Brecciated Spacetime

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A Comment on the Closer To Truth (YouTube) post:
Seth Lloyd - Why is Quantum Gravity Key? (Oct 17, 2023)
https://youtu.be/mTwlD-mDig0

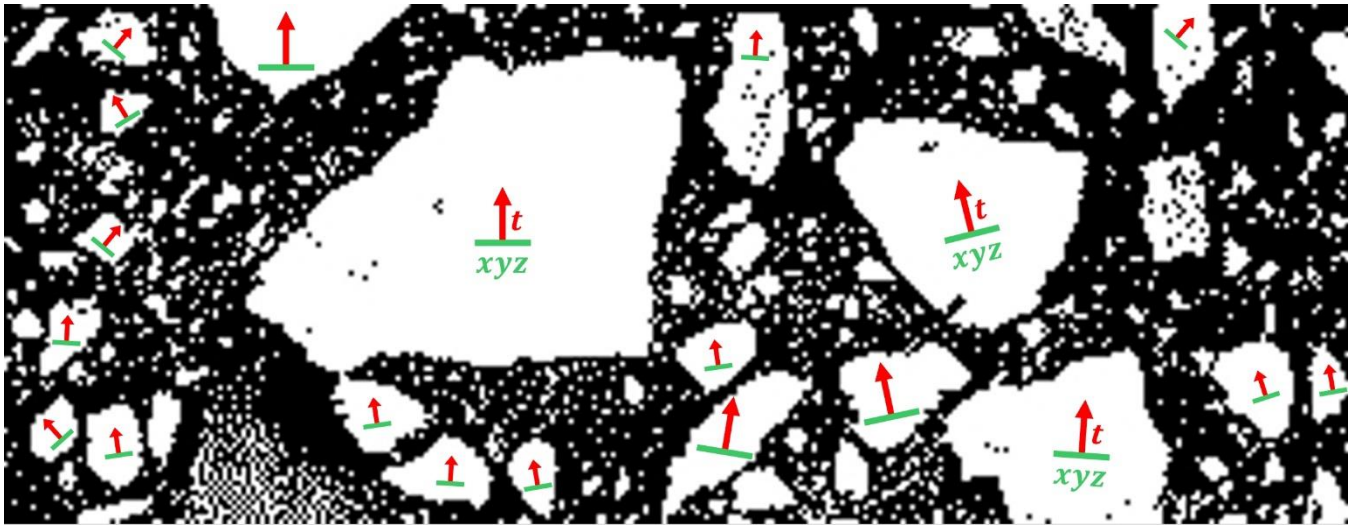

Figure 1. *Brecciated spacetime. Each labeled region (*clast*) forms a well-bounded, experimentally meaningful instance of what special relativity calls an inertial frame. Internally, an xyzt clast is a network of similarly moving objects whose parts have had sufficient time to exchange identity data throughout the clast, establishing shared space and time metrics. Clasts can overlap and embed within each other. At cosmic scales, the delay required to establish self-consistent xyzt metrics means that large clasts (e.g., earth) are necessarily both older and faster-evolving than small clasts derived from them (e.g., spaceships with twins). This clast size distinction is absolute rather than relative and is the deeper cause of twin paradoxes. Clasts are fractal, occurring at every size scale, from fundamental particles to cosmic walls and voids. Clast xyzt resolution depends on mass and drops severely (becomes quantum) at atomic and Standard Model particle scales. The color force falls below the xyzt clast concept and requires a lower-dimensional clast analysis.*

@erawanpencil, thanks. You make an excellent point about how "relative" often seems to be a … "relative" term. :)

There's a profound reason for that, one we didn't know until fairly recently: It's hardwired into our neural systems. For a narrow range of environments, the dual concept of "space state" and "time progression" from that state makes a very compact and fast way to estimate what will happen next. Biology is all about survival, so given how slow our electrochemical data processing is, it's unsurprising that brains make maximum use of this highly effective shortcut [1].

The unfortunate side-effect is that all this wiring makes things like classical space, classical time, and mathematical analogs seem "obviously" fundamental. Delightfully, many of the supposedly "fundamental" axioms of mathematics are not much more than folks' brains tickling them into accepting that since they are doing so much of the work for them, they *really* need to take concepts such as "space" and "time" and "particles" as givens.

Then you get relativity and quantum mechanics, and suddenly all of that delightful simplicity, which we call "classical" physics, gets... weird. We *always* want to make xyzt "obvious" and "fundamental," even when special relativity practically screams at us that it's all wrong.

Incidentally, it's unfair of me to blame Minkowski entirely. For example, *quick!*:

Q: Where in Einstein's 1905 special relativity papers that made c a constant did Einstein inadvertently violate his own speed of light limit? (No, you won't find that on Brilliant!)

A: When he wrote down $x'y'z't'$ as the new set of *unguarded* coordinates that result from boosting an object to a new, unimpeded velocity.

What!?

It's not complicated. By doing nothing more than *writing down* those four *completely unguarded* variables, Einstein implied they "of course" apply out to infinity.

That assumption has no physically meaningful experimental interpretation and thus does not form a valid theory [2]. In a newly created inertial frame, all space and time metrics require the completion of information loops back to the observer. Loop completion, in turn, means that any *experimentally meaningful* definition of $x'y'z'$ expands outwards at lightspeed and no faster — and that's not even including the feedback part, just how quickly the old xyz frame is undermined [3].

The bottom line is that the more profound solution to genuine problems like Feynman's delightfully pointed double-slit experiment is not to play games with $xyzt$ in different frames but to realize that x, y, z, and t are *never* fundamental.

Instead, you get what I've taken (this week, heh!) to calling a *fractally brecciated universe* (Fig. 1). (Shout out to Shawn Willsey for providing the "brecciated" adjective).

Just forget universal space and time. That's nonsense, and Einstein *told us that* it's nonsense over a century ago. What happens instead is a *very* messy mix of inertial frames with multi-scale, often overlapping, definitions of $xyzt$. You don't need humans for these local metrical systems to pop up, either. We use these shortcuts precisely *because* they pop up naturally in large clumps of thermal matter.

Enough, Cirque du Soleil time approaches!

References

[1] Computers rely even more heavily on space-and-time approximation since the entire concept of a "state machine" is an idealized version of space (state) and time (execution).

That's also why smaller is always better in computation. Larger computer chips bump harder into the reality that light speed is finite, meaning you can never have a truly singular, universal state in the physical universe. The best you can do is approximate one by keeping parts stable and hoping lightspeed is very fast… which, fortunately for our existence, is true in our universe.

[2] The Spekkens/Leibniz principle is relevant here: *"If your theory claims two things are physically distinct yet impossible to distinguish experimentally, they are the same thing, and you need a new theory. It was only your description that made them look different."*

It would be an exponential understatement to say that I paraphrased Spekkens a bit, but it captures his intent.

[3] In Apabistia Press, I call this the Sea-And-Lagoon (SAL) model [4] — a spreading metrical disturbance (the Lagoon) in the formerly peaceful xyz sea (the Sea).

[4] T. Bollinger, "The Roles of Laws and Information in Physics (Plus Wave Relativity)," *Apabistia Notes*, vol. 2023, p. 9101350, Sep. 2023, [Online]. Available: https://sarxiv.org/apa.2023-09-10.1350.pdf. See p. 2, Fig. 1(b) SAL.