The Curious Case of the Faster-Than-Light Train Flashes [PREVIEW]

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PAPER PREVIEW

PAGE 1: INTRO AND FIGURE 1

Imagine a train moving at 60% of lightspeed. Its passengers hold synchronized smartphones against their windows and flash them at what looks to them like the same moment. But what do observers on the platform see? The answer is a bit unexpected, and sheds light on the deeper nature of space and time.

The Train-Flash Thought Problem

Figure 1 shows unusually speedy three-car train in which the passengers have linked and synchronized their smartphones. As they pass next to the platform of one station, they hold their phone up to the windows and flash them at the same moment. The platform has its own set of synchronized receivers placed close to the windows of the passing cars. The closeness allows them to track the timing of the flashes with great precision, since there is almost no speed-of-light delay between the flashing phones and the receivers.

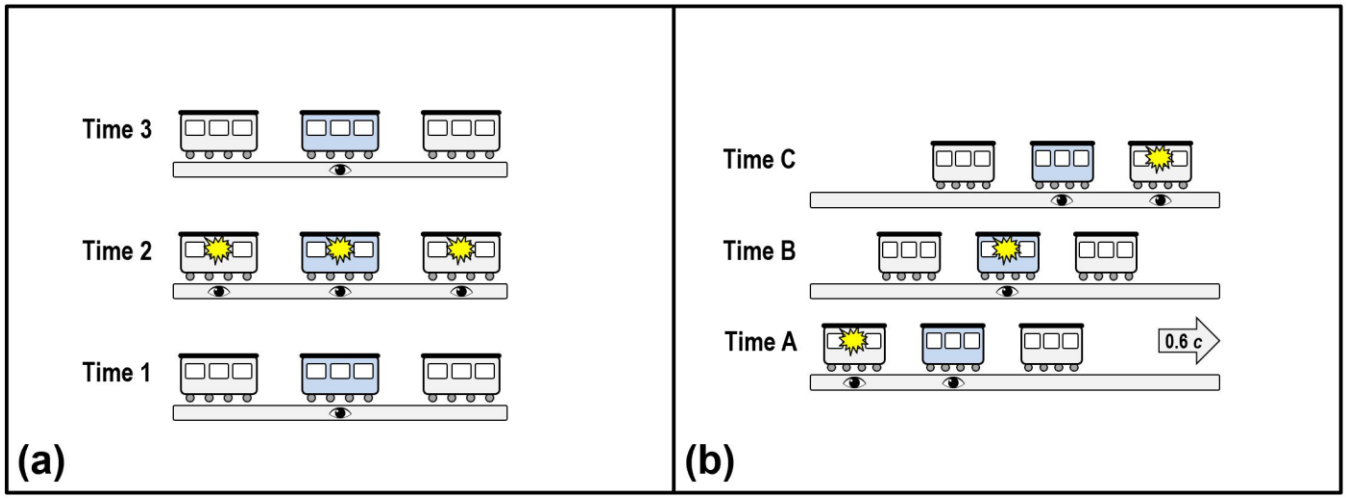

Figure 1. *Einstein's train problem with flashes inside the train.*

Einstein famously used a train much like this one to explain why two flashes of lightening that appear simultaneous to observers on an embankment (or platform) cannot appear simultaneous to observers in the moving train. This problem is much the same, with the important qualifier that this time the flashes take place *inside* the train, rather than around the platform or embankment. Thus it is no surprise that flashes that appear simultaneous inside the train must look non-simultaneous when viewed from the platform. The goal is to get more specific about how the flashes appear on the platform.

The title of this paper gives the broad answer: The flashes move *faster than light* in the same direction the train moves. That is a bit surprising given the central role special relativity plays in keeping matter, energy, and information from traveling faster than the speed of light. So why would flashes exceed that speed limit, and what does that mean?

