

ON SPECIAL RELATIVITY

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ABSTRACT

In Einstein's paper of 1905 "The Electrodynamics of Moving Bodies" more commonly known as special relativity, he makes one intentional and misleading statement which places the whole paper in jeopardy. To understand this single disingenuous change does not require high level mathematics but rather basic linguistics. The erroneous change was first noticed by the author in the mid-sixties in a high school physics class which yielded incorrect results when calculated. The same basic calculation can be done today and yields exactly the same result. It is certainly strange that to this day not a single person has noticed the misleading statement and the common saying that, "*the best place to hide something is in plain sight*", could never be truer. This paper shows where the intentional misleading statement occurs and its effect on the entire theory.

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1. Introduction

Einstein proposes a simple Gedanken experiment using rods and clocks whereby a rod travels from a source at point A to a second point B and is reflected back to the source A'. He also places clocks on the ends of the rods and places observers in strategic positions. As it happens the clocks and observers are actually inconsequential and only serve to confuse the underlying issue. What becomes more important is a critical reading of the document and an understanding of the underlying thought process.

The Electrodynamics of Moving bodies¹ also establishes two postulates;

1. The laws by which the states of physical systems undergo change are not affected, whether these changes of state be referred to the one or the other of two systems of co-ordinates in uniform translatory motion
2. Any ray of light moves in the "stationary" system of co-ordinates with the determined velocity c , whether the ray is emitted by a stationary or by a moving body.

The important postulate being the first in this analysis, whereby the second is only applicable if the first is considered correct.

2. Basic Theory

Following the two postulates Einstein launches into his first equation which is basic high school physics. It would appear that Einstein is attempting to establish from basic

principles his theory of relativity, so much so that he emphasizes it by quoting it in a literal form;

$$velocity = \frac{light\ path}{time\ interval} \quad (1)$$

Everyone must surely recognize this equation for calculating velocity from distance and time is universally accepted as valid and as proclaimed by Einstein in his first postulate must be equally valid in any frame of reference. After declaring the equation above, the very next pair of equations in the paper immediately begin with an erroneous and obviously invalid suggestion;

$$t_B - t_A = \frac{r_{AB}}{c - v} \text{ and } t'_A - t_B = \frac{r_{AB}}{c + v} \quad (2)$$

"where r_{AB} denotes the length of the moving rod..."

The problem lies not only in the validity of the equations themselves but also the comment immediately following "where r_{AB} denotes the length of the moving rod..." which establishes the manner in which the equations should be interpreted. Einstein simply removes "distance" and replaces it with a completely different parameter of "length". No explanation is given as to why this is done and he does not include any prior mathematical support requiring this change. This seemingly innocuous statement alters both equations and establishes a new proportionality which is clearly erroneous;

$$time\ interval = \frac{length}{velocity} \quad (3)$$

From this point onwards due to this apparently simple change the exact opposite of what is claimed occurs, the faster an object travels the longer it gets. Not only this, but this brand new proportionality must also be valid in all reference frames as per his first postulate.

Taking the first of Einstein's own equations and also using the very model suggested by Einstein himself, actual values can be substituted into both equations. It can be assumed that the rod begins at some arbitrary length and travels for $2.99 * 10^8$ meters at a velocity of half the speed of light for two seconds. The rod then returns to the source travelling at half the speed of light for a further two seconds. As such a legitimate enquiry can then be made as to the length of the rod after the initial two seconds on the first leg of the rods journey;

$$t_B - t_A = \frac{r_{AB}}{c - v} \quad (4)$$

$$r_{AB} = -(v - c) (t_B - t_A) \quad (5)$$

Substituting the prior values, results in;

$$r_{AB} = -(v - c) (t_B - t_A) = 2.99 * 10^8 \quad (6)$$

Consequently, after completing the first leg of the journey the length of the rod has now become $2.99 * 10^8$ meters whereby the initial length appears somewhat unimportant.

The rod is then reflected and returns to the origin A. The final length of the rod upon completion of the second leg of the rods journey can be calculated from the second equation of Einstein;

$$t'_A - t_B = \frac{r_{AB}}{c + v} \quad (7)$$

$$r_{AB} = (t'_A - t_B) (v + c) = 8.97 * 10^8 \quad (8)$$

The results are clear after travelling at half the speed of light for four seconds, the length of the rod has increased not decreased as is claimed by Einstein. The first leg of the journey resulted in an increase in length irrespective of its original length to $2.99 * 10^8$ meters and on the second leg of the journey back to the source increases once more to a value of $8.97 * 10^8$ meters, again irrespective of the intermediate or original length.

At this point it cannot be denied that length contraction has not occurred but rather length expansion which is in direct contradiction to the theory. As such "length dilation" becomes a much more descriptive term.

In the next section, Einstein then proceeds to build upon this erroneous assumption and using calculus succeeds to manipulate the results sufficiently to obtain some form of mathematical validation of his original thought experiment. The result is an equation that is used throughout the remaining paper in every subsequent section;

$$\frac{1}{\sqrt{1 - v^2/c^2}} \quad (9)$$

This equation will be immediately recognizable to the advocates of Einstein's theory of not Special Relativity but also his subsequent General theory of Relativity. However the foundational theory is without doubt erroneous as has been shown by the simple introduction of sample values into Einstein's own equations.

3. Summary and Conclusions

It must be acknowledged that the insertion of the comment was in fact intentional in an attempt to mislead the reader. The ploy appears to have been somewhat successful as in excess of one hundred years it has been passed by unnoticed by physicists and mathematicians alike. The disturbing part however is that Einstein specifically emphasized the fact from the inclusion of the statement "where r_{AB} denotes the length of the moving rod..." excluding any possibility of ambiguity.

The insertion of this one statement changes the paper in its entirety. Inserting actual values into the two foundational equations of his paper produces nonsensical results due to the erroneous interpretation implied by the statement. There can be little doubt that Einstein's paper of 1905 "*The Electrodynamics of Moving Bodies*" is fatally flawed, as are any theories which rely upon it and all should be disregarded as being untenable until such time as a credible solution is presented.

4. References

ⁱ <https://www.fourmilab.ch/etexts/einstein/specrel/specrel.pdf>