Einstein's mathematical deception: Special relativity conceals that it changes the speed *c* along the X-axis in the stationary frame of reference

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Abstract: In his famous paper "On the Electrodynamics of Moving Bodies" [A. Einstein, Ann. Phys. **17**, 891 (1905)], Einstein derived kinematic time dilation by considering a coordinate system k that moves relative to a stationary coordinate system K along the X-axis, where he let the x-axis and the X-axis of the two systems coincide. Einstein defined for light beams moving along the X-axis, which are emitted from the origin of the coordinate system k to the mirror and back to the origin of the coordinate system k, no matter in which direction a light beam moves, each time interval by the sum of the two time intervals $x'/(c-v)$ and $x'/(c+v)$ divided by 2. Afterwards, Einstein defined x' as infinitely small, so that x' disappeared and he obtained the differential quotient $1/2[1/(c-v)+1/(c+v)]\partial\tau/\partial t$, from which the kinematic time dilation factor γ squared results if the two terms in the brackets are added. However, after x' has disappeared, the change in time is now only defined by the speed c of light and v, where v is a uniform speed. This means that the two quotients within the brackets cannot be added without changing the value of c. By adding the two quotients within the brackets of the differential quotient $1/2[1/(c-v)+1/(c+v)]\partial\tau/\partial t$, Einstein's special relativity (SR) mathematically creates in the stationary frame of reference two different values for the speed of light that differ from the value of c. Einstein was able to conceal that SR mathematically alters the laws of nature because his derivation of kinematic time dilation along the X-axis does not change the letter "c," but only the value of c. Einstein's miracle year is demystified here and a theory of relativity without mathematical tricks is presented. © *2025 Physics Essays Publication*. [http://dx.doi.org/10.4006/0836-1398-38.1.25]

Résumé: Dans son célèbre article "De l'électrodynamique des corps en movement" [A. Einstein, Ann. Phys. **17**, 891 (1905)], Albert Einstein détermine la dilatation cinématique du temps en considérant un système de coordonnées k en mouvement par rapport à un système stationnaire K. Les axes des x des deux systèmes, appelés respectivement x et X, coïncident, et c'est le long de cet axe que le système k se déplace. Pour tout rayon lumineux qui se meut le long de l'axe X et qui est émis par l'origine du système de coordonnées k puis réfléchis par un miroir le renvoyant dans ce même système, quelle que soit la direction dans laquelle le rayon lumineux se déplace, Einstein définit chaque intervalle de temps par la somme de deux intervalles $x'/(c-v)$ et $x'/(c+v)$ divisée par 2. Par la suite, Einstein considère x' comme infiniment petit, le faisant ainsi disparaître. Il obtient alors le quotient différentiel $1/2[1/(c-v)+1/(c+v)]\partial\tau/\partial t$, dont on déduit le facteur de dilatation cinématique du temps γ^2 par l'addition des deux termes entre crochets. Cependant, après la disparition de x', la variation du temps est uniquement définie par les vitesses c et v, v étant une vitesse uniforme. Cela signifie que les deux quotients entre crochets ne peuvent être additionnés sans changer la valeur de c. Par l'addition des deux quotients entre crochets du quotient différentiel $1/2[1/(c-v)+1/(c+v)]\partial\tau/\partial$t, la théorie de la relativité restreinte crée mathématiquement, dans le système de référence stationnaire, deux valeurs différentes pour la vitesse de la lumière qui ne correspondent pas à la valeur de c. Einstein a réussi à dissimuler le fait que la relativité restreinte altère les lois de la nature car il détermine la dilatation cinématique du temps le long de l'axe X non pas en changeant la lettre « c », mais en modifiant la valeur de c. Le présent article démystifie « l'année miracle » d'Einstein et présente une théorie de la relativité sans tour de passe-passe mathématique.

Key words: Special Relativity (SR); Kinematic Time Dilation; General Relativity (GR); Gravitational Time Dilation; Quantum Gravity; Space–Time Curvature; Michelson–Morley Experiment; Hafele-Keating Experiment; Interference Experiments.

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I. INTRODUCTION

The Michelson–Morley experiment carried out in 1887 disproved that the speed of light on Earth is influenced by some kind of medium, called "ether," in which Earth's motion might take place.[1] The Michelson–Morley interferometer uses two perpendicularly arranged vacuum tubes. A light beam is sent from a light source to a beam splitter, which directs one part of the light beam along one arm to one mirror and the other part of the beam along the other arm to a second mirror; each of these beams is then reflected back toward the beam splitter, which combines their amplitudes using the superposition principle. If a medium had been able to cause a difference in arrival times between the light beam that moves back and forth in the arm aligned parallel to the direction of Earth's motion around the Sun and the light beam that moves back and forth in the perpendicular direction, an interference pattern would have had to result. In the case of an "ether" capable of influencing the speed of light, we would expect a difference in the arrival times between the two light beams, which should lead to an interferences pattern at the detector. However, the Michelson–Morley experiment yielded a null result. Today, this null result and the equivalent results of similar experiments are interpreted according to Einstein's relativity, which postulates a constant speed c of light in all inertial frames, respectively, in all frames of refernce.[2–4]

II. HOW EINSTEIN DERIVED THE KINEMATIC TIME DILATION FACTOR γ ALONG THE X-AXIS

In his original paper "On the electrodynamics of moving bodies," Einstein still used the sign V for the speed of light, which has been replaced by the sign c in the present work, as in the translations of his paper. Einstein derived kinematic time dilation by considering a coordinate system k that moves relative to a stationary coordinate system K along the X-axis, where he let the x-axis and the X-axis of the two systems coincide.[2] Einstein writes in his original paper: "From the origin of the system k let a ray be emitted at τ_0 along the X-axis to x', and at time τ_1 be reflected thence to the origin of the coordinates, arriving there at time τ_2; we then must have:

$$\frac{1}{2} \times (\tau_0 + \tau_2) = \tau_1. \tag{1}$$

Or, by inserting the arguments of the function τ and applying the principle of the constancy of the velocity of light in the stationary system:"

$$\frac{1}{2} \times \left[\tau(0,0,0,t) + \tau\left(0,0,0, \left\{ t + \frac{x'}{c-v} + \frac{x'}{\text{c+v}} \right\} \right) \right] = \tau\left(x', 0, 0, t + \frac{x'}{c-v}\right). \tag{2}$$

On the left side of Eq. (2), Einstein describes, according to his assumptions, the situation for the moving coordinate system k; on the right side of Eq. (2), he describes the situation for the stationary coordinate system K. To recognize that Einstein applies the concept of the arithmetic mean average to the light path back and forth in Eq. (1) to obtain equal time intervals for each moving direction of the considered light beam, we need to define the time separately for both parts of the total light path of the back and forth movement of the light beam. The time the ray emitted at τ_0 needs to move along the X-axis to the mirror and arriving there at time τ_1 we define as $\Delta\tau_1$ $(=\tau_0 + \tau_1)$ and the time the ray needs to move from the mirror to the origin of the coordinates and arriving there at time τ_2 we define as $\Delta\tau_2$ $(=\tau_2 - \tau_1)$,

$$\Delta\tau = \Delta\tau_1 + \Delta\tau_2. \tag{3}$$

Calculating the arithmetic mean of the two parts of the whole light path, we obtain Einstein's result on the left side in Eq. (1)

$$\frac{\Delta\tau_1 + \Delta\tau_2}{2}, \quad \frac{(\tau_0 + \tau_1) + (\tau_2 - \tau_1)}{2}, \quad \frac{(\tau_0 + \tau_2)}{2} = \frac{1}{2} \times (\tau_0 + \tau_2). \tag{4}$$

Einstein writes further after Eq. (2): "Hence, if x' be chosen infinitesimally small:"

$$\frac{1}{2}\left(\frac{1}{c-v} + \frac{1}{c+v}\right)\frac{\partial\tau}{\partial t} = \frac{\partial\tau}{\partial x'} + \frac{1}{c-v}\frac{\partial\tau}{\partial t}$$
$$\text{or } \frac{\partial\tau}{\partial x'} + \left(\frac{v}{c^2 - v^2}\right)\frac{\partial\tau}{\partial t} = 0. \tag{5}$$

