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Reply to 'Critical comments on the Paper "On the Logical Inconsistency of the Special Theory of Relativity" '

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Abstract

It has been critically argued by V. A. Leus (Sobolev Institute of Mathematics, Novosibirsk, Russia) that in my proof that Einstein's Special Theory of Relativity is logically inconsistent and therefore false, I violated the basic tenets of Special Relativity and foisted an alternative theory upon Einstein's. A careful study of the critical analysis reveals however a failure to address the key arguments I adduced to prove Special Relativity logically inconsistent, and a concomitant invocation of Einstein's theory to try to argue that my analysis is incorrect because it does not concur with Einstein. There is therefore no proof advanced of any alleged error in my analysis. In my paper I did not introduce an alternative theory. The aforementioned critical paper affords opportunity in rebuttal to amplify the invalidity of A. Einstein's tacit assumption, in constructing the Special Theory of Relativity, that systems of clock-synchronised stationary observers consistent with Lorentz Transformation can be mathematically constructed. Since such systems of observers have in fact no mathematical existence the Special Theory of Relativity is logically inconsistent. It is therefore invalid. The consequences for physics, astronomy, and cosmology, are significant.

Keywords

Special Relativity, Simultaneity, Stationary Observers, Clock-Synchronised Observers, Lorentz Transformation, Time.

1. Introduction

The recent critical paper [1] by V. A. Leus (*Journal of Applied Mathematics and Physics*) has not addressed the two key arguments I have adduced in [2] to prove logical inconsistency of Special Relativity. Instead, a comparison is made of conclusions I drew from my analysis with conclusions Einstein drew from his theory, concluding that my analysis is wrong because my conclusions do not concur with Einstein's. But that is the whole point: Einstein's conclusions are erroneous because his theory is logically inconsistent, despite its historical standing.

The two key arguments I adduced in [2] are:

(a) Einstein defined time by means of his clocks. However clocks do not define time. Clocks no more define time than a pressure gauge defines pressure, than a speedometer defines speed, than a graded spring defines gravity. Measuring instruments are invented to measure something other than themselves. Einstein's clocks measure only themselves. By defining time by means of his clocks, Einstein detached time from physical reality.

(b) Einstein's method of clock-synchronisation is certainly inconsistent with the Lorentz Transformation, recently proven by Engelhardt [3], the proof generalised by Crothers [4]. Why then is Einstein's method of clock- synchronisation inconsistent with the Lorentz Transformation? The answer to this question is given in my paper [2]: to wit, Einstein tacitly assumed that he can construct systems of clock-synchronised stationary observers consistent with Lorentz Transformation. His systems of observers can

contain any number of observers. However, in [2] I investigate Einstein's tacit assumption and prove that it is false by first explicitly constructing a system of stationary observers consistent with Lorentz Transformation, proving that these observers cannot be clock-synchronised. I then explicitly constructed a system of clock-synchronised observers consistent with Lorentz Transformation, proving that these observers cannot all be stationary. Therefore Einstein's tacit assumption is proven false, rendering his theory logically inconsistent and therefore invalid.

The paper [1] proceeds without any reference to these issues and essentially compares the consequences I drew from (a) and (b) above with the conclusions Einstein drew from his theory.

2. Systems of Stationary Observers and Lorentz Transformation

Figure 1 from [2] was reproduced in [1], along with its caption, which I reproduce here for convenience.

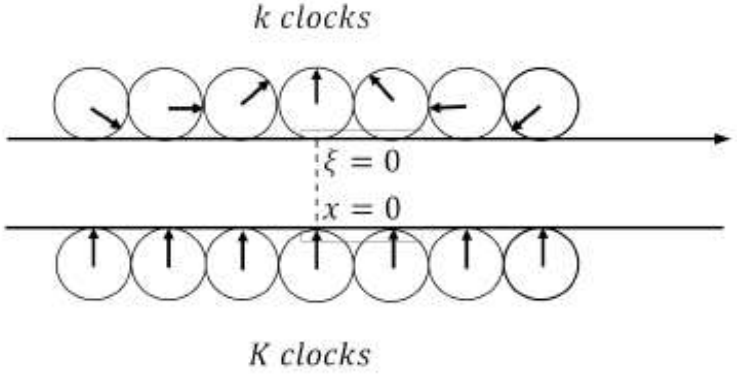

Figure 1. All the synchronised clocks in the 'stationary system' *K* read the same time at all positions in the *K* system. All the clocks in the 'moving system' *k* do not read the same time according to the *K* system, despite being synchronised with respect to the *k* system. Only at $x = \xi = 0$ do the clocks depicted read the same time in both systems, where $t = \tau = 0$.

