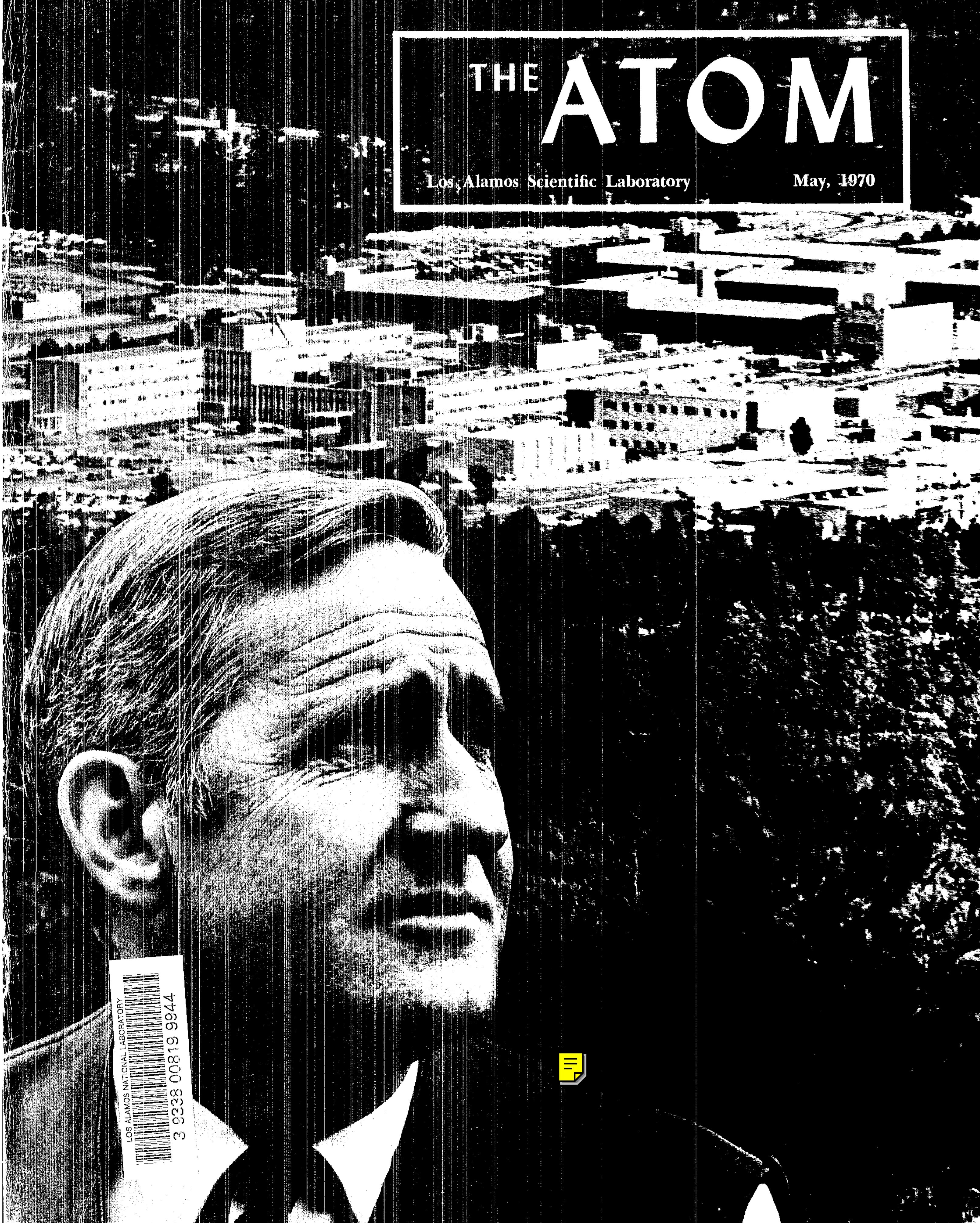
THE ATOM

Los Alamos Scientific Laboratory May, 1970



Volume 7 Number 5
May, 1970

THE ATOM

Published monthly by the University of California, Los Alamos Scientific Laboratory, Office of Public Relations, P. O. Box 1663, Los Alamos, New Mexico 87544. Second Class Postage Paid at Los Alamos.

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Office: D-413 Administration Building. Telephone: 7-6102. Printed by The University of New Mexico Printing Plant, Albuquerque.

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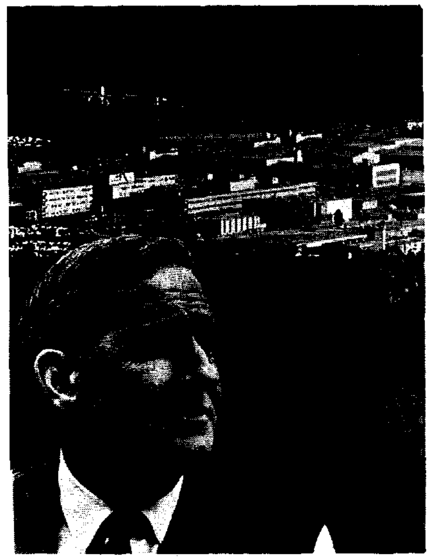

COVER:

Harold Agnew, who was named by the regents of the University of California to direct the Los Alamos Scientific Laboratory effective Sept. 1, was photographed with the Laboratory in the background by PUB-1 Group Leader Bill Regan. The story on Agnew's appointment begins on page one.

Harold Agnew Named LASL Director Effective September 1

Harold M. Agnew, Weapons Physics division leader, has been named to succeed Norris E. Bradbury as director of the Los Alamos Scientific Laboratory effective Sept. 1. The announcement was made by the regents of the University of California at a meeting in San Francisco.

Bradbury is resigning after serving as director of the Laboratory 25 years. After learning of the appointment of Agnew as his successor, he said: "I am very happy with the decision of the regents of the University of California and the Atomic Energy Commission to appoint Harold Agnew as my successor. His long nuclear experience and his devotion to Los Alamos will evoke, I am sure, the same high level of support and loyalty which I have always been enormously fortunate to have. Harold is a man of wide interests and great competence. I am confident that under his direction the Los Alamos Scientific Laboratory will continue to provide the country with increasingly effective fundamental research and technological development wherever it is needed for our national goals."

Agnew has been with the Laboratory since April 1, 1943. He made significant contributions to the development of the first atomic bomb and flew with the 509th Bombardment Group as a

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member of the scientific team on the first nuclear weapon strike against Hiroshima, Japan.

In 1946 he left Los Alamos to earn his doctorate with Enrico Fermi at the University of Chicago. He returned to Los Alamos as a staff member Aug. 10, 1949, and resumed work in weapons development. He was the assistant to the technical associate director from 1951 to 1953 and from 1954 to 1961 was alternate Weapons Physics division leader.

In 1962 he took leave of absence from the Laboratory to serve as scientific advisor to the Supreme Allied Commander in Europe at NATO headquarters in Paris. Upon his return in 1964 he was named head of the Weapons Physics division. In this capacity he directs specific investigations related to development of nuclear components of weapons. The scope of this work extends from fundamental physical and chemical research to actual detail design and testing of weapons. Over the years he has made many valuable physics measurements on light element cross-sections and on the neutron flux in cosmic rays.

The 49-year-old physicist has shown technical insight and leadership in adapting technology to the necessities of public policy and administration. An example of this is the important role he played in developing "locks" and safety devices for U.S. nuclear weapons. The "permissive action link" concept, which was developed in response to suggestions from the Joint Committee on Atomic Energy as to its need, has been an important contribution to the command and control system for U.S. nuclear weapons, permitting greater control by the President and commanders in the field of dispersed nuclear weapons.

Agnew has also been effective in encouraging others in accomplishments of improved nuclear design along lines of maximum benefit to the Department of Defense as well as the Atomic Energy Commission. He has served as an important channel in both promoting understanding with, and in contributing sound technical advice to, the government. His most recent contribution in this regard was a position paper on the ABM program in which he argued that the original Sentinel concept should be modified by moving ABM sites away from heavily populated areas and concentrate them on protecting missile bases. This concept was adopted by the administration in its minimized system, now known as Safeguard.

He has been a technical advisor to a number of government agencies. He was technical consultant to the Joint Congressional Committee on Atomic Energy in 1960 and 1961, and assisted the Committee on its trip to NATO countries in the fall of 1960 and the preparation of its report to President Kennedy in February of 1961.

Since 1965 he has been the chairman of the Army Scientific Advisory Panel. He has been a member of the Aircraft Panel, President's Scientific Advisory Committee since 1965, a member of the Defense Science Board since 1966, and a member of the NASA Aerospace Safety Advisory Panel since 1968. He is also a Fellow of the American Physical Society, Phi Beta Kappa, Sigma Xi, and Omicron Delta Kappa.

Agnew was chairman of the U.S. Army Combat Developments Command Scientific Advisory Group in 1965; a member of the U.S. Air Force Scientific Advisory Board from 1957-1968; a member of the U.S. Air Force Minuteman Planning Committee in 1961; and a member of the Von Karman Study Group in 1960. In recognition of his contributions to the nuclear weapons program he was one of the five U.S. scientists named to receive the AEC's 1966 Ernest O. Lawrence Award.

In addition to his technical achievements, he served two terms as member of the New Mexico State Senate (1950-1955), and member of the Governor's Radiation Advisory Council (1959-1961).

He was born in Denver, Colo., March 28, 1921. He graduated from South High School in Denver in 1938 with science as his major field of study. In 1942 he received the A.B. degree in chemistry from the University of Denver with physics and mathematics as minors and earned a Phi Beta Kappa key for his scholarship. He attended the University of Chicago on a National Academy of Science Fellowship from 1946-1948, and received the M.S. degree in physics. In 1949 he received his Ph.D. in physics from the University of Chicago.

He has been closely associated with the nuclear energy program since 1942 when he joined the Metallurgical Laboratory of the U.S. Army's Manhattan Engineer District and was one of the group which worked with Enrico Fermi on the first nuclear fission chain reaction at the University of Chicago.

Agnew and his wife, Beverly, reside at 1459 46th Street in Los Alamos. They have two children—a married daughter, Nancy Agnew Owens, 26, and a son, John, 21.

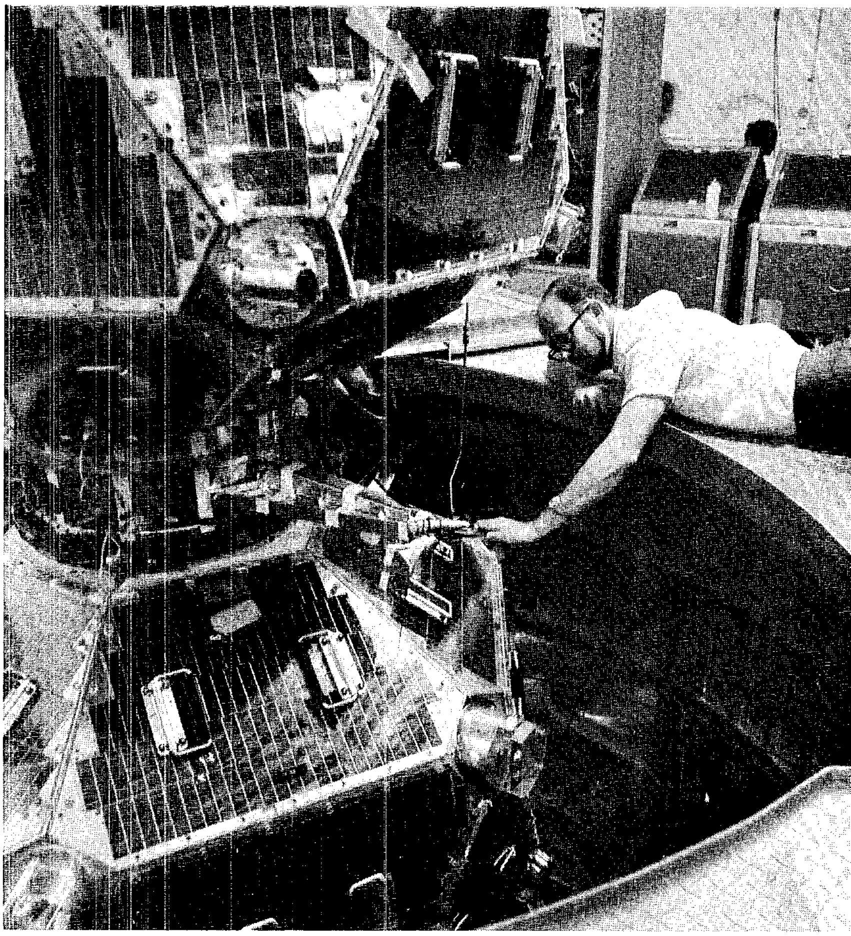
Last of the Velas

By Bill Richmond

As pre-launch preparations for Apollo 13 continued at Cape Kennedy last month, another rocket was being prepared for launch at a nearby pad, a fact that was partially overshadowed by the manned space mission. Men swarmed over a Titan III-C rocket, making adjustments to it and its payload—a pair of satellites.

