

# No qualms about quantum theory

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A colloquium paper published in *European Physical Journal D* looks into the alleged issues associated with quantum theory. Berthold-Georg Englert from the National University of Singapore reviews a selection of the potential problems of the theory. In particular, he discusses cases when mathematical tools are confused with the actual observed sub-atomic scale phenomena they are describing. Such tools are essential to provide an interpretation of the observations, but cannot be confused with the actual object of studies.

The author sets out to demystify a selected set of objections targeted against [quantum theory](#) in the literature. He takes the example of Schrödinger's infamous cat, whose vital state serves as the indicator of the occurrence of [radioactive decay](#), whereby the decay triggers a hammer mechanism designed to release a lethal substance. The term 'Schrödinger's cat state' is routinely applied to superposition of so-called quantum states of a particle. However, this imagined superposition of a dead and live cat has no reality. Indeed, it confuses a physical object with its description. Something as abstract as the wave function – which is a mathematical tool describing the quantum state – cannot be considered a material entity embodied by a cat, regardless of whether it is dead or alive.

Other myths debunked in this paper include the provision of proof that quantum theory is well defined, has a clear interpretation, is a local theory, is not reversible, and does not feature any instant action at a distance. It also demonstrates that there is no measurement problem, despite the fact that the measure is commonly known to disturb the

system under measurement. Hence, since the establishment of quantum theory in the 1920s, its concepts are now clearer, but its foundations remain unchanged.

**More information:** B.G. Englert (2013), On Quantum Theory, *European Physical Journal D*, [DOI: 10.1140/epjd/e2013-40486-5](https://doi.org/10.1140/epjd/e2013-40486-5)

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