We obtain the kinematic time dilation factor squared directly from the differential quotient on the left side in line 1 of Eq. (5)

$$\begin{aligned} &\frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right) \times \frac{\partial\tau}{\partial t} \\ &= \frac{1}{2} \times \left[\frac{(c+v)}{(c-v)\times(c+v)} + \frac{(c-v)}{(c+v)\times(c-v)}\right] \times \frac{\partial\tau}{\partial t}, \\ &= \frac{1}{2} \times \left[\frac{(c+v)}{(c^2-v^2)} + \frac{(c-v)}{(c^2-v^2)}\right] \times \frac{\partial\tau}{\partial t}, \\ &= \frac{1}{2} \times \left[\frac{2c}{(c^2-v^2)}\right] \times \frac{\partial\tau}{\partial t}, \\ &= \frac{1}{2} \times \left[\frac{c}{(c^2-v^2)} + \frac{c}{(c^2-v^2)}\right] \times \frac{\partial\tau}{\partial t}, \\ &= \frac{c}{\left(1 - \frac{v^2}{c^2}\right) \times c^2} \times \frac{\partial\tau}{\partial t}. \end{aligned} \tag{6}$$

If we insert for the speed c of light in the nominator and denominator of the result of Eq. (6) the relative value 1, we obtain the time dilation factor squared

$$\frac{1}{\left(1 - \frac{v^2}{c^2}\right)} \times \frac{\partial\tau}{\partial t} \to \tau = \left(1 - \frac{v^2}{c^2}\right) \times t. \tag{7}$$

In his paper "On the electrodynamics of moving bodies," Einstein assumed that in motion the X dimension appears shortened in the ratio $1{:}(1 - v^2/c^2)^{1/2}$, i.e., the greater the value of v, the greater the shortening. He concluded that a clock must therefore run faster than expected, which is why he shortened the time dilation factor accordingly, whereby in his equation he defined time by the number of time units measured by a clock, which is inversely proportional to time defined by the size of time units[2]

$$\tau = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \times \left(t - \frac{v^2}{c^2} \times t\right),$$

$$\tau = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \times \left(1 - \frac{v^2}{c^2}\right) \times t, \tau = t \times \sqrt{1-\frac{v^2}{c^2}} = \frac{1}{\gamma} \times t. \tag{8}$$

This seemed to confirm a constant speed c of light in all inertial frames because we obtain, according to Einstein's approach, the same kinematic time dilation factor from the assumed speed ratio of a light beam moving along the y-axis of the moving coordinate system k and along the Y-axis of the stationary coordinate system K

$$\frac{\tau}{t} = \frac{c}{\sqrt{c^2 - v^2}} = \frac{c}{\sqrt{1-\frac{v^2}{c^2}} \times \sqrt{c^2}} = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}},$$

$$\tau = \sqrt{1-\frac{v^2}{c^2}} \times t = \frac{1}{\gamma} \times t. \tag{9}$$

Defining time by the size of time units (t_s), which is inverse proportional to time defined by the number of measured time units (t_N) and replacing the sign τ by t' and the sign t by t_0, where t_0 is the so-called proper time, we obtain

$$t' = \frac{1}{\gamma} \times \gamma^2 \times t_0, \quad t' = \sqrt{1-\frac{v^2}{c^2}} \times \frac{1}{1-\frac{v^2}{c^2}} \times t_0,$$

$$t' = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \times t_0 = \gamma \times t_0. \tag{10}$$

In this case $1/\gamma$ is the so-called length contraction factor and factor γ the so-called time dilation factor. However, if in Eq. (6) the two quotients that define the change in time are only defined by the speed c of light and v, where v is a uniform speed, the two quotients within the brackets cannot be added without changing the value of c. We need to analyze this inconsistency more closely.

III. WHY EINSTEIN'S DERIVATION OF THE KINEMATIC TIME DILATION FACTOR γ CHANGES THE VALUE OF THE SPEED c ALONG THE LONGITUDINAL LIGHT PATH IN THE STATIONARY FRAME OF REFERENCE

In SR Einstein defines for light beams moving back and forth in a coordinate system k, which moves along the X-axis in a stationary coordinate system K, where he let the x-axis and the X-axis of the two systems coincide, the kinematic change in time $\Delta t'$ for each motion direction of the light beam

$$\Delta t' = \frac{\left(\frac{x'}{c-v} + \frac{x'}{c+v}\right)}{2} = \frac{1}{2} \times \left(\frac{x'}{c-v} + \frac{x'}{c+v}\right). \tag{11}$$

Einstein's approach is contradictory: The two different denominators $(c - v)$ and $(c + v)$ can only result from two opposite motion directions of light beams because v is a uniform speed and c is a constant speed. If the speed $c - v$ happens in the denominator of a time interval, the speed $c + v$ can only happen in the denominator of the following time interval after the light beam was reflected at a mirror from which the light beam moves in the opposite direction. If Einstein allows the two time intervals $x'/(c-v)$ and $x'/(c+v)$ to take place in both motion directions of the light beam, the time interval with the denominator $(c+v)$ must follow the time interval with the denominator $(c-v)$ before the light beam has reached the mirror and before the light beam was reflected. Therefore, it must be physically wrong to calculate the average value of the two factors $1/(c-v)$ and $1/(c+v)$ that define the change in time by using the arithmetic mean. If there is no kind of "ether" at all, there is no physical reason why two differently defined time intervals should not be combined into one time interval by simple addition, so we have would have to expect the following:

$$\Delta t' = \frac{x'}{c-v} + \frac{x'}{c+v} = \frac{x' + x'}{c-v+c+v} = \frac{2x'}{2c} = \frac{x'}{c}. \tag{12}$$

That it is possible to derive time dilation by calculating an average value of two different quotients that define two different time intervals physically indicates that some kind of "ether" must act the same way in both directions along the longitudinal light path in order to enable time dilation, which we will consider in detail later. Considering that the speed of light must be c in the stationary coordinate system K, we have to convert the two time intervals that Einstein specifies so that the observer at rest sees the light beam move with the speed c. If we do not define x' as infinitely small to avoid that the different values of x' disappear, we obtain two different values for x' that correspond with two different values of X on the X-axis, where $\Delta t'$ is here the total time for the whole light path from the light source to the mirror and back to the light source, while in Einstein's calculations in his original paper $\Delta t'$ is the time for half of the light path

$$\Delta t' = \frac{1}{2} \times \left(\frac{x'}{c-v} + \frac{x'}{c+v}\right) + \frac{1}{2} \times \left(\frac{x'}{c-v} + \frac{x'}{c+v}\right),$$

$$\frac{\Delta t'}{2} = \frac{1}{2} \times \left(\frac{x'}{c-v} + \frac{x'}{c+v}\right)$$

$$= \frac{1}{2} \times \left(\frac{x'}{\left(1-\frac{v}{c}\right) \times c} + \frac{x'}{\left(1+\frac{v}{c}\right) \times c}\right),$$

$$\frac{\Delta t'}{2} = \frac{1}{2} \times \left(\frac{\frac{1}{1-\frac{v}{c}} \times X}{c} + \frac{\frac{1}{1+\frac{v}{c}} \times X}{c}\right). \tag{13}$$

This means that x' of the two different time intervals in the first line of Eq. (13) has two different values, which rules out a constant speed of light and which Einstein has successfully concealed by his calculation method

$$x'_1 = \frac{1}{1-\frac{v}{c}} \times X;\ x'_2 = \frac{1}{1+\frac{v}{c}} \times X. \tag{14}$$

To transform the two different values of x' into one value of x', because v is uniform, the speed c of light must be changed in the stationary coordinate system K, which is not possible according to natural laws. Einstein defined for light beams moving along the X-axis, which are emitted from the origin of the coordinate system k to the mirror and back to the origin of the coordinate system k, no matter in which direction a light beam moves, each time interval by the sum of the two time intervals $x'/(c-v)$ and $x'/(c+v)$ divided by 2. Afterwards, Einstein defined x' as infinitely small in order to calculate the differential quotient of the two different time intervals and obtained according to Eq. (5), where in the following the sign τ is replaced by t' and the sign t by t_0 (so-called proper time):

$$\frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right) \times \frac{\partial t'}{\partial t_0}. \tag{15}$$

Einstein defined time in his original paper by the number of time units measured by a clock. In the following, I want to define time by the size of time units, as it is usual today, which behaves inverse proportional to time defined by the number of time units measured by a clock, so that we obtain instead of Eq. (15)

$$\frac{1}{\frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right)} \times \frac{\partial t'}{\partial t_0}. \tag{16}$$

From Eq. (16), it follows:

$$\frac{1}{\left(\frac{1}{c-v} + \frac{1}{c+v}\right)} \times \frac{\partial t'}{\partial t_0} \to t' = \left(\frac{1}{c-v} + \frac{1}{c+v}\right) \times t_0. \tag{17}$$

