Quantum Openness and the Sovereignty of God

by

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Covenant College

Outline

- Some Preliminary Remarks — What motivates the talk
- Assumptions for the talk
- Evidence for Openness
  - Openness in Quantum Mechanics
  - Openness in Other Areas
- A Teleological Argument for Openness in Creation
- Implications of Openness
- Concluding Theological Reflections

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  $\Rightarrow$Why let the perceived implications of the science of today dictate our interpretation of ontology when they may be wrong tomorrow?

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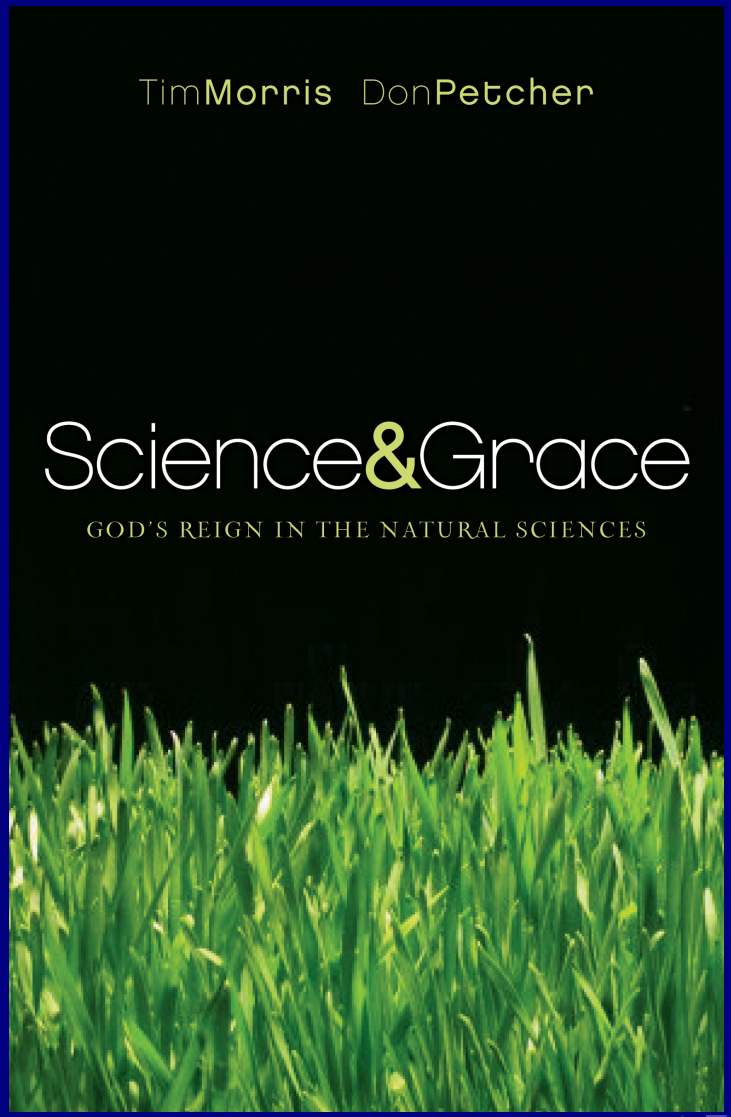
  - God interacts with the world through his Spirit-presence

Science & Grace



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We inherent a reductionist physicalism from our mechanistic heritage of the nineteenth century, and it remains a ”habit of the mind” for many of us, in terms of thinking about the world.

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"Neurobiological reductionism has to be false. If not, then what may appear to be a product of rational processes must instead be the consequence of causal processes in the brain. If this is the case, 'arguments' for neurobiological reductionism are not in fact arguments but mere noises. And while we did not judge there to be a fully adequate response to this problem at the time we began our project (in the fall of 1998) we recognized a growing body of helpful resources in the literature." — *Did My Neurons Make Me Do It?*, Nancey Murphy and Warren S. Brown

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  $\Rightarrow$we have greater freedom in metaphysical/theological speculation than a materialist like Richard Dawkins

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    $\Rightarrow$the end is not "built-in" to the beginning

The Strangeness of Quantum Mechanics

"[T]he structure of nature may eventually be such that our processes of thought do not correspond to it sufficiently to permit us to think about it at all. . . . The world fades out and eludes us, . . . we are confronted with something truly ineffable. . . . We have reached the limit of the vision of the great pioneers of science, the vision, namely that we live in a sympathetic world in that it is comprehensible to our minds."

