The New Relativity Theory: Absolute Simultaneity, Modified Light Speed Constancy Postulate, Uniform Scaling of Physical Properties

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Abstract

The proof that Einstein's theory of relativity is fundamentally flawed is both succinct and definitive. It rests squarely on the fact that an *inertial* clock cannot change its rate spontaneously. As a consequence, the elapsed times registered on any two such clocks must always occur in strictly the same proportion ($\Delta t' = \Delta t/Q$). This stands in direct contradiction to the well-known prediction of remote non-simultaneity of the Lorentz transformation which Einstein illustrated with his famous thought experiment of two lightning strikes hitting a train as it passes by a station platform. Moreover, his version of the light-speed constancy postulate states that if a light source moves with constant speed v relative to the origin, the distance traveled by the light pulse relative to the origin is $c\Delta t$. Since the light source itself moves a distance of $v\Delta t$ in the same direction, one finds by subtraction that the corresponding distance traveled by the light pulse relative to its source is $c\Delta t - v\Delta t$. By definition, this means that *the speed of the light pulse relative to its source is c-v*, in direct contradiction to his version of the postulate. There is an alternative version of the postulate, however, which is consistent with all known experimental measurements. It states that the speed of light in free space is only equal to c for an observer who is stationary in the rest frame of the source. This version of the light-speed postulate has been combined with the proportionality relation for elapsed times given above (Newtonian Simultaneity) to obtain a space-time transformation (Newton-Voigt transformation NVT) which is consistent with all known experiments, as well as with Galileo's Relativity Principle. More generally, it is shown that analogous proportionality relations (conversion factors), including those dealing with the effects of gravity, exist for every physical property. The resulting procedures (Uniform Scaling) depend on only two quantities (Q above for kinetic scaling and S for gravitational scaling) that are easily calculated for each pair of rest frames in the universe. All conversion factors are shown to be exclusively integral multiples of S and Q.

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Keywords: Newtonian Simultaneity, Uniform Scaling of Physical Properties, Newton-Voigt transformation (NVT), Conversion Factors

I. Introduction

The experiment with onboard atomic clocks that was carried out with circumnavigating airplanes in 1970 [1,2] marked an inflection point in the history of attempts to verify predictions of Einstein's version of relativity theory [3] which he had published 65 years earlier. However, the results of this investigation have unfortunately been widely misinterpreted. They show, for example, that although time dilation is a real effect, it does not possess the symmetry claimed by Einstein (two clocks each running slower than the other). They also prove that his concept of remote non-simultaneity (RNS), as supposedly demonstrated by his famous conjecture [4] about lightning strikes on a moving train as it passes a station, is totally outside the bounds of rational thinking.

As a consequence, it was immediately clear that the Lorentz transformation [4-6], which by now has been the object of blind adulation by theoretical physicists for more than a century, is bogus. That realization immediately calls into serious question a number of other totally groundless beliefs such as in Lorentz-FitzGerald length contraction (FLC) and the possible time reversal of events, just to mention a few.

What follows is a revision of Einstein's theory which not only does away with the aforementioned misconceptions, but also turns out to be far easier to comprehend than was its predecessor. Instead of symmetric time dilation, one has new laws of physics which are completely consistent with both Galileo's Relativity Principle and also Maxwell's theory of electromagnetism. Einstein's version of the light-speed postulate, which is shown to be self-contradictory, is replaced by one which merely claims that the speed of light in free space is only equal to c relative its source. This is consistent with both Maxwell's equations and the Michelson-Morley null-interference result of their famous interferometry experiment [7]. A thought experiment is presented which shows that someone who observes a light source departing his position with speed v at exactly the same time that it emits a light beam must conclude that the distance travelled by the latter in a given time T is (c+v) T, thereby demonstrating that his measured value of its speed is not c, but rather c+v. It is nonetheless clear that von Laue's interpretation [8] of the Fresnel-Fizeau light-damping experiment does require a space-time transformation other than the classical (Galilean) version which is employed successively in the above example. For this purpose a different transformation is derived which unlike the LT is consistent with the concept of absolute simultaneity espoused by Newton in the 17th century.

