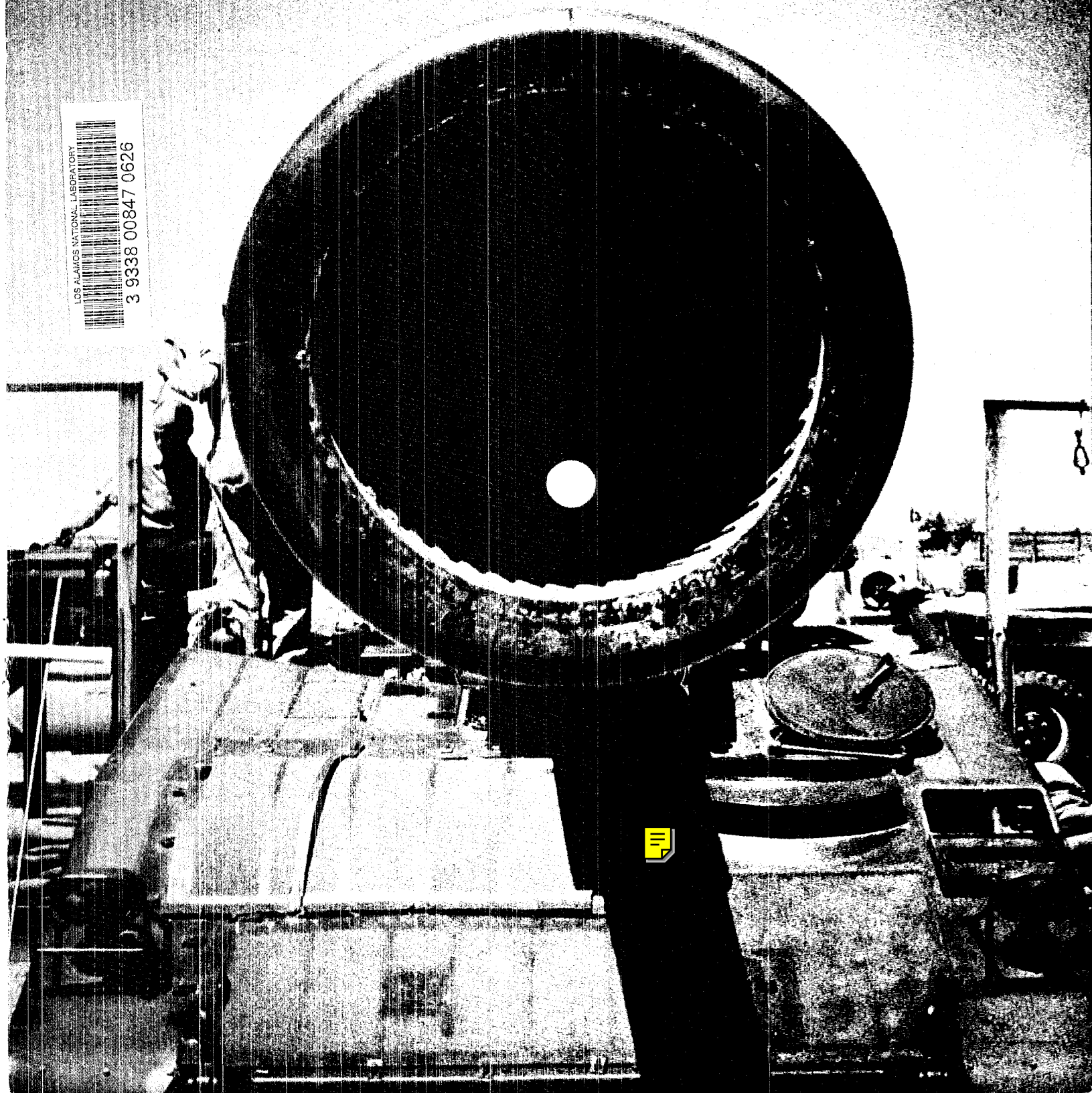
THE ATOM

Los Alamos Scientific Laboratory



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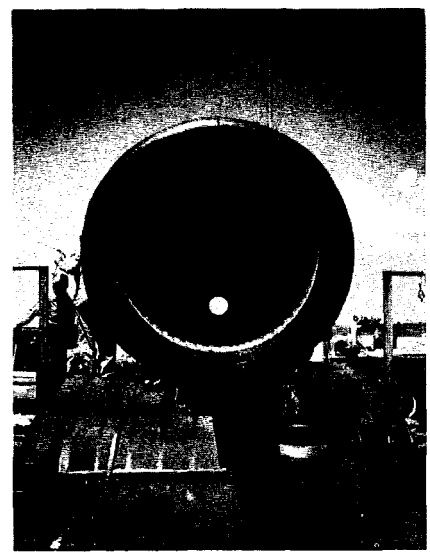
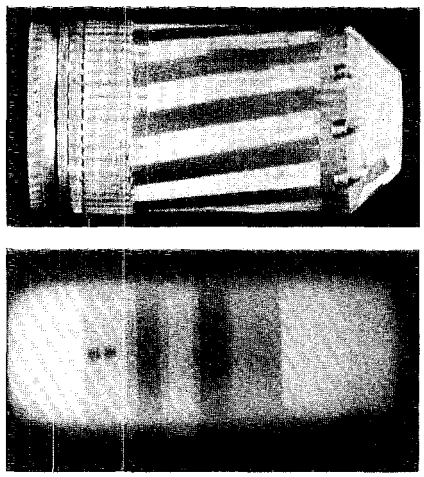


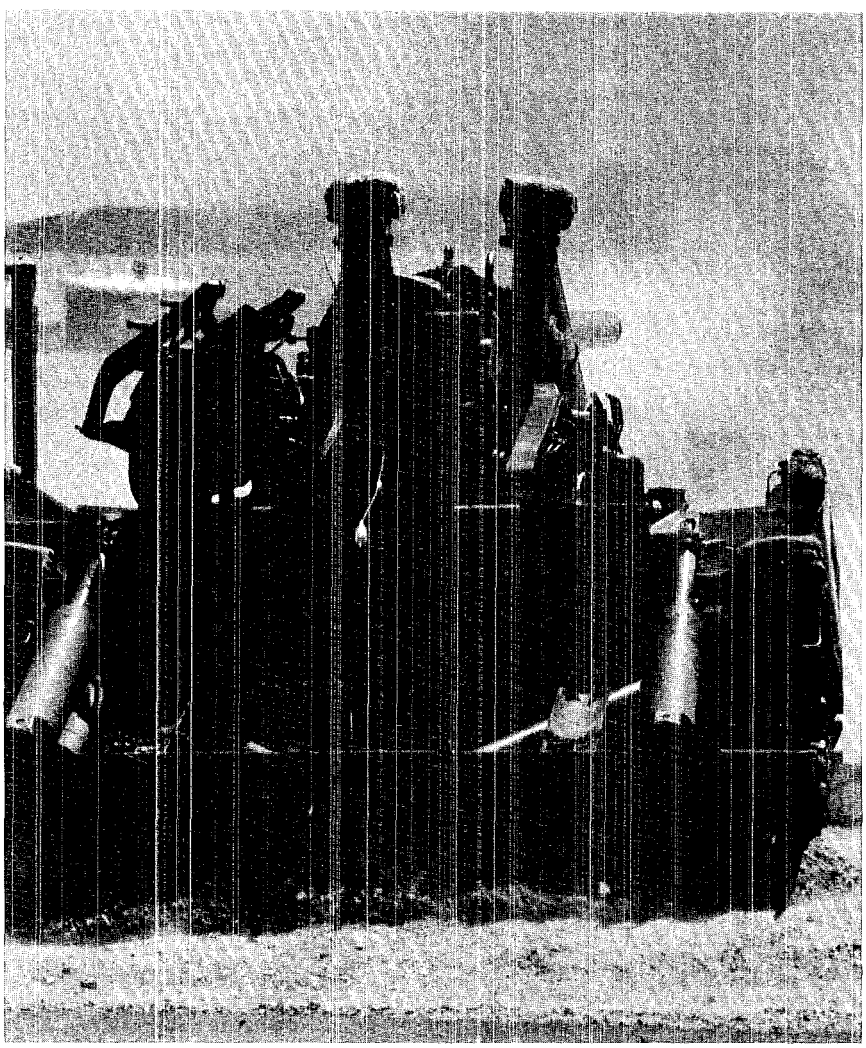
COVER:

Looking down the business end of the 175mm self-propelled gun used by W-3 in testing artillery-type projectiles of new design, ISD-7 Photographer Bill Jack Rodgers took the picture that decorates the cover of this edition of The Atom. The picture is related to the story, "Stopping the Motion," which begins on page one.

Stopping the Motion



At top is a photograph of the 175mm projectile in flight taken by W-3's Photographic section. The bands on the surface appear to be slanted because of the rotation of the projectile. Above is a radiograph of the same projectile, taken by the GMX-1 Radiography section.



Both camera and gun were triggered simultaneously by remote controls from an instrumented bunker to get this photograph of the 175mm gun firing a projectile.

What can happen to an artillery round of new design from the time its primer is ignited until it reaches its target is best not determined on the battlefield. There are economy reasons for this, but more importantly there are the lives of friendly troops at stake—at the gun emplacements where the round is fired and on the front lines over which it passes on the way to its target.

An artillery round is torn from a state of rest by the resounding and explosive force of its propellant charge. A rapid steadying spin is imparted to the projectile as it progresses through the rifled (spirally grooved) gun barrel and almost instantaneously its forward motion is accelerated to speeds of 2,000 to 3,000 feet per second.

Providing the assurance that projectile components of new design will hold together under such punishing acceleration loads as these involves some interesting detective work. One trick is to look at projectiles while they are in flight.

For several years the Los Alamos Scientific Laboratory has used spe-

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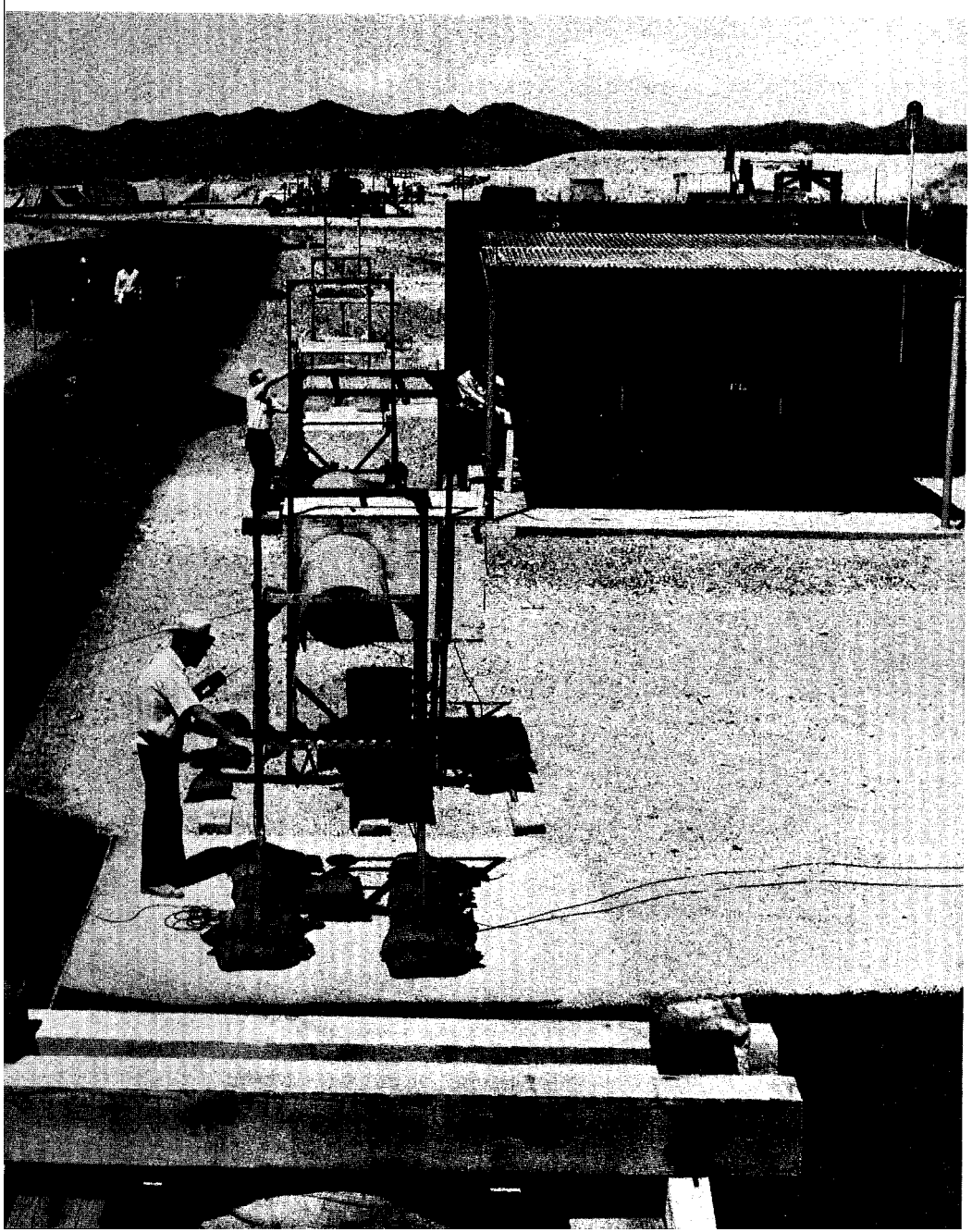
cialized photographic techniques to determine the integrity of external components of projectiles in flight. More recently it has added flash x-ray techniques to its detection system to observe internal components as well.

Some design and development work in connection with certain nuclear weapons that are to be exposed to high rates of acceleration is the responsibility of Group W-3 at LASL. The group, headed by John Dougherty, also conducts field tests of new concepts, and its photographic section, headed by Paul Giles, is responsible for in-flight photography. Radiographing the projectiles in flight is done by GMX-1's Radiography section, led by Larry Bryant, with the assistance of Ron London.

Looking toward the gun from the target area can be seen a series of velocity screens, a photo chamber in which stop-motion cameras are mounted, the flash x-ray machine at upper right, and film-image-synchronized cameras on the road at left.



Giles' section has been photographing projectiles in flight since 1964. Its members use three methods of obtaining in-flight photographs of artillery-type projectiles: (1) high-speed framing photography; (2) film-image-synchronized photography; and (3) stop-motion flash photography.

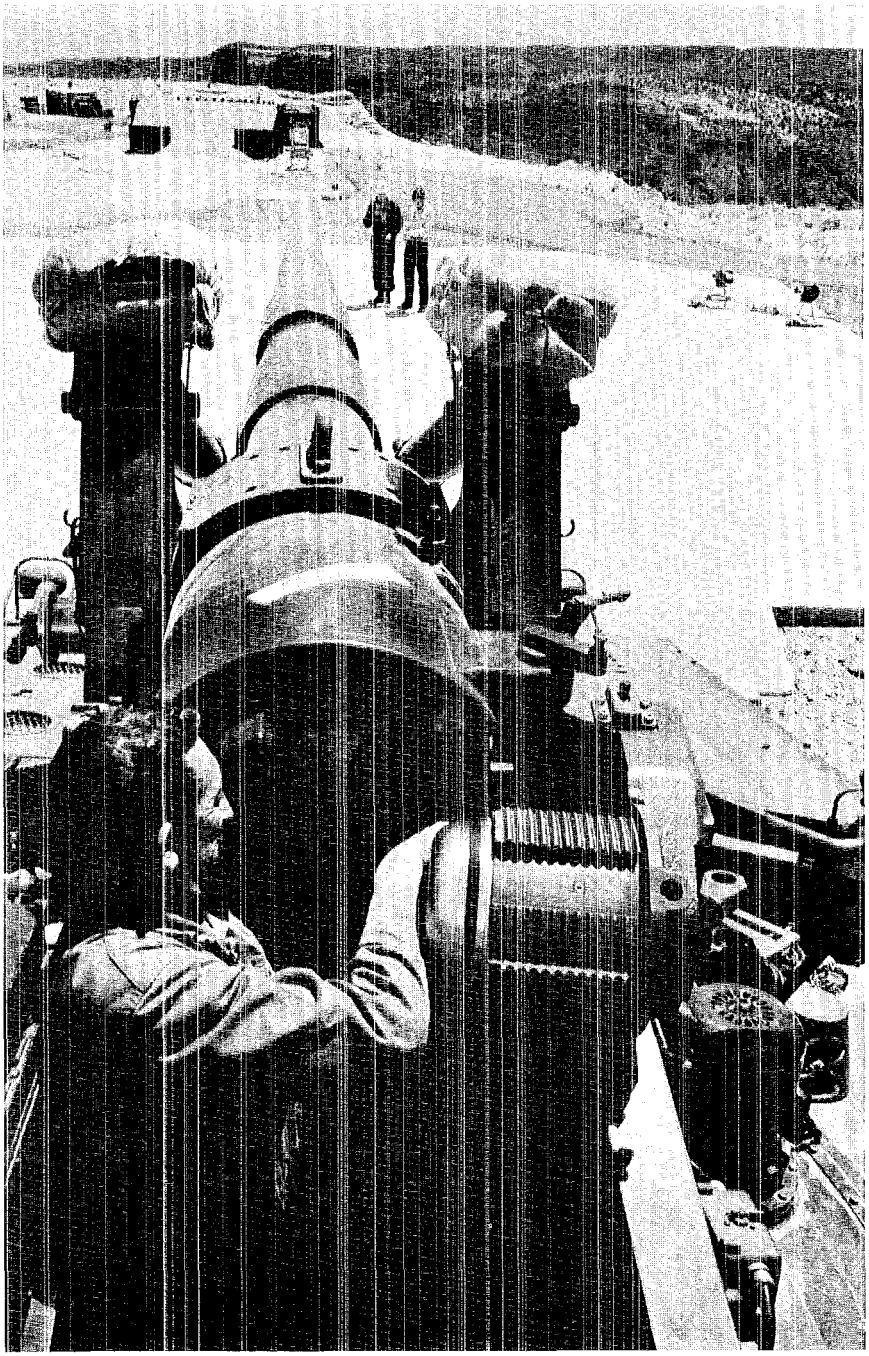
High-speed framing photography is commonly used at several research and development installations around the country, including LASL. In W-3, however, commercially-built motion-picture cameras are used to keep projectiles under surveillance all the time they are in flight to show any gross failures.

