

# A Simple Proof that the Universe is Profoundly Non-Deterministic

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Universe



$M = 1 U$

State of the Universe



$\times \infty$

$M = \infty U$

*The Universe and the State of the Universe are profoundly different forms of matter-energy organization.*

Arvin Ash, in keeping with several other good comments on your short video on how a quantum universe can be deterministic, I note that you have instead proved precisely why a quantum universe must be non-deterministic.

Why? Because the information model of the state of the universe is not identical to the universe itself. The universe has finite energy, as indicated by all experiments we can perform. In sharp contrast, “the full information about the initial state of the universe” is an indefinitely large construct of mass and energy that dwarfs the size of the universe.

Think about how much energy it takes to specify the location of one electron in one hydrogen atom. Next, create a mechanism for storing that data, since information is not an abstraction but a construct involving at least some fermionic matter, and then multiply that total mass and energy cost by the entire universe. I think you can see where this is going.

No matter how popular the remarkably sloppy historical concept of an “initial state” of the universe or any quantum system has been, and no matter how casually people conflate “initial state” with the universe itself, these are utterly different concepts.

This inattention to the cost of information storage is also a great example of what I call fairy dust in physics.

Fairy dust accumulates in mathematical models when physicists assume that information is some free, magical entity they can slather on to any depth of detail at no cost. There is no such thing as free information, and this free information that gets assumed is the fairy dust. It’s hard to do real physics until you shake off the fairy dust since until you do, you are living in a fantasy world that only exists in your head.

In this example, the fairy dust would have infinitely larger mass and energy than the universe. That’s a pretty silly starting point for saying that the universe is deterministic.

Again, thank you for this succinct proof that the universe is non-deterministic, even if it was inadvertent.

## References

- [1] Terry Bollinger comment on 2024-09-07.17:42 EST Sat:  
<https://youtu.be/H6865KHcenc&lc=UgzgU6-MgvTlbfXxMUJ4AaABAg>