The Hafele-Keating experiment [1.2] also teaches us something critical about the effects of gravity on the rates of atomic clocks. In this case the solution is provided by Einstein's 1907 paper [8] in which he successfully predicted the gravitational red shift for light waves emitted near the surface of the sun. The results demonstrate, however, that the effects of gravity are completely separate from those caused by kinetic acceleration, in contradiction to the Equivalence Principle Einstein employed to derive the red shift. .taken together, all these results lead to a completely new approach referred to as *uniform scaling* which allows one to convert the values of all physical properties observed in any given rest frame to the values that are obtained when using the set of standard units employed in his own rest frame.

II. Uniform Scaling of Time Due to Motion.

The key result from the Hafele-Keating experiment [1,2] is that the rates of atomic clocks decrease as their speed relative to the earth's center of mass (ECM) increases. In point of fact, the authors did not actually mention the ECM, but rather the polar axis as the reference for determining the relative rates of the clocks. Nonetheless, it is clear that the polar axis and the ECM are in the same rest frame, so the distinction is of no consequence. It also needs to be pointed out that the above conclusion about the rates of the clocks is reached only after a correction is made for the effect of gravity on the rates.

The quantitative findings can be expressed in terms of the inverse relationship for measured elapsed times Δt and Δt' for the same event:

$$\Delta t' \gamma(v') = \Delta t \gamma(v) . \qquad (1)$$

In this equation, v (or v') is the speed of a given clock relative to the ECM, c =299792458 ms^{-1} is the speed of light in free space and $\gamma(v)=(1-v^2c^{-2})^{-0.5}$, whereby the authors approximated the latter function by $1+0.5v^2c^{-2}$.

It is useful to look upon eq, (1) in the following way. The *unit of time* for each observer depends on his speed relative to the ECM. Specifically, in this case, the value of the elapsed time is γ(v) times larger for the hypothetical observer at the ECM than it is for an actual observer in a different rest frame moving with speed v relative to the ECM. In general, it is assumed that the elapsed times measured by any two observers always satisfy the following relation:

$$\Delta t' = \frac{\Delta t}{Q}, \tag{2}$$

whereby Q=γ(v')/γ(v). The quantity Q can thus be interpreted as a *conversion factor* between the two sets of units [10].

The above conclusions are consistent with the fundamental assumption that measurement is completely *objective*. By contrast, Einstein's theory of symmetric time dilation [3] is clearly incompatible with such a view of the measurement process. It is impossible to define a unit of time if one isn't sure which of two clocks is running slower or faster.

A more specific notation for the rest frames in eqs. (1-2) will be adopted in the following discussion for the purpose of distinguishing between the two observers. The subscript P will be used to designate the rest frame in which the measurement is carried out, whereas the subscript O will be used to designate the rest frame of the observer who uses the conversion factor to express the latter result in his units.

Accordingly, eq. (1) becomes:

$$\Delta t_O \gamma(v_O) = \Delta t_P \gamma(v_P), \tag{1'}$$

while the definition of Q is $\gamma(v_P)/\gamma(v_O)$. If the tables are reversed, so that the measurement is carried out in rest frame O and evaluated by the observer in P, the corresponding conversion factor is just the reciprocal of the original (Q'=1/Q). This is the analogous relationship for conversion factors in general, such as between ft and m or lb and kg. Note that the aforementioned reciprocal relationship arises naturally upon reversal of the roles of object and observer namely, as $Q'=\gamma(v_O)/\gamma(v_P)=1/Q$.

