hydrogen Atoms," 17th Gaseous Electronics Convention, Oct. 14-16, Atlantic City, N. J.

Certificate Recognizes G. A. Fowler's Contribution To Int'l. Conference

G. A. Fowler, Vice President, Development, recently received a certificate of appreciation in recognition of his contribution to the U.S. presentation at the Third UN International Conference on the Peaceful Uses of Atomic Energy, held in Geneva, Switzerland, Aug. 31-Sept. 9.

The certificate was signed by Edward R. Gardner, executive director of the U.S. delegation.

Mr. Fowler discussed "Aerospace Safety of Isotopic and Reactor Power Sources" in a paper presented to the conference.



MEMBERS of Planning Committee for the forthcoming ASME Symposium to be held at UNM, Oct. 15-17, met recently to discuss last-minute preparations for the event. Members include (seated, l to r) R. G. Illing, publicity; E. L. Harley, administrative chairman; R. H. Schultz, general chairman; I. M. Brady, ACF, transportation; (standing, l to r) J. M. Michaels, printing; Charles Mauck, finance; W. A. Sebrell, proceedings; L. H. Stradford, facilities; Richard Dove, UNM, UNM-Student committee; and R. J. Hart, registration and reservations.

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LAB NEWS

OCTOBER 9, 1964

Bellcomm President to Speak Before 5th ASME Symposium

A number of Sandia Laboratory employees will participate in the Fifth Annual Symposium of the American Society of Mechanical Engineers to be held at the University of New Mexico Student Union Building in conjunction with the 75th Anniversary of UNM. The symposium will be held Oct. 15-17.

The program for the symposium will be "Aerospace Frontiers in New Mexico." Banquet speaker will be Dr. John Hornbeck, President of Bellcomm, Inc., who will discuss "Bellcomm and the Apollo Program."

The opening and welcoming address will be presented by T. L. Popejoy, President of the University of New Mexico. E. H. Draper, Sandia's Vice President, Development and vice president of Region VIII, ASME, will present the Introductory Address at the first session of the Symposium, Oct. 15.

Keynote speaker for the fourth session of the symposium will be R. W. Henderson, Vice President, Weapon Programs. Other speakers for the session will include G. A. Fowler, Vice President, Development, who will discuss "Aerospace Nuclear Safety"; A. Y. Pope, manager of Aero- & Thermodynamics Department, who will discuss "Aero-Dynamics and Rocket Design"; and H. H. Patterson, manager of Systems Engineering Department, who will discuss "Vela Hotel Program."

S. A. Moore, manager of Engineering Analysis and Equipment Design Department, will be chairman of the opening session on Oct. 16, and V. E. Blake, Jr., manager of Aerospace Nuclear Safety Department, will chair Session Four.

R. H. Schultz, manager of Environmental Research and Operations Department, is general chairman for the symposium. E. L. Harley, supervisor of Aerospace Design Project Division I, is administrative chairman.

A change in the program has been made which does not appear in the Symposium brochure. Dr. T. M. Fraser of the Lovelace Foundation for Medical Education and Research will discuss "The Reliability and Quality Assurance of Man in a Man-Machine System" during the fourth session.

Sessions at the symposium will include the following: Research at New Mexico Universities Related to Aerospace; Air Force Programs at Air Force Weapons Laboratory, Air Force Special Weapons Center, and Holloman AFB; White Sands Missile Range, Department of the Army, and National Aeronautics and Space Administration; Sandia Corporation; Lovelace Foundation for Medical Education and Research; and ACF Industries, Inc., and Los Alamos Scientific Laboratory.

Sandia Authors

Current or forthcoming articles by Sandia authors in technical journals include the following:

Marvin Moss and R. A. Lefever, both of Materials Research Division, "Metastable Phases and Superconductors Produced by Plasma-Jet Spraying," September issue, *Applied Physics Letters*.

