“Paradoxes” of Quantum Mechanics

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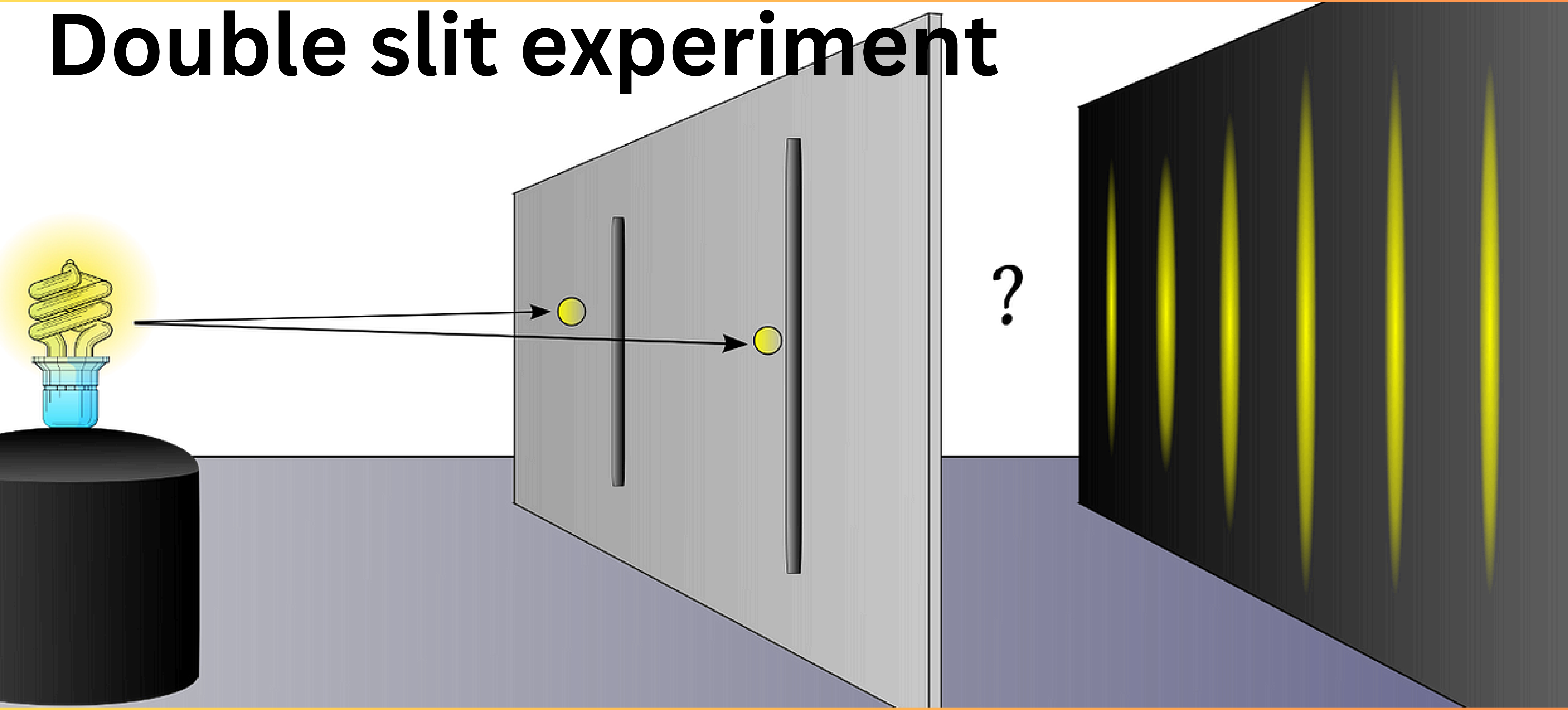
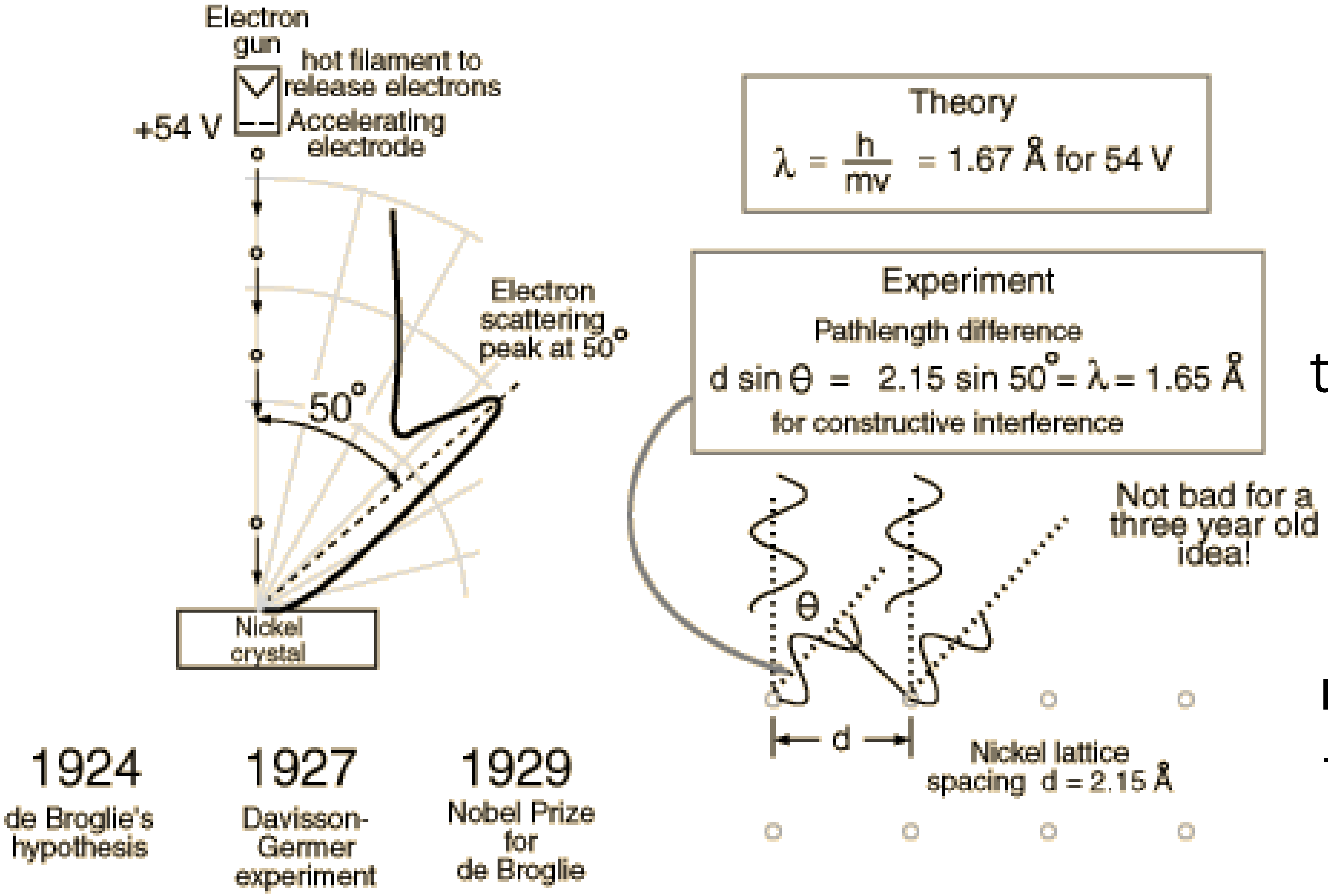
Double slit experiment





