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Georges Sagnac. Evidence of the reality of the luminiferous ether in an experiment with the rotation of an interferometer (December 22, 1913)

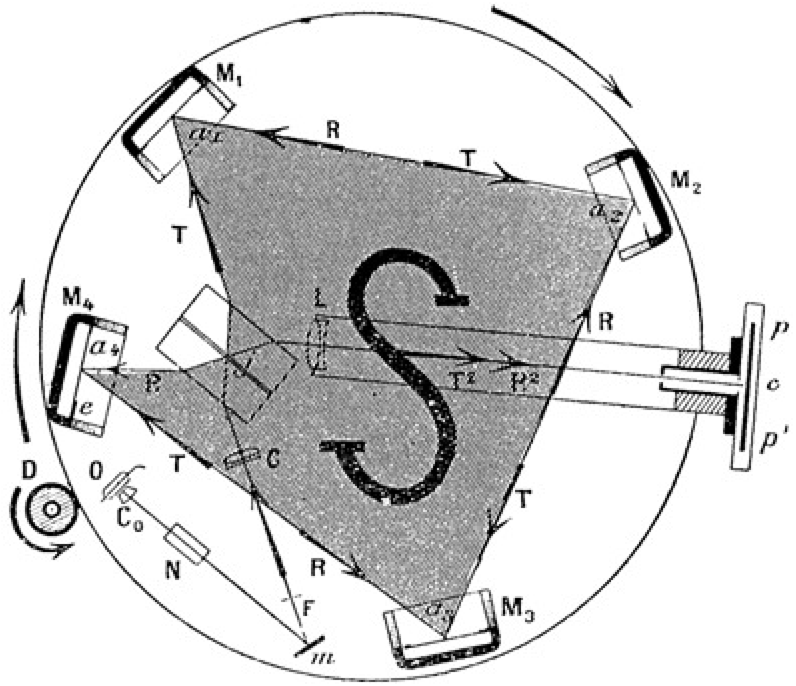
Georges Sagnac. Sur la preuve de la réalité de l'éther lumineux par l'expérience de l'interferographe tournant // Comptes Rendus, 157: 1410-1413. December 22, 1913.

Note **F. Sagnaka**presented by E. Bouty.

In *Comptes rendus* of October 27 (page 708 of this edition), I showed that an interferometer, the optical design of which surrounds a certain*region* and rotates in the plane of this diagram, determines its absolute movement in relation to to the ether in a vacuum.

1. Interferometer

Interferometer (interferograph) already described briefly, schematically shown in plan in the figure: a horizontally rotating platform (50 cm in diameter) carries, being securely fixed with screws on it (the adjusting screws are locked fixing screws), all optical parts, as well as the light source O, small lamp with a metal horizontal filament. The microscope lens C_0 projects image of this thread through a Nicolas prism N onto a horizontal slit F in focal plane of the lens collimator C; m— reflective mirror. Vertically polarized according to the Fresnel principle parallel the beam is separated by an air gap in a thin plate*J*, as usual this happens in the interferometer in my research*(Comptes rendus, issue* 150, 1910, p. 1676), which I used for optical study of the movement of the Earth*(Congrès de Bruxelles,* September 1910, vol. 1, p. 207; *Comptes rendus,* volume 152, 1911, p. 310,*Le Radium,* 1911, p. 1): ray T, which passes into air gap*J*, reflected sequentially from four mirrors M and goes through a closed cycle$Ja_1a_2J'.pp$, ray T, again missed, and ray R, again reflected, intersect in one direction, along T² and R², and form interference fringes at the main focus of the lens L on fine-grained photographic plate*J* area S. Ray R, which is reflected the same air gap, follows the same route in the opposite direction. Coming back to$_4a_3a$



2. Procedure

I would like to note that it is ideal the combination of two opposite rays T and R is characterized by a general disappearance in the telescope field of the radiation used, which here is close to part of the spectrum indigo colors of mercury arc. Starting from here, slight rotation ε of the separator rays*J*around vertical axis clockwise (rotation direction*D*) or counterclockwise (rotation direction*S*) *(from Latin Dexter and Sinister – right-handed and left-handed, respectively – approx. trans.)*narrows the dark field of the central vertical stripe, which borders on stripes located parallel to it.

Suitably configured stripes and a photographic plate*pp',*mounted on its frame and not closed to the red light, I gradually start the electric motor, vertical the axis of which is carried by a horizontal disk D, surrounded by a belt*of leather*, and which rotates on a thick plate rim. When the desired frequency N is reached, I make a photographic exposure by turning on an electric current from a light bulb O, using a sliding contact on the rotary table axis.

3. Direction and magnitude of the optical effect of the vortex

If we assume the Fresnel ether hypothesis, light waves T and R propagate in the vacuum of the ether with a speed $V_{0,}$ which is not depends on the overall movement of the interferometer; phase of T waves in the direction propagation clockwise (see figure) changes along a closed contour, as if the luminiferous ether was directed by a vortex in a counterclockwise direction arrows when the device rotates in direction D. Amount 4πNS of this vortex, or the relative motion C of the ether in the optical scheme, is given by formula $\frac{C}{\lambda V_0}$, wave phase delay*x* T and equal wave motion R propagates in the opposite direction; offset*y* stripes equals 2*x*. The absolute direction of this displacement the stripes should be*pp*', that is, direction*d,* as well as rotation of the interferometer (effect in *positive direction*), when The beam splitter rotation direction setting is set to D. Total stripe shift*z*, equal to 2*y* or 4 *x,* measured by comparing the exposure *s* with the exposure *d*, then it should have a direction must change direction.*z* and*y*. If the rotation direction setting of the beam splitter is set to S, the offsets*d*

In many studies I constantly observe a shift in bands in the expected direction. The fact that the effect*z,* becomes reversed when I turn the beam splitter *J* just a fraction of a degree to change the direction setting rotation, characterizes the effect as a phase difference associated with movement interferometer and makes it possible to distinguish it from the influence of optical deformation details.

Here are examples of measurements *z* compared to the values calculated using the formula $\frac{16\pi NS}{\lambda V_0}$; I determined the wavelength λ proportional to the distance between the interference rings obtained by using light bulb O, comparing this distance with distance between slightly different interference ring diameters obtained using a 436 µm mercury arc line. Measurements were performed in one of two ways methods indicated in my note dated October 27. The central strip *c,* which is clearly visible on the negative that we studied, and dark side stripes *f* , limited only a relatively narrow penumbra, which was favorable for accurate measurements band peaks, which I did at low magnification, highlighting the band peaks between two parallel threads of the micrometer eyepiece.

	Direction of rotation	N.	*z* from *c*	*z* from *f.*	*z* calc.
Method 1 (S=863 cm^2)....	S	0.86	–0.026	»	–0.029
	D	1.88	+0.070	»	+0.065
Method 2 (S=866 cm^2)....	S	2.2	–0.072	-0.078	–0.075
	S	2.35	–0.077	-0.080	–0.079

The interferometer produces and measures, in accordance with expression $\frac{1}{2}z$, vortex effect of the first order relative to its absolute motion, without using any external links.

Measurement results show that in the environment space, light propagates at speed V_0, regardless of general movement of the light source O and optical system. This property of space experimentally characterizes luminiferous ether. The interferometer measures, in accordance with the expression $\frac{1}{4}z\lambda V_0$, relative motion luminiferous ether in a closed circuit *J* $a_1 a_2$< a i=8>a3 a_4 *J*< a i=13>.

Translation: R.G. Chertanov, May 27, 2012.

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