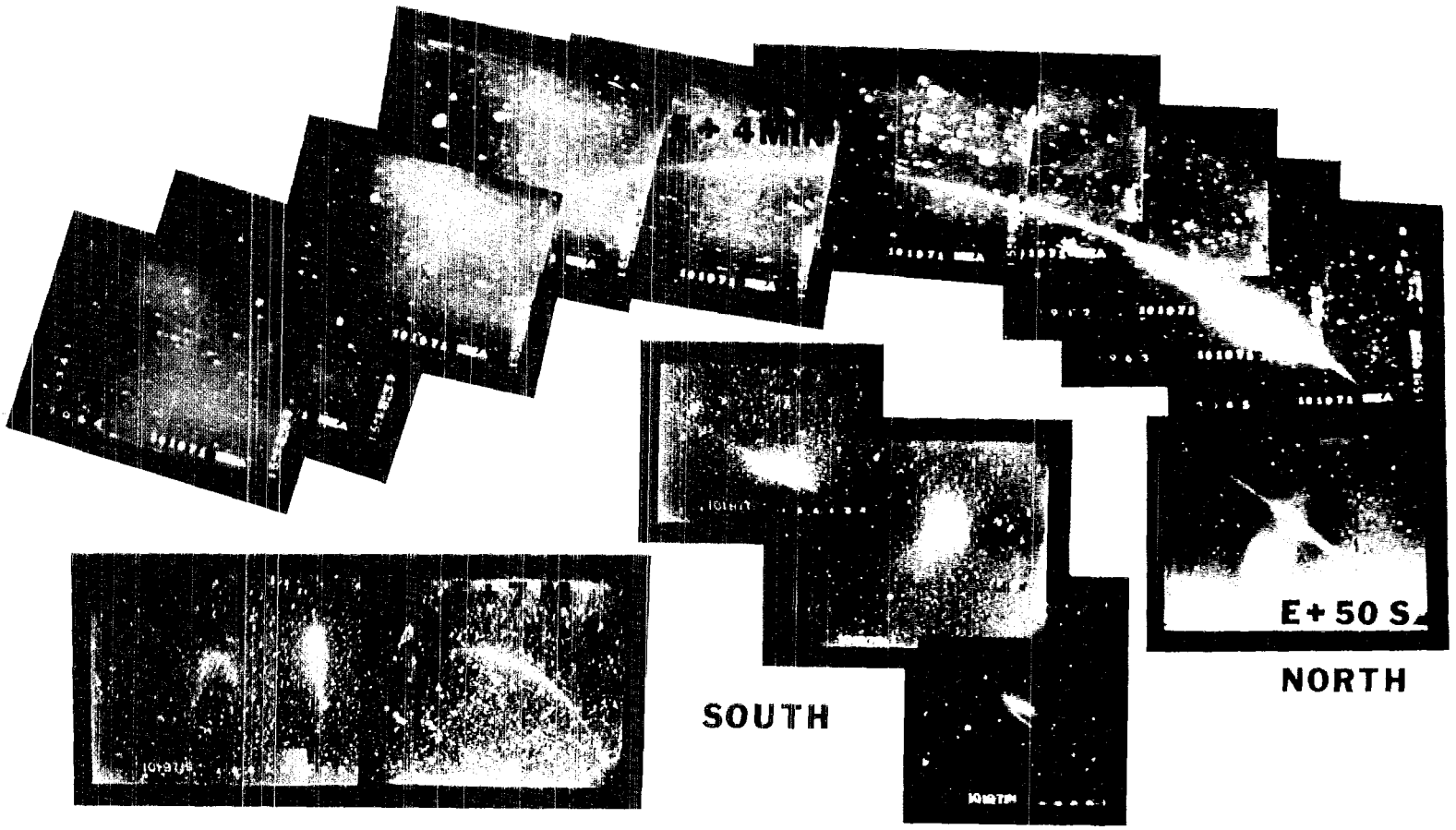
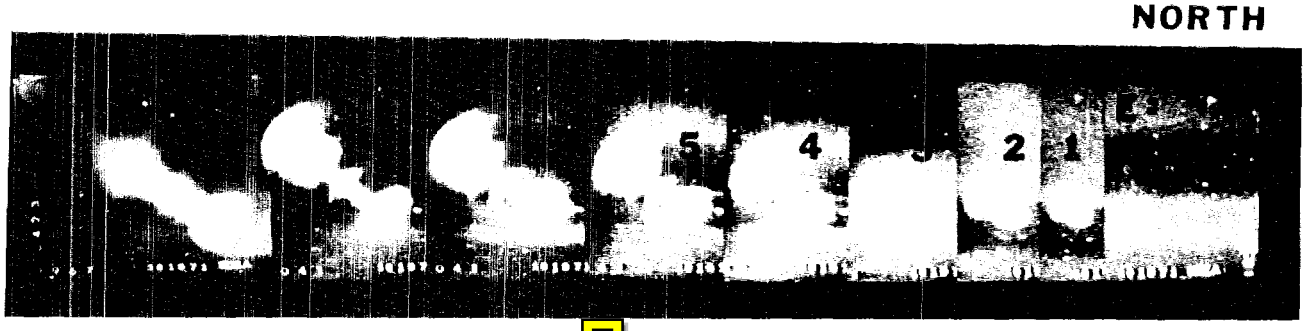
THE ATOM

Los Alamos Scientific Laboratory Jan.-Feb. 1972





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THE ATOM

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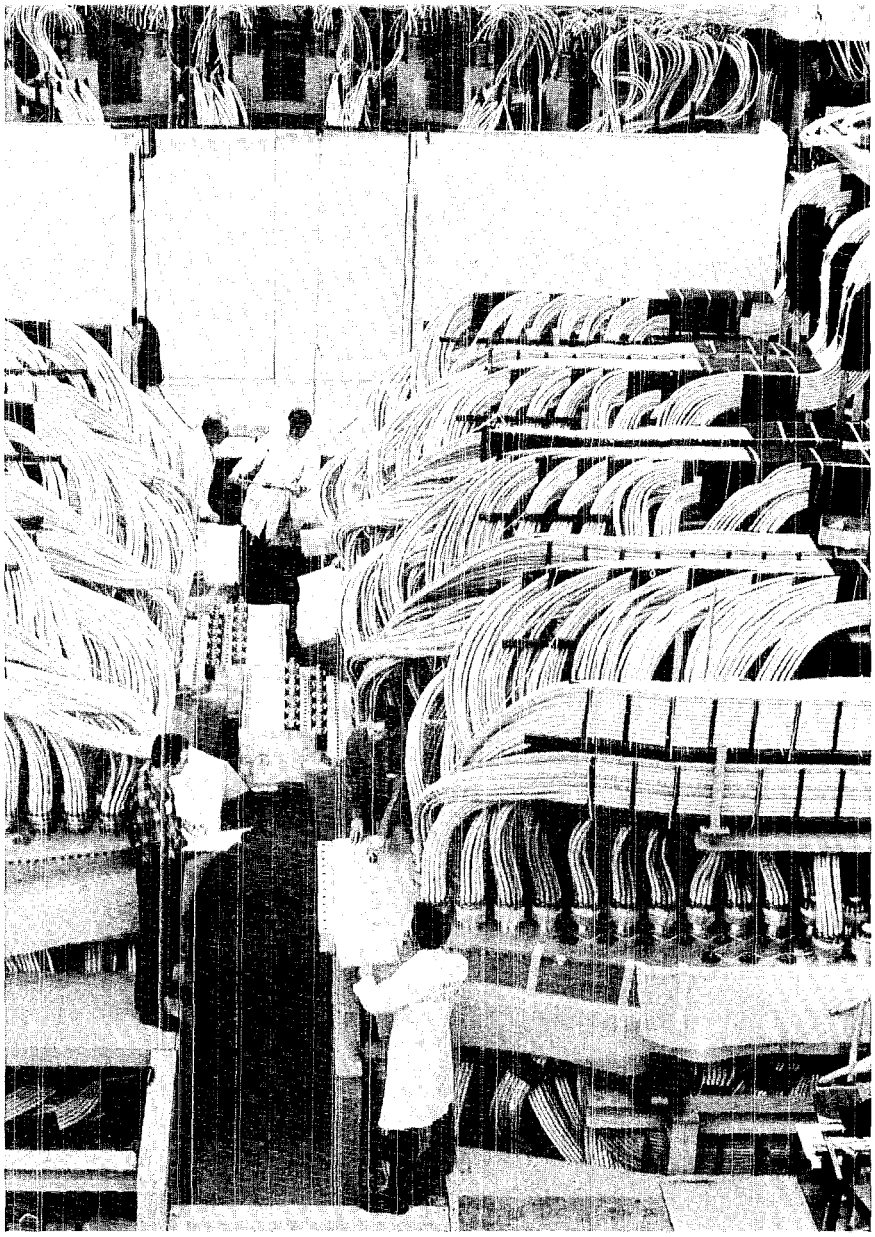
COVER:

Still photo copies of intensified-image orthicon tape records when matched together in top panel show a barium ion streak tracing a geomagnetic field line from a point over Kauai to its disappearance over the southern horizon (left). Center records were made from two NC-135 aircraft flying near the southern conjugate point southeast of Tonga. The same streak is shown arching up from the northern horizon. Bottom sequence shows the detonation of the shaped charge which surrounded a cone of barium metal. The barium was vaporized, creating a rapidly moving jet of barium plasma in the ionosphere. LASL scientists with the collaboration of the University of Alaska Geophysical Institute successfully conducted two experiments in "painting" a magnetic field line for its whole length—a first in the field of ionospheric research. For more information read the story which begins on page 12.



LASL scientists work on Sherwood's new linear machine. The open-ended quartz tube will be placed in the compression coil between the two rows of capacitor banks. The two outside banks, on the right, will be used to energize the magnetic mirrors. The curved sector of Scyllac is just beyond the wall.

A Straight Machine for Toroidal Problems

Project Sherwood history is a chronology of step-by-step design improvements which are substantiated by testing and retesting. Although the designs and tests have become considerably more complex than they were 20 years ago when the Los Alamos Scientific Laboratory began work in controlled thermonuclear (fusion) reactions, this philosophy has not changed. Scientists are still improving experimental devices and are confident that several years from now, these devices will lead to a fusion reactor capable of producing electrical power.

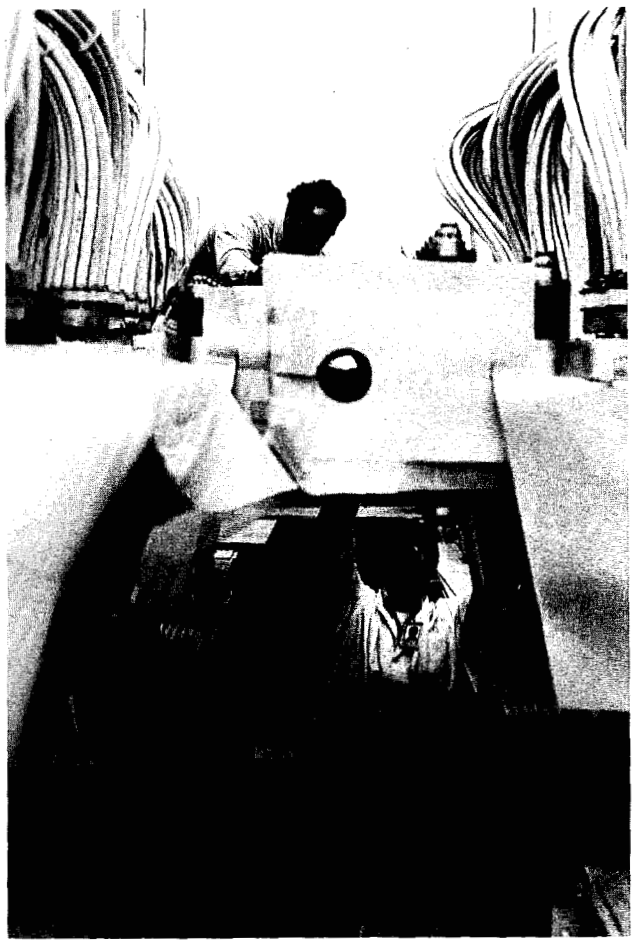
The latest step in the Los Alamos fusion project is a new linear machine which will be used to investigate some of the problems associated with the development of both "straight" and toroidal machines.

Most of the experimental devices built for Project Sherwood have been linear. One of the problems associated with them has been the confinement of a very hot, compressed plasma (ionized gas). The scientists calculate that plasma temperature in a fusion reactor must be about 100 million degrees. Since no earthly material can resist such a temperature, they have turned to the idea of "bottling" the plasma in strong magnetic fields. In linear machines used to date, con-

continued on next page

Jose Garcia and Neil Lowry, both of P-15, work on capacitor bank load cables.

The quartz tube will be placed in the hole at center. Working on the compression coils are Tom Dominguez, P-16, top, and Mike Thomas, P-15.

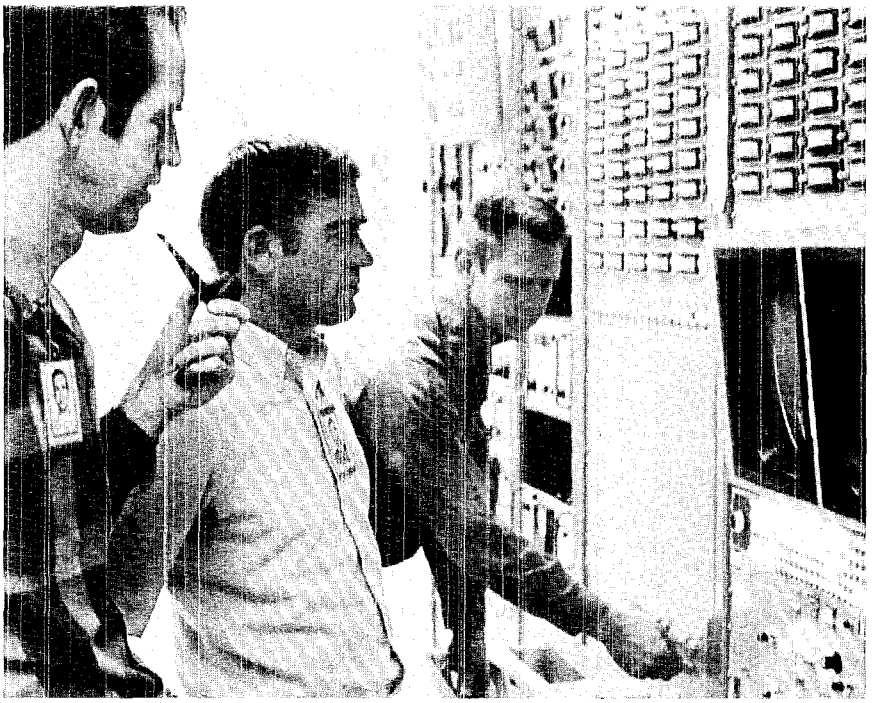


finement time has been limited by radial diffusion of the plasma through the magnetic fields and through the ends of the linear devices.