In the case of the double slit paradox, where particles appear as particles by observing them through a single slit, we "blur" the phase information and obtain statistics of maxima and minima, which eliminates the interference pattern.

Heisenberg’s uncertanty principle

Planck's constant

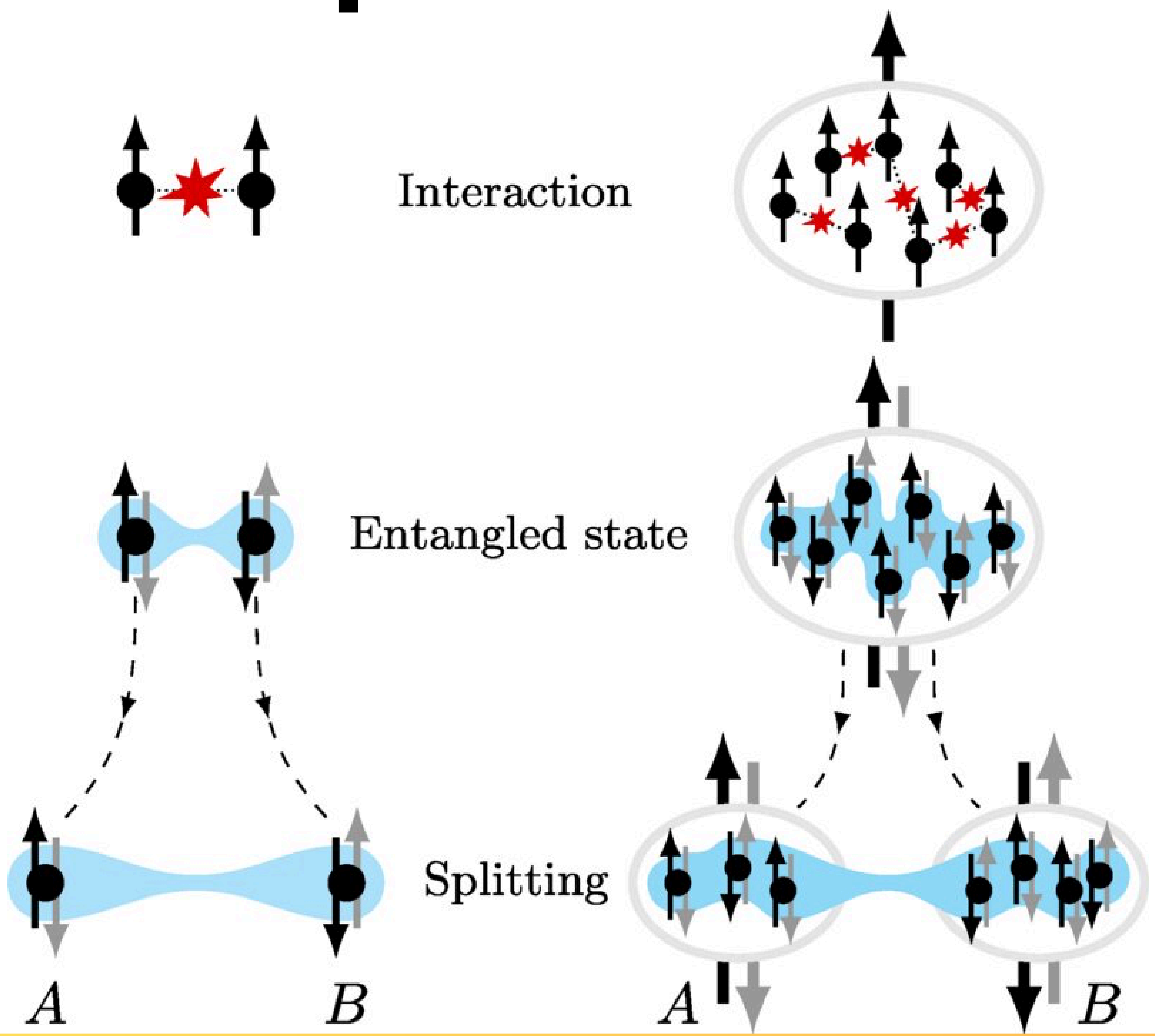
$$\Delta p \Delta x \geq \frac{h}{4\pi}$$

