RESEARCH FACILITIES AND PROGRAMS

Meson factories

Among the recommendations made last year by the Ramsey Panel to study needs in high-energy physics was an endorsement of MURA's proposal to build a high-intensity 12.5 BeV machine. Because it was expected that the energy range of the MURA accelerator would overlap that of the so-called "meson factories", the Ramsey report advised against authorizing the latter type of accelerator for the time being. Meson factories are medium-energy accelerators (300-1000 MeV), capable of producing proton beams of much greater intensity than other types of existing machines. The report stated that for research in particle physics, the MURA accelerator and the meson factory would be roughly comparable. It was noted, however, that a meson factory might also serve as a powerful tool for investigating nuclear structure, and the panel recommended that studies be continued on the possible use of meson factories for this purpose.

Last December, a panel was appointed by the White House Office of Science and Technology for the specific purpose of considering the usefulness of meson factories in studies of nuclear structure. In January of this year, the Atomic Energy Commission announced its decision not to build the MURA accelerator. This announcement offered the panel on meson factories a strong reason for recommending the early construction of a high-intensity machine, since the arguments which the Ramsey Report had given for building the MURA accelerator could now be advanced in favor of the meson factory. The latter, according to the panel, would be much less expensive (about $50 million instead of some $150 million for the MURA machine) and could also carry out some of the important high-energy experiments originally proposed for MURA.

The report, in recommending that a meson factory be built, stated that such an accelerator is needed for accurate determination of the nuclear force, as an intensive source of slow pi and mu mesons, and for a variety of high-energy nuclear structure experiments.

To be useful for studies in nuclear structure, a meson factory must have relatively high energy, good energy resolution, and intense currents. Many planned experiments require intense secondary beams of muons and pions; therefore, a suitable accelerator should provide proton beams of hundreds of microamperes at energies of 500 MeV or greater.

In the past, electrostatic accelerators have been used for detailed investigation of low-energy nuclear states. While they give the over-all properties of these states, they cannot give high-energy information. Scattering of electrons at energies up to 1 BeV would supply the required energy and momentum for some experiments proposed for the factories, but by no means all. High-energy synchrocyclotrons cover the same energy range as would a meson factory. However, the maximum deflected beam available from existing synchrocyclotrons, even if proposed improvements are made, is no more than 0.05 μA. On the other hand, meson factories would have deflected beams of 100 to 1000 μA.

In its report, the panel recommended that a meson factory be constructed, that the energy be variable, and that the maximum value be 500 to 800 MeV.

The panel members were: Hans A. Bethe, chairman, Herman Feshbach, Harry Gove, W. W. Havens, Jr., Robert Christy, Gerald Phillips and Robert R. Wilson.

Yerkes telescope

A 24-inch reflecting telescope designed to map the magnetic field surrounding the Milky Way was recently installed at the University of Chicago's Yerkes Observatory, in Williams Bay, Wis.

The telescope, which was constructed to observe extremely small amounts of polarization with high precision, is equipped with a 7-foot-long tube and a diaphragm which narrows its field of vision. Starlight beams are collected through the telescope's mirror and passed through a prism which splits them into horizontal and vertical components. These components are then focused on separate light-sensitive photoelectric cells.

William A. Hiltner, director of Yerkes and designer of the new telescope, took part in the discovery 14 years ago that the light from some stars in the Milky Way was polarized. It was later concluded that polarization measurements on nearby stars (not more than about 300 light years away) would show the orientation of dust particles in the galactic magnetic field, and that the field could thus be charted.

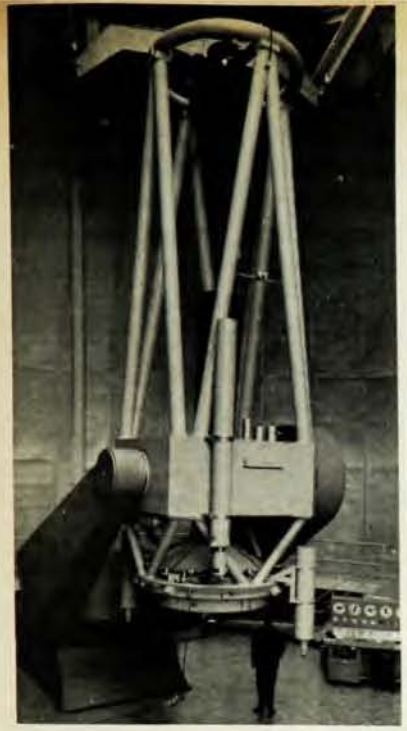
The 24-inch telescope, financed by an $80 000 grant from the National Science Foundation, replaces an outmoded 16-inch instrument at Yerkes. Three other major telescopes are in use at the Observatory, including the original Yerkes 24-inch reflector and a 40-inch refracting telescope which is the largest of its type.