Katheryn E. Lawson of Electron Structure of Solids Division, J. J. Freeman, and G. A. Crosby, both of the University of New Mexico, "The Effect of Deuterium on the Luminescence Decay Times of Solvated Rare Earth Chlorides," August issue, *Journal of Molecular Spectroscopy*.

W. J. O'Sullivan and J. E. Schirber, both of Electron Structure of Solids Division, "Effect of the Pressure on the Electric Field Gradient in Metallic Antimony," October issue, *Journal of Chemical Physics*; "Pressure Dependence of the Electric Field Gradient in Metallic Indium," Sept. 1 issue, *Physical Review*.

R. M. Jefferson of Reactor Engineering and Operations Division, "50 Kilocurie Gamma Irradiation Facility," November 1964 Transactions of the American Nuclear Society.

D. M. Carlton, D. K. McCarthy, both of Polymer Chemistry Section, and R. H. Genz of Diagnostic Instrumentation Division, "The Effect of Structure on the Electrical Conductivity of Organic Compounds—Polyazophenylenes," September issue, *Journal of Physical Chemistry*.

W. F. Sefcik Completed 35 Years Service With BTL Sept. 30

William F. Sefcik observed his 35th anniversary with Bell Telephone Laboratories on Sept. 30.

Mr. Sefcik began his employment with Bell Telephone Laboratories in New York in 1929, and he has been in



drafting organizations since 1941. Prior to 1941, he was assigned to general service organizations and was also a technical assistant in an electrical laboratory. In May 1957, Mr. Sefcik came to Sandia Corporation, where his assignment has been as a Designer-Checker in Design Definition Section C-4.

He resides at 7405 Gladden NE with his wife and daughter. The couple also has two married children. Among Mr. Sefcik's hobbies are camping, stamp collecting (specializing in UN stamps), and photography.

Sandia's Safety Scoreboard

Sandia Laboratory:

54 DAYS
1,890,000 MAN HOURS
WITHOUT A
DISABLING INJURY

Livermore Laboratory:

50 DAYS
264,000 MAN HOURS
WITHOUT A
DISABLING INJURY



DIRECTOR of Nuclear Burst Physics and Mathematical Research Organization, T. B. Cook, Jr., right, discusses current research programs with J. W. Weihe, left, Mathematical Research Department manager, and B. F. Murphey, center, Nuclear Burst Physics Department manager.

(Continued from page One)

Sandia Group Helps Idea Exchange

organization makes important contributions to this interchange."

Nuclear Burst Physics Department
Many times, new weapons are based upon the advanced research performed by the Nuclear Burst Physics Department.

"Work of our group is directed toward obtaining a basic understanding of all phenomena produced by nuclear bursts," B. F. Murphey, department manager, says. "This understanding is pursued for the sake of improvements it will ultimately allow in the usefulness of nuclear devices in war or in peace. The work is expected to result in significant additions to the general fund of scientific knowledge and not necessarily in immediate application in the use or design of nuclear devices. The usual case is that better understanding of burst phenomena does influence the use or designs of nuclear bursts, and the department activities are self-balancing studies."

"Our work is compounded of theoretical studies and experiments in the laboratory," Mr. Murphey continues. "Since atmospheric and space testing is not permitted, the special problems of measurements of weapon outputs in connection with underground nuclear tests are active pursuits."

The studies are divided into two general approaches among the divisions of the department. Theory and Analysis Division under C. R. Mehl provides a theoretical approach to understanding the physics of nuclear bursts. The division is involved in use and development of computer codes to calculate the transport of energy by nuclear radiations, hydrodynamics, atomic and molecular radiations, and by other forms of energy produced by a nuclear explosion or formed indirectly as a result of the explosion.

Primary emphasis is placed on understanding free-field phenomena at all points of space exterior to the nuclear devices, and influence of air, ground, water, etc., on these phenomena. The damage which these weapon outputs produce is not generally emphasized except in those special cases where the things damaged are of particular relevance to Sandia.