— Percy Williams Bridgman

(1882–1961, Noble Laureate Physicist and Philosopher)

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- Entanglement – particles affect each other *instantaneously* even though widely separated – spooky action at a distance

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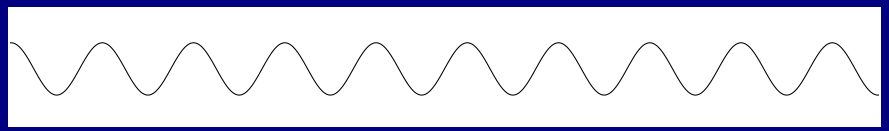
$$p = h/\lambda.$$

(h is a very small number known as 'Planck's constant', after Max Planck who discovered it.)



Uncertainty Principle

If Δx is the uncertainty within which you can measure the position, and Δp is the uncertainty with which you can measure the momentum (think, standard deviations or the width of a bell curve), then the uncertainty principle states:

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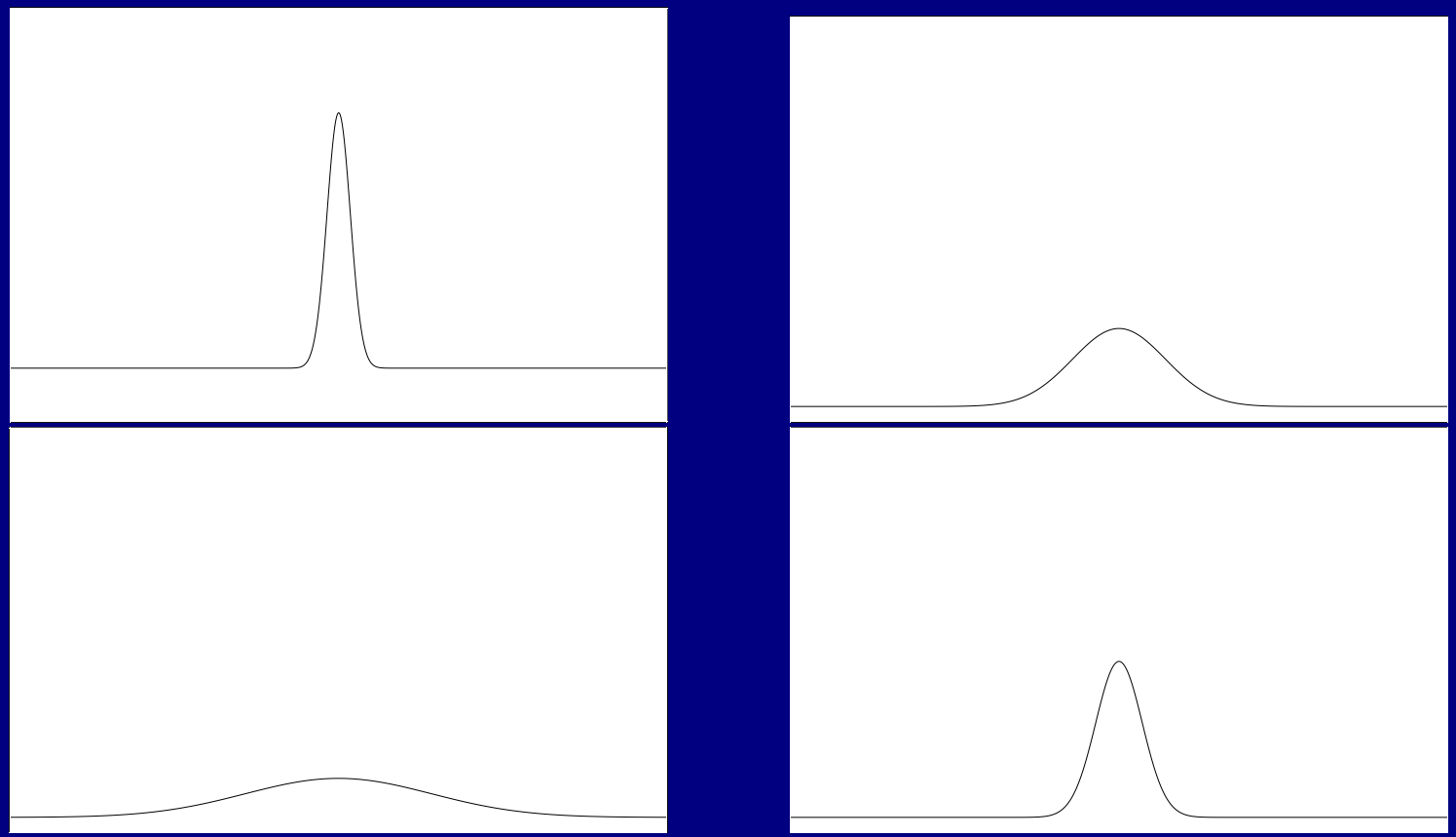

