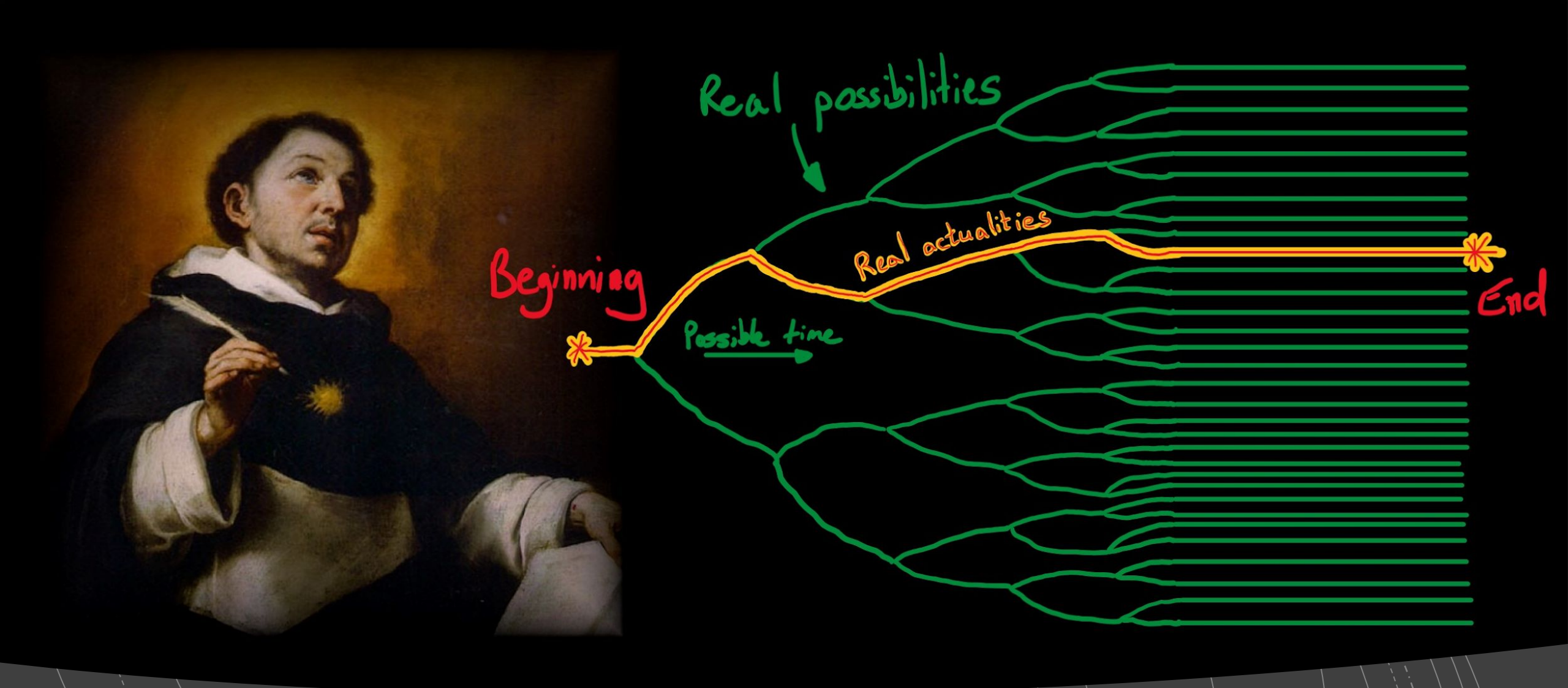




Aquinas and Quantum Theory

Fr. Robert Verrill OP, Baylor University





Motivation

Question: Why would a Catholic theologian be interested in physics?

Answer 1: Some people think physics contradicts the Catholic Faith, so a Catholic theologian should try to offer interpretations of physics that are compatible with the Catholic Faith.

