

In three of these are attachments for the pumping system that maintains an almost perfect vacuum in the chamber through which the electrons travel. In the fourth straight section is a radio-frequency cavity. Electrons, shot into the synchrotron by an external electron gun driven by a high voltage pulse transformer, pass through an accelerating tube immersed in oil and are injected into the vacuum chamber with an energy of about one million volts. Their velocity then is roughly 175,000 miles a second, or about 94 percent that of light. The electrons move clockwise around the synchrotron. Each time they reach the radio frequency cavity they get a 250-volt boost in energy. In one-fourth of a second they will have traveled some 46,000 miles—almost twice around the earth—to reach an energy of one-half billion volts.

At these speeds a powerful magnetic field which increases as their speed increases must be used to keep the electrons from flying out of their orbit. Power for the electromagnet which does this job is supplied by a 7,500 kilowatt motor-generator. As each burst of electrons is shot into the synchrotron the magnetic field is produced by a current which rises steadily from zero to 3,000 amperes in one-quarter second, then decays again to zero as the current flows back through mercury arc rectifiers. These convert electrical energy to mechanical energy which is stored in a large motor-driven flywheel until the process is repeated—at the rate of about 70 times a minute. When the radio frequency cavity is turned off at peak magnetic field the electrons leave their orbit and strike the target.

Construction of the machine was speeded up by the fact that Caltech secured the vacuum pumping system and iron for the magnet from the University of California. They had been used for a pilot model of the six-billion volt proton accelerator now under construction at Berkeley.

Aeronautical Structures

New Laboratory Established at Columbia

An Aeronautical Structures Laboratory will be established at Columbia University during the next academic year, according to John R. Dunning, dean of Columbia's School of Engineering. Designed primarily as a clearing house for information on high-speed rockets and aircraft research, the laboratory will be under the supervision of the department of civil engineering and will be directed by J. M. Garrelts, professor and head of that department. In its research the laboratory will be able to make use of the facilities of the university's physics, mathematics, and other departments as well as such installations as the cyclotron laboratory at Irvington-on-Hudson and the Materials Testing Laboratory.

New Hopkins Astrophysics Lab

Modern APL Building Also Planned

A new laboratory of astrophysics and physical meteorology has been established at The Johns Hopkins University under the direction of John D. Strong, pro-

fessor of experimental physics. A study of the spectra of planetary atmospheres is currently under way, according to Dr. Strong, and it is hoped that astrophysical measurements can be extended from the visible region of the electromagnetic spectrum to the longer wavelengths including the far infrared. Other aspects of the laboratory's research program will include investigations of the behavior of atmospheric pressure and certain optical studies of interest in astrophysical work, with special emphasis to be placed on lens and mirror coatings. The laboratory will also train graduate students working toward the doctor's degree in astrophysics.

At the same time, the university has announced that a firm of New York City architects has been assigned to proceed with final plans for construction of the new Applied Physics Laboratory, which will be located on a newly purchased 205-acre tract about fifteen miles from the present APL site at Silver Spring. According to APL Director R. E. Gibson, construction of the entirely air-conditioned laboratory building is expected to begin early next year.

High Altitude Research

The Mauna Loa Observatory, Hawaii

According to a recent communication from R. H. Simpson of the U. S. Department of Commerce Weather Bureau in Washington, D. C., another high altitude laboratory should be added to the list of such stations given in the May 1952 issue of *Physics Today* (p. 28). A new geophysical observatory, he points out, has been established at the summit of Mauna Loa (altitude 13,453 ft) on the island of Hawaii. Equipped at present as a weather observatory, it is attended by U. S. Weather Bureau personnel stationed at Hilo, Hawaii.

Meteorological instruments are of the recording type and are capable of operating as long as three months without attention. Continuous records of wind direction and speed, sunshine, rain and snowfall, temperature, humidity, and pressure are now recorded at the observatory and it is planned to install additional equipment including a Dobson ozone recorder and a water vapor absorption spectrometer. It is also hoped that a two-way radio system can be installed which will be suitable for collecting meteorological data from the observatory at Hilo through a push button relay process.

The single structure at the observatory site includes accommodations for two or three observers to remain overnight. The observatory is connected to Hilo, the principal city on the island of Hawaii, by a fifty-nine mile stretch of road which runs from sea level through the dense rain forest of Kulani, above the timberline, and across endless fields of lava formations. The last fifteen miles of the journey must be made by a four-wheel drive vehicle but plans call for the completion of a passenger sedan road within the next seven months.

The Mauna Loa Observatory, one of the highest elevation weather stations in the world, is well exposed to prevailing winds and is perhaps the only spot on