RESEARCH FACILITIES AND PROGRAMS

Saucer Field Antenna

A square array of four 30-foot paraboloidal reflectors, described as a possible new approach to the construction of high-sensitivity radio antennas, has been erected at Ohio State University. Each of the instruments is mechanically independent of the others, but servo mechanisms have been installed to allow them to be locked together when desired. They have been mounted so that all four reflectors can track through 360 degrees of azimuth and through altitudes greater than thirty degrees without aperture blockage. Three of the antennas can be used at altitudes down to the horizon. Arranged around a 60-foot square, the four reflectors are expected to provide the equivalent of a single aperture 60 feet in diameter. Nine such elements would approximate a 90-foot paraboloid, and sixteen would be equivalent to one of 120-foot diameter. If the sensitivity and performance of the new type of array compare favorably in operation with large single dishes, the innovation would permit substantial saving in construction costs.

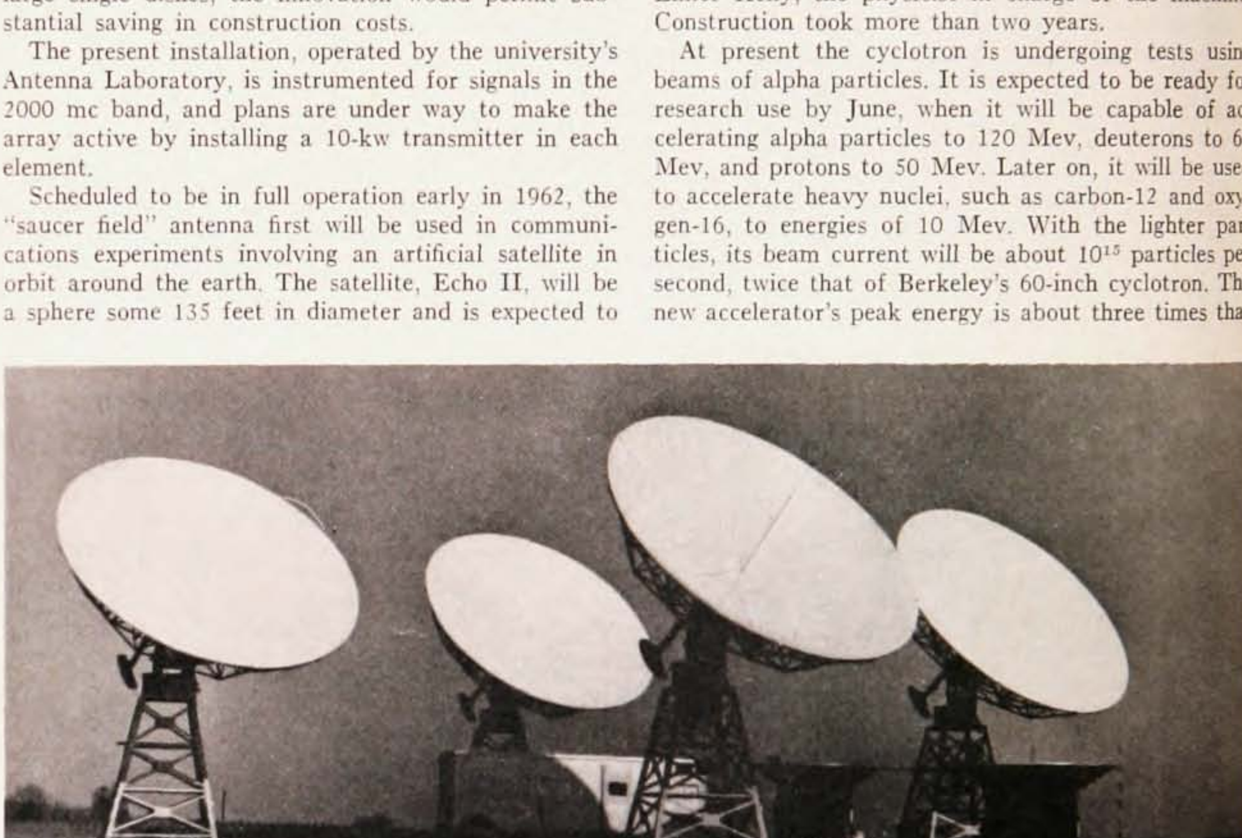
The present installation, operated by the university's Antenna Laboratory, is instrumented for signals in the 2000 mc band, and plans are under way to make the array active by installing a 10-kw transmitter in each element.

