

# The present moment in quantum cosmology: Challenges to the arguments for the elimination of time

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## Abstract

Barbour, Hawking, Misner and others have argued that time cannot play an essential role in the formulation of a quantum theory of cosmology. Here we present three challenges to their arguments, taken from works and remarks by Kauffman, Markopoulou and Newman. These can be seen to be based on two principles: that every observable in a theory of cosmology should be measurable by some observer inside the universe, and all mathematical constructions necessary to the formulation of the theory should be realizable in a finite time by a computer that fits inside the universe. We also briefly discuss how a cosmological theory could be formulated so it is in agreement with these principles.

**Keywords:** cosmology, relativity, quantum cosmology, time, problem of time

[Specific Sciences: Physics: Cosmology](#)

[Specific Sciences: Physics: Fields and Particles](#)

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[Specific Sciences: Physics: Quantum Mechanics](#)

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