Newton, Leibniz, and the Need for Non-Point Calculi

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[Message Excerpt]

Hi Parth,

I am delighted you are recovering well! While COVID is nothing like it used to be in total numbers, I like to hear the words “full recovery” before I stop being concerned. These days, whenever I hear the phrase “long COVID,” all I can think of is Physics Girl and all of her supporters. It’s heartbreaking. I am happy that so many folks are helping on Patreon.

I’m glad you enjoy Apabistia Notes! Guess what the next one is? :)

As you may have noticed, I’m no longer just going after ol’ Albert but the *foundations* of modern continuum mathematics. Seeing a rather silly YouTube “explanation” of how 3D math “proves” the inverse square law of physics, done by someone who should know better, convinces me that the bug regression to fix physics cannot stop at 1905.

The problem is exquisitely simple: Any mathematical expression that uses orthogonal plus-to-minus infinity axes originates in a set of opinions that are, at best, a narrow and badly incomplete approximation of a small fragment of some self-consistent but unknown system that should have been the basis of such maths. In other words, all orthogonal real-dimensioned spaces are deeply and profoundly self-inconsistent and buggy.

The narrow set of opinions was that of low-speed, low-energy, medium-sized entities living on medium-temperature lumpy planet surfaces. We call these opinions “classical physics.” Even for that domain, as demonstrated by Newton’s gravity, the mathematical generalizations created from these badly incomplete data sets tend to be buggy.

I should emphasize that this is *not* one of those debates about whether math is created or eternal. The problem is much simpler: The *concept* of n-space with infinite dimensions is wrong, in much the same way that it’s wrong to say the earth is flat just because it looks flat locally. When you define your maths from a sample set that lacks some of the axioms required to make it self-consistent, there’s no way the overall result can be anything but profoundly buggy and, in many cases, flatly wrong. General relativity attempts to address this inadequacy, of course. But doing nothing more than adding curves to an already profoundly flawed foundation is like trying to fix a failing bridge by giving an excellent paint job. At best, it just distracts from the real problems.

The more profound resolution is this: Stop assuming everything *must* be point-like. We do that mainly because, you know, rocks are *sort of* point-like if you squint hard, and our brains get a kick out of throwing rocks… so isn’t that proof enough of points?

Quantum theory pretty much screams at us that this point fixation is a *horrible* idea, but we humans are superb at not listening to what silly old nature has to say. Points require infinite information and thus are infinitely classical, making them delicious to our point-biased neural architectures. Alas, since information is *always* the differentiator between whether one should apply quantum or classical rules, this also drives us into maths that lack sufficient axioms to achieve self-consistency for quantum mechanics.

Flipping from an xyz or txyz space to a Poincaré symmetric space is an excellent potential step in the right direction. However, it also emphasizes my earlier assertion about the dangers of assuming points since there's no such thing as a point in Poincare space.

Say what?

Poincare symmetries unavoidably require age gradients in objects and thus also require asynchronous equivalence. That's because any such object is viewable from any other frame, each applying its own Lorentz compression and age gradient to interpret the original object. Asynchronous equivalence, in turn, means the units of distance and time within that frame must possess *R inversion equivalence.*

By "R inversion equivalence," I mean this: Multiplying the time and space units by R in one selected direction and by 1/R in the opposite direction must always give the same physics as a rest-frame object in which R=1.

Next, what does this mean in terms of defining points? In a Poincaré space, you can approach an infinitesimal limit in both time and space while going in one direction, but only at the cost of *expanding* the units of space and time in the opposite direction.

That's *not* a point!

Well, at least not by 1700s maths, it's not. But that's the problem. Suppose you base calculus on a style of coordinates without self-consistent definition in the physical world. In that case, you cannot expect those maths to work reliably if you apply them to modeling problems in that same physical world.

So yeah, instead of critiquing Einstein and Minkowski, I'm now taking whacks at Newton and Leibniz for creating an impossibly buggy mathematical framework whose most fundamental concept, the point, does not and cannot exist.

The alternative? Loops, but not just any loops. These loops *create* time and space and exist at many scales, all mixed in a lovely stew that makes some operations incredibly energy efficient (e.g., single photons "reporting" the shape of an entire lens) and others extremely energy wasteful (e.g., nuclear fusion and sorry, I cannot resist, chatbots).

Enough for now. Please keep recovering!

Cheers,
Terry

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