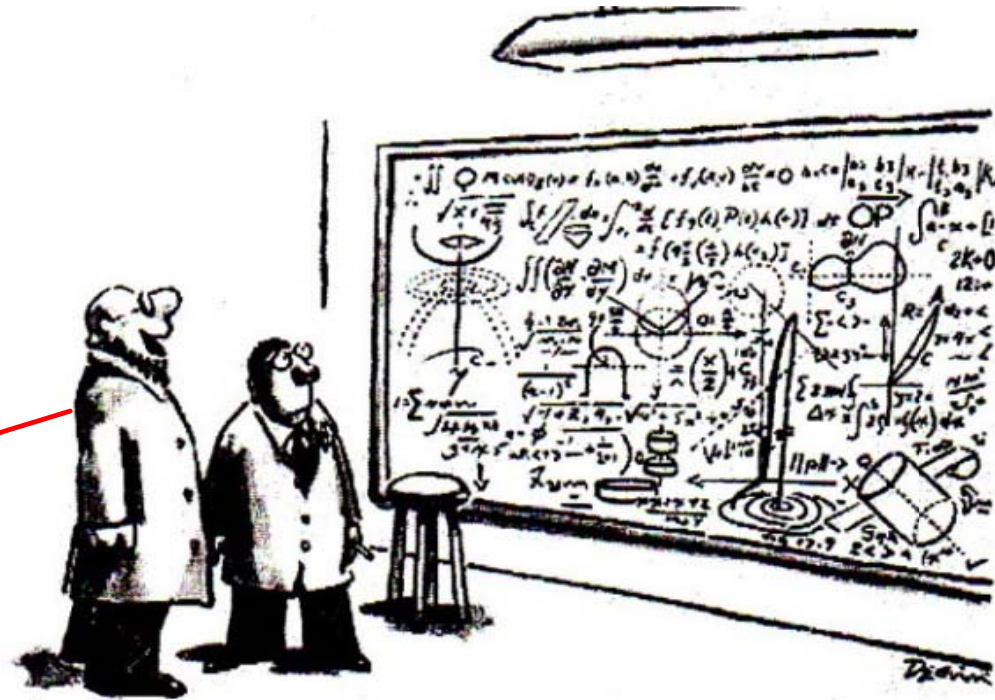


Physics 102 - March 5, 2014


Quantum
Weirdness



"Hey, no problem!"

$$-\frac{\hbar^2}{2m} \frac{d^2 \psi(x)}{dx^2} + V\psi(x) = E\psi(x) \quad \text{Schrodinger's EQUATION}$$

Max Born German (1882-1970)

What is ψ ?


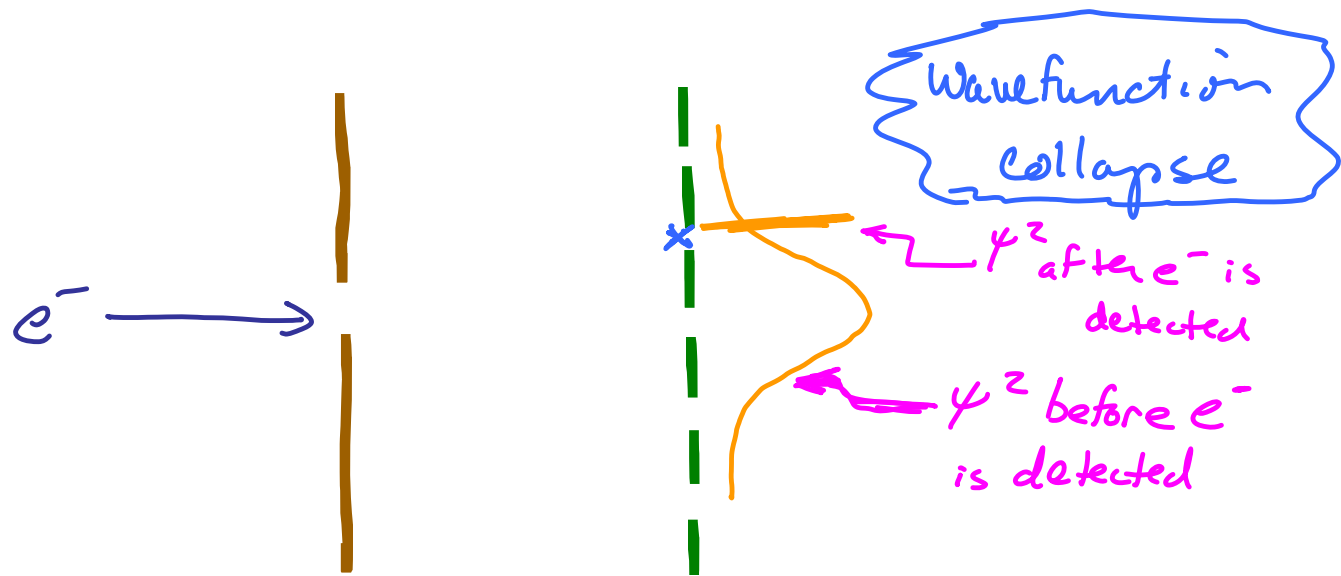


$\psi(x)$ ~ wave function

$\psi^2(x)$ ~ probability density

1954 Nobel Prize in physics

"For his fundamental research in quantum mechanics, especially for his statistical interpretation of the wavefunction."