It is important to emphasize that eq. (1) has not been derived from first principles. Rather is a concise summary for the timing results of the HK experiment with atomic clocks

[1,2]. An earlier experiment carried out by Hay et. al. [11] serves as an additional verification, however. These authors used a high-speed rotor on which both an x-ray source and detector were mounted. They found that when the source was located at the origin while the detector as located at the edge of the rotor, the observed x-ray frequency was *blue-shifted*. This result runs contrary to Einstein's prediction [1] that light must always be red-shifted for an observer. The same result was obtained in other experiments carried out somewhat later [12-13]. Hay et al. invoked Einstein's Equivalence Principle [9] to explain the apparent discrepancy with Einstein's prediction. However, the HK results prove that this argument is specious. The blue shift is explained quantitatively on the basis of eq. (1) because it predicts that the detector must obtain a shorter period of radiation since it is moving faster than the x-ray source at the axis. The agreement is quantitative. Sherwin emphasized in a paper published shortly thereafter [14] that the blue-shifted frequency is certainly inconsistent with Einstein's belief in symmetric time dilation.

There has never been a violation of eq. (1) and so it deserves the designation of Universal Time-dilation Law (UTDL) [15]. Einstein's qualitative prediction that clocks must run slower at the earth's Equator than at its Poles because the speed of rotation relative to the ECM is greater at the Equator also agrees with the UTDL. These different verifications emphasize that one must designate a rest frame relative to which the speeds in the γ factors are determined. In previous work this has been referred to as the *objective rest system* (ORS).

In the cases discussed above, both O and P have the same ORS. When this is not the case, it is still possible to use the UTDL of eq. (1') to evaluate Q. Consider, for example, the situation when P is a satellite in orbit around the moon and O is the observer located on the earth's surface. The ORS of the latter is the ECM, whereas that for the satellite can be safely assumed to be the moon's center of mass. The first step is to calculate a partial value Q1 by assigning P to the moon and using the known speed of the moon v_M relative to the ECM in applying the UTDL in the standard way, i.e.$Q1=\gamma(v_M)/\gamma(v_O)$. Then calculate the value Q2 for the conversion factor between the units of the satellite and the moon's ECM by inserting the orbital speed v_S of the former in the UTDL. The result is $Q2=\gamma(v_S)$, whereby it is assumed that the moon's center of mass is its own ORS so that the appropriate value of the speed to be inserted in this case in the γ factor is 0. The total value of Q is thus the product Q1Q2. This means that the time dilation connected with the moon is simply cancelled out in the calculation. First, the slowing down of the hypothetical moon clock is taken into account and this effect is then passed on to the clocks on the satellite, which slow down even more.

In principle this "bootstrapping" technique can be applied multiple times using the UTDL to capture the overall effect. One simply needs to know what the ORS is in each step, as well as of course the values of the appropriate relative speeds. Note also that the reciprocal rule for computing the associated "reversed roles" conversion also holds in this application, namely Q'=Q1'Q2'=(1/Q1)(1/Q2)=1/Q.

III. Uniform Scaling of Physical Properties Other Than Time.

The realization that there is a conversion factor for the values of measured elapsed times obtained in different rest frames raises the question of whether analogous conversion factors exist for other physical properties. To this end it is important to underscore the point made in the Introduction that the speed of light in free space *relative its source* is the same for all observers located at the same gravitational potential. *This means that the unit of speed must be the same in all rest frames.* Therefore, since the unit of time varies between rest frames, it follows that *the unit of distance must vary in exactly the same proportion* in order to satisfy the light-constancy postulate. In other words, *the unit of distance must also scale by the same factor of Q.* Moreover, experiments carried out with electrons in the presence of a magnetic field [17] indicate that inertial masses increase with acceleration in direct proportion to the values of lifetimes. For this to occur, it is also necessary that *inertial mass scales with Q*.

Inertial mass, time and distance are the three fundamental mechanical quantities in terms of which all other physical quantities are defined. This is the basis for the establishment of the mks system of units, for example. As a result, one can determine the appropriate conversion factor for any property simply from knowledge of composition in terms of distance, inertial mass and time. For example, it is clear from this consideration that the conversion factor for speed is unity (or Q^0) since it is the ratio of distance traveled to elapsed time, as already discussed. In other words, this conversion factor is obtained as Q/Q=1.

