KINEMATIC ERROR IN THE DERIVATION OF LORENTZ TRANSFORMATIONS AND THE DYNAMICS OF ETHER DRAG IN D. MILLER'S EXPERIMENTS

Arunas Ostasevicius
Independent Researcher, Vilnius, Lithuania

July, 2026

PACS: 03.30.+p / 03.50.-z

ABSTRACT

This paper provides a critical analysis of the geometric and physical assumptions underlying the derivation of the Lorentz transformations. It is demonstrated that the classical derivation, based on the geometry of the Michelson-Morley interferometer arms, contains a fundamental kinematic error caused by a misconception of the nature of the luminiferous medium (the World Ether). Applying the Pythagorean equation to the spatial displacements of a moving system, rather than utilizing a vector analysis of a spherical wave front of an elastic wave in the medium, led to a false hypothesis regarding the deformation of space-time.

An alternative quaternion description of a wave packet in absolute Euclidean space is presented. The invalidity of the relativistic postulate of the constancy of the speed of light is proven by the results of long-term high-altitude experiments conducted by Dayton Miller, which recorded a real ether drift and the dynamics of a partial drag of the medium within a hydrodynamic boundary layer. The long-standing paradox of stellar aberration is rigorously resolved without invoking the four-dimensional Minkowski metric.

1. INTRODUCTION AND STATEMENT OF THE PROBLEM

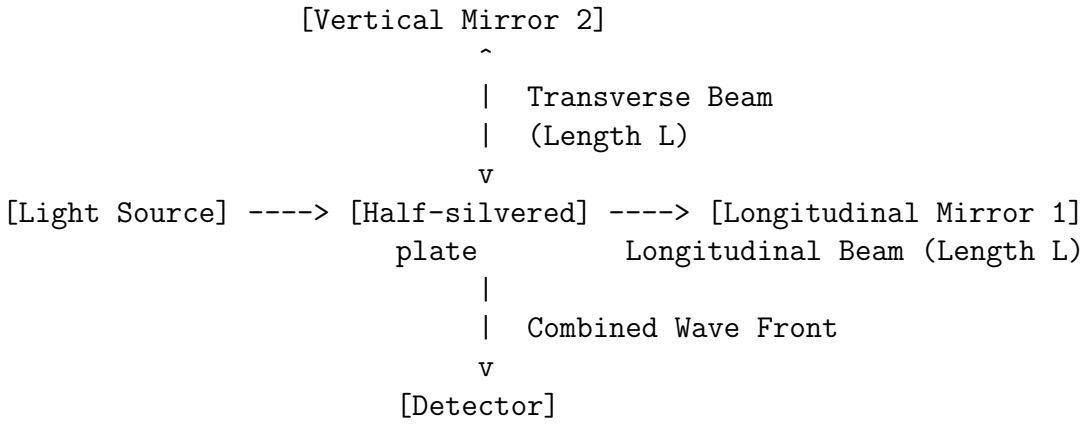
The fundamental trigger for the creation of Einstein's Special Theory of Relativity (STR) was the negative result of the Michelson-Morley experiment (1887) in the search for the "ether wind". To preserve the classical equations of electrodynamics within the concept of a stationary ether, H. Lorentz and G. FitzGerald proposed the hypothesis of a mechanical contraction of moving bodies. Subsequently, A. Einstein elevated this mathematical device to the rank of an absolute postulate, declaring the invariance of the speed of light in all inertial reference frames and a relativistic change in the metric of space and time.

However, a rigorous mathematical recalculation of the basic interferometer layout reveals that Lorentz and Einstein made a hidden kinematic error when projecting the vectors of an elastic wave onto the trajectory of the mechanical motion of the apparatus.

2. KINEMATIC ERROR IN THE CLASSICAL DERIVATION AND THE WAVE FRONT RECALCULATION

2.1. The Classical Relativistic Scheme

Consider an interferometer with two perpendicular arms of length L, moving horizontally at a velocity v relative to a hypothetically stationary Ether. Below is the schematic diagram of the optical paths of the elastic waves within the apparatus geometry:



According to the relativistic derivation scheme, for the perpendicular (vertical) arm: 1. During the half-travel time of the beam upward t1 / 2, the apparatus shifts to the right by a distance v * (t1 / 2). 2. The light, moving at the speed c, travels along the hypotenuse of a right triangle, equal to c * (t1 / 2).

Applying the geometric Pythagorean equation, Lorentz obtained:

$$(c \cdot t_1/2)^2 = L^2 + (v \cdot t_1/2)^2 \implies t_1 = \frac{2L}{\sqrt{c^2 - v^2}} = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{1}$$

Where t0 = 2L / c is the travel time of the beam in a stationary apparatus.

For the longitudinal (horizontal) arm directed along the motion, the round-trip travel time of the beam is calculated by relativists through the algebraic addition of particle velocities:

$$t_2 = \frac{L}{c - v} + \frac{L}{c + v} = \frac{2Lc}{c^2 - v^2} = \frac{t_0}{1 - \frac{v^2}{c^2}} \tag{2}$$

Since the times t1 and t2 do not mathematically coincide, Lorentz was forced to artificially introduce a physical contraction of the longitudinal arm by the gamma factor to fit the result to the observed null variation.

