

Space as a Cooperative Venture of Repeating Events

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<https://youtu.be/GrEQHnAA56E&lc=UgwNAMho5XTU-y3GuVd4AaABAq>

A Comment on the [Robinson's Podcast Clips](#) YouTube post:

Superposition and The Many-Worlds Theory of Quantum Mechanics | David Albert & Sean Carroll (Jun 25, 2023)

<https://youtu.be/GrEQHnAA56E>

4:42 DA: *"Something very strange is going on ... We are anchored in ... intuitions ... that [tell us that] asking which slit [the electron] went through is a reasonable question."* Our spatial intuitions fail at times mainly because space is not as fundamental as our wired-for-distance brains lull us into thinking it is. Space is better understood as a painstakingly constructed cooperative venture of repeating events that collectively share enough guarantees of persistence and consistency to create the *illusion* of a concept that we think of as a collective "instantaneous" or "simultaneous" state. The customized and overly optimistic separation metrics between these repeating events then are what we interpret as an xyz "space" filled with embedded "objects" at various locations.

Just as the illusion that the light and sound from lightning are simultaneous falls apart over large distances, this optimistic illusion of spacelike separations as "fundamental" starts to fall apart if the distance needed to send a signal to and back from another repeating event grows too great. Breaking the naïve assumption that true simultaneity exists in large event cooperatives is better known as special relativity — a region of dynamics in which no amount of optimistic framing can prevent the emergence of ambiguities in what is space and what is time.

The cooperative also fails if some event property — usually just one of many, such as the spin of a particle or the "location" of an electron — manages to escape the constant self-regulation of the event cooperative. It's not that the electron "went" through either slit. It's just that in the postmortem event meeting of the instrument cooperative, all the participating atoms realized they had let something slip through the cracks and could no longer *define* an xyz interpretation of what happened.

(Incidentally, the nature of self-regulation in an event cooperative is not exotic. It consists of a nearly continual micro-exchange of linear momentum pairs that keeps cooperative members entangled in ways more subtle and lower-energy than the showy, look-at-me entanglements of angular momentum pairs. Phonons and thermodynamics are more fundamental to defining inertial-frame spacetime than folks realize.)

9:57 SC: *"Everett says ... if the whole universe is my quantum mechanical system, [then] there are no outside observers. I have to ... treat the observer as a quantum mechanical system."*

An observer looks at an electron spin and creates two new superposed universes: One in which she records an up electron spin and one in which she records a down electron. These become two Hilbert states superposed as part of a smooth wave function.

A question: How long does it take for the two states to become entirely orthogonal, that is, proper elements of Everett's Hilbert space representation?

Everett's answer: It's instantaneous for the entire universe because that's what the Hilbert space formalism says happens.

A better answer: It takes longer than the universe has existed since the impact of the change must first propagate outward at no faster than the speed of light.

The experimental answer: If Everett were correct, then the security provided by quantum encryption equipment would expand faster than the speed of light and violate physics. In commercial equipment, entanglements in Schrödinger waves and electromagnetic waves propagate *no faster than lightspeed*. Everett seems not to have understood the difference between an entirely abstract "preexistent" Hilbert state and the slow complexity of getting a sizeable object *into* such a state.

11:19 SC: *"You are not the part of the wave function that describes you in all that superimposed glory. You are one of those possibilities in each one of those terms in the wave function. [12:04] What we now call the many worlds interpretation [Everett] first called the theory of the universal wave function."*

Of what *substance* is this universal wave function with infinite information capacity composed? In a Veritasium interview with Derek Muller, you noted that since gravity links all these proposed universes, the total energy of these universes must remain finite.

The problem is that no laboratory energy or matter wave behaves this way. Lab experiments and mundane radio channels show that all energy-based waves maintain strictly finite information capacities and that infinities of harmonics never emerge. That's what the ultraviolet catastrophe problem that kicked off quantum mechanics was about.

The bottom line is this: Either this mysterious finite-total-gravity substance is energy, in which case you get only one universe, or it is "something else" that only *looks* like energy when viewed from a laboratory existing in only one universe.

One can certainly *propose* a substance that looks like energy with infinite storage capacity, but for clarity of discussion, it should not be called energy. That substance is well known and *always* has finite information-carrying capacity.

The more straightforward explanation for Everett's infinite-information-capacity version of energy is that he made a math error. Defying decades of laboratory observations, he assumed that occupied Hilbert states representing enormous collections of highly distributed matter and energy come into being "instantly" every time a local-only change occurs. Applying the Hilbert formalism without acknowledging this critical role of finite-time propagation in creating occupied Hilbert states is just bad math.