Using the experimental approach is Underground Physics Division under M. L. Merritt. The division has been involved in shock wave studies for more than 12 years. The investigations have included air-shock-induced and direct-ground-transmitted ground shock, the weakening in severity of shock with depth, and the surface motion and crumbling or spitting of the surface from contained underground bursts. Results of the studies have been used in the prediction of ground motion for underground tests at the Nevada Test Site.

"It would be ideal if we could make complete numerical predictions of pressures, particle velocities, and residual displacements around such explosions," Mr. Merritt says, "but not enough is known about material properties under high transient stress for such predictions."

To fill this area of limited knowledge, the division has conducted and is continuing an extensive program of experiments in Coyote Test Field. Very high stresses in rocks and other materials are created with conventional high explosives. Shock and particle velocities are recorded and related to the "Hugoniot equations of state of the material," and other theoretical concepts of value in analyzing energy transfer by shock waves in the earth.

The division measures shock waves and times of arrival near underground tests at the Nevada Test Site. Such data are similar to fireball data from atmospheric tests and are now a basic measurement used by Los Alamos Scientific Laboratory and Sandia in determining the yield of the tested devices.

Part of the work of the division has been in the Plowshare Program, which seeks ways to use nuclear explosives for peaceful purposes. A 1957 study by a member of the division staff resulted in the earliest proposal for using nuclear explosives to dig an Isthmian canal. A current report, "Construction of a Sea-Level, Transisthmian Canal Using Nuclear Explosives," outlines the problems and possible solutions in detail.

Other studies have been concerned with

building earth slide dams and various other kinds of earthmoving projects, using nuclear explosives.

One of the interests of the Radiation Physics Division, under C. D. Broyles, is centered around the understanding of emission and interaction of gamma, neutrons, and x-rays produced by nuclear bursts. Second category of concern is the understanding of thermal radiation from atmospheric bursts and of the composition and interaction of the debris from a burst in the upper atmosphere.

Experimental programs in the past have involved both laboratory work and measurements of some of these phenomena in connection with underground tests.

"We have always considered that full-scale tests should provide the final check on knowledge acquired theoretically and through laboratory studies," Mr. Broyles says.

One means of heating gases to very high temperatures for these studies is by using a Sandia-designed machine, nicknamed "Charybdis," which produces temperatures of hundreds of thousands of degrees above absolute zero.

"Some of the physical properties of these super-heated gases we are interested in are those controlling the emission and absorption and, thereby, the flow of radiant energy," Mr. Broyles says. "The emissivity and absorptivity of these hot gases are studied in the infrared, in the ultraviolet, and, in some instances, well into the extreme ultraviolet and soft x-ray region of the electromagnetic spectrum."

In order for the measurements of the properties of the gases to be significant, the amount of energy put into the gases must be determined.

This becomes almost more of an experimental problem than measuring the gas properties themselves. It involves making measurements of the electro-magnetic field, the number of ions and electrons present in the gas, and of their velocities.

Another experimental laboratory program of the division uses an apparatus which can accelerate small masses of materials to very high velocities. This device, called a plasma accelerator, is also driven by the discharge of a capacitor bank. In this case, the discharge takes place between two coaxial copper cylinders. The discharge, as in the case of the Charybdis, is of the order of million amperes maximum current which lasts for a few millionths of a second. The magnetic field from this current acts on the discharge between the cylinders and accelerates the plasma in the discharge to tremendous velocities.

Only a few millionths of a gram of material is accelerated, but this material reaches velocities with which it travels 150 ft. in one millionth of a second. Even though only a few millionths of a gram of material is involved, this plasma corresponds to a greater beam intensity than that achieved in ordinary heavy ion accelerators where a few thousandths of an ampere of current flows in the beam.

For materials such as aluminum, iron, and lead accelerated to such velocities, the energies correspond to hundreds of kilovolts. The capabilities of heavy ion accelerators such as a Cockcroft-Walton device allow studies of interaction of individual atoms with gases, with surface, and with magnetic fields. With a very high intensity beam, studies may be made not only of the interaction of individual atoms but of interactions in which the intensity of the beam is important.

