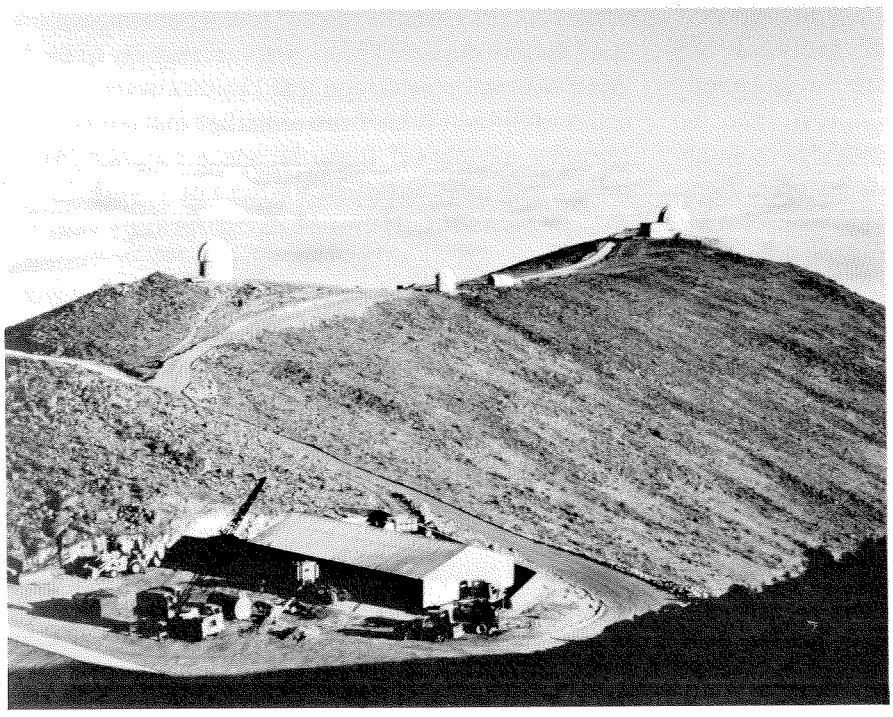

A New Observatory In Chile

Las Campanas joins Mount Wilson and Palomar

IN 1903 the Carnegie Institution of Washington seriously considered a proposal to establish a major astronomical observatory south of the equator. The project was set aside, however, in favor of one at Mount Wilson in California. Under the guidance of George Ellery Hale, a pioneering series of telescopes resulted: the 60-inch reflector and the 100-inch Hooker Telescope at Mount Wilson, followed by the 200-inch Hale Telescope and companion instruments on Palomar Mountain. Together, they have made possible great advances in astronomy, including much basic knowledge of the universe.

The early idea of an observatory south of the equator was realized on October 6 with the dedication of Las Campanas Observatory in Chile. It joins Mount Wilson and Palomar to become one of three major observatories that will be operated as a group with a combined scientific staff. The joint sponsors are the Carnegie Institution of Washington and the California Institute of Technology.

The project that resulted in this new observatory had its beginnings in 1961, when the trustees of the Carnegie Institution, reviewing the possibilities for new scientific ventures, decided that the most promising approach centered on a large new telescope that might be built in the Southern Hemisphere. It was evident from the start that favored locations would be on coastal mountains of moderate altitude on the western edge of a continent in latitudes about 30° south. Essential requirements were clear skies, stable atmospheric conditions, a congenial relationship with the host country, and freedom from artificial sources of pollution such as dust or the glare of city lights. Site investigations were conducted in Chile, New Zealand, and Australia, and reports of conditions in South Africa and on various islands were carefully studied. It soon became clear that the Norte Chico region of Chile offered advantages superior to those that could be found anywhere else.

Beginning in 1963, successive administrations of the Chilean government have welcomed the Carnegie Institution's observatory project and provided substantial assistance. Site investigations and observatory construction have been conducted with the cooperation of the University of Chile. Assistance has also been rendered by the Associated Universities for Research in Astronomy and by the European Southern Observatory, both engaged in observatory development in the same general region.

Portable site-testing equipment developed in California was used for testing the quality of the astronomical seeing at numerous mountain locations before Las Campanas was chosen in 1968 on the basis of good topography, an exceptionally high percentage of clear nights, an adequate water supply, freedom from both present and future sources of artificial light, and immediate availability.

Las Campanas is in the Sierra del Condor on the boundary between the provinces of Coquimbo and Atacama. The mountain is approximately 40 kilometers from the coast, with a ridge 5 kilometers long and summits ranging from 2290 to 2540 meters above sea level.