PAGES 2-4: FIGURES 2-10 (TITLES ONLY, NO DISCUSSION)

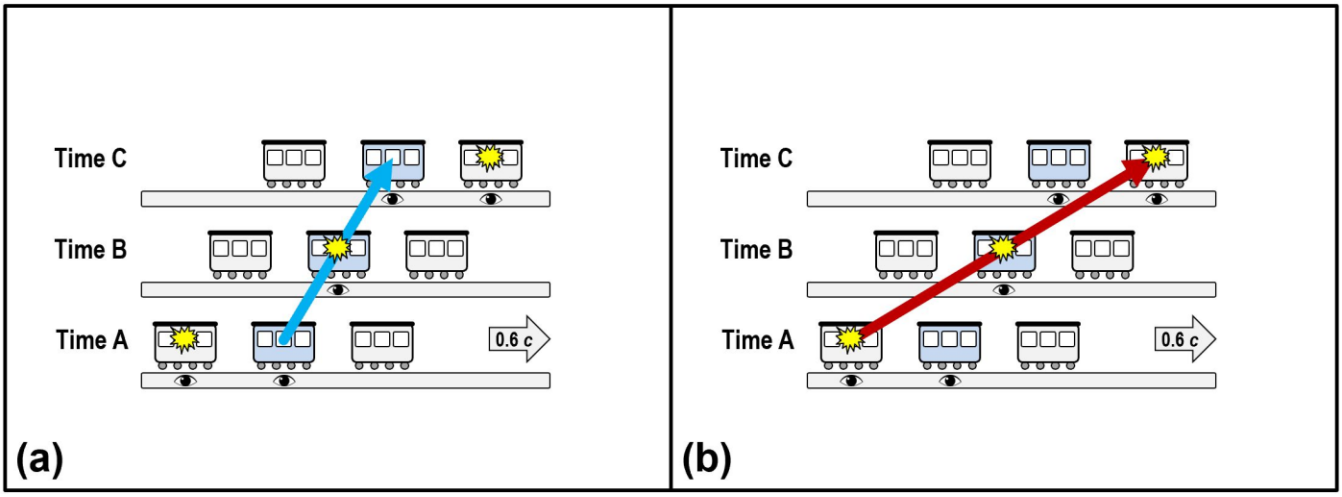

Figure 2. *Describing the train's appearance requires two velocities.*

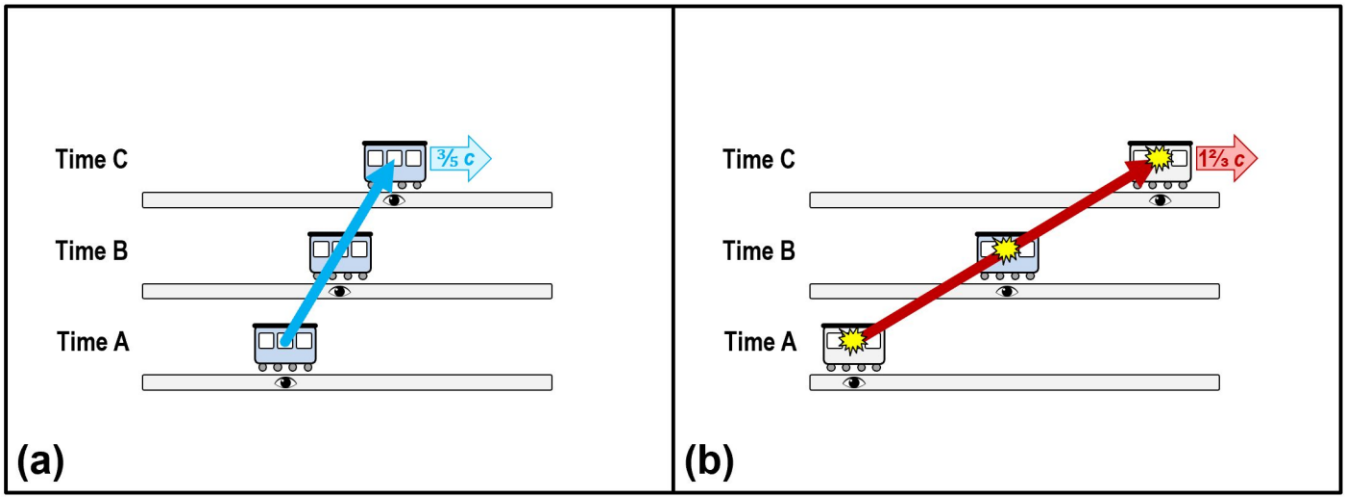

Figure 3. *The flash velocity is the faster-than-light (tachyonic) inverse of velocity.*