In relation to this **Figure 1**, paper [1] purports quotation from [2]:

"*The Lorentz Transformation is the basis for Einstein's time dilation and length contraction. It is regarded in general by physicists [4, §12.1] that a stationary system of observers k which are clock-synchronised when at rest are not synchronised when they all move together with respect to a clock-synchronised 'stationary system' K, as illustrated in figure 1.*" [1 §1]

When compared with the actual passage in [2] it is immediately clear that the quotation above is a truncation, combined with an alteration from the plural to the singular. The passage from [2] reads as follows:

"*A system of clock-synchronised stationary observers and the Lorentz Transformation are the bases for Einstein's time dilation and length contraction. It is regarded in general by physicists [4, §12.1] that a stationary system of observers k which are clock-synchronised when at rest are not synchronised when they all move together with respect to a clock-synchronised 'stationary system' K, as illustrated in figure 1.*" [2 §2]

Note that Einstein's theory requires systems of clock-synchronised stationary observers and the Lorentz Transformation. This is the essence of his tacit assumption: that he can construct systems of clock-

synchronised stationary observers consistent with the Lorentz Transformation. It has been proven in [2] that such a construction is impossible. The passage in [1] has removed from the passage in [2], Einstein's requirement of a system of clock-synchronised stationary observers. The Lorentz Transformation of itself is not the basis for Einstein's time dilation and length contraction; systems of clock-synchronised stationary observers and the Lorentz Transformation are both required.

An objection to **Figure 1** above is raised with the following assertion:

"*The depicted drawing is rather bewildering than helpful. Nothing similar can be going on if the order established in the special relativity is strictly kept. A correct illustration is delineated in the Figure 2*." [1 §1]

I reproduce figure 2 from [1] for convenience:

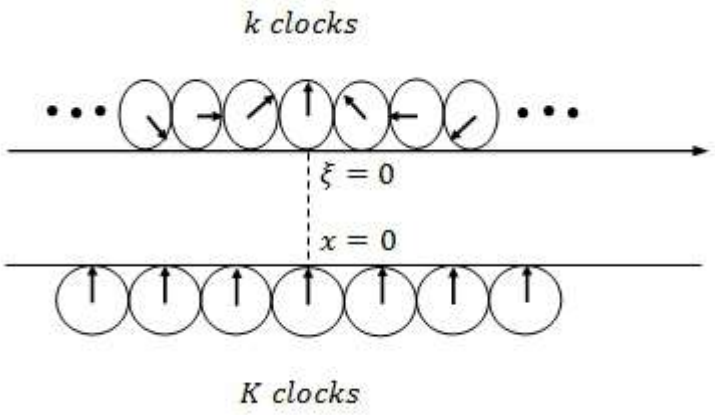

Figure 2. Situation viewed from the "stationary system".

The contraction of the clock faces into ellipses in the moving system is irrelevant to the issue, which is time, by Einstein's false definition thereof. Moreover, my **Figure 1** above is a standard representation drawn from the literature, including that of Einstein himself. Note the reference I supplied in the caption to my **Figure 1**. **Figure 1** is just a reconstruction of figure 12.18 in the cited reference there, "*[4, §12.1]*", which is now reference [5 §12.1] herein. In their book Einstein and Infeld [6 §III] present sections of **Figure 1** above, as follows:

