New Measurement of the Velocity of Light.[1]

By Prof. A. A. MICHELSON, For. Mem. R.S.

THE velocity of light is one of the most fundamental of the constants of Nature, and this fact 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 twenty or thirty miles. If this uncertainty could be reduced to one mile per second, the timing of light could be utilised 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 utilising 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, twenty-two 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 feat 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 which consisted in the substitution of an octagonal revolving mirror for the usual plane-parallel, together with the introduction of a system of reflectors which eliminated all direct and diffuse extraneous light. Finally, a simple method for returning the light from the distant station to the source was substituted for the plane mirror used for this purpose in previous work, and this equipment functioned so well that no readjustment was required during the entire two months of the work.

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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 deflexion of the returned beam; or rather, transferring this measurement to the construction of the octagon, the angles of which were tested and found to be equal, with an uncertainty of only one part in a million.

The determination of the velocity of light is thus reduced to the measurement of the distance between the stations, and of the speed of rotation of the mirror. The former operation was carried out by the U.S. Coast and Geodetic Survey, and the result obtained was 35,426·3 metres (about twenty-two miles), with an uncertainty of the order of only two parts in a million. The errors in the measurement of the speed of the revolving mirror were much greater, as no very effective means were employed to ensure its constancy. (This defect will be eliminated in the continuation of the work next summer.)

Notwithstanding the inconstancy of the speed of the mirror, the choice of the most favourable moment, when the speed was that corresponding to the frequency of a control tuning-fork, made the resulting uncertainty of the measurements of the order of one ten-thousandth part, which is about that of the mean of all the previous measurements. It is hoped that next year's work will furnish results four or five times more accurate.

The result of eight independent observations in the present preliminary work is, for the velocity of light *in vacuo*, 299,820 kilometres per second.

Following is a table of results of the more important investigations to date, with an estimate of the weight which should be assigned to each:

Investigator.	Method.	Distance.	Weight.	Velocity.
		km.		
Cornu	Toothed wheel	23	1	299,950
Perrotin	Toothed wheel	12	1	299,900
Michelson	Revolving mirror	0·6	2	299,895
Newcomb	Revolving mirror	6·5	3	299,860
Michelson	Revolving mirror	35·4	3	299,820

Obituary.

DR. FRANZ DOFLEIN.

IT seems but a short time since we deplored the premature death of Prof. Minchin, and now protozoologists have lost another distinguished leader, Prof. Doflein of Breslau, who died at the age of fifty-one on August 26. It is by his excellent text-book, "Lehrbuch der Protozoenkunde," that Doflein is most widely known. The fourth edition, which appeared in 1916, has been out of print for some years, and he had been working for the last three or more years on a fifth edition, although often interrupted by illness, aggravated by depression caused by the War. However, it is some satisfaction to learn that this new edition may be expected soon to appear, as it is being prepared for the press by Prof. Reichenow, of the Institute of Tropical Medicine in Hamburg.

Many in Great Britain will remember Prof. Doflein's charming personality and his readiness to help any one interested in his subject. He attended the Dundee Meeting of the British Association in 1912 and worked much at the Zoological Stations of Naples and Rovigno as well as in the Musée Océanographique at Monaco.

Franz Doflein was born in Paris in April 1873, his mother being of English origin and his father a German merchant. At seven years of age, on the death of his father, he was taken to Germany to be educated. In 1896 he went to the University of Munich to study medicine, but, coming under the influence of Prof.