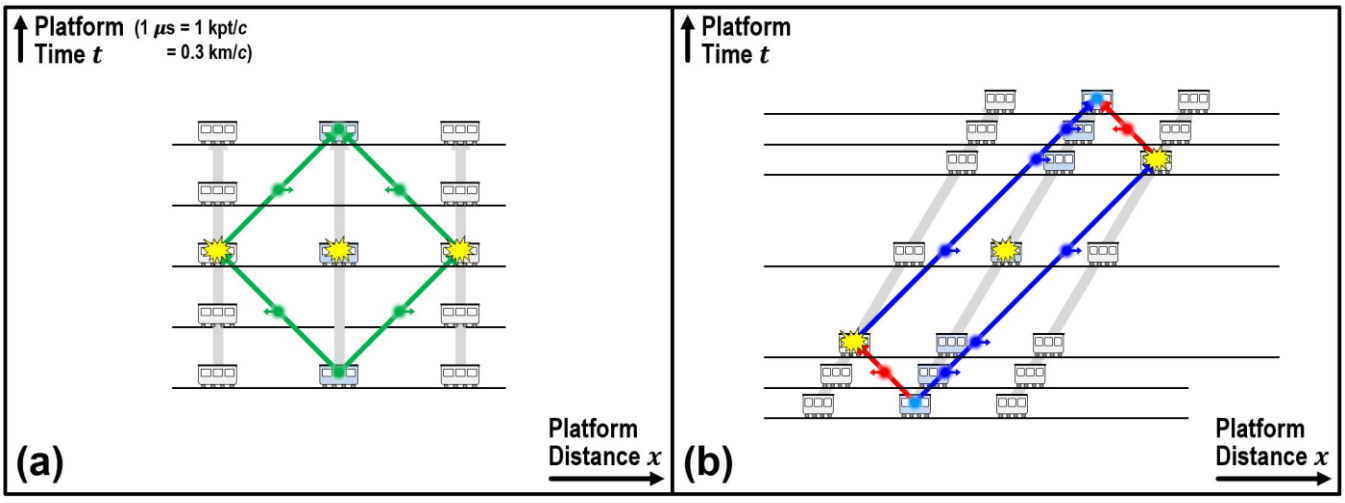

Figure 4. *Flash velocities exist only after prior synchronization of train car clocks.*