With these machines scientists have been able to confine a plasma for about 10 microseconds, roughly 1/1,000 of the time required for a fusion reactor. Because the new linear device is longer than any previous LASL machine and magnetic mirrors will be used to cut down on end losses, Sherwood scientists feel that plasma confinement time can be more than doubled and much can be learned about plasma behavior that will be applicable to the development of the toroidal machine, Scyllac.

Scyllac is being built in three sectors, the first of which was completed in April. Although the torus is an extremely complex system, it is expected to have several advantages over the straight machine concept. One of these is that there are no ends through which the plasma can escape. Also, according to Fred Ribe, P-15 group leader, "The toroidal machine, as a reactor, is less expensive—by a factor of 10. A comparable linear machine would have to be very long—about two miles. The Scyllac torus will be about 50 feet in circumference and 16 feet in diameter.

"Some of the problems, however, can be investigated better with a straight machine. The torus



Both the curved sector of Scyllac and the linear device will be operated from the same control console. Ward Harris, P-16, right, adjusts one of the television monitors. At left are Keith Thomas and Carroll Harder, both of P-15.

concept brings in some complicating factors. We must work hard to keep the plasma off its walls and on its curved axis. With a linear machine we don't have this problem. With the new machine we will be concerned with such things as how plasma diffuses through magnetic fields and we will be studying it as a complete alternate to the toroidal system by attempting to stopper the ends against end loss with magnetic mirrors."

The mirrors are, in essence, stronger magnetic fields. On the new linear machine there will be two whose strength and timing can be controlled individually to obtain the longest possible plasma confinement time.

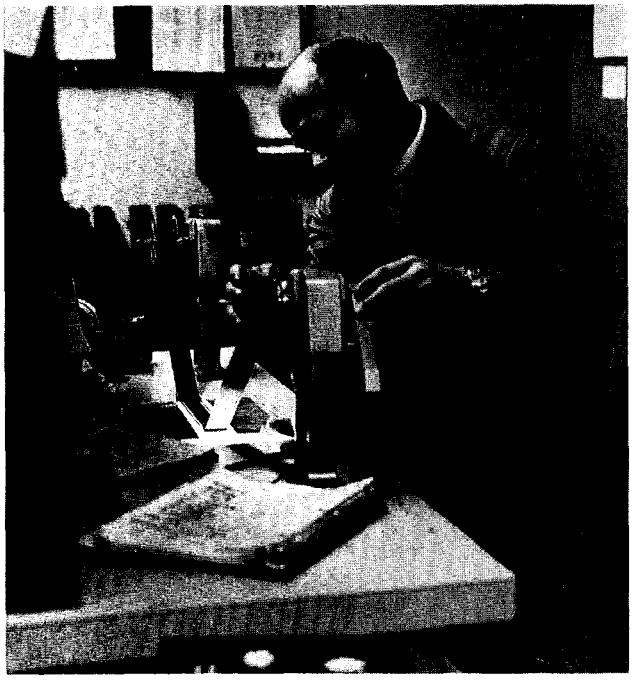
With two exceptions—the mirrors on the linear device and the curved axis of the Scyllac sector—the machines are identical. Both are 16 feet long, use the same hardware and operate on the theta-pinch principle whereby a magnetic field rapidly compresses the plasma into a very hot column one inch in diameter.

Like its predecessors, the new linear machine operates in pulses of short duration. In essence, it consists of an open-ended quartz tube four inches in diameter. The tube contains deuterium gas and is surrounded by a coil. A current of more than 50 million amperes is passed through the coil for a very short time by the discharge of five energy storage capacitor banks. This strong current flowing through the coil generates a powerful magnetic field which compresses and heats the plasma. The machine has a total of seven capacitor banks. The other two are used to energize the magnetic mirrors.

Construction of the linear device was completed by Los Alamos Constructors, Inc. (LACI), just before Christmas and it will be used in experiments as soon as it is meshed with its auxiliary components and checked out. Key figures in these phases include Ward Harris, P-16, who is chief engineer for the project, Ross Harder, P-15, who is in charge of checkout testing, and Alan Rawcliffe, P-15, who is control systems engineer for both the toroidal and straight machines.

According to George Sawyer, P-15 alternate group leader, the linear machine will be used in the Sherwood project ". . . until we can control the torus. Then we intend to use its components to complete the ring."

The linear machine stands adjacent to the curved sector of Scyllac. The two machines were conceived at the same time as separate stages of the Scyllac experiment. The sector of Scyllac was built first in order to make preliminary experiments with regard to a plasma following a curved axis before building the full torus, Ribe said. "From a construction point of view, the fact that the curved sector was built first was an engineering detail," according to Ed Kemp, P-16 group leader. "The torus will be with us longer so we built its first sector at the back of the room. The linear machine is nearest the door."



Charles Sargent sorts a group of negatives generated on one of the Central Computing Facility's 4020 printer/ plotters.

Charles Sargent is a Very Busy Man

The average American lives at a pretty hectic pace, but he would be hard put to compete with Charles Sargent.

Sargent is a full-time employee in Group C-1 at the Los Alamos Scientific Laboratory and a full-time student at the College of Santa Fe. He is a member of the College's student government, has organized a business club and a day-care center at the institution and is currently working toward the procurement of a computer terminal for its Business division. In addition, he is building a three-bedroom home in Cordova for his family, commutes 150 miles a day and still finds time for horseback riding, a hobby, hiking, fishing and other family activities.

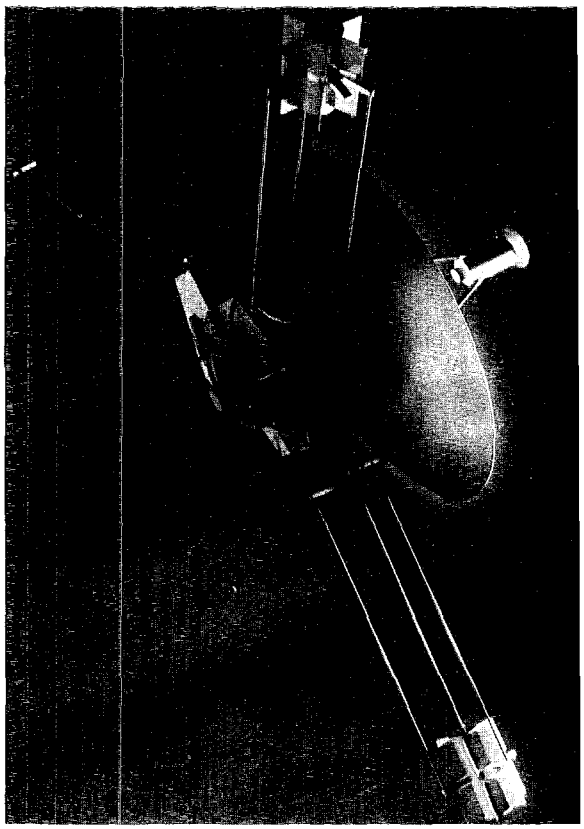
Sargent begins each day about 6:30 a.m. He and his wife, Eloida, commute from their home in Cordova to the College of Santa Fe where he is majoring in business management and she is majoring in psychology. Sargent is a senior and has carried 15 to 18 credit hours per semester during the three years he has attended classes in Santa Fe. He has been on the dean's list every semester and has been accepted for inclusion in the 1971-72 edition of "Who's Who Among Students in American Universities and Colleges." He is the Business division's student government senator. He organized the College's Business club ". . . to help businessmen with bookkeeping problems, advertising, marketing or anything else we can do to help them." For the past year—summers and between classes—he has been working to establish a free day-care center for Santa Fe children whose mothers attend classes at the College. The day-care center opened in January. More recently he has been working with the Business club toward the procurement of a computer terminal which would give the Business division access to a major computing facility.

Sargent currently attends classes from 9 a.m. to 2 p.m. Monday through Friday. He arrives at the Laboratory by 4 p.m. and works until midnight as a computer and printer-plotter operator. After completing his workshift, Sargent arrives home about 1 a.m.

"Sargent's other activities don't interfere with his Laboratory job," said Paul Harper, assistant C-division leader. "He does excellent work."

On weekends, Sargent divides his time among several activities. He works on his house, attends to his hobby (organic gardening), or goes horseback riding, hiking or fishing with his family. The Sargents have two children—Jeff, 4, and Chris, 11.

"I'm 33 years old," Sargent said. "I feel that if I don't do these things now, I won't do them later. It's hard to find a job with working hours that will allow you to go to school at the same time. Both the College and the Laboratory have been very cooperative in helping me work out a compatible schedule for classes and working hours."



In this artist's conception of the Pioneer F spacecraft, the radioisotope thermoelectric generators are located at the ends of the two booms. Two of the RTG's are mounted on each one. (NASA/JPL photo)

The Jupiter Flyby and LASL

In late February or early March a small delegation from the Los Alamos Scientific Laboratory will witness the launch of NASA's Pioneer F spacecraft at Cape Kennedy. The launch will mark the culmination of nearly three years' work at the Laboratory on the heat sources for the craft's power supplies.

The Pioneer will be the first spacecraft to probe the territory beyond Mars. Its goal is a flyby of Jupiter to collect information about the planet and its atmosphere.

The 550-pound probe serves as a scan platform for 11 on-board experiments, the first deep-space probe in history to rely solely on nuclear generators for electrical power. Nuclear generators have been used, however, on various orbiting satellites and are still providing power for scientific instruments on the moon.

This system was chosen by NASA to power the mission experiments because of the problems that could be expected if other sources were used. Solar cells and storage batteries have been used in previous missions. But, enormous numbers of solar cells would be necessary to generate the power required when the spacecraft encountered Jupiter. The sun's energy drops 25-fold this far out in space, and it is unlikely they would survive the debris of the asteroid belt and anticipated high-radiation fields trapped by Jupiter's magnetic field. In the case of storage batteries, weight restrictions prevent the use of the large numbers of them that would be necessary to produce enough power for the experiments. The number of batteries that could be accommodated would be run down before the end of the mission and could not be recharged.

For these reasons, it was decided to use four rugged nuclear generators, each one producing 30 watts of electrical power. Although three of them would be enough to meet the minimum requirements of the experiments at the time of the Pioneer's encounter with Jupiter, the fourth generator was added to

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Tom Keenan and Mike Tokar, both of CMB-11, examine a part of the high-density carbon die used in a 50-ton press to form plutonium-238 dioxide spheres.

reduce the possibility of a power shortage at a crucial moment.

Technically, the generators are called radioisotope thermoelectric generators (RTG's). An RTG has no moving parts. The spontaneous radioactive decay of its plutonium-238 dioxide fuel generates heat which is converted directly into electrical energy.

The fuel for each of the four generators consists of 18 stacked disks, each producing 40 watts of thermal energy. The disks are about two inches in diameter and a quarter of an inch thick. The stack is encased in a multi-layered refractory metal capsule which is contained in a hexagonal graphite reentry shield. The fuel-capsule-shield assembly is inserted in a compact cylindrical generator 11 inches high and 20 inches in diameter which weighs about 30 pounds.

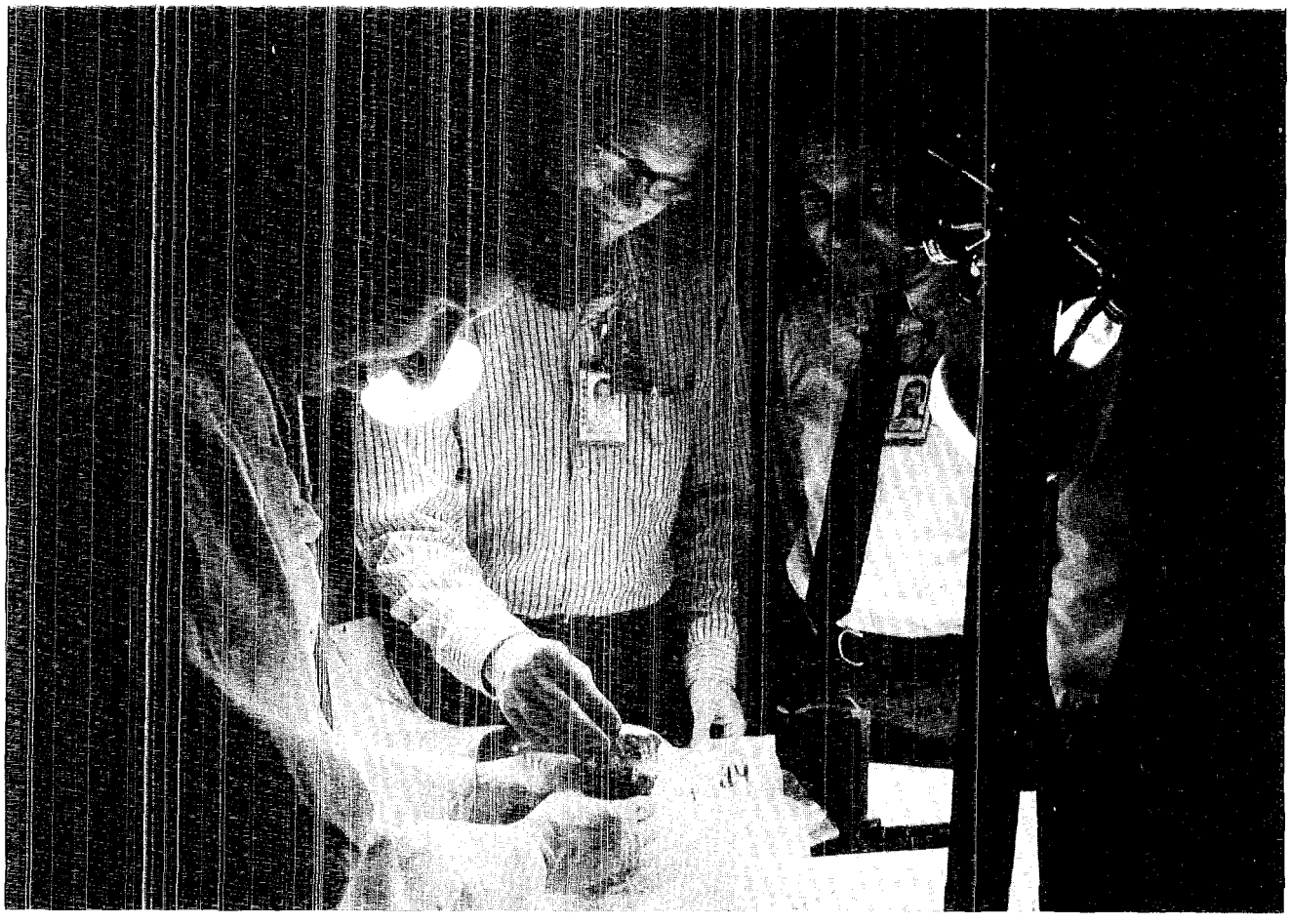
Much of the initial development of the disks was done by Group CMB-11 at the Los Alamos Scientific Laboratory. Characterization and testing were done by members of CMB-5, CMB-1, CMB-7, N-2, GMX-1, GMX-3, and GMX-6.

According to Tom Keenan of CMB-11, group members have produced 46 plutonium-238 disks for the project, some of which have been used in development and characterization testing and others that will be used in the Jupiter-bound spacecraft's RTG's. Mound Laboratory, the AEC-designated production site, fabricated the majority of the disks required.

