

RESEARCH NOTE

The Michelson-Morley experiment is incorrect, since wave speed is not affected by apparent wind.

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Abstract

Objective: after some evidences recently emerged about the fact that physical vacuum is actually a dilatant fluid (then a sort of ether), the famous Michelson-Morley experiment, which excluded the existence of the ether, has been reanalyzed to verify its theoretical correctness.

Results: the reanalysis has surprisingly showed that in the Michelson-Morley experiment and in the subsequent similar tests, a fundamental fact of physics has been neglected, i.e. that apparent wind has no effect on wave speed (as evident also in the Doppler effect). Only real wind affects the speed of a wave but in the Michelson-Morley experiment the ether was considered at rest. The experiment must be therefore declared wrong and this fact reinforces the recent findings concerning a fluid, dilatant vacuum.

Keywords: Michelson-Morley experiment; nature of light; luminiferous ether; dilatant vacuum

Introduction

The Michelson-Morley experiment [1] (MME) is perhaps one of the most important test of modern physics. The experiment aimed at verifying the existence of a luminiferous ether by searching for the influence on the speed of light of apparent ether wind due to Earth's motion around the Sun. The setup consisted in a

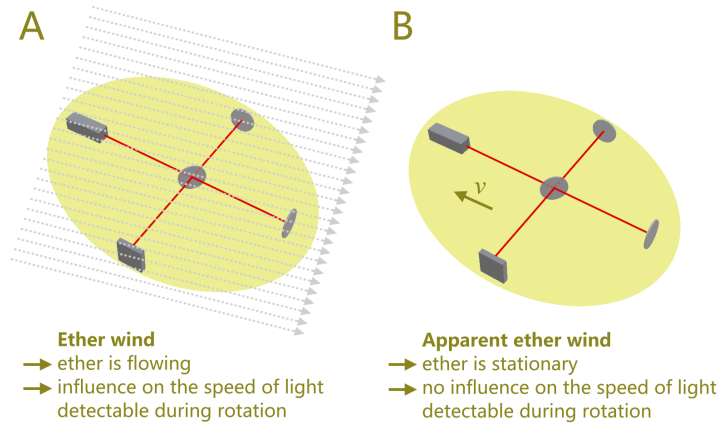


Figure 1: In the theorization of the Michelson-Morley experiment, the effect of a real ether wind (A) has been erroneously attributed also to apparent ether wind (B). Indeed, in B the ether is stationary and cannot modify the speed of light. The velocity v is the orbital speed of the Earth at which the interferometer travels through the ether. In B, the apparent wind only acts on the material components (source, mirrors, detector) not on the emitted waves, whose speed remains the same (i.e. the medium-specific speed: for light in the ether it is $c = 299792458$ m/s) as we also know from the Doppler effect, where, similarly, the source (and/or the observer) travels through the propagation medium but wave speed is unaffected.

split light beam traveling in orthogonal directions in a rotating interferometer and recombining in a detector, to verify the hypothesized shift of the interference fringes. As we know, the result of that test, performed in 1887 by Michelson and Morley [1] and repeated various times with increasing accuracy [2, 3, 4], is negative: no apparent ether wind can be detected.

This fact allowed to exclude the existence of a luminiferous ether and pushed Einstein to elaborate his theory of relativity based on a purely mathematical (geometrical) space-time, deprived of any concept of *substance*. For 130 years, until today, science has been believing that the Michelson-Morley experiment was correct and that no ether existed. That, despite contrasting evidences from quantum physics and modern cosmology, which later suggested that physical vacuum was not a real vacuum at all: the 95% of all mass-energy of the universe were in it, in form of some dark substances (dark matter, dark energy). After all, also the recently proven Higgs field, viscous and ubiquitous, suggests false vacuum. Furthermore, Einstein's stress-energy tensor has hydrodynamic features: vacuum's energy (or mass) density (T^{00}), pressure, shear stress, momentum density, momentum flux. And his cosmological constant, $\Lambda = \kappa\rho_0$, is based on vacuum energy (or mass)

density, ρ_0 . Not by case Einstein, after the publication of general relativity, declared [5]: “according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an aether. According to the general theory of relativity space without aether is unthinkable”. This being torn, probably means that Einstein, in his heart, knew that something was wrong with the null result of the MME. If this was the case, now we know he was right, because the MME is actually a wrong test, not because of insufficient accuracy but as it has been incorrectly thought out from a theoretical point of view. Indeed, no influence on the speed of light due to apparent ether wind could be detected, since *apparent wind does not affect wave speed*, as it is evident also as regards the Doppler effect where, despite the motion of the source / of the observer through the propagation medium, the speed of the wave remains unaltered.

Methods

Theoretical reanalysis of the MME. The knowledge according to which the motion of a wave source through a propagation medium does not affect wave speed, as also evident in the Doppler effect, has been applied to the MME, which searched for the influence of apparent ether wind on the speed of light.

Results

Since apparent wind does not affect wave speed, the concept on which the MME has been based, i.e. that apparent ether wind would have modified the speed of light, is wrong. Only a real (not apparent) wind in the medium could alter the speed of light but in the MME the ether was considered at rest. Thus, after 130 years the MME must be declared unfounded.

Discussion

From the Doppler effect we know that apparent wind acting on a wave source / on an observer does not change the speed of the emitted wave but rather its frequency. In the MME not even frequency variation could be taken into account, since the light source and the other elements (mirrors, detector) were traveling with the same velocity (magnitude, direction and sense). No Doppler effect then and no influence on the speed of light when the beams are traveling in different

directions, since apparent wind does not affect wave speed. Obviously the result of the MME had to be *null*.

Light, as all waves, is probably subject to wind in its medium only *if it is not apparent*. Sound propagating in the air has a specific speed (~ 343 m/s at 20°C), unaffected by the motion of the source (unaffected by *apparent* wind) but affected by wind. Gravitational fields could be a case of ether wind [6, 7] and that would explain gravitational lensing due to ether flow, while gravitational waves would be negative pressure waves in the ether. After the proven groundlessness of the MME and the positive tests on vacuum dilatancy [8], 21st Century's physics can begin the passage from a purely mathematical space-time to a fluid vacuum, which will also allow to transform Einstein relativity in a quantum theory [9]. After all, the first classical test of general relativity, Mercury's perihelion precession, seems to have given way to a fluid, dilatant vacuum [8].

It is interesting to notice that if the ether is a dilatant fluid, light as a transverse wave and its very high frequencies are justified, the orbits of the planets can nevertheless remain stable [8] and the wave-particle duality of photons is explained via the pseudomomentum which also phonons possess. Photon as a transverse phonon (a boson) through the quasi-lattice of dilatant vacuum, would obey all the effects which photons are subject to: from Compton scattering and photoelectric effect up to squeezed coherent states and parametric down conversion, etc.

One could therefore conclude, stating that the MME is wrong and that photons are probably transverse phonons in dilatant vacuum's quasi-lattice. The famous asymptote at the speed of light that we observe in the Lorentz factor would refer to transient solidification of the dilatant vacuum under shear stress. Of course, solidified vacuum is impenetrable even for a tiny electron, except for acoustic waves (transverse phonons = photons). These considerations can now reveal us the real nature of light and they can pave the way for quantum relativity, since, after a century of purely geometrical space-time, the substance quantum physics needs is back on the scene but now we know more precisely what it actually is: a non-Newtonian, dilatant fluid[8].

- **Limitations:** there are no limitations to the fact that apparent wind does not affect the speed of waves: therefore no limitations to the validity of the present refutation of the MME.

Declarations

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