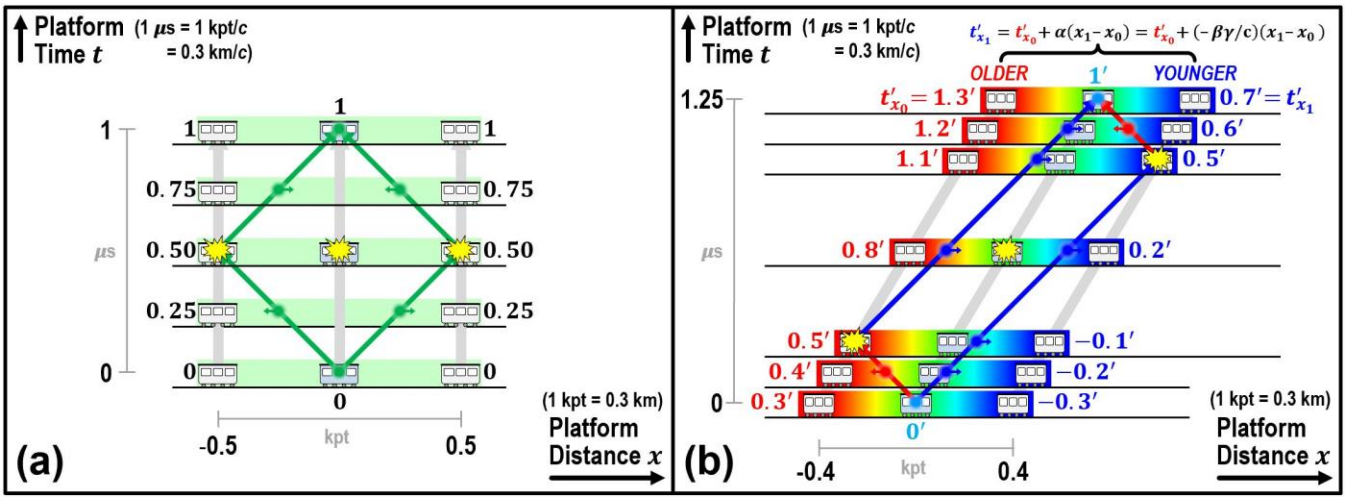

Figure 5. *Motion means squeezing length, slowing clocks, and adding an age gradient.*

