THE CONSTRUCTION OF THE PRESENT OBSERVATORY

Ralph Stair National
Bureau of Standards

The observatory building in June 1956.

The Mauna Loa Observatory had been a dream of many for several decades. Although the U.S. Weather Bureau had from time to time set up temporary observation posts at a number of places along the trail leading to the summit of the mountain, the origin of the observatory came about in a rather peculiar manner differing greatly from any plans made or contemplated by those most interested in having a permanent weather station on the north slope of Mauna Loa.

The National Bureau of Standards (NBS) had been interested in the intensity of the ultraviolet solar radiation since about 1928. This interest grew with time and expanded in scope to include not only the total solar ultraviolet but also the spectral intensity through a wide region of the spectrum; the total amount and vertical distribution of ozone; and some information on water vapor, dust, and other pollutants in the atmosphere. In connection with this work, much effort was expended on the development of new instrumentation and standards of radiant energy. Much of this work was financed through non-Bureau sources, including the Army, Navy, Air Force, National Academy of Sciences, and Air Pollution Foundation, with assistance from others, such as the High Altitude Observatory, Upper Air Research Observatory, U.S. Weather Bureau, Lowell Observatory, and California Institute of Technology.

As the instrumentation and standards were improved through the years, the lack of atmospheric clearness remained the chief obstacle to obtaining high accuracy in the measurements of spectral solar energy. Measurements were made in various localities: Washington, D.C.; Mount Evans, Colorado; Climax, Colorado; San Juan, Puerto Rico; Flagstaff, Arizona; Pasadena, California; White Sands, New Mexico; and Sunspot, New Mexico.

It was at Sunspot, in June 1955, that we had the good fortune to receive a prominent visitor from the Florida Hurricane Center - none other than Dr. Robert H. Simpson himself. As there had been a dust storm of considerable magnitude over the adjacent New Mexico desert, the sky was very bright with the sun coming through weakly. Dr. Simpson was very sympathetic to our need for a clear sky with direct sunlight coming through at high intensity and for seeing Venus in the daytime and unobscured by clouds. (Venus was clearly visible in the daytime at Climax, Colorado, except when there were clouds.) We wanted a better location but knew not where to turn, since we had considered all possible locations within the continental United States and found no place superior to Sunspot.

Dr. Simpson had a suggestion that we agreed to consider. It was to set up our laboratory on one of the mountains in the Hawaiian Islands. Upon our return to Washington, a number of conferences at the NBS and at the Washington office of the U.S. Weather Bureau resulted in an agreement for NBS to use some

$25,000, which would be transferred from the U.S. Weather Bureau to the Radiometry Laboratory of NBS, in the establishment of a laboratory for the joint use of the Weather Bureau and NBS. The amount of money available was insufficient for the construction of a permanent building through the normal construction channels, but for use in establishing a durable "shelter" for practical use in all kinds of weather expected on one of the Hawaiian mountains it was considered adequate if strict economies were followed throughout.

Following preliminary discussions and evaluations in Washington, it was decided that the best location for a solar radiation laboratory in the Hawaiian Islands would be on the north slope of Mauna Loa, where as a result of the shielding effect of Mauna Kea the atmosphere would be least turbulent and most free of clouds. Furthermore, a mountain cinder road was already in existence in this area. Accordingly, an arrangement was made for a conference (in December 1955) with the Honorable Samuel Wilder King, then Governor of Hawaii, for the purpose of transferring title to a suitable area on the north slope of Mauna Loa (within the Mauna Loa forest and game reserve) from the Territory of Hawaii to the Department of Commerce of the federal government. Mr. King agreed to the transfer, and it was accomplished through the proper Hawaiian channels, with survey by C. L. and D. J. Murray for an area of 4.05 acres (10 hectares) in the shape of a square 420 by 420 ft (tax map 4-4-16; C.S.F. No. 12333). The exact area was chosen previous to the survey by Ralph Stair, Roy L. Fox, and James W. Steiner, of NBS; Pacific Area, U.S. Weather Bureau; and Hilo office, U.S. Weather Bureau, respectively.

