

Critical mathematical analysis of the Special Theory of Relativity

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Abstract - This article attempts to prove that Einstein obtained his transformation formulas by applying striking manipulative mathematics.

1 Introduction

It is quite easy to show, using a highly compressed text, what essentially makes Einstein suspicious regarding the said charge.

Einstein defines the relation between x , x' and v as $x' = x - vt$, with x an arbitrary time independent position at the x -axis of K , x' its projection at the x -axis of k and v the velocity between K and k .

In § 3 of his article he defines the principle relation between x , y , z , t and ξ , η , ζ , τ as follows:

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 , and our task is now to find the system of equations connecting these quantities.

Surprisingly, he next defines $\xi = ct$, emphasized by his statement:

But the ray moves relatively to the initial point of k , when measured in the stationary system, with the velocity $c-v$, so that $x'/(c-v) = t$.

Writing $x'/(c-v) = t$ as $x' = ct - vt$, shows that the definition of x (time independent) has also been changed into $x = ct$, just like the definition of ξ has been changed in the same manner.

Einstein applies this $x' = ct - vt$ in the first version of intermediate expressions for τ and ξ , but returns to $x' = x - vt$, in order to arrive at its second version.

So he effectively used $x = ct$ only for a while, to be qualified as shocking unscientific behaviour.

Section 2 shows in detail that Einstein's mistakes are so extremely obvious that one can hardly believe that he didn't make them purposely.

Section 3 shows that the scientific establishment changed, after his death, Einstein's hypothesis regarding the speed of light fundamentally, but that it maintained, uncriticized, the result of his theory.

2 Einstein's unpardonable mistakes

If Einstein would not have made these mistakes he would not have succeeded in presenting his consistent transformation formulas. 'Consistent' regarding the following property: after having transformed the coordinates x and t from system K to system k (k moves with velocity v relative to K), the original coordinates in K are found again applying the same formulas with the appropriate variables from k to K . The mistakes will be shown in the italic texts copied from ref [1], being a correct translation of ref [2].

Einstein defined the velocity v as follows:

Now to the origin of one of the two systems (k) let a constant velocity v be imparted in the direction of 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....

At the start of § 3 in his article, he writes:

If we place $x' = x - vt$, it is clear that a point at rest in the system k must have a system of values x' , y , z , independent of time.

This is a contradiction in itself, because $x' = x - vt$ shows that x' is a function of time. Unless x would be $x_0 + vt$, with x_0 independent of time! So the question is: what has x been meant to be?

To answer this question the final result of the STR has to be considered, especially: $\xi = \beta(x - vt)$.

Suppose $x = x_0 + vt$, then ξ would be βx_0 . This has, for sure, not been the purpose of the STR. The transformation $\xi = \beta(x - vt)$ can, given the relation $x' = x - vt$, be written as $\xi = \beta x'$. This result is in accordance with the purpose of the STR, meant to show that, due to the velocity v between k and K , the projection of x in k is not just x' , but an enhanced value $\beta x'$, given the fact that $\beta = 1/\sqrt{1-v^2/c^2}$.

The words ‘independent of time’ in his text: “a system of values x', y, z , independent of time” will be ignored.

Since τ is a linear function, it follows from these equations that

$$\tau = a \{t - vx' / (c^2 - v^2)\}$$

where a is a function $\varphi(v)$ at present unknown, and where for brevity it is assumed that at the origin of k , $\tau=0$, when $t=0$.

Considering the remark: ‘it is assumed that at the origin of k , $\tau=0$, when $t=0$ ’ one has to conclude that for $t = 0$ the variable $x' = x - vt$ equals x and thus $\tau = - a \{vx / (c^2 - v^2)\}$. So τ is only 0 if x is chosen 0. But $x = 0$ means that that the origin of K , not of k , is chosen. This remark of Einstein will be ignored too.

With the help of this result we easily determine the quantities ξ, η, ζ by expressing in equations that light (as required by the principle of the constancy of the velocity of light, in combination with the principle of relativity) is also propagated with velocity c when measured in the moving system. For a ray of light emitted at the time $t = 0$ in the direction of the increasing ξ

$$\xi = c\tau \text{ or } \zeta = ac \{t - vx' / (c^2 - v^2)\}$$

Given Einstein’s text in § 3: 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 , the definition $\xi = c\tau$ is fully misplaced, because ξ now represents two fundamentally different coordinates.