uncertainty in position

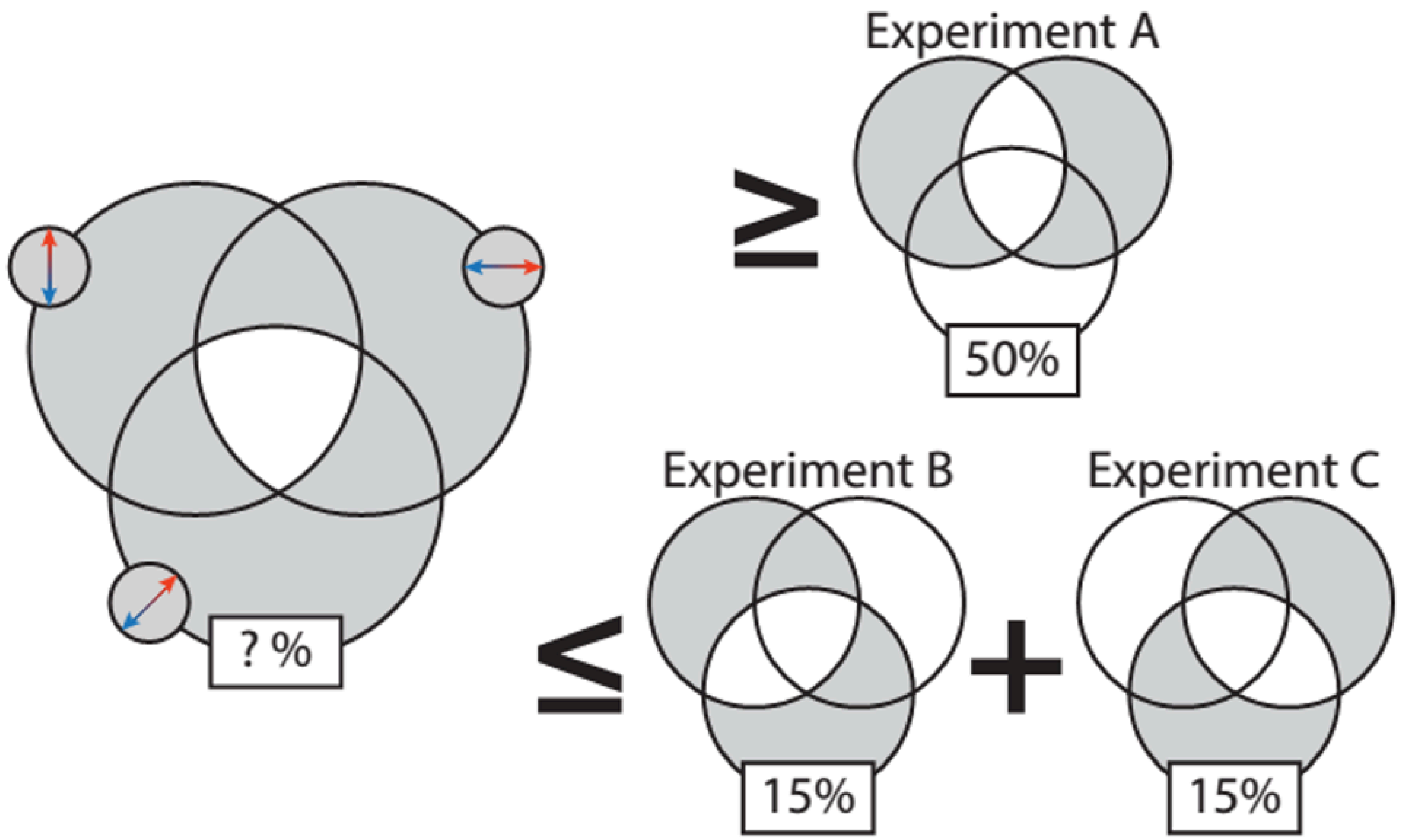
uncertainty of momentum

Heisenberg may have been here... but he wasn't sure where he was going

EPR paradox and Bell's inequalities



When particles are entangled, their properties are linked; if you measure one particle's property, you'll immediately know the other's corresponding property. This connection remains even if the particles are separated by vast distances. It's like a magical bond that defies classical intuition about how things should interact at a distance.



