Discrete Versus Point-Like and the Emergence of Classical Physics

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Email Excerpt

From: Terry Bollinger
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Subject: Re: Certainty +

Hi Ron,

I hope the walk helped you establish equilibrium! We can all use some of that sometimes!

Michael is right to distinguish *discrete* from *infinitely precise*. You can choose classically to enter one of two rooms, and that decision never goes away: You *choose* a well-defined path, which "sticks" at every level that counts. That's how we can have monthly meetings!

The quantum problem only pops up when you push that concept of history-changing discrete choice *too far down* in terms of the total mass and energy of the object in question. You eventually reach a point, starting (if you are very careful) at about the size of large molecules, where you find *it is no longer possible in any experiment to say which door was chosen.* That's the essence of the double-slit interference experiment: It is no longer *possible* to devise an experiment that uncovers which way the electron went without adding external energy — more "observation" — into the situation. Such cases lose the possibility of a *discrete* choice.

I'm unsure how all of this works in your view of uncertainty. The boundary between the classical case of making an irreversible, history-altering *discrete* choice as you approach two doors versus the quantum case of never having the option to choose is *never* absolutely fixed. Researchers keep pushing the entity size up, with the current record standing at about the mass equivalent of about three codons of DNA. That's a colossal molecule! It's so big that it has enough internal states to have its own "personal" definition of time and change, independent of the outside universe.

Thus, if you try to say there's an *absolute* difference, you must add an asterisk and say, "As long the entity neither hits nor emits photons or atoms, it never sees the doors." Even *one* photon messes it all up. That's the deeper cause of "classical" certainty: It's just too difficult to keep ourselves isolated enough from the rest of the universe.

The other point in favor of uncertainty is, of course, what I already said: Any concept of a point particle, even momentarily, is energetically impossible — and then it self-destructs in an unimaginably large explosion if it was seriously point-like. All that nonsense about "perfect" points and "perfect" lines is pure fantasy by classical Platonic-focused math types from the 1700s and 1800s, before the discovery of quantum physics. Such dumb maths are also why quantum field theory needs tricks like "renormalization."

Shoot, if you analyze concepts such as "planes" carefully enough (I have), you find that the current definitions aren't even self-consistent: You *cannot* define shapes without simultaneously giving them width in a higher-dimensional space, and the current maths mostly miss that or misidentify it as "duality." It's quite a mess, but with centuries of peer review behind it to stamp approval, it's also blinking hard to fix. Even the *concept* of a "manifold" has profound math errors. Wow.

(We computer types tend to be brutal in discussing legacy formal constructs from pre-computer days. When you have to work hard to make your human logic drive actual mechanical devices instead of just *claiming* your logic works based on how "smart" you are, you quickly discover that *everyone* makes mistakes. The further back the mistakes were made the more destructive the impacts. We need a nicely catastrophic update of our physics maths — an update that considers actual results instead of spinning Platonic fantasies and claiming those bits of lousy programming are "more real" than reality.)

So, bottom line: *Approximate* discrete choices exist, but always with the odd qualifier that the same actions that lead to discrete choices in one case — e.g., a fat molecule passing through one or another door (slit) — may in another quieter, less noisy case end up proving that *no* discrete choice is possible. In the latter case, the post-passage universe is *forever* unable to ascertain a discrete path through which the molecule passed. Yet that result is for the *same* molecule traveling the *same* general path! The only difference is whether some silly photon or something happened to gently bump into it, forcing the molecule to make a choice. That single photon can be incredibly powerful in "locking down" reality to produce a statistically irreversible discrete-choice result [1].

In contrast, mathematically precise particle-like paths are always a complete fantasy.

We readily engage in that fantasy because of the extreme "discrete lock-down" power of all those tiny photons and atomic bumps in our classical world. Tiny but powerful bumps give the *illusion* of precise, baseball-like point trajectories for any object, including baseballs and humans [2]. If you, as a human, could approach those two doors in utter isolation from the rest of the universe, you, too, would find it impossible to make a discrete choice. You would pass through *both* to use current casual quantum terminology.

However, I try to avoid that terminology these days except to communicate. That's because the deeper story is this: Space and time are after-the-fact "data structures" created by local inertial frames, that is, by singular Einstein frames-of-reference. These frame-specific xyzt "interpretations" of what happened are *never* universal, and they are *never* complete. You can always construct scenarios, such as double-slit self-interference experiments, in which what happened *cannot* be mapped into a discrete-choices-enabling xyzt interpretation. That's the more profound nature of quantum reality: It's not *particles* that are fuzzy, but *spacetime*. Spacetime is nowhere near as fundamental as folks would have you think. That's also why, as Einstein noted, *every* inertial frame has its version of completely acceptable and equivalent "spacetime" coordinates. You might as well say that "every house makes its bread." You get into trouble only when you declare only *your* bread is "universal," thus conflicting with every other breadmaker.

The mathematical conundrum that keeps me busy nowadays is figuring out the actual pre-xyzt maths of causality. Such deeper causality maths cannot rely on xyzt formalisms

since those are the unreachable asymptotic *limits* of the deeper maths. Additionally, even if those limits were reachable, they would remain valid only for the causally synchronized region surrounding a local instance of an inertial frame. Attempting to describe how causality works using such impossibly broad and perfect point-and-space xyzt maths is like a goldfish attempting to describe its owner's house by naïvely extending its local "fishbowl water" perspective to include (and drown) everyone in the much larger and more complicated region of the entire house.

Cheers,
Terry

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[1] T. Bollinger, *Photons as High-Voltage Decoherence Power Lines*, Apabistia Notes **2023**, 09241430 (2023). https://sarxiv.org/apa.2023-09-24.1430.pdf

[2] T. Bollinger, *The Particle Illusion: A Closer Look at Feynman's Double-Slit Paradox*, TAO Physics **2023**, 0712 (2023). DOI: https://doi.org/10.48034/20230712