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SIGNIFICANCE OF THE ETHER-DRIFT EXPERIMENTS OF 1925 AT MOUNT WILSON¹

THE general acceptance of the theory that light consists of wave motion in a luminiferous ether made it necessary to determine the essential properties of the ether which will enable it to transmit the waves of light and to account for optical phenomena in general. The ether was at first presumed to fill all space, even that occupied by material bodies, and yet to allow all bodies to move through it with apparent perfect freedom. The question of whether the ether is carried along by the earth's motion has been considered from the early days of the wave theory. Theories of the ether are intimately associated with theories of the structure of matter, and these are among the most fundamental in the whole domain of physical science.

The discovery of the aberration of light, in 1728, was soon followed by an explanation according to the then accepted corpuscular theory of light. The effect was attributed to a simple composition of the velocity of light with the velocity of the earth in its orbit. A second explanation was proposed, based on the wave theory, which seemed almost as simple as the former, but it failed to account for the fact, later proved by experiment, that the aberration is unchanged when observations are made with a telescope filled with water. Fresnel developed the theory which has been generally accepted, first, that the ether is at rest in free space and in opaque bodies, while, second, in the interior of moving transparent bodies it is supposed to move with a velocity less than the velocity of the

body in the ratio $\frac{n^2 - 1}{n^2}$, where n is the index of refraction. These two hypotheses give a complete and satisfactory explanation of aberration; the second is considered to have been proved by the experiments of Fizeau and of Michelson and Morley on the velocity of light in moving media; the first hypothesis, that of an ether at rest in space and in opaque bodies, has always been in doubt.

Several physicists have sought to prove the existence of the stationary ether by direct experiment. The most fundamental of such proposals was that of Professor A. A. Michelson, made in 1881, based upon the idea that the ether as a whole is at rest and that light waves are propagated in the free ether in any direction and always with the same velocity with re-

¹ Address of the president of the American Physical Society, read at Kansas City, December 29, 1925.

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Those who have published research work in the natural and exact sciences and are not included in the third edition of the directory or have not already sent the information are requested to fill in this blank and forward it to J. McKeen Cattell, 3939 Grand Central Terminal, New York, N. Y.

*Full name with title and mail address,
the part of the name ordinarily omitted
in correspondence being in parentheses—
e.g., Prof. J(ohn) W(ilson) Smith,
1234 Lincoln St., Washington, D. C.*

*Department of
investigation*

*Place and date
of birth*

*Education and degrees,
including honorary
degrees, with dates*

*Positions with
dates at which
they were held*

*Temporary or minor positions and honors,
such as lectureships, trusteeships,
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