Then, shortly before dawn on April 8—three days before the Apollo launch—the booster rockets of the Titan ignited and the 10-story-high vehicle began rising slowly into the air over the Atlantic Ocean.

The satellites it carried were part of the Vela project which began quietly more than a decade ago with the formation of a small, classified, study group. The project, which has now been concluded with the launching of 12 Velas (Spanish for "vigil") over a six-year period, owes much of its huge success to scientists, engineers and technicians of the Los Alamos Scientific Laboratory.



Dick Belian, P-4, on the gantry with the Vela satellites, checks out a cosmic x-ray detector. (U.S. Air Force photo.)

These satellites, whose mission is to watch with unblinking eyes for clandestine nuclear detonations on earth, in the atmosphere, in outer space, and to furnish data pertaining to the Sun and our universe, contain instrumentation designed and developed by LASL. Much of the data about space received from these "eyes in the sky" has been invaluable to our manned space program.

The Vela satellite program's beginning can be traced back to 1958, shortly after the unsuccessful East-West nuclear test ban talks in Geneva. As an outgrowth of these negotiations, it was recognized by this country that a method would have to be developed of detecting, via space-based instrumentation "watchdogs," the testing of nuclear weapons.

Thus, scientists at LASL started working on detectors sensitive to x-rays, gamma rays and neutrons—radiations which are common to all explosive nuclear reactions. It had to be assumed in the early days of research that when the detectors were ready, the state-of-the-art of space rocketry would have proceeded at a relatively equal pace in order to place the instrumentation at the most strategic spot in space.

The principles involved in measuring this radiation were well known. However, there was no experience at all regarding the high degree of sensitivity desired and the durability needed to hold up

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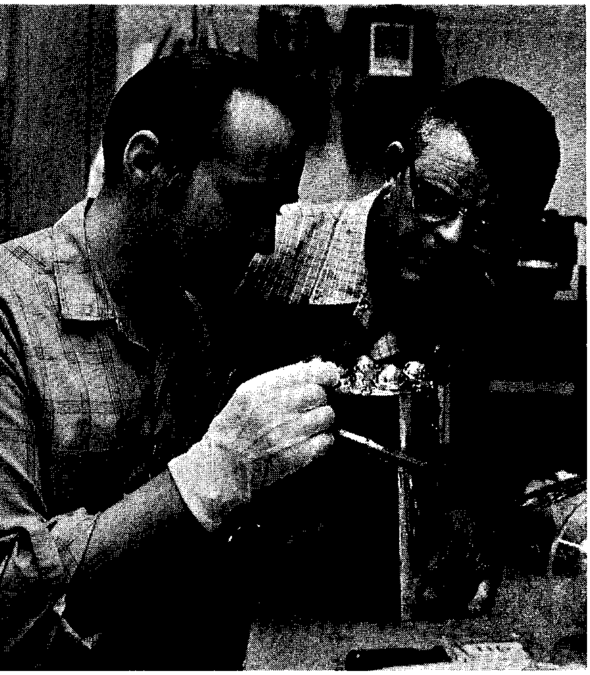
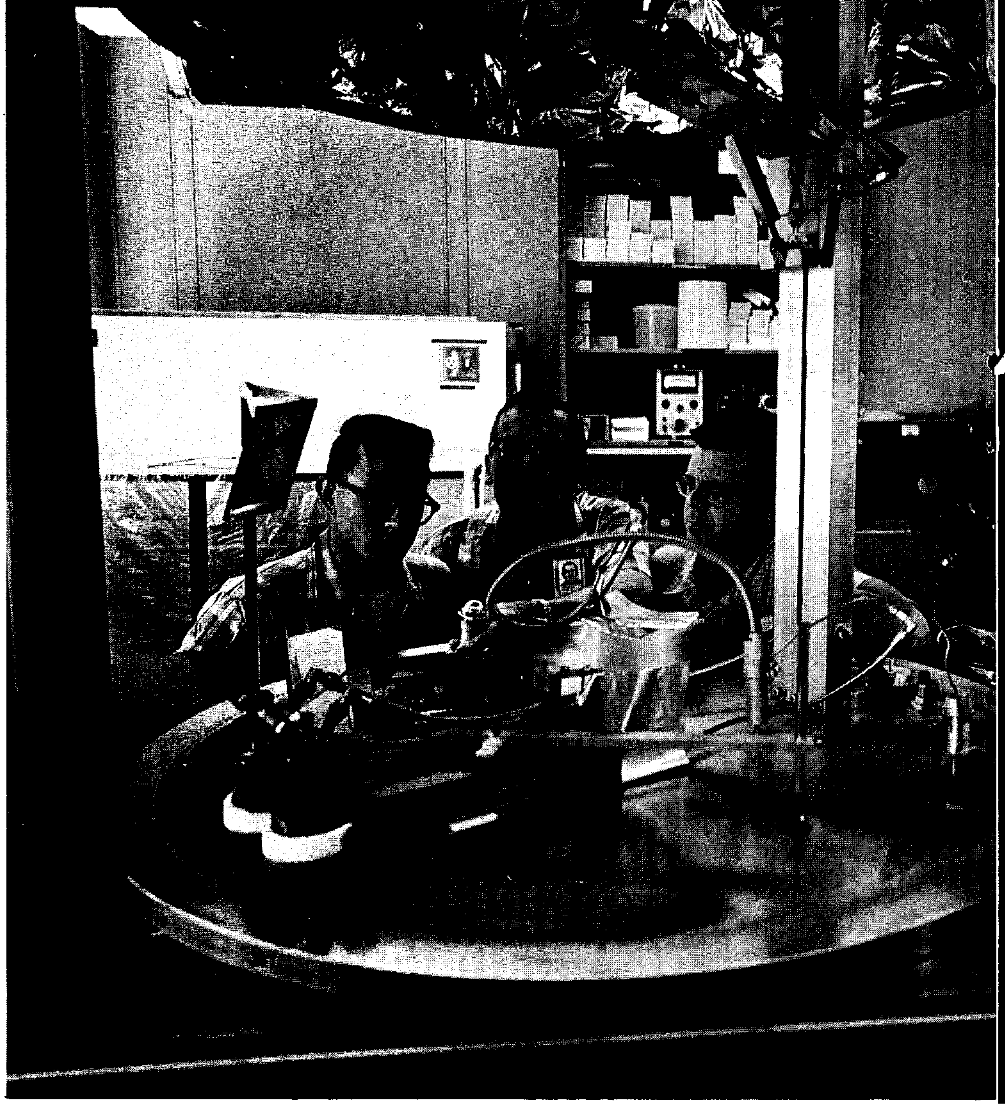
Below, Ray Klebesadel and Willie Everett, both of P-4, inspect a sensor window on an x-ray detector. Right, a part of an x-ray detector, which has been coated with a thin film of aluminum in the vacuum-evaporator is inspected by David Deck, Ralph Greenwood and Everett, all of P-4.





under launch acceleration and continual operation in orbit.

A study group known as the Buzzer Committee was established in early 1959 by LASL and Sandia Laboratories in Albuquerque. The group studied the factors involved in the use of satellites as orbiting platforms with detectors for pinpointing nuclear explosions on earth and in space. A number of recommendations were made by this committee and, in November of 1959, LASL's group P-4 was reorganized into a space science group.

It was decided that LASL would design and build the sensors while Sandia would construct a logics system to record the signals and convert them to electronic intelligence for transmission from the satellites to earth.

Tests of the prototype instruments were made in 1959 aboard Deacon-Arrow rockets launched from the AEC range at Tonopah, Nev. An altitude of approximately 70 miles was reached by the two-stage rockets.

The next year the Air Force allowed certain high-altitude research instrumentation to be carried aloft during the development of the Atlas intercontinental ballistic missile and the launch area was shifted to what was then known as Cape Canaveral. A number of checkout flights were conducted during the next two years from Air Force facilities in California and Florida and during Operation Dominic—the 1962 weapons tests in the Pacific.

In October of 1963 the detectors and the Vela satellites were ready to be mated and placed on board an Atlas-Agena rocket for insertion into earth orbit.

At the time of the initial Vela launch, the entire project was highly classified. It was described by one news reporter as ". . . so secret that even the fact that it's a secret is a secret. . . ."

These first satellites were launched only two months after the Limited Test Ban treaty was signed in August of 1963, by the U.S., USSR, and the United Kingdom. This treaty prohibited the three signatories from testing nuclear weapons on the surface of the earth, in the atmosphere or in outer space above the atmosphere. Before ratifying the treaty, the U.S. Senate adopted four safeguards—one of which pertains directly to the Vela programs. It states: "The improvement of our capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities and achievements."

Two Vela satellites were carried aloft during the initial launch on Oct. 16, 1963, and this practice of launching two at one time has continued. Launches II and III, in July of 1964 and July of 1965, also used Atlas-Agena booster rockets while launches IV, V and V-B, in April of 1967, May of 1969 and April of 1970, used Titan III-C booster rockets. The latest launch, on April 8 of this year, was the sixth in the series but was designated V-B because it used the backup or spare equipment that was constructed originally for use in launch V if it was needed. The backup satellites and instrumentation were not required for the fifth launch so it was decided to extend the project for one more launch—V-B.

Each progressive launch carried improved instrumentation as the state-of-the-art advanced and certain "bugs" were discovered in prior launches and eliminated.

Approximately 20 types of instrument assemblies with more than 100 sensors have been designed, developed, tested and constructed by LASL groups P-4, under Jim Coon; P-1's space electronics section under Paul Glore; and W-7, under Bill Chambers.

After the instruments are certified to be in good working order at LASL, they are shipped to California where they are mated to the satellites which are built under Air Force contract and management by TRW Space Systems. The entire package is then forwarded to Cape Kennedy for final checkout and testing.

The Vela satellites are approximately five feet in diameter and consist of 12 instrumentation—or detector—points plus 24 solar panels. The panels provide the energy source of about 100 watts to power the Vela instruments and other spacecraft electrical systems. A number of other detectors and instruments, including a transmitter to transmit data to earth and a receiver to receive commands from earth, are contained inside the satellites.

Each satellite weighs approximately 770 pounds.

One of the first stops for the satellites after they arrive at the Cape is the Spin Test Facility. Here the vehicles and the instrument packages are twirled at approximately two revolutions per second—the same spin ratio they undergo in space. Mechanical adjustments are made to ensure accurate dynamic balancing of the satellites, a requirement for precise orientation manuevers in space. Some of the sensors are earth-oriented and others are designed to look at the sun, depending on their individual missions.

After the sensitive adjustments to the satellites have been made in the Spin Test Facility, they are removed and placed atop the booster rocket where the LASL scientific team tests and calibrates each of the more than 100 sensors in the 12 detector points on each of the two satellites.

Radioactive sources are employed to do this. A source is positioned near a satellite detector on the gantry and a computer in what is called the assembly building several miles away begins spewing out data. By comparing this data against a known norm, the investigators for each of the experiments can determine if the detector is operating properly. Various checks are run on each detector and, if all function correctly, they are ready for service in space.

However, as sometimes happens, the computer printout information does not jibe with previous data and the trouble must be located. Perhaps this can be done on the gantry, but, in some cases, the faulty detector must be removed from the satellite and returned to the assembly building. Here it will be checked again and either corrected or replaced. This can take minutes, hours or days—but it must be repaired before the launch date or the "bird will fly" without a properly functioning detector.

Extreme care must be taken in handling the detector and its sensors to prevent scratches or chips in the heat-reflecting or heat-absorbing outer covering. Also, the detector is precisely weighed when it is removed from the satellite and it must weigh exactly the same when it is returned. If not, the satellite is likely to wobble in space and not be perfectly aligned with relation to the earth.

Eventually, after all tests have been made and any deficiencies corrected, the bird and its satellite package are declared ready for launch.

Launch V was a drastic re-design as compared to earlier ones, Coon noted, and V-B consolidated the improvements made on V.

"When we make as many changes as we did on V, we have problems getting it exactly right," he said. "Launch V was more complicated and sophisticated than earlier ones." Also, the operational capability of many of the systems were improved "very significantly" on V-B as compared to V.

