the general science journal

Critique of an article on twin paradox in Scientific American

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

Articles by believers in Einstein's relativity never seem to properly deal with issues like the twin paradox. I highlight a Scientific American article as an example of that tactic.

In the article Ronald C. Lasky [1] says: "The term time dilation was coined to describe the slowing of time caused by motion."

First of all, I could complain that the term "clock dilation" would be more appropriate and dispute the derivation of the maths for it; but I wish to pass on that issue and move on.

Lasky continues: "And to illustrate the effect of time dilation, he [Einstein] proposed an example--the twin paradox--that is arguably the most famous thought experiment in relativity theory. In this supposed paradox, one of two twins travels at near the speed of light to a distant star and returns to Earth. Relativity dictates that when he comes back, he is younger than his identical twin …."

Lasky refers to what Paul Davies says, but will omit; because does not seem relevant.

Lasky: "The paradox lies in the question Why is the traveling brother younger? Special relativity tells us that an observed clock, traveling at high speed past an observer, appears to run more slowly--that is, it experiences time dilation. (Many of us solved this traveling-clock problem in sophomore physics, to demonstrate one effect of the absolute nature of the speed of light.) Because special relativity says that there is no absolute motion, wouldn't the brother traveling to the star also see his brother's clock on Earth move more slowly? If this were the case, wouldn't they both be the same age?"

There is a great deal to complain about here in what he says, such as what is meant by "absolute nature of the speed of light", "absolute motion" etc. As for claims like: "special relativity says that there is no absolute motion" – I dispute that, as far as I am concerned special relativity is just ambiguous on numerous issues such as this one; it is true that certain people make such claims; but it is not clear whether they understand or misunderstand what they are talking about. And even if it were true that in special relativity there was no absolute motion, it is still ambiguous as to whether that meant only in the context of special relativity and that in a bigger context as general relativity it might be allowed.

Lasky: “This paradox is discussed in many books but solved in very few.”

i.e. I presume he means in many relativity books. He says “solved in very few” – I would think that would not be the opinion of the authors of those relativity books; I would think if they mentioned the twin paradox then they would be seeking to explain it. So, when he says “solved in very few” what he really means is that he is disagreeing with what they are saying.

He is trying to side-step the issue that these books are saying different things about the twin paradox. Rather than address why the books are all saying different things and apparently contradicting one another; he sneakily tries to brush it under the carpet. (brush (something) under the carpet meaning: To ignore, deny, or conceal from public view or knowledge something that is embarrassing, unappealing, or damaging to one's reputation.) If he were writing a proper article he would try to address the difficult issues rather than ignore them. But all articles on twin paradox seem to try to ignore the difficulties!

Lasky: “It is typically explained by saying that the one who feels the acceleration is the one who is younger at the end of the trip; hence, the brother who travels to the star is younger.”

That’s one of the solutions offered.

Lasky: “Although the result is correct, the explanation is misleading.”

i.e. presumably, he is sneakily not agreeing with that type of explanation.

Lasky: “Some people may falsely assume that the acceleration causes the age difference and that the general theory of relativity, which deals with noninertial or accelerating reference frames, is required to explain the paradox.”

Note the words “falsely assume”, so he is disagreeing with people who claim “acceleration causes the age difference….” So now ideally, he would need to explain why he thinks they have got it wrong; but of course, he is not going to address that; instead he is merely going to claim that they are wrong and carry on giving his explanation.

It is a fundamental problem in relativity that some people will claim a certain thing about relativity while others will claim the opposite, and none of them will address the issue of explaining/justifying why they think they are right and the other wrong. Thus, all we are left with in relativity is claims and counter-claims without adequate reasoning to back any of it.

Lasky continues: “But the acceleration incurred by the traveler is incidental, and the paradox can be unraveled by special relativity alone.”

As far as I am concerned this is again ambiguous; this time as to whether he thinks special relativity (a) does not deal with acceleration, and in the scenario being considered acceleration can be ignored or (b) does deal with acceleration.

He then describes a thought-experiment twin paradox scenario.

Lasky: “LET US ASSUME that twin brothers, nicknamed the traveler and the homebody, live in Hanover, N.H. They differ in their wanderlust but share a common desire to build a spacecraft that can achieve 0.6 times the speed of light (0.6 *c*). After working on the

spacecraft for years, they are ready to launch it, manned by the traveler, toward a star six light-years away. His craft will quickly accelerate to 0.6 *c*. To reach that speed, it would take a little more than 100 days at an acceleration of two g's. Two g's is two times the acceleration of gravity, about what one experiences on a sharp loop on a roller coaster. If, however, the traveler were an electron, he could be accelerated to 0.6 *c* in a tiny fraction of a second. Hence, the time to reach 0.6 *c* is not central to the argument."

How the time it takes to make the acceleration to 0.6c is supposed to then somehow ignore the acceleration is not explained.

