MATHEMATICAL PHYSICS. — *The entraining of ether and aberration of stars.* Note ([1]) by Mr. **André Metz**, presented by Mr. Émile Borel.

Mr. Brylinski ([2]) examined whether the assumption of the entrainment of ether by the Earth was incompatible with the aberration of stars, such as observation shows. This work was made following a series of studies where that author again dealt with a high degree of accuracy the problems arising from the experiment of Mr. Michelson. These researches have provoked

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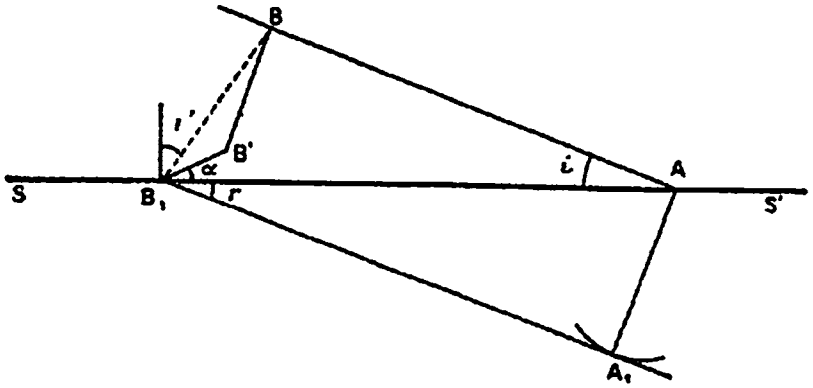
([1]) Meeting of 9 February 1925.
([2]) *Comptes Rendus*, t. **179**, 1924, p. 1034

others and emphasized the utility of a thorough discussion of questions often too quickly treated.

In particular, the most widespread theory about the *aberration* of stars is this one: *the aberration, such as it is repeated by experiment, is entirely explained by the assumption of ether not pulled by the Earth; it is thus in contradiction with the assumption of entrained ether*. But the justifying calculation of the last proposal generally misses.

It is this calculation that was proposed by Mr. Brylinski ([1]). Let SS' track the surface of separation between motionless ether of interplanetary space and the entrained ether, AB that of an incidental plane wave forming angle i with this surface, and α the angle of the direction of the translational movement of ether entrained with the surface of discontinuity.



Let us take the axes related to the Earth, of which we neglect rotation; at the end of time t, such as BB' = ct and $B_1B' = vt = \beta ct$, point B comes to B'. By connecting B_1 to the tangent to the circle of center A, having ct for the ray, one has, in B_1A_1, the trace of the wave in the entrained part of the ether (which is in rest compared to the selected axes); let r be the angle which A_1B_1 forms with the surface of separation.

This preamble is that of Mr. Brylinski; it calculates then the value of i' and that of r.

The value of i' is that which corresponds to the traditional aberration in ether not entrained: one has, with the allowed approximation,

$$i' - i = \beta \cos(\alpha + i) = \Delta$$

and r is given by

$$\sin r = \frac{\sin i \cos(\alpha + i')}{\cos(i' - i)\cos(\alpha + i)}$$

([1]) The figure reproduced here is that of page 1034 of *Comptes Rendus*, vol. **179**, 1924, with the correction of two material errors.

The new aberration on the case studied is $i - r = \Delta'$.

An error was made here in the Note of Mr. Brylinski, who wrote $i' - r$. It is $i - r$ that he should have written, because directions of stars must be regarded as the *true directions* which are perpendicular with waves such as AB, directions which *are not influenced* by the relative speed of entrained ether and non-entrained ether (whereas the directions such as BB_1, from where it would be necessary to leave to justify the formula $i' - r$, are already distorted by the *aberration* in the non-entrained ether).

It results from this correction ([1]) that Δ' is expressed, with the allowed approximation, by

$$\Delta' = \beta \tan i \sin(\alpha + i)$$

In this case, the hypothetical aberration Δ' resulting from entrained ether would be null, whereas the aberration Δ observed is then maximum ([2]).

It results from this calculation that the aberration of stars, such that the observation shows, is incompatible with the assumption of the entraining of ether by the Earth.

([1]) Mr. Brylinski, to whom this Note was submitted, agreed to give his approval to this correction, as with the conclusion which results from it on the incompatibility of the assumption of entrainment with the astronomical observations.

([2]) It also seems that the ether should not (on the assumption of entraining) be involved *in block*, as noted by Mr. Brylinski at the end of his Communication; there would undoubtedly be a series of layers sliding over each other along with their area, so that the calculation of this Note would apply to the consideration of *two successive layers*, with $\alpha = 0$.

This remark does not change the conclusions: indeed, in the particular case of a star located in a direction perpendicular to the movement of the Earth, all the crossed successive layers would be parallel between them and parallel to the waves considered; the aberration Δ' would be thus still be null on the whole.