The placement of the Vela V-B

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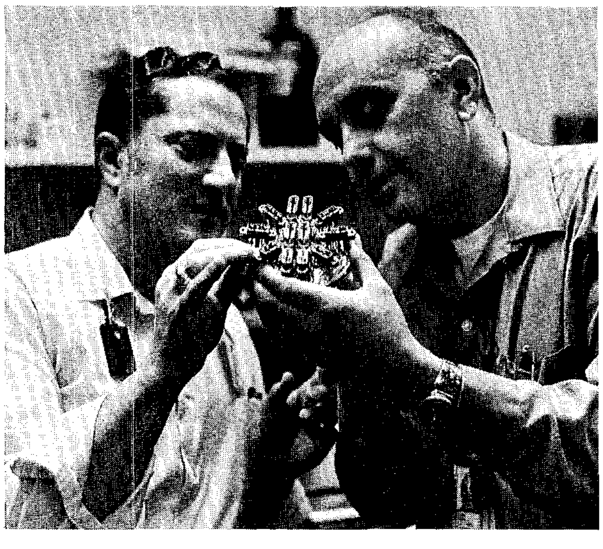
Bill Aiello, P-1, and Sydney Singer, P-4, discuss the grouping of electrical connectors known as the "rats nest" in detectors.



satellites in their proper orbits was a masterful piece of rocketry. The satellites were mounted in tandem atop the Titan III-C and enclosed in a protective nose cone.

Shortly before 6 a.m. the two solid fuel booster rockets ignited and the Titan—the 100th such rocket launched from the Cape—began rising into the air with a mighty roar. Once outside the earth's atmosphere the protective nose cone fell away. When the boosters burned out, compressed springs were released to push the tandem mount free and jets of compressed gas started the assembly spinning at two revolutions per second.

The two satellites were then separated from each other and an injection motor in one fired, sending the satellite into a circular orbit about 70,000 statute miles above the earth—or about one-third of the distance to the moon. The second Vela was permitted to make a natural elliptical orbit that swung it around the earth, about 10,000 miles out, and then returned it to the original apogee.

When this point was reached, the injection motor in the second satellite fired and this Vela also entered a circular orbit. The first spacecraft had by this time traveled to a point roughly 180 degrees from the other. Thus, the two satellites are on opposite sides of the same circular orbit. This sixth pair of satellites is phased with those of the fifth launch to be located in space at intervals of about 90 degrees apart.

Tracking stations located in California, New Hampshire, Hawaii, Guam and the Seychelles Islands in the Indian Ocean, receive the data transmitted from the Velas. This data is then analyzed and interpreted. Since the initial launch, more than 10 billion bits of data have been sent back to earth from the 12 satellites.

What type of data has been received?

In the words of Jim Coon, "In addition to the radiation detection instruments for nuclear test surveillance, beginning with Launch II, the Vela satellites have also carried instruments designed to measure the natural radiation environment where the nuclear test surveillance instruments must operate.

"The study of the natural radiations by the Vela satellites has provided valuable scientific information on the x-ray and particle radiations from the sun, on the character of the geomagnetosphere, on cosmic x-ray sources, and on the primary galactic cosmic rays. As an example of the scientific accomplishments of the Vela Satellite Program, many of the properties of the solar wind were first determined by electrostatic analyzers carried on the Vela satellites.

"In addition, unique contributions have been made to the understanding of the interaction of the solar wind with the earth's magnetic field.

"Another example is the observation of the birth, development, and disappearance of a strong cosmic x-ray source, the second such occurrence ever recorded. The study of such sources is especially important in the development of theories of the origin and nature of novae and supernovae."

The Vela program is carried out with the management of the Air Force and under the joint administration of the Advanced Research Projects Agency (ARPA) and the AEC.

Sam Bame, P-4, holds up a detector assembly while discussing it with Harry Felthauser and Jack Asbridge, both of P-4, and Paul Glore, P-1.

The Auxiliary Fire Brigade

A practical and serious hobby

By Tom Langhorst

Emergencies seldom, if ever, occur at convenient times or places. For this reason alone, it's a special kind of person who will volunteer his services during crises again and again. Among the more than 750,000 volunteer fire fighters in the United States who are people of this kind are the members of the Los Alamos Auxiliary Fire Brigade. These "fire buffs" have a practical and serious hobby which provides Los Alamos with a working force during times of emergency.

"The Brigade," now in its 18th year, was organized in 1952 to back up the Fire Department with manpower in time of a major conflagration. Members of the Brigade receive the same training as the paid members of the Los Alamos Fire Department. In fact, several Fire Department "regulars" have been made "honorary" members of the Brigade in recognition of their help in training Auxiliary members.

Albro Rile, founder of the Auxiliary Fire Brigade, serves as training officer and liaison between the Brigade and the Department. Rile's interest in both fire prevention and fire fighting dates back to his early high school days, followed by service as a volunteer in the Hastings on Hudson Hose and Ladder Volunteer Company in New York State. Through his interest and capability in the fire service he became first lieutenant in that department and he has instilled the same degree of interest in the Auxiliary Fire Brigade.

Currently, all members of the Brigade are employees of the Los Alamos Scientific Laboratory. But, membership is open to any interested person who can qualify. Each member must purchase his dress uniform. Members of the group are always resplendent in their helmets, red shirts and red-striped blue serge pants in the annual rodeo parade. The foreman, who is elected each year, leads the Brigade's parade entry and carries a speaking trumpet. This trumpet, the traditional badge of office, is bedecked with a bouquet of flowers to show that it will not be used that day for commands or orders. The Brigade has won many trophies and awards for its participation in civic events throughout the southwest.

Home for the Brigade is Civil Defense Headquarters located on Arkansas Street. In this building is housed the equipment which is owned by the members who have raised the required money through fund raising projects and by imposing upon themselves dues, fines and assessments.

This equipment includes five pieces ranging from an 1875 hand-drawn chemical cart to a modern 1957 rescue unit. One of the unit's most unusual pieces of equipment is an 1890 horse-drawn hose-cart which has been restored.

The oldest and most spectacular truck is the 1921 American La France pumper. This truck was purchased from Hugo, Okla., when that town retired it from "active duty" in 1961. Some 800 man-hours of work have been devoted to the restoration of this unit. It is not only an operable piece of equipment but a valuable antique.

The 1940 GMC pumper was obtained from Kirtland Air Force Base in 1957. This unit required extensive repair which was done by the members. It, as well as the 1921 pumper, are used in fire fighting training.

The 1957 Search and Rescue unit was purchased in 1964. It is a one-ton panel truck that has been overhauled, dressed up and equipped with life-saving equipment. Members of the Brigade consulted with the Albuquerque Rescue Squad to learn what type of gear is most often used in rescue operations. Armed with this information they proceeded with the purchase and outfitting of the rescue unit. This vehicle is available to the Los Alamos Fire Department should a situation arise that would require its use.

Civic pride and willingness to help Los Alamos progress is demonstrated by the Brigade in many forms. Annually they provide ambulance service for the rodeo, fireworks display, Shrine Circus performances and the high school foot-

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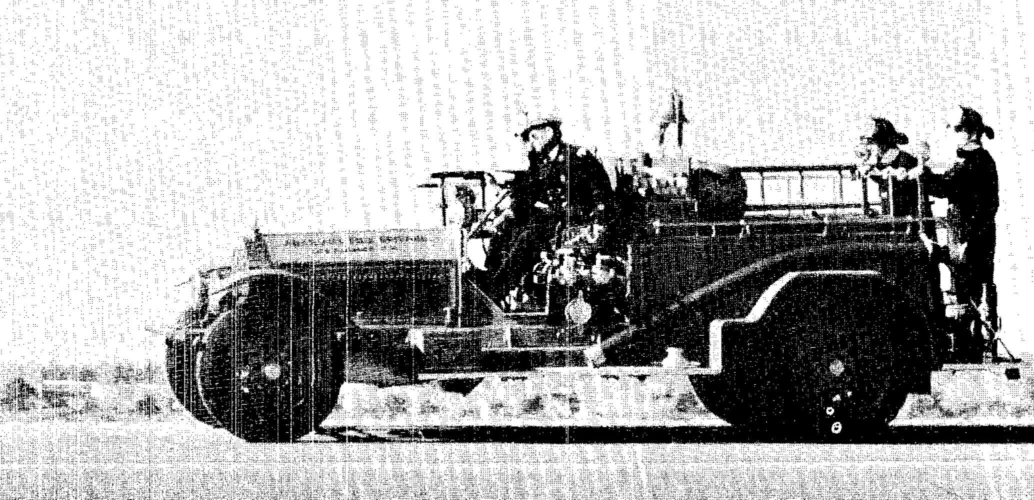
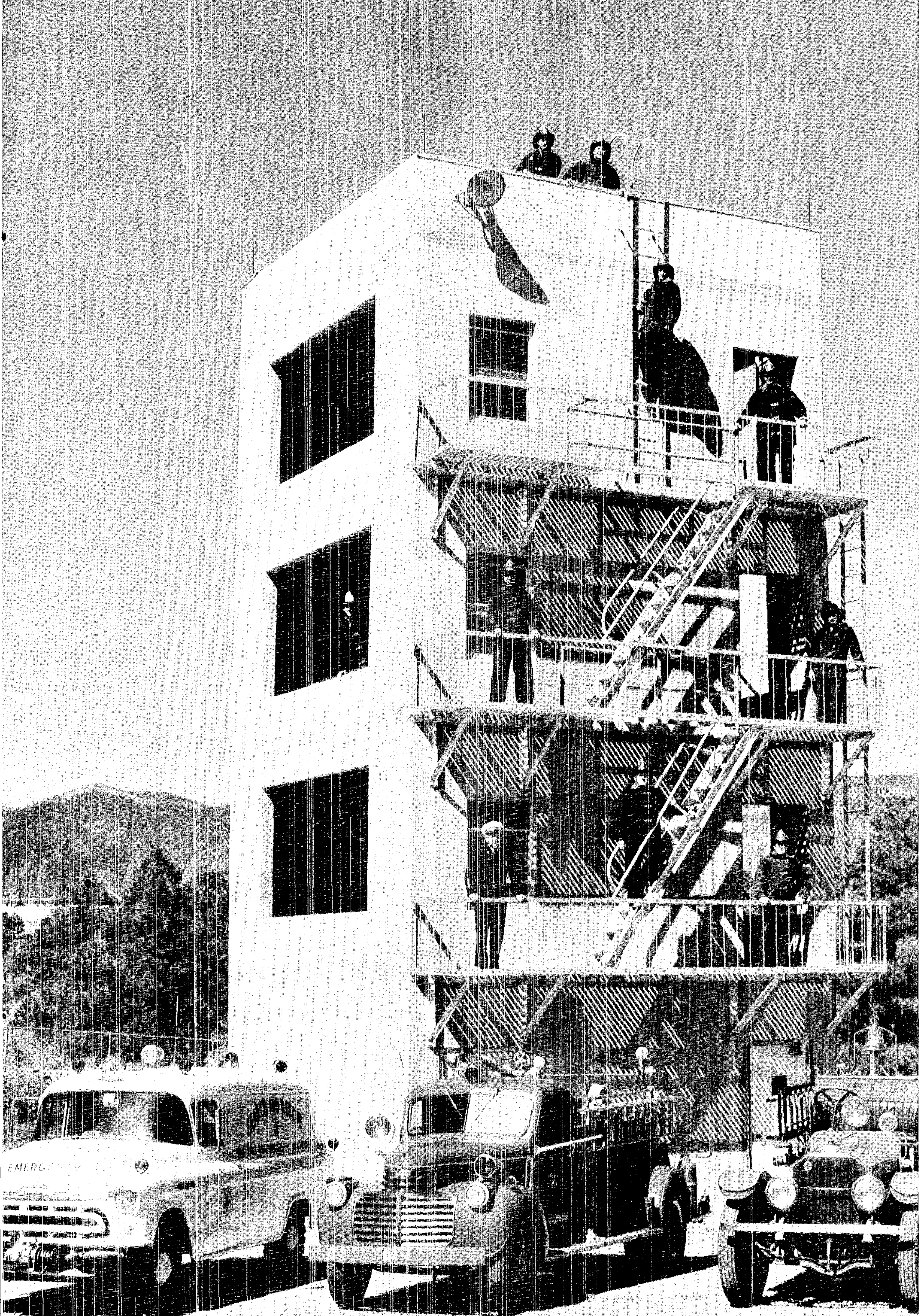


Below, Albro Rile briefs members of the Brigade before a drill. They are Bob Stelzer, SD-5; Vinson Hall, ENG-4; Paul Salazar, P-1; Charlie Charlton, P-16; and Mike Thomas, P-15. Right, Rile talks with C. D. Hellingsworth, SP-3, and Dick Pierce, H-1, in front of Brigade headquarters. At far right, Brigade members stand on the drill tower at Fire Station No. 2 on DP Road. At the top are Thomas, Leroy Grady, SD-5, Stelzer, and Charlton. At window is Pierce, and on the adjacent landing are Salazar and Hall. On bottom landing are Rile, Hollingsworth and John Wahlen, ENG-2.