Consider energy E as a further example. It has units of inertial mass multiplied with the square of speed. Therefore, the appropriate conversion factor is $QxQ^0 = Q$. Force F has units of energy divided by distance and so its conversion factor is unity or Q^0. The conversion factor for frequency ν is just the reciprocal of that for elapsed time, i.e. Q^{-1}. It is evident that all other conversion factors must be integral multiples of Q. For example, angular momentum has units of kgm^2s, thus its conversion factor is $QxQ^2xQ^{-1}=Q^2$. Another way to obtain the conversion factor for F is to consider its definition as a product of inertial mass and acceleration. The latter has units of distance divided by seconds squared, so the conversion factor is Q^{-1}, which means that the conversion factor for F is unity/Q^0 by this route as well. The factor for momentum p =mv is also Q, so Newton's Second Law, F=dp/dt, is also conserved by uniform scaling (0=1-1).

More generally, the laws of physics are equations which are balanced with respect to the units in which they are expressed. The Uniform Scaling procedure thus guarantees that the laws of physics are the same in all inertial systems, in accord with Galileo's Relativity Principle. It can therefore be amended [17] to read: *The laws of physics are the same in all inertial systems but the units in which they are expressed differ from one state of motion to anoth*er. A collection of conversion factors for many other physical properties may be found elsewhere [19,20].

IV. Gravitational Scale Factors

The atomic clock experiments on airplanes [1,2] also provide valuable information about the manner in which gravity affects the timing results. These authors assumed that Einstein's red shift prediction [9] can account quantitatively for the gravitational effects on the atomic clocks. The situation is very similar to what has been discussed in Sect. II, namely that the unit of time differs from one rest frame to another. It is easy to see how the gravitational effect is determined by considering how the energy of an object changes with its position in a gravitational field. It is assumed that an object with rest mass m has an energy equal to the relativistic value of mc^2 for a local observer, but that the corresponding value for another observer located at a vertical distance of h *below* the object is greater by mgh, where $g=GM_E/r^2$ ($G= 6.67x10^{-11}$ m^3/kgs^2 is the Universal Gravitational Constant). The interpretation is therefore that the unit of energy is $S=(mgh+mc^2)/mc^2=1+ gh/c^2$ times greater at the higher potential, i.e. S is a conversion factor between the two units of energy.

It is found that the same factor applies to light frequencies. This is the cause of the gravitational red shift of light frequencies emitted near the surface of the Sun [9]. Since the distance r between the Earth and the Sun is far greater than h in the case discussed first, the change in the value of g over this range must be taken into account by integration over small increments of distance [21]. The result is $S=1-GM_s/c^2r=1–2.122x10^{-6}$, i.e. S<1 in this case from the standpoint of an observer on the Earth's surface, where r is the radius of the chromosphere of the Sun (6.96×10^8 m) and M_s is the gravitational mass of the Sun (1.99×10^{30} kg). In the analogous notation used for kinetic effects, the value in the general case is:

$$S = \frac{1 + \frac{GM_s}{c^2 r_O}}{1 + \frac{GM_s}{c^2 r_P}} = \frac{A_O}{A_P}, \tag{3}$$

i.e. where the observer is located at position O ($r_O = \infty$ in the present case) while the object is at position P($r_P = r$).

It is important to see that eq. (3) leads directly to the local conversion factor $1 + gh/c^2$. In this case, $r_O = r$ is the distance from the Earth's surface and $r_P = r+h$ is the larger corresponding value for the object located at higher altitude. Thus

$$S = \frac{1 + \frac{GME}{c^2 r}}{1 + \frac{GME}{c^2 (r+h)}}. \tag{4}$$

Upon using the $1/(1+x) \approx 1-x$ approximation for small values of x, and noting that $r+h \approx r$, one obtains:

$$S = \frac{1 + \frac{GM_E}{c^2 (r+h-r)}}{r^2} = 1 + \frac{gh}{c^2}, \tag{5}$$

since $g = GM_E/r^2$.