Fuel characterization work done by CMB-5 is essentially measurements of the fuel's properties with respect to its capsule and shield. From these measurements nuclear safety guidelines are determined to assure containment and control of the nuclear fuel in the unlikely event of an aborted mission. Characterization, Bob Mulford, alternate CMB-5 group leader, said, includes a thorough study of the chemical and metallurgical compatability of the fuel and capsule, and the behavior of the fuel-capsule-shield assembly when subject to conditions such as ground impact, high temperatures that would be experienced during reentry, and submersion in sea water.

Among other fuel characterization aspects investigated by CMB-5 is the measurement of the helium nuclei (alpha particle) release rate from the fuel. Helium is a product of plutonium-238 decay. The measurements were made to aid in the design of the nuclear generators.

The generators will provide 120 watts of power for 11 experiments on board the Pioneer. There will be two asteroid particle detector experiments and three energetic proton and electron detectors to measure the intensity and energy distribution of radiation fields. A plasma probe will measure the extended solar corona and its interaction with the planet's magnetic field. A magnetometer will be used



Dana Douglass and Stan Bronisz, both of CMB-5, study capsules and reentry shields of various designs to determine their capabilities to contain the plutonium fuel under velocity, temperature and impact conditions similar to those that would be expected from reentry. At right is Bob Mulford, alternate CMB-5 group leader.

for interplanetary and magnetic field measurements, and a detector will measure the influx of galactic cosmic rays and the efflux of solar rays.

The Pioneer spacecraft will encounter Jupiter 600 to 800 days after launch and fly within 100,000 miles of its surface. At that time, an infrared radiometer will measure the planet's thermal energy balance. An imaging photopolarimeter will take pictures of the planet in red and blue light, and an ultraviolet photometer will make measurements of Jupiter's atmosphere.

Additional information about Jupiter will be collected from earth tracking stations. The Pioneer's S-band telemetry signal will penetrate and be altered by the upper edge of the planet's atmosphere as the spacecraft starts to pass behind Jupiter. The craft will eventually be completely shadowed by the

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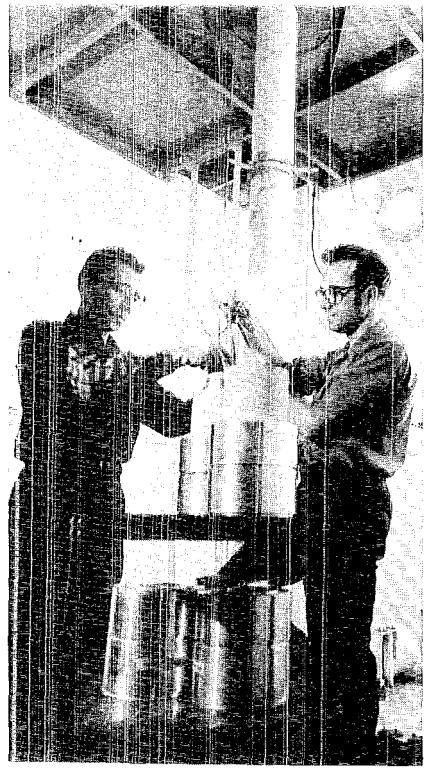
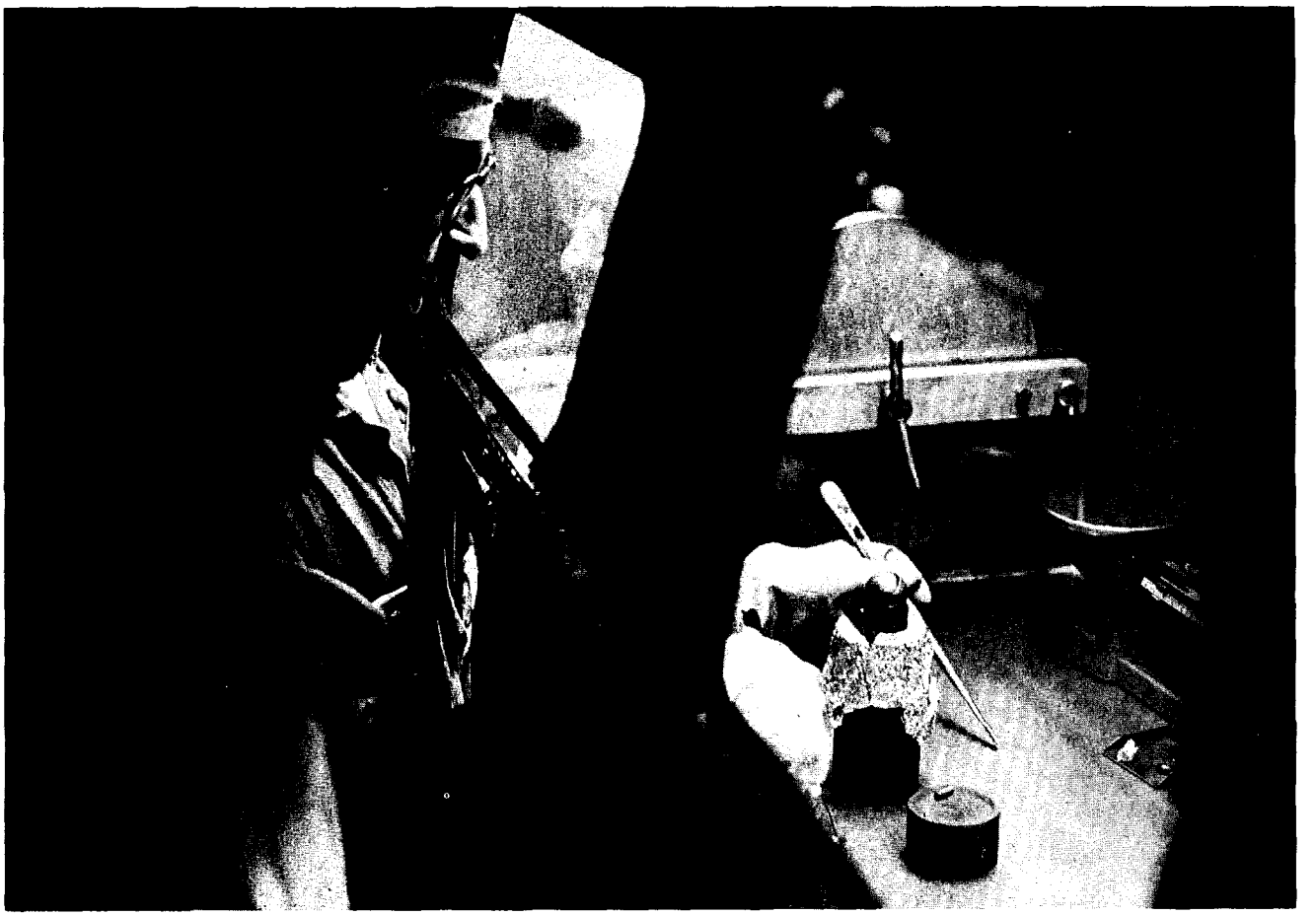


Raphael Montano and Charles Franz, both of CMB-5, load a container holding a fuel sample into an air-gun "bullet" at Ten site. The air gun is used to simulate the hot impact of a fuel capsule on the earth's surface, such as might be expected after reentry.



Richard Kent and George Melton, both of CMB-11, examine a plutonium-238 dioxide fuel sphere developed by members of CMB-11.

planet and the propagation changes of its radio signals will give additional information about its atmosphere. Earth tracking stations will also provide data on Jupiter's orbital position and mass by the way it alters the spacecraft's trajectory.

While the Pioneer mission will help untangle some of the mysteries of our solar system, it will also be a precursor to the forthcoming "Grand Tour" missions. About every 175 years, the planets in our solar system become so aligned that it is possible to "tour" several of them with one space probe. This alignment comes about again in 1975. Through 1980 NASA has planned several multi-planet space probes.

According to Keenan, these missions will require higher power levels over longer times. An advanced fuel form to meet these requirements is being developed at LASL. A proposed new generator design requires that the fuel be spherical in shape. CMB-11 has made enough prototype spheres to prove the feasibility of this form. The spheres are made of pure plutonium-238 dioxide, about an inch and a half in diameter, and are produced by a more simple process than that required for the cermet disks. Each sphere generates about 100 watts of thermal energy and the cherry-red glow from a single sphere is easily visible in a darkened room. The LASL-developed fabrication technology for the spheres has been used successfully at the Mound Laboratory production site.

The generator system which employs the sphere-shaped fuel could be used for the Grand Tour probes scheduled for 1975 through 1980 and beyond. However, LASL is continuing to develop and characterize even more advanced fuel forms and assemblies to meet the different requirements of missions envisioned by space scientists.

The Trend Toward Lower Cost Insurance

For several years there has been a trend toward the lower-cost group health insurance plan offered to employees at the Los Alamos Scientific Laboratory, and it appears the trend will continue in 1972. During the recent open enrollment period, this plan—Equitable III—gained 196 subscribers at the expense of its two counterparts—Equitable II and New Mexico Blue Cross/Blue Shield.

According to Ken Wilson, PER-6 group leader, and Neva Roberson, assistant group leader, the first big surge toward Equitable Plan III began in 1967. During the open enrollment period for that year, the plan gained 729 policy holders and has recorded consecutive gains in each year since then. In 1968 Plan III rose by 201; 1969, 351; and 1970, 73.

Cost is apparently the factor responsible for the trend toward the lower-priced plan. For family coverage, Equitable Plan II now costs the employee $50.62 per month, up $8.64 from the previous year. Equitable Plan III is $18.78, up $3.05; and New Mexico Blue Cross/Blue Shield is $47.30, up $10.95. Total enrollment for each of the three plans at the close of the recent open enrollment period is: Equitable Plan II, 636; Equitable Plan III, 2,880; New Mexico Blue Cross/Blue Shield, 214.

In addition to the group health insurance plans, several other coverages are available to Laboratory employees. These are Equitable Employee Group Life, Dependent Group Life and Employee Short-Term Disability; American Home Assurance Company Accidental Death and Dismemberment; and California Casualty Insurance Company Automobile Insurance.

Approximately 90 per cent of the Laboratory's employees are enrolled in the health insurance plans. Ninety-five per cent are enrolled in the life insurance plan and 62 per cent carry dependent life. Thirty per cent carry short-term disability; 65 per cent, accidental death and dismemberment; and 34 per cent, automobile insurance.

"With the exception of short-term disability insurance," Wilson said, "the percentage of em-

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Revising insurance summary sheets are Neva Roberson, assistant PER-6 group leader, and Lou Foyt. The summary sheets provide employees with a condensed explanation of all insurance plans available through the Laboratory.

	'67	price change	'68	price change	'69	price change	'70	price change	'71	price change
II	—711	+7.50	—179	+2.87	—363	+7.33	—70	+5.28	—136	+8.64
III	+729	+2.20	+201	+2.15	+351	+4.27	+73	+3.11	+196	+3.05
BC/BS	— 18	+6.00	— 22	+0.75	+ 12	+2.15	— 3	+5.75	— 60	+10.95

The table above shows the net change during open enrollment and the change in cost to the employee for family coverage in each of the plans. These figures were recorded at the completion of enrollment periods and price changes reflect adjustments in the employer contribution during the calendar year. During the five-year period covered in the table, the University of California's contribution has increased from $6 to $12 per enrolled employee. Therefore, the net increase to the employee with family coverage has been $25.62 (102%) in Plan II, $8.78 (88%) in Plan III, and $19.60 (71%) in New Mexico Blue Cross. The table at right shows enrollment figures over a five-year period for each of the three group health insurance plans offered to employees at the Laboratory. The figures represent enrollment just prior to open enrollment periods.

	'67	'68	'69	'70	'71
II	2337	1619	1378	922	784
III	972	1894	2282	2512	2611
BC/BS	299	300	290	275	278

ployees enrolled at Los Alamos in the University insurance programs is higher than at any other University location.

"The University of California has a group insurance manager in Berkeley whose responsibility is to develop and administer group insurance programs. He and his staff work with the personnel people from the University campuses and laboratories, and he is our contact with respect to changes in programs, employee complaints and suggestions for the annual negotiations with the insurance carriers. Once or twice a year he holds meetings with employee benefits people from the different University locations. At these meetings, participants exchange ideas and discuss suggestions they have received. The manager evaluates these proposals and resolves any conflicting points of view before meeting with representatives of the insurance carriers.

"Insurance premium rates are based on three things. These are claims experience in the preceding fiscal year; retention that the insurance companies must have for such things as outstanding claims, administrative expense, profits, taxes and reserves, and projected costs for the current fiscal year. Unfortunately, for all of us, the cost of medical care has been skyrocketing in this country. As a result, some new national health plan may be passed by the Congress in 1972. How this may affect private plans such as ours is not yet clear.

"Equitable Plans II and III are University-wide, and Los Alamos is a part of the total University claims experience, so rates are not geared specifically to LASL."

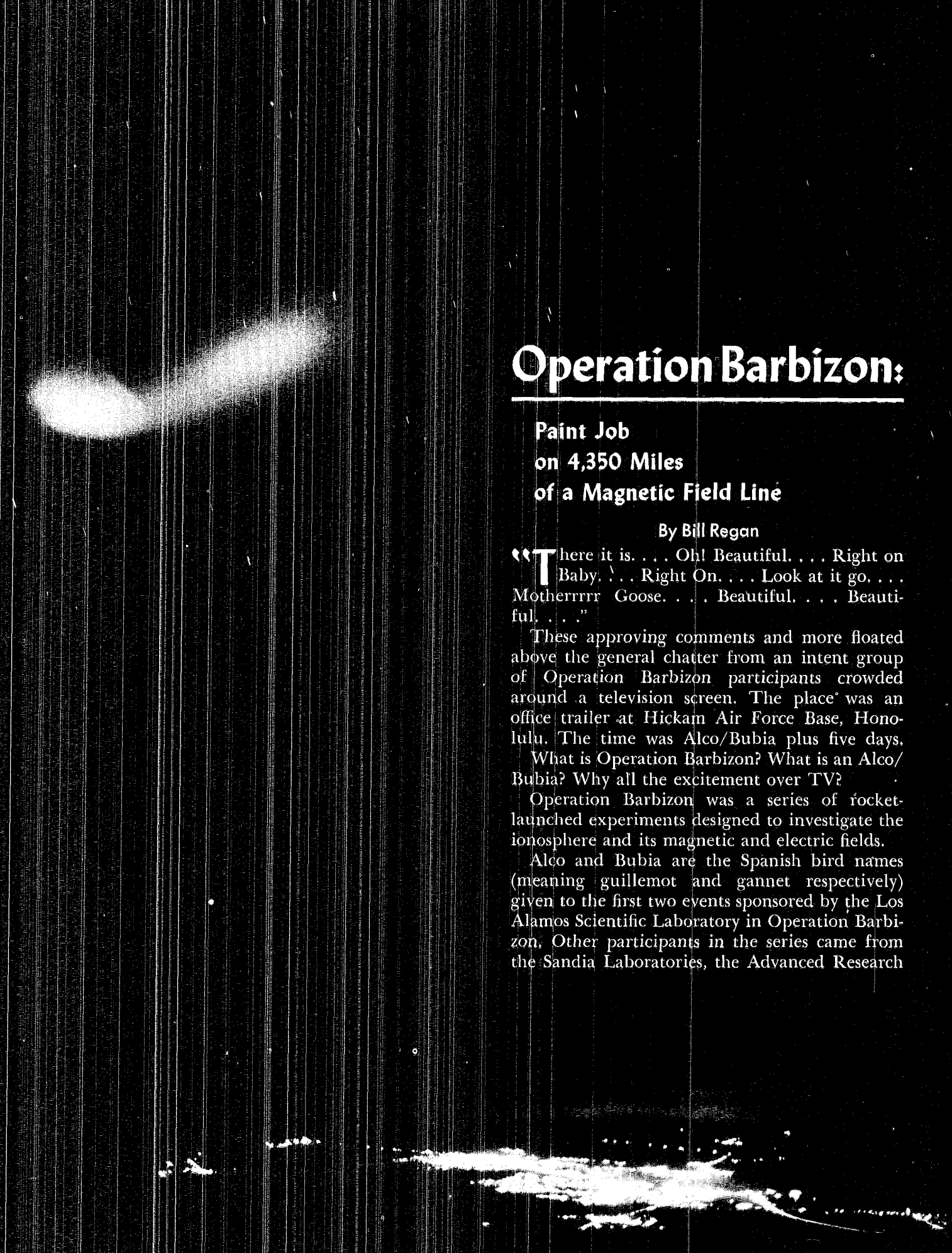
Group PER-6, however, does keep track of LASL's claims experience—employee dollars paid in versus cash claims paid out. According to Mrs. Roberson, the cumulative total for Equitable Plan II since its inception at the Laboratory in 1962 is $1.04 paid out in cash claims for every premium dollar paid in. Cumulative totals for

Inez Hults of PER-6 explains the employee benefits program to Robert Anderson, a new hire in J-8.