Charlton and Hall ride the rear of the 1940 GMC pumper. At rear can be seen the search and rescue unit and the American La France pumper.

Hollingsworth, Brigade foreman, and Pierce, assistant foreman, look over some of the awards the auxiliary unit has won.

ball games. Over 200 Los Alamos residents receive instruction from Brigade members in either first aid or fire prevention. The local Boy Scout district awarded a trophy to the Brigade for its outstanding service in conducting merit badge courses.

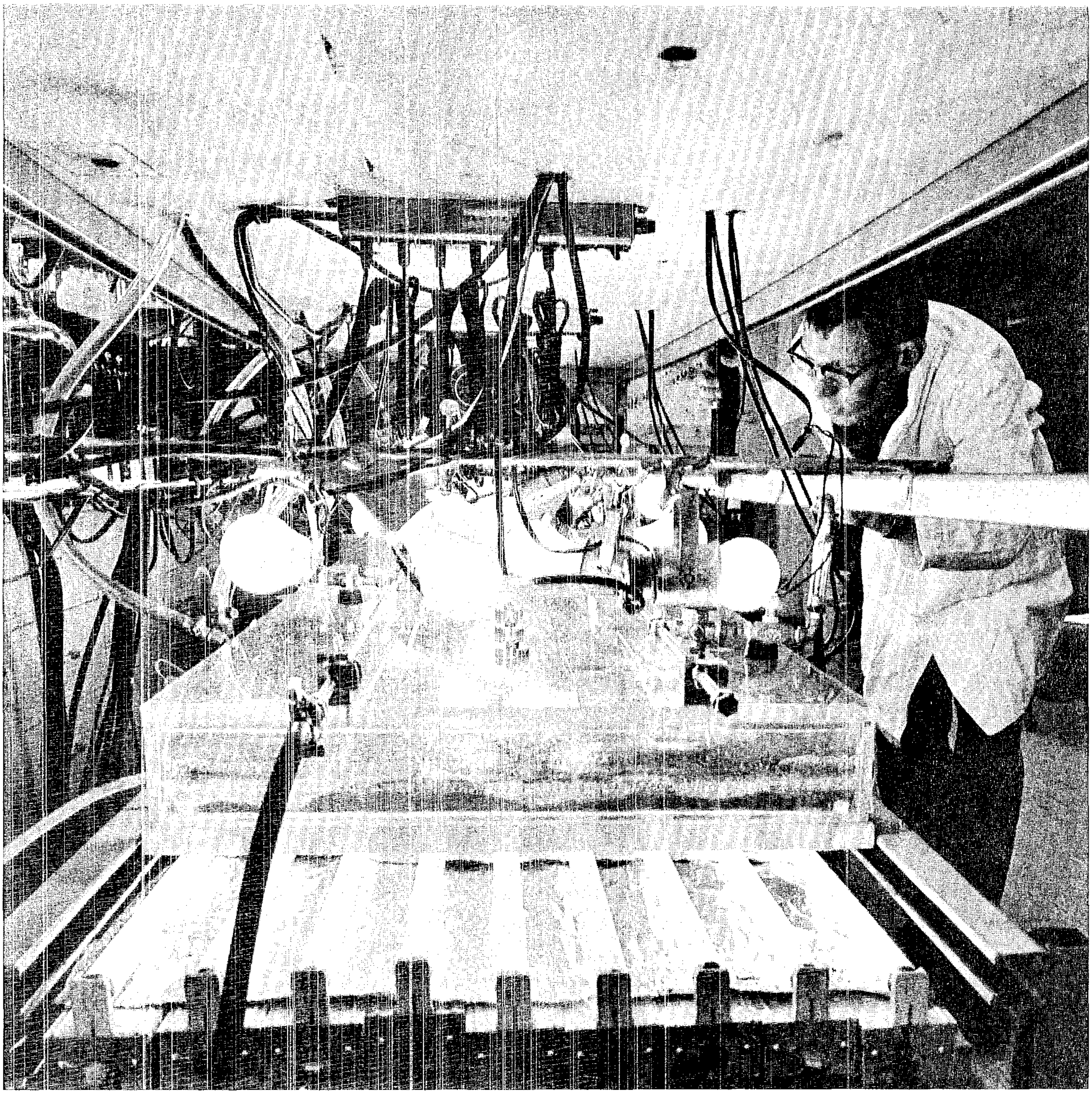
Brigade members have assisted Pojoaque and Chimayo in raising money to start volunteer fire departments in their communities.

Other activities include forest-fire patrol and fire suppression, search and rescue operations, spring cleanup campaign participation, flag display detail on holidays, blood donations and the privilege of bringing Santa Claus to Los Alamos each Christmas season.

One of the many highlights of the Brigade's history was its participation in guarding President Kennedy during his visit in 1962.

Civil Defense Director Robert Porton looks on the members of the Auxiliary Fire Brigade as the main tenants of the Civil Defense Headquarters. With their know-how and equipment they are capable of playing a major role in any Civil Defense search or rescue operation. Los Alamos is constantly reminded of the volunteer services the Brigade embraces by their motto, "Always Ready to Serve."

Carbon-13 Algae Grown at LASL



Jerry Buchholz checks algae growing in four 50-liter boxes.

The first algae whose carbon content is greater than 90 per cent carbon-13 have been successfully grown by Group H-7 scientists at the Los Alamos Scientific Laboratory. The algae and a carbon-13 yeast which will also be prepared by H-7 will be used as food for mice in a series of toxicity studies to be conducted by H-4.

The toxicity studies will be performed to determine if high levels of carbon-13 have any adverse or toxic effects in living systems, to enhance production of the isotope and to show its utility in basic research.

A stable isotope, carbon-13 makes up only 1.1 per cent of all naturally

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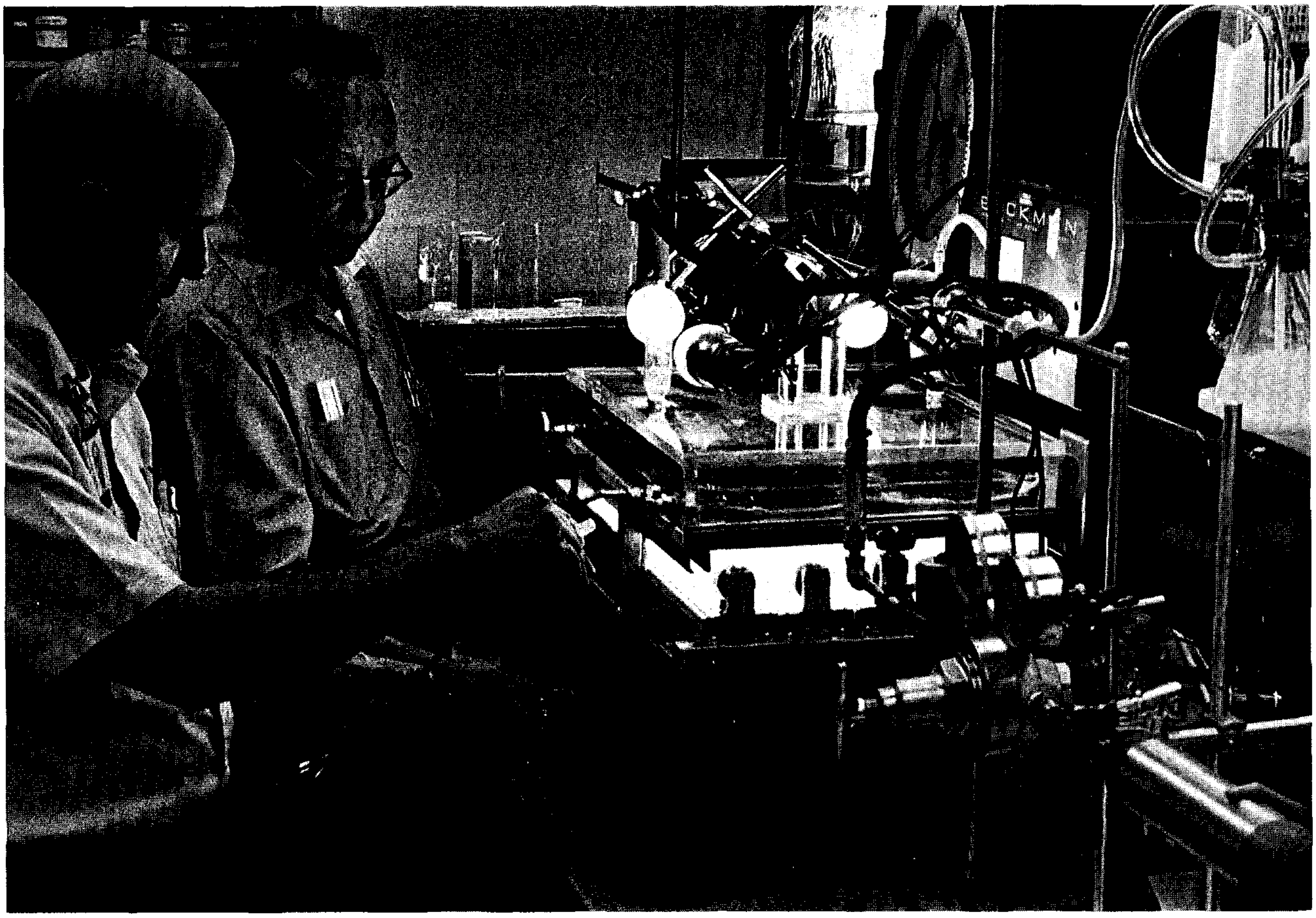


Victor Kollman and H-7 Group Leader C. W. Christenson draw a sample of algae grown in a five-liter box. It was in this box that the first algae was grown whose carbon content was greater than 90 per cent carbon-13.

occurring carbon. Until recently it has never been available in large enough quantities to be used in basic research. Thus, its practical applications have also been limited.

The Atomic Energy Commission's Division of Biology and Medicine became interested in the isotope as a basic research tool that would be used widely in medical, biological and chemical research if it could be made available in larger quantities and at reduced cost. As a result, plans by the Los Alamos Scientific Laboratory to establish a production capability were accelerated.

About a year ago, CMF-4 put into operation the first of three planned carbon-13 distillation columns at LASL. Since then, H-7 has been provided with quantities of 95 per cent carbon-13 dioxide for the algae project being conducted under the direction of Eric Fowler, alternate group leader.

Algae grows by photosynthesis; when exposed to light under suitable conditions of temperature, water supply, and nutrient, it uses carbon dioxide from the atmosphere and releases oxygen to it.

Simulating these conditions in a laboratory, the scientists developed techniques for growing algae in a prototype system using normal carbon dioxide which is 98.9 per cent carbon-12. Having done this, they used carbon-13 dioxide in a repeat of the process.

The algae were grown in five-liter quantities in a clear lucite box which served as a closed environment. Mineral salts, carbon-13 dioxide and water were used as nutrients and heat and light were provided by incandescent and fluorescent lamps. A small electric motor was geared to move the box to and fro on a short track to agitate the contents of the box. This kept the algae cells suspended and gave them maximum exposure to nutrients and light.

After five days the carbon content of the algae cells was about 90 per cent carbon-13. The process was twice repeated, each time using a small portion of the algae that had been grown as an inoculum for growing the next batch (much the same as using sourdough as a starter for the next batch of home-baked bread). With each subsequent run, scientists project that carbon-13 concentration increases, although measurements to determine the extent of this increase have not been completed.

The algae were vacuum dried to maintain the integrity of cells. The yield of dry algae was about 20 grams containing 10 grams of carbon-13 per five liters of material taken from the box.

Magnified 1,600 times, the algae appear no different than if they had been grown in a natural environment. However, studies are being conducted to determine whether they have undergone any changes in form or structure. Gross changes would lead to speculation that there would be some difficulty in adapting mice to high levels of carbon-13.

Based on their success in prototyping the techniques and system to grow carbon-13 algae, a production system with four 50-liter boxes has been built and is being tested by growing algae in 30 liters of medium per box with normal carbon dioxide.

Eric Fowler, H-7 alternate group leader, and David Martinez study a portion of the vacuum-dried carbon-13 algae.

Carbon-13 yeast will be grown by aerobic fermentation. Using this process, yeast cells are produced rather than alcohol which is the product of anaerobic fermentation.