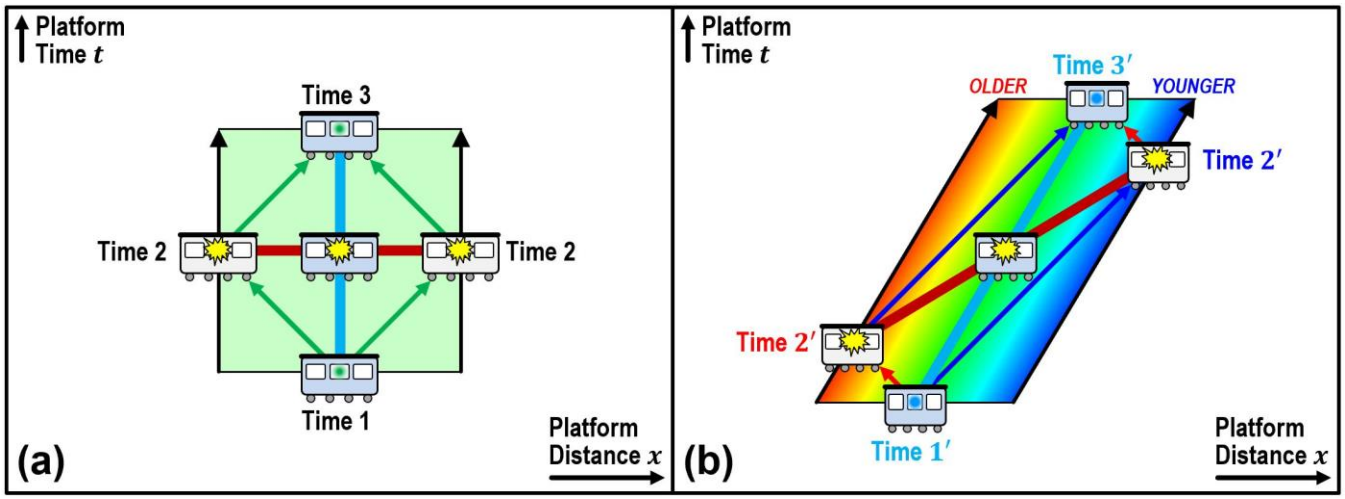

Figure 6. *A more complete image of relativistic transformation.*

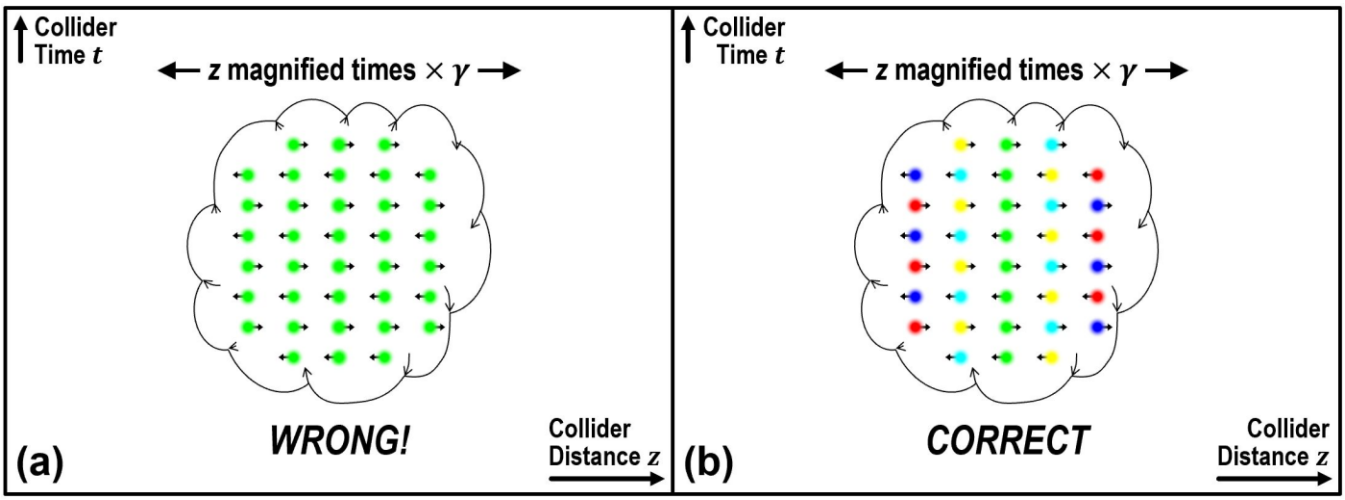

Figure 7. *Colliding lead nuclei create nucleon collision-time anomalies in QGPs.*

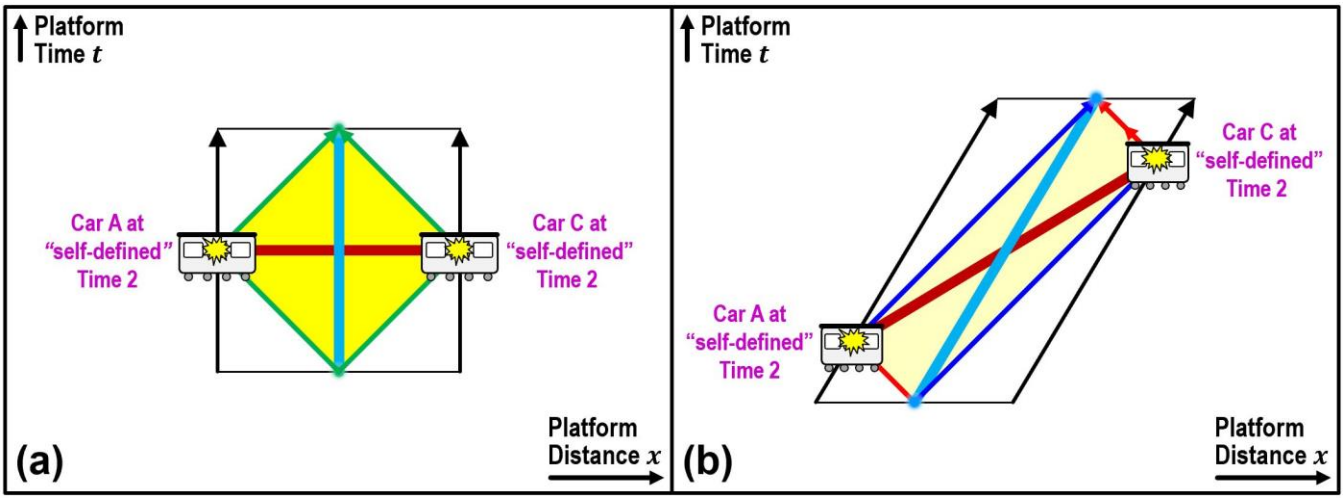

Figure 8. *The invariant Lorentz area distance (LAD, in yellow) between two* objates*.*

