

## Wavefunction as a Concrete Object

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In his book *Something Deeply Hidden* Sean Carroll defends the Everettian concept of a branching multiverse and in doing so makes some contradictory statements about the nature of the quantum wavefunction. He writes: "What the World Is Made Of: a quantum wave function" and "wave functions are superpositions of different possibilities" and "Wave functions may be real but they're undeniably abstract". How can our concrete environment be made of something abstract? How can physical objects be constituted by possibilities? Many Worlds theory has been haunted by the tension between wave functions understood as mathematical objects and wavefunction understood as physical stuff. I describe a recent approach to this problem which involves applying set theory to physics in a novel way. In the 1960s the logician Willard Quine demonstrated that sets need not be thought of as necessarily abstract, non-spatiotemporal objects. A particular type of set can be construed as concrete. It turns out that Quine's idea can be built on to provide a settheoretic interpretation of quantum indefiniteness. The components of a superposition can be understood to be its subsets. Each subset is a set of objects in the same definite state and different subsets have set-theoretic elements in different definite states. The universal wavefunction is interpreted as a set of universes, each of which instances a different configuration of particles and/or fields. Unitary evolution is the partitioning of wavefunction. The talk will be based on a paper to be found at <https://arxiv.org/abs/2309.14004>

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