If the distance x' is defined as infinitively small, x' becomes irrelevant and a possible difference between the distances x' disappears. However, this causes another contradiction to the postulate of a constant speed c of light in all frames of reference. If x' disappears, the change in time is now only defined by the speed c and v, where v is a uniform speed, so that the two quotients within the brackets cannot be added without changing the value of c in the stationary frame of reference. To prove this I want to calculate a simple example inserting for c the relative value 1c and for v the relative value 0.4 c

$$\begin{aligned}
&\frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right) = \frac{1}{\left(1-\frac{v^2}{c^2}\right) \times c} = \frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right),\\
&\frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right) = \frac{1}{\left[1-\frac{(0.4c)^2}{(1c)^2}\right] \times c} = \frac{1}{2} \times \left(\frac{1}{c-v} + \frac{1}{c+v}\right),\\
&\frac{1}{2} \times \left(\frac{1}{1c-0.4c} + \frac{1}{1c+0.4c}\right) \neq \left(\frac{1}{0.84c}\right) = \frac{1}{2} \times \left(\frac{1}{0.88c-0.4c} + \frac{1}{0.8c+0.4c}\right),\\
&\frac{1}{2} \times \left(\frac{1}{0.96c} + \frac{1}{1.4c}\right) \neq \left(\frac{1}{0.84c}\right) = \frac{1}{2} \times \left(\frac{1}{0.84c} + \frac{1}{0.84c}\right),\\
&\to t' = \frac{1}{2} \times \left(\frac{1}{1c-0.4c} + \frac{1}{1c+0.4c}\right) \times t_0 \neq \left(\frac{1}{0.84c}\right) \times t_0 = \frac{1}{2} \times \left(\frac{1}{0.88c-0.4c} + \frac{1}{0.8c+0.4c}\right) \times t_0.
\end{aligned} \tag{18}$$

Einstein's calculation splits the speed of light in the stationary frame of reference into two different values of c, which is necessary to transform the two different values of x' of Eq. (14) into one value of x':

$$\begin{aligned}
&x'_1 = \frac{1}{1-\frac{v}{c}} \times X; x'_2 = \frac{1}{1+\frac{v}{c}} \times X, \quad \to x'_1 = \frac{1}{0.88-\frac{0.4c}{c}} \times X; x'_2 = \frac{1}{0.8+\frac{0.4c}{c}} \times \mathrm{X},\\
&\to x'_1 = \frac{1}{0.84} \times X = x'; x'_2 = \frac{1}{0.84} \times X = x'.
\end{aligned} \tag{19}$$

In his famous 1905 paper, Einstein relates to a constant speed of light in all frames of reference, which contradicts his own approach because x' cannot have the same value in the two different time intervals that Einstein defined, where $\Delta t'$ is here the total time for the whole light path from the light source to the mirror and back to the light source

$$\Delta t' = \frac{1}{2}\times\left(\frac{x'}{c-v}+\frac{x'}{c+v}\right)+\frac{1}{2}\times\left(\frac{x'}{c-v}+\frac{x'}{c+v}\right),$$
$$\frac{\Delta t'}{2}=\frac{1}{2}\times\left[\frac{x'}{\left(1-\frac{v}{c}\right)\times c}+\frac{x'}{\left(1+\frac{v}{c}\right)\times c}\right],$$
$$\frac{\Delta t'}{2}=\frac{1}{2}\times\left(\frac{\frac{1}{1-\frac{v}{c}}\times X}{c}+\frac{\frac{1}{1+\frac{v}{c}}\times X}{c}\right)\neq\frac{1}{2}\times\left(\frac{X}{c}+\frac{X}{c}\right)=\frac{\Delta t_0}{2} \tag{20}$$

If we do not define x' as infinitely small, we obtain for a certain distance the light beam has to move back and forth in the moving frame of reference, where $\Delta t'$ is here the total time for the whole light path from the light source to the mirror and back to the light source

$$\Delta t' = \left(\frac{x'}{c-v}+\frac{x'}{c+v}\right)\rightarrow\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right). \tag{21}$$

I would like to use an illustrative example to demonstrate that Einstein's derivation of the kinematic time dilation factor along the X-axis is physically wrong. A rocket stands on a space base on Earth, ready to take off. The rocket contains an interferometer. The light source of the interferometer is located in the rear part of the rocket, from which a light beam is emitted straight ahead in the direction of a mirror at the front of the rocket. After the distance d_0, the light beam is reflected back at the mirror in the direction of the light source. Because we measure the speed of light c in all directions on Earth, for an observer in the rocket and for an observer on Earth we obtain for the rocket at rest on Earth

$$\Delta t'_{(\text{rocket})} = \left(\frac{d_0}{c}+\frac{d_0}{c}\right) = \Delta t_{(\text{Earth})} = \left(\frac{d_0}{c}+\frac{d_0}{c}\right). \tag{22}$$

After the rocket has been launched, the rocket reaches a certain constant traveling speed, which it maintains while flying a large circle with a diameter of 1×10^{12} km, before the rocket shall pass Earth tangentially again and is observed from Earth. Einstein derived the first term within the brackets of Eq. (15) from an imagined light beam that moves in the direction of the moving inertial frame

$$\Delta t'_{(\text{rocket})} = \frac{x'}{c-v}\rightarrow\frac{d'}{c-v}. \tag{23}$$

Einstein derived the second term within the brackets of Eq. (15) from an imagined light beam that moves in the opposite direction than the moving inertial frame

$$\Delta t'_{(\text{rocket})} = \frac{x'}{c+v}\rightarrow\frac{d'}{c+v}. \tag{24}$$

When the light beam that moves in the rocket back and forth is observed from Earth, because the light beam in the rocket, observed in the frame of reference of Earth must have the speed c, as we always measure it in empirical experiments, this inevitably results in a longer light path in the frame of reference of Earth for the light beam moving in the same direction as the rocket, so that we obtain from Eq. (23) in the frame of reference of Earth

$$\frac{d'}{c-v}=\frac{d'}{\left(1-\frac{v}{c}\right)\times c}\rightarrow\frac{\frac{1}{\left(1-\frac{v}{c}\right)}\times d_0}{c}. \tag{25}$$

Because the light beam in the rocket, observed in the frame of reference of Earth must have the speed c, this inevitably results in a shorter light path for the light beam moving in the opposite direction than the motion direction of the rocket, so that we obtain from Eq. (24) in the frame of reference of Earth

$$\frac{d'}{c+v}=\frac{d'}{\left(1+\frac{v}{c}\right)\times c}\rightarrow\frac{\frac{1}{\left(1+\frac{v}{c}\right)}\times d_0}{c}. \tag{26}$$

In order to mathematically simulate two constant time intervals from these two inconstant time intervals, Einstein allows the two time intervals of both directions of movement of the light beam to take place in the rocket in each direction simultaneously. Afterwards, Einstein, who was convinced of his concept of a constant speed c of light in all frames of reference and of a constant proper time $t_0 = d_0/c$ in all frames of reference, changes natural laws in two steps. In the first step, he adds the two different time intervals and calculates the arithmetic mean in order to obtain equal time intervals. This shortens the light path of the first time interval and lengthens the light path of the second time interval in the inertial frame of Earth, so that he obtains two equal lengths of light paths. Shortening or lengthening light paths is physically not possible, but mathematically enables Einstein to obtain equal time intervals, which is necessary to mathematically simulate a constant speed c of light in all frames of reference. While $\Delta t'$ is here the total time for the whole light path, in Einstein's calculations in his original paper $\Delta t'$ is the time for half of the light path

$$\Delta t' = \left[\frac{\frac{1}{\left(1-\frac{v}{c}\right)}\times d_0}{c}+\frac{\frac{1}{\left(1+\frac{v}{c}\right)}\times d_0}{c}\right],$$
$$\Delta t' = \left[\frac{\frac{\left(1+\frac{v}{c}\right)}{\left(1-\frac{v}{c}\right)\times\left(1+\frac{v}{c}\right)}\times d_0}{c}+\frac{\frac{\left(1-\frac{v}{c}\right)}{\left(1+\frac{v}{c}\right)\times\left(1-\frac{v}{c}\right)}\times d_0}{c}\right],$$
$$\frac{\Delta t'}{2}=\frac{1}{2}\times\left[\frac{\frac{1+\frac{v}{c}+1-\frac{v}{c}}{1-\frac{v^2}{c^2}}\times d_0}{c}\right]=\frac{1}{2}\times\left[\frac{\frac{2}{1-\frac{v^2}{c^2}}\times d_0}{c}\right]$$
$$=\left[\frac{\frac{1}{1-\frac{v^2}{c^2}}\times d_0}{c}\right]. \tag{27}$$