Answer 2: The fact that God became incarnate should have consequences for how theologians think about physical reality.



Some Views that Lead to Difficulties

1. Atomism gives a complete account of physical reality.
2. The whole of physical reality is deterministic.
3. Physical reality fundamentally random.
4. Physical reality is fundamentally weird.

"The more the universe seems comprehensible, the more it also seems pointless"
Steven Weinberg, Physicist and Nobel Laureate

A Catholic Interpretation of Quantum Theory?

- Adrian Kent's paper: "Solution to the Lorentzian Quantum Reality Problem", 2014.
- Jeremy Butterfield's survey: "Peaceful Coexistence: Examining Kent's Relativistic Solution to the Quantum Measurement Problem", 2017.
- My presentation "Hylomorphism and the Superposition of Cat States", Philosophy of Physics Summer School, Chicago, 2018.
 - Matter= A thing's principle of potency
 - Form= A thing's principle of actuality



The Divine Nature

- God is the First Cause
- God is simple (no composition)
- God creates freely
- God is Eternal
 - Eternity = the simultaneously-whole and perfect possession of interminable life.
- God is perfectly knowing
 - For all eternity, God understands the ways in which His being can be imitated.



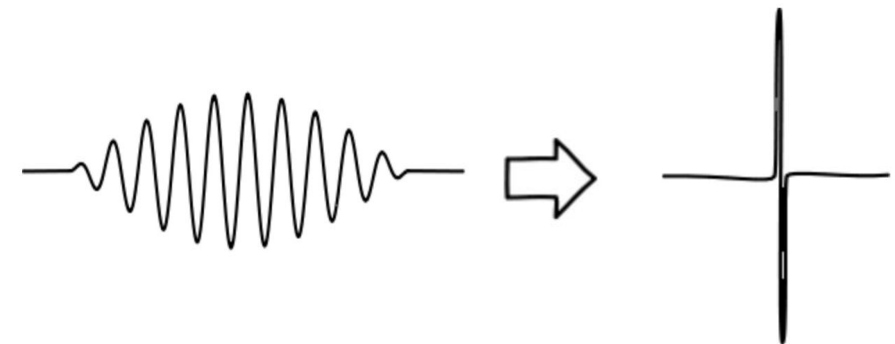
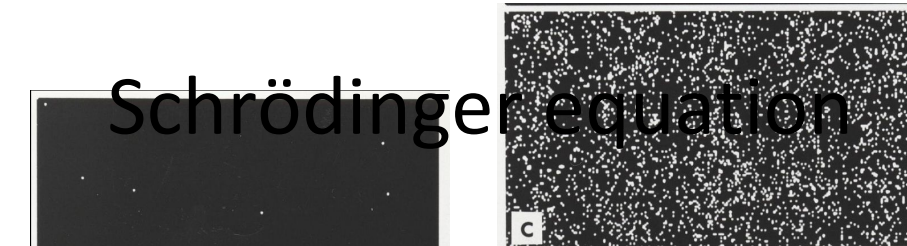
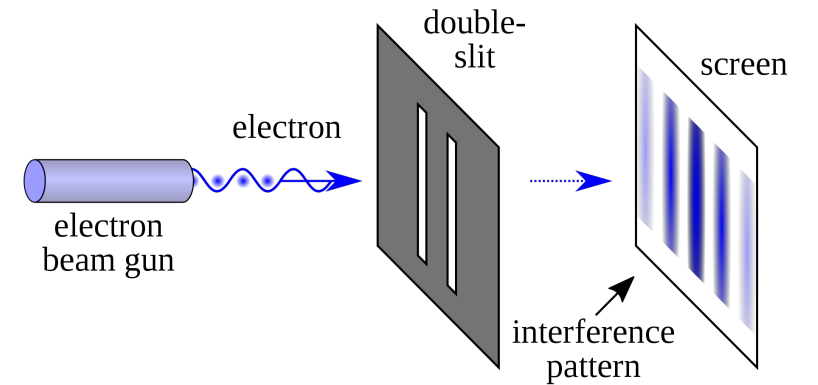
God's single act of knowing

