

Lightspeed Is as Fast or Slow as You Want, But Only in One Direction

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<https://youtu.be/O8Ph5sfpkbs&lc=UgwjtLi5lly4wwhsimZ4AaABAq>

Part 1 of 2 of a Comment on the [Dr Ben Miles](#) YouTube post:

Why Can't We Travel Faster Than Light? (Jun 1, 2023)

<https://youtu.be/O8Ph5sfpkbs>

Ah, you are a bold person! The directional lightspeed situation is delightful since special relativity *requires* "reciprocal equivalence" (my phrase), meaning that given some number R , the Ratio, there is *no* local test one can perform to disprove that light travels at cR in one direction — any direction — and c/R in the opposite direction.

For example, if you are talking to someone 1 meter in front of you, you *cannot devise* any physics test to disprove that light takes one billion years to travel from your face to theirs, yet is, for all practical purposes, instantaneous in the opposite direction. It cannot be genuinely instantaneous since it must be a reciprocal of the other speed of light for the math to work out correctly. But you can get so close that it makes no practical difference.

What's extraordinary is that this is not just some mathematical abstraction but an absolute requirement of how special relativity works. Even though the tests have no meaning to you, there could be an observer for whom they represent very real delays, in which time for you is asynchronous to an extraordinary degree.

I'm working on an Apabistia Note called *Einstein's Unfinished Homework* that starts with the same lighting and train example. The part Einstein never finished was how to *calculate* the delay in the flashes of lightning. The missing math is to multiply the signed distance between flashes by an "age gradient" α , which is:

$$\alpha = -\frac{\beta\gamma}{c}$$

For a train 0.3 km long traveling at 0.6 c with flashes that appear synchronous *inside* the train, anyone on the embankment sees the back flash occurring 0.6 microseconds before the front flash — that is, the back always appears *older* than the front.

Einstein never finished his thought problem by writing down the equation because the concept of an *internally asynchronous* object went a bit too far. If you follow that idea to its logical conclusion, the very concept of an object breaks down into a sequence of probabilistically linked but otherwise isolated spacetime events. That's going a bit too far from the classical viewpoint for most people, even now, let alone a century ago.

Object-ness is one of our most fundamental assumptions about the nature of the universe. It is also, alas, flatly incorrect. There are *only* spacetime events, and the only self-consistent, non-paradoxical separation metrics possible are the ones that separate such spacetime events, not objects. We humans, in particular, love to string events together in ways that create what we think of as objects, but that's not the deeper fabric.