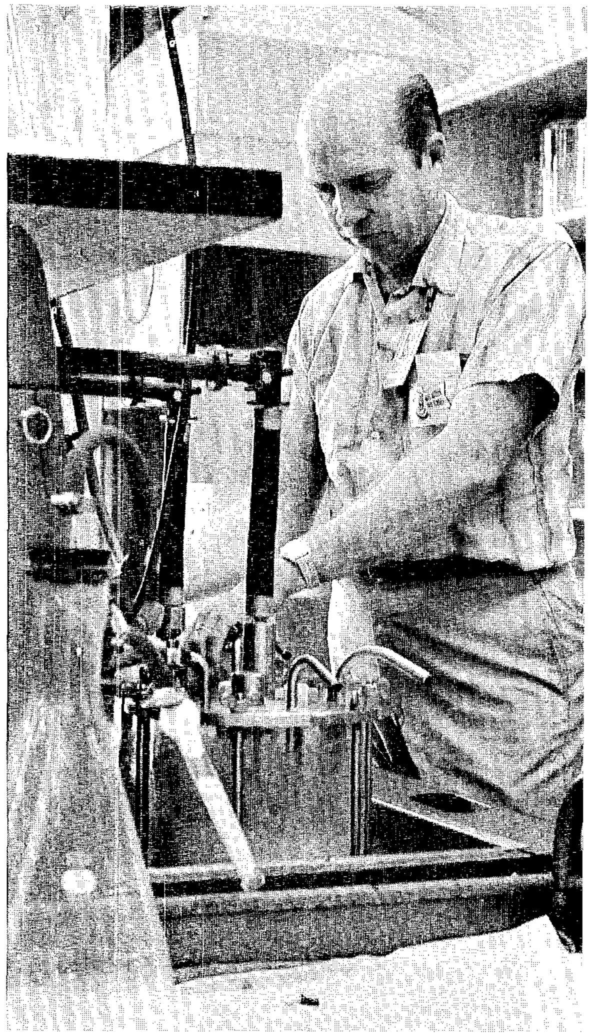
Yeast cells, when properly supplied with oxygen, grow well on carbohydrates and release carbon dioxide to the atmosphere. In the past, scientists have had little success in growing yeast cells on anything but carbohydrates. However, H-7 has successfully adapted a yeast to grow on a carbon-12 acetate. Adapting the yeast to the acetate diet took three months. The trick was to "wean" the yeast from glucose. This was done by gradually increasing the yeast's intake of acetate and decreasing its intake of glucose until it was completely dependent on the acetate for carbon.

The yeast, like the algae, was grown in a closed environment. A beater was used to keep the yeast cells, mineral salts, acetate and oxygen in a state of constant agitation in each of two containers. In this way the cells were kept suspended, as much oxygen as possible was dissolved in the mineral salts and acetate, and the yeast was given maximum exposure to the nutrients.

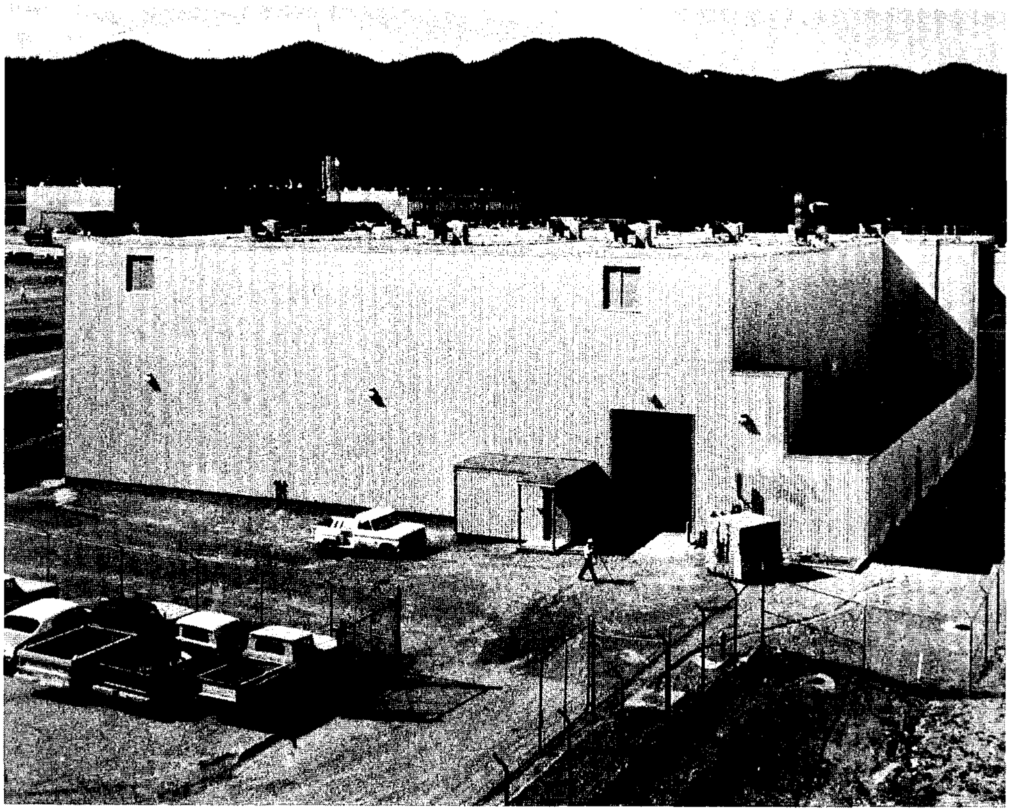
Under these conditions, yeast cells reproduce at a rapid rate. Four to five generations are produced each 24 hours. By current procedures, a base of 15 million cells per cubic centimeter of medium will grow to about 150 million cells per cubic centimeter in this period of time. Then, about 95 per cent of the yeast cells are harvested and the process is repeated using the remaining five per cent of the cells as an inoculum for the next batch. With each repeat of the process the concentration of carbon-13 increases.

When vacuum dried, each liter of material yields about two grams of dry yeast.

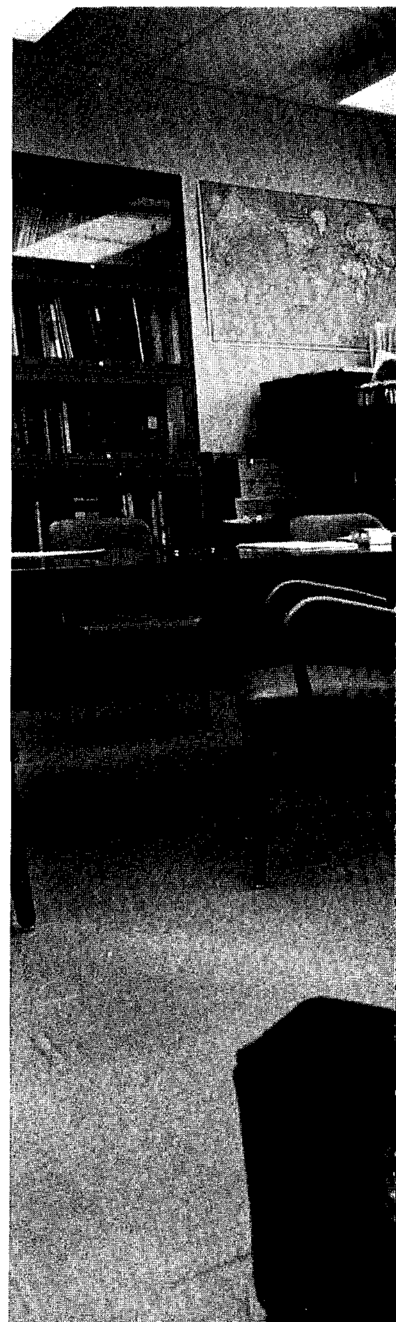
The carbon-13 acetate to be used in growing yeast will be prepared by H-4. The process for adapting the yeast to carbon-13 acetate will be much the same as it was for adapting it to carbon-12 acetate.



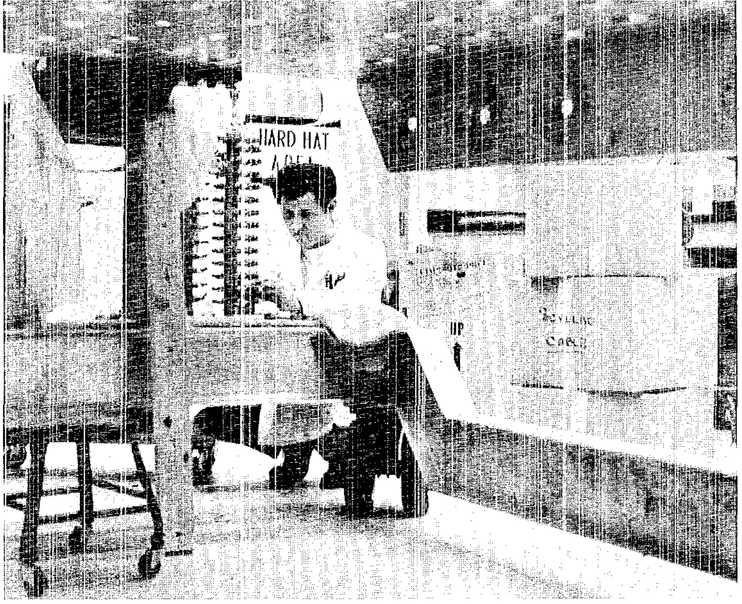
Howard Adams checks the fermenter where yeast is being grown aerobically on carbon-12 acetate.



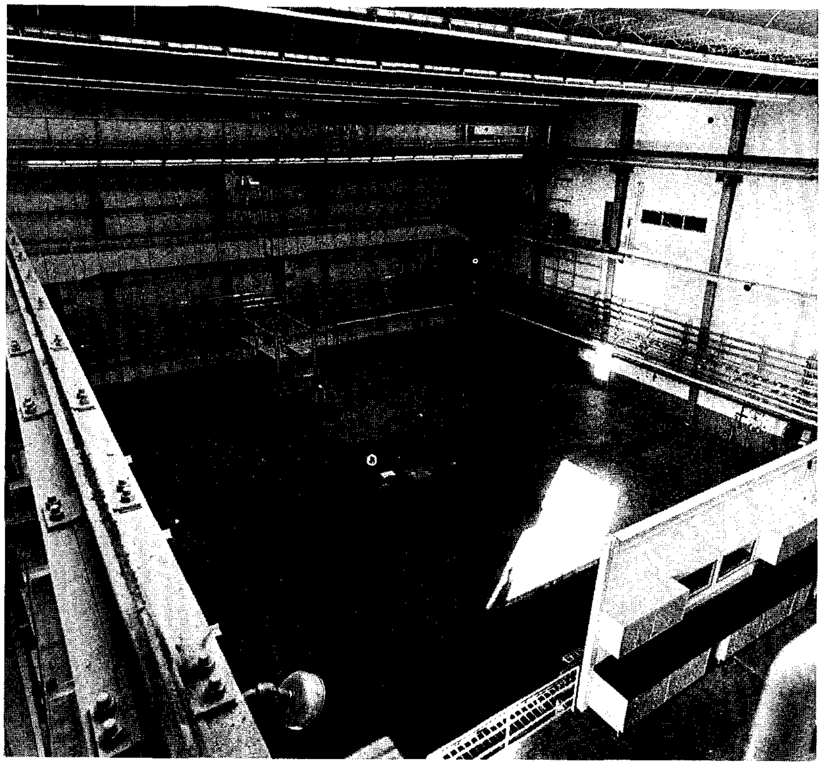
The Laboratory and Energy Storage Facility for Scyllac, left, has been accepted and occupied. Scyllac will extend LASL technology toward the achievement of the controlled release of thermonuclear (fusion) energy for peaceful purposes. Below, P-15 Group Leader Fred Ribe moves into his new office. His entire group of 36 persons has now moved into the building. Members of P-16, the Engineering department and LACI are also working in the facility. Right, Demetrio Ortega, P-15, checks collector plate manifolds for leaks.