Various Bell curves representing data

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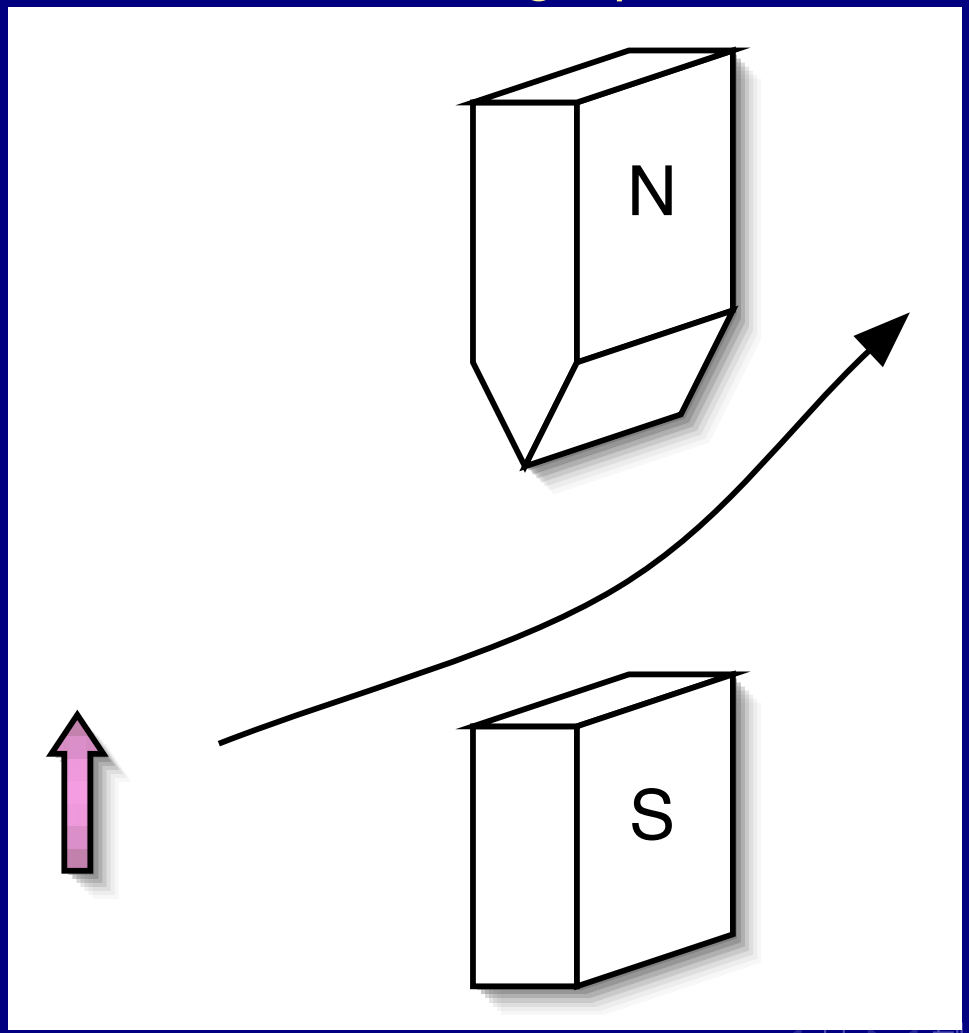
- Quantum mechanics works very well in describing experiments