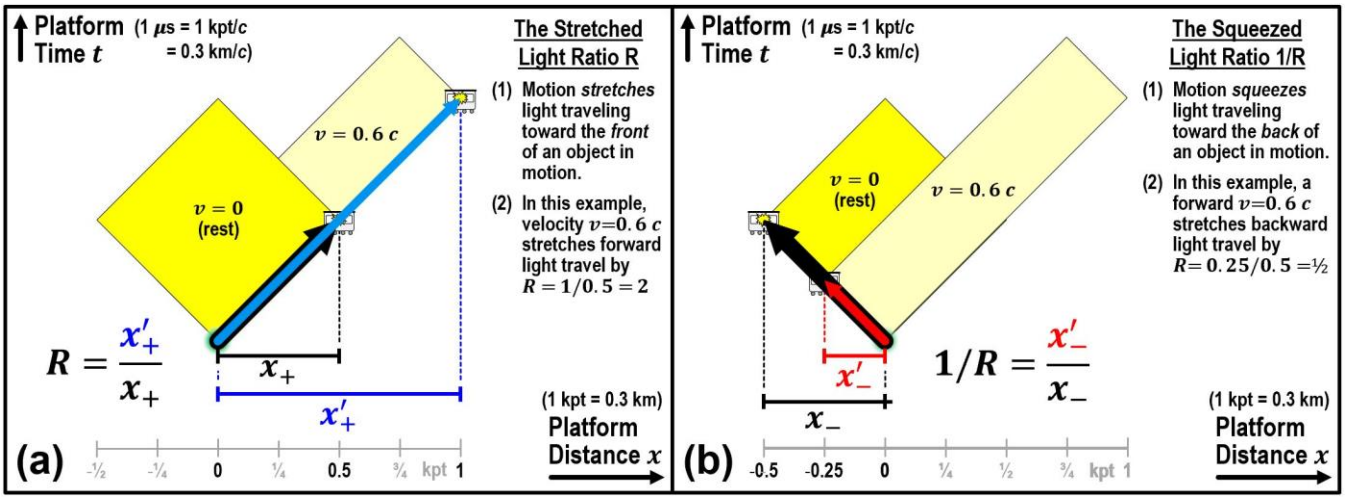

Figure 9. *The stretched and squeezed light ratios R and 1-over-R.*

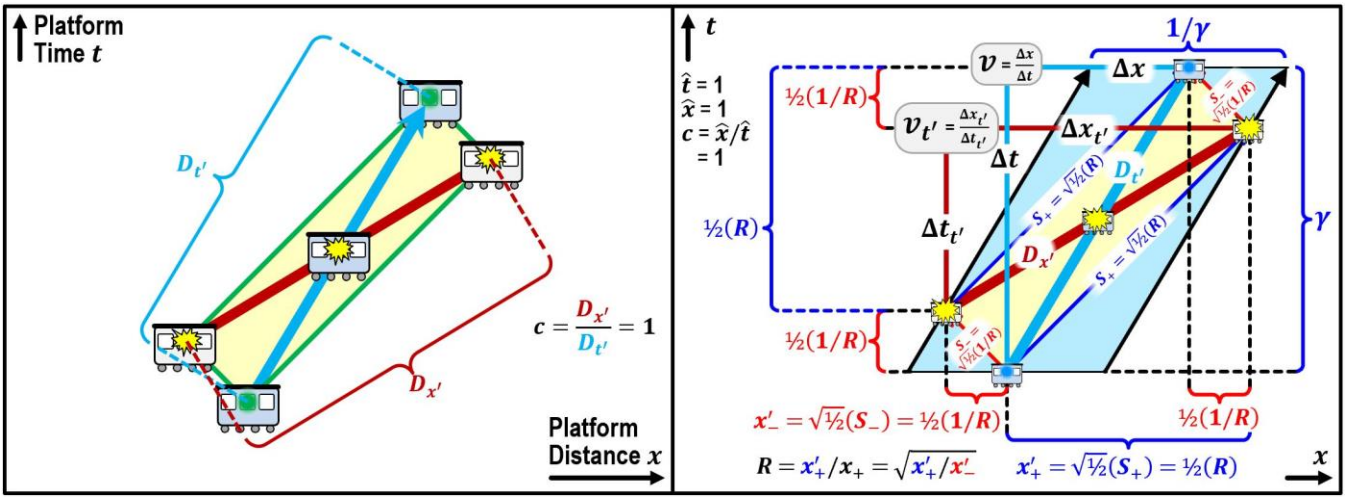

Figure 10. *A visual collection of several Lorentz area parameters.*

CONCLUSION OF PREVIEW