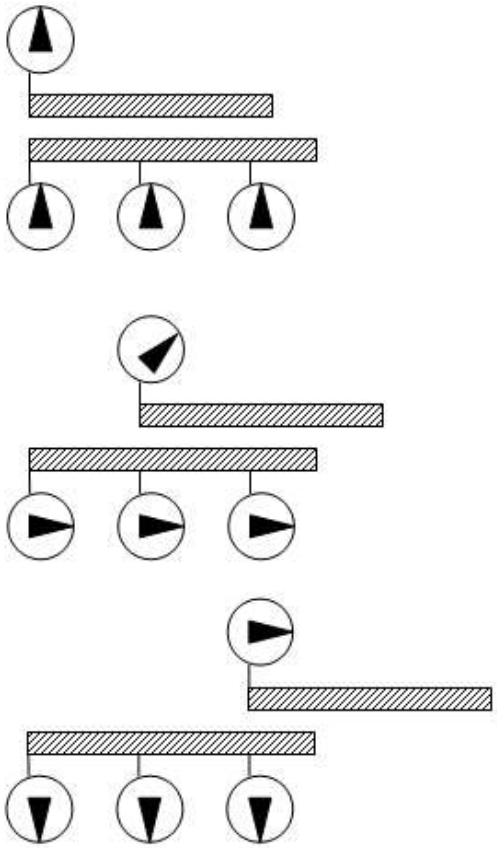

Figure 3. Einstein clocks constructed from Einstein and Infeld [6 §III].

The insinuation that I have drawn an inaccurate figure for relativist representations of Einstein's clocks is not correct. Moreover, the point is that all these diagrams depicting stationary and moving clocks are meaningless.

In [1 §1] there appears a quote from the caption of figure 1 in [2], reproduced above as **Figure 1**:

"*Only at* $x = \xi = 0$ *do the clocks depicted read the same time in both systems, where* $t = \tau = 0$."

A vague and protracted objection is raised in relation this condition. However, this condition is clearly evident in Einstein's **Figure 3** above, as well as in **Figure 1** above. Since Einstein defined time by means of his clocks and their dial readings, dial readings of certain clocks in the *K* and *k* systems can look the same at some stage in the relative motion depicted in the figures. This does not mean that the same time interval has been recorded by these clocks, because the clocks are periodic.

In [1 §1] it is asserted:

"*In the second section of his paper [1] the author considers a range of events occurring at positions* $x_{\sigma_i} = x_i$ *in different moments of time* t_i *, which are specified as follows*:

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$$t_{\sigma_i} = t_i = t_1 + \frac{(\sigma_i - 1)vx_1}{c^2}$$

where t_i *is at will.*"

This is not correct. The expressions that actually appear in [2 §2] are:

$$x_\sigma = \sigma x_1 , \tag{1}$$

$$t_\sigma = t_1 + \frac{(\sigma - 1)vx_1}{c^2} , \tag{2}$$

wherein $\sigma \in \Re$, $x_1 \neq 0$. Expressions (1) and (2) convey very different outcomes to those alleged in [1 §1]. The author of [1] has not addressed the right equations. The author's variable *i* does not even have a counterpart in expressions (1) and (2). The equations adduced in [1] are quite meaningless.

In relation to figure 3 in [1], for what the author calls a "*neutral point*", is the statement:

"*The time t = T is elapsed in the K system, so the origin of the k system* $\xi_o = 0$ *is located at the point x = vT. The event* (x_n, t_n)*, where* $x_n = \gamma vT/(\gamma + 1)$*,* $t_n = T$*, is subject to the Lorentz Transformation (1):*" [1 §1]

The term x_n is the author's "*neutral point*". The term ξ_o and Eqs. (1) in [1 §1] implicate the expressions I adduced in [2 §2] for systems of stationary observers consistent with the Lorentz Transformation, namely:

$$\begin{aligned}
&\tau = \beta\left(t_\sigma - vx_\sigma / c^2\right), \\
&x_\sigma = \sigma x_1 , \\
&\xi_\sigma = \beta\left(x_\sigma - vt_\sigma\right) = \beta\left[\left(\frac{\sigma}{\beta^2} + \frac{v^2}{c^2}\right)x_1 - vt_1\right], \\
&t_\sigma = t_1 + \frac{(\sigma - 1)vx_1}{c^2}, \\
&\eta = y, \\
&\varsigma = z, \\
&\beta = 1/\sqrt{1 - v^2/c^2} , \\
&\sigma \in \Re.
\end{aligned} \tag{3}$$

However, "*The time t = T is elapsed in the K system*" is inconsistent with Eqs. (3) above, because there is no common time *t* for the stationary observers of Eqs. (3) – they cannot be clock-synchronised, contrary to Einstein's tacit assumption. The "*time t = T is elapsed in the K system*" is in fact just Einstein's common time by his false tacit assumption. Furthermore, the 'neutral point' x_n is moving:

"*The neutral point is moving along the x-axis in positive direction with speed* $v_n^x = v\gamma/(\lambda+1)$." [1 §1]

None of the observers x_σ in Eqs.(3) are moving – they are all stationary by mathematical construction (none are functions of time). The 'neutral point' argument simply invokes Einstein's Special Theory of Relativity, which is already proven false by Eqs.(3). There is nothing in the arguments in [1] levelled against Eqs.(3) above that prove them inconsistent with Lorentz Transformation or inconsistent with Lorentz invariance. These crucial issues are not even addressed.