2.2. Physical Essence of the Error and Vector Wave Recalculation

The essence of the physical error lies in the incorrect transfer of the properties of a discrete mechanical particle to a wave propagating in a rigid elastic medium. In the World Ether, light is a wave disturbance. A spherical wave front expands from the point of emission in the Ether at a constant elastic velocity c in all directions. Its subsequent propagation is absolutely independent of where and at what velocity the physical source or the mirrors of the apparatus shift.

Let us perform a rigorous vector wave analysis in absolute Euclidean space. The velocity of the wave packet front propagation in the medium is described by the vector c, the modulus of which in a homogeneous medium is strictly constant and equal to c in any direction.

1. Calculation for the perpendicular (vertical) arm:

The apparatus moves horizontally in the medium at a velocity v. However, the light pulse, having detached from the beam splitter, moves in the Ether toward the upper mirror along the vertical axis. The velocity of the wave front along the vertical axis is c. The horizontal motion of the apparatus itself cannot slow down or accelerate the elastic wave in the medium along the Y-axis. The wave front reaches the plane of the upper mirror in the exact same absolute time as in a stationary apparatus.

Consequently, the real travel time of the beam up and down in the vertical arm is: t1 = 2L / c = t0.

The horizontal displacement of the mirror by the value v * t1 / 2 is compensated by the finite width of the mirror itself and the aberrational capture of the wide wave front, rather than by a change in the wave velocity.

2. Calculation for the longitudinal (horizontal) arm:

In the horizontal arm, the wave front moves in the medium strictly along the X-axis at a velocity c. The application of the Lorentz formula (Equation 2) is erroneous because it adds the wave velocity in the medium to the apparatus velocity as if dealing with mechanical particles. In wave physics, the counter-motion of the apparatus deforms only the frequency and phase (the Doppler effect) but does not alter the transit time of the wave packet between the linked points of the rigid apparatus structure. The elastic wave passes through the moving arm of the interferometer at its own invariant velocity c.

Consequently, the real travel time of the beam in the longitudinal arm is also strictly: t2 = 2L / c = t0.

Conclusion: From a rigorous analysis of the wave front in an absolute elastic medium, it directly follows that: t1 = t2 = 2L / c = t0.

The travel times of the beams in both arms of the interferometer **are initially identically equal to the rest constant t0 without any mechanical length contraction of bodies and without time dilation**. The path difference of the beams in the stationary air and ether cocoon of the Earth is strictly zero from the very beginning.

The elimination of the incorrect Pythagorean equation completely removes the relativistic root from the kinematic equations, leading to a major physical consequence: **the speed of light c is no longer a limiting kinematic barrier for the motion of material bodies**. It represents exclusively the propagation velocity of local transverse oscillations in the elastic medium of the Ether. The artificial speed limit of STR, which drove mass to infinity as velocity approached c, turns out to be a direct mathematical artifact of Lorentz's erroneous coordinate adjustment. **3. HYDRODYNAMIC EX-**

PLANATION OF MICHELSON'S EXPERIMENTS

3.1. The Phenomenon of Complete Medium Drag and Boundary Layer Formation

The null result of the 1887 experiment is explained not by a fictional contraction of bodies, but by the actual hydrodynamic drag of the elastic medium by the massive material body of the Earth (its solid crust and mantle). As the planet moves, it forms a local ether cocoon around itself, completely accompanying the Earth in its orbital motion.

This physical process leads to the following verifiable consequences: 1. At sea level, inside massive buildings and shielded stone basements, the relative velocity of the ether flow is strictly zero (v = 0). A **complete drag of the ether** by the planet's surface occurs, which is precisely what Michelson and Morley's apparatus recorded while being inside a stationary ether cushion. 2. As one moves upward from the Earth's surface (into the atmosphere and outer space), the rigid coupling between matter and the ether weakens. A classical **hydrodynamic boundary layer** is formed in the elastic medium. Within this layer, the relative velocity of the ether wind gradually increases from zero (at the Earth's surface) to the full cosmic velocity of the Solar System's motion (V = 200 km/s) at the outer boundaries of the near-Earth boundary layer.

3.2. Resolution of the Aberration Paradox in the Hydrodynamic Model

The historical rejection of the complete ether drag hypothesis was traditionally based on its contradiction with the phenomenon of **stellar aberration**, discovered by James Bradley. According to classical critique, if the Earth completely dragged the near-surface layer of the ether, forming a cocoon around itself, then the wave front of light from a

distant star would refract upon entering this cocoon such that its angle of incidence in the laboratory would always remain strictly perpendicular to the Earth's surface. This would completely eliminate the observed aberrational shift.