Once electron hits the film/detector we know with 100% certainty where the electron hits
- So wavefunction has to "collapse"

EPR Paradox — Einstein, Podolski, Rosen 1935

"Spooky Action at a distance"



Two photons are produced at once — They are correlated.

If one has spin one way the other has spin the other way.

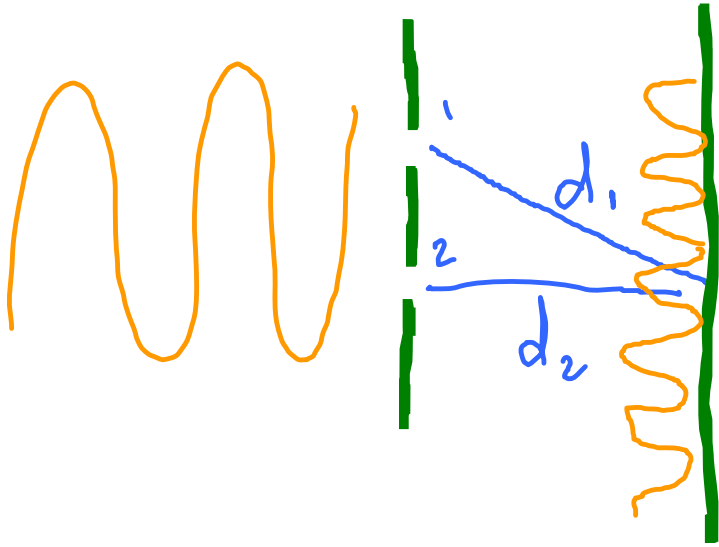
They are in an "entangled quantum STATE"

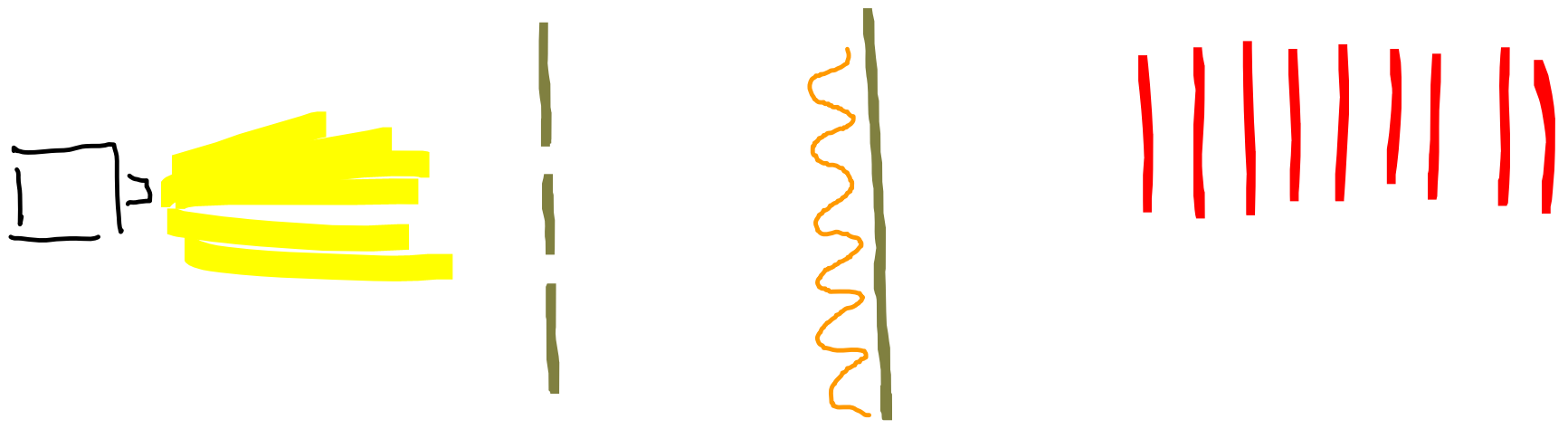
When observer A observes the spin of photon — The wavefunction collapses and the spin of the photon observer B will observe is determined.