3. Systems of Clock-Synchronised Stationary Observers and Lorentz Transformation

Paper [1 §2] quotes from [2]:

"*Either way, Einstein's system of clock-synchronised stationary observers is inconsistent with the Lorentz Transformation.*" [2 §2]

The following remarks then appear:

"*This conclusion is fatally wrong. The very notions "stationary-moving" are quite relative: from the point of view of any* K*-observer the* K *system is stationary and the* k *system is in motion, but from the point of view of any* k*-observer the* k *system is stationary and the* K *system is the moving one*." [1 §2]

This passage clearly attests that neither my arguments nor those of Einstein have been understood by the author. Einstein's systems *K* and *k* of clock-synchronised stationary observers are each clock-synchronised and stationary with respect to themselves. Einstein then sets his system *k* of clock-synchronised stationary observers into motion with respect to his system *K* of clock-synchronised stationary observers; his system *K* he calls 'the stationary system':

"*Now, however, as we know how to judge whether two, or more, clocks show the same time simultaneously and run in the same way, we can very well imagine as many clocks as we like in a given CS. Each of them will help us to determine the time of events happening in its immediate vicinity. The clocks are all at rest relative to the CS. They are 'good' clocks and are synchronized, which means that they show the same time simultaneously*." [6 §III]

"*It is essential to have time defined by means of stationary clocks in the stationary system, and the time now defined being appropriate to the stationary system we call it 'the time of the stationary system'*." [7 §1]

"*Now to the origin of one of the two systems (k) let a constant velocity v be imparted in the direction of the increasing x of the other stationary system (K), and let this velocity be communicated to the axes of the co-ordinates, the relevant measuring rod, and the clocks*." [7 §3]

It is plainly evident that Einstein's systems of observers *K* and *k* are each clock-synchronised and stationary. That one system is then set into constant rectilinear parallel motion with respect to the other system does not alter this. Einstein's moving system of clock-synchronised stationary observers is *k* and his stationary system of clock-synchronised stationary observers is *K*. There is a difference between

systems of clock-synchronised stationary observers and the relative motion of such systems, which has not been recognised in [1]. Note also that Einstein asserts that time is defined "*by means of stationary clocks in the stationary system.*" This is fundamentally incorrect - clocks do not define time.

I repeat, for emphasis, the objection in [1] to my statement that Einstein's system of clock-synchronised stationary observers is inconsistent with the Lorentz Transformation:

"*This conclusion is fatally wrong.*" [1 §2]

However, my statement is correct. Engelhardt [3] proved that Einstein's method of clock-synchronisation is inconsistent with the Lorentz Transformation. I generalised his proof [4] from $t = 0$ to $t \geq 0$, Einstein's entire time domain. Einstein synchronised his clocks for both his 'stationary system *K*' and his 'moving system *k*':

"*We have so far defined only an 'A time' and a 'B time.' We have not defined a common 'time' for A and B, for the latter cannot be defined at all unless we establish by definition that the 'time' required by light to travel from A to B equals the 'time' it requires to travel from B to A. Let a ray of light start at the direction of A, and arrive again at A at the 'A time'* t'_A.

"*In accordance with definition the two clocks synchronize if*

$$t_B - t_A = t'_A - t_B .$$" [7, §1]

"*... let the time t of the stationary system be determined for all points thereof at which there are clocks by means of light signals in the manner indicated in §1; similarly let the time τ of the moving system be determined for all points of the moving system at which there are clocks at rest relatively to that system by applying the method, given in §1, of light signals between the points at which the latter clocks are located.*

"*To any system of values x, y, z, t, which completely defines the place and time of an event in the stationary system, there belongs a system of values ξ, η, ζ, τ, determining that event relatively to the system k ...*" [7, §3]

Einstein began running his clocks from $t = \tau = 0$, at $x = \xi = 0$:

"*At the time* $t = \tau = 0$*, when the origin of the co-ordinates is common to the two systems, let a spherical wave be emitted therefrom, and be propagated with the velocity c in system K."* [7, §3]