Although the length of the light path of a light beam moving in the motion direction of a moving light source has been shortened by calculating the arithmetic mean of both time intervals and the length of the light path of the light beam moving in the opposite direction has been lengthened, the half of the total length of the light path is still too long to obtain the time dilation factor γ. Einstein uses the help of mathematics by applying the length contraction factor $1/\gamma$ to shorten the arithmetic mean of the two different lengths of the two light paths in order to obtain the correct kinematic time dilation factor γ

$$\begin{aligned}
&\frac{\Delta t'}{2}=\frac{\frac{1}{1-\frac{v^2}{c^2}}\times\frac{1}{\gamma}\times d_0}{c},\quad \frac{\Delta t'}{2}=\frac{\frac{1}{1-\frac{v^2}{c^2}}\times\sqrt{1-\frac{v^2}{c^2}}\times d_0}{c}=\frac{\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times d_0}{c},\\
&\frac{\Delta t'}{2}=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times\frac{d_0}{c}\rightarrow t'=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times t_0=\gamma\times t_0.
\end{aligned}\tag{28}$$

Einstein was able to seemingly confirm the belief of physicists in the constancy of the speed c of light in all inertial frames. Physicists and mathematicians have meanwhile internalized the belief in the constancy of the speed c of light in all frames of reference to such an extent that they even accept an inconstancy of the speed of light in order to seemingly confirm a constancy of the speed c of light. While $\Delta t'$ is here the total time for the whole light path, in Einstein's calculations $\Delta t'$ is the time for half of the light path

$$\begin{aligned}
&\Delta t'=\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right),\\
&\Delta t'=\left[\frac{d'\times(c+v)}{(c-v)\times(c+v)}+\frac{d'\times(c-v)}{(c+v)\times(c-v)}\right],\\
&\Delta t'=\left[\frac{d'\times(c+v)}{(c^2-v^2)}+\frac{d'\times(c-v)}{(c^2-v^2)}\right],\\
&\frac{\Delta t'}{2}=\frac{d'\times c}{(c^2-v^2)}=\frac{1}{\left(1-\frac{v^2}{c^2}\right)}\times\frac{d'}{c}\rightarrow\frac{1}{\left(1-\frac{v^2}{c^2}\right)}\times\frac{\frac{1}{\gamma}\times d_0}{c}=\gamma\times t_0.
\end{aligned}\tag{29}$$

Which physicist and mathematician is today still able to recognize that lines 2 and 3 in Eq. (29) describes an inconstant speed of light because of two different lengths of light paths? If we compare lines 1 and 4 of Eq. (29) and insert for c the relative value 1c and for v the relative value 0.4 c, we see again that the value for "c" has changed from lines 1 to 4 by Einstein's calculation method

$$\begin{aligned}
&\frac{1}{2}\times\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right)=\frac{d'}{\left(1-\frac{v^2}{c^2}\right)\times c}=\frac{1}{2}\times\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right),\\
&\frac{1}{2}\times\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right)=\frac{d'}{\left[1-\frac{(0.4c)^2}{(1c)^2}\right]\times c}=\frac{1}{2}\times\left(\frac{d'}{c-v}+\frac{d'}{c+v}\right),\\
&\frac{1}{2}\times\left(\frac{d'}{1c-0.4c}+\frac{d'}{1c+0.4c}\right)\neq\left(\frac{d'}{0.84c}\right)=\frac{1}{2}\times\left(\frac{d'}{0.88c-0.4c}+\frac{d'}{0.8c+0.4c}\right),\\
&\frac{1}{2}\times\left(\frac{d'}{0.96c}+\frac{d'}{1.4c}\right)\neq\left(\frac{d'}{0.84c}\right)=\frac{1}{2}\times\left(\frac{d'}{0.84c}+\frac{d'}{0.84c}\right),\\
&\quad\rightarrow t'=\frac{1}{2}\times\left(\frac{d'}{1c-0.4c}+\frac{d'}{1c+0.4c}\right)\times t_0\neq\left(\frac{d'}{0.84c}\right)\times t_0=\frac{1}{2}\times\left(\frac{d'}{0.88c-0.4c}+\frac{d'}{0.8c+0.4c}\right)\times t_0.
\end{aligned}\tag{30}$$

Physicists may argue that it is not the speed of light that changes here. However, two different time dilation factors in a single motion direction of a light beam rules out a constant speed of light. For logical reasons it is not possible to calculate the kinematic time dilation factor γ for light beams moving back and forth along the longitudinal light path without an inconstant speed of light because two different time intervals are necessary to calculate from them an average value that is different from the average value of two equal time intervals resulting from a constant speed c of light. Even Einstein's relativity needs an inconstant speed of light for the calculation of the factor γ for the longitudinal light path, but Einstein concealed this so well that physicists have not noticed this.

IV. THE CORRECT DERIVATION OF THE KINEMATIC TIME DILATION FACTOR γ ALONG THE LONGITUDINAL LIGHT PATH IN RELATION TO EARTH'S FRAME OF REFERENCE

Because the speed of light on Earth is constant in all compass directions, it does not matter in which direction a light beam moves on Earth. Therefore, if a light beam moves back and forth in an interferometer that moves in a straight line on the Earth, the total light path $2d_0$ from the light source to the mirror and back to the light source must be considered for the derivation of the kinematic time dilation factor and not the two parts of the total path length $2d_0$ separately, because the movement of the light beam cannot be divided into two separate parts. An observer on Earth watching a light beam moving back and forth in the moving interferometer must see the following changes for the two different motion directions of the light beam along the longitudinal light path in relation to the frame of reference of the moving interferometer:

$$\frac{d'}{(c-v)} = \frac{d'}{\left(1-\frac{v}{c}\right)\times c} \text{ and } \frac{d'}{(c+v)} = \frac{d'}{\left(1+\frac{v}{c}\right)\times c}. \tag{31}$$

From this follows with respect to the frame of reference of Earth, because the light beam must move with the speed c in the frame of reference of Earth:

$$\frac{\frac{1}{\left(1-\frac{v}{c}\right)}\times d_0}{c} \text{ and } \frac{\frac{1}{\left(1+\frac{v}{c}\right)}\times d_0}{c}. \tag{32}$$

If we compare Eqs. (31) and (32), we can see that the time change in the moving reference system is seen from the stationary frame of reference of Earth and also from the moving frame of reference. While the time dilation in the moving frame of reference must occur due to a change in the speed of light in the moving frame of reference, because the speed of light c cannot change in relation to Earth, the change in time in Earth's frame of reference must occur due to changes in the distances that the light beam has to travel on Earth due to the movement of the interferometer. For the light beam moving in the same direction as the interferometer, the factor $1/(c-v)$ causes a change in time and in the opposite direction the factor $1/(c+v)$ causes a change in time. If something changes by a certain factor and simultaneously or subsequently changes by another factor, then the factors must be multiplied in order to calculate correctly. For example, if a mass changes by the factor 1.666 and simultaneously or subsequently by the factor 0.714, then the change in mass is (1.666×0.714) m = 1.19m. Adding the factors, we obtain a wrong mass of $(1.666+0.714)$ m = 2.38 m, which is double the value of the correct mass. Therefore, the average of the mass change when using the geometric mean for the correct value of the mass must be different from the average of the mass change when using the arithmetic mean for the incorrect value of the mass. For calculating the kinematic change in time along the longitudinal light path, Einstein adopted the calculation method from Michelson and Morley and added the two factors that cause the change in time. The correct factor for the kinematic change in time $[1/(c-v)\times 1/(c+v)]$ thus became the incorrect factor $[1(c-v)+1/(c+v)]$ in Einstein's SR. To adjust the incorrect result of the kinematic change in time to the correct result, Einstein simply divided the change in time by 2. Because the result was still not correct, Einstein adopted Lorentz's space contraction. A light beam does not differentiate between moving directions on Earth, so that both factors are effective on the total length of the light path $2d_0$ because the light path cannot be divided in two separate parts, so that we have to calculate the geometric mean of both factors that cause the change in time if we want to calculate the average value of the kinematic change in time for an object moving on Earth, where part one of Eq. (33) describes the time dilation in the moving frame of reference seen from the moving frame of reference and part two of Eq. (33) describes the time dilation in the moving frame of reference seen from the stationary frame of reference:

$$\begin{aligned}\Delta t' &= \frac{2d'}{\sqrt{\left(1-\frac{v}{c}\right)\times\left(1+\frac{v}{c}\right)}\times c} \\ &= \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times\frac{2d'}{c} \rightarrow t' = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times t_0, \\ &\text{or} \\ \Delta t' &= \frac{\sqrt{\frac{1}{\left(1-\frac{v}{c}\right)}\times\frac{1}{\left(1+\frac{v}{c}\right)}}\times 2d_0}{c} \\ &= \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times\frac{2d_0}{c} \rightarrow t' = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\times t_0.\end{aligned} \tag{33}$$

However, in our example t_0 is now not the proper time any more, as defined by Einstein, but is the time that we measure at rest in Earth's frame of reference. And t' is the slower going time that is measured in an object moving on Earth. However, Einstein is forced to calculate physically wrong, in order not to destroy the belief in a constant speed of light in all frames of reference. Due to the high speed of light, we cannot imagine the short time it takes for a light beam to move from the light source to the mirror and back to the light source. In order to better understand the difference between the geometric mean of time change and the arithmetic mean of time change, we need to slow down the process mentally to such an extent that we can clearly imagine the difference of the changes in time. Let's imagine that in Earth's frame of reference a photon that moves with the speed c takes 50 years to travel in an interferometer at rest on

