

LOGICAL INVALIDITY OF THE POSTULATE OF THE CONSTANCY OF THE SPEED OF LIGHT

by

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The Theory of Relativity is based on two postulates: the postulate that the speed of light is a constant for all inertial observers, and the postulate that all uniform rectilinear motion is relative.

The first postulate states that all inertial observers will obtain the same result when measuring the speed of light, namely c , which is calculated these days to be 299,792,458 metres per second.

However, the following simple thought-experiment will show that this cannot possibly be the case.

Let there be two long cylindrical spaceships S and S' , each parallel to the other, in a region of space far away from any detectable gravitational field. Let there be two observers O and O' in the spaceships S and S' respectively, each carrying timepieces accurate to one part in a million: that is, they show less than one millionth of a second of difference after the passage of one second. Let the two ends of the spaceship S be labelled A and B , and the two ends of spaceship S' be labelled A' and B' . Let S and S' be identical in dimensions to an accuracy of one in a million — *i.e.*, let every metre of their dimensions be accurate to one-thousandth of a millimetre.

Let each spaceship have a “proper length” of one light-second (*i.e.*, let the distance AB as well as the distance $A'B'$ be 299,792,458 metres in length, as measured by observers on the spaceships S and S' , respectively). Let them each be one metre in diameter, and let them be separated from one another by a distance of one metre. Let them be moving along their long axes relative to one another at a velocity of exactly one-thousandth of the speed of light, *i.e.*, 299,792.458 m/s.

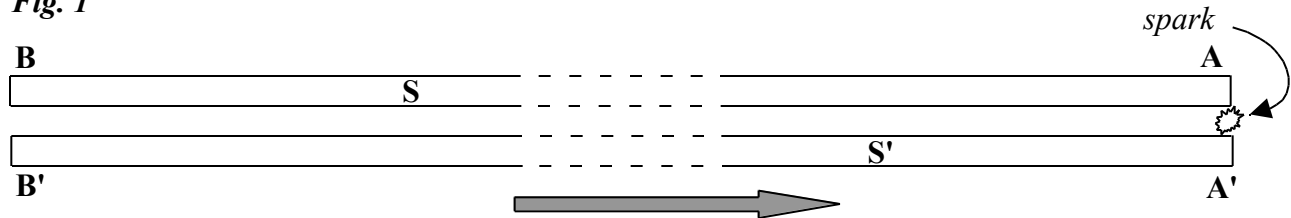
Note that at this speed, the Lorentz γ factor, namely $1/(1-v^2/c^2)^{0.5}$, which when calculated is $1/(1-0.000001)^{0.5}$, equals 1/0.9999995 or 1.0000005, accurate to seven decimal places. Thus the difference in length between the two spaceships due to any Relativistic length contraction, even if any exists, would be smaller than the limits of accuracy of the measurements of the spaceships, which as we said is one part in a million. So the spaceships would not be *measurably* different in length, even if there were such a thing as Relativistic length contraction.

And likewise, the timepieces carried by the observers O and O' would not show any difference between one second elapsed on the timepiece carried by O , for instance, as compared to one second elapsed on the timepiece carried by O' — for any such difference, even if any truly existed, would be too small to measure.

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Now as the two spaceships pass one another there must come a point at which **A** and **A'** are at their minimum distance apart, namely one metre, and at that instant, so too must **B** and **B'** be at their minimum distance apart. (See **Fig. 1** — the grey arrow represents the direction of movement of spaceship **S'** relative to spaceship **S**.) When this happens, let there be a small and delicate antenna jutting out from **A** at right angles to spaceship **S**, and another similar antenna jutting out from **A'** at right angles to spaceship **S'**, oriented in such a manner that as **A** and **A'** pass one another, the two antennae make brief contact. Let an electrical current pass through the antennae when they make contact, creating a brief spark as they make contact and then break away.