Equitable Plan III and New Mexico Blue Cross/Blue Shield are 84 cents and 95 cents respectively.

Administration of the Laboratory's insurance programs is a function of PER-6 and includes counseling services and processing of insurance data. New hires are given reasonable time to enroll in any of the insurance programs. For employees who are already enrolled, changes are made during an annual open enrollment period which is usually in November. These normally become effective the first day of the new calendar year. During the open enrollment period employees can enroll or make changes in life and health insurance plans without evidence of insurability, increase life insurance coverage, change health plans and add previously uninsured dependents. Exceptions to the open enrollment period are that employees can enroll or make changes in the accidental death and dismemberment and automobile insurance plans at any time during the year. The same is true of short-term disability insurance, although the employee must submit a statement of health for approval by the insurance company before he can be enrolled. Also, beneficiary designations in life and accidental death and dismemberment plans may be changed at any time.

Wilson and Mrs. Roberson pointed out several advantages to belonging to the group insurance plans offered through the Laboratory. Cost to the employee is lower under the group plans than if they were to subscribe individually. The University contributes $12 per month for each employee enrolled under one of the group health insurance plans which helps offset employee costs. The University's monthly contribution has increased $2 each year for the past two years. Other advantages can result from improved claims experience. In 1971, for example, December premiums were waived for employee and dependent life insurance and short-term disability plans because of favorable experience.



Operation Barbizon:

Paint Job on 4,350 Miles of a Magnetic Field Line

By Bill Regan

"There it is. . . . Oh! Beautiful. . . . Right on Baby. . . . Right On. . . . Look at it go. . . . Motherrrrr Goose. . . . Beautiful. . . . Beautiful. . . ."

These approving comments and more floated above the general chatter from an intent group of Operation Barbizon participants crowded around a television screen. The place was an office trailer at Hickam Air Force Base, Honolulu. The time was Alco/Bubia plus five days.

What is Operation Barbizon? What is an Alco/Bubia? Why all the excitement over TV?

Operation Barbizon was a series of rocket-launched experiments designed to investigate the ionosphere and its magnetic and electric fields.

Alco and Bubia are the Spanish bird names (meaning guillemot and gannet respectively) given to the first two events sponsored by the Los Alamos Scientific Laboratory in Operation Barbizon. Other participants in the series came from the Sandia Laboratories, the Advanced Research

Projects Agency (ARPA), University of Alaska Geophysical Institute, National Science Foundation, Defense Nuclear Agency (DNA), National Aeronautics and Space Administration (NASA) and the United States Navy and Air Force.

The TV show? . . . well, it was no ordinary program. Appearing on the screen was visual proof that Don Kerr's and Milt Peek's J-10 space physicists and their colleagues had added another first to the Laboratory's long list of successes.

The screen first showed the darkness of space with myriad stars—more numerous than the human eye normally sees even on the clearest of nights. The intensified-image orthicon camera which recorded the scene has sensitivity far surpassing that of the eye. A small dot of light appeared in the lower right and rose to a point near a bright star. Suddenly the dot exploded and expanded into a large double doughnut-shaped cloud of light which moved diagonally to almost fill the screen. A short line of light speared through the doughnut and stretched and stretched until it streaked from corner to corner.

A second video record tracked ahead of the streak showing its movement from north to

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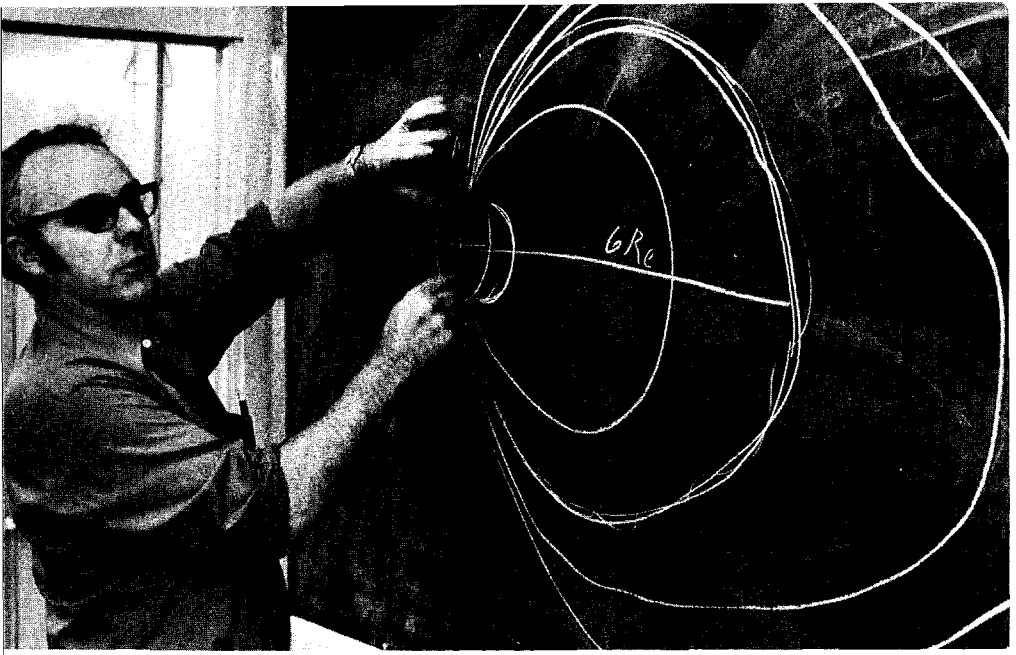
It was Alco/Bubia plus five days when an intent group of Operation Barbizon experimenters gathered around a television monitor to see the data. They are Gene Wescott, University of Alaska; Dan Stillman, J-8; Ed Marram, EG&G; Don Kerr, J-10, test group director; Bob Jeffries, J-10; and Tom Hallinan and Russ Beach, both of the University of Alaska.



Neil Davis, University of Alaska Geophysical Institute, describes the next field line tracing experiment for Honolulu newsmen. The pioneering experiments, Alco and Bubia, traced a short geomagnetic field line represented by innermost arc to globe.

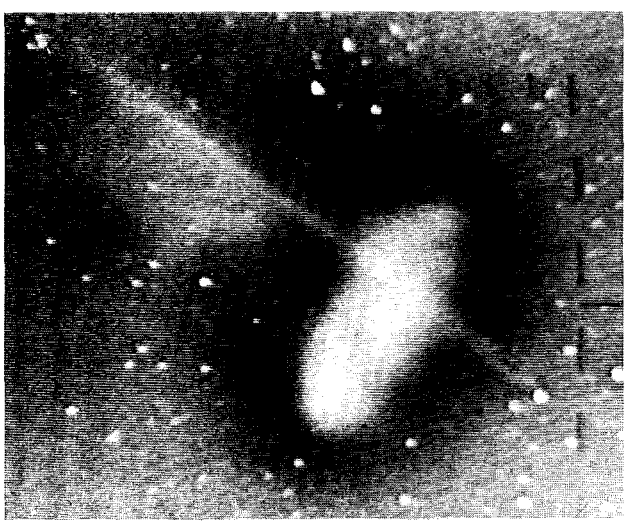
south across the star background. The streak curved on and on and finally was lost over the southern horizon. These were the video tapes of Alco/Bubia recorded by Eric Jones, J-10, Johnnie Gallegos, J-14, and Russ Beach, University of Alaska, from Mount Haleakala on the island of Maui.

A third and a fourth tape were run showing the same streak as it looked to airborne observers aboard two Air Force/AEC NC-135 flying laboratories far south of the equator near Tonga. From this viewpoint the streak appeared low on the northern horizon and arched high into the star-studded sky background.

This was proof that LASL scientists had succeeded in injecting a jet stream of barium plasma upwards along a specific magnetic field line of the earth, visibly painting it with barium ions for its whole 4,350-mile length. Man for the first time could actually see one strand in that invisible magnetic envelope that originates inside our planet's rocky mantle and extends thousands of miles out into space.

The earth's external field can be pictured by imagining lines of force that emerge from one magnetic pole and curve around the earth to re-enter at the opposite magnetic pole. Before the space age began, the field was assumed to be symmetric around the poles and it was believed that it extended to infinity. Now it is known that this picture of the blanket that serves as the first barrier to radiation streaming toward earth from the sun and interplanetary space is not at all accurate.

The pioneering experiment in ionospheric investigation was done not just once, but twice.



Eric Jones, J-10, and Johnnie Gallegos, J-14, recorded this closeup of the beginning of the barium plasma jet which traced a geomagnetic field line for its whole length. The intensified-image orthicon record was made from Mount Haleakala, Maui.

During each morning twilight of Oct. 18 and 19, a Sandia-launched Sandhawk-Tomahawk rocket roared into the pre-dawn sky over the Atomic Energy Commission's Kauai Test Facility at Barking Sands. At 291 miles altitude a high explosive shaped charge, surrounding an 800-gram cone of barium metal, detonated on radio command creating a barium plasma jet. The jet had sufficient particle velocity upwards to the south along the magnetic field line to get over the equatorial summit.

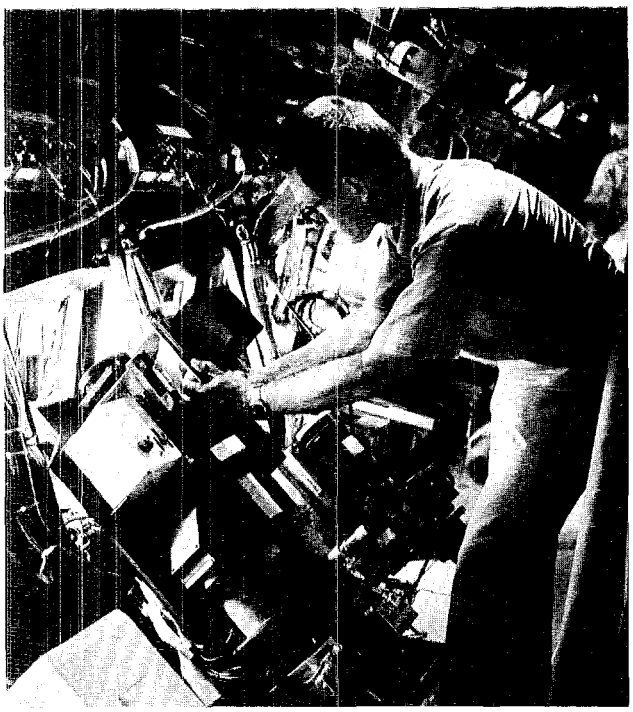
In a matter of a few seconds much of the neutral barium became ionized by solar ultraviolet radiation and the positively charged particles streamed south with a complicated spiraling motion along the magnetic field line. The stream of particles in effect formed a tube of ions around the line and scattered light in the visible spectrum making it possible to photograph it with very sensitive optical systems.

About five minutes after injection the first barium ions reached the southern conjugate deposition points where their arrival was recorded by the scientific crews aboard the two NC-135 flying laboratories on station southeast of Tonga. Directing the LASL airborne observations were Bob Jeffries and Bill Roach, J-10.

Relatively bright barium emissions appeared as more ions arrived and piled up at the point where they entered the upper atmosphere. Striations developed in the southern conjugate barium cloud about 24 minutes after release and their distance of separation increased slowly with time. During each experiment barium ion streamers were observed for about an hour until sunlight prevented further observation.

All along the ion path from ground stations on Maui, tiny Johnston Island, isolated Canton Island, American Samoa and remote Niue—the men of LASL and their colleagues from other laboratories and agencies observed and recorded a mass of data with a variety of optical equipment.

In Honolulu, when the records were returned, the theoreticians were waiting and the tedious job of preliminary analysis began. John Zinn and John Kodis, J-10, Gene Wescott, Neil Davis and Wally Murcray, University of Alaska, and Jerry Fu, Los Alamos EG&G, pored over star maps comparing them with photographic records which had superimposed star images. Ion trail positions were established by triangulation methods, relatively simple for the data collected at ground stations, but more complicated in the case of the aircraft data.



Ivars Henins, P-17, adjusts optical equipment aboard the NC-135 aircraft in preparation for the Buitre plasma gun experiment.