Scheduled to be in full operation early in 1962, the "saucer field" antenna first will be used in communications experiments involving an artificial satellite in orbit around the earth. The satellite, Echo II, will be a sphere some 135 feet in diameter and is expected to be placed in orbit this spring. Transmitters in Trinidad, British West Indies, and in Rome, N. Y., will beam signals at the satellite and the reflections will be collected by Ohio State's array. The antennas also have been planned for use in studying the surface characteristics of the moon and planets.

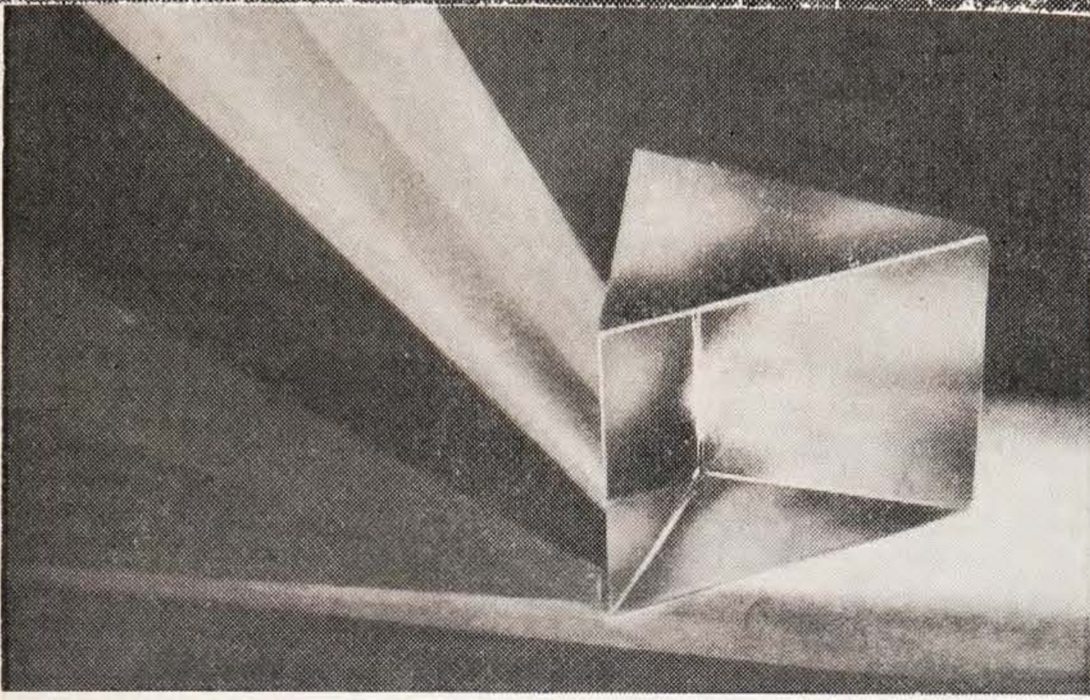
Accelerators

Lawrence Radiation Laboratory recently announced the completion of a new 88-inch cyclotron for low-energy research. The design of the new machine incorporates the new spiral-ridge principle, a configuration of the pole faces which allows greater versatility and precision than is possible with older designs. The 300-ton instrument was built at a cost of $4.85 million, which was supplied by the Atomic Energy Commission, and was developed by a group headed by Elmer Kelly, the physicist in charge of the machine. Construction took more than two years.

At present the cyclotron is undergoing tests using beams of alpha particles. It is expected to be ready for research use by June, when it will be capable of accelerating alpha particles to 120 Mev, deuterons to 60 Mev, and protons to 50 Mev. Later on, it will be used to accelerate heavy nuclei, such as carbon-12 and oxygen-16, to energies of 10 Mev. With the lighter particles, its beam current will be about 10^{15} particles per second, twice that of Berkeley's 60-inch cyclotron. The new accelerator's peak energy is about three times that



The "saucer field" radio antenna above, an array of parabolic reflectors of relatively modest size, will be tested to determine how its performance compares with the more costly giant dishes used in radio astronomy. The installation is located at Ohio State University, where it is a newly completed facility of the Antenna Laboratory.



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of the 60-inch machine, and its range includes lower energies than those of the older instrument. The new cyclotron is expected to be used primarily for scattering experiments in nuclear structure studies.