- God's necessary knowledge
 - Divine ideas = the principle of God's knowledge of things as they exist in God's mind.
 - Divine ideas are identical to the divine essence.
 - God has many divine ideas.
 - Divine ideas necessarily "flow" from God's self-understanding = the divine essence.
- God's contingent knowledge
 - God can think about individual/particular things that imitate His being. E.g. individual human beings.
 - God does not have to think about individual things.
 - But God does have a reason to think about individual things - because it's good!
 - Because He freely/contingently thinks about individual things, what He thinks does not belong to His divine essence. i.e. They're CREATED.
 - The freedom of individual things = the freedom of God to contingently think them.



Copenhagen Interpretation

- The Born Rule gives the probability of a measurement outcome.
- The Schrödinger Equation determines the time evolution of the state.
- The state is a complete description of the system.
- On measurement, the wavefunction collapses randomly (subject to the Born Rule).
- Until the collapse, the wavefunction evolves deterministically.



Multiparticle Quantum Physics

- Two-particle state:

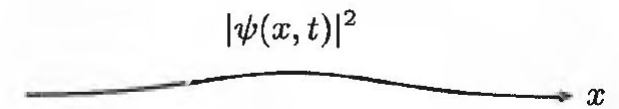
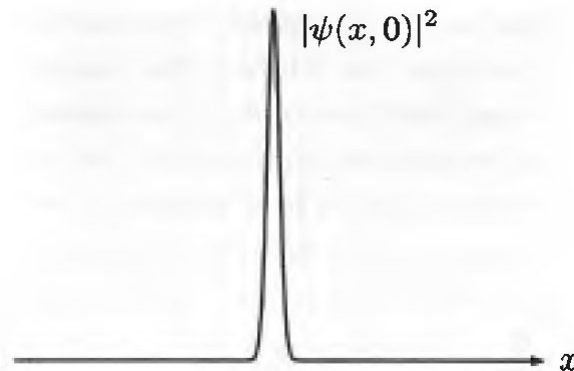
$|\text{cat}\rangle$