He then produced the Lorentz Transformation:

$$\begin{aligned}\tau &= \beta\left(t - vx/c^2\right),\\ \xi &= \beta(x - vt),\\ \eta &= y,\\ \varsigma &= z,\\ \beta &= 1/\sqrt{1 - v^2/c^2}\,,\end{aligned} \tag{4}$$

where x, y, z, t, pertain to his 'stationary system'. Elimination of x from Eqs.(4) gives:

$$\tau = \frac{t}{\beta} - \frac{\xi v}{c^2}\,. \tag{5}$$

Setting $\tau = 0$ yields:

$$\xi = \frac{tc^2}{\beta v}\,. \tag{6}$$

Thus, for every $t > 0$ of the 'stationary system K' there exists a point $\xi \neq 0$ in the 'moving system k' where $\tau = 0$. However, according to Einstein's clock-synchronisation method this is impossible because all clocks in his moving system k are synchronised, so that when $t > 0$, $\tau > 0$ too. Thus, Einstein's clock-synchronisation method is inconsistent with the Lorentz Transformation [2, 3, 4].

Systems of stationary observers consistent with the Lorentz Transformation cannot be clock-synchronised. In §5 of [2] I mathematically constructed a set of clock-synchronised observers consistent with the Lorentz Transformation, proving thereby that they cannot all be stationary observers. Systems of clock-synchronised stationary observers consistent with the Lorentz Transformation cannot be mathematically constructed. Einstein's tacit assumption that they can be mathematically constructed is false, yet they are essential to his theory. Therefore his Theory of Relativity is false because it contains an insurmountable logical inconsistency.

In §3 of [2] I drew conclusions as to lengths of moving rods in relation to systems of stationary observers consistent with the Lorentz Transformation. I proved there that systems of stationary observers consistent with the Lorentz Transformation observe length extension, not length contraction. In [1] an objection is raised to this deduction, with the following:

"*Then in the section 3 the author addresses the procedure of length measurement. There is a thin rigid rod fixed along the abscissa ξ in his own k system. Let (ξ_1, τ_1) and (ξ_2, τ_2) be the simultaneous event ($\tau_1 = \tau_2 = \tau$) of measurement the location of its two ends, so that the rod's length is $L_\xi = \xi_2 - \xi_1$. The inverse Lorentz transformation gives us these events viewed from the K system:*

$$(x_1, t_1) = \left[\lambda(\xi_1 + v\tau), \gamma\left(\tau + \frac{v}{c^2}\xi_1\right)\right];\quad (x_2, t_2) = \left[\lambda(\xi_2 + v\tau), \lambda\left(\tau + \frac{v}{c^2}\xi_2\right)\right].$$

Here the procedure of measurement lost its simultaneity. Thus, the value $(x_2 - x_1) \neq L_x$ because the rod has shifted during the time interval $(t_2 - t_1)$ for the distance $\Delta L = v(t_2 - t_1)$. In this case the real rod's length would be

$$L_x = (x_2 - x_1) - \Delta L = \gamma(\xi_2 - \xi_1) - \gamma\frac{v^2}{c^2}(\xi_2 - \xi_1) = \gamma\left(1 - \frac{v^2}{c^2}\right)(\xi_2 - \xi_1) = \frac{L_\xi}{\gamma}.$$

The rod is contracted by the factor γ despite the author's assertion." [1 §2]

This is not correct. The objection is merely Einstein's theory, as the common time "($\tau_1 = \tau_2 = \tau$)" immediately attests. However, relative to the system k the times τ_1 and τ_2 cannot be equal because, by Eqs.(3), a system of stationary observers consistent with the Lorentz Transformation cannot be clock-synchronised. The inverse Lorentz Transformation adduced in [2] for a system of stationary observers is:

$$\begin{aligned}
&t = \beta\left(\tau_\sigma + v\xi_\sigma / c^2\right),\\
&\xi_\sigma = \sigma\xi_{1,}\\
&x_\sigma = \beta\left(\xi_\sigma + v\tau_\sigma\right) = \beta\left[\left(\frac{\sigma}{\beta^2} + \frac{v^2}{c^2}\right)\xi_1 + v\tau_1\right],\\
&\tau_\sigma = \tau_1 - \frac{(\sigma - 1)v\xi_1}{c^2},\\
&y = \eta,\\
&z = \varsigma,\\
&\beta = 1/\sqrt{1 - v^2/c^2},\\
&\sigma \in \Re.
\end{aligned} \tag{7}$$