The cameras are positioned adjacent to the projectile line-of-flight. They are operated by timers which are turned on in the instrumented control bunker to the rear of the firing range just prior to firing a projectile.

The Photographic section has pioneered in the simplification of the other two photographic methods employed by W-3 and is continually improving both instrumentation and techniques for their use. One of the section's most important contributions to in-flight photography of artillery-type projectiles is in film-image-sychronized photography. Through the years the section has developed a light-weight, self-contained, radio-controlled camera system which takes a single high-resolution picture of a projectile in flight. By spacing camera units of this type along the projectile line-of-flight, several photographs of a projectile can be taken.

The camera carries a 12-inch strip of film which is looped around a drum. A signal from the radio control system causes the drum to rotate. A pressure-switch, placed ahead of the photographic target area and actuated by the projectile shock-wave, triggers the camera shutter as the projectile passes through the target area.

When even closer and more de-



Merced Lopez, W-3, makes some repairs on the breach of the 175mm gun. The flash x-ray machine is behind the bunker at left of the gun barrel downrange. At right on the cement pad are a pair of high-speed framing cameras.

tailed surface definition is required, stop-motion photography is employed. This method requires more time to set up and there is greater risk of damage to camera equipment, but it is most effective in "stopping" the spin of a projectile.

In the stop-motion method, a light source is placed inside a light-tight chamber through which the projectile passes. The chamber is a plywood box through which a nine-foot-long by 22-inch diameter steel tube is mounted. A window cut in the tube opens it to the inside of the box, and the cameras are placed on a shelf just outside this window.

With this photographic method it is the duration of light which stops the motion of the projectile rather than the camera shutter. When the light source discharges it illuminates the interior of the chamber for a mere two millionths of a second, while the camera shutters are open.

Two types of cameras developed by the W-3 photographic section are generally used in the stop-motion method. These are ruggedly-built plate cameras and radio-controlled drum-film-image-synchronized cameras. The drum-film-image-synchronized cameras resemble the film-image-synchronized cameras with some exceptions, including wider angle lenses for close-up pictures and corrector lenses to compensate for film curvature inside the drum.

The chamber is placed in the line-of-flight so the projectile passes through the steel tube. Pressure switches actuated by the projectile shock wave trigger both the flash unit and camera shutters.

With these specialized photographic methods, W-3 obtains quality photographs of the exterior of artillery-type projectiles in flight.

The flash x-ray machine used by GMX-1 was purchased from the Field Emission Corporation of McMinnville, Ore. Although more elaborate and powerful than those used in medicine to photograph in-

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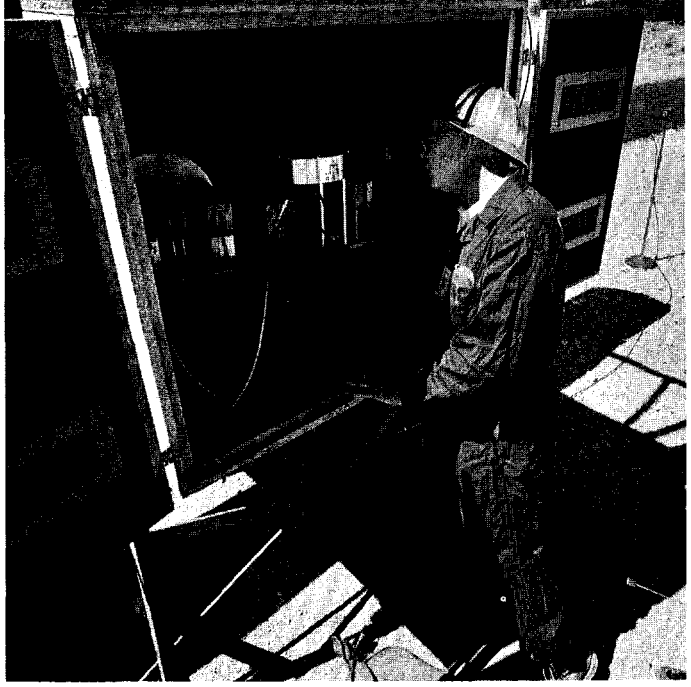
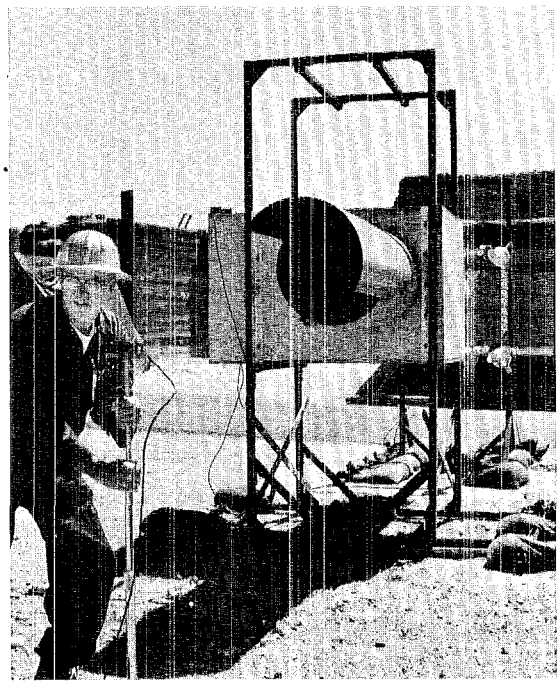
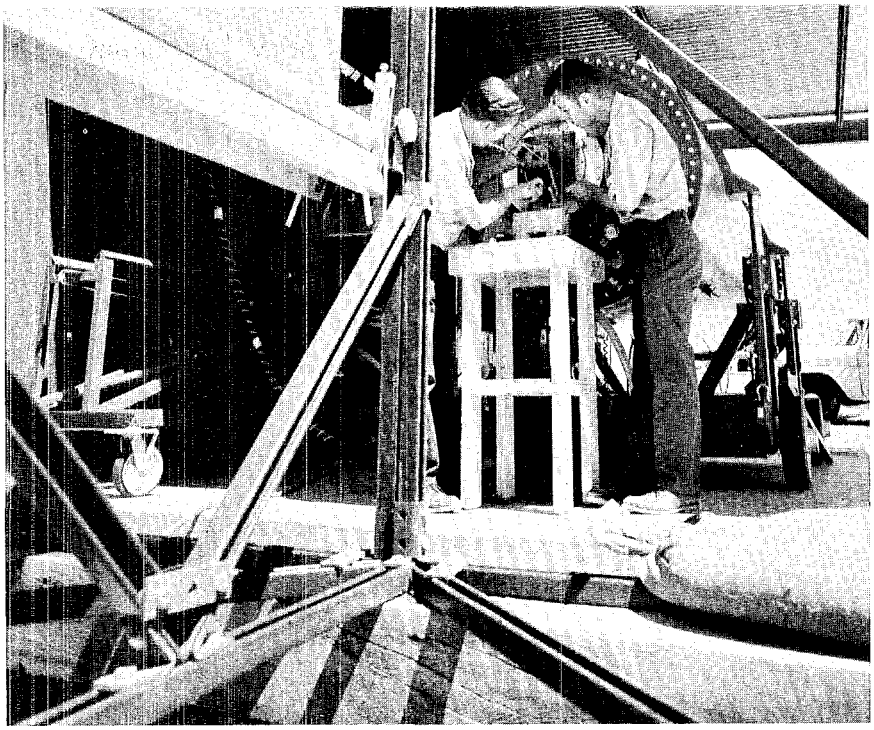


W-3 Photographic Section Leader Paul Giles makes adjustments on camera equipment in the photo chamber.

Thomas Harlow, W-3, holds a cigarette lighter at the center of a velocity screen for Giles to focus one of the remote controlled film-image-synchronized cameras.

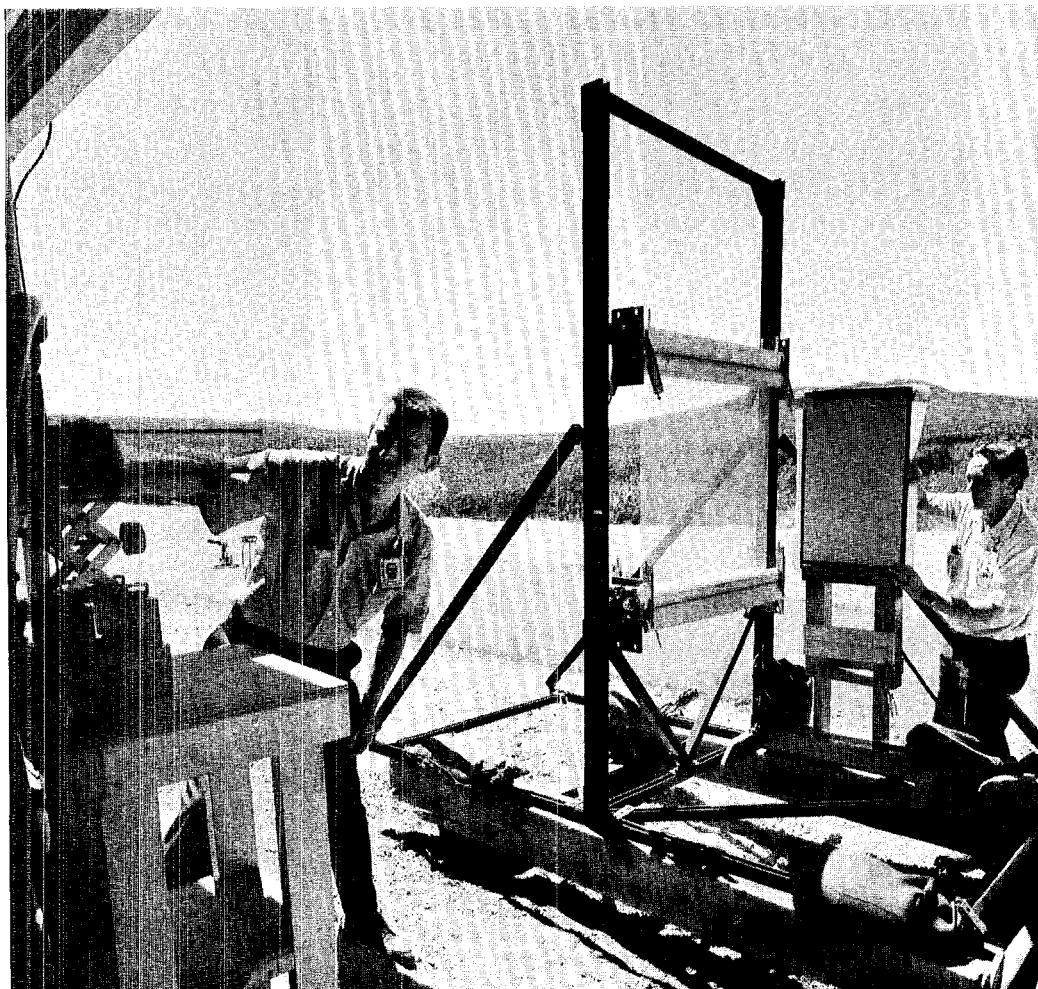


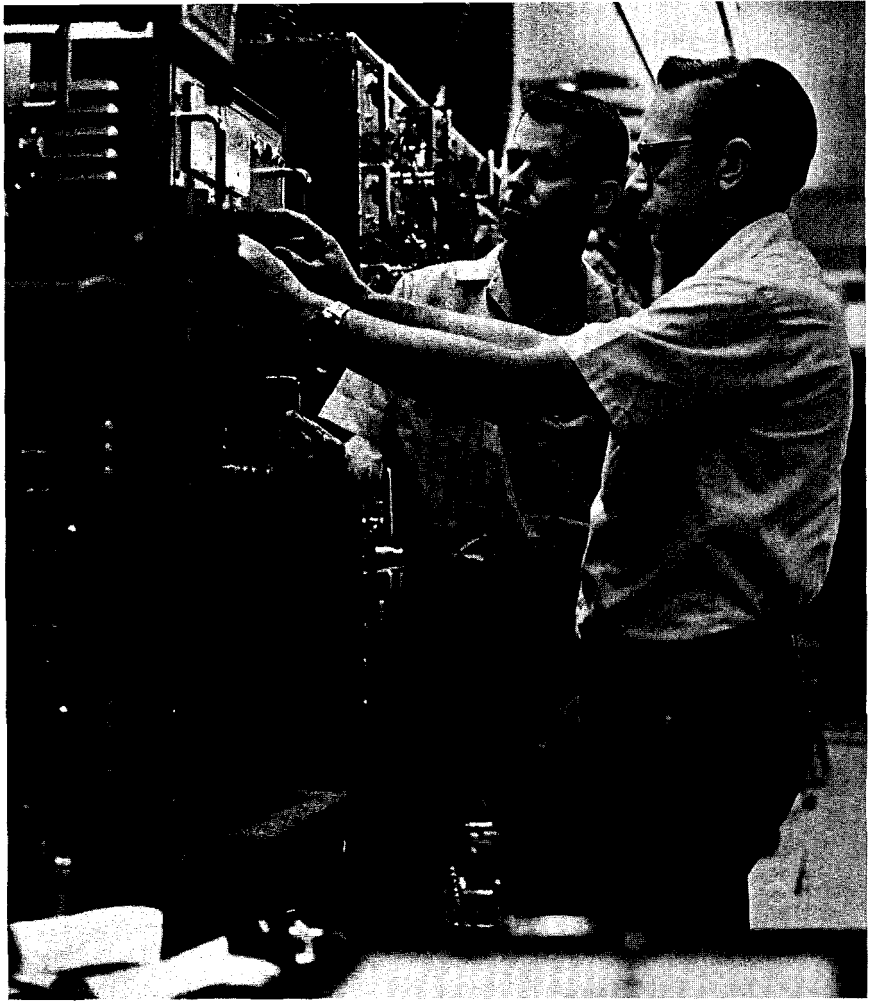
At top, Giles positions a pressure switch that will trigger cameras inside the photo chamber behind him. Above, Harlow and Giles position film-image-synchronized cameras adjacent to the path the 175mm projectile will follow when the gun is fired.



Ron London of the GMX-1 Radiography section, and Section Leader Larry Bryant, ready the flash x-ray machine for the projectile test.

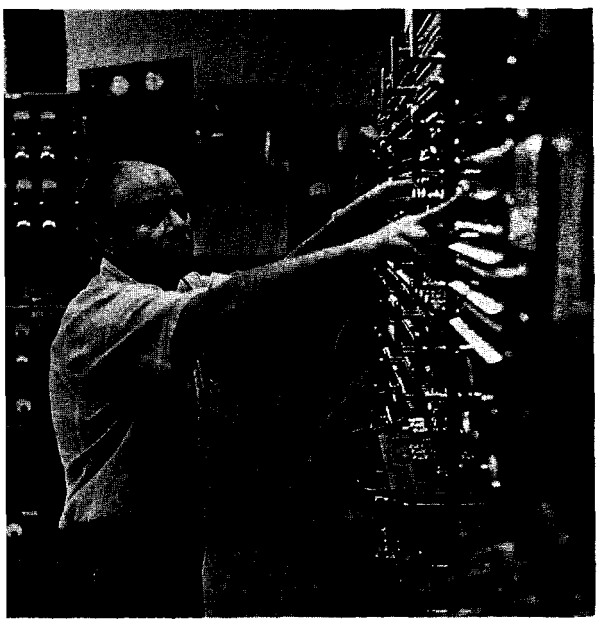
Bryant and London align the x-ray machine with the film holder. To the left of the film holder is the screen which, when struck by the projectile, triggers the machine.





Bryant and London charge the x-ray machine from an instrument panel within the control bunker.

