

LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the

twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Note on the Repetition of the Michelson-Morley Experiment

In a very interesting report¹ on his ether-drift experiments, Mr. Miller compares his positive ether-drift effect with the negative results of other experimenters of whom I myself am one.² Mr. Miller finds the cause of the discrepancy in the fact that I enclosed the optical arrangement in a metal case and worked in a massive building, as did the other experimenters cited by Mr. Miller. I did so, of course, in order to eliminate disturbances caused by local and temporal variations of temperature. For if, assuming a length of the light path of 30 m, one calculates what difference in temperature of the two branches of the interferometer produces a displacement of 1/10 of a fringe (this is the order of magnitude observed). One gets the astonishing result that a difference of 1/500° is sufficient. The mere warmth of the body of the observer who, in Mr. Miller's experiments, stands near the interferometer can produce such an effect. But the question whether the ether penetrates the walls of a building, from the point of view of any ether theory, is decided by the fact that in the Sagnac

and the Michelson-Gale experiments one gets the full displacement expected from the theory of a resting ether. To make use of this result in an experiment which, without the best protection against disturbances by temperature, is hardly performable, is but a natural chain of reasoning. As in general one cannot answer all questions of a physical complex by only one experiment, one must draw conclusions from the whole experimental material. Therefore I think that my experimental arrangement is apt to decide the question whether the ether drift exists or not and that it is not—as readers of the paper of Mr. Miller might be inclined to think—an arrangement adopted to prove a preconception.

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November 11, 1933.

¹ D. C. Miller, *Rev. Mod. Phys.* 5, 203 (1933).

² G. Joos, *Ann. d. Physik* 7, 385 (1930).

Comments on Dr. Georg Joos's Criticism of the Ether-Drift Experiment

A small change in the temperature of the air in the entire light path of the interferometer of the order of magnitude given by Professor Joos would produce a displacement of the fringe system of 0.1 of a fringe width, the entire light path being uniformly heated. When Morley and Miller designed their interferometer in 1904, they were fully cognizant of this fact, and it has never since been neglected.¹ Elaborate tests have been made under natural conditions, and especially with artificial heating, for the development of methods which would be free from this effect.

It should be borne in mind that the ether-drift observation does not depend upon any absolute reading, nor even upon a simple displacement of the fringes; it depends upon a regularly periodic variation in the position of the entire fringe system, and the period is twenty-five seconds throughout. The temperature would have to increase and decrease, with periodic regularity in each twenty-five seconds! to produce the results. Any irregular fluctuation will be eliminated in the long series of turns. The observer maintains a constant relation to the apparatus and if the warmth of the observer's body is effective, it would be a continual heating effect which produces a continuous drift

of the fringes, which is of no effect in the calculated results. The body cannot cool and heat the air, alternately every twenty-five seconds, and by variable amounts which depend upon the sidereal time.

The ether drift reported cannot be due to the heating of the house; elaborate analyses have been made to detect such effects. The effects are wholly independent of the sun's heat, of day and night, of summer and winter.

It seems quite sufficient that throughout the thousands of observations, the results are found to vary in both magnitude and azimuth in a systematic manner, depending upon sidereal time, and upon the varying combinations of cosmical and orbital motions, as is fully explained in the printed report.

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Cleveland, Ohio,
December 26, 1933.

¹ See D. C. Miller, *Rev. Mod. Phys.* 5, 203 (1933), especially pages 212, 213, 215, 220, etc.