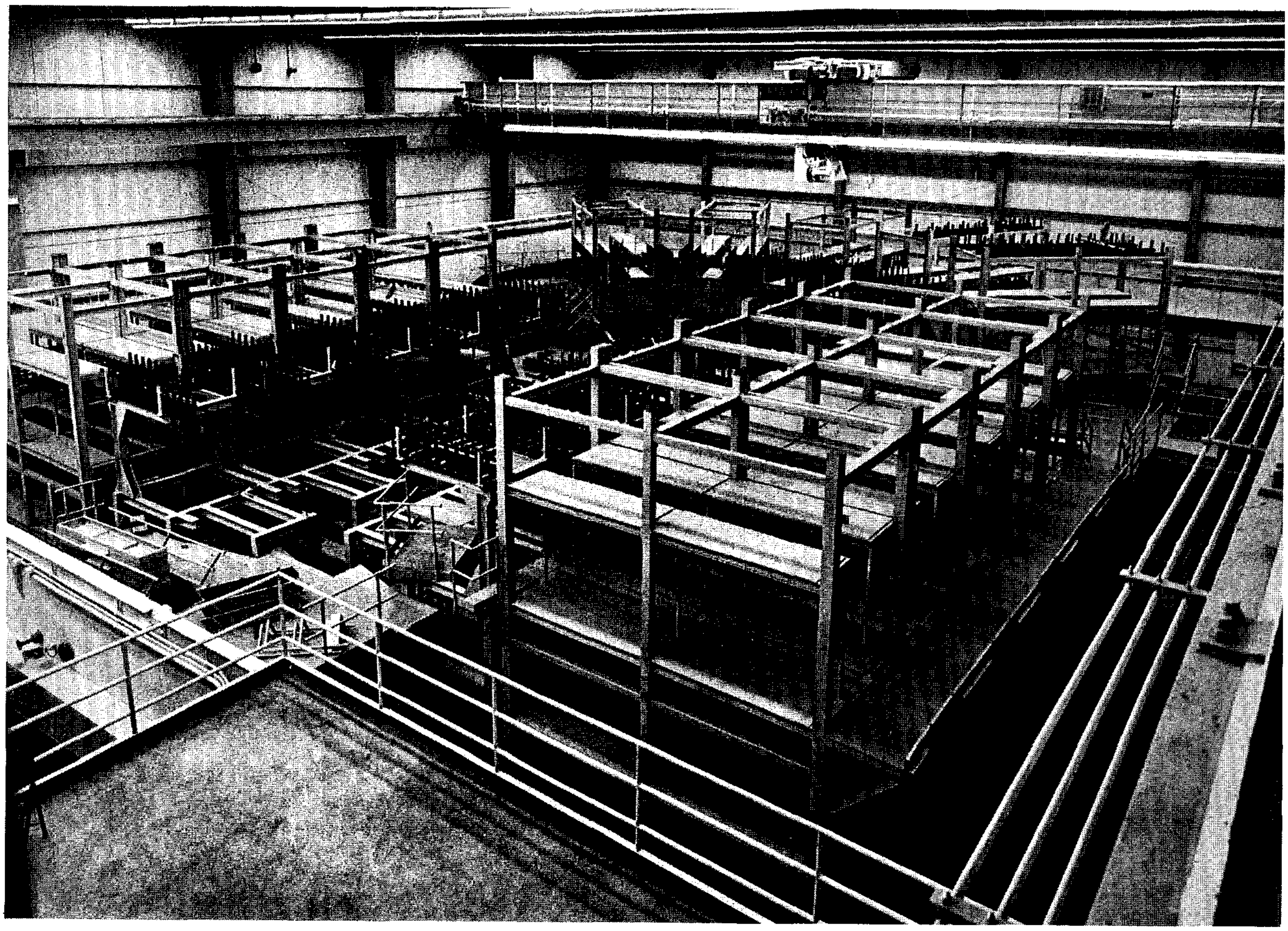
Inside the Scyllac Building



Bill Ellis, P-15, unpacks books from a large box in a corridor of the Scyllac building and moves them into his new office.



Left, the large bay where Scyllac will be contained before installation of capacitor racks began. Below, the same bay with installation of racks well underway.



Lee Roy Leppke, LACI, finds a comfortable stance while working on the topside of the capacitor racks.

LACI workmen, John Chubbuck and J. L. Montoya (holding magnetic drill) work on capacitor racks.

As Apollo 13 hurtled toward earth

LASL was ready if needed

As the crippled Apollo 13 spacecraft was making its troubled journey toward earth last month, an NC-135 aircraft was being instrumented to assist in recovery operations if needed.

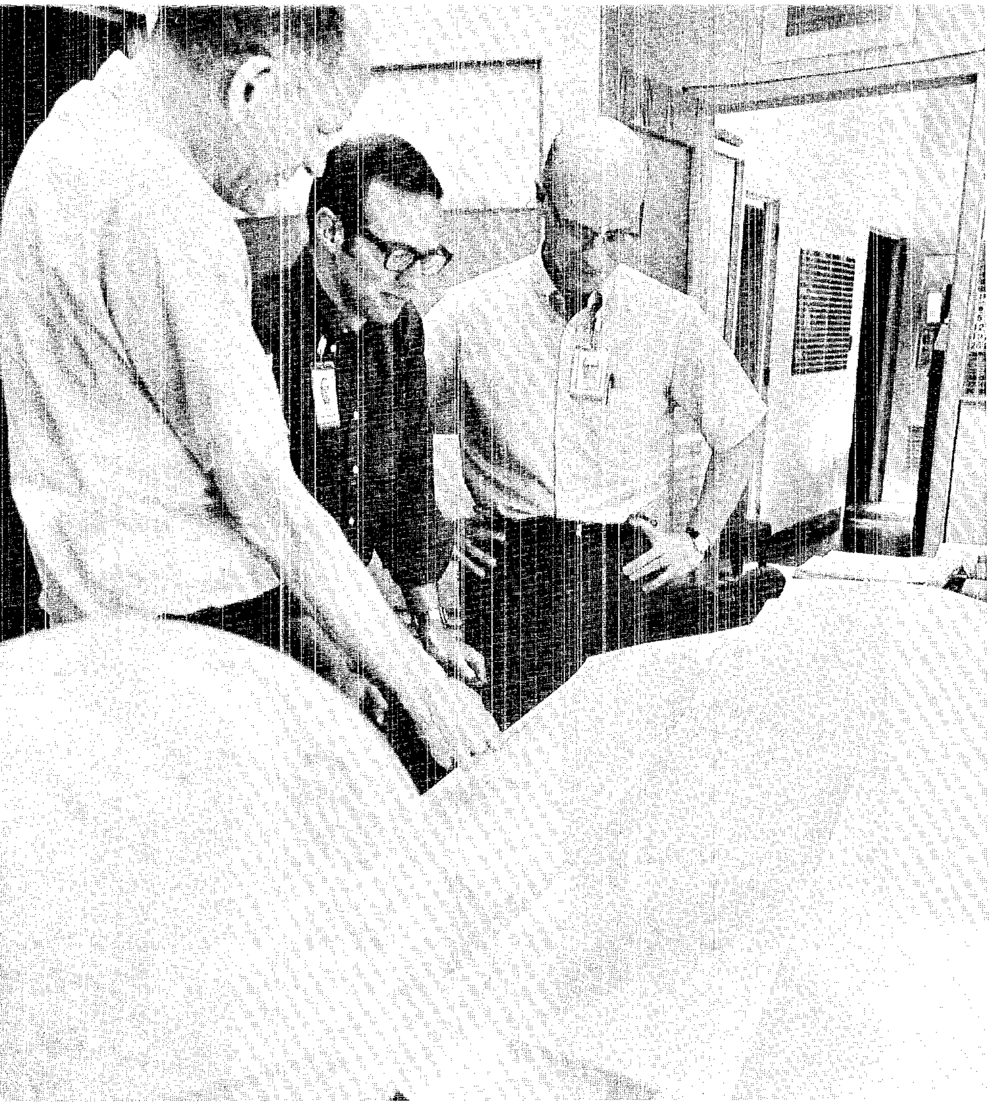
The aircraft, at Kirtland Air Force Base in Albuquerque, was one of the Atomic Energy Commission's "flying laboratories" which are maintained and flown by the U.S. Air Force. The plane has been modified and instrumented for use in many scientific experiments during the past several years.

Its services and those of a select group of men from Sandia Laboratories, the Los Alamos Scientific Laboratory, EG&G and General Dynamics were placed at the disposal of the National Aeronautics and Space Administration to aid in locating the Apollo craft after splashdown.

The plane and personnel were offered during a time when three possible landing sites were under consideration—the Atlantic, Indian and Pacific Oceans. The earliest splashdown that could have been achieved would have been Thursday, April 15 in the Atlantic. Participation of the flying laboratory would have been more likely to come about if the Atlantic landing site had been chosen. Recovery forces were not as readily available there as they were in the Pacific where the American astronauts safely ended their trouble-beset space mission, and the splashdown would have been at night when pinpointing the exact location would have been, at best, difficult.

The Los Alamos Scientific Laboratory's involvement was coordinated by Bill Ogle, J division leader, and at Sandia by Vice President Jack Howard.

Steering preparations at Los Alamos were Neel Glass, J-16 group leader, and his alternate, Bob Peterson. The two men called upon other groups at the Laboratory for manpower and equipment support in the event their assistance would be required. Preliminary



Studying maps of possible splashdown areas are Neel Glass, J-16 group leader, Don Kerr, J-10, and Bob Peterson, J-16 alternate group leader.

planning called for eight of the aircraft's seats to be manned by personnel from Los Alamos. The LASL contingent, however, consisted of 11 men, including Glass and Peterson, in order to provide sufficient reserves if additional manpower was needed.

In addition to Glass and Peterson, the LASL group was to include Walter Wolff, J-8 alternate group leader; Don Kerr, J-10; Don Westervelt, J-14 group leader; Dick Tatro and Rodney Biddle, both of J-16; John Marshall, P-17 group leader; W. L. Headdy, D-8; Bob Harper, D-10; and Bill Jack Rodgers, PUB-1.

Their role in the mission would have been to operate the many optical instruments with which the NC-135 aircraft would be equipped. These were to consist mostly of cameras which would have been located in staggered positions at windows in the aircraft in order to give complete sky coverage. Some of the cameras were equipped to render photographs seconds after their shutters were tripped for a "quick look," while kits were provided for hurried development of other film while the plane was in flight.

Flying at high altitudes parallel to Apollo's re-entry line, the scientists after sighting the spacecraft, would film its trajectory. The curve of the trajectory with relation to the plane's position would then be used in determining the location of splashdown.

Gathering of personnel and equipment for the mission began Tuesday morning. By Tuesday evening it was clear that the mission would not be called that night, nor early Wednesday morning. Readiness was maintained until about noon Wednesday when NASA reported that use of the aircraft would not be necessary. "However slim the probability that we would be called on," said Peterson, "it was worth the effort."

short subjects

Joseph W. Mather, P-7 group leader, was the United States participant on a Euratom ad hoc panel in Brussels, Belgium, last month. The Euratom countries will base their next five-year plan in the field of very hot and dense plasmas on the recommendations of the panel.

Mather, who was a guest of the Italian Atomic Energy Commission, presented information on the present status, future and possible applications of plasma focus, and also about its possible connection with steady state flow reactors.

The P-7 group leader also gave invited talks on "Dense Plasma Focus" at Italy's Frascati National Laboratory, and at the nuclear research center (Kernforschungsanlage), in Julich, Germany.

The Los Alamos Scientific Laboratory will host the National Symposium on Carbon-13 June 9-11, 1971, which is jointly sponsored by the Associated Western Universities, the Atomic Energy Commission and LASL.

Fifteen speakers have been invited to cover the general topics of enrichment and synthesis, nuclear magnetic resonance, biological effects, and applications.

The symposium is open to all interested persons. Inquiries should be addressed to CMF-4 Group Leader **Eugene Robinson,** general chairman of the event, or to H-4 Alternate Group Leader **Donald Ott,** technical chairman.

Elmer King, formerly of N-4 at LASL and NRDS, died recently in Red Rock, Ariz. Services were held in Parker, Ariz. He is survived by his wife, Rose, one son and two daughters.

Gerold H. Tenney, technical advisor to the Director's office on nondestructive testing, has been named an honorary member of the American Society for Nondestructive Testing.

Tenney will formally receive his honor at the Sixth International Conference on Nondestructive Testing in Hanover, Germany, June 1-6.

He is a former president of the Society and is currently a member of its board of directors, chairman of the International Relations Committee and a contributing editor to "Materials Evaluation," the Society's journal for which he writes the column, "Internationally Speaking."

Helen Redman, D-2 group leader, has been selected to receive the New Mexico Library Association's first "Librarian of the Year" Award. The award, an inscribed Nambeware tray presented at the Association's 47th Annual Conference in Albuquerque last month, recognizes Mrs. Redman as the Librarian of the Year 1969.