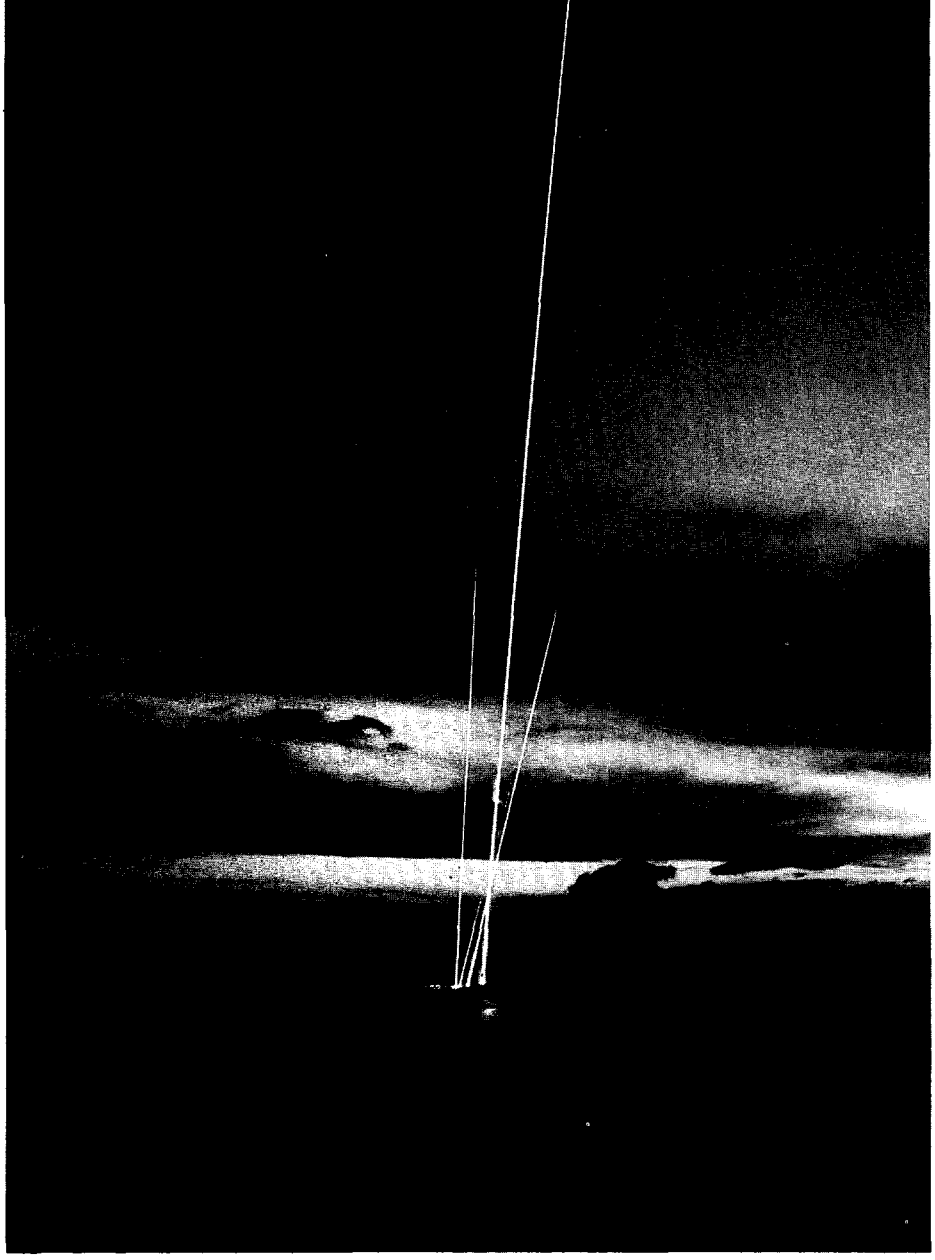
Comparison of Alco/Bubia field line tracings with most of the existing magnetic field models showed that the southern conjugate locations are consistently to the east of predictions by as much as 50 miles. However, one model, POGO 10/68, was in good agreement with the LASL data for early time observations. More complete data analysis is now underway and will continue for some time.

What does all this mean? It points out that although geomagnetic observations have been made for many years from ships, aircraft, ground stations and more recently, satellites, the resulting models have many deficiencies. If man is to be able to predict what the magnetic field structure is at a given point and time much more data is required for real understanding.

Alco/Bubia shows that a new and probably more exact technique is practicable. These two experiments mark only the beginning of what could be a significant, long range, systematic pro-

continued on next page

Above, C. R. Robertson, left, J-DO, runs a communication check at the LASL ground station on Logatala Hill, American Samoa, while Larry Krenzien, J-8, and Bruce Stewart, J-10, finish the housing for the optical equipment inside the trailer.



A four-rocket finale, photographed by Bill Jack Rodgers, ISD-7, marked the end of Operation Barbizon.

gram to visually map the geomagnetic field structure and perhaps to add to man's understanding of the transition region (magnetopause) between the magnetosphere containing the earth's protecting field and the interplanetary medium. Such understanding is desirable if man is to carry out his plans of routinely sailing the interplanetary seas and returning safely to harbor—earth with its protective magnetic barrier.

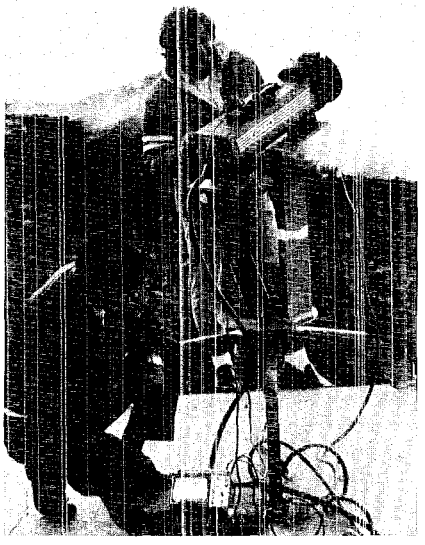
The next step will be to see if it is possible to inject barium particles and paint a field line which runs from pole to pole and arches out a greater distance into space, perhaps as far as five earth radii, instead of the modest one and a half of Alco/Bubia. The easiest way to do this would be to make the injection much further north, nearer to where the field lines dip downward to the magnetic pole.

And LASL's energetic team of space physicists is going to try just that. Plans are under way to launch another barium jet payload from near Fairbanks, Alaska, home base of the University of Alaska Geophysical Institute which will once again collaborate with Los Alamos. Target date is early March. The field line tracing experiment will be an "add on" to a series of coordinated rocket investigations of auroras.

Operation Barbizon which kept a LASL field test group of 50 in the Pacific Ocean areas for about 40 days during October and November ended Nov. 7 with a grand finale performance involving four rocket launches and a double-

Above, at the Pacific Missile Range control room at Barking Sands, Milt Peek, alternate director for the LASL test group, and Jim Wells, J-1, receive last minute reports from both ground and air observation stations.

Theoreticians John Kodis, and John Zinn, both of J-10, compare Alco/Bubia photographs with star maps to locate the precise position of the barium ion streak in space.



Johnnie Gallegos, J-14, and Brook Sandford, J-10, prepare an intensified-image orthicon camera at the LASL station on Mount Haleakala, Maui.

header early evening experiment. One rocket was used to deposit two barium clouds in the ionosphere at an altitude of 125 miles. Observation of barium cloud movements is a relatively common way of studying the magnetic field in the ionosphere. Their color change from green to pink-violet provided Hawaiian Island residents and tourists with a spectacular view of science at work. A similar experiment earlier in the series was hidden from most Island viewers by clouds.

A second rocket carried a plasma gun powered by a high explosive generator which injected a high energy neon plasma jet at an angle to the geomagnetic field to study interactions with the ambient atmosphere and field-aligned excitation processes. It was not visible to ground observers. Two other rockets carried instrumentation probes to look at the experiments. This was a repeat of an experiment first successfully conducted in the Birdseed 1970 spring rocket series.

In addition to the large contingent from Group J-10, personnel from J-DO, J-1, J-6, J-8, J-9, J-14, J-16, N-4, GMX-6, P-17, P-1, ENG-5, ISD-1 and ISD-7 participated in the field test phase of Operation Barbizon. Important contributions to the success of the pioneering field-line tracing experiments were made at Los Alamos by members of Groups CMB-3 and GMX-6 who constructed the barium cones and explosive assemblies and worked closely with J-10's Reed Jensen in conducting performance tests prior to the Oct. 18 and 19 experiments.

Left, trainees at the Los Alamos Sheltered Workshop, Inc., have three contracts with LASL to assemble electronic components for the Los Alamos Meson Physics Facility. Some of the trainees are shown working on the Laboratory projects under the supervision of the workshop's director, Tony Dizon (standing, upper left).

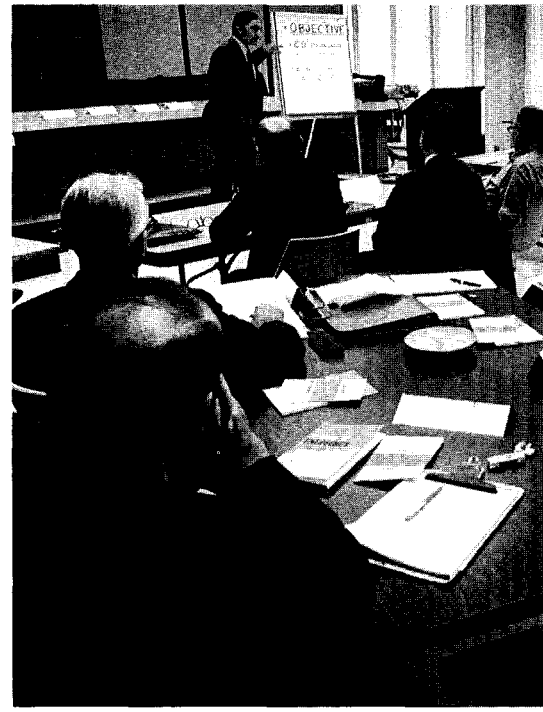
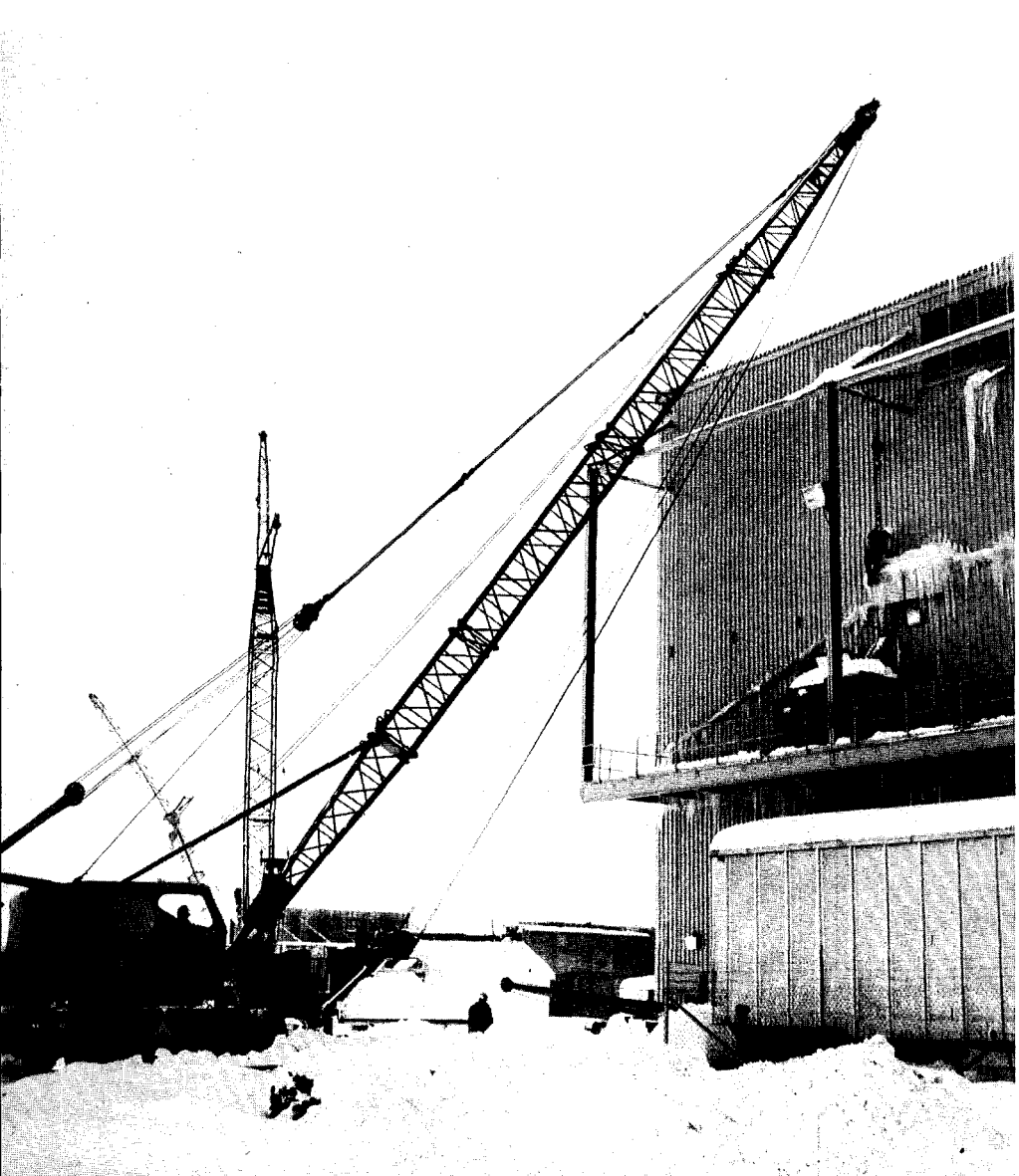
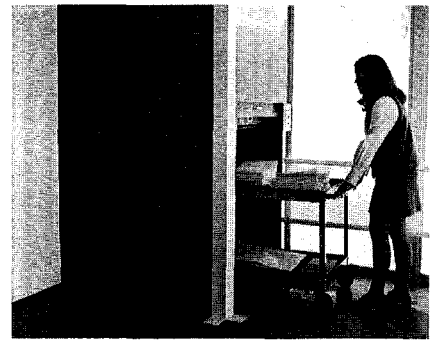


Photo Shorts

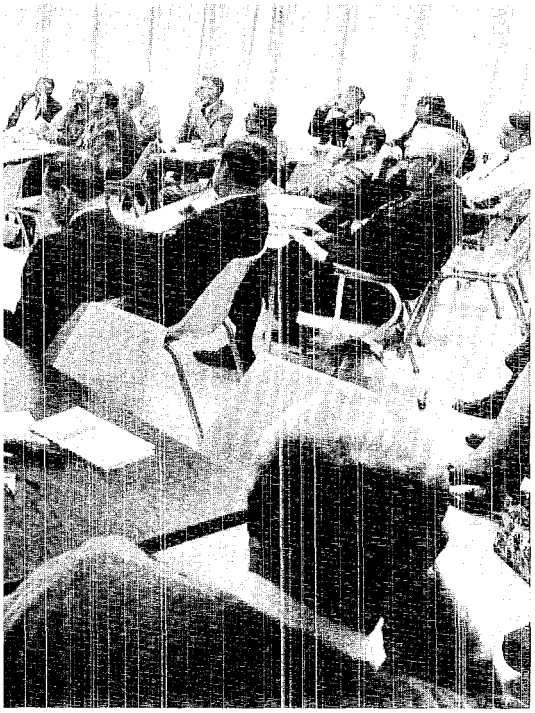
By Bill Jack Rodgers, Ivan Worthington and Henry Ortega



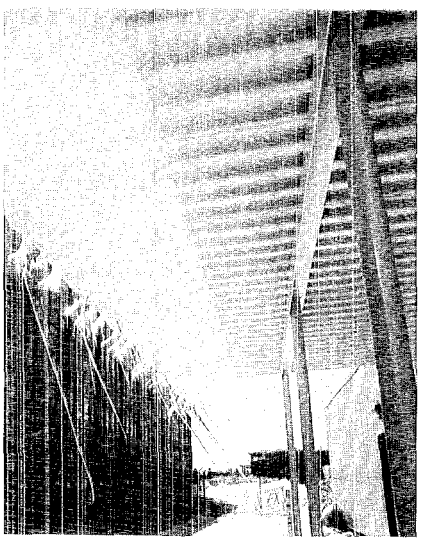


Above, Catherine Wiig, TD-5 data analyst, wheels a cart of computer listings into a dumbwaiter near the Laboratory's Central Computing Facility. The dumbwaiter carries materials to the covered walkway which links with the Administration building. The apparatus was installed because of concern for the safety of data analysts, mostly women, who previously wheeled their carts across the oftentimes snowpacked or icy service area between buildings.