Another low-energy cyclotron, a four-sector, spiral-ridge machine capable of accelerating protons to energies of 30 to 35 Mev, was scheduled to reach completion last month, according to an announcement released by the University of Colorado in January. A grant of $293 000 was recently awarded by the Atomic Energy Commission for completing the construction of the $1.3 million accelerator and to support research in nuclear physics on the Boulder campus.

The new Colorado cyclotron will serve as the main research tool of the University's Nuclear Physics Laboratory and it is heralded as the only such instrument located on a university campus between the Mississippi River and the Pacific Coast. The cyclotron will be operated under the direction of David A. Lind, professor of physics at the University.

Two tandem Van de Graaff machines rated at 15 Mev, the most powerful yet designed, are being constructed by the High Voltage Engineering Corporation. One of the machines will be installed at Stanford University's new Russell Varian Laboratory of Physics; the other will be erected near Rutgers University's new physics building in Piscataway Township, N. J. A third machine is on order for the Atomic Energy Commission.

The Stanford machine will cost $1.3 million, granted by the National Science Foundation, and will require more than two and one half years for delivery, installation, and testing. It will be operated under the direction of Walter E. Meyerhof of the Stanford Physics faculty and will be used in precise energy studies of nuclear forces and structure. The new machine will for some experiments be coupled with an existing 3-Mev Van de Graaff at Stanford to produce 36-Mev neutrons, 18-Mev protons and deuterons, and alpha particles in a range up to and exceeding 15 Mev. Acceleration of heavy nuclei to energies above 50 Mev is also expected.

The Rutgers accelerator will be operated in collaboration with Bell Telephone Laboratories. The $1.2 million for the machine itself will be provided out of bequests to the University. Funds for the building in which it will be housed ($700 000) have been requested from the state of New Jersey, and additional funds for auxiliary equipment are being sought from the federal government. Bell Laboratories will make annual payments to allow its scientists one third of the accelerator's use for a period of ten years. The cooperative arrangement allows the University to install a larger and more versatile machine than it could otherwise obtain. Both the new physics building and the Van de Graaff are expected to be ready for use by the fall of 1963.

Rensselaer Polytechnic Institute, in ceremonies held in late October, formally dedicated its new high-intensity linear accelerator, together with two recently completed laboratories of the RPI Science Center. The new linac, which has a beam current of nearly one ampere, was designed to accelerate electrons to an energy of about 35 Mev.

In the course of dedicating the new Rowland and Jonnson Laboratories, plaques were unveiled honoring Henry A. Rowland and Mr. and Mrs. Erik Jonnson of Dallas, Texas. Rowland, who is remembered for many brilliant accomplishments in physics (including the development of the diffraction grating machine that gave rise to a new era of spectroscopy in the 19th century), graduated from Rensselaer in 1870. He later became the first president of the American Physical Society. Mr. Jonnson, after whom the second laboratory is named, is an RPI alumnus and benefactor who is an organizer of Texas Instruments, Inc., of Dallas.

At the convocation preceding the dedication, addresses were presented by Frederick Seitz, head of the Department of Physics at the University of Illinois, and by Edwin M. McMillan, director of the University of California's Lawrence Radiation Laboratory. Seitz and McMillan each received the honorary degree of Doctor of Science, accompanied by citations presented by Rensselaer's president, Richard G. Folsom.

Neutrino Counter

A grant of $77 000 has been awarded by the Atomic Energy Commission in support of a new neutrino-detection project to be carried out under the direction of Frederick Reines, head of the Department of Physics at Case Institute of Technology. The project will involve the construction of a large liquid counter of the Čerenkov type which is to be installed in a deep underground location to minimize the effects of cosmic radiation. The detector, with its associated array of photomultiplier tubes, is expected to observe the passage of only one neutrino every few days, while the cosmic-ray count is expected to be about 500 per hour, even under a thick shield of earth.

Studies preliminary to the new project have been underway for the past year. In March of 1961, Dr. Reines and his associates installed a smaller detector of the same type (which is still the world's largest) in a Morton Salt Company mine in Fairport Harbor, Ohio, where it was used in studies of the stability of the proton. That counter, with a tank the size of a small swimming pool, has a capacity of 1800 gallons of doubly distilled water. The proposed new detector is planned to be more than one hundred times as large.

The most recent grant brings the total support provided by the Atomic Energy Commission for Dr. Reines' low-level counting project to $611 000.

New Canadian R & D Labs

The first two buildings of a planned research center of four laboratories designed to house 1000 scientists, technicians, and supporting staff of the Northern