Quantum to Classical Transition per the Relational Blockworld

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Abstract

The transition from the quantum realm to the classical realm is discussed in the context of the Relational Blockworld (RBW) interpretation of non-relativistic quantum mechanics (QM). Per the ontology of RBW, reality is a collection of spacetime relations in a blockworld compatible with the construct of classical objects via trans-temporal identity, so RBW is a geometric (as opposed to a dynamic) description of reality. Accordingly, the transition from the quantum realm to the classical realm is the transition from spatiotemporally rarefied distributions of spacetime relations to spatiotemporally dense collections of spacetime relations. Since a classical object is created trans-temporally via multiple spacetime relations, the continuity equation of classical mechanics need only be satisfied statistically in spacetime regions containing rarified distributions of spacetime relations. That QM's continuity equation can be understood to satisfy this requirement is already well established in Bohmian mechanics. In contrast to the assumption of Bohmian mechanics that the detector events on a trajectory are caused by a particle moving along the trajectory, we argue that detector events evidence spacetime relations whence trajectories can be inferred. The first such detector event along a trajectory is distributed per $\psi^*\psi$ while subsequent detection events on the trajectory are in accord with classical probability. In this sense, reality is strongly disposed to classicality. We provide a simple example of this quantum-to-classical transition via a gedanken twin-slit experiment. Implications for particle physics are broached.