Astrometric reflector

The US Naval Observatory at Flagstaff, Ariz., has acquired a new telescope for determining the distances of very faint stars by measuring their heliocentric parallax. The new $2.3 million, 61-inch Astrometric Reflector is the first large reflecting telescope designed specifically for this purpose, and is capable of detecting the apparent motion of stars as distant as 100 light years and of a magnitude as faint as 18.5. Of particular interest are the red dwarfs, white dwarfs, and subdwarfs—all stars of unusual properties whose energies cannot be evaluated until their distances are known.

In addition to the determination of stellar distances, the telescope will be used for the study of stellar systems, including the perturbation of stars by "dark companions", and photoelectric and spectroscopic studies of very faint objects.

The optics of the telescope include a 61-inch paraboloidal primary mir-



Official US Navy Photo

The new 61-inch astrometric reflecting telescope at the Naval Observatory in Flagstaff, Arizona.

ror with a focal length of 15.2 meters and a flat secondary mirror that reflects the light through a perforation of the primary to a focus behind it. Made from a fused-silica blank, the 2200-pound primary is the largest quartz mirror ever manufactured.

Nuclear distillery

Last year, in response to proposals that large, combined nuclear-power and desalination plants be built to provide both electricity and salt-free water, the Office of Science and Technology established a special interagency task group to consider the matter. The proposals providing the stimulus for the study had originally been advanced by reactor specialists at the Oak Ridge National Laboratory. The ORNL group suggested that the combined nuclear-power desalination plants might be run at relatively low cost in view of the dual-purpose nature of the operation and because of the savings in unit cost of product that are inherent in very-large-scale operations.

The findings of the OST task group, which were released in April, agreed in principle that relatively low-cost desalinated water can be obtained with very-large-scale, dual-purpose operations in areas where there is a sufficient demand for electrical power, and that nuclear plants appear to have better economic potential in these very large dimensions than do fossil-fuel plants.

The task group's study was conducted under the chairmanship of Roger Revelle, consultant to the OST and former science adviser to the Secretary of the Interior. Other members of the group included Robert E. Wilson and James T. Ramey of the Atomic Energy Commission, Joseph A. Jessel and Norman C. Nelson of the Federal Power Commission, W. Sherman Gillam of the Office of Saline Water, Gilbert Stamm of the Bureau of Reclamation, and John C. Calhoun, science adviser to the Secretary of the Interior.

"Our basic conclusion," the group stated, "is that, following an orderly development program that appears entirely feasible, water can be made available from combination plants in coastal areas in large quantities, at prices that are reasonable to pay for municipal and industrial purposes. The timing of development and application of this technology should depend upon its comparative economies at specific locations. Stated more specifically, combined installations producing 1000 to 1500 megawatts of marketable electrical energy and 500 to 800 million gallons of water per day, with the water costing 20 to 25 cents per thousand gallons at the plant site (exclusive of conveyance costs) and the electric power valued at 2.3 to 2.5 mills per kilowatt hour, can be envisioned by about 1975 if an appropriate research and development program is actively pursued. Smaller quantities can be available at earlier dates and higher prices. Research and development are needed both to increase the scale of nuclear reactors and desalination plants and to advance their efficiency of performance."

Noting that nuclear technology is currently further advanced than water desalination technology, the task group stated that single-unit nuclear plants could now be built with an electrical capacity of 240 megawatts and enough heat energy for a water plant producing from 170 to 220 million gallons per day. The largest water distillation unit now in operation in the United States, however, has a capacity of about 1.4 million gallons per day, and the group estimated that the development of distillation units of optimum size would require another ten or fifteen years. Promising sea-water desalination techniques other than distillation are currently under study by the Office of Saline Water, and it was emphasized that these techniques, if successfully developed, might obviate the need for the dual-purpose nuclear power and desalination plants.

Nevertheless, in view of water needs in the near future, the task group recommended the early development of intermediate-size distillation plants to provide the engineering data necessary for the large plants that have been proposed. At the same time, it was recommended that a close watch be kept on other developing technologies so that a shift in emphasis can be made if and when one of these shows a clear promise of becoming economically superior to the distillation process.

New NASA-sponsored labs

The National Aeronautics and Space Administration has announced that it will support the construction at two universities of new laboratories that will augment the capabilities of NASA's Goddard Space Flight Center in Greenbelt, Md., and the Manned Spacecraft Center in Houston, Tex.

The Space Science and Technology Laboratory at Rice University in Houston will house the University's recently established Space Science Department, a satellite techniques laboratory, and various NASA-sponsored research programs. NASA will contribute $1.6 million toward construction of the laboratory, which is expected to be ready for occupancy in the early part of 1966.

The University of Maryland will receive $1.5 million from NASA for a building to be located near the University's computer science center to provide additional space for research in physics, chemistry, fluid dynamics, astronomy, computer sciences, and mathematics.