The definition of S in eq. (3) is consistent with the general requirement for conversion factors that their "reversed role" counterpart is the reciprocal of that in the forward direction. Interchanging O and P gives S'=1/S, just as doing this for the kinetic scale factor leads to the analogous relationship discussed in connection with eq. (1'), i.e. Q'=1/Q.

In some ways, the determination of the gravitational scale factor is easier to accomplish that its kinetic counterpart. For one thing, one doesn't have to search for a reference rest frame (ORS). There is only a single mass needed to evaluate S in eq. (3), so one just needs to know the appropriate distances between it and the two rest frames in this case. There may be more than a single active mass, however, as is the case for the example given for calculation of the gravitational red shift of light frequencies emitted from the Sun. The influence of the Earth on S can be calculated using eq. (3) as well, simply by substituting the Earth's mass for the Sun's. In this case r_O and r_P are distances from the ECM. Thus the partial value for the Earth is greater than unity in this case, thereby canceling out a portion of the effect of the Sun on the frequencies. The total value of S for both masses is then simply *the product of the* *individual S values*, The product can theoretically run over all the masses in the universe, whereby obviously most of the partial S values are simply equal to unity and thus do not affect the total product in any way. Note also that the "reciprocal rule" holds for the total value of the "reversed-role" S'=1/S as well.

It has already been indicated that S is the appropriate scale factor for both energy and light frequencies. Einstein [9,22] used the Doppler effect to arrive at this conclusion. It is ultimately based on results of the special relativity theory [3] and the Equivalence Principle, both of which have been shown to be faulty based on the atomic clock experiments with circumnavigating airplanes [1,2]. He also noted that the proportionality of energy and light frequency is consistent with Planck's E=hν relation [23]. For this it is also necessary to assume that h is independent of gravitational potential, which in turn means that angular momentum P is invariant as well, since it has the same unit (Js). Finally, Einstein concluded [9,24] that the speed of light c is nit invariant, but rather scales with the same factor S as E=energy and light frequency. This result led him to further conclude that light is bent as it passes by the Sun.

It is important to note that it has been demonstrated quantitatively that the rates of atomic clocks change with gravitational potential in the above manner. This is evident from experiments in which the rates of atomic clocks located at different gravitational potentials are compared over large periods of time [25]. Shapiro's investigations [26] of radio waves passing by Jupiter also confirm the above result for the decrease in light speed with increasing gravitational potential.

Based strictly on the above experimental results for the scaling of time/frequency and the speed of light in free space, it is possible to make a few additional predictions for other properties. For example, *distance L must be independent of gravitational potential* based on the definition of speed as the ratio of distance traveled to elapsed time, i.e. L scales as S^0=S (for speed) multiplied with S^{-1} (for time). The last of the three fundamental properties, inertial mass m, must have the same conversion factor (S^{-1}) based on the definition of energy E, which scales as S, as the product of inertial mass and the square of relative speed (S^2). The result for energy can be deduced from the E = mgh formula from classical gravitational theory/measurement. It is also consistent with Einstein's $E=mc^2$ mass/energy equivalence relationship. It is important to note, however, that gravitational mass m_G is distinct from inertial mass. It is independent of gravitational potential and therefore scales as S^0. It also scales as Q^0, since it is unchanged by acceleration.

As kinetic scaling, once the conversion factors have been determined for the three fundamental quantities, distance, inertial mass and time, it is possible to calculate the corresponding value for any other physical property. A few examples will suffice. Linear momentum p =mv is invariant since m scales as S^{-1} and v as S. Force F is equal to dp/dt, so it scales as S, i.e. the exponent is obtained as the quotient of 0 for p and -1 for t. Acceleration (dv/dt) scales as S^2 (1/-1), so F=ma= again is found to scale as S. In agreement with Einstein's assumption [9], angular momentum P=mvL and Planck's constant h scale as S^0 since the appropriate exponent sum is -1+1+0. Further applications of gravitational scaling are discussed elsewhere [27,28].