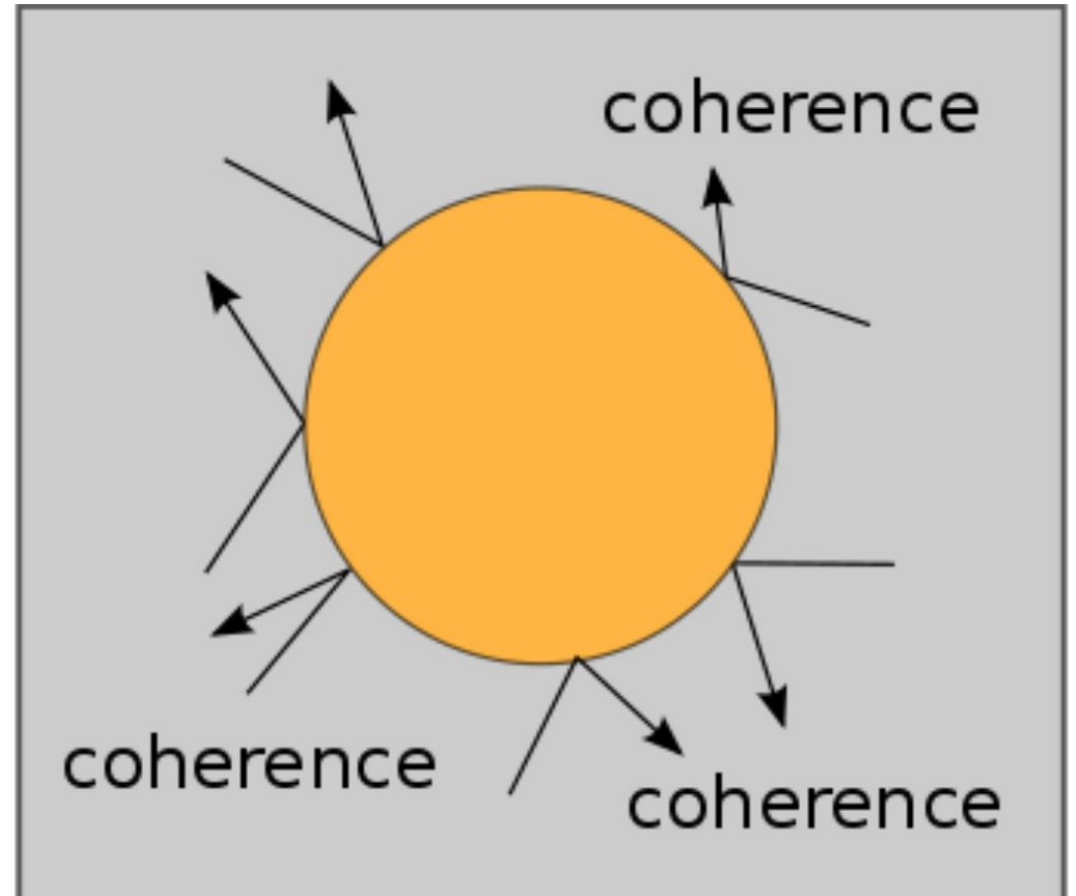
More Weirdness

- The Problem of Wave packet spreading

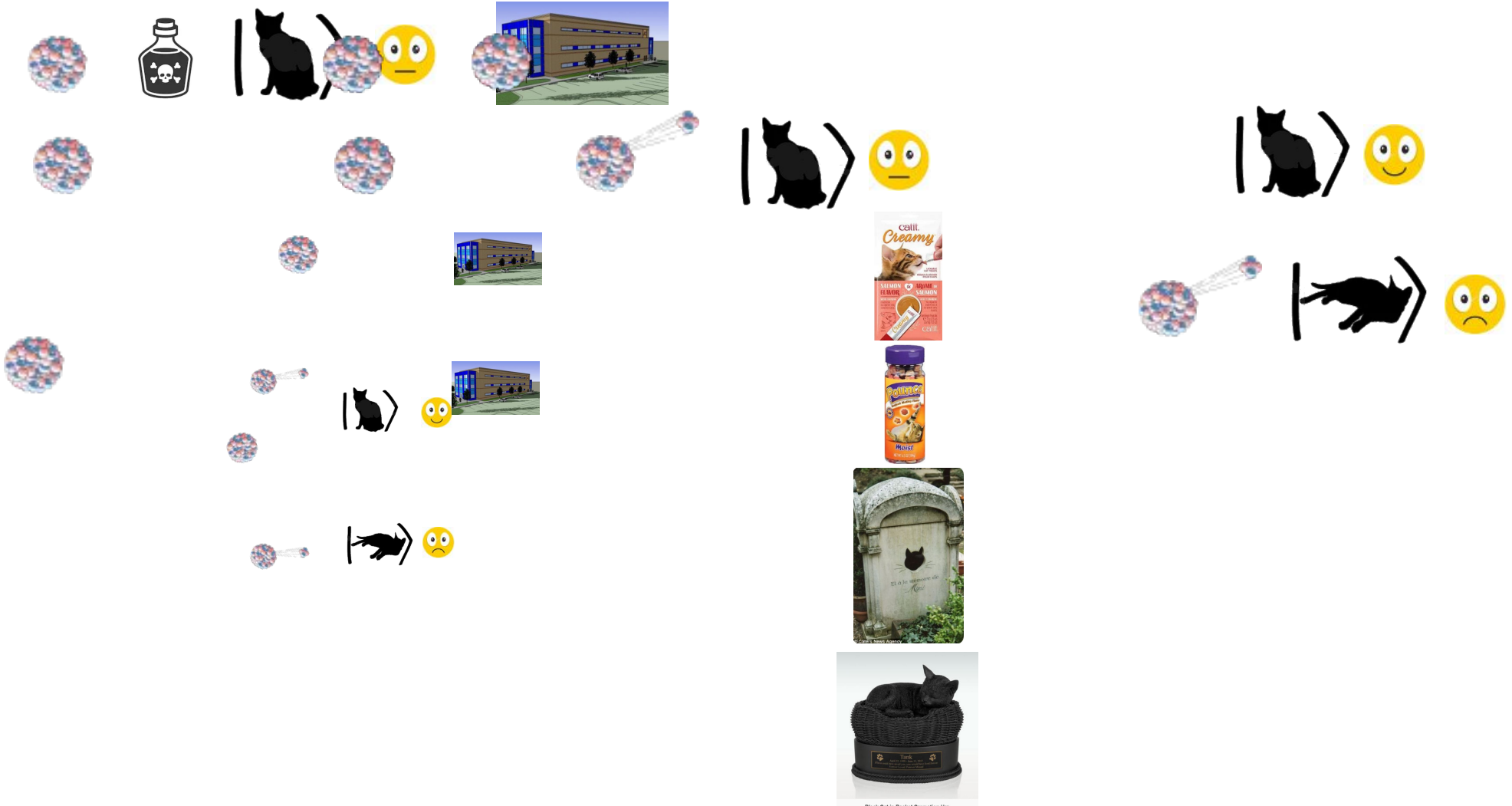


Decoherence Theory

- Considers the interaction of a system with its environment
- The photons and the system enter a superposition of states = entanglement.



Schrödinger's cat in the light of decoherence



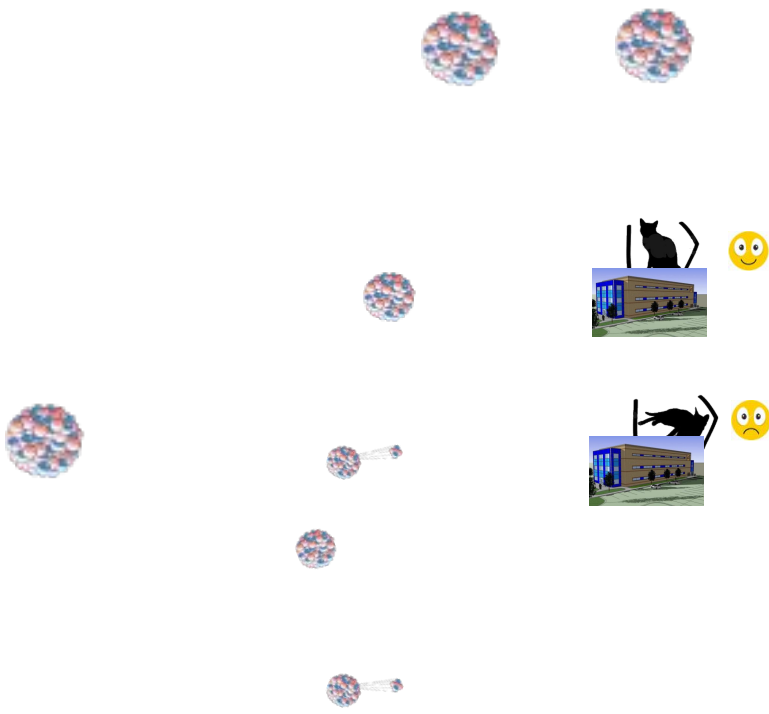
Black Cat in Basket Cremation Urn



Aquinas and Quantum Theory




Schrödinger's cat again



Black Cat in Basket Cremation Urn





In the beginning God created the heavens and the earth. The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. And God said, "Let there be light"; and there was light. And God saw that the light was good.

Aquinas and Quantum Theory