Large icicles hanging over the outside walkways at LAMPF Experimental Area A were potentially hazardous to the safety of employees until the Zia Company's Placido Ortiz was hoisted aloft in a boatswain's chair to chip them off. Operating the crane is J. D. Tyra, also of the Zia Company.



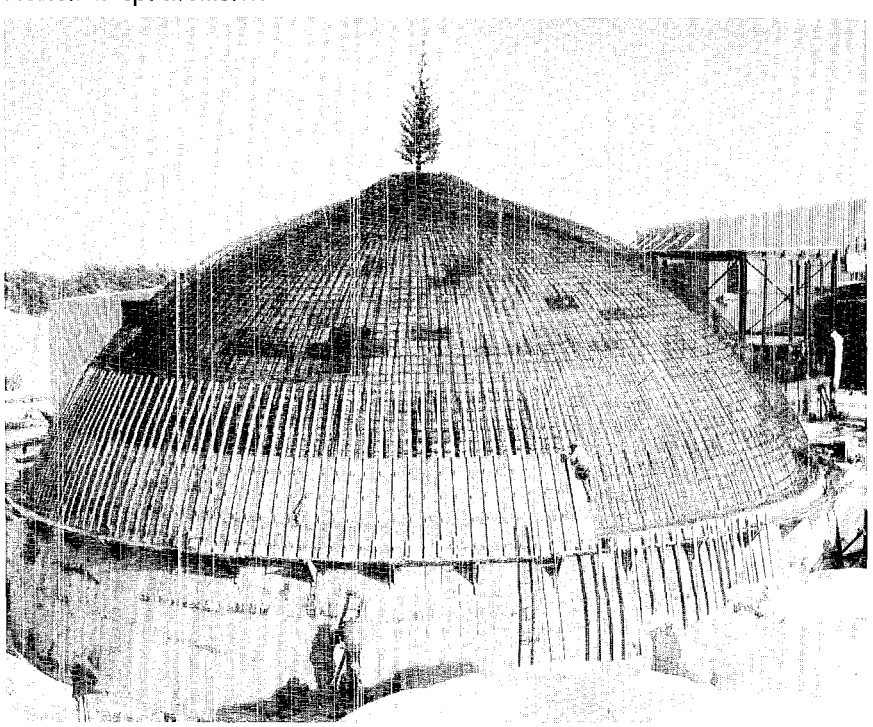
Left, Harry Krespy of the University of New Mexico Civil Defense Extension Staff speaks to Los Alamos County, LASL and AEC representatives at the recent Emergency Planning Workshop. Purpose of the workshop, conducted under contract with the Department of Defense, was to provide the local Civil Defense organization with information that can be used to develop a written county plan for handling emergency situations resulting from both nuclear and natural disasters. County Civil Defense Director Bob Porton, ISD-2 group leader, said an emergency plan is being formulated under the direction of Mayo Pacheco, deputy civil defense director, which will be submitted to the New Mexico Civil Defense Office for approval.

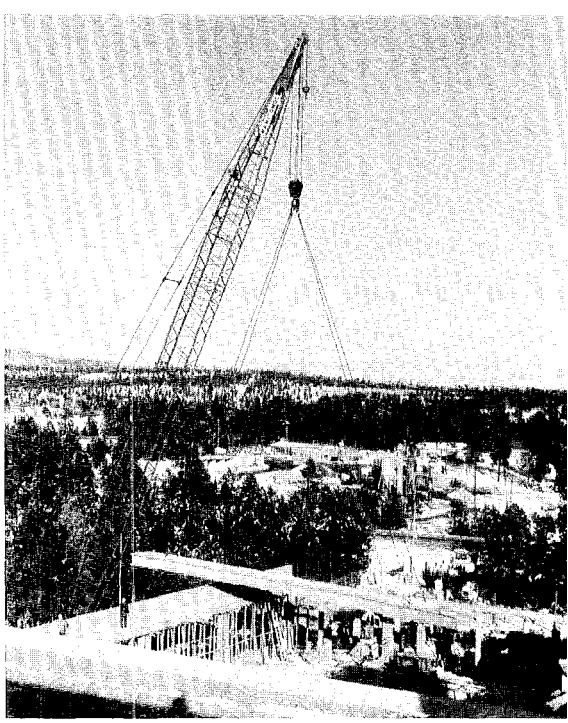


Left, when the snow started to melt it began to slide off the awning over the entrance to the Scyllac building's machine shop entrance.

Below, a crane is used to emplace one of fourteen huge prestressed concrete beams which will support the roof of the new addition to the Central Computing Facility. The beams were brought to Los Alamos by a convoy of seven trucks from Albuquerque. The beams are made of lightweight, steel-reinforced concrete ranging from 15.5 to 17 tons. The smallest of them is 30″x6′5″x88′ and the largest is 30″x8′x97′.

Lighted Christmas trees aren't limited to homes and office lobbies anymore. Members of MP-division put one on top of LAMPF Experimental Area C which is being built to house a high resolution spectrometer.





LASL-NMSU Scientists Collaborate On Mars Dust Cloud Study

The dust cloud which obscured Mars from Mariner 9 television cameras during the first half of the spacecraft's basic mission was a disappointment to geologists, for one of the mission's basic objectives was to photograph 70 per cent of the planet's surface features.

On the other hand, a Mars dust storm was one of several phenomena of interest to the National Aeronautics and Space Administration. Dust storms on the planet have been observed in the past from earth stations and have been known to obscure large portions of the face of Mars for as long as two months.

Fortunately, NASA scientists built flexibility into the Mariner 9's systems so they could react to opportunities to study unusual or unexpected surface and atmospheric phenomena. This is done by programming the spacecraft's on-board computer.

When it became apparent that light-scattering data could be obtained from the Martian dust cloud, Henry Horak of the Los Alamos Scientific Laboratory and Reta Beebe of New Mexico State University began a collaborative study.

Horak taught astronomy at the University of Kansas for 17 years prior to joining Group J-10 at the Laboratory five years ago. For several years, he and Mrs. Beebe have collaborated on various planetary light scattering problems and are now sharing computer codes to interpret the properties of the Mars dust storm. Mrs. Beebe is a research associate in NMSU's Astronomy department and formerly worked at LASL in Group J-15 as a summer graduate student.

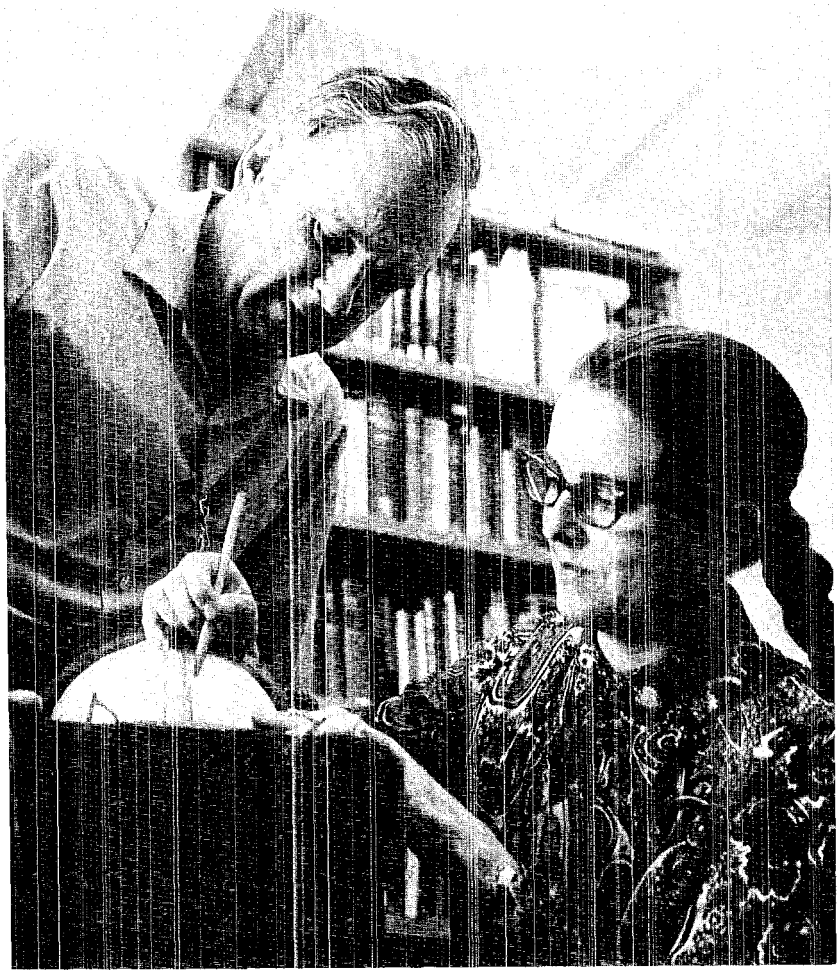
The two scientists visited the California Institute of Technology's Jet Propulsion Laboratory at Pasadena, Calif., where the spacecraft's orbital operations are scheduled, and made recommendations for observations that would be most useful in studying properties of the cloud. Their recommendations were considered by the JPL science team which meets daily to capitalize on the flexibility of the Mariner's capabilities. Photometric measurements of the dust cloud were subsequently included in the mix of data transmitted to earth by the spacecraft's instrumentation.

The Mariner's television cameras are equipped with a series of filters which allows them to function as photometers, instruments used to measure brightness and polarization of reflected light. These measurements are being used by the LASL and NMSU scientists to determine particle size distribution and their refractive indices. From these parameters, others, such as density, that will help in modeling the cloud, can be inferred.

"Photometric studies of Mars," Horak said, "are important to us in J-10 because we study atmospheric phenomena of all kinds. And they're helpful in planning future space missions, such as the Grand Tours scheduled in the late 70's when vehicles will be sent to the outermost planets."

Mrs. Beebe noted, "The variations in the properties of the dust cloud over the planet can be used to determine the forces of the wind and the circulation pattern on Mars."

The Mars probe was launched May 30 and was put into orbit around the planet in mid-November. NASA planned a basic 90-day mission for the Mariner and, if the condition of the spacecraft permits, an extended mission of up to one year is possible. The dust cloud began dissipating in late December and television coverage was begun. Although photographs will cover somewhat less than 70 per cent of Mars' surface, scientists received a bonus in atmospheric measurements. Together, the mix of atmospheric and surface data will greatly increase man's knowledge of Mars and of the solar system.



Henry Horak, J-10, and Reta Beebe, New Mexico State University, position Mars on a space globe.

Wolfgang Poppelbaum to Head E-Division

Wolfgang Poppelbaum, professor of electrical engineering and computer science at the University of Illinois, has been named to head a new division at the Los Alamos Scientific Laboratory.

Wolfgang Poppelbaum

The new organization is known as E-(electronics and instrumentation) division, and is expected to improve the overall Laboratory capability in the electronics field by eliminating duplication of effort, by improved coordination and sharing of achievements. Emphasis will be placed on electronics research and development of highly specialized equipment to meet the needs of the Los Alamos Scientific Laboratory programs.

The division's size is expected to be in the range of between 150 and 200 employees. Present members have been drawn from other Laboratory groups including P-1, C-8, CMB-7, ENG-5, ENG-7 and SP-3.

Its staff includes William Briscoe, alternate division leader; Thomas Gardiner, assistant division leader and leader of the digital systems group, with James Gallagher as alternate group leader; Bobby Strait, leader of the control systems group, and John Buchen, alternate; Richard Hiebert, leader of the analog device and detector group; George Bjarke, acting leader of the fabrication group; and Donald Lester, leader of the maintenance group. Supporting the division office will be John Lamb, business management; Charles Beckett, information; and Bjarke, equipment and quality control.

short subjects

Bill Ogle, J-division leader, has been appointed chairman of the Nevada Test Site Planning Board. The appointment was announced by R. E. Miller, manager of the Atomic Energy Commission's Nevada Operations Office.

As chairman, Ogle is responsible for transmitting to Miller the board's recommendations on various policy and operational matters including program or project schedules, technical impact of current and proposed experiments, budgetary impacts on proposed programs and other planning necessary to conduct nuclear experiments at NTS and off-site locations.

Ogle, who has participated in all of the United States Pacific nuclear tests and most of the LASL events at NTS, succeeds **Roger Batzel.** Batzel resigned after he was appointed director of the Lawrence Livermore Laboratory.

LASL Director **Harold Agnew** has been appointed a member of the Committee on Federal Laboratories for a three-year term ending Dec. 31, 1974.

The committee is the major arm of the Federal Council for Science and Technology and deals with the internal management problems of federal laboratories, both government-operated and contract-operated.

Science Youth Days at the Los Alamos Scientific Laboratory will be April 12-14. The event drew 750 students from a five-state area last year.

Ken Hill and **LeRoy Apodaca,** both of ISD-2, are co-chairman for the event.

Los Alamos high school students will tour LASL facilities during the first day. Local senior science students will serve as honor guides for out-of-town students the next two days.

Registration for second semester classes at the University of New Mexico's Los Alamos Residence Center will be from 10 a.m. until 5 p.m. Jan. 19-21. Classes will begin Jan. 24.

Persons planning to enroll will have a choice of 29 courses. Most are basic freshman and sophomore classes in the humanities, sciences and arts. Two junior-level courses—magazine journalism and Spanish literature—will also be offered.

More detailed information is available from the registrar, Betty Myers, 662-6966.

Celeste Porto retired after more than 22 years in Group H-5. She plans a trip to Florida and will return to Los Alamos in the spring.

Grace Williamson, SP-12, retired following more than 21 years with the Supply and Property department. She and her husband, John, plan to do some traveling, but will maintain their home in Los Alamos.

Pedro Samuel Vigil retired after more than 21 years in GMX-3. He will continue to live in the Espanola Valley.

Elizabeth Graves, P-6 group leader and one of the first scientists to arrive at Los Alamos in early 1943, died in an Albuquerque hospital after a lengthy illness.

Mrs. Graves came to Los Alamos with her husband, Alvin, from the Metallurgical Laboratory at the University of Chicago. Both were physicists. He was associated with the group which initiated the first self-sustaining nuclear chain reaction Dec. 2, 1942, and was head of LASL's J-division at the time of his death in 1965. She began work on fast neutron measurements and related research in neutron physics at the University of Chicago, and continued working in these areas almost without interruption until her death.

She is survived by three children: Marilyn (Mrs. George) Hedrick of Stillwater, Okla., Alvin Palmer, and Elizabeth Anne, a student at the University of New Mexico; one grandson, Bryan Hedrick; and one brother, John Riddle of Los Altos Hills, Calif.

MP-Division Begins Reorganization Aimed at LAMPF Operation and Research

Several years ago, MP-division was organized in a way that was compatible with the development and construction phase of the Los Alamos Meson Physics Facility. Now that this phase is nearing completion, the division has begun a gradual reorganization to permit a smooth transition to operation and research at LAMPF.