Plasma for this device is generated by discharge of the energy from a secondary capacitor bank through a very thin wire, which is exploded by the heat of the high current of the discharge. The velocity is measured by observing the plasma pulse with photoelectric devices which are sensitive to the light emitted by the plasma. The atomic mass and charge are measured with ion probes and the output of these detectors is recorded on high-speed oscilloscopes.

Upper atmosphere research and aerospace nuclear safety studies are the reasons Aerospace Physics Division exists, according to J. D. Shreve, division supervisor. For both studies, the upper atmosphere above 100,000 ft. is the focal region.

The division measures wind, tempera-

ture, and atmospheric density in its study of high altitude climatology and planetary circulation patterns. Chemical constituents of the atmosphere are also of interest. Data such as relative abundance, chemical and physical states (atomic, molecular, ionized or dissociated, charged or uncharged) are important to the Aerospace Nuclear Safety and Sampling programs.

Theoretical analyses and laboratory experiments now in process are concerned with reentry physics and chemistry of fuels proposed for satellite power reactors.

One prospective fuel being investigated is an alloy of zirconium and uranium. The principal theoretical effort is focused upon the energetics of oxidation during reentry burnup. In this phase, where the reactor fuel is reentering the atmosphere after orbital flight, the material may exist as a solid, liquid and a vapor at the same time and react to each phase. Similarly, chemical forms such as suboxides, essentially unknown at ordinary temperatures, appear to be primary participants in the high temperature chemical kinetics.

Experiments include studies of hydrogen and oxygen diffusion through the fuels and the resulting surface reactions as temperature is raised. Basic high temperature crystallographic forms and their change in the fuel matrices are under study via x-ray diffraction and neutron diffraction. A facility has been built for checking experimental feasibility of such measurements at the SERF reactor.

Reactive particulate systems generated by ablating bodies are being studied. Individual droplets are made by pulse heating metal foil squares and filaments variously sized to control droplet mass. Once formed, the droplet falls through a controlled atmosphere. The thermal effects, condensation, and chemical consequences of high temperature exposure to various reagents are observed by high speed photography, particle sampling, and spectroscopy.

To eventually better understand particle-surface interactions for sizes ranging from microns to molecules, one division effort is devoted to the study of surface physics by the techniques of atomic and molecular beams. Chemical kinetics are studied with the addition of a reagent beam.

"The chemical and radiochemical analyses necessary to measure and interpret particulate matter collections are demanding in both precision and sensitivity," Mr. Shreve says. "A principal division objective is the research of radioassay techniques."

"Of course, various responsibilities accumulated through past projects and specialization by members of our technical staff keep other work underway in the division," he says. "Examples are microbarography, fallout and contamination problems (especially the study of plutonium-bearing weapons in accidental non-nuclear explosion), and micrometeorology."

Mathematical Research Department
"The basic purposes of the Mathematical Research Department are to stay abreast of and contribute to research in those general areas of mathematics relevant to Corporation interests and to apply the knowledge and experience gained by those Corporation problems which require a high degree of mathematical specialization," says J. W. Weihe, manager of the department. "In particular, classical applied mathematics, statistics, systems analysis and computer related mathematics are the areas of greater emphasis. The existence of an industrial mathematics group of the scope and stature of Sandia's is almost unique in the United States today."

Applied Mathematics Division performs research and consults in the fields of differential and integral equations, special functions, functional analysis, mathematical physics, and set theory.

"Research and consulting are complementary to one another," says H. H. Wicke, supervisor of the division. "Consulting yields problems for research and insures a sound contact with problems arising from reality. On the other hand, the experimental researcher is often able to make a successful attack on non-routine problems because of his research orientation. Members of the division are



PUBLISHED PAPERS represent the work of the Mathematical Research Department. A few of the journals and reprint articles are collected here on the conference table. Seated in right foreground is J. W. Weihe, manager of the department.

engaged in one or the other of research or consulting to varying degrees."

