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Almost quantum theory: classical theories with a constraint on knowledge

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What kind of theory would be appropriate for an agent living in a world that is essentially classical but where there is a fundamental restriction on how much knowledge can be acquired about the physical state of any system? Formalizing such a restriction, one can define several toy theories that are found to have a rich structure similar to that of quantum theory, including a notion of coherent superposition and entanglement. These theories are also found to have analogues of a wide variety of quantum phenomena, such as complementarity, interference, teleportation, no-cloning, and many quantum cryptographic and communication protocols. The diversity and quality of these analogies provides compelling evidence for the view that quantum states are not states of reality – as most interpretations suggest – but rather states of knowledge that are incomplete (and cannot be completed). The question "what is the nature of the reality to which this knowledge refers?" remains open in this research program but the phenomenon of contextuality (a consequence of the Bell-Kochen-Specker theorem) provides, I argue, our best clue for how to answer it.