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PRELIMINARY MEASUREMENT OF THE VELOCITY OF LIGHT[1]

THE velocity of light is one of the most fundamental of the constants of nature, and this alone would justify the attempt to measure its value with the highest possible precision. But in addition to its scientific importance it may prove to have a practical value if the result of such a measurement can be obtained with sufficient accuracy.

The mean of the various measurements thus far attempted is 186,330 miles per second, with an uncertainty of 20 or 30 miles. If this uncertainty can be reduced to one mile, the result could be utilized to obtain distances between stations from 50 to 100 miles apart far more expeditiously and with an order of accuracy at least as great as that obtainable by the usual method of triangulation. Indeed, there are possibilities of utilizing the velocity of light in cases where triangulation would be difficult or impossible.

An invitation tendered by Dr. G. E. Hale, then director of the Mt. Wilson Observatory, and supported by Dr. J. C. Merriam, director of the Carnegie Institution, made it possible to install the necessary apparatus on Mt. Wilson, with Mt. San Antonio 22 miles away as the distant station, during the summer of 1923; but smoke and haze from burning oil and from forest fires made it impossible even to test the feasibility of the method at so great a distance.

This was accomplished during the past summer with very promising results. The set-up of apparatus involved several important changes in the arrangement employed in previous investigations, the most important of these consisting in the substitution of an octagonal revolving mirror instead of a plane-parallel, together with a system of reflectors which eliminated all direct and diffuse extraneous light. Finally, a simple method for returning the light from the distant station back to the source was substituted for the plane mirror used for this purpose in previous work, and this functioned so well that no readjustment was required during the entire two months of the work.

The advantage of the octagonal revolving mirror, in addition to the higher speed obtainable, lies in the possibility of receiving the return light on a succeeding face, thus eliminating the measurement of the angular deflection of the returned beam; or rather

[1] Presented at the Centenary Celebration of the Franklin Institute, Philadelphia, September 17–19, 1924.