The contribution of the division in consulting is a direct one. Mathematics researchers give advice and assistance in the solution of problems arising from Sandia projects. Some consulting problems lead to further questions of mathematical interest and research on these questions may lead to results which help in future problems.

Part of the division's research is on problems arising from the individual researcher's background and interest. These frequently concern some class of physical problems or the mathematics useful in such a problem.

"Mathematics has a key position in science and engineering," Mr. Wicke says. "The presence at Sandia of researchers in mathematics insures a contact with the major developments of modern mathematics, a contact which is important to the general effort. The existence of groups of mathematicians who are in a position to be motivated by difficult practical problems is a healthy thing for mathematics and the interests of our country. Sandia Corporation is a leader in being one of the few places where there is such a group."

Systems analysis is one of the most valuable tools used in making decisions about future weapons. This sort of mathematical analysis involves making quantitative comparisons or evaluations of weapon characteristics or functions.

To perform this type of study, it is necessary to describe the essentials of the problem in mathematical terms—in other words, to be able to construct a mathematical model with assigned values for performance characteristics of the system. The essential features of the proposed weapons may also become part of the mathematical model, such as the characteristics of the delivery method, safety factors, etc.

The model is frequently written into a computer program in order to handle the large number of parameters and assumed values, but mathematical analysis is used whenever possible either to avoid unnecessary computation or, at least, to utilize the computing time in the most efficient manner.

Results of the systems might serve as a guide to what may be expected in the actual use of the system, but, more frequently, they influence the decision-making that goes into the development of a new system.

Constructing a realistic and mathematically tractable model, collecting the necessary input information describing weapon characteristics and use, quantitatively examining the effects in the parameters, and drawing conclusions from these effects are typical steps in a study. Such work may involve any branch of mathematics and the related sciences. The successful system analyst must have both a sound analytic background and broad interests.

The work is performed in Systems Analysis Division I under W. F. Roherty and Systems Analysis Division II under Stoughton Bell II.

The Statistical Research Division under G. P. Steck is concerned primarily with research in probability and statistics, though it also provides consultation for the many areas within Sandia that have occasion to apply the principles and methods of probability and statistics. Statistics, in contrast to probability

theory, Mr. Steck feels, has a popular conception that is wider of the mark than for almost any other branch of mathematics. "It is not a 'Bureau of the Census' type activity at all," he says, "rather it is the science of behaving intelligently in the face of uncertainty. An example would be the use of rainfall data to decide how large to make flood control canals."

The division's staff has done research in such areas as stationary time series, foundations of ergodic theory, and distribution theory for the equicorrelated multivariate normal distribution. Their consulting frequently consists of constructing mathematical models for natural or engineering phenomena which contain chance elements. "We are not a data analyzing or processing group," Mr. Steck says, "although we use computers a great deal in attacking the numerical aspects of our problems."

Personnel of the division are active in the programs of national statistical societies and frequently contribute articles to statistical journals. Mr. Steck is Book Review Editor for *Technometrics*, a statistical journal for researchers in the physical and engineering sciences.

"Our staff reads as many of current journals as possible," Mr. Steck says. "To keep up with the literature, we maintain a file by subject of *International Journal of Abstracts—Statistical Theory and Method*. We also keep a current file of *Quality Control and Applied Statistical Abstracts* at hand. This enables us to tell statisticians in other parts of the company the status of solutions to many of their problems."

"Extremely rapid growth has created a basic difficulty for computer technology and programming techniques," says D. R. Morrison, supervisor of Computer Mathematics Division. "Modern computing is too much an art and not enough a science. Not nearly enough people have been able to devote their attention to problems in this field which are inherently difficult because of complexity and perhaps for other reasons as yet undiscovered."

