

Memorandum regarding Mount Wilson Solar Observatory, Pasadena,California - October 1, 1926

Friday afternoon, October 1, 1926, I went with Doctor Adams to the laboratory of the observatory which consists largely of a main building for offices for the fifteen technical members of the staff, an unusual physical laboratory for the experimental reproduction of phenomena associated with the structure of the sun and stars, and an optical department for grinding the lenses used in the work, including the large reflectors now in use at Mount Wilson.

While here I met Doctor Hubble (a friend of Mr. Shepardson) who is devoting his studies to the nebulae, and Doctor VanMaaren who is working on the distances of the stars.

We then took the bus for Mount Wilson, a ride of about two hours. This included a climb of about nine miles on a seven degree road to the top which is about one mile above Pasadena. The construction of this road has involved a large expenditure. It was first designed as a trail and the original apparatus and building material were all brought up by mules. Later the trail was widened for wagons and still later for trucks in order to make possible hauling equipment and materials for the 100-inch reflector.

After dinner at the Inn we listened to an excellent illustrated talk on the work of the Laboratory. I had known something of the structure of the universe of which the solar system is a part, but had not known that this universe in its entirety was probably a

spiral nebula and that there are some 135,000 such nebulae in the heavens, discovered through long time photographs. One such nebula was shown with the statement that it was probably from 850,000 to 1,000,000 light years distant from the earth. With light traveling 136,000 miles a second, or about $7\frac{1}{3}$ times around the earth, it is practically impossible to conceive of a distance light travels in 850,000 years.

We visited the 60-inch reflecting telescope and saw Jupiter and then visited the 100-inch reflecting telescope then being used in making a 100 hour photographic exposure of one of the nebulae. This apparatus is marvelous in its operation, construction, and design. The large lens was ground by the laboratory and is resilvered about twice a year by the staff. The design of the machine and structure were prepared by the staff. The clock mechanism, including the large accurate gear for controlling the movement of the telescope, was built by the staff, and the result of this meant cutting the cost to about one-half the estimates submitted by manufacturing concerns.

The Observatory is open to the public Friday evenings and evidently attracts people from all over the world. The weather on the evening of our visit was very threatening, resulting in an unusually small attendance of about 50. The party included a professor and his wife from Cambridge, England, and a party of nine Japanese.

We spent the night at the "Monastery" (men only), and in the morning saw the solar observatories, the buildings where Michelson of Chicago has been making new determinations of the velocity of light.

and is planning further measurements with a still longer distance. Incidentally Doctor Hale stated that the results of the past summer's work by Doctor Michelson were almost incredible, showing a probable error of only 1 part in 300,000. We also saw the laboratory of Doctor Abbott of the Smithsonian Institute, and the foundations for the new seismological laboratory.

After breakfast we returned to Pasadena where I spent most of the morning with Doctor Anderson. We discussed electromagnetic waves and he gave a most illuminating statement of the progress in this field from the predictions of Thompson through the verifications of Herz and others, including the contributions of R. W. Wood of Johns Hopkins and others.

This is an excellent illustration of the "great simplifications" that finally emerge after the accumulation of studies of years in apparently unrelated fields. From the minutely short hard cosmic rays, through the scale of "gamma rays," "X-Rays," "ultra violet," "light," "infra-red" and the relatively long rays for radio broadcasting we have one and the same phenomenon; in other words, light and heat are but different manifestations of electro-magnetic waves of different length.

Doctor Anderson and I then visited the Laboratory where he explained his research work in getting unusual temperatures and studying their spectra, thus reproducing phenomena of the heavens and enabling interpretation of the phenomena shown by the spectro photography of the sun, stars, and nebulae.

I then met Doctor Pease who has been responsible for the designs of the various observatories on Mount Wilson. He showed me his plans for a 25 foot reflecting telescope, a machine which with equipment will probably cost some eight millions. This design has been prepared to illustrate the fact that such an apparatus can now be constructed, although the laboratory does not plan such a construction, nor does it have any plans for securing the funds needed.

Altogether my visit to Mount Wilson has impressed me more than I can say with the unusual opportunities that now exist for adding to human knowledge. Here again is a laboratory that far excels that of any educational institution. Doctor Hale and his staff have shown a most daring initiation and conception of possible studies, with results already secured that more than justify the installation and maintenance of this research station. In the design of equipment the staff has shown unusual ability and exceptional skill, coupled with an ingenuity that is very rare and has been most productive.

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