Week 7

Second Half of Quantum Mechanics (overview)

4) Schrödinger's Cat

Schrödinger: "Had I known that we were not going to get rid of this damned quantum jumping, I never would have involved myself in this business."

- He clearly didn't like the state of QM

Solve posed:

Cat in a steel chamber w/ radioactive substance (~1 decay / hr)

decays → cat dies (hammer shatters HCN)

no decay → cat lives

taken out after 1 hr.

- It is very much alive or dead.

Not "fuzzy" superpose

- Meant to show the absurdity of QM.

Now we use it to explain QM

Explanations of "Collapsed Wave Function"

Quantum "Relativity"

- Every observer is right!
  - That's very confusing - how do we mesh 6 billion people's perceptions?
- Do "observers" need to be "intelligent"

Speculation

maybe just a superposition of all realities + perspectives

EPR = Einstein
Boris Podolsky
Nathan Rosen

Entanglement

Set up an experiment so that 2 particles get opposite quantities (eg ↑ ↓ spins).
You don't know which has ↑ or ↓
until you measure - Then you instantaneously know both

But the other particle didn't have a definite spin until you measure the first

How does the other particle know when the other was measured

Heisenberg: It must just be experimental error

NO! The second particle can be infinitely far away - can't feel experimental effects

EPR: hidden variables
"secretly" determine the states of physical variables
- Basically "we don't know"

Bell's theorem says no!

QM Applications

Quantized energy levels → Characteristic lines → measure REDSHIFTs

Hawking Radiation?

Bose-Einstein Condensates