On the optical dissymmetry of space and the laws of the reflection

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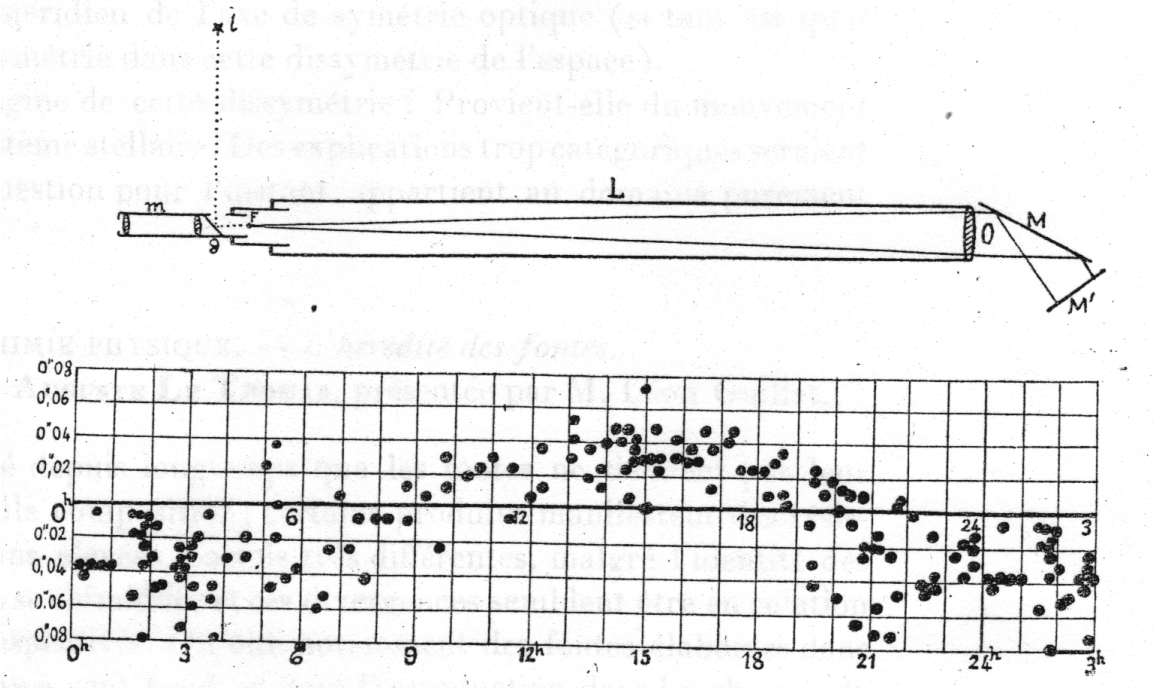
Sur la dissymétrie optique de l'espace et les lois de réflexion.
Note de ERNEST ESCLANGON
Comptes Rendus hebdomadaires des séances de L'Académie 1927 (T185) p.1593-1594.
http://gallica.bnf.fr/ark:/12148/bpt6k31384/f1595.table

The following observations that I have the honor to present to the academy appear to reveal an optical dissymmetry of celestial space, such as it appears by ground observations.

Lets take a telescope (L) which can turn around a vertical axis (altazimuth of the Observatory of Strasbourg; $F=I^m$, 50). In front of the objective (O) is mounted a first mirror (M) whose normal forms an angle from approximately 55 degrees with the optical axis (FO). The rays resulting from the horizontal wire (F) of the reticle are reflected after their exit from the objective, on the mirror (M); then normally on a second mirror (Me) and, by the same way followed in opposite direction, return in (F). A lamp placed in L lights the wire (F) which one can see at the same time as its reflected image through the ocular microscope (m). The mirrors (M), (Me) and the lamp (l) are all interconnected to the optical device. The wire (F) is mobile and its vertical displacement is measured by a micrometric screw. We now proceed in the following way to the observations, which are, moreover, very delicate. The optical device is placed horizontally in the north-western direction, and one aligns into coincidence the wire (F) and its image, such that, in the set position, the direction of light in the optical device defines a ray which returns on itself. Ten coincidence points are made in this position; one then turns the optical device gently, without touching it directly, around the vertical axis of the instrument to bring it to the north-eastern direction; so on a great number of times. A session of observation usually includes 25 to 29 alternating series of uninterrupted observations in the north-western and north-eastern directions.

However one notes a systematic difference between these two systems of readings, the difference which depend only of the average sidereal hour of the sessions of observation; i.e. of the orientation of the celestial sphere of fixed stars compared to the instrumental system. The figure below shows the result provided by 150 sessions of observation which includes 40,000 points.



On the abscissa the sidereal hours are shown, on the ordinate the difference P-P (of the north-western and north-eastern readings); each point represents the average provided by a session. I started these observations in this form in February 1927 and have since continued them regularly, to correspond to the various daylight hours, as well as during the night, the season of summer as well as of winter. With an ordinate following the average solar time, the observations disperse without apparent order, without defining any curve apart from the axis O which represents their average; this character indicates that the movement of the Earth on its orbit around the Sun, with the degree of precision obtained, is not related with this phenomenon. The experimental technique is exactly differential; the observations are made with artificial light (closed cupola) and only in covered weather when the temperature is very constant. Systematic errors being able to come from lighting, inflection, etc, are eliminated thus perfectly.

In summary, the ray which is reflected on itself, in the material system constituted by the optical device and the mirrors, occupies a variable position, which depends, with the degree of precision of these experiments, on the orientation of the optical device compared to the celestial sphere of fixed stars. The difference P-P observed vary between -0.036 arc seconds and +0.036 arc seconds at 3 hours and 15 hours, respectively; they are cancelled around 9 hours and at 21 hours; hours corresponding to the passage about the meridian line of the optical axis of symmetry (as well as there is an axis of symmetry in this dissymmetry of space).

What is the origin of this dissymmetry? Does it come from the absolute movement of our stellar system? Categorical explanations would be premature; the question for the moment belongs to the purely experimental field.