Johnnie Salazar, W-3, pushes the button on a panel in the control bunker which fires the gun.



ternal organs of the body, the GMX-1 machine serves a similar purpose. It takes a picture—a shadow image of the variations in transparency of a projectile to radiation. This picture is called a radiograph.

The prefix word "flash," denotes short bursts of the penetrating radiation. It accelerates short high-current bunches of electrons to a peak energy of 2,300 kilovolts. These electrons strike a tantalum target in which some of them are converted to x rays.

The flash x-ray unit is positioned adjacent to the projectile line-of-flight, downrange from the gun emplacement behind a sand-filled bunker. On the other side of the line-of-flight is placed a holder which contains a sheet of film on which the image of a projectile's internal components are recorded.

The pulse of x rays is synchronized with the passing of a projectile by an electrical signal emanating from a velocity screen. A velocity screen consists of two planes of electrically charged wires. On one plane the wires are strung vertically and on the other they run horizontally. The screen is placed in the projectile line-of-flight. After being fired, the projectile strikes one plane of wires and drives it into the other, causing a short circuit which in turn triggers the flash x-ray machine.

Prior to using flash radiography, determining how well internal components of new design fared was a tedious matter of recovering the projectile from the berm into which it was fired. Its parts were then thoroughly examined by W-3 experts who could attribute any failures to either high acceleration loads during firing or to rapid slowing in the berm. In combination, photography and radiography make a hard team to beat in giving scientists rapid and foolproof information on the validity of projectile components of new design.

Of Service to Education

Laboratory Director Harold Agnew addresses LASL officials and New Mexico college and university representatives at a meeting in Los Alamos to explore areas of mutual cooperation.

New Mexico college and university presidents or their representatives met recently with officials of the Los Alamos Scientific Laboratory to explore possible future areas of mutual cooperation.

The meeting was suggested by Laboratory Director Harold Agnew who believes that LASL can be of greater service to the state's educational facilities. There have been ties between the Laboratory and some of New Mexico's educational institutions for many years, such as through the University of New Mexico Graduate Center in Los Alamos, the LASL-New Mexico State University Undergraduate Cooperative Program, and the Associated Western Universities Nuclear Science Fellowship Program. But, the recent meeting called by Agnew marked the first time in which the Laboratory has taken the initiative to search for ways to assist in educational programs of all the four-year degree-granting institutions of the state.

The director told the educational leaders the Laboratory was willing to share some portion of its wealth of facilities, equipment, qualified people, and scientific activities within limitations such as those imposed by LASL's contract with the AEC, security, budget restrictions, and the program requirements of the Laboratory.

Agnew introduced several LASL division leaders and department heads who described unclassified activities at the Laboratory where cooperative efforts might be launched. These were Henry Motz, P-division; Louis Rosen, MP-division; Dr. George Voelz, H-division; L. Philip Reinig, Engineering department; and George Cowan, CNC-division.

Informal discussion ranged over a wide field of subjects including: how the Laboratory's facilities could be used to motivate students, especially in areas where it is difficult for them to gain work experience; how visits to LASL and use of its facilities can be included in a planned seminar along with advanced preparation and homework; the possibility of student and faculty use of facilities during weekends and during vacations; time required for students to gain useful

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MP-Division Leader Louis Rosen talks with Harold Daw, vice president of New Mexico State University.

LASL and education officials held further discussions on areas where mutual cooperation might be effected while inspecting the Norris E. Bradbury Science Hall.

experience in areas of interest; the possibility of granting credit for seminars at LASL as substitutes for a portion of regular academic work on campus; the possibility of lectures by qualified scientists to supplement normal classroom instruction, scientists with teaching capabilities to instruct students interested in specific scientific topics and scientists to help in the design of scientific apparatus for student or faculty laboratory work; the possibility of faculty members using LASL facilities to further their own research interests; how insurance and housing for visitors would be handled; and the problems of safety and security in some areas.

Agnew asked the educational leaders to continue thinking about ventures of interest to their institutions and LASL. He told them the Laboratory welcomes the opportunity to consider specific proposals.

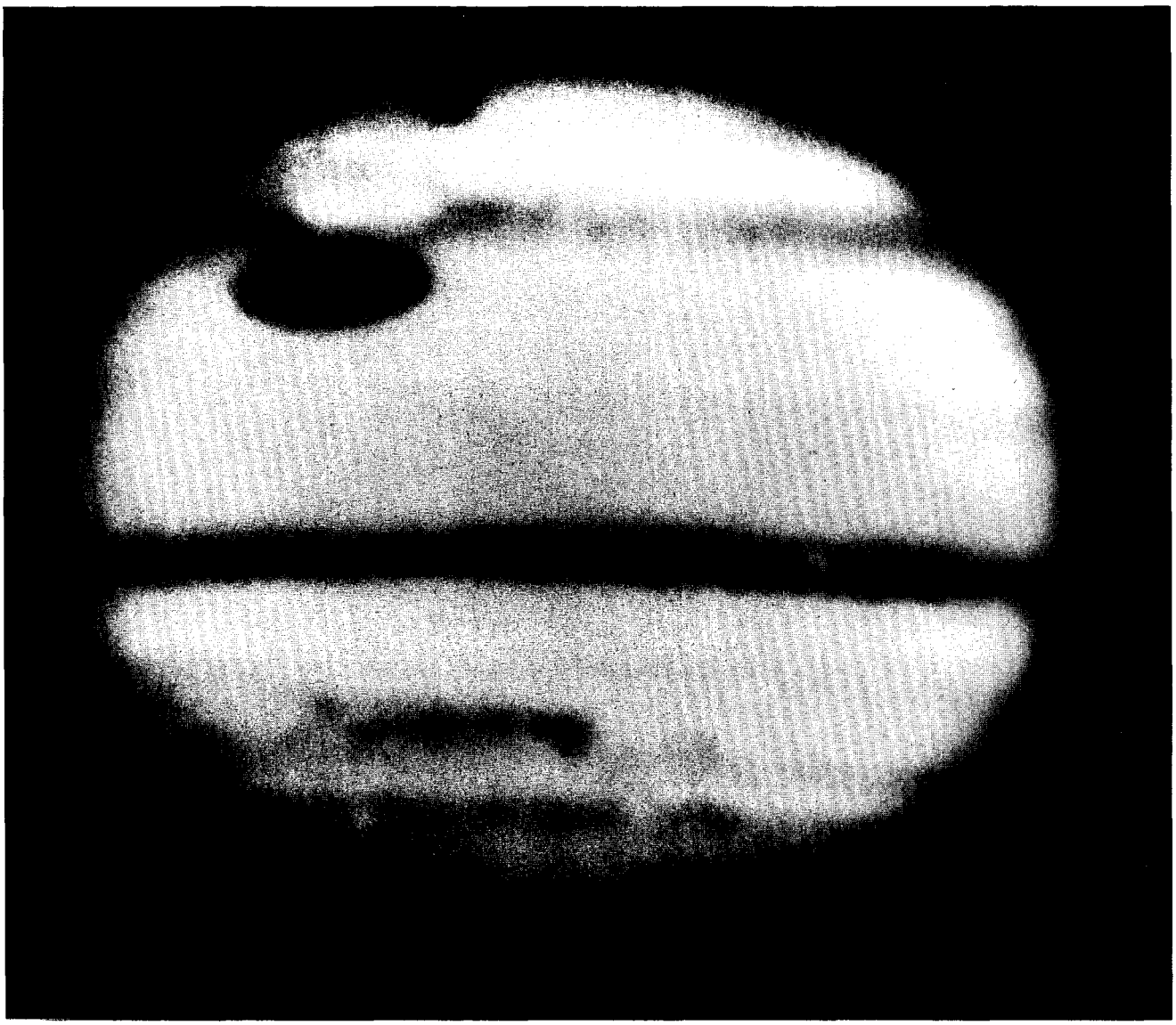
In addition to the speakers and Agnew, other LASL officials attending the meeting were Raemer Schreiber, technical associate director; Richard Taschek, assistant director for research; Philip Belcher, assistant director for security and legal liaison; John Manley, research advisor; J. Carson Mark, acting T-division leader; Delbert Sundberg, head of the Information Services department; Ted Dunn, university relations coordinator.

College and university representatives were Stirling Colgate, president of the New Mexico Institute of Mining and Technology; Harold Daw, vice president of New Mexico State University; Ferrel Heady, president of the University of New Mexico; Brother Cyprian Luke, president of the College of Santa Fe; Ralph Carlisle Smith, acting president of New Mexico Highlands University; Morris Stubbs, chairman of the chemistry department at the University of Albuquerque; James Sublette, dean of graduate studies at Eastern New Mexico University; Richard Weigle, president of St. John's College in Santa Fe and S. J. Haggard, dean at St. John's.

Health-Division Leader Dr. George Voelz, left, talks with Ralph Carlisle Smith, acting president of New Mexico Highlands University, and Ferrel Heady, president of the University of New Mexico.

Brother Cyprian Luke, president of the College of Santa Fe, second from right, talks with John Manley, LASL research advisor, Agnew, and George Cowan, CNC-division leader.

New Information on a Moon



Ganymede, upper right, casts its shadow on Jupiter (dark spot at top left center) in this photograph from the Hale Observatories.

The inability of astronomers to wander about the universe looking at objects of interest to see what they are made of and how they came to be has led to an impressive arsenal of astronomical weapons for the observance of mysteries in space.

By theoretical treatment of the results of their observations, astronomers calculated very accurately the nature of the moon's surface long before astronauts walked on it. These calculations were backed up by telescopic observations extending over a period of more than 300 years and, more recently, by measurements made possible through the innovation of photometric, thermal radiation and radar instrumentation.

As sophisticated and sensitive as these instruments have come to be, the surface nature of objects mil-

# of Jupiter

lions of miles away can be calculated. A notable example is the recent study of Ganymede, the largest of the 12 moons of the planet Jupiter, which is estimated to range about 367 million miles from earth to 601 million miles.

Scientists from the Los Alamos Scientific Laboratory and the University of Hawaii have made the first measurements of thermal radiation from Ganymede throughout an eclipse. Measurements of this type during an eclipse provide a shortcut to a great deal of information.

Thermal emissions are related to surface temperatures which vary over a period of about seven days. During an eclipse of the satellite, however, all possible temperature variations occur during the course of about two and a half hours.

During the March 17 eclipse of Ganymede by its parent planet the scientists measured the rate at which the satellite's surface cooled and warmed. Because Ganymede's surface was quick to respond to temperature changes during the eclipse, the scientists conclude it has low thermal inertia—a term used in astronomy with relation to the rate at which the temperature of a body approaches that of its surroundings.

Low thermal inertia in turn, the scientists say, implies a surface of high porosity and the absence of an atmosphere with surface pressure any greater than 1/1,000 that of earth. It also implies that the upper half inch of Ganymede might be composed of loose, fine-grained rock.

Surface temperatures during the eclipse were calculated to range

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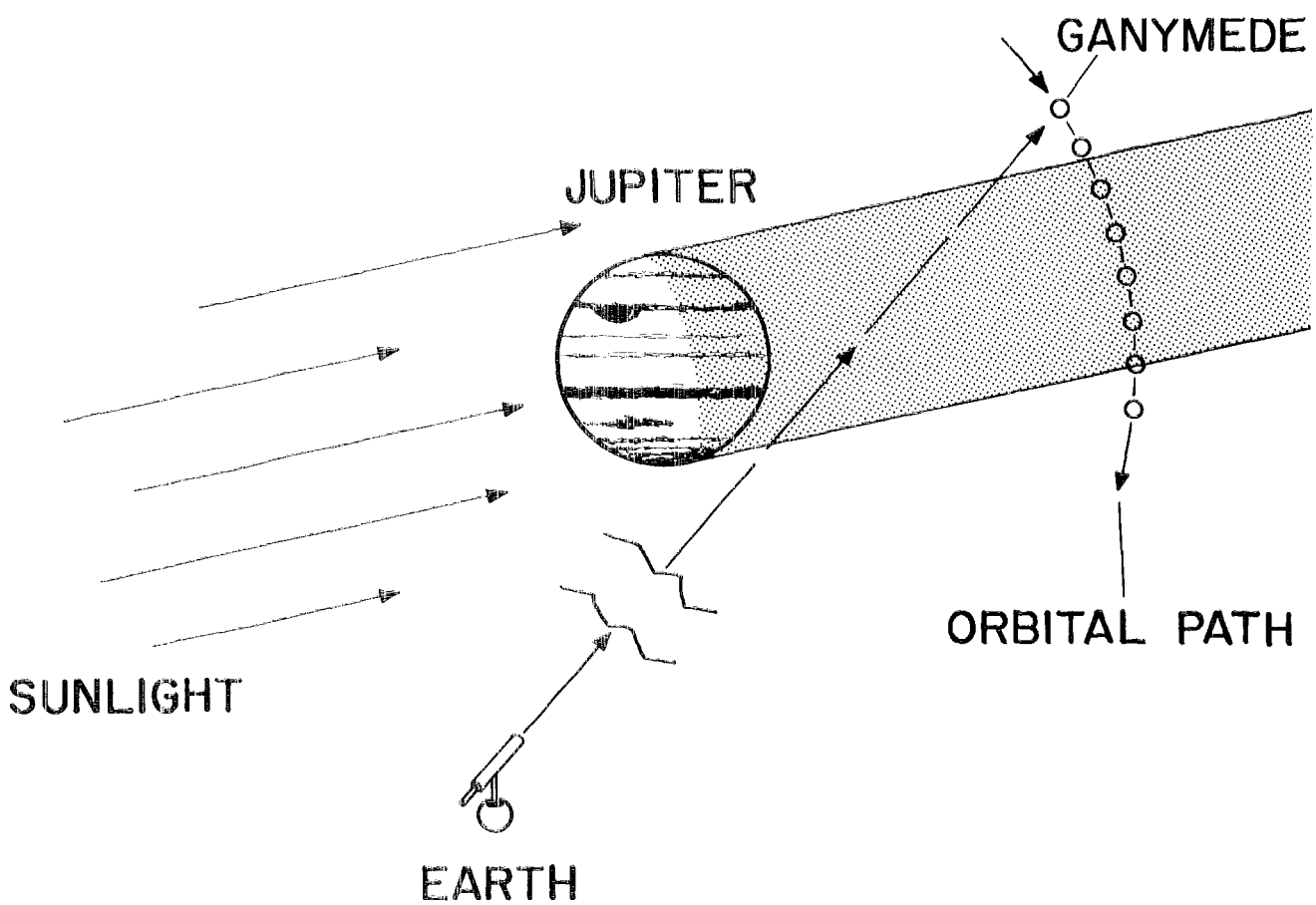
The orbital path of Ganymede in relation to the sun, Jupiter and Earth is shown in this line drawing.



from about minus 250 to minus 170 degrees Fahrenheit at the center. These temperatures are in agreement with measurements made previously by other scientists.

Thermal radiations measured were those in the infrared region of the electromagnetic spectrum, that region which lies beyond the red portion of the visible light spectrum.

This region of the spectrum has a wavelength of 20 microns. Visible light ranges from about .4 to .7 microns.

The observations were made with an infrared radiometer mounted on the back of the 88-inch telescope at the University's Mauna Kea Observatory on the island of Hawaii. The instrument was funded jointly by the two institutions and built at Los Alamos. Radiometers are sensing devices which can be made to accept by means of a filter system, radiations of whatever wavelengths are desired. In this case the radiometer was built to accept only infrared radiation entering the telescope lens. After passing through the filter system the radiation is reflected by a "chopping" mirror, so-called because it moves in a chopping manner. The mirror's motion causes the collection of infrared radiation to alternate between that emitted by Ganymede and its sky background. The chopping mirror is, in essence, the tool used to separate background radiation from that actually emitted by the satellite. The rate at which the satellite-to-background cycle is completed is typically 10 times per second and is called the chopping frequency.

The mirror reflects the radiation from the two sources to a germanium bolometer. This is a detector whose germanium element absorbs infrared radiation. Absorption causes the element's electrical resistance to change and this change is a measure of the infrared radiation emitted by the satellite.