The Carnegie Institution originally

planned a 200-inch (5-meter) telescope in Chile, but for economic reasons it was postponed. By 1969, however, it was evident that it would be advantageous to go ahead with the development of the site and to install an initial telescope of more modest size. This crucial step in the development of the project was made possible by means of a substantial gift to the Institution from Henrietta M. Swope, a member of the scientific staff of the Hale Observatories from 1952 to 1968. By her wish, the gift remained anonymous for a number of years.

Essential steps in the development of the Observatory involved construction of an access road from the valley to the west and of a water supply system. Other facilities include an astronomers' lodge, diesel-electric generators, warehouses, and maintenance facilities. Administrative and logistical support is provided through an office at Colina el Pino in the coastal city of La Serena.

The first astronomical instrument of the Observatory was a 40-inch telescope, which has been in operation since June 1971. Observations with it have confirmed the excellence of the site. A 10-inch photographic refractor, long used at Mount Wilson, has also been erected at Las Campanas. In 1970 an agreement was reached that enabled the University of Toronto to install and operate a 24-inch telescope on the ridge.

In December 1970, Mr. and Mrs. Crawford H. Greenewalt made a gift of $1,500,000 to the Carnegie Institution to initiate construction of a 60-inch or larger telescope to be designed by the staff of the Hale Observatories and constructed at Las Campanas. The Institution decided to provide the funds necessary to make this a 100-inch instrument. The telescope was to be named for Mrs. Greenewalt's father, the late Irénée du Pont.

In January 1971 the Observatory staff began work on the design and development of this new instrument. The optical design was the work of Ira S. Bowen, former director of the Mount Wilson and Palomar Observatories, in collaboration with Arthur H. Vaughan (who has been named assistant director for the Las Campanas Observatory), and the Hale staff. The special coudé system was devised by Horace W. Babcock, the present director of the Hale Observatories. Bruce H. Rule, project officer and chief engineer, assembled an engineering group to design the telescope and oversee its construction. He also directed installation of the instrument in its dome in 1975.

The design of the Irénée du Pont Telescope incorporates many concepts that have been evolved from its predecessors at Mount Wilson and Palomar: a short, stiff tube structure using the Serrurier truss, a fork mounting for compactness and convenience, and thin-film pressurized oil bearings for low-friction support of the polar axle, to mention a few. It also has many new features such as a special Ritchey-Chrétien optical system with a Gascoigne corrector that gives an exceptionally wide field (2.1° in diameter) for direct photography at the Cassegrain focus, a radically new coudé optical system to provide maximum efficiency for observing the south polar region of the sky, and an electronic control system employing programmable microprocessors.

The large coudé laboratory room will be fitted with a 10-meter spectrograph, interferometers and special photoelectric receivers, and Schmidt cameras.

The primary mirror is a solid disk of fused silica, 101 inches in diameter and 15 inches thick. The disk was supplied by the Corning Glass Works. It was optically figured under the general supervision of the Hale Observatories at the Optical Sciences Center of the University of Arizona.

Every effort has been made to match the quality of the telescope to the unsurpassed natural conditions at Las Campanas. Because of the excellent atmospheric conditions, star images as small as one arc-second are frequently obtainable, and it is expected that on rare occasions images one-third that size may be encountered.

The microprocessors of the telescope's electronic control system interact with the many switches, motors, encoders, and indicators that set the telescope accurately, move the dome and windscreen automatically, provide correct rates for driving the telescope, and assist the astronomer with data acquisition. Automated controls and sensing devices will permit much of the observing to be done remotely, with the astronomer in the control room adjacent to the observing floor. An integrated closed-circuit television system permits guiding on very faint objects.

The Cassegrain focus, where a great deal of the observing will be done, is equipped for direct photography with plateholders of various sizes up to 50 centimeters (20 inches) square. An instrument adapter accommodates spectrographs and photometers.

Every large telescope needs an ongoing program of auxiliary instrument development. Two of the basic auxiliaries for the du Pont Telescope are a fast spectrograph and a digital photometer. The fast spectrograph, a grating instrument offering intermediate and low dispersions, has an image tube that can be interchanged readily with other devices such as a SIT (silicon intensifier target) Vidicon system. The photometer is a multi-filter, two-channel digital instrument designed for star-sky switching. A special system for observing at infrared wavelengths from 1 to 20 microns is being constructed.

A "flip-top" at the upper end of the telescope permits quick changes between the Cassegrain secondary mirror and the smaller coudé secondary. The telescope's unique design provides a coudé system with only three reflections for the southern part of the sky instead of the usual five. It should make the system unusually efficient.

The du Pont Telescope is an important addition to the worldwide array of large reflectors. With its very wide field and its ability to record faint limiting magnitudes, combined with its eventual coudé capability, it is especially suited to tackle certain problems related to the chemical history of galaxies, particularly of the Magellanic Clouds. These problems, in turn, are related to the understanding of galaxy formation in an evolving universe. □