

OPTICS – *The absence of the ether wind on Rigi.*

Note ⁽¹⁾ By **A. PICCARD and E. STAHEL**, transmitted by Mr. Weiss.

The experiments made in free balloon and in Brussels with our recording, Michelson interferometer appeared to demonstrate that the results of Mr. Miller

⁽¹⁾ Meeting of November 21, 1927.

cannot be explained by an ether wind ⁽¹⁾. Our conclusions were moreover in agreement with the observations that Mr. Kennedy ⁽²⁾ has made on Mount Wilson. The measurements made in balloon, like those of Mr. Kennedy, not exceeding however a certain precision, of which Mr. Brylinski and others expressed doubts, as for their interpretation, and maintained the assumption of the ether wind ⁽³⁾. The question was important enough to be begin again for a final result.

We chosen as the observation point Rigi (long. 8°30' East Gren. and lat. 47°0' Northern), of which the height (1800m) exceeds that of the Wilson Mount slightly. Its summit, very reachable, lends itself particularly to our work. It is with about forty kilometers north of the principal main range of the Alps. The isolated summits which are closer and which exceed it slightly are within 20km in the east and the west (Mythen and Pilate). The north, from where according to Mr. Miller would blow the ether wind, is completely open. The apparatus was placed 3m higher, under the roof of the highest hotel. No thick wall could stop the ether current.

We used the same interferometer as for the preceding experiments, but a small modification in the adjustment enabled us to obtain films of great contrast. The line of white interference between the black bands is very fine and allows pointing with a high degree of accuracy at the machine divisions. Measurements were made September 16th and 17th 1927, between 5:00 and 6:00 and 17:00 and 18:00 (local time). The first of these terms corresponds to the time when the apex of Mr. Miller is most close to the horizon. The horizontal ether wind must thus have its maximum value, that is to say 9.5 km/sec. The second corresponds to the minimum of the horizontal component (3.3 km/sec). Only the photographs made between 5:00 and 6:00 were measured up until now. We give the results here:

120 turns of the apparatus were used. In each half-turn, the fringes should describe, according to the assumption of the ether wind, a whole sinusoid. The microscope was focused on the line of the fixed datum and two white lines of interference with intervals of 4/20 of a turn. For each of the 12 groups of 20 half-turns, it was, by harmonic analysis, calculated on the average of the

⁽¹⁾ MILLER, *Science*, **63**, 1926, p. 433 – A. PICCARD and E. STAHEL, *Comptes Rendus*, **183**, 1926, p. 420; **184**, 1927, p. 152.

⁽²⁾ KENNEDY, *Proc. Nat. Acad. of Sci.*, **12**, 1926, p. 621.

⁽³⁾ BRYLINSKI, *Comptes rendus*, **184**, 1927, p. 192 – A. PICCARD and E. STAHEL, *Comptes Rendus*, **184**, 1927, p. 451.

observations the most probable sinusoid. Amplitude of each one of these sinusoids remained far below that of the sine wave that would have produced by the ether wind of Mr. Miller, and, moreover, their phases were distributed completely randomly between zero and $\frac{\pi}{2}$ so much so that the overall average of the 12 sinusoids gave a new sine wave whose amplitude is 40 times smaller than that which Mr. Miller would have provided, and this is within the limits of our probable errors. If one numbers for each half-turn the points observed, from 1 to 10, and if one takes the average of all the of the same point numbers in the 240 half-turns, one obtains 10 points of which can give the variations in the axis expressed in thousandths of a fringe.

N ^{os.}	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Diff.	-0.27	-0.25	+0.88	+0.11	-0.46	-0.42	+0.027	+0.21	+0.46	-0.49

It is seen that the pace of these points does not point out anything of a sinusoid. Moreover, while the ether wind of Mr. Miller would have produced a sinusoid oscillating between +3.2 and -3.2 thousandths, these points give a sine wave with a most probable curve ranging between the limits of +0.08 and -0.08 thousandths. This curve corresponds to an ether wind of 1.45 km/sec. We conclude from it that, under the conditions corresponding to the experiment of Mr. Miller, the ether wind by no means appears. The experimental base of the theory of Einstein thus remains valid.
