The Theory of Everything public lecture:

Quantum Cosmology and the Arrow of Time

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CONCLUSIONS

- Classical cosmology describes very well our Universe starting from the first moments after the Big Bang.
- Quantum cosmology is an attempt to understand what had happened at (or before) the Big Bang.
- Perhaps, the most surprising prediction of quantum cosmology is that the entire universe is timeless.
- In order to solve the timelessness problem of quantum cosmology we must better understand observers
  - in quantum cosmology for any given observer of mass M the rest of the universe of mass $-M$ might still evolve.
  - In quantum mechanics nothing happens (evolution is deterministic) until observations are made by observers.
  - In thermodynamics entropy (of all systems without observers) grows suggesting thermodynamic arrow of time.
- Next lecture we will study the role of observers and observations in context of the so-called Multiverse theories