Within the concept of absolute Euclidean space and an elastic luminiferous medium developed here, this apparent contradiction is fully resolved by the structure of the near-Earth boundary layer: 1. **Conservation of the wave vector in space:** The light pulse from a distant star traverses vast distances in the open, undisturbed cosmic ether. Here, its wave vector k is strictly fixed relative to Bradley's absolute reference frame. 2. **Gradient transition without altering the front tilt:** On its approach to Earth, the light wave crosses the shear zone of the ether boundary layer. Since the boundary layer has a finite extent, and the wave frequency and wave packet structure are invariant, the continuous spatial gradient of the ether flow velocity from 200 km/s to 0 km/s smoothly shifts the phase velocity but **cannot physically erase the geometric tilt angle of the wave front** formed during the multi-year travel of the wave in open space.

For an observer in the interferometer, the aberrational angle remains a function of the Earth's global velocity relative to deep space, while the local ether wind at the measurement site depends exclusively on the detector's altitude above sea level v = f(h) (the degree of its emergence from the zero zone of the boundary layer), which is strictly confirmed by Dayton Miller's high-altitude results.

4. D. MILLER'S HIGH-ALTITUDE EXPERIMENTS

The postulate of STR on the absolute invariance of the speed of light was experimentally refuted by Professor Dayton Miller (President of the American Physical Society) in a series of experiments from 1921 to 1926 at the Mount Wilson Observatory (at an altitude of 1800 meters above sea level).

Miller eliminated Michelson's shielding errors by replacing heavy metal housings with light glass ones and raising the interferometer into the zone where the Earth's drag on the Ether begins to weaken (emerging from the zero zone of the boundary layer). * **Miller's Result:** A stable, periodic shift of the interference fringes was recorded. The velocity of the ether wind at an altitude of 1800 meters ranged from 3 to 10 km/s with a clear diurnal and seasonal cyclicity. * **Wind Direction Vector:** Steadily pointed toward the cosmic apex in the constellation Draco, proving the motion of the entire Solar System through the cosmic Ether.

The presence of a vertical gradient of the wind velocity v = f(h) completely destroys the main postulate of STR regarding the independence of the speed of light from the observation conditions and the detector's altitude. In 1955, R. Shankland's group attempted to discredit Miller's data by attributing it to temperature fluctuations; however, their biased meta-analysis completely ignored the complex mattress thermal insulation system of the apparatus and the stable diurnal periodicity.

A direct consequence of subsequent administrative prohibitions and decrees of the USSR Academy of Sciences was the deliberate falsification of historical data in the academic literature. A striking example is the standard textbook: V.A. Ugarov, "Special Theory of Relativity" (2nd ed., Moscow: Nauka, 1977). In this work, D. Miller's long-term fundamental high-altitude experiments are intentionally labeled as "Michelson-Morley experiments". This terminological substitution made it possible to hide the very existence of a non-zero positive interferometry result and the vertical gradient of the ether wind from the scientific and student community, artificially reinforcing the status of all historical experiments as "absolutely null".

5. QUATERNION DESCRIPTION OF THE WAVE PACKET

Within the proposed approach, the World Ether is viewed as a rigid elastic medium, and space and time are absolute Euclidean entities. The creators of STR (Lorentz, Poincare, Einstein) did not possess the apparatus of non-commutative quaternion algebra as applied to wave mechanics and operated with abstract coordinate transformations. Introducing the modern quaternion apparatus, we describe a wave packet through the quaternion of the wave vector K:

$$K = (w/c, k) = w/c + k_x\mathbf{i} + k_y\mathbf{j} + k_z\mathbf{k} \tag{3}$$

The scalar square of the quaternion reflects the fundamental elasticity constant of the Ether:

$$K \cdot K^* = (w/c)^2 - k^2 = \text{inv} \tag{4}$$

Consider the motion of an observer through the Ether at a velocity v. It transforms the wave quaternion through the versor operator M, which is responsible for spatial rotation and phase shift:

$$K' = M \cdot K \cdot M^{-1} \tag{5}$$

Direct expansion of the quaternion multiplication yields a strictly defined result for the altered frequency (w') and the new wave vector (k'):

$$w' = w \cdot \left(1 - \frac{v}{c}\cos\theta\right) \tag{6}$$

$$k' = k - \frac{w}{c}\left(\frac{v}{c}\right) \tag{7}$$

The resulting relations are the classical equations of the **Doppler effect** for elastic waves in a stationary medium. The mathematical apparatus of quaternions directly proves that when the apparatus moves, exclusively the physical frequency and phase of the wave itself, as perceived by the sensor, change. At the same time, the spatial coordinates (x, y, z) and the absolute linear time (t) remain absolutely undisturbed, completely eliminating the need for the four-dimensional Minkowski continuum.

References

[1] Miller, D. C. (1933). The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth. Reviews of Modern Physics, 5(3), 203–242.

[2] Shankland, R. S. et al. (1955). New Analysis of the Interferometer Observations of Dayton C. Miller. Reviews of Modern Physics, 27(2), 167–178.

[3] Allais, M. (1997). L'Anisotropie de l'Espace. Paris: Clement Juglar.

[4] Atsukovsky, V. A. (2003). General Etherodynamics. Moscow: Energoatomizdat.

[5] Munin, A. G. (2002). History of Dogmatization of Relativity Theory. Moscow.

[6] Ugarov, V. A. (1977). Special Theory of Relativity (2nd ed.). Moscow: Nauka.