Earth from the light source to the mirror (c is in this case a very slow constant speed, e.g. 0.95 cm/a) and 50 years to return from the mirror to the light source, respectively to the detector. In the frame of reference of an interferometer moving at the speed of 0.4c on Earth (in our thought experiment 0.38 cm/a), we would then see that the photon, after it has been reflected at the mirror, arrives at the light source later than after 100 years. Since the speed of light c is constant on Earth, the change in time must be a continuous process over the entire time interval and cannot be interrupted by resetting the time change after half the distance traveled, as with a stopwatch, because the longer time that has elapsed in the moving interferometer cannot be reversed. Therefore, we must multiply both quotients that define the change in time, so that we obtain for the geometric mean of $\Delta t'$, where $\Delta t'$ is here the total time for the whole light path from the light source to the mirror and back to the light source

$$\begin{aligned}
&\text{geometric mean of time change}:\\
&\sqrt{\frac{1}{1-0.4}\times\frac{1}{1+0.4}}=\sqrt{1.666\times 0.714},\\
\Delta t' &= \sqrt{\frac{1}{1-0.4^2}}\times 100a=\sqrt{\frac{1}{0.84}}\times 109.1a,\\
&\text{Einstein's } SR:\\
\Delta t' &= 2\times\left[\frac{1}{2}\times\left(\frac{1}{1-0.4}+\frac{1}{1+0.4}\right)\times 50a\right],\\
\Delta t' &= 2\times\left[\frac{1}{2}\times(1.666+0.714)\times 50a\right],\\
\Delta t' &= \left(\frac{1}{1-0.4^2}\right)\times 50a+\left(\frac{1}{1-0.4^2}\right)\times 50a\\
&= 59.5a+59.5a=119a.
\end{aligned} \tag{34}$$

For the difference between the time interval $\Delta t'$ and Δt we obtain, where $\Delta t'$ and Δt is here the total time for the whole light path

$$\begin{aligned}
&\Delta t'-\Delta t=\left(\sqrt{\frac{1}{1-0.4}\times\frac{1}{1+0.4}}\times 1\right)-1\times 100a,\\
&\Delta t'-\Delta t=\left(\sqrt{1.666\times 0.714}\right)-1\times 100a=0.91\times 100a=9.1a,\\
&\text{Einstein's SR}:\\
&\Delta t'-\Delta t=2\times\left\{\left[\frac{1}{2}\times\left(\frac{1}{1-0.4}+\frac{1}{1+0.4}\right)\times 1-1\right]\times 50a\right\},\\
&\Delta t'-\Delta t=2\times\left\{\left[\frac{1}{2}\times(1.666+0.714)-1\right]\times 50a\right\},\\
&\Delta t'-\Delta t=0.19\times 50a+0.19\times 50a=9.5a+9.5a=19a.
\end{aligned} \tag{35}$$

However, a 50 cm long interferometer with a light path of about 2×47.5 cm would have to appear shortened by a factor of $(0.84)^{1/2}$ to approximately 45.8 cm for an observer at rest on Earth as soon as the interferometer starts moving at a speed of 0.38 cm/a in order to obtain the correct value for the kinematic time dilation in our thought experiment. Because of Einstein's incorrect calculation of the kinematic change in time, which changes the laws of nature, Einstein had to invent mathematical tricks to bring the incorrect results back into line with nature in order to adapt nature to his belief in a constant proper time t_0 and a constant speed of light in all frames of reference. In the case of SR it was length contraction and "relativistic velocity addition," in the case of GR it was the curvature of space-time. Since Einstein's mathematical tricks seemed to work, it was not recognized that they were merely mathematical tricks and not reality. Therefore, Einstein's mathematical tricks were paradoxically used as an argument for the reality of his theory. This elevated mathematical tricks to the level of physical reality.

V. BECAUSE EINSTEIN'S SR IS PHYSICALLY WRONG, WE NEED AN EXPLANATION FOR THE NULL RESULTS OF INTERFERENCE EXPERIMENTS CARRIED OUT ON EARTH, WHICH IS DIFFERENT FROM EINSTEIN'S SR

The physical explanation of time dilation measured on Earth is not difficult. That it is possible to derive time dilation by calculating an average value of two different quotients that define two different time intervals physically indicates that some kind of "ether" must act the same way in all directions along the longitudinal light path in order to enable time dilation. Since time dilation has been experimentally verified on Earth by moving clocks, we have to ask ourselves, what can be effective on Earth in the sense of an "ether" that acts equally in all compass directions? This can only be Earth's gravitational field, which can be considered to represent some kind of "ether" that moves with Earth through space and acts in all compass directions the same way (neglecting Earth's rotation around its axis). There is a difference in the calculation method of the average of the two time intervals of light beams moving back and forth in an "ether" that is only effective in one direction and an "ether" that is equally effective in all directions. If an "ether" wind were to blow for a certain time interval against the motion direction of a light beam that moves back and forth along the longitudinal light path and for the same time interval in the motion direction of the light beam, the "ether" wind would have opposite physical effects on the light beam. In this case, if the mathematical expansion of the two quotients of the two time intervals leads to opposite algebraic signs in the nominator, this opposite algebraic signs describe opposing physical effects, which must be subtracted from each other because they cancel each other out. This means that in the case of the interpretation of the Michelson–Morley experiment, the arithmetic mean of the two time intervals has to be calculated to obtain the correct average value of the two time intervals because the ratio of the physical effect of an "ether" wind blowing against the light beam and the physical effect of an "ether" wind blowing in the same motion direction of the light beam is

$$\text{ratio of physical time change}:\frac{-v}{+v}=\frac{-1}{1}. \tag{36}$$

Therefore, the calculation method of Michelson and Morley, who assumed an "ether" at rest in space, is correct because by adding the two time intervals the ratio −1:1 of the factors that define the change in time is transformed in a seeming 1:1 ratio, which is necessary to obtain the correct total change in time, so that the arithmetic mean of both time intervals is allowed to be calculated

$$\begin{aligned} t' &= \frac{d}{c-v} + \frac{d}{c+v} = \frac{(c+v)\times d}{(c-v)\times(c+v)} + \frac{(c-v)\times d}{(c+v)\times(c-v)}, \\ t' &= \frac{c\times d + v\times d}{(c-v)\times(c+v)} + \frac{c\times d - v\times d}{(c+v)\times(c-v)}, \\ \text{arithmetic mean} \rightarrow \frac{t'}{2} &= \frac{1}{2}\times\left[2\times\frac{1}{\left(1-\frac{v^2}{c^2}\right)}\times\frac{d}{c}\right]. \end{aligned} \tag{37}$$

Although Einstein rejected an "ether" that rests in space, he nevertheless adopted the calculation method of Michelson and Morley and added the two time intervals, respectively, the two factors that define the change in time, which is wrong in this case because the ratio of the factors of the change in time that are defined by Einstein is $1/(c-v)$:$1/(c+v)$ and not -1:1. The same applies to an "ether," which has the same effect in all compass directions on a light beam moving back on forth on Earth in an interferometer in uniform motion at the speed v. Because the speed of light is constant on Earth and the speed v is defined as uniform, the ratio of the two different quotients that describe the change in time and that are defined by nature must not be changed. In the case of an "ether," which acts equally in all motion directions of light beams, we must therefore calculate the geometric mean of the two time intervals along the longitudinal light path or the geometric mean of the two factors that define the change in time. Calculating the arithmetic mean of the two time intervals would change the ratio of the two factors that define the change in time and thus change the total time interval, which changes the laws of nature. For better understanding, I would like to give an illustrative example from another field we are better used to. Let us assume that we have invested 3600 $ over two equal intervals (2 years). In the first time interval, the profit rate is $1/(1-0.2)$, and in the second time interval, the profit rate is $1/(1+0.2)$. Just as the speed of light on Earth is a continuous speed that happens at the constant speed c in all directions, the increase in profit over the time interval of two years is also a continuous process, and just as the laws of nature cannot be changed, the ratio of profit rates cannot be changed either. If we calculate the arithmetic mean of the two profit rates, this would change the ratio of both profit rates and the total profit rate over the two equal time intervals. Bankers know that the average profit rate over the two equal time intervals has to be calculated by the geometric mean of both profit rates to obtain the correct average profit rate, so that we obtain after the two time intervals

$$\begin{aligned} \$' &= \sqrt{\frac{1}{100\% - 20\%}\times\frac{1}{100\% + 20\%}}\times 3600\$, \\ \$' &= \sqrt{\frac{1}{\frac{100\%}{100\%} - \frac{20\%}{100\%}}\times\frac{1}{\frac{100\%}{100\%} + \frac{20\%}{100\%}}}\times 3600\$, \\ \$' &= \frac{1}{\sqrt{(1-0.2)\times(1+0.2)}}\times 3600\$, \\ \$' &= \frac{1}{\sqrt{1-0.04}}\times 3600\$ = 1.0206\times 3600\$ = 3674\$ \sim +2.06\%. \end{aligned} \tag{38}$$

