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Quantum Mechanics, the Universe, and the Multiverse

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Traditionally considered a theory only of the subatomic domain, quantum mechanics entered cosmology in 1931 with G. Lemaître's primeval-atom hypothesis. Much later, theories based on quantum gravity, such as string theory and loop quantum gravity, have been developed into cosmological models. Moreover, quantum-based theories of multiple universes have recently attracted much attention. Modern hypotheses of the multiverse are in part justified by the many-worlds interpretation of quantum mechanics which according to some physicists is the only correct interpretation. Apart from outlining the historical background for the role of quantum mechanics in cosmological thinking, the presentation will focus on the multiverse and related hypotheses in which quantum mechanics play a crucial role. Is 'quantum cosmology'more than just a label? By critically looking at the fate of this diverse class of theories, some general comments will be offered on the current status of the standard cosmological model (ΛCDM) and its possible alternatives.

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