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A Solution to a Century Old Riddle

And my apologies for some previous miss-presentations !

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Abstract:

Since 1887, by occasion of the famous experiment conducted by Albert Michelson and Edward Morley in order to verify the existence of an all pervasive light propagation medium constituting a universal fixed reference system against which we could measure the absolute speed of any moving object, the negative result of that experiment has produced a fuss in scientific circles, each member trying he's own explanation for the unexpected result. Since then, many experiments, using more refined and precise methods, followed such as by Trouton and Noble and Rayleigh and Brace among many others. Several explanations have emerged, some more some less extravagant. Among those explanations, the one that still keeps being accepted, certainly with a lot of reluctance by many, is the contraction of material bodies in the direction of movement originally proposed by physicists George Fitzgerald and Hendrik Lorentz.

However, all the explanations so far have been unsatisfactory and the puzzle stood unabashed to this days. I must confess that I, too, made some frustrated forays in that field just to realize, later, how naive my attempts have been and that I should not have published that twaddle. I'm not alone ! But the failure had the magic power of strengthening my drive in pursuing an answer to the riddle and, since there ought to be a physical reason hidden somewhere, I decided to do a meticulous attempt to dig it out. More so, certainly, to redeem myself of my previous blunders.

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The problem begun when a well known interferometer experiment performed by Michelson and Morley gave an unexpected result when the outcome ought to be:

$$\frac{d}{c+v} + \frac{d}{c-v} \neq \frac{2 \cdot d}{c} \qquad (1)$$

where

$\frac{d}{c-v}$ is the time a light pulse with velocity c, generated in an observer's inertial frame of reference (O.I.F.R) moving at speed **v** is supposed to take to travel a distance **d** when going in the same direction as the O.I.F.R.

$\frac{d}{c+v}$ is the time the same light pulse is supposed to take to travel distance **d** when reflected back in the opposite direction of the O.I.F.R. movement

$\frac{2 \cdot d}{c}$ is the two way time light takes to travel a distance **d** to a reflector and back to the origin when **v = 0** and all similar experiments up to now resulted in a counter-intuitive outcome such as

$$\frac{d}{c+v} + \frac{d}{c-v} = \frac{2 \cdot d}{c} \qquad (2)$$

It becomes clear that there must be some hidden phenomenon that validates Eq.(2) and some factor of proportionality **x** must, therefore, be found as to make

$$\frac{d}{c+v} \cdot x + \frac{d}{c-v} \cdot x = \frac{2 \cdot d}{c} \qquad (3)$$

So, solving (3) for **x** we obtain

$$x = 1 - \frac{v^2}{c^2} \qquad (4)$$

Applying (4) in place of x in Eq. (3) solves the equality but we can, obviously, not apply that factor ad hoc without a good physical reason!
There is, today, a well known and proven physical relation, linking local time (or light velocity) with the distance to a center of mass.

$$t' = t \cdot \sqrt{1 - \frac{2 \cdot G \cdot M}{R \cdot c^2}} \qquad (5)$$

where
G = universal gravitational constant; **M** = mass of gravitating object; **R** = local distance from gravitating object; **c** = velocity of light.

A simple dimensional analysis of the quantity under the radical hints to a probable relation with factor **x** in Eq.(3). Plugging pertinent physical values under the radical in (5):

$G = 6.67390 \cdot 10^{-11} \cdot \frac{m^3}{kg \cdot s^2}$ $\qquad S_m = 1.987864 \cdot 10^{30} \cdot kg$ <= solar mass (**gravitating object**)

$R_{orb} = 1.49595 \cdot 10^{11} \cdot m$ <= Earth mean orbital radius (**distance from gravitating object**)

$v = \sqrt{\frac{G \cdot S_m}{R_{orb}}}$ $\qquad v = 2.978 \times 10^4 \frac{m}{s}$ <= Earth mean orbital speed

And here we have it ==>
up to 14 decimals

$$\frac{\sqrt{1-\frac{2\cdot G\cdot S_m}{R_{orb}\cdot c^2}}}{1-\frac{v^2}{c^2}} = 1.00000000000000 \qquad (6)$$

To un encumber next calculations let's make

$$\delta = \sqrt{1-\frac{2\cdot G\cdot S_m}{R_{orb}\cdot c^2}}$$

Set an arbitrary length only to maintain dimensional coherence ==> $d = m$

$$\left(\frac{d}{c+v}\cdot\delta + \frac{d}{c-v}\cdot\delta\right) - \frac{2\cdot d}{c} = 0\cdot\mu s \qquad (7)$$

Equation (7) solves the riddle. Note that the result is independent of length **d,** and will always be zero.

Finally the long sought solution:

$$\delta\cdot\left(\frac{d}{c+v} + \frac{d}{c-v}\right) = \frac{2\cdot d}{c} \qquad (8) \qquad \textbf{(Q.E.D.)}$$

The same factor **δ** could be applied to time or speed indifferently. Look at this figure

$$c - c\cdot\delta = 2.958\,\frac{m}{s}$$

The light speed at a distance R_{orb} from the sun is just 2.958 m/s slower than free space velocity and just enough to cause the null result of the interferometer measurements!