

Fresnel Law Awesome Consequences

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Abstract

Not only that the *Relative-Velocity Completion of Newton Gravity Law* has replaced the *General Theory of Relativity* (without pointing to any inconsistency or disagreement with experiment), but, herein, also removes the *Special Theory of Relativity*, via the *Fresnel law* on his hypothetical ether. We extend Fresnel's law to vector form, by postulation, and using the *gravitational index of refraction* apply it to account for Michelson type experiments (including Miller's). Reasons to resort to the Lorentz transformations, i.e., to the special theory of relativity, to account for the Michelson-Morley experiment do no more exist.

Keywords: Fresnel law; Fresnel law vector generalized; Michelson-Morley experiment; Miller experiment.

1 Introduction

In usual notations, Fresnel's law is

$$u = \frac{c}{n} \pm \left(1 - \frac{1}{n^2}\right)v, \quad (1)$$

which he inferred in 1818 [1] from his hypothesis that there exists an ether having some mechanical properties (like density), not participating in bodies' motion. The term in parentheses is called the *Fresnel drift/drag coefficient*. The law was verified (1851) through the famous Fizeau experiment [2], repeated (1886) with more accuracy by Michelson and Morley [3].

However, this law was not well understood. Cite from Gamow [8]: “Neither Fizeau nor anybody else at that time could figure out what it could possibly mean and the case rested until half a century later when Einstein showed that the mysterious empirical formula is a direct result of the theory of relativity.” Ironically just this misunderstood and overlooked law explains the Michelson-Morely experiment for which the Special Theory of Relativity (STR) was created, but thanks to the gravitational index of refraction that

missed at that ages (as missed the *Newton's gravitation law RVD completed*, from which to be extracted).

Strangely, Gamow believed that the law (1) was obtained empirically by Fizeau, while Fresnel was not mentioned at all...

2 Vector generalization of Fresnel's law

We now advance the following

Postulate (Fresnel law vector generalization) *The Fresnel law (1) is valid in the vector form*

$$\vec{u} = \frac{\vec{c}}{n} + \left(1 - \frac{1}{n^2}\right)\vec{v}, \quad (2)$$

where \vec{c} is the velocity vector of light defined as $\vec{c} = c\vec{1}_c$, where $\vec{1}_c$ is the unity vector of the light beam velocity at the initial point (at entering the medium).

Now that, unlike at the Fresnel and Fizeau times, the *gravitational index of refraction* is available [9], the most interesting use of the law (2) is to find the *drift/drag velocity of light* caused by the earth motion through the gravitational ether, specifically to account for Michelson type experiments.

3 Explaining Michelson type experiments

The analogy between the case of the earth moving through the gravitational ether, on the one part, and Fizeau's experiment, on the other part, is not quite easy to note, since it is not the optical medium (the ether) that moves, but reversely, the earth moves through the ether (not enclosed in any kind of Fizeau tubes). This is a place for a sarcastic joke: *if the gravitational ether would...flow through some Fizeau tubes, then it had also been observed by Shankland, by Michelson, and ultimately by Einstein*. Miller [6] however did intuit the fact, so he looked for some effects caused by the earth orbital motion, and even found some (seasonal patterns).

Transcribe from [9] the formula of the gravitational index of refraction

$$n = \sqrt{\frac{1 + 3\xi}{1 - \xi}}, \quad \xi = \frac{U_N}{c^2}, \quad U_N = \frac{GM}{r}, \quad (3)$$

U_N being the Newton gravitational potential, in usual notations.

The last term in (2) represents the drift/drag velocity caused by the gravitational ether, specifically produced by the sun and galaxies upon light, on the earth surface,

$$\vec{u}_{drag} = \left(1 - \frac{1}{n^2}\right)\vec{v}, \quad (4)$$

which, on substituting for n according to (3), becomes

$$\vec{u}_{drag} = \frac{4\xi}{1 + 3\xi} \vec{v}. \quad (4')$$

For numerical values, use the 6-digit table, in SI units of measure.

	Earth	Sun		Milky Way	
		at perihelion (max.)	at aphelion (min.)	if directions \vec{v}_{earth} \vec{v}_{sun} same opposite	
U_N by (3)	6.24947×10^5	9.09026×10^8	8.73144×10^8	5.65280×10^{11}	
$4\xi/(1+3\xi)$	2.78139×10^{-11}	4.04571×10^{-8}	3.88601×10^{-8}	2.515786×10^{-5}	
$ \vec{v} $	0	3.029×10^4	2.929×10^4	2.5×10^5	1.9×10^5
$ \vec{u}_{drag} $	0	1.22585×10^{-3}	1.13860×10^{-3}	5.53473	4.77999

U_N is the one on the earth surface (generated by Earth, Sun, and Milky Way).