According to Louis Rosen, MP-division leader, the major objective of the reorganization plan is to make changes within the division ". . . with minimum perturbation and anxiety to the personnel involved, and with minimum disturbance to the on-going construction work on the accelerator proper, the experimental areas and the all-important secondary beam lines.

"Division personnel will be kept on their present tasks until these are concluded. Then, the people involved will gradually be phased into new duties consistent with operation of the facility and the research programs that will be conducted there."

Although a full 800-MeV beam is not expected for another six months and experiments are not scheduled to begin until 1973, Rosen noted, "Some experiments have already been accepted, and it will take all the time we have left to adequately prepare for them. The present reorganization plan allows the division to move expeditiously and in an orderly fashion from the construction phase to operations and research."

In a memorandum to MP-division personnel, the division leader stated that some administrative changes ". . . will be implemented as soon after Jan. 1, 1972, as is feasible without causing unacceptable disruption of construction activities."

These include the appointments of Tom Putnam as assistant division leader for safety; Paul Edwards, assistant division leader for facility planning and budget control; Ed Knapp, associate division leader for practical applications; and Don Hagerman, associate division leader for operations.

Hagerman will have overall responsibility for accelerator operations, maintenance and development activities in Groups MP-1, MP-2, MP-8 and MP-9. He will also be chief of operations with responsibility for day-to-day scheduling of experiments on line and in preparation.

Other administrative changes include the appointment of Ray Gore as MP-1 group leader; Hagerman, acting MP-2 group leader, and Bob Warner, alternate group leader; Bob Macek, alternate MP-6 group leader; H. A. Thiessen, alternate MP-7 group leader.

Group MP-5 has been disbanded since construction scheduling, planning and budget control activities have been moved to the division office under Edwards.

Two new groups, MP-8 and MP-9, have been formed under the leadership of Tom Boyd and Bob Jameson respectively. H. C. Worstell is alternate MP-8 group leader. Don Swenson is associate MP-9 group leader, and Ralph Stevens is assistant group leader.

The responsibilities of MP-8 include electrical and mechanical engineering, drafting, metronics laboratory, klystron repair and accelerator improvements.

Group MP-9 will be responsible for the development of advanced concepts for improvement of accelerator reliability and capability.

the technical side

Taken from LASL Technical Information Reports submitted through ISD-6

Seminar, Physical Technical Institute of Leningrad, USSR, Sept. 17:

"Los Alamos Meson Factory" by R. L. Burman, MP-7

Colloquium, Physics Department, Stevens Institute of Technology, Hoboken, N.J., Oct. 14:

"Anomalous Microwave Absorption Near the Plasma Frequency" by H. Dreicer, P-13

Turbulence Modeling Workshop, Boulder, Colo., Oct. 18-19:

"A Brief Review of Recent Work in Turbulence Modeling at Los Alamos" by R. A. Gentry, T-3 (invited)

Seminar, Department of Biophysics, Pennsylvania State University, University Park, Pa., Oct. 19:

"DNA-Membrane Associations in Chinese Hamster Cells" by C. E. Hildebrand, H-4 (invited)

Los Alamos—Santa Fe Subsection, Institute of Electrical and Electronic Engineers Meeting, Los Alamos, Oct. 20:

"Superconducting Power Transmission Lines" by E. F. Hammel, P-8

Symposium on Implementing Nuclear Safeguards, Kansas State University, Manhattan, Oct. 25-27:

"Real Problems—Real Solutions" by J. H. Menzel, A-1

Seminars, Physical-Technical Institute of the Ukrainian Academy of Sciences of the USSR, Kharkov, Oct. 26; Lebedev Physical-Technical Institute of the USSR Academy of Sciences, Moscow, Oct. 28; and Ioffe Physical-Technical Institute of the USSR Academy of Sciences, Leningrad, Nov. 1:

"Basic Plasma Research at Los Alamos on Anomalous Microwave Absorption, Plasma Cyclotron Emission, and the Application of Radioactive Ion Tracers to Plasma Diagnostic Problems" by H. Dreicer, P-13

1971 Symposium on Thermal Expansion, Corning, N.Y., Oct. 27-29:

"The Variation of Lattice Parameter of UC-ZrC Solid Solutions with Temperature and Composition" by A. L. Bowman and N. H. Krikorian, both CMB-3, and N. G. Nereson, P-2

Seminar, Rocky Flats, Golden, Colo., Oct. 29:

"Plutonium-Chemistry Studies Related to New Weapons Designs" by J. W. Ward, CMB-5

"The Plutonium-Hydrogen Reaction: A Study of the Reaction Rate with a Vacuum Microscope and by Pressure Measurements" by W. M. Olson, CMB-5

Conference on Superconductivity in d- and f- Band Metals, University of Rochester, N.Y., Oct. 29-30:

"Superconductivity of Various Ternary Thorium Compounds" by A. L. Giorgi, E. G. Szklarz and M. C. Krupka, all CMB-3

Twenty-fourth Pacific Coast Regional Meeting of American Ceramic Society, Anaheim, Calif., Oct. 30-Nov. 3:

"The Grindability of Petroleum Cokes" by R. J. Imprescia, H. D. Lewis and J. A. O'Rourke, all CMB-13

Twenty-fourth Annual Conference on Engineering in Medicine and Biology, Las Vegas, Nev., Oct. 31-Nov. 4:

"Electronic Cell Sorting by Volume, Light Scatter and Fluorescence" by J. A. Steinkamp and M. J. Fulwyler, both H-4, and J. R. Coulter, SD-5

Health Physics Society Symposium, Richland, Wash., Nov. 2-5:

"Human Values in Standard Setting" by H. J. Otway, J-DO (invited)

Colloquium, University of California, San Diego, Nov. 3:

"Plasma Flow Systems and Hydromagnetic Guns" by J. Marshall, P-17

1971 Institute of Electrical and Electronics Engineers Nuclear Science Symposium, San Francisco, Calif., Nov. 3-5:

"Gamma-Ray Scanning System for Barrels Containing Plutonium Waste" by L. V. East, J. L. Parker, T. D. Reilly and R. B. Walton, all A-1

"SHIRX—A High-Resolution Rocket-Borne X-Ray Spectrometer" by S. Singer, P-4, W. P. Aiello and J. A. Bergey, both P-1, F. J. Edeskuty and K. D. Williamson, Jr., both P-8

Second Joint Working Conference in Chemotherapy, National Cancer Institute, Annapolis, Md., Nov. 3-5:

"Design of an **In Vitro** Screening Test for Anti-Tumor Compounds" by R. A. Tobey, H-4 (invited)

Panel Discussion, AESOP-V Meeting, Kansas City, Mo., Nov. 3-5:

"Problems as Seen by a Contractor" by E. A. Voorhees, C-DO

Seminar, Department of Biochemistry, University of New Mexico School of Medicine, Albuquerque, Nov. 4:

"Heparan Sulfate: A General Component of Mammalian Cells" by P. M. Kraemer, H-4 (invited)

1971 Fall Meeting, American Physical Society, Tucson, Ariz., Nov. 4-6:

"Excitation Function for the $^{235}U(\alpha, 3n)^{236}$ Pu Reaction" by B. H. Erkkila, P-12, G. R. Bethune, Bethune-Cookman College, Daytona, Florida, and H. C. Britt, P-DOR

"Microscopic Analysis of New (p,n) Analog Data at E_P = 23 MeV" by R. B. Perkins, P-DO, R. F. Bentley and C. D. Zafiratos, both University of Colorado, Boulder

"Low-Energy Neutrons Produced by 740-MeV Protons on Uranium" by L. R. Veeser, E. R. Shunk, and R. R. Fullwood, all W-8, and A. A. Robba, A-2

"E3-M2—El Multipole Mixing in the 1189-KeV Gamma Radiation of ^{182}W" by K. S. Krane, J. R. Sites and W. A. Steyert, all P-8

"Neutron Fission Cross Section of ^{237}Np" by M. M. Hoffman, G. Berzins, W. Sanders and L. J. Brown, all J-12

"Medical Applications of LAMPF"

by L. Rosen, MP-DO (invited)

"Parity-Nonconserving Amplitudes Observed Through Nuclear Orientation Studies" by K. S. Krane, J. R. Sites and W. A. Steyert, all P-8

"The Spin of the 1770 keV State of Palladium-108" by K. S. Krane, P-8, R. M. Steffen, Purdue University Tandem Laboratory, Lafayette, Ind., and M. E. Bunker, P-2

"E1-M2-E3 Mixing of the 1159.3 keV Transition in 176-Hafnium" by K. E. G. Lobner, visiting staff member, P-2, H. A. Smith and M. E. Bunker, both P-2

"Levels of ^{11}Be from a Study of the ^{9}Be(t,p)^{11}Be Reaction" by F. Ajzenberg-Selove, University of Pennsylvania, Philadelphia, R. F. Casten, and T. J. Mulligan, both formerly P-DOR, and O. Hansen, P-DOR

"Proton Two Particle-One Hole States in ^{209}Bi" by P. D. Barnes, C. Ellegaard and E. Romberg, all Carnegie-Mellon University, Pittsburgh, Pa., O. Hansen, P-DOR, and R. Casten and T. Mulligan, both formerly P-DOR

"T = 45/2 States in ^{205}Tl" by O. Hansen, P-DOR, R. F. Casten and T. J. Mulligan, both formerly P-DOR, E. R. Flynn, P-12, O. Nathan, Niels Bohr Institute, Copenhagen, Denmark, and N. Stein, Yale University, New Haven, Conn.

"Polarized Protons on Helium-3 at 13.6 Million-Electron-Volts" by N. Jarmie, P-DOR and J. H. Jett, A-2

"Polarization Transfer in the Reaction Triton(proton, neutron)Helium-3 at 13.6 Million-Electron-Volts" by R. C. Haight, T. R. Donoghue, and J. E. Simmons, all P-DOR

"Excitation Functions for Fission Isomers Produced in (t, xn) and (p, xn) Reactions" by B. B. Back, visiting staff member, P-DOR, H. C. Britt, P-DOR, and B. H. Erkkila, P-12

Institute of Electrical and Electronics Engineers 1971 Nuclear Science Symposium, San Francisco, Calif., Nov. 5:

"Problems of Plutonium Measurement in the Environment" by J. W. Healy, H-DO

Fifth Asilomar Conference on Circuits and Systems, Department of Electrical Engineering, Naval Postgraduate School, Monterey, Calif., Nov. 8-10:

"Design Considerations for Circuits and Systems Security" by R. A. Stutz, TD-3

University of Colorado, Boulder, Nov. 9:

"Conjectures on the Nature of Ball Lightning" by J. L. Tuck, P-DO

Department of Computer Science, University of California, Berkeley, Nov. 10:

"Madcap: A Unique Programming Language" by M. B. Wells, C-7

Seminar, University of Southern California, Los Angeles, Nov. 10, and University of New Mexico, Albuquerque, Nov. 18:

"Computational Considerations in Digital Image Enhancement" by B. R. Hunt, C-5

Seminar on the Use of Stable Isotopes in Clinical Pharmacology, Center for Continuing Education, University of Chicago, Ill., Nov. 10-11:

"Organic Synthesis and Biosynthesis" by D. G. Ott, H-4 (invited)

"Nuclear Magnetic Resonance" by C. T. Gregg, H-4 (invited)

"Production of Stable Isotopes" by E. S. Robinson, CNC-4

"Nuclear Magnetic Resonance—Carbon-13 NMR in Clinical Chemistry" by N. A. Matwiyoff, CNC-4

Joint Committee on Atomic Energy 1971 Hearings on Controlled Thermonuclear Research, Washington, D.C., Nov. 10-11:

"The High-Beta Pulsed Pinch Program" by F. L. Ribe, P-15

University of Arizona, Optical Science Center, Tucson, Nov. 10-14:

"The Theory of the High Intensity Laser in Two and Three Level Systems" by B. J. Feldman, P-18 (invited)

Joint Western Interstate Nuclear Board—LASL Symposium, "Risk vs Benefit: Solution or Dream?," Los Alamos, N.M., Nov. 11-12:

"Risk-Benefit Quantification" by H. J. Otway, J-DO

1971 Digital Equipment Computer Users Society Fall Symposium, San Francisco, Calif., Nov. 11-13:

"Yet Another Photopeak Analysis Program for the PDP-9 Computer" by L. V. East, A-1

Seminar, Department of Physics, University of Missouri, St. Louis, Nov. 12:

"The Use of Ion Beams in Spectroscopic Studies" by W. B. Maier, II, and R. F. Holland, both J-10 (invited)

Seminar, University of Chicago, Department of the Geophysical Sciences, Chicago, Ill., Nov. 12:

"Subterrene" by E. S. Robinson, CNC-4 (invited)

Colloquium, Center for Numerical Analysis, University of Texas, Austin, Nov. 15:

"A Survey of Methods for the Direct Solution of the Discrete Poisson Equation" by F. W. Dorr, C-6

University of Oklahoma, Norman, Nov. 15:

"Use of Ion Beams in Spectroscopic Studies" by R. F. Holland and W. B. Maier, II, both J-10 (invited)

Radiation Shielding Information Center Seminar-Workshop on Radiation Transport in Air, Oak Ridge National Laboratory, Tenn., Nov. 15-17:

"Multigroup Monte Carlo and S_N Methods for Air Transport" by D. R. Harris, Jr., T-2, D. R. Koenig, TD-4, and W. E. Preeg, TD-3

"An Evaluation of the Neutron and Gamma Ray Cross Sections for Nitrogen" by P. G. Young, Jr., and D. G. Foster, Jr., both T-2

"A Preliminary Evaluation of the Neutron and Photon-Production Cross Sections of Oxygen" by D. G. Foster, Jr., and P. G. Young, Jr., both T-2

"Time-Dependent, Two-Dimensional Calculation of Energy Deposition in Air Due to Neutrons from a High Energy Source" by W. H. Roach, J-10

"Air Transport Calculations Using the Los Alamos Scientific Laboratory—Naval Weapons Evaluation Facility Neutron-Gamma Air Flux Tape and the Naval Weapons

continued on next page

Evaluation Facility Computer Program CDR" by J. E. Campbell, Naval Weapons Evaluation Facility, Albuquerque, and H. A. Sandmeier, TD-3

"Two-Dimensional Coupled Neutron-Gamma S_n Transport from a 14.1 MeV Neutron Source in Air Over Ground Using the Los Alamos Scientific Laboratory Twotran-FC Program" by H. A. Sandmeier, TD-3, K. D. Lathrop and F. W. Brinkley, both T-1, G. E. Hansen, N-2, and J. E. Campbell, Naval Weapons Evaluation Facility, Albuquerque.