Lasky: "The traveler uses the length-contraction equation of special relativity to measure distance. So, the star six light-years away to the homebody appears to be only 4.8 light-years away to the traveler at a speed of 0.6 *c*. Therefore, to the traveler, the trip to the star takes only eight years (4.8/0.6), whereas the homebody calculates it taking 10 years (6.0/0.6). To solve the twin paradox, we need to consider how each twin would view his and the other's clocks during the trip. Let us assume that each twin has a very powerful telescope that permits such observation. Surprisingly, by focusing on the time it takes light to travel between the two, the paradox can be explained."

He continues: "Both the traveler and homebody set their clocks at zero when the traveler leaves Earth for the star …. When the traveler reaches the star, his clock reads eight years. But when the homebody sees the traveler reach the star, the homebody's clock reads 16 years. Why 16 years? Because, to the homebody, the craft takes 10 years to make it to the star, and the light takes six additional years to come back to Earth showing the traveler at the star. So, viewed through the homebody's telescope, the traveler's clock appears to be running at half the speed of his clock (8/16)."

"As the traveler reaches the star, he reads his clock at eight years as mentioned, but he sees the homebody's clock as it was six years ago (the amount of time it takes for the light from Earth to reach him), or at four years (10 6). So the traveler also views the homebody's clock as running at half the speed of his clock (4/8).

"ON THE TRIP BACK, the homebody views the traveler's clock going from eight years to 16 years in only four years time, because his clock was at 16 years when he saw the traveler leave the star and will be at 20 years when the traveler arrives back home. So the homebody now sees the traveler's clock advance eight years in four years of his time; it is now twice as fast as his clock."

"As the traveler returns home, he sees the homebody's clock advance from four to 20 years in eight years of his time. Therefore, he also sees his brother's clock advancing at twice the speed of his. They both agree, however, that at the end of the trip the traveler's clock reads 16 years and the homebody's 20 years. So the traveler is four years younger."

Really the homebody's clock shows 20 years have passed and the traveler's clock shows 16 years has passed, so the initial impression that one gets is that the traveler's clock is wrong by 4 years and should have been adjusted. However, many relativists want to interpret that as actual time difference. Two clocks showing different time does not usually mean to us (i.e. in daily life) that time travel has occurred, rather it means that one or both clocks is not keeping the correct time.

Lasky now descends into talking just gibberish:

“The asymmetry in the paradox is that the traveler leaves Earth's reference frame and comes back, whereas the homebody never leaves Earth. It is also an asymmetry that the traveler and the homebody agree with the reading on the traveler's clock at each event, but they don't agree about the reading on the homebody's clock at each event. The traveler's actions define the events.”

So, he is saying there is both “asymmetry” and “symmetry” happening. What maybe happening is that thinking in terms of the constant velocity motion there should be “symmetry” occurring for that, but the acceleration is causing the “asymmetry” part. But he is not explaining it in that way, and just talking about “symmetry” and “asymmetry” as if they are mysterious.

Lasky: “The Doppler effect and relativity together explain this effect mathematically at any instant. The reader should also note that the speed that an observed clock appears to run depends on whether it is traveling away from or toward the observer.”

He mentions maths, so now basically he is going to hide everything in the maths which he is not going to enter into giving.

Lasky: “Finally, we should point out that the twin paradox today is more than a theory, because its fundamentals have been exhaustively confirmed experimentally. In one such experiment, the lifetime of muon decay verifies the existence of time dilation. Stationary muons have a lifetime of about 2.2 microseconds. When traveling past an observer at 0.9994 *c*, their lifetime stretches to 63.5 microseconds, just as predicted by special relativity. Experiments in which atomic clocks are transported at varying speeds have also produced results that confirm both special relativity and the twin paradox.”

This is the end of the article and he appeals to experiments as supporting what he says about theory; but he does not go into what the critics have to say about such experiments. i.e. he presented a biased one-sided point-of-view and omits addressing the criticism that can be raised against those experiments being interpreted by Einstein’s relativity. That is just the typical tactic of a believer in Einstein’s relativity to make appeal to experiments as supporting their beliefs without mentioning the many criticisms raised against interpreting that way. (Criticisms that have started by such scientists as Louis Essen [2] and then been picked up by other critics subsequently.)

What we have here with Scientific American is just another typical example of an article dealing with relativity that does not go properly into the details; it seeks to gloss over things to give a biased viewpoint in favour of Einstein’s relativity.

References

[1] Time and the Twin Paradox, By Ronald C. Lasky
https://www.scientificamerican.com/article/time-and-the-twin-paradox-2006-02/

A more detailed article: "Time and the Twin Paradox" by Lasky at Scientific American: special collector's edition: A matter of time, vol. 27 no.2, Summer 2018 p.30-33

[2] Relativity- Joke or swindle? Louis Essen
https://www.ekkehard-friebe.de/Essen-L.htm

c.RJAnderton14June2018