Measuring a Classical Spin in Inhomogeneous Magnetic Field

Measuring Spin



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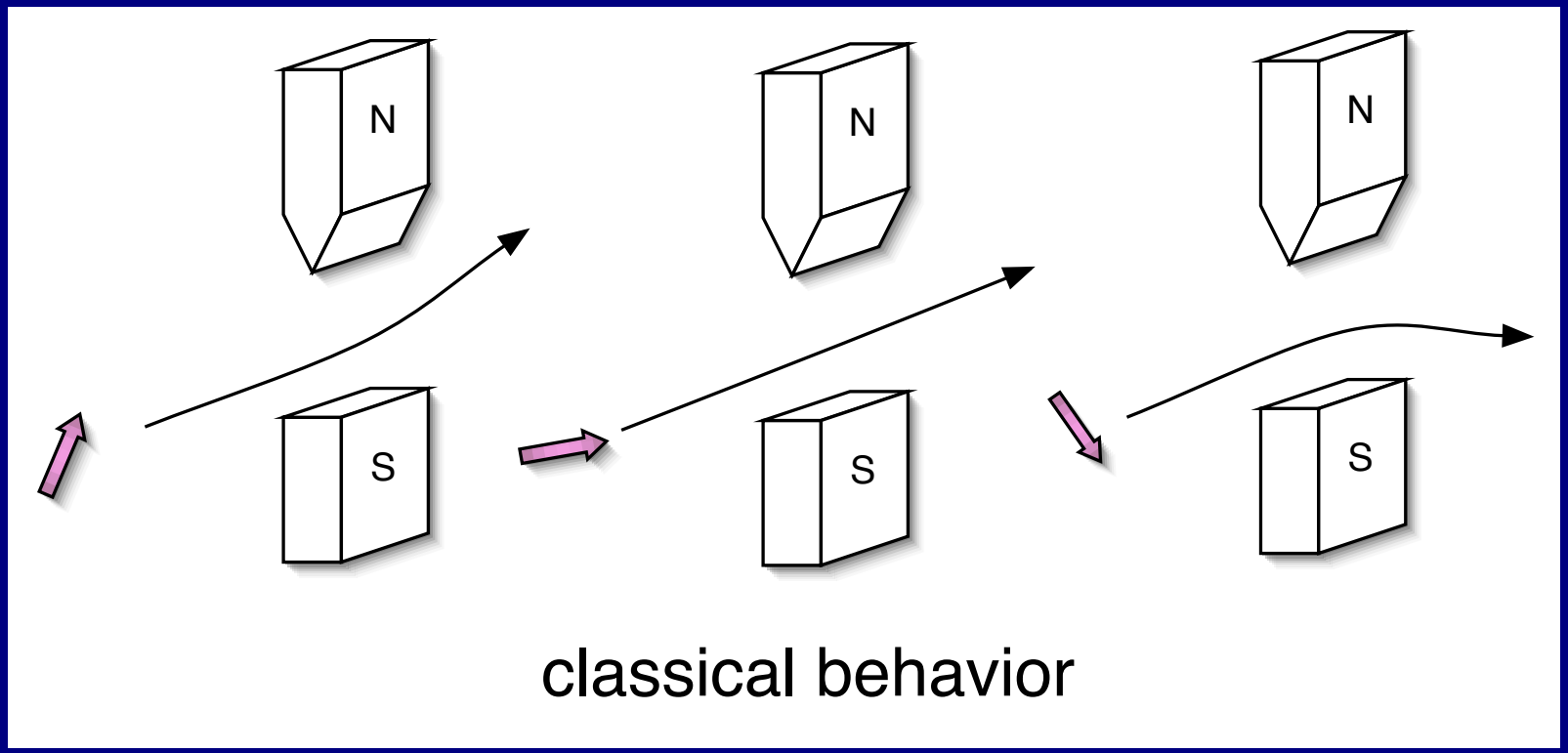
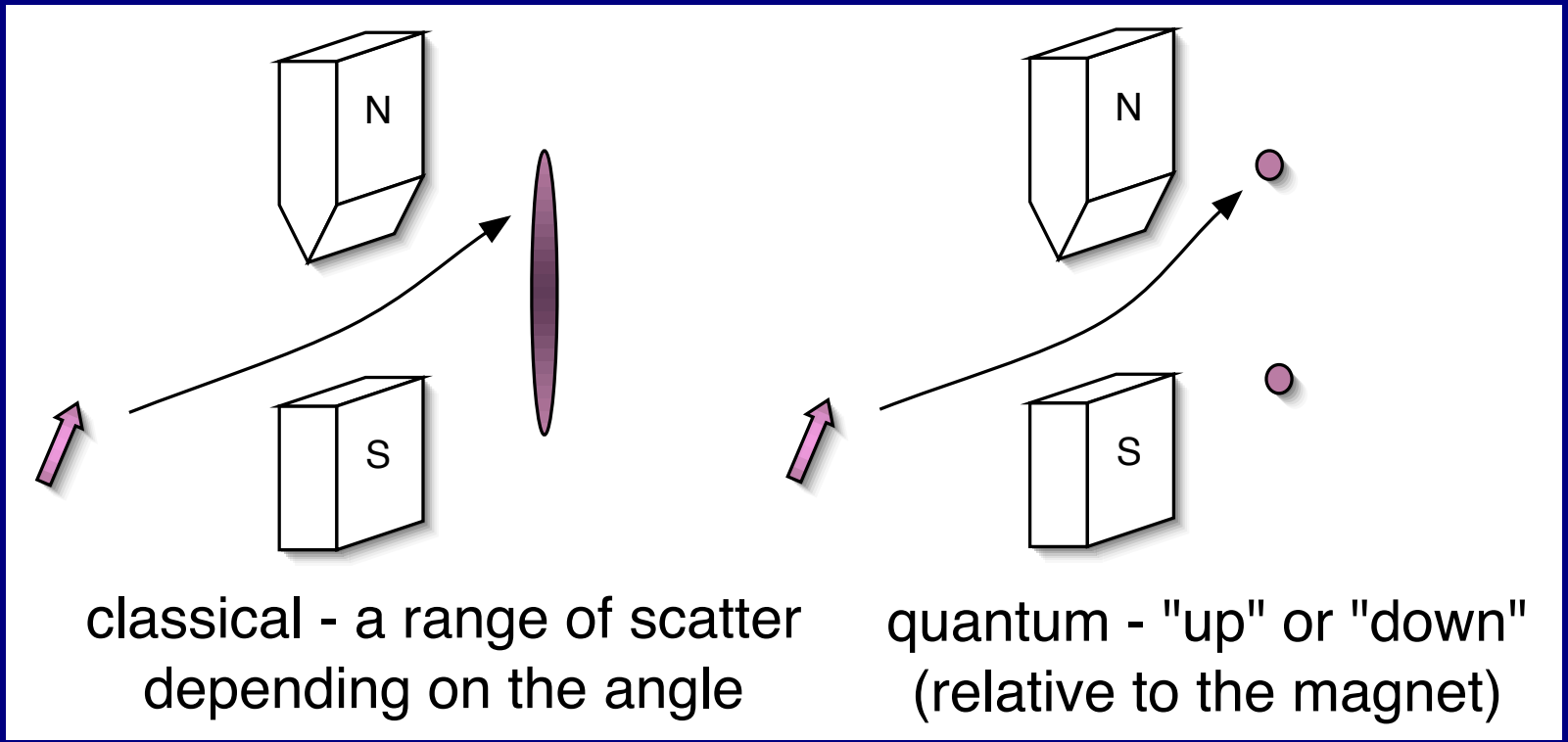


