

How to Create a Parallel Universe Using a Bicycle

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<https://youtu.be/4ICIObFtWjM&lc=UgzxfI2JVDjIv-TPNzB4AaABAq>

A Comment on the Sabine Hossenfelder (YouTube) post:

Is Time Travel Possible? (Oct 14, 2023)

<https://youtu.be/4ICIObFtWjM?t=11m35s>

11:35 "[Time travel] causality paradoxes can be removed [by allowing] multiple timelines and parallel worlds. The problem is we don't have parallel worlds in Einstein's theories, so we have no idea how that should work."

Since Einstein's special relativity requires an infinite number of timelines, one per inertial frame, the more precise question is this: Why does riding your bicycle at a constant speed down a straight road *not* create a private, parallel universe in which all future events in that universe unfold according to *your* definition of time?

It does. But, of course, there's a catch.

You may already suspect the answer: Your private definition of time, and thus of causality, ends the moment you smash into the back of a parked truck you failed to notice because you were thinking too hard about Sabine Hossenfelder's time-travel video.

In addition to forcing your face to say hello to the back of the truck, the experience also forces you to face the fact that your definition of time and causality was never more than a tiny, short-lived bubble in a much larger universe. You did indeed "own" the direction of time and flow of causality for a while, but *only* for the micro-universe comprised of you and your bicycle. Even there, it applied only for the short interval between speeding up and crashing.

Does experimental physics tell us there are infinitely many timelines and universes? Can some of those, perhaps the smaller ones, even go backward within their local-only definitions of time?

Sure. Every clump of matter moving without acceleration sees its local history unfold based on its definition of time. It acts causally like an independent universe. The catch is that each such local-only instance of an inertial frame lasts *only* until it bumps, sometimes face-first, into someone else's private universe.

These multi-scale universes are indeed parallel, but only in the mundane sense of having to compete, sometimes ferociously, over who gets to have the most turf and thus the most "universal" definition of time.

But Terry, if all that is true, why isn't special relativity taught as a fierce competition of time-flow bubbles at multiple scales, with each such micro-universe bookended and limited by accelerations?

Math before computers was necessarily a simple thing. Folks desperately wanted and hoped for the simplest formalisms possible. So, when experiments proved vividly that the time, space, and physics of every newly accelerated clump of matter was identical to that of every other clump, the temptation to discard ugly, head-bumping, matter-only limits surrounding each new Time and Space definition proved overwhelming.

The coordinates $xyzt$ became $x'y'z't'$, and, well... sorry, that was it. Nice, simple, and "instantly" universal. The view after 1905 was that ugly, lumpy, finite-size clocks and rulers might be limited by light speed, but surely not the beautiful maths of boosts and Minkowski spaces. Uh... oops.

It's been tough trying to understand the universe using such naïve, light-speed ignoring maths. We can do better.