It is also possible to obtain both kinetic and gravitational scaling factors for electromagnetic properties. This possible because of a degree of freedom in Coulomb's Law (q_1 and q_2 are electric charges, r is the distance between them and ε_0 is the electric permittivity): $F=q_1q_2/4\pi\varepsilon_0r^2$. Note that q_1q_2/ε_0 must have units of Nm^2 in order for the value of the force F to be in N. This can be arranged in many different ways [29,30]. One attractive example is to designate the unit of electric charge to be the same as for energy J=Nm, while that of the electric permittivity is N, It is also necessary to assign the unit of magnetic permittivity μ_0 in order to allow electromagnetic properties to have standard mks units. This is done by using Maxwell's Law; $\varepsilon_0\mu_0 c^2=1$. Accordingly, μ_0 has the unit of s^2/Nm^2. Once these assignments have been made, all that is necessary in order to determine the appropriate kinetic and gravitational scale vectors for a given electromagnetic property is to make the change to exclusively mks units and scale accordingly.

V. Combined Kinetic and Gravitational Scaling

One of the most important, and yet widely overlooked, result of the Hafele-Keating circumnavigating atomic clock experiment [1,2] is the fact that their analysis of the timing results is based on the assumption that the effects of motion on the rates of the clocks can be treated in a completely *separate* manner from the corresponding effects of gravity. In effect, what they did was to use both the kinetic and gravitational conversion factors for time discussed above, and simply add the two results to arrive at their successful predictions. This approach is antithetical to the Equivalence Principle [9], which assumes that a gravitational field is always generated by the kinetic acceleration of an object. The attempt to explain the blue shift of x-ray radiation observed at the rim of the rotor in the Hay et al. experiment [11-13] is proof that the EP assumption is false in this case, as Sherwin [14] concluded shortly thereafter. The HK experiment shows explicitly that it is not correct to apply the EP in the rotor experiment, since it would amount to assuming that the actual kinetic effect must be ignored entirely in order to obtain a quantitatively correct prediction of the observed blue shift.

The complete separation of kinetic and gravitational effects has an important consequence for the Uniform Scaling method. It is possible to define a *total conversion factor* Z (X) for every physical property X that accounts simultaneously for both the kinetic and gravitational effects in each case. The corresponding values of Z (X) for the fundamental physical properties of inertial mass, distance and time are given below:

$$\begin{gathered} \mathrm{Z}\left(\text{Inertial Mass, kg}\right) = \frac{\mathrm{Q}}{\mathrm{S}} \\ \mathrm{Z}\left(\text{Time, s}\right) = \frac{\mathrm{Q}}{\mathrm{S}} \\ \mathrm{Z}\left(\text{Distance, m}\right) = \mathrm{Q} \end{gathered} \tag{6}$$

As discussed above these conversion factors are all that one needs to define corresponding values for other properties including electromagnetic quantities.
A sample of these total conversion factors are given below:

$$\begin{gathered} \mathrm{Z}\left(\text{Energy, J}\right) = \mathrm{QS} \\ \mathrm{Z}\left(\text{Frequency, } \nu\right) = \frac{\mathrm{S}}{\mathrm{Q}} \\ \mathrm{Z}\left(\text{Speed, c}\right) = \mathrm{S} \\ \mathrm{Z}\left(\text{Linear Momentum}\right) = \mathrm{Q} \\ \mathrm{Z}\left(\text{Angular Momentum, h}\right) = \mathrm{Q}^2 \\ \mathrm{Z}\left(\text{Force}\right) = \mathrm{S} \\ \mathrm{Z}\left(\text{Linear Acceleration}\right) = \frac{\mathrm{S}^2}{\mathrm{Q}} \\ \mathrm{Z}\left(\text{Coulomb}\right) = \mathrm{QS} \\ \mathrm{Z}\left(\text{Electrical Permittivity } \varepsilon_0\right) = \mathrm{S} \\ \mathrm{Z}\left(\text{Magnetic Permittivity } \mu_0\right) = \mathrm{S}^{-3} \end{gathered} \tag{7}$$