Note the gravitational potential U_N of Sun on Earth surface three order of magnitude stronger than that of Earth itself, while that of Milky Way also three orders than of Sun.

Michelson-Morley experiment Seeing the table, an ether drag speed \vec{u}_{drag} of maximum $\approx 5.5 m/sec$ is to be expected, occurring if the earth orbital velocity \vec{v}_{earth} has the same direction with Sun's orbital velocity \vec{v}_{sun} , not the $30 km/sec$ expected by Michelson, because of which he drawn the conclusion that the result was zero, as the Special Theory of Relativity (STR) predicted—a correct conclusion for the purpose of the experiment. Note the order of $1 mm/sec$ of Sun's contribution to the ether drift.

There must be stressed that this experiment is aimed at verifying the existence of Maxwell's hypothetical eather, not more.

Miller experiment After the clear negative result in the Michelson experiment (on existing or not existing Maxwell's hypothesized eather), Miller complained of the lack of a correct theory of eater, and therefore he embarked on an experimental study without any guiding theory, but with an apparatus much improved in precision, looking for any effects along Earth's orbit, and found some tiny patterns.

Discussion There are three arguments against STR, as follows.

1. ***Distortion/alteration of the fundamental natural, ancestral, notions of space and time by which the human intelligence operates.*** Referring to the scientific world's philosophical reluctance on accepting STR, Einstein complained of philosophers' refusal to bring the notions of space and time down from the Olympian heights of apriority. Such a distortion is a too high price for explaining Michelson-Morley Experiment, a kind of philosophical frivolity.

2. Non-vector (non-linear) velocities adding/summing/combining/composing, in contrast to the human intuition and to Quantum Mechanics where all are basically linear, including momentum.
3. **Prediction of a zero ether drift of light, in flagrant disagreement with Fresnel's law** that predicts a much smaller effect than early expected, but not zero. If the gravitational index would have been available in the second half of the 19th century, then Fresnel's law would have been used instead of Lorentz transformations—i.e., STR, on which Lorentz himself was reluctant—to explain Michelson type experiments.

Abolishing STR is a complex task since it is involved in almost the whole physics. Quantum electrodynamics, for example, is relativistic from the very outset. Principal works of Dirac and of Feynman, for instance, are essentially relativistic. All must be rebuilt.

References

- [1] Fresnel, A. (1818), "Lettre d'Augustin Fresnel à François Arago sur l'influence du mouvement terrestre dans quelques phénomènes d'optique", *Annales de chimie et de physique*, **9**: 57–66
- [2] Fizeau, H. (1851) "Sur les hypothèses relatives à l'éther lumineux, et sur une expérience qui paraît démontrer que le mouvement des corps change la vitesse avec laquelle la lumière se propage dans leur intérieur", *Comptes Rendus*, **33**: 349–355.
English: "The Hypotheses Relating to the Luminous Aether, and an Experiment which Appears to Demonstrate that the Motion of Bodies Alters the Velocity with which Light Propagates itself in their Interior", *Philos. Magazine*, **2**: 568–573; also accessible at https://en.wikisource.org/wiki/The_Hypotheses_Relating_to_the_Luminous_Aether
- [3] Michelson, A.A., and Morley, E.W. (1886) "Influence of Motion of the Medium on the Velocity of Light", *Am.J.Sci.* **31**: 377–386.
- [4] Michelson, A.A., and Morley E.W. (1887) "On the Relative Motion of the Earth and the Luminiferous Ether", *Am.J.Sci.*, **34** (203): 333–345
- [5] Einstein, A. (1905) "Zur Elektrodynamik bewegter Körper", *Annalen der Physik* **17**: 891–921; English: "On the Electrodynamics of Moving Bodies" translation by George Barker Jeffery and Wilfrid Perrett (1923); also accessible at <http://www.fourmilab.ch/etexts/einstein/specrel/www/>
- [6] Miller, D.C. (1933) "The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth", *Rev.Mod.Phys.*, **5**(2): 203–242; also accessible at <http://www.orgonelab.org/EtherDrift/MillerRMP1933.pdf>

- [7] Shankland, R.S., McCuskey, S.W., Leone, F.C., and Kuerti, G. (1955) "New Analysis of the Interferometer Observations of Dayton C. Miller", *Rev.Mod.Phys.*, **27**(2): 167–178.
- [8] Gamow, G. (1964) "Biography of Physics", p. 164, Harper & Row, New York; accessible at <https://archive.org/details/BiographyOfPhysicsf>
- [9] Reffer, D.H.W. (2019) "Gravitational Index of Refraction", <http://vixra.org/abs/1903.0407> also https://www.academia.edu/38608214/Gravitational_Index_of_Refraction