Neither Eqs.(3) nor Eqs.(7) have been directly addressed in [1]. Instead, Einstein's theory has been employed to argue that Eqs. (3) and Eqs.(7) must be wrong because they do not concur with Einstein's theory. But, again, that is the very point: Einstein's tacit assumption that he can construct systems of clock-synchronised stationary observers consistent with the Lorentz Transformation is false, so his theory is logically inconsistent. His theory is not consistent with the Lorentz Transformation. Equations (3) and (7) are consistent with the Lorentz Transformation. It is therefore to be expected that Eqs.(3) and Eqs.(7) do not concur with Einstein's theory. Consider two identical rigid rods; to each one attached a coordinate system. When there is no relative motion the length of each rigid rod is l_0, as shown in **Figure 4**.

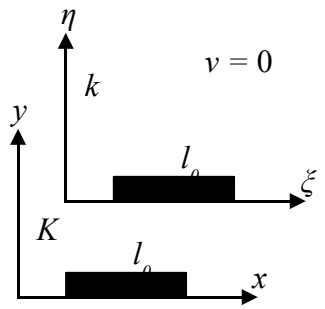

Figure 4. The two systems of stationary observers K and k are 'at rest'. The relative speed is $v = 0$. The rod in each system has exactly the same length l_0.

Now, following Einstein, impart constant motion at speed $v > 0$ to the system k as in **Figure 5**. The moving rod attached to the 'moving' system k, as perceived by the stationary observers in the 'stationary' system K, has a length Δx and the rod in K has the length l_0 according to observers in K.

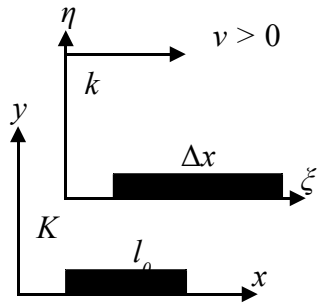

Figure 5. The system of stationary observers k and its rod are moving with constant speed $v > 0$. According to the stationary system of stationary observers K the moving rod has length $\Delta x > l_0$. According to the observers in system k the rod in k has length l_0.

By Eqs. (3) above,

$$\Delta x = \beta l_0 = \frac{l_0}{\sqrt{1-\frac{v^2}{c^2}}}. \tag{8}$$

Thus, the moving rod is longer than the stationary rod. Einstein however maintained that the moving rod is shorter than the stationary rod, owing to his false assumption.

In [2 §4] I showed that although no observer in the stationary system K of stationary observers is clock-synchronised, every observer x_σ of the stationary system K observes the same time interval in K and the same time-dilated interval as Einstein in the moving system of stationary observers k, but they do so at the expense of length contraction and of clock-synchronised stationary observers, which is irreconcilable with Einstein's theory. The entire objection to this is simply:

"*In section 4 the author manipulates with a time interval.*" [1 §2]

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A derivation of Einstein's time-dilation is then presented in [1] to obtain the very same relation obtained in [2].

4. Alternative Theory

Section 3 of [1] opens with these two sentences:

"*The further analysis of the article would be senseless because it just seems to criticize the special relativity theory. The author neglects basic tenets of the SRT, foists his own and confuses this makeshift "theory" with Einstein's creature."* [1 §3]

That [2] refutes Special Relativity is no basis for rejection of the refutation. The allegation that I neglect the "*basic tenets of the SRT*" is simply not true, for it is the basic tenets of SRT that I prove to be false, owing to inherent logical inconsistency. I advanced no theory of my own.

5. Conclusions

No proofs are adduced in [1] of any alleged errors in [2].

Clocks do not define time. Clocks no more define time than a pressure gauge defines pressure or a speedometer defines speed, or a graded spring defines gravity [8].

Einstein's Special Theory of Relativity is certainly inconsistent with Lorentz Transformation. The reason why is somewhat subtle: Einstein's tacit assumption that he can construct systems of clock-synchronised stationary observers consistent with the Lorentz Transformation is false [2, 8].

The Special Theory of Relativity is logically inconsistent. Therefore it is false. The Lorentz Transformation is meaningless.

The consequences for physics, astronomy, and cosmology, are profound. All aspects of theoretical physics where the Theory of Relativity has been employed must be re-examined because they cannot hold good. Certain consequences have already been explored [9-22].

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