The Need for Energy-Aware Quantum Formalisms

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Chaos: The real problem with quantum mechanics
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The momentum eigenstates are handy because they are the entirety real asymptotic _limits_ of how the universe works. That's why quantum theory has been so incredibly successful despite the unnecessary infinities embedded within it.

The problem is not the math but the finite nature of real-world physics. No finite system has sufficient energy to reach the asymptotic limits of the abstract continuum models.

Thus to make the same math more powerful, it must explicitly include limits on how far eigenstate _resolution_ -- numeric precision -- can extend when modeling a given physical system. These limits apply both conceptually and arithmetically.

Or more bluntly: While all infinite-dimension Hilbert spaces are necessarily fantasies -- both conceptually and arithmetically -- the _approximation_ of such spaces is extremely useful and well-proven. This is especially the case when the details of approximation are explicitly, rather than accidentally, synchronized to the energy-resolution limits of the systems modeled. That's another way of saying more parameters are needed.

There is a delightful opportunity here, not for _discarding_ math, but for _extending_ it in ways that make it more powerful than it is even now. Quantum computation, for example, might have avoided decades of _faux pas_ about emerging "error correction" difficulties if their models had been resolution-aware back in the 1980s and onward.

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