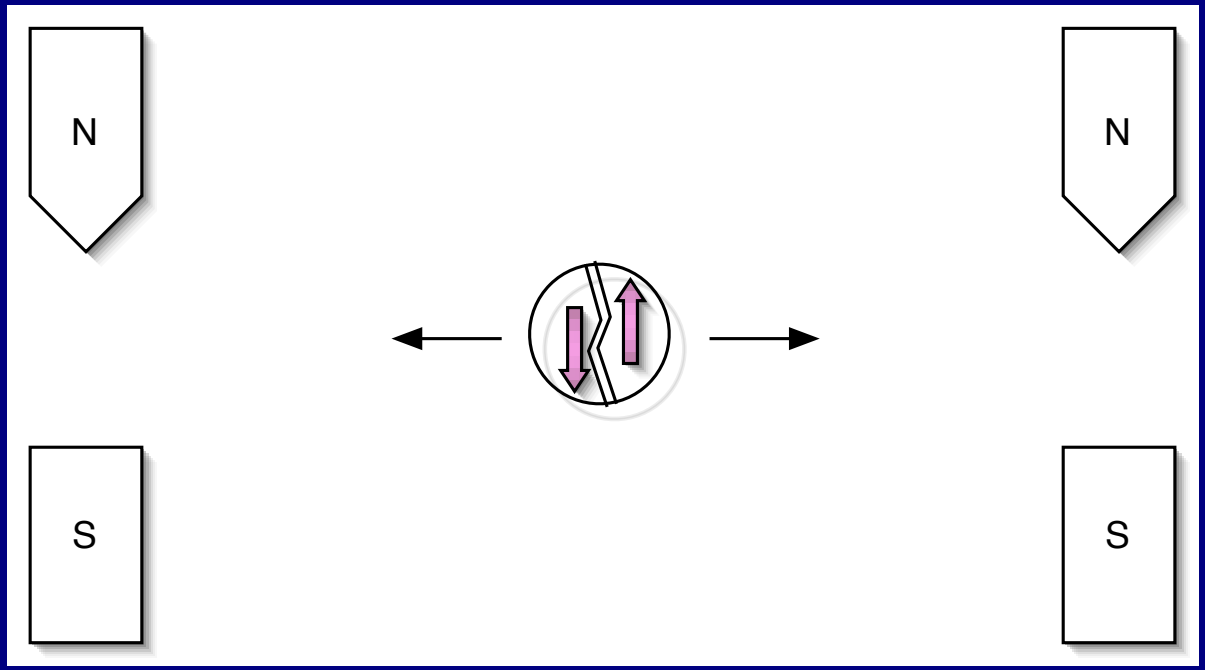
Classical and Quantum Behavior - electron (spin $\frac{1}{2}$)



