

Quantum Physics

Why the Hamilton operator alone is not enough

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In the many worlds community seems to exist a belief that the physics of a quantum theory is completely defined by it's Hamilton operator given in an abstract Hilbert space, especially that the position basis may be derived from it as preferred using decoherence techniques.

We show, by an explicit example of non-uniqueness, taken from the theory of the KdV equation, that the Hamilton operator alone is not sufficient to fix the physics. We need the canonical operators p , q as well. As a consequence, it is not possible to derive a "preferred basis" from the Hamilton operator alone, without postulating some additional structure like a "decomposition into systems". We argue that this makes such a derivation useless for fundamental physics.

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