Fig. 1



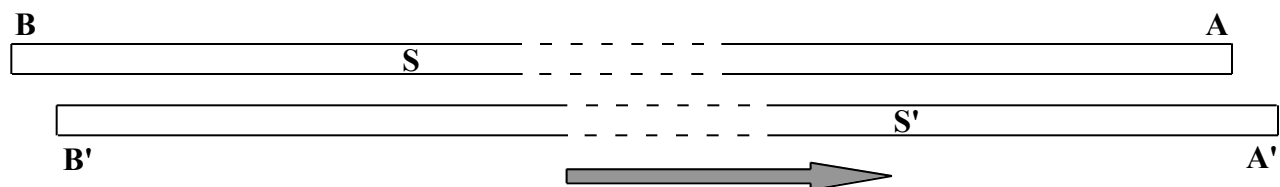
Now the question is, how long should it take the light from the spark to reach **B** and **B'**, respectively, as calculated by observers **O** and **O'**?

If the Relativistic postulate of the constancy of the speed of light for all inertial observers is correct, it should take *exactly one second* for the light from the spark to reach both **B** and **B'**, as calculated by *either* observer. That's because in the frame of observer **O**, the distance from **A** to **B** is exactly one light-second, and in the frame of the observer **O'**, the distance from **A'** to **B'** is also exactly one light-second.

(Remember that the time dilation *<gamma>* factor is too small to show any difference between one second as measured by *either* of the two timepieces, as compared with one second as measured by the other; and so is the Relativistic length contraction factor to show any difference in the length of the spaceships as measured by either of the two observers.)

However, since the spaceships are moving at a relative velocity equal to one-thousandth **c**, as calculated by observer **O**, say, during the one second the light from the spark takes to travel from **A** to **B**, the end **B'** of spaceship **S'** will have moved *away* from **B** and *towards* **A** by an amount equal to one-thousandth of a light-second, or about 299 metres. (See **Fig. 2**.) Thus as calculated by the observer **O**, the light from the spark would have reached **B'** about a thousandth of a second *before* it reached **B**: which means that as per the calculations of the observer **O**, light would take 0.999 seconds to reach **B'**, and not exactly 1.000 seconds as calculated by the observer **O'**.

Fig. 2



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And as calculated by the observer $\mathbf{O'}$, the light from the spark would have reached $\mathbf{B'}$ exactly 1.000 second after it left $\mathbf{A'}$, but during that one second, $\mathbf{B}$ would have moved *away* from both $\mathbf{A'}$ and $\mathbf{B'}$, again by an amount equal to one-thousandth of a light-second. Thus according to the observer $\mathbf{O'}$, the light from the spark would have reached $\mathbf{B}$ about one-thousandth of a second *after* it reached $\mathbf{B'}$: which means that as per the calculations of the observer $\mathbf{O'}$, light should reach $\mathbf{B}$ 1.001 seconds after the spark ignited.

But this is a contradiction, because as we calculated, the timepieces of both $\mathbf{O}$ and $\mathbf{O'}$ must tick at the same rate (within the margin of error of one millionth of a second for every second). If the calculations performed by $\mathbf{O}$ show that light from the spark must reach $\mathbf{B'}$ in 0.999 seconds, then the calculations performed by $\mathbf{O'}$ should show the same thing; and if the calculations performed by $\mathbf{O'}$ show that light from the spark should reach $\mathbf{B}$ in 1.001 seconds, so should the calculations performed by $\mathbf{O}$.

The following table (*Table 1*) illustrates the contradiction very clearly. It is seen that the figures obtained by assuming that the postulate of the constancy of the speed of light for all inertial observers contradict the figures obtained by both observers as a result of the calculations performed by them.

Table 1

	<i>Time that should be taken by light to travel the length of spaceship $\mathbf{S}$</i>	<i>Time that should be taken by light to travel the length of spaceship $\mathbf{S'}$</i>
<i>As calculated by observer $\mathbf{O}$</i>	1.000 sec.	0.999 sec.
<i>As calculated by observer $\mathbf{O'}$</i>	1.001 sec.	1.000 sec.
<i>According to the postulate of the constancy of the speed of light</i>	1.000 sec.	1.000 sec.

Because the assumption that light travels at the same speed for both $\mathbf{O}$ and $\mathbf{O'}$ results in a contradiction, the postulate of the constancy of the speed of light for all inertial observers cannot be logically valid, for no logically valid postulate should result in a contradiction!

Any comments? [e-mail me](#).