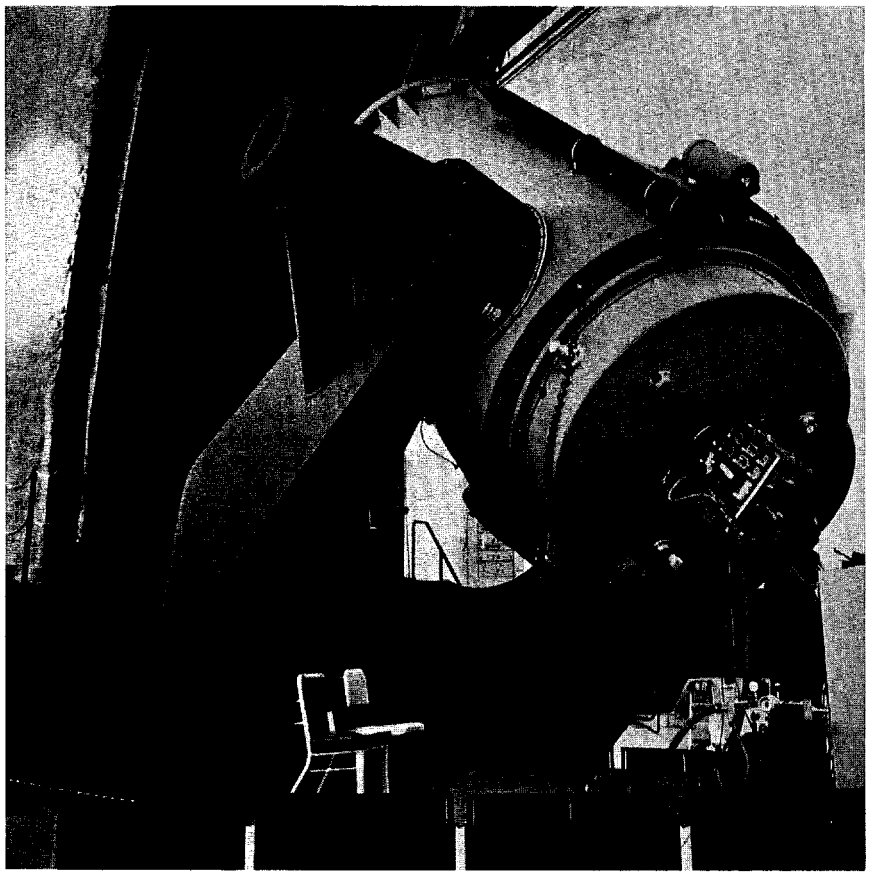
In order to interpret the radiometric observations, the scientists also measured the brightness of Ganymede during the disappearance and reappearance phases of the eclipse with a photometer mounted on a nearby 24-inch telescope. Photometric measurements are not possible throughout an eclipse of Ganymede because of the absence of visible light.

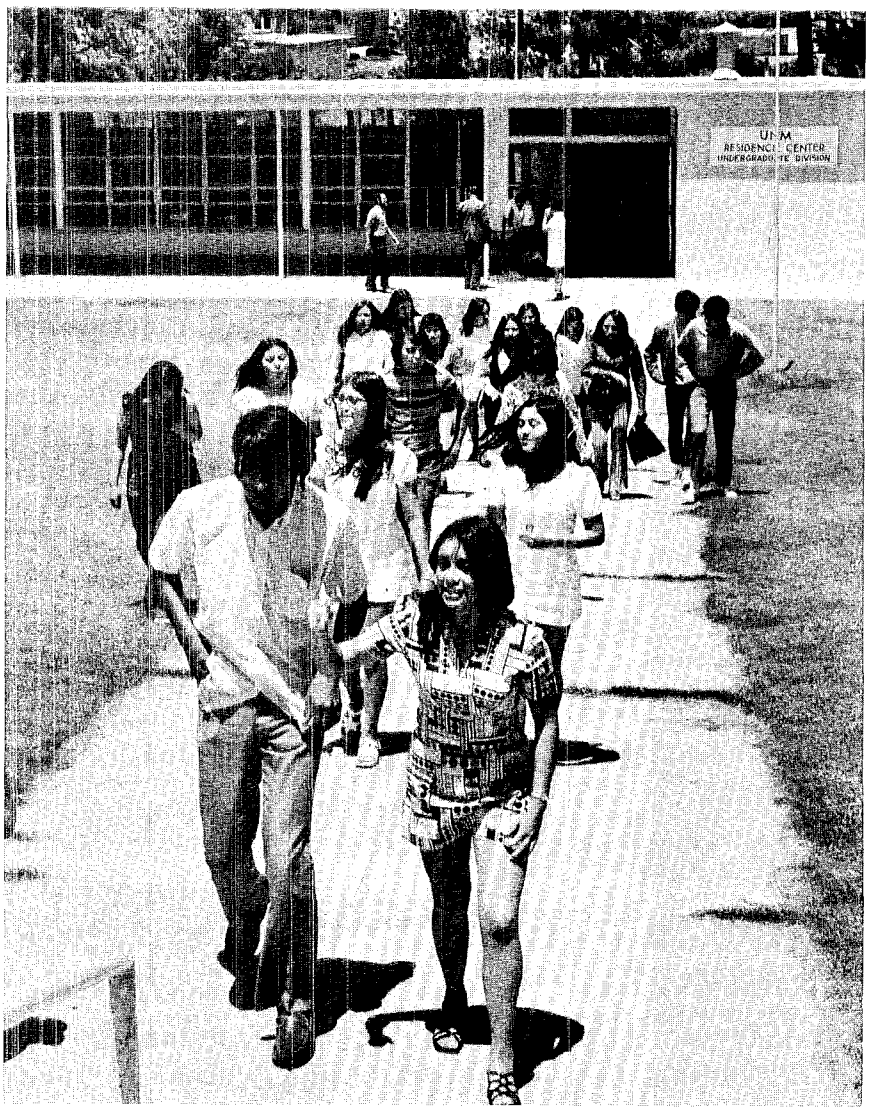
Scientists from the Los Alamos Scientific Laboratory participating in the achievement were Jerry Beery and Allen Blair, both of P-DOR, and Jim Shipley of P-1. Design of the radiometer's mirror system was by Tom Carroll, SD-2. From the University of Hawaii's Institute for Astronomy were David Morrison, R. E. Murphy, D. P. Cruikshank and T. Z. Martin.

Previous attempts by other scientists to make similar measurements of Ganymede were only partially successful. The satellite could only be detected during the initial cooling and final heating phases of the eclipse. One of the reasons for the previous limited success is thought to be the presence of water vapor which somewhat retards the transmission of infrared radiation.

The Observatory where LASL and University of Hawaii scientists made their measurements is situated on top of 14,000-foot Mount Mauna Kea which rises far above vapor-laden cumulus cloud formations in that area. This factor and the high sensivitity of the germanium bolometer have been credited to a large extent for the experiment's success.

University of Hawaii astronomer Ted Simon looks through the eye piece on the radiometer built at LASL which is mounted on the back of the University's Mauna Kea Observatory 88-inch telescope. (Photograph from the University of Hawaii).





Leaving the Residence Center after a session during a six-week orientation program are high school seniors from northern New Mexico pueblos.

The Los Alamos Residence Center

Bringing Higher Education to Northern New Mexico

By Barbara Storms

It has no legal status, no financial assistance, and only one full-time employee. Nevertheless, on Aug. 30 the University of New Mexico Residence Center at Los Alamos will roll full steam into its second year, determined to bring higher education directly to the young people of northern New Mexico.

Surviving on little but tuition money and a lot of help from its friends, the Residence Center next year will add a general sophomore curriculum to an expanded freshman program—a total of 51 courses—making it possible for students to complete their lower division requirements without leaving home. Full college credit is given for the courses by UNM and admission requirements and tuition charges are the same.

To meet more specific needs of the area, the Center will launch a two-year program in Laboratory Instrumentation Technology leading to an Associate of Science de-

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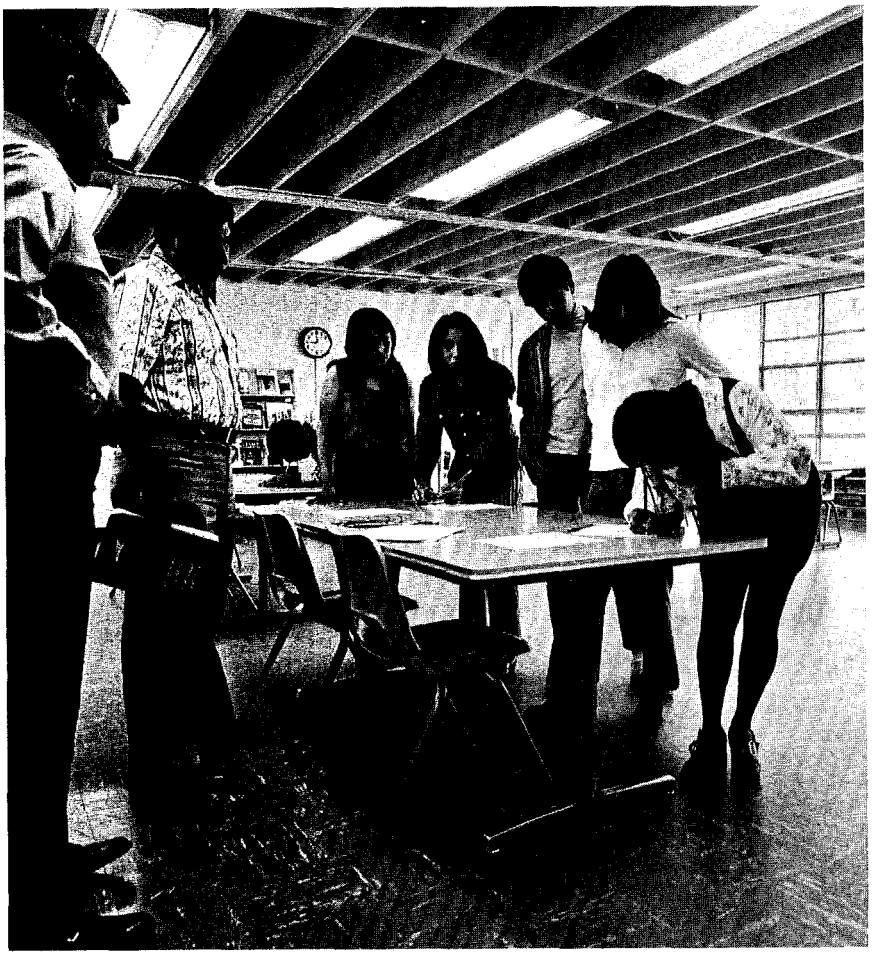

Al Martinez, Taos Pueblo, and Bob Martinez, Santa Clara Pueblo, watch as pueblo high school students sign up for college courses.

gree, and will expand its existing two-year teacher-aide program for an Associate of Arts degree. If all goes well, according to Hillard Howard, part-time director, the Residence Center eventually will offer courses in outlying communities, wherever the demand lies.

"We must expand to meet the needs of the people in the area," says Howard, who divides his time between the Residence Center and LASL's P-12 where, as a visiting research assistant, he is working toward his Ph.D. in physics. "We want to give the people of northern New Mexico the opportunity to get an education without breaking away from their cultural backgrounds."

It was the obvious need for just such an opportunity that gave Joseph Carroll, superintendent of Los Alamos schools the determination to see that a two-year college in the area became a reality.

Although the idea had been discussed on the Hill for years, it was not until 1969 that the University of New Mexico, after an extensive survey of the Santa Fe, Espanola, Pojoaque and Los Alamos school districts, published its four-in-one report which spelled out the educational needs of the region and recommended that the communities pool their resources and interests to establish a branch college, preferably in Pojoaque.

It was clear, Carroll points out, that a large number of young people in the area wanted and could benefit from the two-year college. First, although tuition costs are the same as they are on the main campus, the savings realized by living at home is substantial. Second, a commuter college provides an easier transition between the outside world and the rural ethnic cultures.

"What we need," said Ed Hammel, P-8, and representative of the Los Alamos School Board on the Residence Center Advisory Council, "is to build bridges between cultures rather than to encourage people to transfer from one culture to another. We must develop a curriculum capable of producing graduates who can live comfortably in both cultures and contribute to both."

The first effort toward bridging the cultures was made when Indian and Spanish representatives were included on the Residence Center Advisory Council when it was organized early in 1970 to plan the college. As the Indians explained, it was the first time the white man had ever asked them to participate in such a project from the beginning.

The enthusiasm was overwhelming. Almost immediately the tiny Pojoaque pueblo offered 30 acres of land on which to build a college.

The governors of the eight northern New Mexico Pueblos, all of whom are members of the Council, issued a proclamation in which they stated that a branch college "will greatly enhance the educational opportunities available to the residents" and expressed their "deep appreciation for the foresight displayed by the University, the people of Los Alamos and the Pojoaque and Espanola school boards in recognizing the special needs of Indian education and the value of tribal participation at the decision-making level in planning and implementing the program."

Frank Lopez, superintendent of Pojoaque schools, has since stated that "one of the greatest values derived from the Residence Center is that it has gathered local people together to work with ethnic groups."

Chaired by Superintendent Carroll, the Advisory Council does represent all groups by including the eight Pueblo governors, Superintendent Lopez of Pojoaque; Norbert Lopez, superintendent of Espanola schools; Ramos Sanchez, director of the Bureau of Indian Affairs' Talent Search; school board representatives Reuben Archuleta, Espanola; Martin Aguilar, San Ildefonso; Preston Keevama, San Juan, and Ed Hammel, Los Alamos. M. H. McMichael, UNM Director of the Division of Continuing Education, represents the University and Ted Dunn, LASL's assistant personnel director, represents the Laboratory and the UNM Graduate Center.

From the start it seemed clear that the procedure to establish and build an officially sanctioned community college, fundable by the state, would be too complicated, too time consuming and unnecessarily expensive. In Los Alamos unused school buildings, a school administration eager to participate, exceptional library facilities and a remarkable pool of teaching talent

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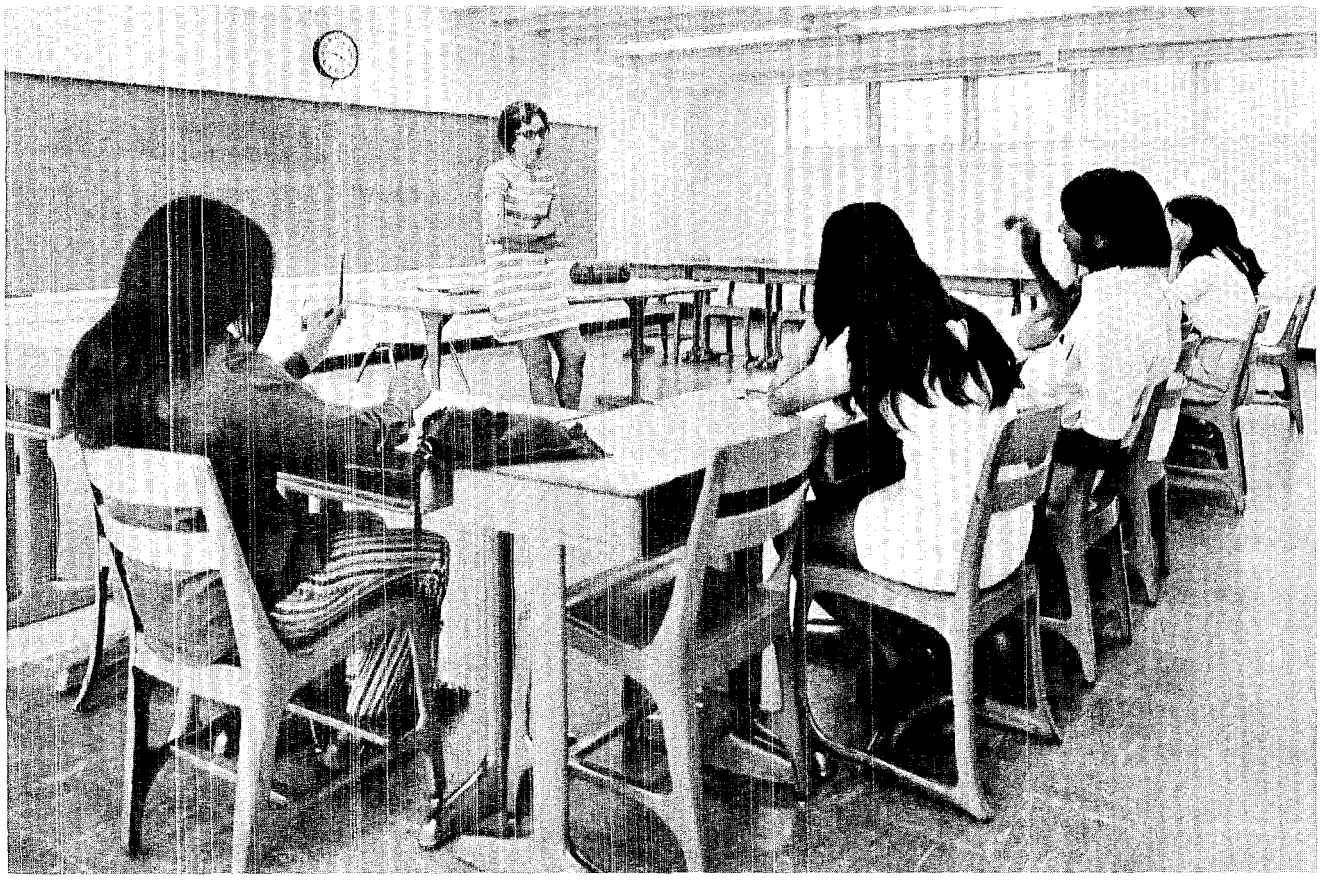
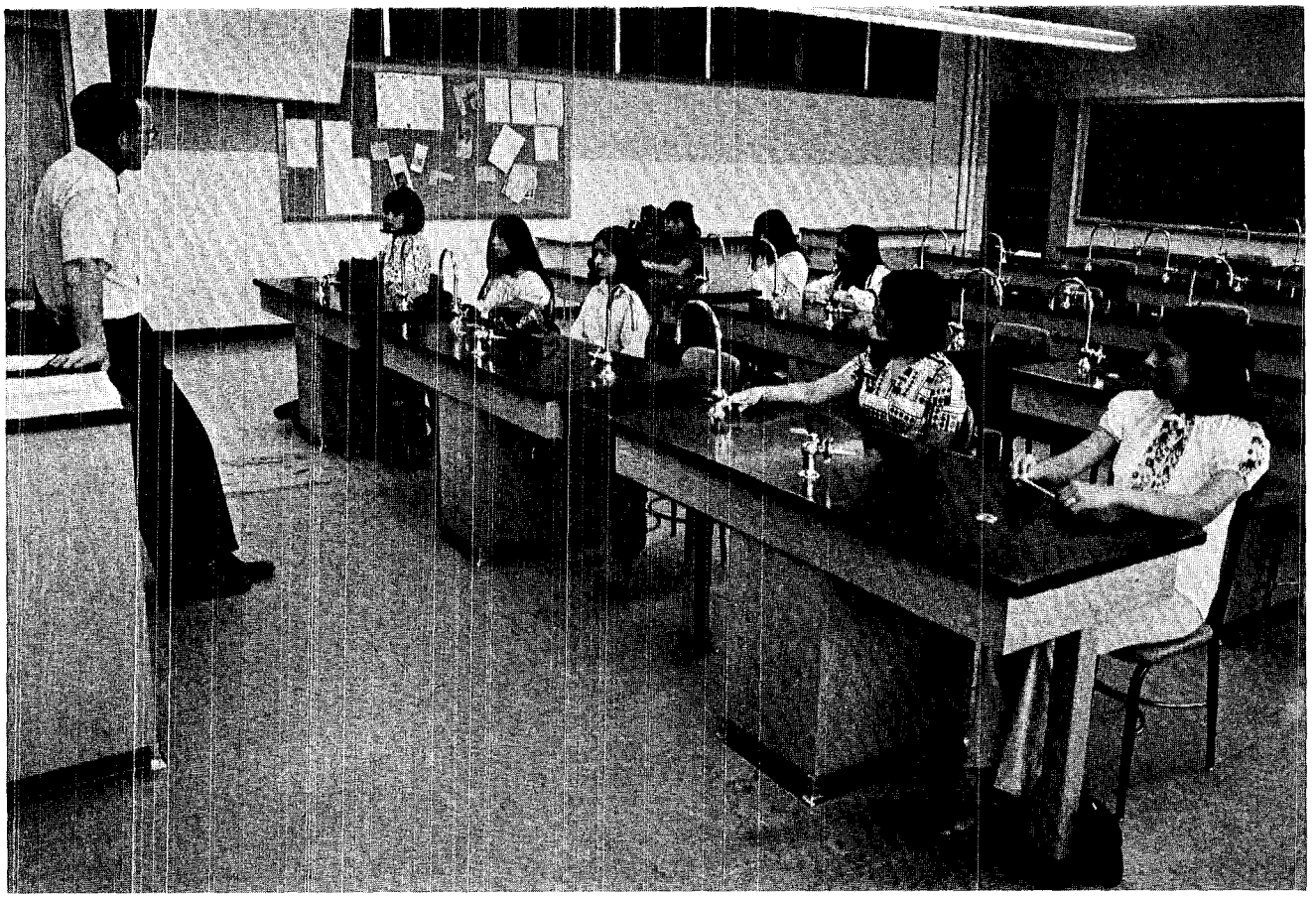
Mrs. Lois Sharp presents an orientation lecture on English courses to be taught at the Residence Center.





