

A digital approach to quantum theory

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Does information play a significant role in the foundations of physics? Information is the abstraction that allows us to refer to the states of systems when we choose to ignore the systems themselves. The viability of this can be formalized by postulating the existence of an information unit such that the state of any system can be reversibly encoded in a sufficient number of such units (bits/qubits in the classical/quantum case). This property of classical and quantum theory is not true in general, so we promote it to a postulate. We derive the full structure of quantum theory from the following operational postulates: Continuous Reversibility, Tomographic Locality and Existence of an Information Unit, which includes Information Causality. This new axiomatization provides an alternative perspective from which to look at the physical content of quantum theory, and opens the possibility of modifying and generalizing it in new ways.

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