Calculating the arithmetic mean, we would get more money because the profit rates are now mathematically equalized

$$\begin{aligned} \$' &= \left(\frac{\frac{1}{100\% - 20\%} + \frac{1}{100\% + 20\%}}{2}\right)\times 3600\$, \\ \$' &= \frac{1}{2}\times\left(\frac{1}{\frac{100\%}{100\%} - \frac{20\%}{100\%}} + \frac{1}{\frac{100\%}{100\%} + \frac{20\%}{100\%}}\right)\times 3600\$, \\ \$' &= \frac{1}{2}\times\left(\frac{1}{1-0.2} + \frac{1}{1+0.2}\right)\times 3600\$, \\ \$' &= \frac{1}{2}\times[1.25 + 0.8333]\times 3600\$ = \frac{1}{2}\times[(1+0.25) + (1-0.1667)]\times 3600\$, \\ \$' &= \frac{1}{2}\times 2.08333\times 3600\$ = \frac{1}{2}\times[(1+0.041\,66) + (1+0.041\,66)]\times 3600\$, \\ \$' &= 1.041\,66\times 3600\$ = 3750\$ \sim +4.166\%. \end{aligned} \tag{39}$$

A banker who knows that the result of Eq. (39) is wrong can apply a money reduction factor in order to obtain the correct result, similar to the factor applied in physics to reduce the length of longitudinal light paths

$$\begin{aligned}
\$' &= \sqrt{100\%^2 - 20\%^2} \times 3750\$,\\
\$' &= \sqrt{\frac{100\%^2}{100\%^2} - \frac{20\%^2}{100\%^2}} \times 3750\$,\\
\$' &= \sqrt{1 - 0.2^2} \times 3750\$,\\
\$' &= \sqrt{1 - 0.04} = 0.9798 \times 3750\$ = 3674\$ \sim +2.06\%.
\end{aligned} \tag{40}$$

When we observe over a period of 3600 s a clock in a rocket that tangentially passes Earth at the speed of $0.2c$, calculating the arithmetic mean of the two different time intervals defined by Einstein, we obtain 3750 s instead of 3600 s ($c = 1$) for the longitudinal light path, where Einstein's SR changes in Eq. (41) the unequal ratio of the two quotients that define the change in time into an apparent 1:1 ratio

$$\begin{aligned}
\Delta t' &= \frac{1}{2} \times \left(\frac{1}{c - 0.2c} + \frac{1}{c + 0.2c}\right) \times 3600\,s,\\
\rightarrow \Delta t' &= \frac{1}{2} \times \left(\frac{1}{1 - 0.2} + \frac{1}{1 + 0.2}\right) \times 3600\,s,\\
\Delta t' &= \frac{1}{2} \times (1.25 + 0.8333) \times 3600\,s = \frac{1}{2} \times [(1 + 0.25) + (1 - 0.1667)] \times 3600\,s,\\
\rightarrow \Delta t' &= \frac{1}{2} \times \left[\frac{1 + 0.2}{(1 - 0.2) \times (1 + 0.2)} + \frac{1 - 0.2}{(1 + 0.2) \times (1 - 0.2)}\right] \times 3600\,s,\\
\Delta t' &= \frac{1}{2} \times \left(\frac{2}{1^2 - 0.2^2}\right) \times 3600\,s = \frac{1}{2} \times \left(\frac{2}{1 - 0.04}\right) \times 3600\,s = \frac{1}{2} \times \left[\frac{1}{0.96} + \frac{1}{0.96}\right] \times 3600\,s,\\
\Delta t' &= \frac{1}{2} \times (1.041\,66 + 1.041\,66) \times 3600\,s = 3750\,s,\\
\Delta t' &= \frac{1}{2} \times [(1 + 0.4166) + (1 + 0.4166)] \times 3600\,s = 1.041\,66 \times 3600\,s = 3750\,s.
\end{aligned} \tag{41}$$

The mathematical trick that Einstein invented in his miracle year is simple. By mathematically expanding the two different quotients that define the change in time, the difference between the two quotients moves to the numerator where the difference appears by different algebraic signs. The difference then disappears by adding the two quotients, giving the false impression that the ratio of the two different rates of time change is a 1:1 ratio, so that it seems permissible to calculate the arithmetic mean, which however changes the total time interval and thus the laws of nature. Therefore, Einstein must apply another mathematical trick by introducing a length reduction factor to finally get the correct result

$$\begin{aligned}
&\Delta t = \frac{1}{\gamma} \times 3750\,s, \quad \Delta t = \sqrt{1 - \frac{v^2}{c^2}} \times 3750\,s,\\
&\Delta t = \sqrt{1 - \frac{(0.2c)^2}{c^2}} \times 3750\,s, \quad \Delta t = \sqrt{(1 - 0.04)} = 0.9798 \times 3750\,s = 3674\,s.
\end{aligned} \tag{42}$$

If we calculate the change in time correctly by the geometric mean of the two different time intervals, we obtain the correct time dilation without the need of length correction ($c = 1$)

$$\begin{aligned}
\Delta t' &= \sqrt{\frac{1}{c - 0.2c} \times \frac{1}{c + 0.2c}} \times 3600\,s,\\
\rightarrow \Delta t' &= \sqrt{\frac{1}{1 - 0.2} \times \frac{1}{c + 0.2}} \times 3600\,s,\\
\Delta t' &= \sqrt{(1.25 \times 0.8333)} \times 3600\,s,\\
\Delta t' &= \sqrt{(1 + 0.25) \times (1 - 0.1667)} \times 3600\,s = 1.0206 \times 3600\,s = 3674\,s,\\
&\text{or}\\
\Delta t' &= \frac{1}{\sqrt{1^2 - 0.2^2}} \times 3600\,s = \frac{1}{\sqrt{0.96}} \times 3600\,s = 1.0206 \times 3600\,s = 3674\,s.
\end{aligned} \tag{43}$$

However, the physical correct geometric mean of the two different time intervals rules out Einstein's idea that the speed of light is constant in all frames of reference. If we want to understand physics in detail concerning the constant speed c of light that we measure at rest on Earth, we should be aware of some facts. (1) While we measure a constant speed c in the rest frame of Earth, in a frame of reference that moves on or near Earth the speed of light cannot be constant, as demonstrated in Secs. III and IV. (2) Einstein derived the kinematic time dilation factor γ along the longitudinal light path on the basis of back and forth movements that take place with the speed of light. However, we know that photons propagate in a straight line in nature and do not move back and forth. Therefore, we must conclude that the derivation of the kinematic time dilation factor γ calculated by the motion of photons can only be understood as a mathematical model describing another physical process that is responsible for the kinematic time dilation. Because condensed intra-atomic or intra-elemental particular structures are also expected to move with the speed c and we know that atoms are always in motion, so that even in a solid matter they permanently move back and forth, we have to assume that the kinematic time dilation results from motion of atoms and elemental particles. And indeed, it physically makes no sense that photons that move in a straight line should be able change the oscillation frequency of atoms that move back and forth in atomic clocks. How to calculate the time dilation factor γ for other pairs of emission angles than 0°/180° and 90°/270° please see my former papers.[5–7] However, I must admit that in these papers I also still did not recognize that the time dilation factor γ results for the pair of emission angles 0°/180° (longitudinal light path) from the geometric mean of the two time intervals $d/(c-v)$ and $d/(c+v)$. (3) We know that the speed of light in the rest frame of Earth is constant and has always the speed c in a vacuum. Because Earth cannot be an exception and all large celestial objects (planets, moons, stars) cause a predominant gravitational field at their location, we must assume that we will also measure the speed c of light in a vacuum on or near other planets, moons or stars. (4) That the speed of light must be constant and isotropic within predominant gravitational fields can be justified by the principle of minimum energy and the principle of energy conservation if we do not exclude the possibility of an interaction between photons and gravity. (5) The argument that photons emitted from stars of galaxies do not show a lateral momentum so that we can see the stars and galaxies at their position in the past, seems to argue against the idea that photons orient with respect to their speed c of light to gravitational fields. To refute this argument, we have to describe a quantum physical theory of gravity, which would be going too far here. (6) When the speed of light is always c in the rest frame of Earth (more exactly in the rest frame of the predominant gravitational field of Earth), it is not possible that the transverse Doppler shift at the emission angles 90° and 270° of electromagnetic radiation would be able to be observed by an observer at rest on Earth, unless the transverse Doppler shift at the emission angles 90° and 270° results from the dilation of the emission process of photons from moving atoms or elemental particles, which causes an increase in wavelength when intra-atomic structures that emit photons move back and forth and in addition move in a certain direction in the predominating gravitational field of Earth. (7) It should be noted that everywhere in the universe there is always a nearest celestial object, which causes a predominant gravitational field at a certain position in the universe. (8) The slowing down of intra-atomic or intra-elemental particular structures must also cause a stronger effect of gravity on these structures, which can be measured as an increase in inertial mass and a decrease in the oscillation frequency of atoms in atomic clocks when the atomic clocks are in motion within a predominant gravitational field (kinematic time dilation) or when atomic clocks are located at stronger gravitational potentials (gravitational time dilation).[7] Although gravitational time dilation is then objectively caused by a decrease in the speed of light in an object that is located at a stronger gravitational potential within a predominant gravitational field, at any gravitational potential the same speed c of photons can be measured, because a slower speed of light near the surface of a mass at a stronger gravitational potential is compensated by a time passing slower at this stronger gravitational potential.[8]