"An Automated Method to Calculate Non-Fission Neutron and Neutron-Induced Gamma Heating in Air and Other Materials from Basic Multigroup Cross Section Data" by H. A. Sandmeier, TD-3, G. E. Hansen, N-2, and Margaret E. Asprey, C-4

"Two Dimensional Air Transport from a Point, Anisotropic Source" by K. D. Lathrop, T-1

"The Simulation of Low Energy Photon Transport and the Simulation of the Adjoint Neutron Transport Equation with Monte Carlo" by L. L. Carter, E. D. Cashwell and R. G. Schrandt, all TD-6

Thirteenth Annual Meeting, Division of Plasma Physics, American Physical Society, University of Wisconsin, Madison, Nov. 15-18:

"Initial Theta-Pinch Experiments in the Scyllac 5-Meter Toroidal Sector" by G. A. Sawyer, R. F. Gribble, W. E. Quinn and D. M. Weldon, all P-15, and C. F. Hammer, P-16

"Electrically Driven Ionizing Shock Waves" by B. R. Suydam, T-DOT

"Plasma Focus Experiments, Theory, and Numerical Simulation" by J. W. Mather, P-7 (invited)

"Interpretation of Anomalous Microwave Absorption Measurements" by J. C. Ingraham, H. Dreicer and D. B. Henderson, all P-13

"Anomalous Microwave Absorption Near the Plasma Frequency" by H. Dreicer, D. B. Henderson and J. C. Ingraham, all P-13

"Q-Machine Ion Drift Speed and Resonant Charge Exchange Near the Hot Plate" by D. B. Henderson, H. Dreicer and J. D. Thomas, all P-13

"Shock Heating of a Biased Plasma" by T. A. Oliphant, P-18

"Theory of Laminar Collisionless Shocks" by D. W. Forslund and J. P. Freidberg, both P-18

"Numerical Simulation of the Plasma Focus Experiment" by B. M. Marder, P-18

"Numerical Simulation of Nonlinear Resonant Damping of Ion Waves in One Dimension" by T. P. Armstrong, visiting staff member in P-18

"Numerical MHD Stability Calculations of Mixed Field Toroidal Equilibria" by D. A. Baker and L. W. Mann, both P-18

"Growth Rates for Axially Symmetric Equilibria" by H. Weitzner, consultant in P-18

"Two-Dimensional Interferometry at 10.6μ" by R. W. Peterson and F. C. Jahoda, both P-15, P. R. Forman, P-14, S. T. Kush, University of Texas, Austin, and F. L. Yarger, Highlands University, Las Vegas, N. M.

"Experimental Study of Magnetic Energy Storage for Theta-Pinch Experiments" by H. L. Laquer and L. D. G. Lindsay, both P-8, and E. M. Little and D. M. Weldon, both P-15

"Experiments on the $\ell = 1,0$ Helical Equilibria in the Scyllac 5-Meter, Theta-Pinch Toroidal Sector" by W. E. Quinn, W. R. Ellis, F. L. Ribe and E. L. Zimmerman, all P-15

"Plasma Measurements on the Scyllac 5-Meter Toroidal Sector" by F. C. Jahoda, S. C. Burnett, W. R. Ellis, R. E. Siemon, all P-15, and M. Kaufmann, Max-Planck Institute for Plasma Physics, Garching, Germany

"A Parameter Study of Next Generation Theta Pinch Experiments" by S. C. Burnett and W. R. Ellis, both P-15

"Wetted-Wall Reactor Concept for Power Generation from Laser-Initiated Fusion Pulses" by J. D. Balcomb, N-DO, and J. C. Hedstrom, N-DOT

"The Separated-Shock Concept for Large-Scale Theta-Pinch Experiments" by F. L. Ribe, P-15

"Variational Algorithms for Numerical Simulation of Collisionless Plasma with Point Particles Including Magnetic Interactions" by H. R. Lewis, P-18

"A Comparison of Some Particle-in-Cell Plasma Simulation Methods" by A. Sykes and J. A. Wesson, both Culham Laboratory, United Kingdom Atomic Energy Authority, Abington, Berkshire, England, and H. R. Lewis, P-18

"Use of a Theta-Pinch for Opacity Studies" by D. B. Thomson, GMX-6, and A. G. Bailey, P-16

"The Toroidal Z-Pinch Experiment with Shock Heating" by L. C. Burkhardt, J. DiMarco, P. Forman, A. Haberstich, H. Karr, J. Phillips and A. Schofield, all P-14

"Cross-Field Resistivity Due to the Nonlinear Electron Cyclotron Drift Instability" by C. W. Nielson, D. W. Forslund and R. L. Morse, all P-18

"Absorption of Laser Light in Plasmas" by R. L. Morse, J. P. Friedberg, B. M. Marder, R. W. Mitchell and C. W. Nielson, all P-18, and L. Rudsinski, C-4

"Barium Cloud Striation Structure" by S. R. Goldman, formerly J-10

Seminar, Department of Electrical Engineering, University of Colorado, Boulder, Nov. 16:

"An Introduction to the Los Alamos Meson Physics Facility" by D. C. Hagerman, MP-2

1971 Conference on Magnetism and Magnetic Materials, Chicago, Ill., Nov. 16-19:

"Neutron Diffraction Studies on Dysprosium Antimonide, Neodymium Antimonide, and Cerium Antimonide" by N. G. Nereson, P-2, and V. O. Struebing, CMB-5

University of North Carolina—Duke University Joint Physics Colloquium, Chapel Hill, N.C., Nov. 17:

"Ferromagnetic Superconductors and Thermometry Below 0.1 K" by R. D. Taylor, P-8 (invited)

Eleventh Annual Meeting, American

Society for Cell Biology, New Orleans, La., Nov. 17-20:

"Protein Synthesis in Isoleucine-Deficient Chinese Hamster Ovary Cells" by M. D. Enger and R. A. Tobey, both H-4

"DNA Constancy in Heteroploidy and Interphase Chromosome Continuity" by P. M. Kraemer, D. F. Petersen, and M. A. Van Dilla, all H-4

"The Metabolism of Histone fl Isolated from Cytoplasm" by L. R. Gurley, M. D. Enger and R. A. Walters, all H-4

Seminar, University of New Mexico, Albuquerque, Nov. 18:

"Computational Considerations in Digital Image Enhancement" by B. R. Hunt, C-5

Seminar on Materials Science, Sandia Corporation, Albuquerque, Nov. 18:

"Thermodynamic Properties of the Transition Metal Carbides" by E. K. Storms, CMB-3

Second Rocky Mountain Apprenticeship Conference, Denver, Colo., Nov. 18-20:

"Journeymen as Teachers" by A. P. Delgado, SD-DO

New Mexico Chapter, American Society of Safety Engineers, Albuquerque, Nov. 19:

"Respirator Efficiency Measurement and New Regulations" by E. C. Hyatt, H-5

Seminar, Nuclear Engineering Department, University of New Mexico, Albuquerque, Nov. 19:

"Use of Activation Analysis and Scanning Electron Microscopy to Characterize Aerosol Sources" by W. A. Sedlacek, P. R. Guthals and Helen L. Smith, all CNC-11

Colorado State University, Fort Collins, Nov. 19:

"Energy Resources and Nuclear Power" by G. A. Graves, Dir. Off.

Fifth Annual Conference on Numerical Simulation of Plasmas, University of Iowa, Iowa City, Nov. 19-20:

"Electromagnetic Simulation Methods Based on an Extended-Particle Lagrangian" by E. L. Lindman, J-10

"A Pic-Type Fluid Code" by B. M. Marder, P-18

"Variational Algorithms for Numerical Simulation of Collisionless Plasma with Point Particles Including Magnetic Interactions" by H. R. Lewis, P-18

"A Comparison of Some Particle-in-Cell Plasma Simulation Methods" by A. Sykes and J. A. Wesson, both Culham Laboratory, United Kingdom Atomic Energy Authority, Abington, Berkshire, England, and H. R. Lewis, P-18

"On the Formation and Structure of Strong Electromagnetic Collisionless Shockwaves" by D. W. Forslund and R. W. Mitchell, both P-18

"PIC Codes on Advanced Computers" by R. W. Mitchell, P-18, and L. E. Rudsinski, C-4

"Electromagnetic Particle-in-Cell Methods" by R. L. Morse and C. W. Nielson, both P-18

"Elliptic Equation Solution Using Combined Direct and Iterative Methods" by C. W. Nielson, P-18, and B. L. Buzbee and L. I. Rudsinski, both C-4

Seminar, Nuclear Engineering Department, University of Illinois, Urbana, Nov. 22:

"Dense Plasma Focus at the Los Alamos Scientific Laboratory" by K. D. Ware, P-7

Seminar, Ohio State University, Columbus, Nov. 22:

"Polarization Transfer in the Reaction Triton(proton, neutron)Helium-3" by R. C. Haight, P-DOR (invited)

Meeting, American Physical Society, Division of Fluid Dynamics, San Diego, Calif., Nov. 22-24:

"Calculations of Underwater Detonations" by C. L. Mader, T-4

"Motion of a Compressible Plate Driven by Shock or Explosion—An Exact Solution" by W. C. Rivard, GMX-10, and R. Engelke, GMX-8

Annual Winter Meeting, American Society of Mechanical Engineers Special Session on Heat Pipes, Washington, D.C., Nov., 28-Dec. 2:

"Incompressible Laminar Vapor Flow in Cylindrical Heat Pipes" by C. A. Bankston, N-7, and H. J. Smith, University of Michigan, Ann Arbor

Meeting, Radiological Society of North America, Chicago, Ill., Nov. 29:

"Physical and Radiobiological Aspects of Heavy Charged Particles and their Potential Use in Radiotherapy" by M. R. Raju, H-9

Seminar, University of Texas, Arlington, Nov. 29-30:

"Remarks on the Production Aspects of the Transplutonium Research Programs in the United States" by R. A. Penneman, CNC-4

Semi-Annual Atomic Energy Commission Computer Information Meeting, Lawrence Livermore Laboratory, Calif., Nov. 29-30:

"A View of the Los Alamos Scientific Laboratory Hydra System" by T. L. Jordan, C-DO

"Los Alamos Scientific Laboratory Computer Activity Report" by T. L. Jordan, C-DO

Nuclear Physics Seminars, Purdue University, Lafayette, Ind., Nov. 30 and Indiana University, Bloomington, Dec. 2:

"Isomer Shifts and the Structure of Nuclear States" by G. A. Rinker, Jr., P-DOR

Colloquium, Air Force Cambridge Research Laboratory, Bedford, Mass., Dec. 1:

"Subterrene" by E. S. Robinson, CNC-4 (invited)

Seminar, University of Michigan, Ann Arbor, Dec. 1:

"Conjectures on the Nature of Ball Lightning" by J. L. Tuck, P-DO

American Astronomical Society 136th Meeting, National Astronomy and Ionosphere Center, Arecibo Observatory, San Juan, Puerto Rico, Dec. 5-8:

"The Effect of Rare Earths on the Opacity of Ap Stars" by W. F. Huebner and Mary F. Argo, both T-4, and G. D. Koontz, formerly T-DOT

"The Effects of Autoionization on the Opacity of Stellar Mixtures" by A. L. Merts and N. H. Magee, both T-4

"A W Virginis Model Using Radiation Transfer" by C. G. Davis, Jr., J-15

"New Los Alamos Opacities" by A. N. Cox, J-15, N. H. Magee and A. L. Merts, both T-4

20 years ago in los alamos

Culled from the January-February, 1952, files of the Santa Fe New Mexican
by Robert Porton

Medical Center to be Dedicated

One of the most modern establishments of its kind in the world, the Los Alamos Medical Center, will be dedicated. The new building will be formally presented to the community of Los Alamos by Carroll Tyler, manager of the Atomic Energy Commission's Santa Fe Operations Office. The 84-bed institution will have space for physicians to operate under private practice.

County May Operate Library

It appears probable that another "luxury" may be pruned from the budget of the AEC field office here as the board of trustees of the Mesa Library begins negotiations with county commissioners on a proposal that the library be operated by the county. Library Board Chairman Frederick Reines emphasized that the talks at this time are merely exploratory. King Derr of the Commission, who has administered the contract since its inception, stated that probably the AEC expects to provide some grant-in-aid based on operating figures submitted by the board.

A-Tests Planned for Pacific

The Department of Defense and the Atomic Energy Commission announced that preparations for a new series of A-tests at Eniwetok Atoll are being carried out by Task Force 132. Alvin Graves has been named as Deputy Commander for the tests. Graves, director of the Los Alamos Scientific Laboratory's test division, will direct the technical phases. It is believed plans include further research into the possibilities of a thermonuclear explosion.

Dogs Terrorize Residents

A special meeting of the Los Alamos Board of County Commissioners has been called in an attempt to find a solution for a difficult problem. It has been reported that packs of savage dogs have been terrorizing residents for several days. Earlier this week, citizens told of the dogs attacking a mailman and killing two deer in residential areas.

what's doing

PUBLIC SWIMMING: High School Pool—Monday through Wednesday, 7:30 to 9 p.m., and Saturday and Sunday, 2 to 5 p.m.; Adult Swim Club, Sunday, 7 to 9 p.m.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leaders for information.
Jan. 15—Frostbite Cruise, Cecil Carnes, 672-3593
Jan. 23—Cerro Grande (snowshoe), Betty Perkins, 662-7802
Feb. 6—Puerto Nambe (snowshoe/ski), Dana Douglass, 662-3088
Feb. 19-21—McKittrick Canyon, Texas, Reed Elliot, 662-4515

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 FILM SOCIETY: 7:30 p.m., Civic Auditorium. Admission: members—$.50, others, $2.
Jan. 26—"Shadows"
Feb. 23—"The Knack"

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

LOS ALAMOS SAILORS: Meetings at noon, South Mesa Cafeteria, first Friday of each month. For information call Dick Young, 662-3751.

MESA PUBLIC LIBRARY
Jan. 4-Feb. 1—Los Alamos Opera Guild display
Jan. 6-31—Jacob Trapp, Santa Fe, wood sculpture
Jan. 10-31—"Winter in New Mexico," paintings, Museum of New Mexico
Feb. 1-22—"Dancers of the Four Seasons," paintings, Museum of New Mexico
Feb. 1-29—Los Alamos Heart Association display

LOS ALAMOS CONCERT ASSOCIATION: Feb. 16, 8:15 p.m., Civic Auditorium, I Solisti di Zagreb, a chamber orchestra. For information call Marilyn Stevens, 662-4873.

NEWCOMERS CLUB: Jan. 26, Los Alamos Golf Club: cocktails—6 p.m., installation dinner—7 p.m. For reservations call Linda Hertrich, 662-9355.
Feb. 23, Los Alamos National Bank, white elephant sale, 7:30 p.m. For information call Linda Hertrich, 662-9355.

LOS ALAMOS ARTS COUNCIL: Jan. 14-15, 7:30 p.m., Fuller Lodge. Tony Shearer, author of "Lord of the Dawn," presents "The Path of the Plumed Serpent." For information call Marie Filip, 662-2135.

James Fletcher, administrator of the National Aeronautics and Space Administration, second from right, examines nuclear reactor fuel elements developed by N-division personnel. Looking on are Laboratory Director Harold Agnew, N-Division Leader Roderick Spence and Alternate N-Division Leader Frank Durham.

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

Former New Mexico Governor Jack Campbell gestures during his recent visit with Laboratory officials to discuss the National Science Foundation's RANN (Research Applied to National Needs) programs. Listening to the former governor are Richard Taschek, assistant director for research; George Cowan, CNC-division leader; and Harold Agnew, Laboratory director.