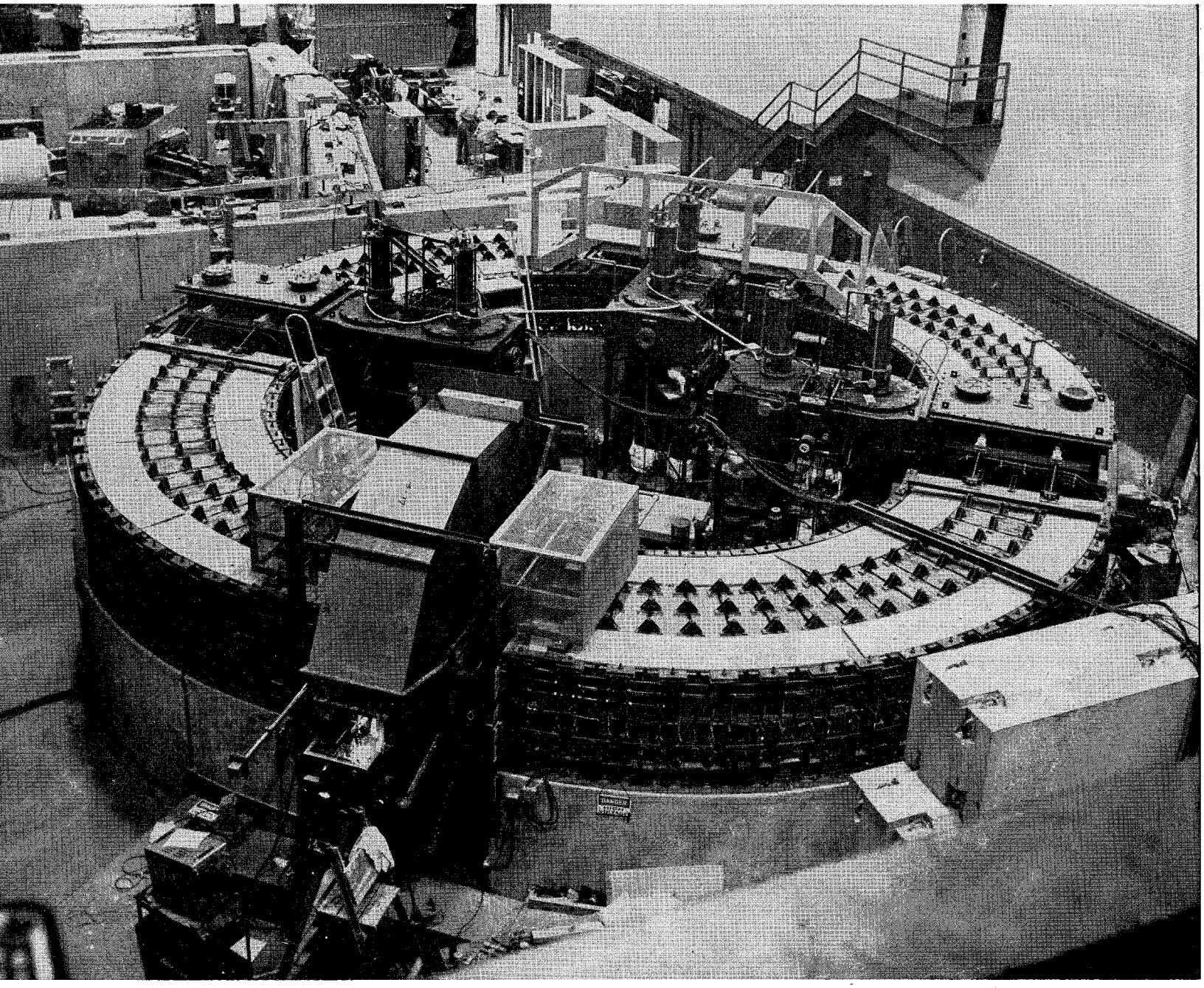


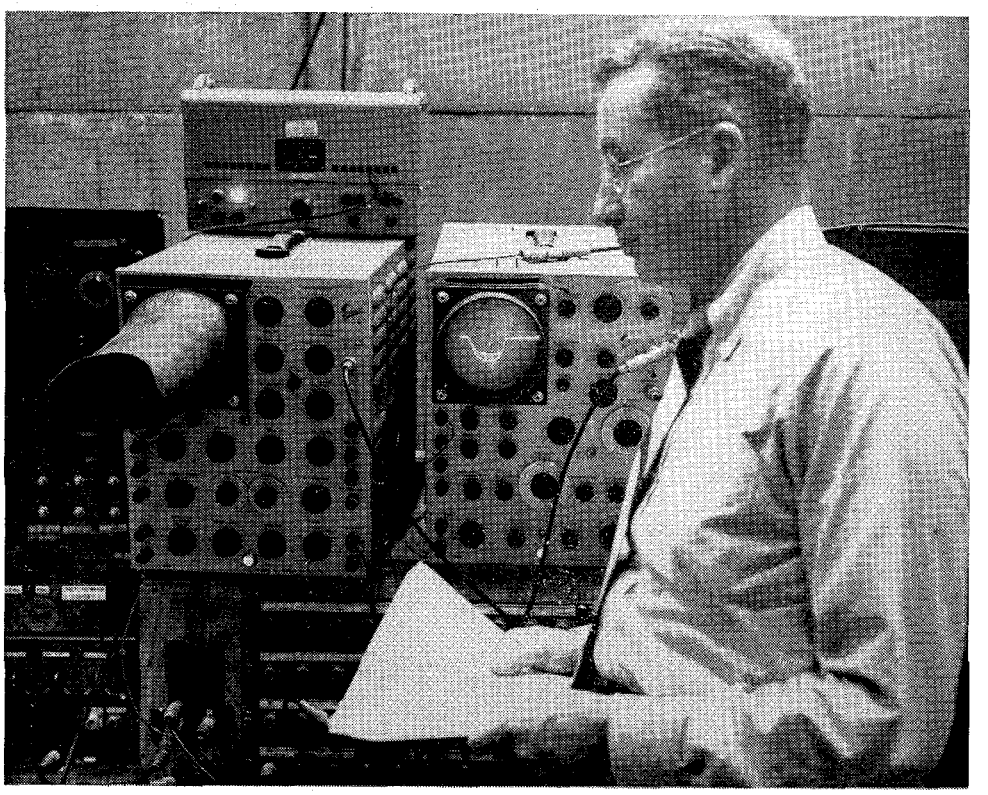
THE SYNCHROTRON

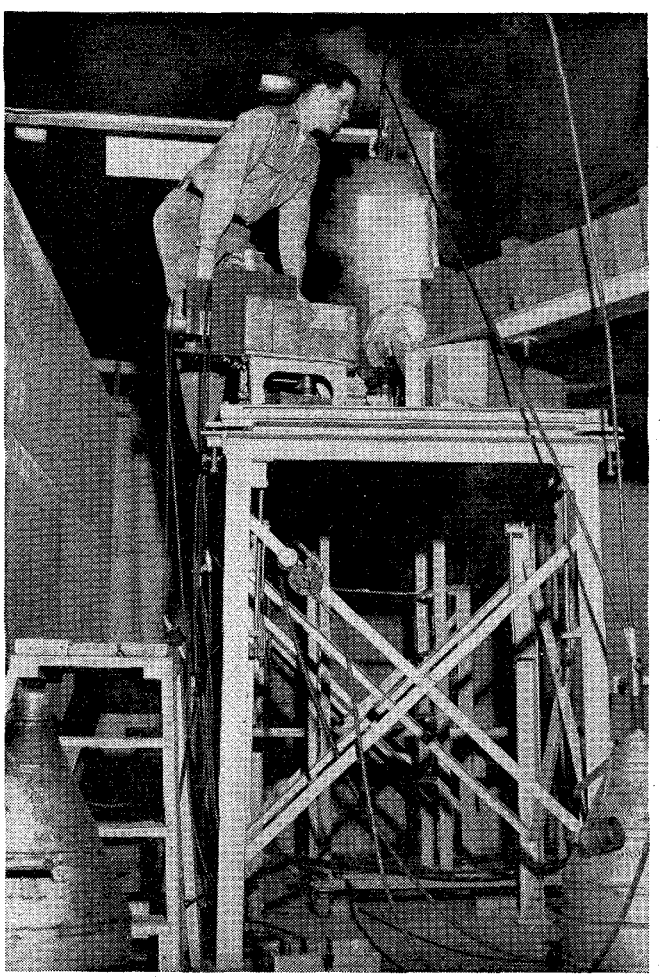
CURRENT WORK on the Caltech synchrotron will increase its power from 500,000,000 to over 1,000,000,000 electron volts to study the simplest atomic nuclei, those of hydrogen and deuterium or heavy hydrogen.

Electrons—negatively-charged particles of matter—are shot into the synchrotron by an electron gun in bursts of about 1000 billion particles at each pulse. Held in place by a powerful magnetic field, the electrons circle the "racetrack," while their energy is kicked to a higher level each time around, as they pass through a radio frequency cavity.

They enter the synchrotron at 94 percent of the speed of light, and at their peak reach a speed of only 60-millionths of one percent less than the speed of light. For research, this electron beam bombards a thin copper target to produce ultra-high energy X-rays. These, in turn, are used to bombard various other materials, particularly the two types of hydrogen.

Dr. Robert F. Bacher, chairman of Caltech's Physics Division and director of the synchrotron project, checks records of excitation curves of the synchrotron. The oscilloscope in the background shows the output of the ionization chamber in the half-billion-volt X-ray beam.





Graduate student David Oakley pours liquid nitrogen into a gas target in the X-ray beam, where it acts as a coolant.

Small mirror at side of synchrotron blinks each time 500,000,000*-volt pulse of electrons rounds the "racetrack." Brilliant white flash occurs as electrons give off visible light because they are whirling in an orbit.*