Einstein makes here an unimaginable fundamental mistake.

Following his misleading approach he continues with:

But the ray moves relatively to the initial point of k , when measured in the stationary system, with the velocity $c-v$, so that

$$x' / (c - v) = t$$

Doing so Einstein changes the definition $x' = x - vt$ into $x' = ct - vt$. In other words: he now effectively changes too the originally definition of x as the fixed coordinate in K into $x = ct$.

If we insert this value of t in the equation for ξ , (meant is $\xi = ac \{t - vx' / (c^2 - v^2)\}$) we obtain

$$\xi = ac^2x' / (c^2 - v^2)$$

Remark:

The description of the variables η and ζ are disregarded, as they do not play a relevant role here compared to the importance of the role of the variable ξ .

Einstein continues with:

Substituting for x' its value, we obtain

$$\tau = \varphi(v)\beta(t - vx / c^2)$$

$$\xi = \varphi(v)\beta(x - vt)$$

$$\beta = 1 / \sqrt{(1 - v^2 / c^2)}$$

where

and $\varphi(v)$ is an as yet unknown function of v .

Remark:

Found right after the expression: $\tau = a \{t - vx' / (c^2 - v^2)\}$ Einstein defined already $\varphi(v)$ as equal to a !

The statement: “Substituting for x' its value,.....” must mean: in the equations $\tau = a \{t - vx' / (c^2 - v^2)\}$ and $\xi = ac^2x' / (c^2 - v^2)$. The question however is which value of x' : the originally defined $x' = x - vt$, or the just defined $x' = ct - vt$? An investigation surprisingly learns that he returns to $x' = x - vt$!

Such manipulations show a shockingly unscientific behaviour.

Doing so, the result is: $\tau = a\beta^2(t - vx/c^2)$ and $\xi = a\beta^2(x - vt)$.

In the appendix it has been proven that $a\beta$ must be 1, so the final transformations are:

$$\tau = \beta(t - vx/c^2) \text{ and } \xi = \beta(x - vt)$$

It is hard to avoid the impression that Einstein used the re-introduction of $\phi(v)$ here to camouflage as much as possible his manipulative mathematical operations by changing the definition of x' for a while.

In order to qualify a theory consistent its result needs to be at least in accordance with its premise In this case the premise is not clear, given the fact that Einstein up to now uses $x = x$ as well as $x = ct$. If the definition $\xi = c\tau$, so $\xi/\tau = c$, is taken as premise the result of the transformation formulas, expressed as ξ/τ , has to be c too. Given: $\xi/\tau = (x - vt)/(t - vx/c^2)$, it is clear that this condition is not fulfilled, except for $x = ct$! Indeed, given the premise $\xi = c\tau$ not really surprising. But $\xi = c\tau$ is, on its turn, contradictive with the most original premise $x' = x - vt$, in which it certainly is not meant that $x = ct$.

The shown manipulative mathematics thus have reduced the Special Theory of Relativity to a meaningless epistle.

The urgent question is: why did, and still does, the scientific establishment not observe such manipulations? Even worse: why did and does it make unpardonable mistakes on top of these?

3 Scientific establishment's unpardonable mistakes

Einstein's postulate about the speed of light sounds:

Any ray of light moves in the 'stationary' system of co-ordinates with the determined velocity c , whether the ray be emitted by a stationary or by a moving body.

The fundamental error in this postulate is that he effectively reintroduced, with his 'stationary' system, the ether model, most likely without noticing it, because he rejected the ether model himself in the same article. It is generally accepted that an absolute stationary system does not exist. As a result only a stationary system w.r.t. another system can exist. As a consequence that other system is also stationary w.r.t. the first mentioned one. Therefore the introduction of a singly 'stationary' system is senseless, whether it is put in quotes or not. Einstein even defined it as *the* 'stationary' system:

Let us take a system of co-ordinates in which the equations of Newtonian mechanics hold good². In order to render our presentation more precise and to distinguish this system of co-ordinates verbally from others which will be introduced hereafter, we call it the 'stationary' system. (Note 2: i.e. to the first approximation.)

