

MATHEMATICAL DEMONSTRATION THAT THE FORMULA FOR TIME DILATION IS MISLEADING

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1. The Lorentz Transformation Equations.

These equations are:

$$\begin{array}{ll} \text{(a)} & Kx' = x - Vt & \text{(b)} & Kt' = t - Vx/c^2 & \text{(A)} \\ \text{(c)} & Kx = x' + Vt' & \text{(d)} & Kt = t' + Vx'/c^2 \end{array}$$

in which

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

2. Two Forgotten Equations.

Anyone who wishes can verify in almost any textbook relating to fundamental physics that both Lorentz and Einstein started to develop the above transforms from the elementary identities:

$$x = ct, \quad x' = c't' \quad (2)$$

This is to say that these two equations are the cornerstones of the transformation. Since c is constant, we can consider different values for t and t' but always the common constant c is retained.

We shall now demonstrate that (A) are consistent with (2). Let us separate (a) and (c), bringing K out of them and making $x = ct$, $x' = ct'$:

$$K = \frac{t}{t'} \left(1 - \frac{V}{c}\right) \quad (3)$$

$$K = \frac{t'}{t} \left(1 + \frac{V}{c}\right) \quad (4)$$

On multiplying (3) by (4), we get:

$$K^2 = 1 - \frac{V^2}{c^2} \quad (5)$$

which is also equation (1). The conclusion is that the value of K is defined by equations (2). Any change in these equations must also be reflected in K .

We now make another demonstration: by making the changes $x = ct$, $x' = ct'$ and $t = x/c$ in (a), we get:

$$ct' = \frac{ct - Vt}{K}; \quad t' = \frac{t - Vt/c}{K}; \quad t' = \frac{t - Vx/c^2}{K} \quad (6)$$

Here we can see that (6) is the same as equation (b) of the Lorentz group. Hence, (b) and (a) are related one to another by the identities $x = ct$, $x' = ct'$. If someone alters these identities, for instance, making $x = Ut$ and $x' = Wt'$ he would violate the mathematical interdependence of (1) with the group (A) and the mathematical relations between (a, b, c, d) represented by (2).

The same operation as (6) can be performed on (c), by successive substitutions of $x = ct$, $x' = ct'$ and $t' = x'/c$. The result is equation (d). Hence (c) and (d) are also tied by the conditions $x = ct$, $x' = ct'$ and we cannot change the values of equations (2) without altering the mathematical dependence of (c) and (d).

3. The Formula for Time Dilation.

This formula is:

$$t' = t/K \tag{7}$$

It was derived from (a) and (c), by making in them $x = 0$. But we think that, in so doing, the operation is incomplete. Let us also make $x = 0$ in the rest of the equations:

$$(a) \quad Kx' = -Vt \qquad (b) \quad Kt' = t \tag{8}$$

$$(c) \quad x' = -Vt' \qquad (d) \quad Kt = t' + Vx'/c^2$$

We can see that after inserting the value $x' = -Vt'$ in (a) and (d), we get the result $t' = t/K$.

However, the value of K which appears in (7), corresponds to $x = ct$ and $x' = ct'$. If we now make $x = 0$ and $x' = -Vt'$, K would also change accordingly. To prove this assertion, we only have to go back to equations (a) and (c), bring K out of them and substitute 0 for x and $-Vt'$ for x' . We obtain:

$$K = \frac{x - Vt}{x'} = -\frac{t}{t'}; \qquad K = \frac{x' + Vt'}{x} = \frac{0}{0} \tag{9}$$

we now repeat the operations done on (4) to get (5):

$$K^2 = \frac{-t}{t'} \times \frac{0}{0} = \frac{0}{0} \tag{10}$$

which is indeterminate. Here we are confronted by a contradiction. § In obtaining (7) the value of K used in the transformations, (1) was employed, which is what is used in equations (2). But, at the same time, the value of K given by (10) is obtained, which, as we now see, is indeterminate. Thus, the famous time dilation actually is an indeterminate quantity.

4. Another Formula for Time Contraction.

On equating (3) and (4), we obtain:

$$t' = t \sqrt{\frac{c - V}{c + V}} \tag{11}$$

This formula represents the relation between t and t' for the values of x and x' given by (2).

Observe, however, that in (7) $t' > t$, while in (11), $t' < t$. Thus, equation (7) cannot be correct, since on the one hand K is indeterminate, while on the other equation (11) leads to time contraction instead of time dilation.

For all these reasons, and many others, we must declare the Lorentz transformation to be the greatest fallacy of the present century.

5. Still One More Proof of the Invalidity of (7).

We have seen how Lorentz derived (7) from (a, c), just by making $x = 0$ in them. If we now substitute the value of t' already obtained from these equations, in (a, c) and bring out the value Vt , we get:

$$Vt = x - Kx' \tag{12}$$

$$Vt = K^2x - Kx' \tag{13}$$

from which we immediately obtain: $K = 1$. That is to say, the operation made by Lorentz contains implicitly the condition $K = 1$. In other words, the contraction does not exist.

As has been said above, the verdict is conclusive: *the formula for time dilation is fallacious and time dilation does not exist.*

§. Editor's Comment: The author has been led to the same conclusion as we have, by a somewhat different analysis, however: that the Lorentz transformations form a self-inconsistent system of equations; vide, this J. pp. 2378-89.