Robert Eikleberry gives an orientation lecture on biology in high school laboratory facilities.

were available. So with the approval and support of UNM, but no money, the Advisory Council proceeded with plans to establish the college on the Hill.

By fall the red tape lay in shreds, somebody hung a sign on the abandoned Little Valley school on Orange street and the Residence Center was open for business.

First semester enrollment exceeded expectations with 172 students, or a full-time equivalent of 88. The 15 available courses were selected from those chosen by most freshmen at the Albuquerque campus. Sixteen of the students were Los Alamos high school seniors qualified to get a head start on college courses, others came from Pojoaque, Nambe, Espanola, San Ildefonso, Santa Clara, Santa Fe, Bandelier, Embudo, El Rito Alcalde, Medanales, Santa Cruz and Los Alamos. Spring semester enrollment increased to 183, or, a full-time equivalent of 100.

In addition to scholarships and work-study grants available through UNM, Residence Center students also may apply for financial help from the Los Alamos Kiwanis Club and the Los Alamos Medical Society. During the past year Kiwanis contributed some $1,500 in scholarships and the Medical Society recently voted to offer two full-tuition scholarships to students interested in pre-medical and para-medical studies.

Administration help has been provided by the Los Alamos school system. Duane Smith, the school's director of pupil personnel, served as director of the Center on a volunteer basis throughout most of the first year until Hillard Howard was hired as part-time director in the spring. Mrs. William Myers is registrar.

From tuition ($17.94 per credit hour) the Residence Center pays what administrators readily admit are "slave wages" to 19 highly qualified instructors. All are required to have masters or Ph.D. degrees

and must be approved by the UNM departments in which they teach. Nevertheless, teachers have been found in abundance among Los Alamos housewives, school teachers and Laboratory staff and from Espanola and the Valley.

Instructors receive $600 per course, or at most, half that paid to faculty members on campus, but as Henry Laquer of P-8, puts it, "Who cares. It's a wonderful experience." Laquer, teaching for the first time since he joined the Laboratory 24 years ago, shares instruction of freshman chemistry with Robert Dinegar, GMX-7, and finds the job exhilarating.

"The emphasis is on the kind of physical chemistry we are practicing and it's a great review for us to have to explain it," he said. He also marvels at the changes in material now offered to freshmen. For example, he explained, the term 'entropy,' one of the most difficult concepts in chemistry for students, used to be saved for the junior year. "Now it's in chapter two."

Faculty members make considerable effort to keep course requirements at the campus level. "If the Residence Center is to serve its purpose, we cannot let it get watered down and become merely an extension of high school," says Mrs. Lois Sharp, who taught three English courses last year.

Although she must juggle a hectic schedule to accommodate three small children and her husband (Robert, J-6) in addition to her teaching duties, Mrs. Sharp thoroughly enjoyed the past year and will teach again next year.

She finds small classes and the wide range of ages in them—something seldom found on the big campuses—among the greatest advantages of the Residence Center. "The discussions were absolutely phenomenal," she said.

The huge lecture classes, where students become sponges, soaking up all that is fed in and spewing out the contents at the end, do nothing for the student, Mrs. Sharp believes. In small classes everyone has the opportunity to express himself and the student is encouraged to think for himself.

Representatives of the Indian and Spanish cultures also feel that the small classes and the opportunity for individual help are among the major factors enabling the Residence Center to bridge the cultural gap.

"If the educational system is going to work," says Ramos Sanchez, a San Ildefonso Indian in charge of BIA's Talent Search, "it needs to unbuckle the criteria and help the individual."

"The University has lost contact with the individual," says Superintendent Lopez of Pojoaque. "The Residence Center realizes the need to reach down to the community."

It was at Lopez's urging that the Residence Center started its teacher-aide program to meet the urgent needs of this school system to provide more training for women assisting in the classrooms. Because the need was great and the commuting so difficult for Valley housewives, the Residence Center took the course down to Pojoaque, offering training in practical classroom skills and communication as a starter. Among both the women taking the course and the teachers who benefited, "The enthusiasm was fantastic" said Lopez. Next year the Residence Center will add the academic courses required for an Associate of Arts degree and is considering offering the same course in the Pueblos.

The second effort toward community-oriented training, the new Laboratory Instrumentation Technician program, will enable grad-

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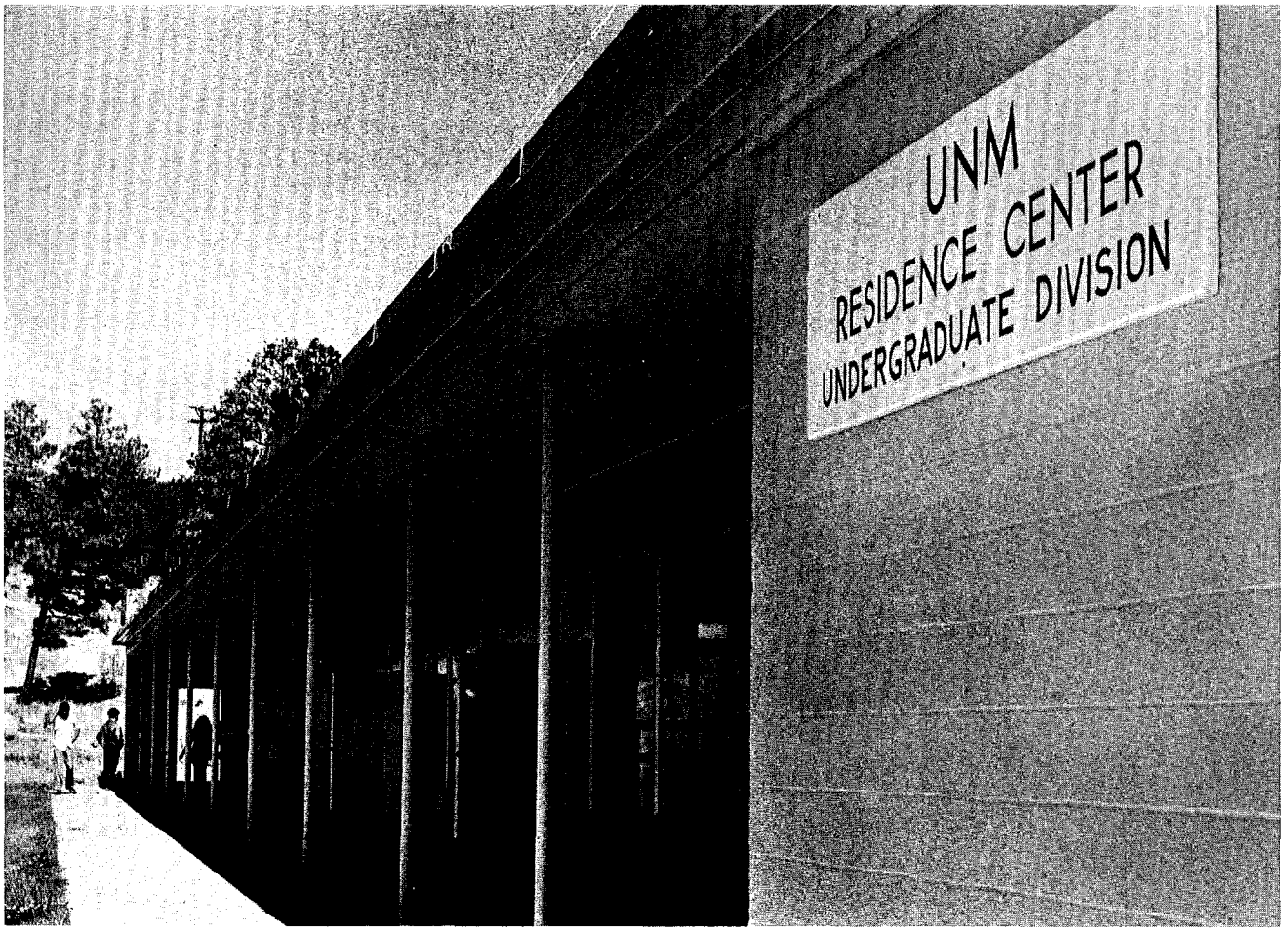
Joseph Carroll, superintendent of Los Alamos schools (standing), and Hillard Howard, part-time director of the Residence Center, talk with pueblo high school students before afternoon orientation classes begin.



The Little Valley school became the Los Alamos Residence Center.

uates to perform the duties of an instrumentation technician with a minimum of additional training. The course will combine academic work and technical courses especially designed in cooperation with UNM's Department of Mechanical Engineering. By second semester, the Residence Center hopes to have worked out a cooperative program with LASL to provide students with practical training.

"Our job," says Ed Hammel, "is to make these courses a complete self-contained education for jobs that exist in New Mexico and not just a way station on the way toward a degree."

This philosophy appeals to Ramos Sanchez because few Indians make a successful transition to college and those who do leave their culture completely. "We need to acquire a core of trained people who are concerned enough about their people to return and contribute to the Pueblo," Sanchez said.

At Sanchez's request and with his group's financial and recruiting assistance, the Residence Center this summer conducted a six-week orientation program for 27 high school seniors from the Pueblos who hope to attend college. In addition to brush-up courses in mathematics, English, communication and science, the students received guidance and counseling help in such aspects of college life as program planning, registration and study skills.

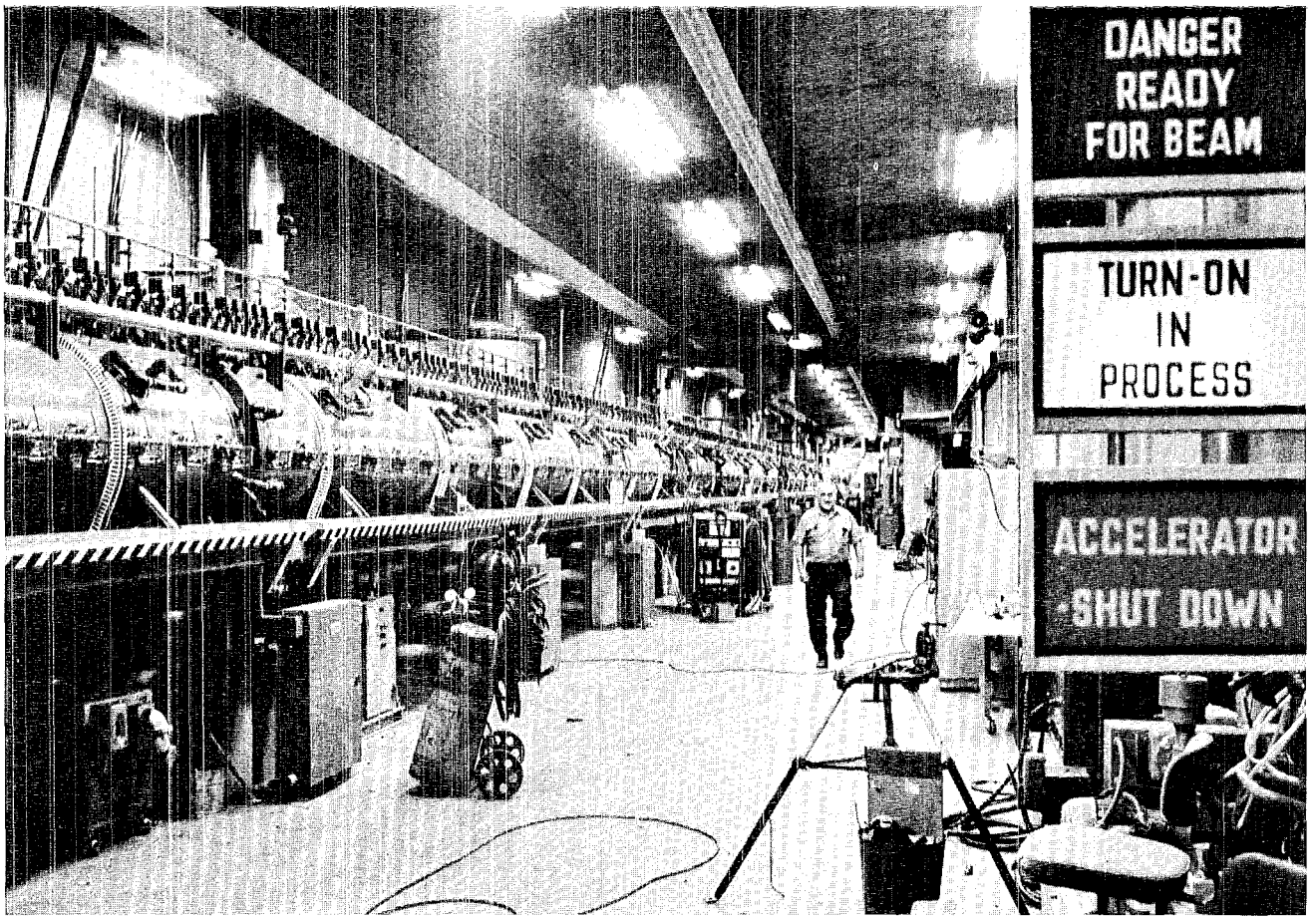
As for the future of the Residence Center, both Duane Smith and Hillard Howard agree that the coming years will be crucial.

"If we survive this year," Howard said, "we will have proved the need for the institution in northern New Mexico and we will have proved that citizens will support it."

Smith attributes the success of the Center to date to the human resources: ". . . to the people of Los Alamos and the Valley who were willing to make it go."

Although he believes the Center's present facilities can accommodate as many as 300 students, Smith said, "We cannot continue to operate indefinitely without financial help. We can't expect to get good people to teach for the kind of money we are paying."