Uniform Scaling can also be employed to compute the trajectories of both light and objects with non-zero rest mass [31]. The conversion factors of the key properties [32] are listed below:

$$\begin{gathered} Z\left(\text{Gravitational Acceleration g}\right) = Q^{-2}S^{-3} \\ Z\left(\text{Radial Velocity}\right) = S^{2} \\ Z\left(\text{Radial Distance}\right) = QS \\ Z\left(\text{Gravitational Mass } m_{G}\right) = 1 \\ Z\left(\text{Gravitational Constant G}\right) = 1 \end{gathered} \tag{8}$$

VI. Conclusion

The underlying principle of the Uniform Scaling method is that the only reason two observers in different rest frames can obtain different values for the same measurement, aside from errors in carrying out their respective investigations, is because they use different units in which to express the results. This is the Principle of Objective Measurement (PRM). This is a matter of consequence in relativity theory because the physical properties of an object are known to vary when either its state of motion or position in a gravitational field changes. As a result, in order to make their findings perfectly compatible with one another, it is essential that each observer in one rest frame knows the values of numerical factors which enable the conversion of any given quantity to the corresponding units employed in the other rest frame.

By examining the results of many experiments, and also paying attention to various conclusions that have been reached in theoretical physics over time, it is possible to define a unique conversion factor between any two rest frames for any physical property. The values of these conversion factors have been shown to depend on two numerical quantities, one for the effects of motion (Q) and the other for the corresponding effects of gravity (S), both of which can be easily calculated on the basis of a small amount of information.

The Uniform Scaling method is closely allied with Galileo’s Relativity Principle (RP). It has been shown to preserve the laws of physics in its application to any rest frame. The relationship can be emphasized by making an addendum to the RP whereby the laws of physics are the same in all inertial frames, but with the proviso that the units in which the various laws are expressed vary with the states of motion and position in a gravitational field of the object of any given measurement. For any observer there is a unique value of the two fundamental scaling parameters Q and S for each rest frame in the universe. On this basis it is possible to determine the values of all conversion factors for each physical property.

The scaling of time is consistent with the proportionality relationship given in eq. (2) and which is referred to in the text as Newtonian Simultaneity. It is thereupon impossible for observers in different rest frames to disagree on whether two events occurred at the same time or not. That situation has a clear consequence for the Lorentz transformation (LT) since it requires that there be remote non-simultaneity (RNS) under certain conditions. It also shows that the LT predictions of symmetric time dilation and FitzGerald Lorentz contraction are not correct.

The scaling procedures cannot be said to have been derived on the basis of so-called “First principles.” They are instead simply the result of gathering together all the measured results for a given property into a Law of Physics. The exact same situation holds for Newton’s Laws of Motion of the Laws of Thermodynamics. One of their main purposes is to provide the basis for carrying out new experiments which can at least theoretically show that they are not valid under all situations. For example, one could carry out many new investigations similar to those carried out by Hafele and Keating [1,2] for atomic clocks which are being transported to far-away locations at various speeds.

The method can also be used successfully to predict the trajectories of light and planets as they pass by heavy masses such as the Sun. This allows for a far less complicated theoretical treatment than is used in applying Einstein’s General Theory of Relativity that is no less accurate. A key component of the calculations in this case is the scaling of the acceleration due to gravity g as $Q^{-2}S^{-3}$, a point which was overlooked in Schiff’s landmark paper [32] on light bending/the displacement of star images during solar eclipses.

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