The division staff regards the computer as only the first of a new species of devices now appearing which have been referred to by such names as Automata, Artificial Intelligence, Thinking Machines, or Cybernetic Machines. Knowing how to use these machines and how to communicate with them will require a much deeper knowledge of many new sciences. These sciences include pattern recognition, information retrieval, communication theory, adaptive systems, computability, information theory, mathematical linguistics, and coding theory. These new sciences in turn have their roots in older forms of mathematics such as metamathematics, number theory, abstract algebra, graph theory, probability and geometry. All of these areas are undergoing study by members of the division staff.

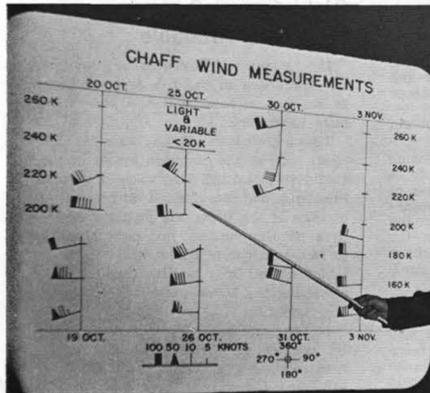
"A few years ago when computations were made by the dozens at most, 'slide-rule accuracy' was sufficient for most purposes," Mr. Morrison says. "Now that high speed digital computers have made it possible to make millions of computations, of which only the first and the last are seen by human eyes, it is entirely possible that the ten decimal digit accuracy of the big computer is not nearly enough."

Numerical analysts consider the effects of errors which creep in at each stage of computation and become propagated and magnified in succeeding stages. By detailed analysis, often involving techniques



HIGH ALTITUDE STUDY—L. B. Smith, right, discusses upper atmosphere climatology with J. D. Shreve, supervisor of Aerospace Physics Division. The chart illustrates data gathered from rocket firings from the Kauai Test Range. The Division conducts a continuing study of the upper atmosphere in the region between top balloon altitudes and lowest satellite orbits.

CRATERING STUDIES, performed using conventional explosives, are part of the work of Underground Physics Division. Crater above was blasted from a series of row charges in Coyote Test Field. Data from this experiment and others were extrapolated to nuclear explosive dimensions and a report, "Construction of a Sea-Level, Transisthmian Canal Using Nuclear Explosives," resulted. Survey rod in foreground is about four ft. long.



of advanced mathematics, the numerical analysts identify the areas where propagated errors can be tolerated, and other areas where they would be disastrous.

Research done in the division is in the fields of abstract algebra, graph theory, pattern recognition, information retrieval, numerical analysis, matrix inversion, and the solution of linear systems of equations. Effort is being applied to the study of mathematical logic and linguistics since these seem to be the scientific disciplines most likely to provide solutions to the language problem associated with man-machine communications.

Work of the Nuclear Burst Physics and Mathematical Research organization diffuses throughout the technical organizations at Sandia and makes its way into the thinking of other agencies involved in the nuclear weapons program.

"We relate to the whole effort" Tom Cook says, "by contributing our ideas, analyses, and judgments. Our advanced mathematics is utilized by many groups and our experimental physics point to new directions for exploration."

Working as teams or as individuals, scientists of the organization contribute to every major program undertaken by the Corporation.

"The nuclear weapons business is like a morality play," Mr. Cook says. "It is not pleasant to dwell on the ultimate purpose of our product. But the necessity for having such a product is well established. All Sandians can take great pride in the fact that the peace we've enjoyed since the end of World War II exists because of the strength of our nation's nuclear program. We can all take satisfaction from Sandia's past contributions, but more importantly we must look forward clearly to a greater challenge ahead of us—that of maintaining an even more sophisticated nuclear weapons program which is responsive to our national policy goals."



MATHEMATICIAN Robert E. Haymond pursues a system analysis problem. Analysis involves making quantitative comparisons of weapon characteristics. Results of the study will aid in design decisions.