"The future," he concludes, "depends upon our becoming an official branch of UNM and getting funded by the State Board of Educational Finance."



The "turn-on-in-process" light was on as Health Physics Supervisor Morris Engelke, H-1, finished the personnel sweep of the beam channel. Four tanks at the Alvarez section which was tested at 100 MeV are at left.

LAMPF Achieves 100 MeV Beam Ahead of Schedule

Photos and Story
By Bill Regan

A 100 MeV proton beam achieved 10 days ahead of schedule marked an ever increasing tempo of activity at the Los Alamos Meson Physics Facility (LAMPF).

This milestone was logged into the LAMPF progress record at 10:59 p.m. on June 21, giving added confidence that MP-Division Leader Louis Rosen's long-projected July, 1972, date for completion of the 800 MeV linear proton accelerator will be met. Protons have now been accelerated through the first two stages of the three-stage $56 million linac.

"Turn on" was accomplished under the general supervision of Don Hagerman, MP-2 group leader, who along with Tom Boyd, Jr., and Bob Jameson has directed the design, development and prototype testing of radio-frequency (rf) power systems involving entirely new concepts in power amplification, phase control and amplitude control. Don Swenson, MP-3 associate group leader, was experimental supervisor for the test while Bob Emigh, MP-4 associate group leader, served as operations supervisor.

But the June 21 test, punctuated by champagne

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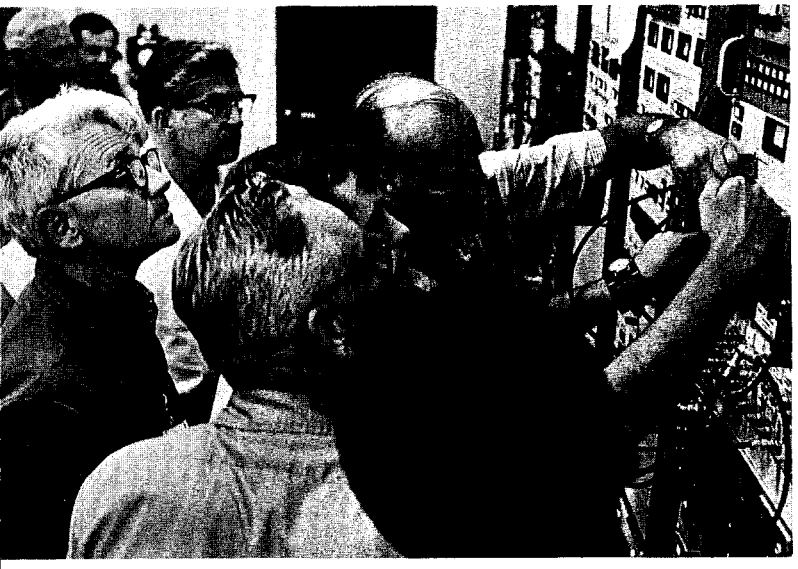
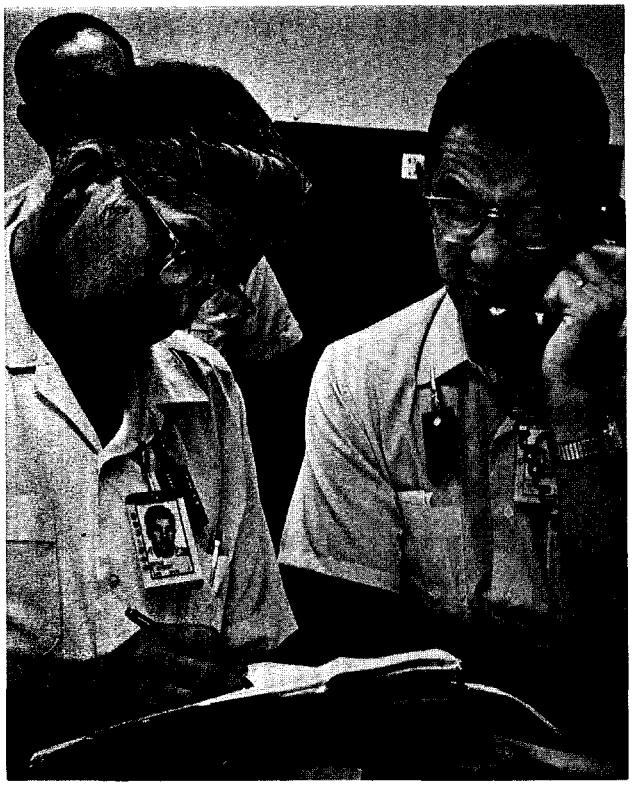
The scope showed the radio-frequency power was A-OK and ready as Don Hagerman, MP-2 group leader flipped the resonant frequency control switch just a few minutes before the successful "turn on."





Above, Darragh Nagle, alternate MP-division leader, joined Bob Emigh, MP-4 associate group leader and operations supervisor for the test, Harold Lederer, MP-1, Steve Palermo and Don Kohl, both MP-4, for a closer look at the scope traces. Right, Emigh and Tom Putnam, MP-1 group leader and safety chief, coordinate a check list for the test.

toasts at midnight, was only the beginning of a very busy three weeks on La Mesita de Los Alamos. A day later all the men and women of MP-division joined with Laboratory Director Harold Agnew to celebrate the 100 MeV achievement at a party in the Experimental building. The Director paid tribute to the great team assembled from throughout the Laboratory.

Two days later the LAMPF Policy Board assembled for a two-day meeting under the chairmanship of Herbert Anderson of the Fermi Institute of Nuclear Studies. On July 2, Congressman Orval Hansen, Idaho, a member of the Joint Committee on Atomic Energy, visited the site and was briefed on the accomplishments and objectives of LAMPF.

Three days later the LAMPF Program Advisory Committee started a six-day meeting to hear 68 proposals for beam time. This committee advises LAMPF Director Rosen on priorities for proposed experiments. Commitments for initial access to the LAMPF beam, which is expected to be available for experiments beginning in January, 1973, may start to be made early next month.

In the meantime, continuing beam diagnostic experiments at the 100 MeV level are going on

Experimental Supervisor Don Swenson, MP-3 associate group leader, describes with gestures how the beam diagnostics will be carried out.

Louis Rosen, MP-division leader, and Laboratory Director Harold Agnew, discuss photo records of scope traces indicating the attainment of the 100 MeV test objective for LAMPF.

and the entire LAMPF team is pushing for an early fall test at 211 MeV—the next major goal for the project.

The 100 MeV tests certify that drastic design changes which were required to extend the duty factor and average power of drift tube accelerators (Alvarez section) by a factor of more than 10 are valid. The LAMPF drift-tube accelerator (second stage) has the appearance of a conventional Alvarez section but incorporates post couplers which form resonant circuits with the drift tube and wall transforming the operation from 2π mode to the $\pi/2$ mode (different electrical field concepts). The post couplers which project from the tank walls toward the center, in effect, divide the Alvarez tanks into cavities and serve the same purpose as the side-coupled cavities in the third stage of the accelerator. This advance in accelerator technology was initiated at Los Alamos by Ed Knapp, MP-3 group leader, and his associate Swenson. Swenson is also directing the experimental team taking data to compare the actual with the calculated performance of the four-tank modified Alvarez section.

When LAMPF is tested at 211 MeV, the second and most significant contribution to accelerator technology, the side-coupled cavity structure, developed at Los Alamos by Darragh Nagle, alternate MP-division leader, and Ed Knapp, MP-3 group leader, will be used to accelerate protons

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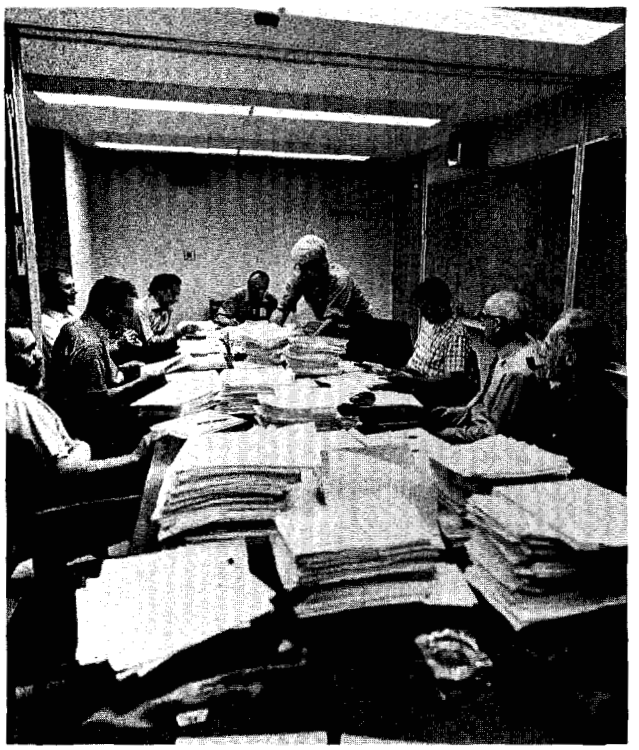
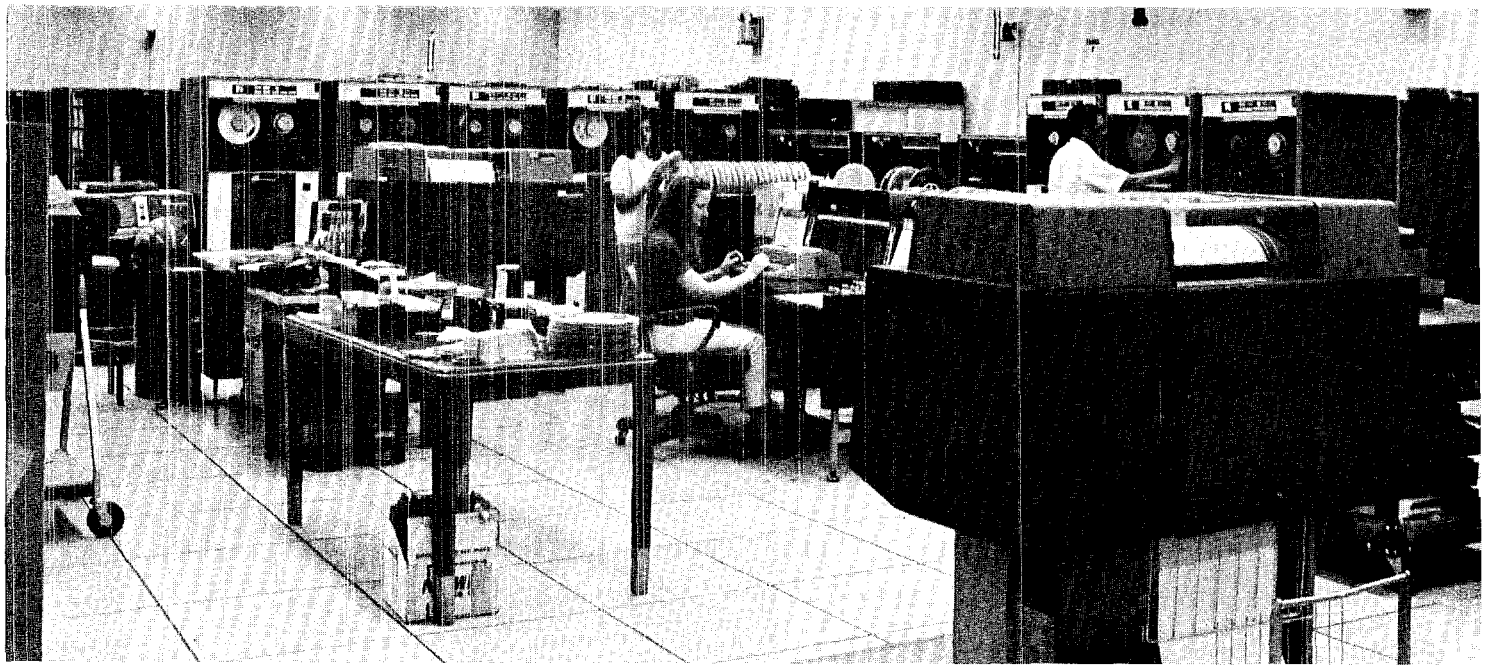
Attainment of the 100 MeV beam was only the beginning of activities at LAMPF. Two days later the LAMPF Policy Board assembled for a two-day meeting.

Three days after the 100 MeV test the LAMPF Program Advisory Committee started a six-day meeting to hear 68 proposals for beam time.



for the first time. Eight sections of side-coupled cavity structure will be in operation out of a total of 44. A prototype of this structure has been tested as an electron accelerator and was so successful that commercial electron machines for x-ray therapy are now being built by the dozens using the LAMPF accelerating structure.

When LAMPF reaches the 211 MeV level it will become the highest energy proton linac in the world. It will also take a step toward reaching the design objective of using computer control more extensive than has heretofore been accomplished. At this time more of the computer control system will be in use than was possible for the first 100 MeV test when only beam diagnostics were performed with the computer. Turn-on and operation of the accelerator was in the manual mode. The upcoming test may use the computer for both turn-on and experiments. Accelerator control and instrumentation are the responsibility of a group headed by Tom Putnam, MP-1 group leader, Hal Butler, MP-1 alternate group leader, Ray Gore, MP-1 associate group leader and Don Machen, MP-1 assistant group leader.



STRETCH as it looked before it was dismantled.

STRETCH, the Super Computer, is Gone

STRETCH, the super computer of the 1960's, is gone.

The machine has been dismantled and removed from the Los Alamos Scientific Laboratory's Central Computing Facility and its name added to the Atomic Energy Commission's surplus list for offer to other government installations, colleges and universities.

The machine and accessories, consisting of some 60 components, required about 2,500 square feet of floor space in the Laboratory's Central Computing Facility. While the computer proper has been crated and stored by a team from International Business Machines Corporation (IBM), many of its accessories, such as tape drives. card punchers and readers, have been transferred to sites at the Laboratory for use with other computing systems.

The likelihood that some other installation will want the computer is questionable because it is no longer considered to be super. During the decade of its service to the Laboratory, computer technology has advanced so fast that STRETCH has been handily outdistanced. The CDC-6600 is three times faster than STRETCH, and the powerful, compact CDC-7600 is four times faster than the 6600 or 12 times faster than STRETCH.

STRETCH was considered to be the greatest of all computers in the early 1960's because it represented such a big step in technology and design.

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It was the largest single step ever made in the history of electronic computers and there has been no other comparable breakthrough since. The magnitude of this step is best illustrated by comparing its capabilities with those of the IBM-704, the stalwart of LASL's computer facilities until STRETCH came along.

First of all, the super machine was 25 times faster than the 704. It could handle about 500,000 instructions per second compared to its counterpart's 20,000. This contrast in speeds was due in part to the advantages of STRETCH's transistorized circuitry over the vacuum-tube-driven 704. The solid state system was also more reliable, required less power, and was more compact.

Another reason for STRETCH's unrivaled speed was its capability to "look ahead." As soon as one step in a computation began, the machine "fetched" from its memory the information necessary for the next one. This was a pioneering aspect in computer design that kept its high-speed arithmetic unit busy a high percentage of the time.

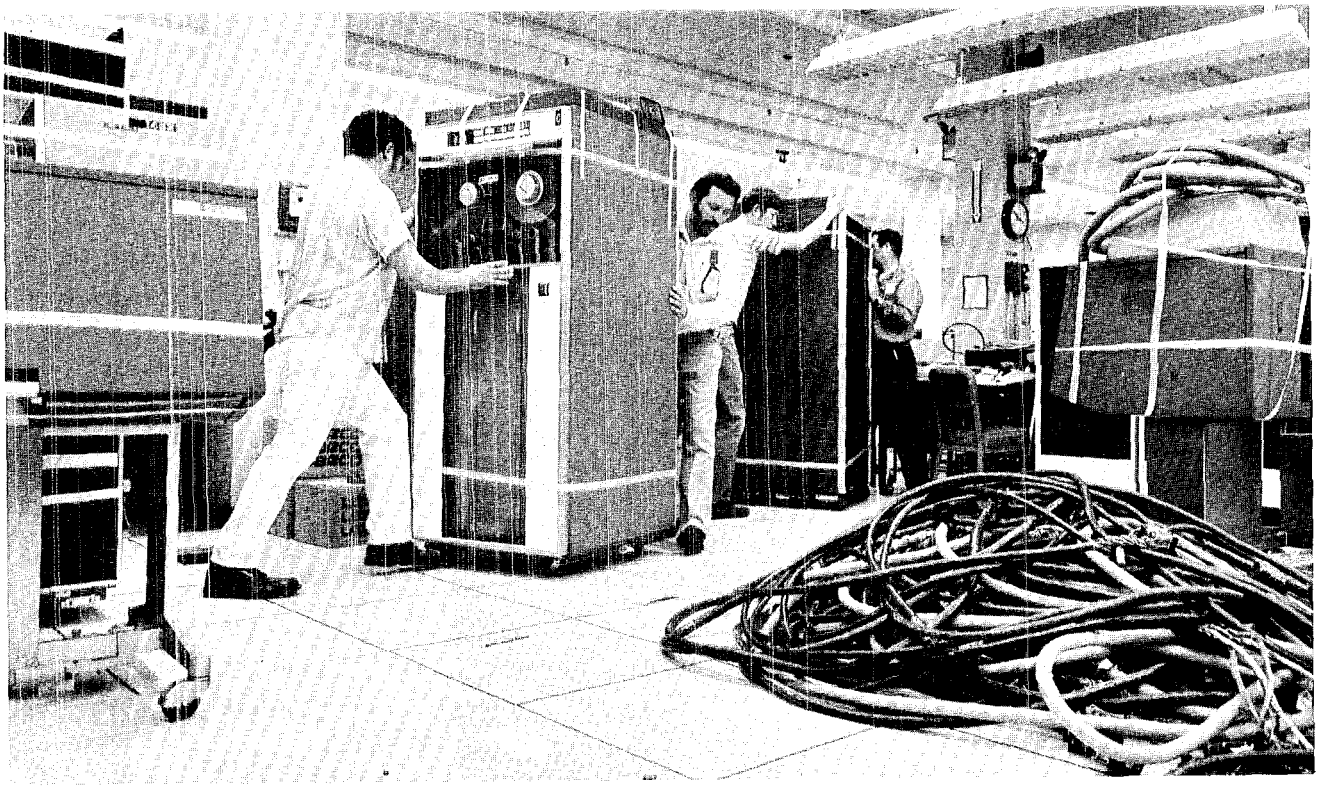
In addition to being able to overlap steps, the machine's fetching cycle was much shorter than the 704's. The 704 required 12-millionths of a second to fetch from its memory. STRETCH required only two-millionths of a second.