But collapse instantaneous and observers A + B far apart

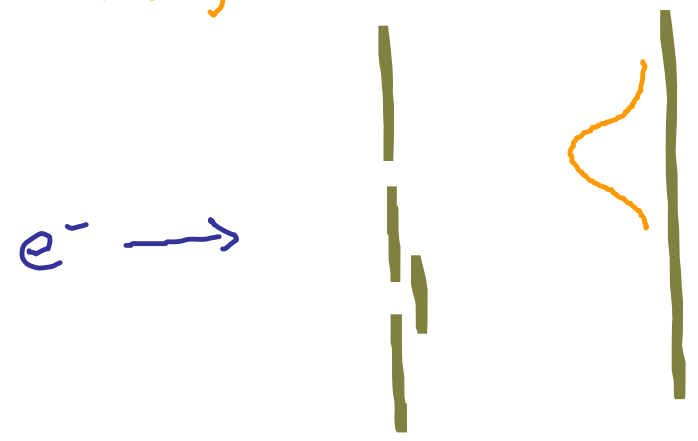
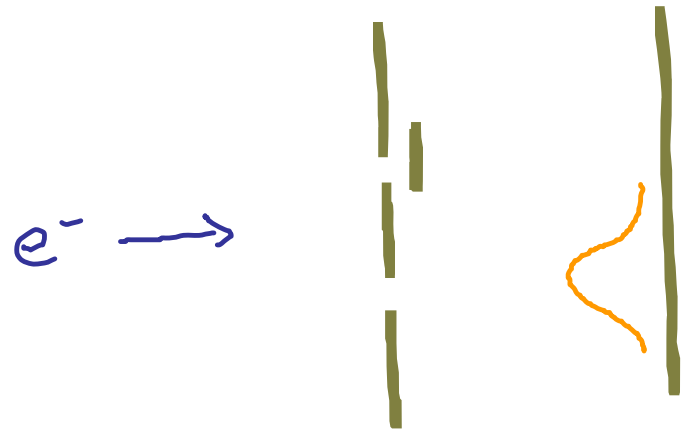
Does this mean information conveys faster than speed of light?

Double S.I.T

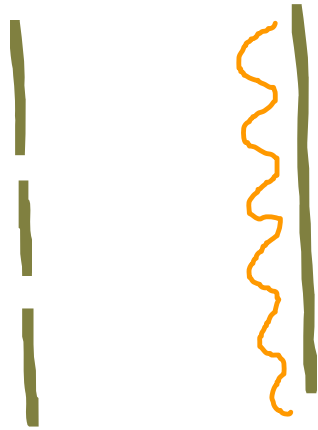


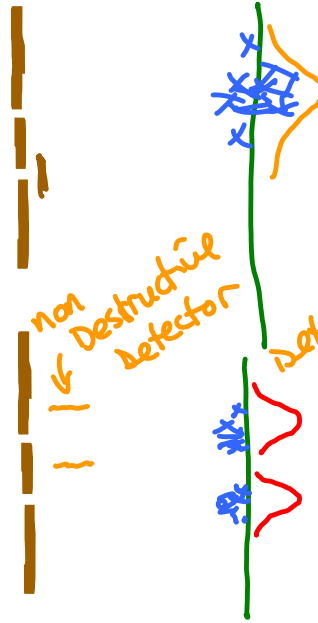
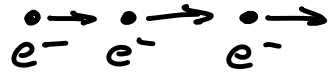
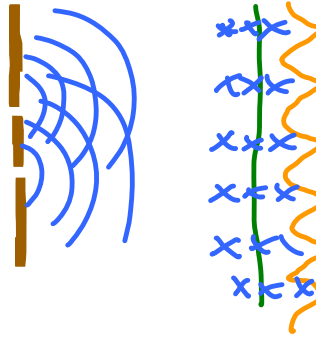
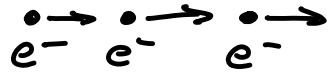


← Intensity

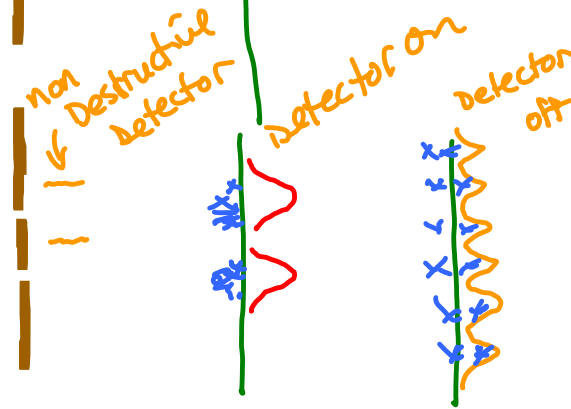
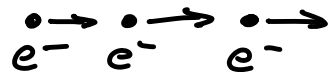