For Reporting Change of Address

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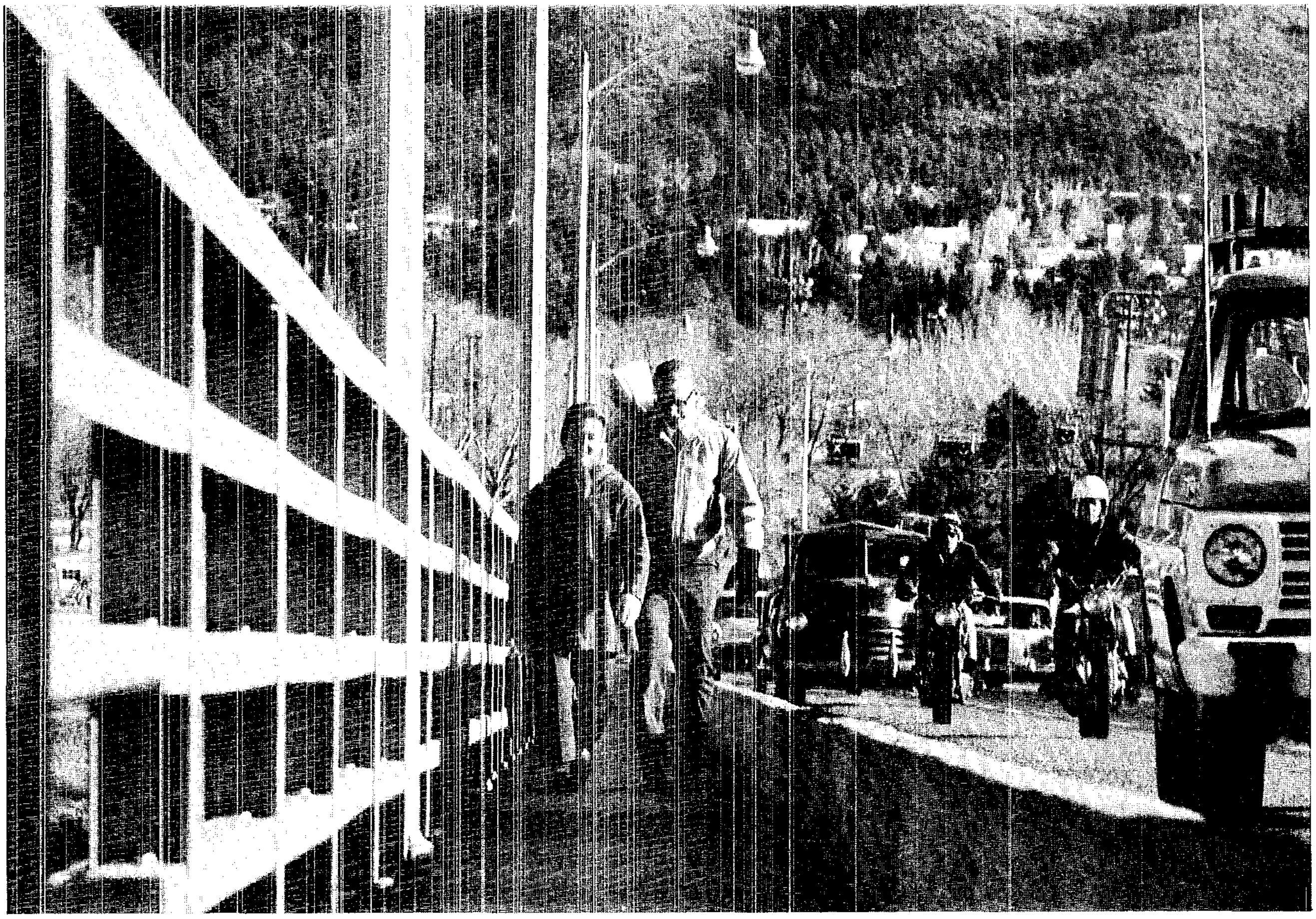
Going to work is

A Family Affair



The Jacobys cross over the high bridge on the way to the Laboratory.

About 7:30 each workday morning, a man and wife, carrying their infant daughter, walk across the traffic-congested Diamond Drive-Jemez Road intersection and then up to the front door of the Administration building at the Los Alamos Scientific Laboratory.

The man enters the building and his wife and child return by the route from whence they came. About 5:15 in the evening, the woman and child return to the Administration building where they are rejoined by the man.

The man is Jerome Jacoby, W-4. For him, his wife, Sally, and daughter, Theresa (Tracy) Ann, going to and from work is really a family affair.

"I walk to work because I need the exercise to keep my weight down," said Jacoby. "Sally is a member of a hiking club and simply enjoys walking."

Sally has been walking to and from work with her husband most of the time since they bought a house in the Western Area in September of 1968. "When Tracy was born July 15, 1969, we just took her along with us," Jacoby said.

At first, Tracy was carried to work on a plastic seat. Soon, however, she was too heavy to carry on the seat and it was replaced by a buggy and later a stroller. To protect Tracy from the elements, Sally made a plastic cab to fit over the stroller. The latest means of transportation is a back pack.

"We live at 678 44th Street," Jacoby said. "It's about a mile from our home to the Administration building where I work. We leave home around 7:20 or 7:30 in the morning when the traffic is light. Crossing the intersection (Diamond-Jemez) below the Administration building is the most hectic part of our walk. But the best part is the stroll through the woods east of the Administration building parking lot."

The Technical Side

Presentation at William Hunt Eisenman Conference on "Metal Matrix Composites" Philadelphia, Pa., Feb. 26:
"Manufactured Polycrystalline Graphites as Composites" by M. C. Smith, CMF-13

Presentation at seminar at Oklahoma State University, Stillwater, Feb. 26:
"The Transition Elements to Z 104. Properties of Some Compounds" by R. Penneman, CMF-4

Presentation at Metal and Ceramics Division Special Seminar, Oak Ridge National Laboratory, Tenn., Feb. 27:
"Design and Development of Heat Pipes for Thermoelectric Application" by J. E. Kemme, N-5 (invited)

Commencement address at the Milwaukee School of Engineering, Wisc., Feb. 27:
"The Engineer's Challenge in Today's Scientific and Technological World" by G. H. Tenney, Dir. Off. (invited)

Presentation at meeting of the American Crystallographic Association New Orleans, La., March 1-5:
"On the Structure of $Y_2Zn_{\sim 9}$ and Related Compounds" by D. T. Cromer and A. C. Larson, both CMF-5
"Pentaerythritol Tetranitrate II, Its Crystal Structure and Transformation to PETN I" by H. H. Cady, GMX-2
"The Crystal Structure of 1, 3, 7-Cyclodecatriene-5-10-Dione, A Discussion of Structure Solution Methods and Refinement Results" by A. C. Larson, CMF-5, and O. Kennard, W. D. S. Motherwell, D. G. Watson, J. Coppola, and D. Wampler, all of the University Chemical Laboratory, Cambridge, England

Presentation at seminars at Ohio State University, Columbus, March 3, and Pennsylvania State University, University Park, March 5:
"Repair of Ultraviolet Light-Damaged DNA in Haemophilus Influenzae" by G. J. Kantor, H-4 (invited)

Presentation at colloquium, Rice University, Houston, Texas, March 4:
"Initial Experiments With the Los Alamos Polarized Ion Source" by G. G. Ohlsen, P-DOR (invited)

Presentation at colloquium, Mechanical Engineering Department, Arizona State University, Tempe, March 6:
"Nuclear Electromagnetic Propulsion" by T. F. Stratton, N-5 (invited)

Presentation at seminar, Stanford University, Palo Alto, Calif., March 10:
"The Transition Elements to Z 104. Properties of Some Compounds" by R. A. Penneman, CMF-4

Presentation at colloquium, Department of Physics, New Mexico State University, Las Cruces, March 10:
"Magnetic Resonance and Optical Studies of Uranium(+5) Compounds" by H. G. Hecht, CMF-2 (invited)

Presentation at the University of Texas, Department of Biochemistry, Arlington, March 10-11:
"Structure Function Relationships of Transfer RNA" by A. E. Hampel, H-4 (invited)

Presentation at seminar, Purdue University, Lafayette, Ind., March 10:
"Difficulties in Making Accurate Theoretical Calculations of Atomic Transition Probabilities" by R. D. Cowan, T-DOT

Presentation at the 12th Scintillation and Semiconductor Counter Symposium, Washington, D.C., March 11-13:

"An Investigation Into the Harms Dead Time Correction Procedure for Pulse Height Analyzers Using Monte Carlo Modeling Techniques" by C. F. Masters, University of Missouri and L. V. East, N-6

Presentation at colloquium, Purdue University, Lafayette, Ind., March 12:

"The Production and Utilization of Intense Beams of Pions and Muons" by L. Rosen, MP-DO

Presentation at colloquium, University of Toledo, Ohio, March 12:

"Difficulties in Making Accurate Theoretical Calculations of Atomic Transition Probabilities" by R. D. Cowan, T-DOT (invited)

Presentation at colloquium, Indiana University, Bloomington, March 13:

"The Los Alamos Meson Physics Facility and Its Application to Basic Research and Applied Technology" by L. Rosen, MP-DO

Presentation at Chico State College, Physics Department, Chico, Calif., March 13:

"Time-of-Flight Neutron Cross-Section Measurements Using Nuclear Explosions" by W. K. Brown, P-3 (invited)

Presentation at seminar for graduate students in Nuclear Engineering, University of New Mexico, Albuquerque, March 13:

"The Thermal Conductivity of Uranium-Plutonium Carbides" by K. W. R. Johnson and J. F. Kerrisk, both CMB-11

Presentation at colloquium, Department of Physics, New Mexico State University, Las Cruces, March 17:

"Atomic and Energy Band Calculations Employing the Statistical Model of Exchange" by J. H. Wood, CMF-5 (invited)

Presentation at Sandia Corporation Research Colloquium, Albuquerque, March 18:

"Polymorphism in Liquid Water?" by S. W. Rabideau, CMF-2 (invited)

Presentation at seminar at New Mexico State University, Las Cruces, March 19:

"Carbon-13 as an Ecological Tracer" by E. S. Robinson and B. B. McInteer, both CMF-4 and C. Gregg, H-4

Presentation at the International Atomic Energy Agency Headquarters, Vienna, Austria, March 20:

"Reactor Accident Calculations" by W. R. Stratton, D. M. Peterson, and L. B. Engle, all N-2 (invited)

Presentation at conference on the Physics of Semimetals and Narrow Gap Semiconductors, Dallas, Texas, March 20-21:

"Lattice Dynamics of Bismuth" by R. E. MacFarlane, P-2

Presentation at the American Cancer Society's 12th Seminar for Science Writers, San Antonio, Texas, March 20-25:

"Mesons, Malignancy, and Money" by W. H. Langham, H-4 (invited)

Presentation at Symposium on Dynamics of Nuclear Systems, University of Arizona, Tucson, March 23-25:

"Coupled Region Kinetics Formulations" by D. R. Harris, T-DOT and R. G. Fluharty, P-DOR (invited)

Presentation to the American Institute of Aeronautics and Astronautics Student Chapter, Texas A&M, College Station, March 23:

"Historical Review of the Los Alamos Rover Program" by C. W. Watson, N-2 (invited)

Presentation at seminar at the University of Texas, Dallas, March 23:

"Coronal Observations in the 1970 Solar Eclipse" by D. H. Liebenberg, CMF-9

Presentation at American Physical Society Meeting, Dallas, Texas, March 23-26:

"Thin Film Superconductors as Sensitive Thermometers" by D. H. Liebenberg, CMF-9 and L. D. F. Allen, CMF-4

"Comparison of Theoretical With Experimental P-N Junction Recombination Effects" by C. L. Wilson and S. J. Brient, both C-7

"Anomolous Recombination in P-N Junctions" by S. J. Brient and C. L. Wilson, both C-7

"Molecular Beam Kinetics: The Differential Reaction Cross Section of the Reaction $Cl + I_2$" by J. B. Cross and N. C. Blais, both CMF-4

"Dispersion Curves for Phonons in Potassium Fluoride and Calcium Oxide" by J. L. Warren and T. G. Worlton, both P-2

"Lattice Dynamics of Thallium" by T. G. Worlton, P-2

"Magnetic Properties of Terbium Indium 3, Holmium Indium 3 and Terbium Platinum 3" by N. G. Nereson and G. P. Arnold, both P-2

Presentation at Conference on Small Accelerators for Teaching and Research, Oak Ridge, Tenn., March 23-25:

"Use of Small Accelerators in Nuclear Safeguards Research" by A. E. Evans, N-6 (invited)

Presentation at Health Physics Society Meeting, Los Alamos, March 26:

"Nondestructive Testing Capabilities of Group GMX-1" by D. E. Elliott, GMX-1

Presentation at seminar at Utah State University, Logan, March 30:

"Unusual Features in the Behavior of the Rare Earth Carbides" by N. H. Krikorian, CMB-3 (invited)

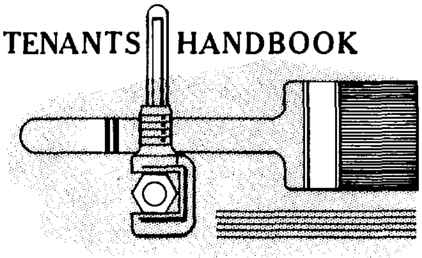
Presentation at East Tennessee Chapter Meeting of the Health Physics Society, Oak Ridge, Tenn., March 30:

"Biological and Medical Potential of Negative Pions" by W. H. Langham, H-4 (invited)

Presentation at Physics Seminar, University of Houston, Texas, March 31:

"Biomedical Applications of the Los Alamos Meson Physics Facility" by L. Rosen, MP-DO

20 years ago in los alamos



Culled from the May, 1950, files of the Los Alamos News by Robert Porton

Tenant's Handbook Being Prepared

A major goal of the new "Tenant's Handbook" being written by Atomic Energy Commission and Zia Company representatives, is to equalize the services being provided to all Los Alamos homemakers and "to put down on paper who pays for what and why." After July 1, the services which the Zia Company will provide without charge will still include "normal" landlord items, but the tenant who insists on a personal handyman will pay the cost of the man and his work. The government will continue to take care of "protective maintenance" and make repairs necessitated by "ordinary wear and tear," but if a tenant's dog chews a hole through a wall, the tenant will have to stand the cost of repairs.

