SCIENCE

VOL. LXIII APRIL 30, 1926 No. 1635

CONTENTS

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 8, 1879.

SIGNIFICANCE OF THE ETHER-DRIFT EXPERIMENTS OF 1925 AT MOUNT WILSON[1]

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.