$e^- \rightarrow$

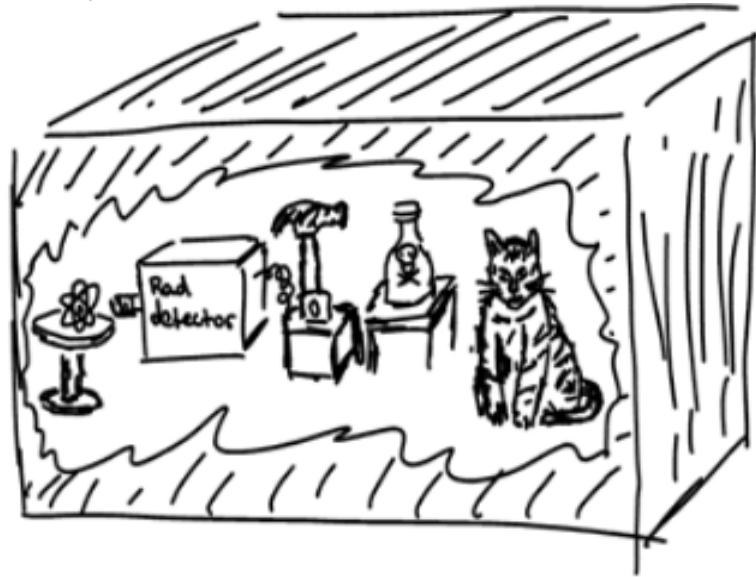




just determining the slit that the e^- passes thru (even with non-destructive detector) is sufficient to collapse the wave function.



Schrödinger's Cat



Thought experiment
nucleus has
50:50 chance
of decaying +
killing the cat.
What is the
"state" of the
cat before box
opened?

Copenhagen
Interpretation

$$\text{nucleus quantum state} = \frac{1}{2}(\text{decayed}) + \frac{1}{2}(\text{not decayed})$$



$$\text{cat state} = \frac{1}{2}(\text{dead}) + \frac{1}{2}(\text{alive})$$



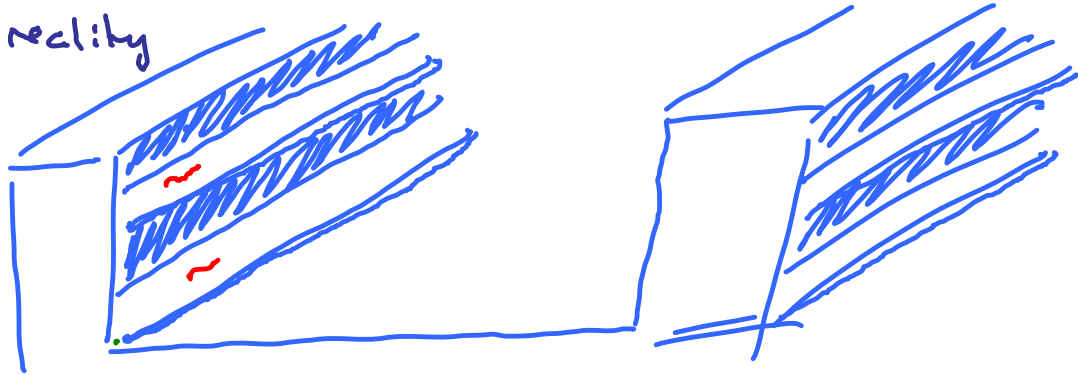


Hugh
Everett (1957)

Bryce DeWitt
1960's + 70's
↳ Many
Worlds
interpretation

Overall wavefunction does not collapse. IT evolves in time.
"Decoherence" forces wavefunction to evolve into different
streams that do NOT interact.

Different Threads of reality
Separated in
 ∞ -dimensional
"Hilbert Space"
of Quantum
Mechanics



Law of Attraction

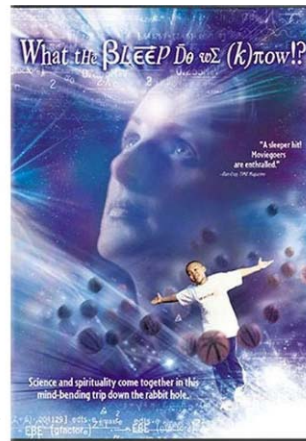
If you want something at truly believe it is possible, you'll get it.

Four things must be done:

- 1) Know exactly what you want.
- 2) Ask the universe for it.
- 3) Feel, behave and know as if the object of your desire is already yours.
- 4) Be open to receive it and let go of the outcome



Somehow the mind chooses the path or causes the collapse so that the universe gives you what you want... so says the proponents



Multiverse of Wishful thinking

Sorta combines the mutually exclusive concepts of Copenhagen and many worlds - And - Assumes consciousness can affect quantum processes