In picking the site for the observatory a number of considerations were taken into account. The site chosen was near the mountain cinder road at the upper terminus of its better condition, that is, at the highest elevation possible to be reached with two-wheel-drive vehicles. The elevation, approximately 3400 m, was considered near the limit for extended living and working for most individuals. The area was on a recent volcanic lava flow which, because of its elevation above adjacent areas to the right and left, offered promise of some protection from future flows on this side of the mountain.

The 4.05-acre area was marked at the northeast corner by a spike set in concrete which was labeled "Stair, 1955." The other three corners and the midpoints of the north and south sides were defined by 3/4-in iron pipes driven into the lava.

The transfer of this parcel of Mauna Loa to the Department of Commerce (of which NBS and the U.S. Weather Bureau were parts) having been arranged, numerous interviews were conducted with other government and business people within the Hilo area concerning the best procedures to follow in getting the most desirable building on the site at the least cost. Afirst thought was to construct the building of lava block, of which there was an abundance within the area. However, investigation showed this to be more expensive than the use of cast cinder block manufactured in Hilo. (The possibility of a lava block building was left open, however, for a time when more money might be available, through the incorporation of a concrete ledge on the building foundation.) Other interviews regarding available material resulted in the location of local overstocks of certain items and sizes (for example, aluminum sash and roofing sheets). The final specifications for the building included only materials available locally so as to permit construction without delay or extra cost. All possible contractors within the area were interviewed and made acquainted with the local supplies in stock.

The Hawaiian Kulani prison authorities were extremely helpful in the construction of the new observatory. They not only continued to keep the roadway in repair but volunteered to "level off" the 4-acre area ahead of the contractor and to deliver to him the water required during construction. The latter was a most important item as it relieved the contractor of all expenses that might be involved in obtaining and operating water tanks.

All developments in the specifications for the new building were handled by NBS, with consultations

and interviews with U.S. Weather Bureau personnel. This work was performed primarily on regular Bureau schedule with no cost to the construction fund. As a matter of fact, to keep all costs to a minimum no drawings or blueprints were prepared, all work being performed from detailed specifications.

With the building specifications in order, the requests for bids on construction were handled through the offices of NBS in the usual official manner.

During construction, in order to keep costs down, all inspections and consultations with the contractor were handled by Hilo U.S. Weather Bureau personnel through occasional visits to the site followed by simple reports to NBS.

By June 1956 the building was essentially complete as described and illustrated in the September 1956 issue of *Weather Bureau Topics*, the October 1956 issue of *National Bureau of Standards Technical News Bulletin*, and the November 1956 issue of *Discovery*.

The construction of the observatory proceeded smoothly throughout. There were helping hands in all quarters with no dissidents anywhere. Donations came from several organizations. One, in the form of a radio transceiver, was supplied by the Radio Section of NBS. A small library was furnished by the Smithsonian Institution and the Department of Agriculture. Only minor problems developed, and those were primarily the result of "corner cutting" to get the job done at low cost. For example, the placing of the diesel electric generator near the building under the water tank required moving it later to a more distant location because of vibrations and noise that interfered with experiments inside or near the building. Although the construction of the observatory building was carefully specified to contain steel rods to hold the structure securely attached to the foundation in case of a hurricane, no such forethought was included in the case of the "outhouse"; it went the ways of the winds upon the arrival of the first 100 mph hurricane.

In getting the "most possible for the least cost," one can run into real trouble. This happened in the case of the NBS project leader, who found it necessary to become plumber and janitor for a day to get the water running and the floors clean for the first scientific observing team to use the observatory (Dr. C. C. Kiess and associates of NBS for the National Geographic Society).

Dedication ceremonies on June 28, 1956, marked the official beginning of the observatory.

By dedication time, the building was completely furnished (down to bed sheets, kitchen utensils, dishes, and flatware) for comfortable living for six observers. Government inspection (by Ralph Stair) confirmed fulfillment of the contractor's obligation, although the observatory faced "magnetic south" rather than geographic south, which shows that one can never be too careful in writing a specification - the contractor used a compass. The building was duly accepted by NBS, the contractor paid, and the Mauna Loa Observatory dedicated on June 28, 1956, the introductory remarks being made by the

Honorable Samuel Wilder King, Governor of Hawaii.

Lava formation at the 7000-ft level on Mauna Loa in December 1966.

Back to Table of contents