VI. WHY WE ALWAYS MEASURE A NULL RESULT FOR LIGHT BEAMS THAT MOVE BACK AND FORTH IN INTERFEROMETERS THAT MOVE OR REST ON EARTH

When in an interferometer that moves on Earth a photon moves in the motion direction of the interferometer, the speed of light with respect to the interferometer must be slower than c because the mirror moves away from the photon, which must cause a slower frequency of pulses arriving at the mirror. When a photon moves in an interferometer moving on Earth in the opposite direction than the motion direction of the interferometer, the speed of light in the interferometer must be faster than c because the detector moves in the direction of the photon, which must cause a higher frequency of pulses that arrive at the detector. However, in the frame of reference of the predominant gravitational field of Earth the speed of light is still c. When the speed of light must be constant in the predominant gravitational field of Earth, but not in interferometers moving on Earth, a change in wavelength must also happen in moving interferometers in the longitudinal light path. When pulses of electromagnetic waves are emitted in the direction of the movement of the light source, because of the slower speed of light in the interferometer, each pulse has moved a shorter distance before the next pulse is emitted, which reduces the wavelength and results in a blue shift. When pulses of electromagnetic waves are emitted in the opposite direction than the movement of the mirror, because of the faster speed of light with respect to the interferometer, each pulse has moved a longer distance before the next pulse is emitted, which increases the wavelength and results in a redshift. This means that in this case we obtain the classical optical longitudinal Doppler shift of electromagnetic waves in the longitudinal light path of interferometers moving on Earth. This must happen within the moving interferometer and also seen from a frame of reference at rest on Earth, which seems to be wrong because in moving interferometers no frequency shift can be measured. For the classical optical longitudinal Doppler shift, we expect for the inertial frame of the moving interferometer I'_I and for the inertial frame I'_E of the interferometer seen from an observer at rest in the predominant gravitational field of Earth

$$
\begin{aligned}
&I'_I \leftrightarrow I'_E\\
&\text{blue shift}: \frac{(c-v)}{c} \times \lambda_0 \leftrightarrow \frac{(c-v)}{c} \times \lambda_0,\\
&\rightarrow \left(1-\frac{v}{c}\right) \times \lambda_0 \leftrightarrow \left(1-\frac{v}{c}\right) \times \lambda_0,\\
&\text{redshift}: \frac{(c+v)}{c} \times \lambda_0 \leftrightarrow \frac{(c+v)}{c} \times \lambda_0,\\
&\rightarrow \left(1+\frac{v}{c}\right) \times \lambda_0 \leftrightarrow \left(1+\frac{v}{c}\right) \times \lambda_0.
\end{aligned}
\tag{44}
$$

According to Einstein's relativity, in the case of the classical longitudinal Doppler shift a change in wavelength is only allowed to be seen by an observer at rest on Earth, but not by an observer moving with the interferometer because of the postulate of a constant speed c in all inertial frames. However, if the speed c of light is constant in each predominant gravitational field, the situation is different. Because in an interferometer moving in a predominant gravitational field the speed of light is slower with respect to the interferometer in the direction of the movement of the interferometer, the blue shift caused by a decrease in wavelength at the light source is compensated by the slower frequency of pulses arriving at the mirror. Considering that frequency and wavelength are inverse proportional, we obtain a null result at the mirror by calculating the geometric mean of the two rates of frequency shift

$$
\begin{aligned}
&I'_I: \text{blue shift}: \left(1-\frac{v}{c}\right) \times \lambda_0 \rightarrow \frac{1}{\left(1-\frac{v}{c}\right)} \times f_0,\\
&\rightarrow \text{null result}: \frac{1}{\left(1-\frac{v}{c}\right)} \times f_0 \text{ and } \left(1-\frac{v}{c}\right) \times f_0\\
&\rightarrow \sqrt{\frac{1}{\left(1-\frac{v}{c}\right)} \times \left(1-\frac{v}{c}\right)} = f_0.
\end{aligned}
\tag{45}
$$

Because in an interferometer moving in a predominant gravitational field, the speed of light is faster with respect to the interferometer in the opposite direction than the movement of the interferometer, the redshift shift caused by an increase in wavelength at the emitting mirror is compensated by the higher frequency of pulses arriving at the detector. Calculating again the geometric mean of the two rates of frequency shift, we obtain a null result at the detector

$$
\begin{aligned}
&I'_I: \text{redshift}: \left(1+\frac{v}{c}\right) \times \lambda_0 \rightarrow \frac{1}{\left(1+\frac{v}{c}\right)} \times f_0,\\
&\rightarrow \text{null result}: \frac{1}{\left(1+\frac{v}{c}\right)} \times f_0 \text{ and } \left(1+\frac{v}{c}\right) \times f_0\\
&\rightarrow \sqrt{\frac{1}{\left(1+\frac{v}{c}\right)} \times \left(1+\frac{v}{c}\right)} = f_0.
\end{aligned}
\tag{46}
$$

This simulates a constant speed c of light in all inertial frames because at the detector of an interferometer moving on Earth no frequency shift can be measured. The null result in moving interferometers on Earth regarding the frequency of pulses arriving at the detector or mirror in the longitudinal light path of moving interferometers is today taken as a confirmation of the constancy of the speed of light in all inertial frames. However, the null result is in this case the result of a constancy of the speed of light in the predominant gravitational field of Earth and has nothing to do with a constant speed of light in all frames of reference. Therefore, the relativistic velocity addition is just a mathematical trick to force the postulate of a constant speed of light c to be correct in all inertial frames, respectively, in all frames of reference. The situation is completely different in condensed matter of intra-atomic or intra-elemental particular structures, which cannot expand like electromagnetic wavelengths. In this case, no change in wavelength but only a "frequency shift" can occur, which must result in a time shift. A decrease in the speed c of the intra-atomic and intra-elemental particular structures must happen, when the intra-atomic and intra-elemental particular structures move in the same direction as matter moving on Earth because these structures cannot move faster than c with respect to Earth's predominant gravitational field, which can be calculated applying the mathematical model of a red shift of electromagnetic waves. An increase in the speed c of the intra-atomic and intra-elemental particular structures must happen, when the intra-atomic and intra-elemental particular structures move in the opposite direction than matter moving on Earth, which can be calculated applying the mathematical model of a blue shift of electromagnetic waves. In this case, within intra-atomic and intra-elemental particular structures of matter, the time dilation factor γ can occur, when we calculate the geometric mean of two rates of "frequency shift" to obtain the average rate of "frequency shift" in the moving frame of reference I':

$$
\begin{aligned}
&\frac{1}{t'_1} = f'_1 = \left(1-\frac{v}{c}\right) \times f_0,\\
&\frac{1}{t'_2} = f'_2 = \left(1+\frac{v}{c}\right) \times f_0,\\
&\rightarrow I': \frac{1}{t'} = f' = \sqrt{\left(1-\frac{v}{c}\right) \times \left(1+\frac{v}{c}\right)} \times f_0\\
&= \sqrt{1-\frac{v^2}{c^2}} \times f_0,\\
&\rightarrow I': \frac{1}{f'} = t' = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \times t_0.
\end{aligned}
\tag{47}
$$

In this case, t_0 is not the proper time as defined by Einstein's relativity, but the time we measure when the clock is at rest with respect to the Earth's gravitational field. When matter moves on Earth within the predominant gravitational field of Earth, not considering the rotation of the Earth around its axis, the intra-atomic or intra-elemental particular structures must move on average by the factor γ slower with respect to the frame of reference of the moving matter (intra-atomic or intra-particular structures) because the speed c of the intra-atomic or intra-elemental particular structures with respect to Earth's predominant gravitational field must be constant in the predominant gravitational field of Earth. This causes, among other things, the slowing down of the oscillation of atoms in atomic clocks. When on Earth, other planets, moons or stars the same natural laws are the same, we have to conclude that the speed c of light and of intra-atomic and intra-elemental particular structures is constant in all predominant gravitational fields, but not between predominant gravitational fields, e.g., between Earth and the Sun. This must be the reason for the null result of the Michelson–Morley experiment because in this case photons are not influenced by Earth's motion around the Sun and we measure the speed c in a vacuum on Earth (neglecting the rotation of the Earth around its axis) in all compass directions.

