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Speed of light "is" c or speed of light "seems" c

Roger J. Anderton
R.J.Anderton@btinternet.com

Speed of light "is" c or speed of light "seems" c, actually gives two different theories, and the way that Relativity is presented by different people actually mixes up these two theories.

There can at first seem to be only a subtle difference between: speed of light "is" c or speed of light "seems" c, but actually there is a great deal of difference.

Consider the scenario of a stage conjurer giving the illusion of a woman being sawn in half; there is a great deal of difference between the lady "is" sawn in half and the lady "seems" sawn in half. The first is physically murder and the second is an illusion. Similarly, there is difference between speed of light "is" c or speed of light "seems" c; where the second case is an illusion.

The speed of light "seems" c, is of course the correct case; namely it is an illusion; however many relativity texts missed this subtle point and believe "is". This omission might even go back to Einstein himself.

Consider the usual scenario of special relativity – two inertial observers A and B measuring the speed of light. The situation is of course idealised so that forces are not considered, that the light is travelling through a vacuum, unaffected by fields and so forth, then it is measured as a constant value c by both observers.

In this idealised scenario, A or B cannot determine from measurement of the speed of light whether they are stationary or moving, because they get the same value of c in both cases. Now if A observes B moving with velocity v then B observes A moving with the same magnitude of v but in the opposite direction. Neither A or B can determine which of them is genuinely moving from measurements based solely on measuring light speed and the speed of the other person. (And of course "genuinely moving" there is the issue of genuinely moving with respect to what; relativity answers by there only being motion relative to something.)

Of course if there is movement with respect to a background, then A or B could assign movement relative to that background; but special relativity still applies because then it becomes a question of who moves - the background or themselves. Thus in special relativity we have only relative motion; motion relative between objects, and no absolute motion because we have no way of assigning who or what is at absolute rest.

Now what gets overlooked in this special relativity scenario is whether – the speed of light "is" c or "seems" to be c. As pointed out earlier there is a great deal of difference; one scenario is that light speed "is" absolutely c, and the other scenario is that the speed of light being measured as c is an illusion. Most relativity texts do not spot this and treat both "absolutely real" and the "illusion" scenarios as being the same; which of course is an error as the lady sawn in half would tell us.

It turns out that the speed of light being c is an illusion in the same way that absolute motion is an illusion, and this might be a hard and subtle concept to grasp in the same way that to many people - the concept that absolute motion is an illusion is a hard concept to grasp.

However, freeing ourselves from the illusion that c presents, we can look at things as follows -

Both A and B seem to measure the same value of c; this is now deemed an illusion.

If it is an illusion, it then means something else is happening; in the same way that the lady sawn in half illusion means something else is happening in the trick other than the woman really being sawn in half.

Consider for a moment A and B they measure the same value of c, believing this to be true then by special relativity the inferences are of time dilation and length contraction i.e. inference that both observers are not measuring the same time and spatial intervals – their clocks and rulers are being distorted.

Now if c is not the same for both, then length and time are not being distorted; and that is the second theory.

For A he measures the same value of c whether he moves or not, and if he assumes that the other person B measures the same value of c; then as consequence B cannot be measuring the same values of length and time intervals as himself. B concludes much the same, he measures c whether he moves or not, and assumes the other person A measures the same value of c, hence A does not have the same values of length and time intervals.

The assumption is that the other person measures the same value of c, and that is special relativity.

We can however assume something else.

As well as this fact about c, observers A and B cannot tell the difference of time intervals; they believe they measure the same time intervals whether they move or not. Time does not appear to change for themselves, it is only that in the special relativity scenario that looking at the other observer they think there is a time difference.

So, person A believes himself measuring the same time intervals whether he moves or not, and recognising that B believes the same thing of himself; we can form the case where A and B assume that they each measure the same time intervals. Based on that

assumption they then say that c is not constant, but varies. That is then the scenario of Galilean relativity.

I have checked the maths of Galilean relativity and special relativity and both work. [1] That means:

A and B can assume that both of them are measuring the same value of c, then as consequence we have time dilation etc.

Or

A and B can assume that both of them are measuring the same value of time intervals, then c varies.

The first theory is special relativity and the second is Galilean relativity.

It is important to point out that in both theories that-

(1) neither A and B are assigning c as varying in their frames of reference.

(2) neither A or B are assigning time intervals as varying in their frames of reference.

This then means:

(3) in the special relativity case- A is claiming that B's time interval measurements have changed; and B is claiming A's time interval measurements have changed.

(4) in the Galilean relativity case – A is claiming that B's lightspeed measurements have changed; and B is claiming that A's lightspeed measurements have changed.

We thus have a relativity between the two relativity theories themselves.

It might seem as mind-boggling to some people that this is the case, in the same way that it is mind-boggling to some people that absolute motion is an illusion; namely mind-boggling that the speed of light "is" c "is" also an illusion. Einstein said that time was an illusion, [2] if he had looked at it further he would have concluded that c was as well.

Reference

[1] Einstein's Unified Field Theory is Newtonian relativity Theory, Roger J. Anderton http://www.wbabin.net/science/anderton8.pdf

[2] Einstein: "People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion." http://rescomp.stanford.edu/~cheshire/EinsteinQuotes.html

30-9-2006 updated to remove a double negative.