The magnetic core memory of the super computer was capable of holding 98,000 "words," each of which was 64 binary digits (bits)—equivalent to almost 20 decimal digits. The capacity of the 704 was 32,000 36-bit words. The figure 64 does not include eight additional bits per word by which STRETCH could check on its own accuracy. It could detect and often automatically correct many errors which might result from its own malfunction.

Another part of STRETCH's memory consisted of 39 large disks, like oversize phonograph records, with space for word storage on both sides. The two-sided disk memory had a capacity for more than two million 64-bit words and could deliver 125,000 words per second on command.

While the 704 required a prepared program for doing such things as finding the square root of a number, changing arithmetic signs, and addressing the memory for variable-length units of information, these functions were a part of STRETCH's hardware. Other features of the ma-

Ross Carr, IBM, and Roy White, C-3, begin dismantling the super computer's memory.



Workmen begin moving some of STRETCH's tape drives.

Below, Jack Worlton, Alternate Coordinator for Automatic Data Processing, and Ed Voorhees, Coordinator for Automatic Data Processing, demonstrate the compactness of modern day computer circuitry. In the foreground is a logic module from the IBM-704. Voorhees holds a module from STRETCH. In his left hand, Worlton holds a module from the CDC-7600 and, in his right hand, one from the CDC-6600. Both men were members of the mathematical planning group for STRETCH.

chine were its faster input and output units which would function in parallel with the computing operation.

STRETCH was built by IBM in consultation with a mathematical planning group from the Los Alamos Scientific Laboratory. The corporation wanted to build a super machine and because of the class of scientific problems requiring solutions, Los Alamos had need of it. Los Alamos scientists also had an impressive history in computer design behind them.

Of the nine LASL scientists who served on this planning group, six still work at the Laboratory. these include the group's leader, Bengt Carlson, T-1 group leader; Robert Frank, C-4 group leader; Roger Lazarus, C-division leader; Edward Voorhees, Coordinator for Automatic Data Processing; Mark Wells, C-7 group leader; and Jack Worlton, Alternate Coordinator for Automatic Data Processing. Other members of the group were M. Goldstein, H. G. Kolsky and D. F. Woods.

Formal arrangements for LASL participation in the design of STRETCH were made through an AEC-IBM contract which was dated in 1956. In March of 1961 a team of 13 scientists from

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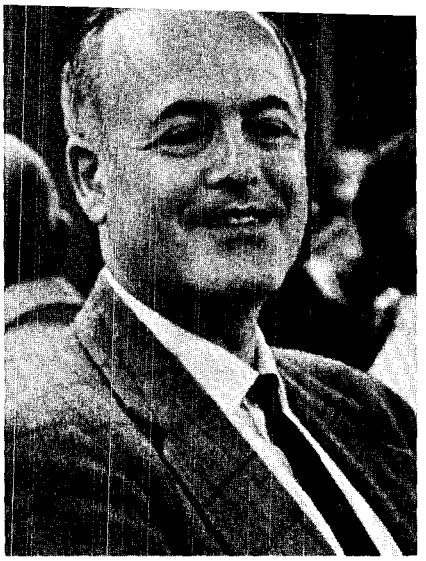
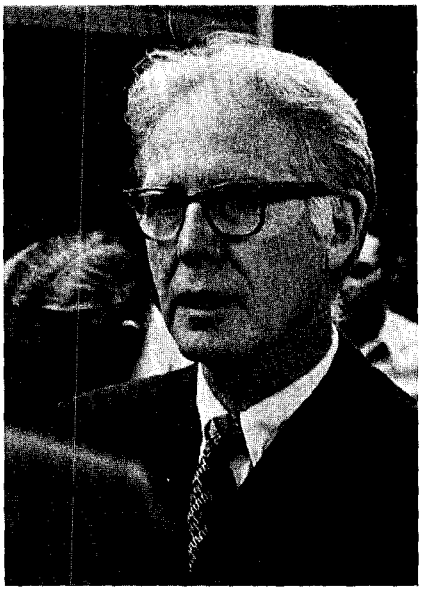
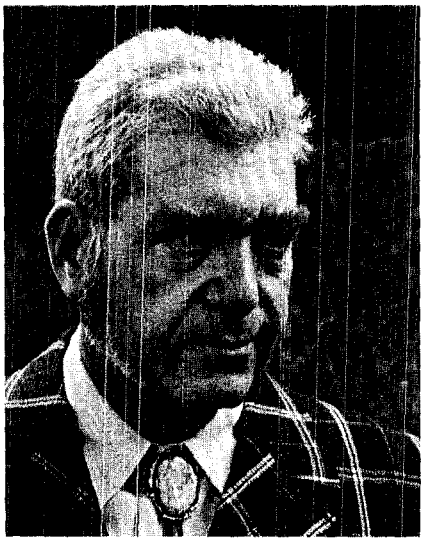


Left, Werner Buchholz of IBM and author of a book describing the design of STRETCH.

Left, Roger Lazarus, C-division leader and member of the mathematical planning group.



Above, Steve Dunwell of IBM who was in charge of the STRETCH design and construction.



Robert Frank, C-4 group leader and a member of the mathematical planning group.

Bengt Carlson, T-1 group leader and member of the mathematical planning group.

LASL put STRETCH through its preshipment reliability tests at IBM's Poughkeepsie, N. Y., laboratory. This was done by requiring the computer to solve 15 scientific problems which had been solved by other LASL computers as a means of comparing results. On STRETCH the problems ranged in running time from five minutes to more than an hour. Carlson noted at that time the machine averaged 90 percent "good time" to "total time"--well above the 80 per cent which had been established as the test criterion.

Then, in the latter part of April, the machine was loaded on six vans and directed toward Los Alamos. Incensed with the cost of computer time, someone noted the machine could have computed 200 billion additions, working 18 hours a day, in the time it took the vans to deliver the machine across country.

The long-awaited super computer was delivered to the Laboratory in May and described by its manufacturer as "dramatically faster than the fastest in existence . . . the most powerful computer ever built."

This was the first STRETCH computer built. In all there were nine produced. Because of the Laboratory's help in designing its wondrous features, Los Alamos acquired it for less than the standard price. The machine was designed to set a new standard of performance and make available the best technology that could be achieved by straining the technical resources of the IBM Laboratory. Hence the name STRETCH.

short subjects

Three LASL staff members were among a group honored last month at a Washington, D.C., banquet to celebrate a quarter century of special service by the AEC's Committee of Senior Reviewers.

They were **John Manley,** research advisor, a member of the original committee; and **Eugene Eyster,** GMX-division leader, and **J. Carson Mark,** acting T-division leader, present members of the committee.

The committee has played a significant role in establishing AEC policies for classification and declassification of information.

Two Laboratory employees were honored at the 17th Annual Meeting of the American Nuclear Society.

James Lilienthal was installed as vice president/president-elect of the Society. He is assistant division leader in CMB and CNC divisions and group leader of CMB-7.

Michael Moore, P-3 alternate group leader, was elected a Fellow of the Society.

Children of LASL employees are now eligible to enroll at one of the University of California campuses with privileges equal to those of California residents regarding tuition and grade-point requirements. Although the deadline for the Fall 1971 semester has passed, applications will continue to be processed. Inquiries should be directed to **Kenneth Wilson,** PER-6 group leader.

Frank Pittman, a chemist at LASL from 1944 to 1948, has been named to head the Atomic Energy Commission's new Division of Waste Management and Transportation.

Pittman was director of technical services, Nuclear Division, for the Kerr-McGee Corporation, before being named to his new post. The new division replaces the Division of Waste and Scrap Management activities which will be transferred to the Division of Production.

George Grover, former N-5 group leader, received a $100 award and certificate for his meritorius contributions to aerospace technology. The award was presented to him prior to his retirement from the Laboratory in July by the American Nuclear Society's Aerospace Division.

Grover pioneered in the development of the plasma thermocouple, was the first to demonstrate thermionic power from fission heating of an emitter, is co-inventor of in-pile thermionic conversion, and spent a year at Ispra, Italy, in thermionics research with the European Atomic Energy Community (Euratom).

The scientist is probably best known for the invention of the liquid metal heat pipe to help solve problems of heat removal from space power supplies.

He directed the investigation of direct-conversion reactor systems for space applications and heat-pipe-cooled reactors for closed-cycle turbine generators. In 1970 while in Russia to arrange a meeting for the International Atomic Energy Agency, Grover was given a standing ovation for a two-hour off-the-cuff talk on his heat pipe work.

The LASL physicist also directed research in advanced propulsion concepts, in particular, electromagnetic plasma propulsion.

Chaim Richman, a physicist with the Manhattan Project at Los Alamos during World War II and a visiting staff member at LASL since 1967, has been named to head H-9, a new group within Health-division.

Richman, a professor at the University of Texas, Dallas, was named to the post by Dr. George Voelz, Health-division leader.

Group H-9—pion radiobiology group—is responsible for the planning and management of the pion experiments required for preclinical studies necessary to support the biomedical addition at the Los Alamos Meson Physics Facility (LAMPF).

Richman was one of the first to recognize the use of pions for biomedical research and has been conducting a research-related program for their use for the past 10 years. He is chairman of the Biomedical Steering Committee of the LAMPF Users Group.

Several items, commemorative of the Los Alamos Scientific Laboratory's role in the development and testing of the first atom bomb, have been placed in the Harry S Truman Library in Independence, Mo. Truman, the President who made the decision to use the bomb in World War II, was mailed the items on behalf of the Los Alamos Veteran's Reunion Committee.

Included in the package were bronze and silver commemorative coins, two illustrated commemorative booklets depicting the recent reunion of Los Alamos veterans, two copies of the July-August, 1970, edition of "The Atom," and some "Trinitite," glass-like substance formed when the intense heat of the world's first atomic bomb—built by Los Alamos scientists and tested near Alamogordo July 16, 1945—fused the sand around ground zero.

These items have been placed among other articles in the Library relating to the atomic age. After receiving the commemorative package, Truman wrote the following letter to **Winston Dabney,** AO-5 group leader, who is chairman of the Reunion Committee:

> Dear Mr. Dabney:
>
> Your letter of May 19, was received together with the Silver Coin and the Bronze Coin commemorating the 25th Anniversary of the Los Alamos reunion. Also, I was pleased to receive the mounted sample of fused sand of the New Mexico desert.
>
> It was interesting to read of your project and its past history and I am fully aware of the great contribution that was made by the Scientific Laboratory in the creation of the nuclear weapons where the first test was made in Alamogordo on July 16, 1945.
>
> It pleases me to know that those who participated in that had a reunion of the members in commemoration of that occasion. The coins and the mounted sample will be placed in the Truman Library with other articles relating to the atomic age.
>
> Mrs. Truman joins me in thanking you for your good wishes and please extend to all of the members of your reunion our good wishes.
>
> Sincerely yours,
>
> Harry S Truman

Robert Sherman, P-8, has been elected a Fellow of the American Association for the Advancement of Science.

T. Robert Connor, staff member in J-10, died June 13 when the plane he was in crashed in the Pacific Ocean 720 miles southwest of Hawaii.

The C-135B aircraft was enroute from American Samoa to Honolulu when it crashed. The cause is not known at this time. Connor is survived by his widow, Gayle, of Los Alamos and his father and stepmother, Mr. and Mrs. Robert M. Connor of Lower Burrell, Pa.

Connor, 32, joined the LASL staff in 1965 after receiving the M.S. in physics from the University of Pittsburgh. He was a member of the American Physical Society and the American Association for the Advancement of Science.

L. Paul Westlake, SD-1, died recently at the Los Alamos Medical Center. He had been a member of the Shop department since July of 1959. He is survived by his wife Anna.

John Downer, CMB-7, died at the Los Alamos Medical Center June 25. He is survived by his wife Marcella and three children, John, Kenneth and Mary.

Eleven LASL employees earned degrees through the University of New Mexico's Los Alamos Graduate Division during the 1970-71 academic year.

Edward Bowlby, formerly of J-6, received the M.S. degree in nuclear engineering; **Roy Haarman,** ENG-7, M.S. in nuclear engineering; **Thomas Adams,** W-7, M.S. in physics; **Alan Dudley,** TD-5, M.S. in physics; **Robert Hotchkiss,** GMX-3, M.S. in mechanical engineering; **George Price,** GMX-7, M.S. in engineering science of materials; **William Goodwill,** formerly of GMX-4, B.S. in electrical engineering; **Homer Lewis,** CMB-13, M.S. in chemical engineering; **Joseph Neudecker,** N-7, M.S. in mechanical engineering; **Ludwig Gritzo,** GMX-3, Ph.D. in nuclear engineering; and **Melvin Prueitt,** TD-4, Ph.D. in physics.

These degrees bring to 183 the total number that has been granted through the Graduate Division.

Congressman Orval Hansen of Idaho, a member of the Joint Committee on Atomic Energy visited LASL for a series of briefings on Laboratory programs. At DP Site, where Hansen, center, saw plutonium fabrication facilities, he was accompanied by John Anderson, CMB-11 associate group leader; Bill Maraman, CMB-11 group leader (partially hidden); Richard Baker, CMB-division leader; and other Laboratory officials.

what's doing

PUBLIC SWIMMING: High School Pool—Monday through Friday, 1 to 6 p.m., and 7 to 10 p.m., Saturday and Sunday, 1 to 6 p.m.; Adult Swim Club, Sunday, 7 to 9 p.m.

LOS ALAMOS FILM SOCIETY: 7:30 p.m., Civic Auditorium. Admission: members—$.50, others, $2.
July 28—"The Magician."
August 25—"The Great Chase."

RIO GRANDE RIVER RUNNERS: Meetings scheduled for noon, second Friday of each month at South Mesa Cafeteria. For information call Joan Chellis, 662-3836.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leaders for information.
July 24-25—Mt. Princeton, Colo. (difficult), Norris Nereson, 662-3839.
Aug. 7-11—Ladore Canyon (river trip), (tentative) Ed Kmetko, 662-7911
Aug. 25—Mushroom Hike, Walter Green, 672-3203
Sept. 1—Picnic and Meeting, Bandelier, 6 p.m., 662-4515

INTERNATIONAL FOLK DANCING: Every Tuesday, 8 p.m., Recreation Hall. For information contact Don Liska, 662-3665, or Roy Greiner, 672-9961.

LOS ALAMOS COUNTY FAIR:
July 24-25—Junior Horse Show, Rodeo Grounds, beginning at 8 a.m. each day.
July 31—Parade, downtown, 10 a.m.
July 31—Junior Rodeo, Rodeo Grounds, 1 p.m. and 7 p.m.
Aug. 1—Junior Rodeo, Rodeo Grounds, 1 p.m.

SANTA FE OPERA: Los Alamos ticket office, Los Alamos Building and Loan, Monday, Wednesday and Friday, 10 a.m. to 1 p.m. For information call Sherron Kirkpatrick, 662-2734.
July 23—"La Grande Duchesse de Gérolstein."
July 24—"The Magic Flute."
July 28—"La Grande Duchesse de Gérolstein."
July 30—"The Marriage of Figaro."
July 31—"Der Fliegende Hollander."
Aug. 4—"The Magic Flute."
Aug. 6—"Der Fliegende Hollander."
Aug. 7—"The Marriage of Figaro."
Aug. 11—"Der Fliegende Hollander."
Aug. 12—"Yerma." (World Premiere)
Aug. 13—"The Magic Flute."
Aug. 14—"La Grande Duchesse de Gérolstein."
Aug. 17—"Don Carlo."
Aug. 18—"Yerma."
Aug. 19—"The Marriage of Figaro."
Aug. 20—"La Grande Duchesse de Gérolstein."
Aug. 21—"Don Carlo."
Aug. 25—"Don Carlo."
Aug. 26—"The Magic Flute."
Aug. 27—"The Marriage of Figaro."
Aug. 28—"La Grande Duchesse de Gérolstein."