VII. DIGRESSION: WHAT IS GRAVITY?

That we must derive time dilation along the longitudinal light path by calculating an average value of two different quotients that define two different time intervals physically indicates that some kind of "ether" must act the same way in all compass directions on Earth in order to enable time dilation. Earth's gravitational field can be considered to represent such a kind of "ether" that acts equally in all compass directions (not considering the rotation of the Earth around its axis) and moves through space with Earth. This confirms my idea that gravity may be considered to be a quantum wind blowing from space towards masses. "Newtonian quantum gravity" distinguishes between two types of quantum physical gravitational fields: one representing the gravitational effect, and one representing the cause of gravity[8–14] While the quantum physical gravitational field of the gravitational effect moves through space with a mass, the quantum physical gravitational field of the gravitational cause does not move through space with a mass; instead, it is always directed towards the place where the mass was located in the past when the "gravitational quanta" were emitted. In the vicinity of a mass that causes a predominant gravitational field, the gravitational field of the gravitational effect is relevant for photons, so that the speed c of light must be isotropic within the gravitational field of the gravitational effect of this predominant mass because of the principle of minimum energy and the principle of energy conservation. In this case, the velocity of a radially emitted photon leaving a locally predominant mass into space, e.g., Earth or a star, is always directed towards the mass causing the predominant gravitational field of the effect. With the increase in distance, however, the gravitational field of the gravitational effect becomes weaker and the gravitational field of the gravitational cause becomes relevant for photons moving radially away from Earth or from a star, so that now the gravitational field of the gravitational cause determines the spatial orientation of the velocity of the light. In this case, the spatial orientation of velocity of a photon that has left the mass radially must change, because of the principle of minimum energy and the principle of energy conservation, so that it is now directed towards the position where the predominant mass was in the past. This is because the gravitational quanta that cause the gravitational field of the gravitational cause are not influenced by the movement of masses through space, because gravitational quanta as the cause of gravitational and inertial mass cannot themselves have mass and momentum. This explains why we can see stars and galaxies at their position in the past. However, because in the vicinity of Earth or of another predominant mass the gravitational field of the gravitational effect is relevant for photons, near to a predominant mass, the photon will nevertheless have a lateral momentum due to the movement of the predominant mass. According to "Newtonian quantum gravity," the quantum physical gravitational field of the gravitational effect causes a "quantum wind" that blows towards masses. We feel this "quantum wind" as what we call heavy mass. The "quantum wind" also causes phenomena that are attributed to so-called Einstein lenses today. Since the "quantum wind" always "blows" in the direction of the current position of a mass, it also causes the phenomena attributed to what we call inertial mass, which explains the equivalence of gravitational and inertial mass.

VIII. CONCLUSIONS AND DISCUSSION

The author has revealed that Einstein's derivation of the kinematic time dilation along the longitudinal light path in "Einstein's year of miracles" is based on mathematical tricks. The speed of light is not always c with respect to frames of references, but must be c with respect to predominant gravitational fields (planets, suns, etc.). Because there are large overlaps between Einstein's wrong physics and the constancy of the speed of light c within predominant gravitational fields, many phenomena seem to confirm Einstein's relativity. However, their derivation by Einstein's relativity must inevitably be wrong, such as the increase in mass when a mass object moves within a gravitational field.[7] A theory of relativity in dependence of locally absolute strengths of gravitational potentials within predominant gravitational fields brings physics back from Einstein's subjective imagination of a constant proper time t_0 to the objective mathematical truth that, according to the definition of time as path length divided by the speed of light, time can only change if either the speed of light changes or the length of the light path in the rest frame within a predominant gravitational field changes, which enforces a change in the speed of light in the frame of reference moving in a predominant gravitational field.[7,8,12] The derivation of the kinematic time dilation factor γ based on the motion of photons just represents a mathematical model to calculate the duration of physical processes in condensed matter that also happen at the speed of light. Kinematic time dilation must be caused by moving structures within atoms or elemental particles having to travel an objectively longer distance within predominant gravitational fields. When matter moves within predominant gravitational fields or is located at a stronger gravitational potential, physical processes in condensed matter in atoms or elemental particles, which happen at the speed of light, slow down, so that the frequency of oscillating atoms in atomic clocks becomes lower, which can be interpreted as time dilation. Therefore, the transverse Doppler shift is recognized as a dilated emission process of photons when atoms or elemental particles are in motion within predominant gravitational fields.[8] The gravitational time dilation calculated by photons within different strengths of gravitational potentials just represents a mathematical model to calculate the duration of physical processes in condensed matter that also happen at the speed of light. Although gravitational time dilation is caused by a decrease in the speed of light in an object that is located at a stronger gravitational potential within a predominant gravitational field, at any gravitational potential the same speed c of photons can be measured, because a slower speed of light near the surface of a mass at a stronger gravitational potential is compensated by time passing more slowly near this mass. The observed redshift of electromagnetic waves arriving at Earth from massive stars must be caused by an increase in wavelength when electromagnetic waves are emitted on massive stars because the emission process of electromagnetic waves from atoms or elemental particles is slower within stronger gravitational potentials, so that each pulse of electromagnetic radiation has moved a greater distance on the massive star than if emitted on Earth before the next pulse can follow, which leads to an increase in wavelength relative to the emission process on Earth.[8] Explaining magnetism with Einstein's relativity must be wrong. Magnetism must be caused by relative motion between negatively or positively charged particles that are located within a predominant gravitational field, e.g. on Earth. Because the speed of propagation of an electric field in the predominant gravitational field cannot be faster than the speed c, the speed of propagation of an electric field emitted by a charged particle must decelerate in relation to the charged particle that moves within a predominant gravitational field. This leads to a weak electrical charge difference between the electric fields propagating from oppositely charged particles that move at different speeds, e.g. in a current-carrying conductor or in ferromagnetic materials. Length contraction and "relativistic velocity addition" are just mathematical tricks to force the postulate of a constant speed of light c to be correct in all inertial frames. The Michelson–Morley experiment[1] and experiments with moving interferometers on Earth and the Hafele–Keating experiment,[15] which confirmed the kinematic and gravitational time dilation, must be explained by a theory of relativity in dependence of gravity.[7,8,12] A new theory of gravity is required, which must be able to explain gravity by quantum physical effects and why photons emitted radially from stars do not show an expected lateral momentum so that we can see stars and galaxies at their position in the past.[9,10,13,14] In my paper "Newtonian quantum gravity" I demonstrated that the correct curvature of a light beam at the surface of the Sun and phenomena observed at the binary pulsar PSR B1913 + 16 can successfully be predicted by just applying Kepler's second law to simple quantum physical considerations.[9] Also the anomalous secular increase in the moon orbit eccentricity can simply be explained.[16]

A. Closing words

Physics is in crisis. We must realize that Einstein's relativity can only seemingly provide correct predictions of physical phenomena, but bases on mathematical tricks and makes no sense physically. The sole purpose of Einstein's SR and GR is to mathematically enforce a constant speed of light in all frames of reference, because the physical context is not understood as to why we measure a constant speed of light on Earth. If we use mathematical tricks to adapt a theory to reality, it must inevitably lead to self-fulfilling apparent confirmations of the theory, which the physicists did not consider. The wrong belief in the constancy of the speed of light in all frames of reference led to an overgeneralization of the constancy of the speed of light and consequently to cognitive bias, cognitive blind spots, confirmation bias and, especially among the authorities on physics, to a bias blind spot. This made the paradox possible that Einstein's theory of relativity, which is physically false, is now considered one of the best empirically confirmed theories in physics. Einstein's relativity is just a pseudo-scientific belief in the constancy of the speed of light in all frames of reference, which has successfully taken over universities. Quite a few physicists were rewarded for their faithfulness in Einstein's relativity with the Nobel Prize when they were able to seemingly confirm Einstein's unreal physics by further mathematical tricks. An example of this is the mathematical trick of the Higgs mechanism. On the other hand, physicists who questioned and criticized Einstein's relativity, were deprived of their career opportunities in physics.

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