$$|\langle AB\rangle + \langle A'B\rangle + \langle AB'\rangle - \langle A'B'\rangle| \leq 2.$$

$$4(\varepsilon + \delta) \geq \sqrt{2} - 1$$

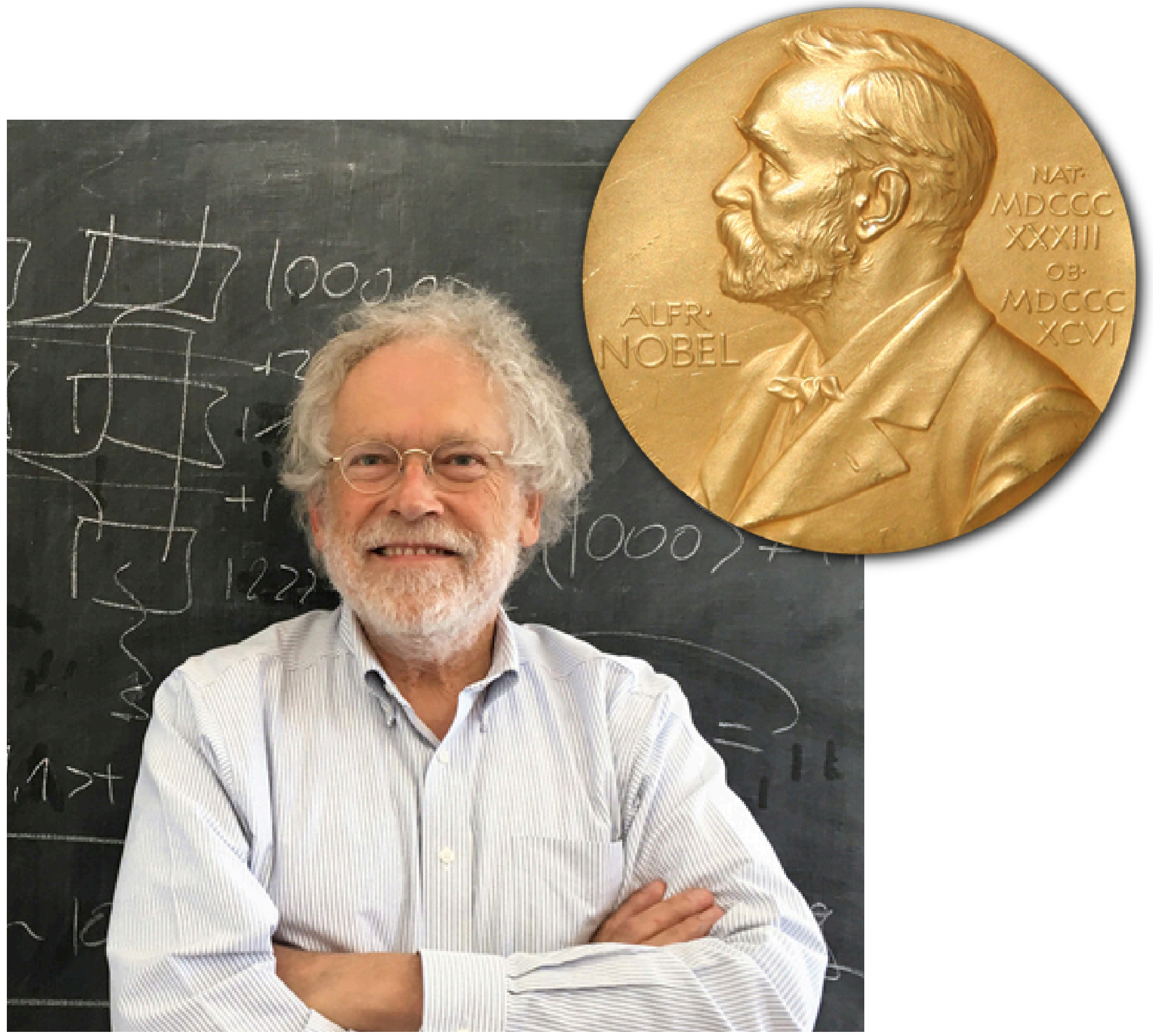
$$P(AB) = P(B)\,P(A|B)$$

$$P_{++}(\mathbf{a},\mathbf{b}) = \frac{1}{2}\cos^2(\mathbf{a},\mathbf{b})$$

If experimental results violate these inequalities, it means that quantum entanglement cannot be explained by any local hidden variables theory and suggests that particles can indeed influence each other instantaneously over any distance.