MOUNTAIN MIXERS SQUARE DANCING CLUB: For information call Mrs. Dee Seitz, 662-7356.
Aug. 7—Pinon Park, Sid Perkins, Albuquerque, caller
Aug. 21—(Location undetermined) Fair Rodeo Street Dance, local callers.
Sept. 4—(Location undetermined) Charles Hartley, Roswell, caller.

MESA PUBLIC LIBRARY: Library exhibits, through Aug. 31. Paintings, Roger Camillo, through July 30.

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

LOS ALAMOS ARTS FESTIVAL: All activities at Fuller Lodge.
Aug. 5—Experimental Films, 7:30 p.m.
Aug. 6—Children's Programs, 2:30 p.m. to 4 p.m.
Concert on the Green (Ashley Pond), 6 p.m.
Variety Show, 7 p.m.
Drama Presentation, 8 p.m.
Aug. 7—Program for Children and Adults, 9:30 a.m. to 4 p.m.
Mixed Media Show, 7:30 p.m.
Aug. 8—Program for Children and Adults, 2 to 4 p.m.
Adult Chamber Music, 7:30 p.m.

NEWCOMERS CLUB: July 28, 7:30 p.m., Los Alamos National Bank. Speaker to be determined later.
Aug. 28, 6:30 p.m., Recreation Hall, pot luck dinner, members and husbands. "National Parks in New Mexico." Cards and games following program.

SPORTS CAR CLUB DEL VALLE RIO GRANDE—Meeting first Tuesday of each month at the Los Alamos National Bank, 7:30 p.m. For information call Steve Yabroff, 662-5370.

the technical side

Taken from LASL Technical Information Reports submitted through ISD-6

American Geophysical Union 52nd Annual Meeting, Washington, D.C., April 12-16:

"Substorm Related Variations of the Magnetotail Plasma Sheet at 18 Earth Radii" by E. W. Hones, Jr., P-4 (invited)

Seventh Annual Symposium, New Mexico Chapter, American Vacuum Society, Albuquerque, April 21:

"Segregation of Impurities on Surfaces of Thorium: Thermodynamics and Kinetics" by W. P. Ellis, CMB-8

Industrial Hygiene Course, University of California School of Public Health, Berkeley, April 28, and Harvard School of Public Health, Boston, Mass., May 14:

"Industrial Hygiene in Nuclear Industries" by H. F. Schulte, H-5

Colloquium, Brooklyn College, Brooklyn, N.Y., April 30:

"Is Bremsstrahlung Useful for Studying Interactions?" by L. Heller, T-9

International Symposium, National Helium Society, Washington, D.C., May 2-4:

"On the Outlook for Controlled Fusion Power with Notes on Its Effect on Helium Consumption" by J. L. Tuck, P-DO (invited)

American Society for Microbiology 71st Annual Meeting, Minneapolis, Minn., May 2-7:

"Development of Induced Prophage HPIcl in **Haemophilus Influenzae**" by B. J. Barnhart and S. H. Cox, both H-4

Seminar, University of New Mexico, Albuquerque, May 3:

"Accurate Cross Section Measurements and Effects on Phase Shift Analyses" by J. H. Jett, P-DOR (invited)

Seminar, Chemistry Department, Utah State University, Logan, May 3:

"Carbon-13 and Organic Chemistry" by D. G. Ott, H-4 (invited)

Seminar, Rice University-University of Houston, Houston, Texas, May 4:

"Experiments with High Energy Pions at LAMPF" by P. A. M. Gram, MP-6

Nuclear Cross Sections Advisory Committee Meeting, Raleigh, N.C., May 4-5:

"Status of LAMPF and Its Proposed Pulsed Neutron Facility" by D. R. F. Cochran, MP-6 (invited)

Atomic Energy Systems, Operations and Programming Association (AESOP-IV) Meeting, Gatlinburg, Tenn., May 5:

"Advantages and Disadvantages of Regional Data Centers" by E. A. Voorhees, C-DO

Sixth Symposium on Advanced Propulsion Concepts, Niagara Falls, N.Y., May 5-6:

"The General Characteristics of Pulsed Propulsion Spacecraft" by T. P. Cotter, N-DOT (invited)

Spring Meeting, American Society of Civil Engineers, New Mexico Section, Albuquerque, May 7:

"Multistory Building Design—Static or Dynamic?" by M. D. Keller, ENG-1

Seminar on Instrumentation Requirements in Automated Cytology at Coherent Radiation, Palo Alto, Calif., May 7:

"Automated Cell Analysis at the Los Alamos Scientific Laboratory" by M. J. Fulwyler, H-4 (invited)

Meeting of Industrial Photographers of the Southwest, Regional Conference, Trade Show and Workshop, Santa Fe, May 7-9:

"A Year's Progress in Color-COM" by D. O. Dickman, C-4

Association for Computing Machinery of the Rio Grande-Phoenix Chapters Joint Meeting, Phoenix, Ariz., May 10:

"String Analysis with Transition Diagrams" by R. W. Mitchell, P-18

"Generalized Data Structure in MADCAP VI" by J. B. Morris, C-7

"SPIL (Special Purpose Input Languages)" by Jennie L. Boring, C-4

Seminars, University of Leeds, England, May 10, and University of Hull, England, May 11:

"Chromium (III) Complexes of Actinide (V) Ions" by T. W. Newton, CNC-2 (invited)

Lecture, Physics and Astronomy Departments, University of Iowa, Iowa City, May 11:

"Numerical Simulation of Collisionless Shocks" by D. W. Forslund, P-18

Spring 1971 Research Materials Meeting, Idaho Falls, Idaho, May 11-12:

"ICONS Program at LASL" by E. S. Robinson, CNC-4 (invited)

High Temperature Fuels Committee 32nd Meeting, Pittsburgh, Penn., May 11-13:

"Boron Carbide Structure" by J. L. Green, CMB-11

"Summary of Recent Work on Ceramic Plutonium Fuel Materials" by J. O. Barner and J. L. Green, both CMB-11

Seminar, Humboldt State College, Eureka, Calif., May 12:

"Biomedical Applications of Pi and Mu Mesons" by R. L. Hutson, MP-7

Department of Nuclear Engineering, University of New Mexico, Albuquerque, May 14:

"The Utilization of Reactors and Cyclotrons to Produce Radioisotopes" by H. A. O'Brien, CNC-DO (invited)

Spring Meeting, Metallurgical Society, American Institute of Mining, Metallurgy and Engineers, Atlanta, Ga., May 17-20:

"Experimental Investigation of

Corners in the Yield Surface" by S. S. Hecker, formerly CMF-5

Espanola Rotary Club, May 18:
"Bio-Medical Program at LAMPF" by H. A. O'Brien, CNC-DO

Colloquium, Lawrence Radiation Laboratory, Berkeley, Calif., May 19:
"Multivariate Statistical Analysis of Test-Site Data and Its Implications to Containment and Risk" by R. K. Lohrding, C-5

Clarkson College, Potsdam, N.Y., May 20:
"Nucleation and Diffusion in the Interaction of Gases with Metals" by R. M. Alire, W-7, and A. W. Czanderna, Clarkson College (invited)

Semi-Annual Atomic Energy Commission Computer Information Meeting, New York City, May 20-21:
"Los Alamos Scienfic Laboratory Computer Activity Report, May 20, 1971" by T. L. Jordan, C-DO
"Computer Architecture and Big Problems" by R. B. Lazarus, C-DO (invited)
"CROS—The LASL 7600 Operating System" by C. A. Folkner, C-2

New Mexico Association of Professional Engineers, Santa Fe, May 21:
"Fusion Power and the Environment" by E. L. Kemp, P-16

Lecture, Rio Grande Section, Health Physicists Association, Santa Fe, May 21:
"Science and Society" by L. Rosen, MP-DO

Fourth International Congress of Cytology, London, England, May 23-27:
"Automated Cytology: An Integrated System of Cell Analysis and Sorting" by M. J. Fulwyler, M. A. Van Dilla and J. A. Steinkamp, all H-4

Science Writers' Seminar, Argonne National Laboratory, Argonne, Ill., May 24-25:
"Electronic Sensing and Sorting of Normal and Abnormal Biological Cells" by W. H. Langham, H-4 (invited)

American Industrial Hygiene Conference, Toronto, Ontario, Canada, May 24-28:
"Respirator Efficiency Using Quantitative DOP Man Tests" by E. C. Hyatt, J. A. Pritchard and C. P. Richards, all H-5
"A Modified Spiral Centrifuge Aerosol Spectrometer" by O. R. Moss, H. J. Ettinger, both H-5, and J. R. Coulter, SD-5
"Performance of Auxiliary Air Hoods" by R. N. Mitchell, J. P. Ortiz, both H-5, and F. M. Toca, formerly H-5

European Nuclear Energy Agency CREST Specialist Meeting on Applicability of Quantitive Reliability Analysis of Complex Systems and Nuclear Plants and its Relation to Safety, Munich, Germany, May 26-28:
"Practical Factors Influencing Reliability and Their Implementation in Reliability Models for Complex Systems" by H. J. Otway, J-DOT

Defense Atomic Support Agency TREE Simulation/Instrumentation Meeting, Air Force Weapons Laboratory, Kirtland Air Force Base, N.M., May 27:
"Recent Developments in Plasma Focus" by J. W. Mather, P-17 (invited)

University of New Mexico Nuclear Engineering Seminar, Albuquerque, May 28:
"Thermal Neutron Radiography—A New Materials Analysis Technique" by D. A. Garrett and R. A. Morris, both GMX-1

Eighteenth International Technical Communications Conference, San Francisco, Calif., June 2-5:
"Taking the Noise Out of Technical Writing" by J. W. McDonald, ISD-6 (invited)

Atomic Energy Commission Contractor Health Protection Meeting, Richland, Wash., June 3-4:
"Respirator Standards, Testing and Fitting—There'll Be Some Changes Made" by E. C. Hyatt, H-5 (invited)
"Where Do We Stand—Personnel Dosimetry" by D. E. Hankins, H-1

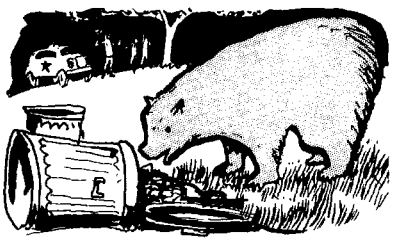
Seminar, University of Alberta, Edmonton, Alberta, Canada, June 10:
"Los Alamos LAMB Shift Polarized Ion Source" by G. P. Lawrence, P-9

American Society of Biological Chemists 62nd Annual Meeting, San Francisco, Calif., June 13-18:
"The Enzymatic Polymerization of the Complementary Trinucleotide Sequence d(A-A-T)·d(A-T-T)" by R. L. Ratliff, F. N. Hayes, D. L. Williams, D. E. Hoard and D. A. Smith, all H-4

American Nuclear Society 17th Annual Meeting, Boston, Mass., June 13-17:
"A Study of Two-Dimensional S_n Transport Synthesis Via 'Angle-Collapse'" by R. E. Alcouffe, T-1
"Space and Time Dependent Slowing Down in Heavy Media" by C. R. Weisbin, R. A. Forster, D. B. Smith, all A-1, and N. Corngold, California Institute of Technology, Pasadena, Calif.
"An Early History of Criticality Safety" by R. Reider, H-3
"Accelerator Neutron Sources for Nondestructive Assay of Fissionable Materials" by R. H. Augustson, A-1
"Experience with ^{252}Cf and Subthreshold Neutron Sources for Nondestructive Assay" by H. O. Menlove and R. A. Forster, both A-1
"Passive Assay Techniques—Gammas and Neutrons" by T. D. Reilly, A-1
"Initiating an Unfolding Capability" by R. R. Fullwood, W-8
"The Storage Ring as a High Intensity Source" by R. R. Fullwood, W-8
"Least Structure Techniques in Unfolding" by C. S. Young, J-14
"Stability of Synthetic Methods in Transport Theory" by W. H. Reed, T-1
"Fission Cross Section of ^{252}Cf" by M. S. Moore, P-3, J. H. McNally, TD-4, and R. D. Baybarz, Oak Ridge National Laboratory, Tenn.
"Multiple Neutron Capture in Nuclear Explosions—Cross Sections and Results" by G. I. Bell, T-DOT
"Swimming Through the Crystal Ball" by R. B. Walton and G. R. Keepin, both A-1

continued on next page

20 years ago in los alamos



Culled from the July-August files of the Los Alamos Herald by Robert Porton

Hill Voting Age Slashed

The Los Alamos Town Council lowered the voting age for its elections from 21 to 18. This means that any local resident 18 years of age or older having a "Z" number, will be eligible to vote in Town Council elections.

Firemen Quell Fire in Forest

Eleven quick-working Los Alamos firemen stamped out a forest fire near the North Community while brisk winds threatened to whip it out of control. The fire department said the blaze, which might easily have swept close to the housing area, evidently was set off by children playing with firecrackers.

Bear Loses Faith in Human Nature

A 200-pound brown bear lost a lot of faith in humans. He was "peacefully" raiding garbage cans in the vicinity of 1788 34th street, when lights flashed on and a general commotion started. He ambled up a tall tree and then, things began to happen. Residents decided a call to police was in order. Police, newsmen and Deputy Game Commissioner Jack Lyon arrived on the double. Armed with nothing but his two bare hands and a rope, Lyon started up the tree. The bear took exception to this violation of his privacy, spat in Lyon's face, and growled menacingly. Lyon retreated! Police Lieutenant Lloyd Umberhind allowed as how a rock on the snoot might bring the animal down. He wound up, let fly, and "whop"—smacked Bruin on his nose. The bear came down pronto and the bystanders suddenly found urgent business elsewhere. Mr. B was heard to mutter as he waddled off into the forest—"It wasn't very good garbage anyhow."

Colonel K. E. Fields Heads DMA

Appointment of Colonel Kenneth E. Fields as director of the Division of Military Application of the AEC was announced in Washington. He succeeds Brigadier General James McCormack Jr., who has been assigned as a special assistant to the Deputy Chief of Staff for Development. U. S. Air Force. The new DMA chief is a West Point graduate, and from Nov., 1945, to April, 1947, was assistant to the commanding general of the Manhattan Project.

"The Requirements of Safeguards and Nuclear Materials Management" by G. R. Keepin, T-1

Calculations of Fast Critical Assemblies Using LASL and ENDF/B Version II Data" by J. T. Hirons, TD-4, and M. E. Battat, T-2

"Fabrication and Testing of Sodium-Bonded Mixed Carbide Fuel for Advanced LMFBR Application" by J. C. Clifford, J. O. Barner and M. W. Shupe, all CMB-11, and F. B. Litton, N-1

"Solutions to a Class of Time-Dependent Transport Problems" by W. L. Hendry, T-1

National Safety Council Symposium on Safety and Development, University of Minnesota, Minneapolis, June 14-15:

"Safety in Cryogenics" by F. J. Edeskuty, P-8 (invited)

"On Working Alone in Research and Development Activities" by R. Reider and J. A. Phoenix, both H-3

American Physical Society Topical Conference on Collisionless Shocks, Los Alamos, June 14-15:

"Wave and Particle Observations Upstream from Earth's Bow Shock" by M. D. Montgomery, P-4, and R. W. Fredricks, TRW Systems, Redondo Beach, Calif., (invited)

American Institute of Aeronautics and Astronautics Seventh Propulsion Joint Specialist Conference, Salt Lake City, Utah, June 14-18:

"System Studies of Fusion Powered Pulsed Propulsion Systems" by K. Boyer, DLP and J. D. Balcomb, N-DO

Los Alamos Geological Society, June 15:

"Geological Characteristics of Los Alamos Related to Structural Design and Safety" by M. D. Keller, ENG-1

Seminar, College of William and Mary, Williamsburg, Va., June 15:

"Lepton Conservation Laws" by J. J. Amato, MP-7

American Chemical Society 26th Northwest Regional Meeting, Division of Organic Chemistry, Bozeman, Mont., June 16-18:

"Oligodeoxyribonucleotides: Blocking Groups for 5'-Phosphate in Stepwise Chemical Synthesis" by D. Williams and D. Hoard, both H-4

Henry T. Motz
3157 Woodland
Los Alamos, New Mexico 87544

Senator Stuart Symington, right, toured Scyllac facilities during a recent visit to the Laboratory. Accompanying him during the tour were Lieutenant General H. C. Donnelly, (retired), manager of the AEC's Albuquerque Operations; Fred Ribe, P-15 group leader; and Harold Agnew, director of the Laboratory. Symington is a member of the Joint Committee on Atomic Energy.

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