Brush Fire Near North Community

Excitement ran high in the North Community when fire was discovered in the brush and timber on a nearby Jemez slope. Some 100 firefighters, including contractors' employees and other volunteers, responded and succeeded in preventing the flames from spreading into the residential area. Thick smoke poured from the scene and was visible from a considerable distance. Cause of the fire is unknown.

36 Construction Projects Announced

The Atomic Energy Commission's Engineering and Construction Division announced that 36 general projects totaling about $25,000,000 are scheduled to be awarded before June 30. New construction includes community buildings such as homes, apartments, schools and business stores; utilities to include warehouses, streets, a bridge, extension of the water system and electrical works; and new Los Alamos Scientific Laboratory area structures and facilities.

Military and AEC Officials Visit Los Alamos

Civilian officials and officers of the nation's military establishment and from the AEC visited Los Alamos for orientation and conferences. Brigadier General James McCormack, Jr., director of the Commission's Military Application Division, and members of his staff, remained several days. Undersecretary of the Navy D. A. Kimball was also at the Laboratory for a brief visit. Others who came to the Hill included A. S. Alexander, assistant secretary of the army; H. C. Stuart, assistant secretary of the Air Force; William Webster, chairman of the Research and Development Board; Major General K. D. Nichols, chief, Air Force Special Weapons Project; and Lieutenant Colonel A. W. Betts, Research and Development Board.

what's doing

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leader for information regarding specific hikes.
- May 14—Evening hike—Dibbon Hagar, 622-6209
- May 20—Evening hike—Ken Ewing, 662-7488
- May 23—Rattlesnake Ridge—Dibbon Hagar, 662-6209

LOS ALAMOS FILM SOCIETY: May 27—"Hamlet," Civic Auditorium, 7:30 p.m. Admission: members—$.75; others, $2.00. (dialogue in English)

RIO GRANDE RIVER RUNNERS: Meetings scheduled for noon, second Tuesday of each month at South Mesa Cafeteria. For information call Cecil Carnes, 672-3539.

NEWCOMERS: May 20, 7:30 p.m., Los Alamos National Bank—panel discussion on Los Alamos County (Del Sundberg, council chairman; Carol Roberts, council member; Paul Noland, county administrator; George Brenner, planning director; Joseph Carroll, superintendent of schools). For information call Judy Ware, 662-5745.

MOUNTAIN MIXERS SQUARE DANCE CLUB: For information call Mrs. Alice Wynne, 662-5964.
- May 16—Harry "Bones" Craig, caller, 8 to 11 p.m., Canyon School

MESA PUBLIC LIBRARY: April 3 to May 21—lapidary exhibit—Frank Miley
- May 12 to June 1—ojos—Anne Lindsay
- May 22 to June 15—children's book exhibit

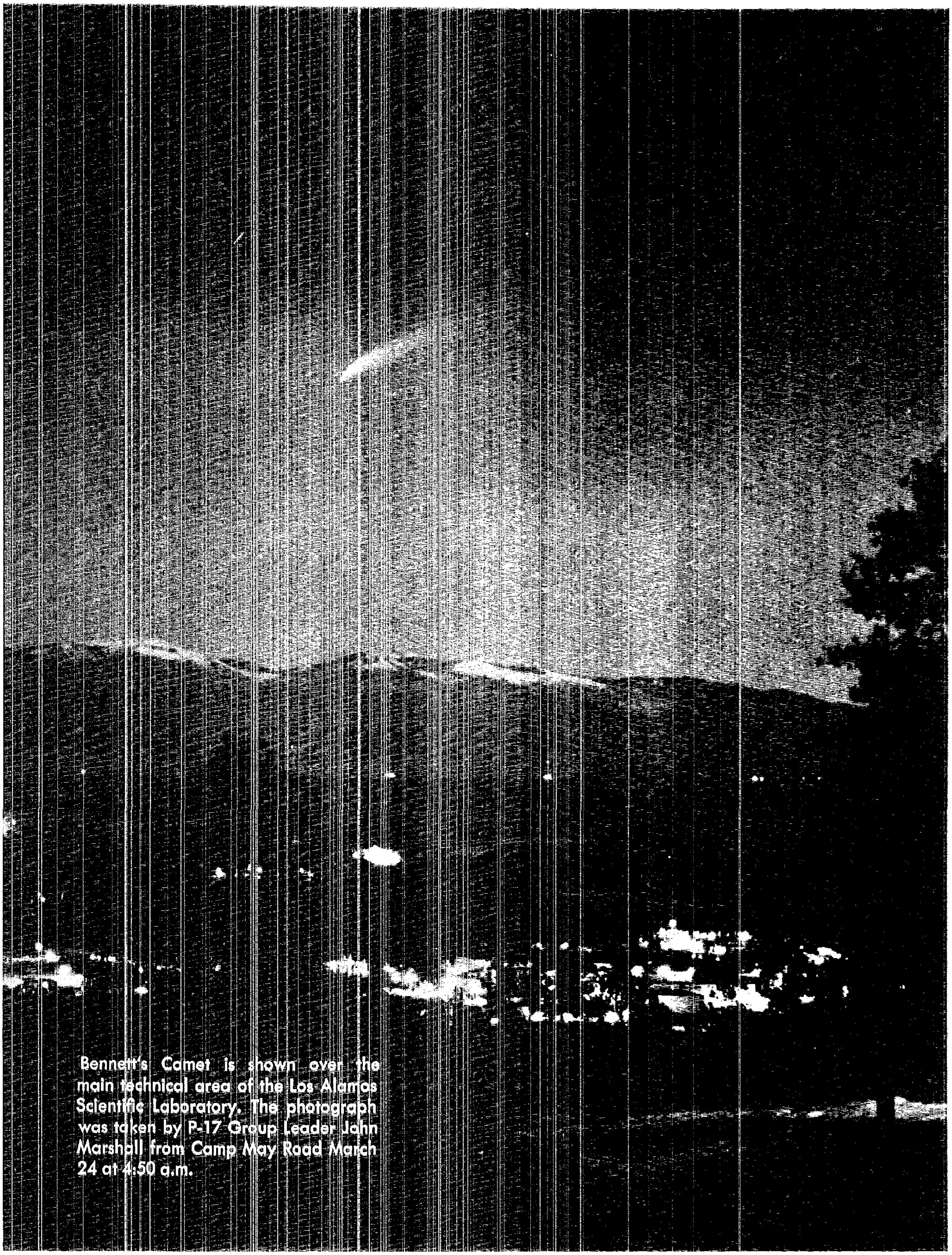
INTERNATIONAL FOLK DANCERS: May 12, 8 p.m., Civic Auditorium: Balkan dancing and music, Duquesne University Tamburitzans. Admission: adults $3; students, $1.50.

LOS ALAMOS ARTS COUNCIL:
- May 24, Fuller Lodge, 7:30 p.m., local folksingers.
- May 25-31, entries will be received at Fuller Lodge from 9 a.m. to 6 p.m. for paintings and graphics competition. Four prizes of $100 will be awarded. Works will be exhibited for purchase June 13-20.

PUBLIC SWIMMING: High School Pool—Mondays through Wednesdays, 7:30 to 9 p.m.; Saturdays and Sundays, 1 to 6 p.m.; Adult Swim Club, Sundays, 7 to 9 p.m. Pool will be closed May 18 through May 22.

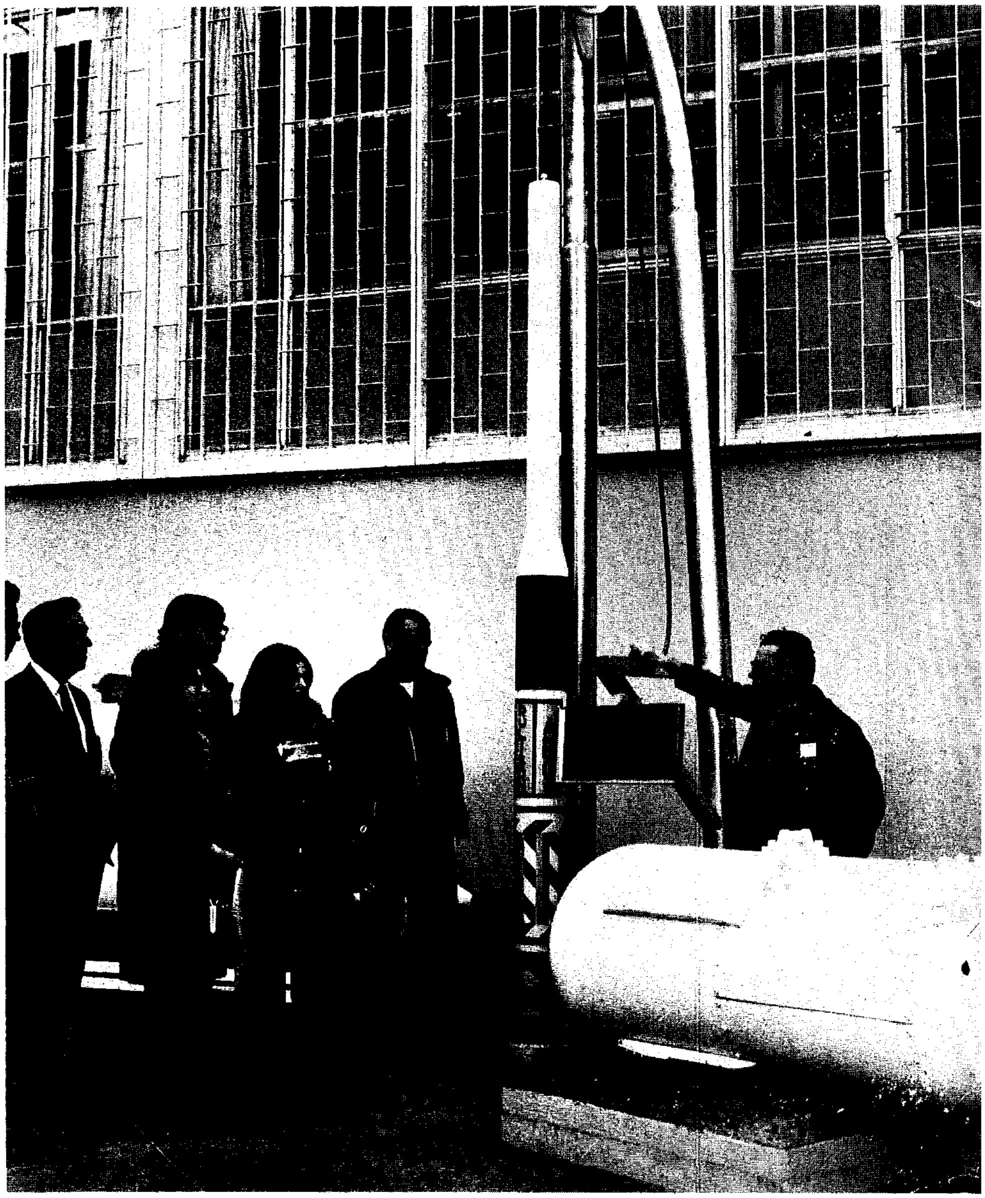
SIERRA CLUB: Luncheon meeting at noon, first Tuesday of each month, South Mesa Cafeteria. For information call Brant Calkin, 455-2468.

CHORAL SOCIETY: Concert, May 10, 7:30 p.m., Immaculate Heart of Mary Catholic Church, "Bach's St. Mathew's Passion," adults, $1.50; students, $.75.



Bennett's Comet is shown over the main technical area of the Los Alamos Scientific Laboratory. The photograph was taken by P-17 Group Leader John Marshall from Camp May Road March 24 at 4:50 a.m.

Henry T. Motz
3187 Woodland
Los Alamos, New Mexico 87544



Carl Cuntz, PUB-2, right, explains the recently installed Rulison exhibit to a group of visitors touring the Los Alamos Scientific Laboratory's Science Museum and Exhibit Hall. Project Rulison, an experiment conducted in Colorado to determine the feasibility of increasing recovery of natural gas by using nuclear explosives, took place Sept. 10, 1969. It was LASL's first major entry in the Atomic Energy Commission's Plowshare Program for finding peaceful uses for nuclear explosives.