Nobel Prize in Physics 2022

Alain Aspect, John F. Clauser and Anton Zeilinger "for experiments with entangled photons, establishing the violation of Bell inequalities and pioneering quantum information science"



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Additional information page

Davisson-Germer experiment

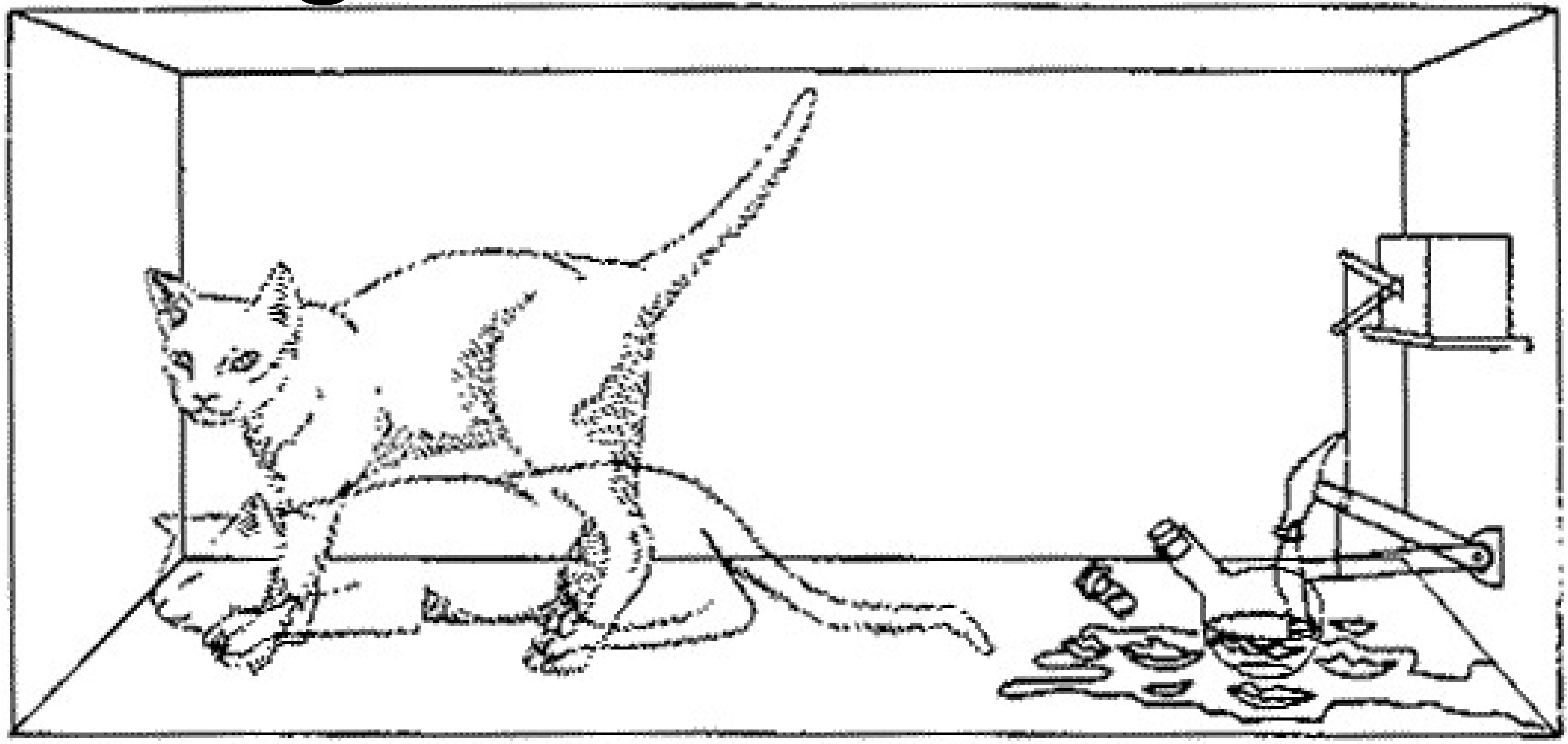
Heisenberg's principle demonstrated

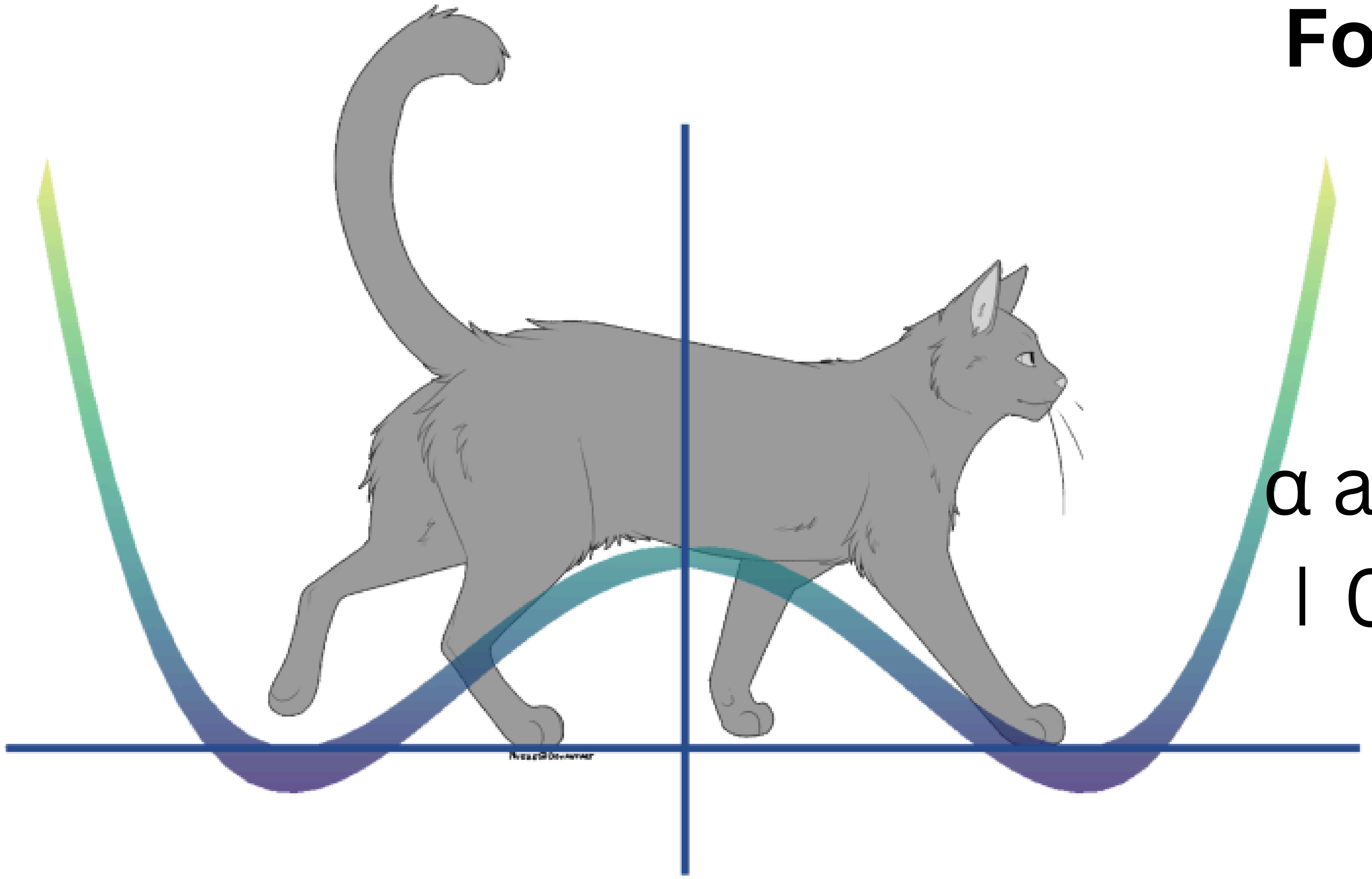
Schrodinger's cat

EPR paradox

Thank you for your attention:)

Schrödinger's Paradox





Formula to describe the superposition of particle states:

$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$

$|\psi\rangle$ – particle state

α and β – complex probability amplitudes

$|0\rangle$ and $|1\rangle$ – basic states of the particle

As the box is opened and observed, the state of "Schrödinger's cat" "collapses" into one of the possible states – a cat that is either alive or dead.