The scientific establishment seemingly realized this mistake too. Instead of combining this mistake with Einstein's mathematical manipulations and as a result reject the STR, it added another mistake to the story:

It changed Einstein's wrong postulate into another, even more unphysical, postulate, by assuming that the velocity of light in vacuum is c relative to whatever reference.

It is of course allowed to create whatever postulate, however it is fully unscientific to change the postulate of a particular theory fundamentally, but still maintain the result of that theory without changing even one word in it.

Moreover, if such an unscientific act is in fact performed sneakily, given that no reference exists to explain this fundamental change in Einstein's hypothesis, this also strongly resembles deceit.

Conclusions

1. Einstein's mathematical errors force us to conclude that he should not be regarded as the widespread praised most intelligent scientist ever. He looks much more like a physicist who has, developing his Special Theory of Relativity, practiced physics in a shocking unscientific manner.
2. Shortly after Einstein's death, the scientific establishment not only made an unforgivable mistake too by not openly denouncing Einstein's unscientific behaviour regarding his Special Theory of Relativity. They made it even worse. His postulate regarding the velocity of light has been fundamentally changed without changing a single word in Einstein's theory. Such behaviour should also be considered as shocking unscientific.
3. The influence of Einstein's unscientific behaviour on the health of physical science is dramatic: all modern physical models and phenomena that are, more or less, based on his Special Theory of Relativity, have to be rejected too. For example: the phenomena space-time, black hole and last but not least: $E=mc^2$!
4. Physicist Walter Ritz (1878 – 1909) should be rehabilitated regarding his emission theory.

References

- [1] Translated original article of Einstein:
On the electrodynamics of moving bodies, By A. Einstein, June 30, 1905
<http://www.fourmilab.ch/etexts/einstein/specrel/www/>
- [2] Original article of Einstein in the German language
http://users.physik.fu-berlin.de/~kleinert/files/1905_17_891-921.pdf

Appendix Determination of the variable 'a' in the provisional transformation formulas

Provisional transformation formulas 'forth':

$$\tau = a\beta^2(t - vx/c^2) \qquad \xi = a\beta^2(x - vt)$$

To transform back:

$$\begin{array}{lll} \text{Change on the left side of the equal sign: } \tau \rightarrow t & \xi \rightarrow x & \\ \text{Change on the right side of the equal sign: } t \rightarrow \tau & x \rightarrow \xi & v \rightarrow -v \end{array}$$

leading to the provisional transformation formulas 'back':

$$t = a\beta^2(\tau + v\xi/c^2) \qquad x = a\beta^2(\xi + v\tau)$$

Application of the τ and ξ from the provisional transformation formulas 'forth' in the formulas 'back' results in:

$$t = a\beta^2\{a\beta^2(t - vx/c^2) + v a\beta^2(x - vt)/c^2\} \qquad x = a\beta^2\{a\beta^2(x - vt) + v a\beta^2(t - vx/c^2)\}$$

$$t = a\beta^2 a\beta^2\{t - vx/c^2 + v(x - vt)/c^2\} \qquad x = a\beta^2 a\beta^2\{x - vt + v(t - vx/c^2)\}$$

$$t = a^2\beta^4\{t - v^2t/c^2\} \qquad x = a^2\beta^4\{x - v^2x/c^2\}$$

$$t = a^2\beta^4t\{1 - v^2/c^2\} \qquad x = a^2\beta^4x\{1 - v^2/c^2\}$$

$$t = a^2\beta^4t(c^2 - v^2)/c^2 \qquad x = a^2\beta^4x(c^2 - v^2)/c^2$$

$$(c^2 - v^2)/c^2 = \beta^{-2}$$

$$t = a^2\beta^2t \qquad x = a^2\beta^2x$$

So, $t = t$ and $x = x$, if $a^2\beta^2 = 1$, or $a\beta = 1$, leading to the final transformation formulas 'forth':

$$\tau = \beta(t - vx/c^2) \qquad \xi = \beta(x - vt)$$