classical - a range of scatter depending on the angle

quantum - "up" or "down" (relative to the magnet)

Einstein-Podolski-Rosen Thought Experiment



- zero spin particle decays into spin up and spin down
- total spin is still zero $\Leftrightarrow$ spin is conserved

Einstein-Podolski-Rosen Thought Experiment

- spins are deflected, up or down
- if the magnetic fields are lined up the results are correlated — when one goes up, the other goes down

Einstein-Podolski-Rosen Paradox

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- therefore we just measure the spin of the second along the y-axis and we know both precisely!
  $\Rightarrow$ something must be wrong with quantum mechanics (it is not 'complete')

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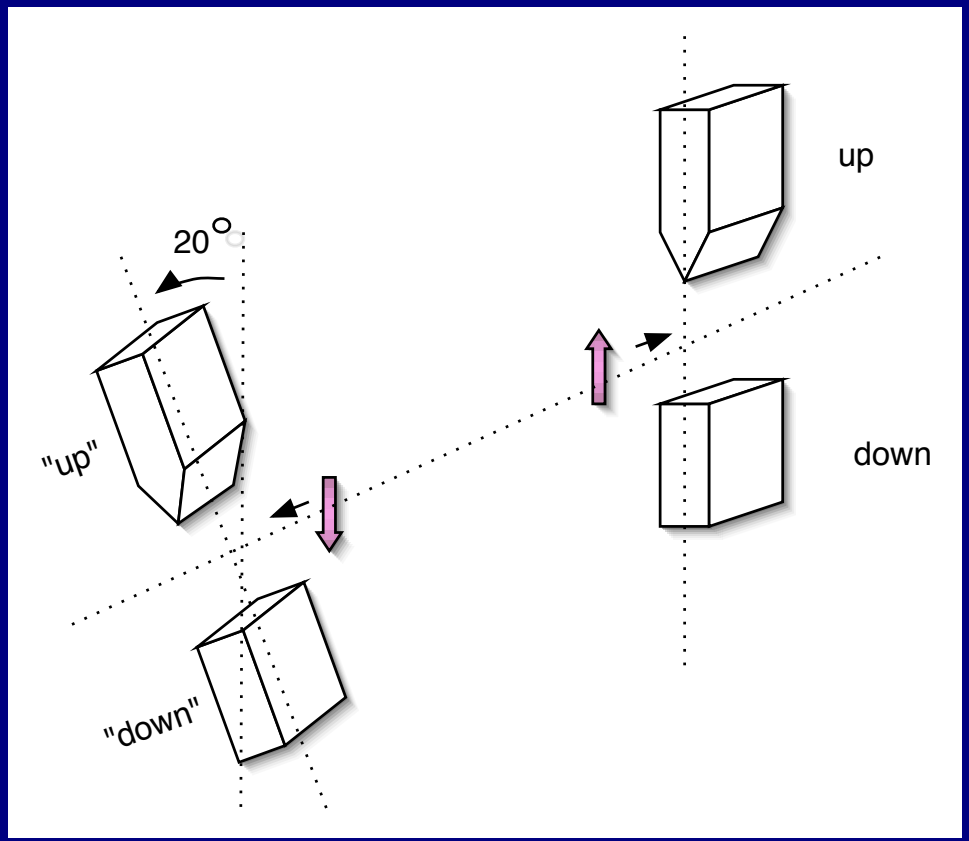
- The inequality therefore represents a statement that follows from a "complete" theory, as Einstein put it.
- Quantum mechanics predicts a violation of the inequality.
- Therefore the issue could be decided experimentally: and quantum mechanics wins every time.

Example: rotating one magnet by 20°

(Einstein's case would be 90°)



Note: "up" and "down" for rotated magnet are different

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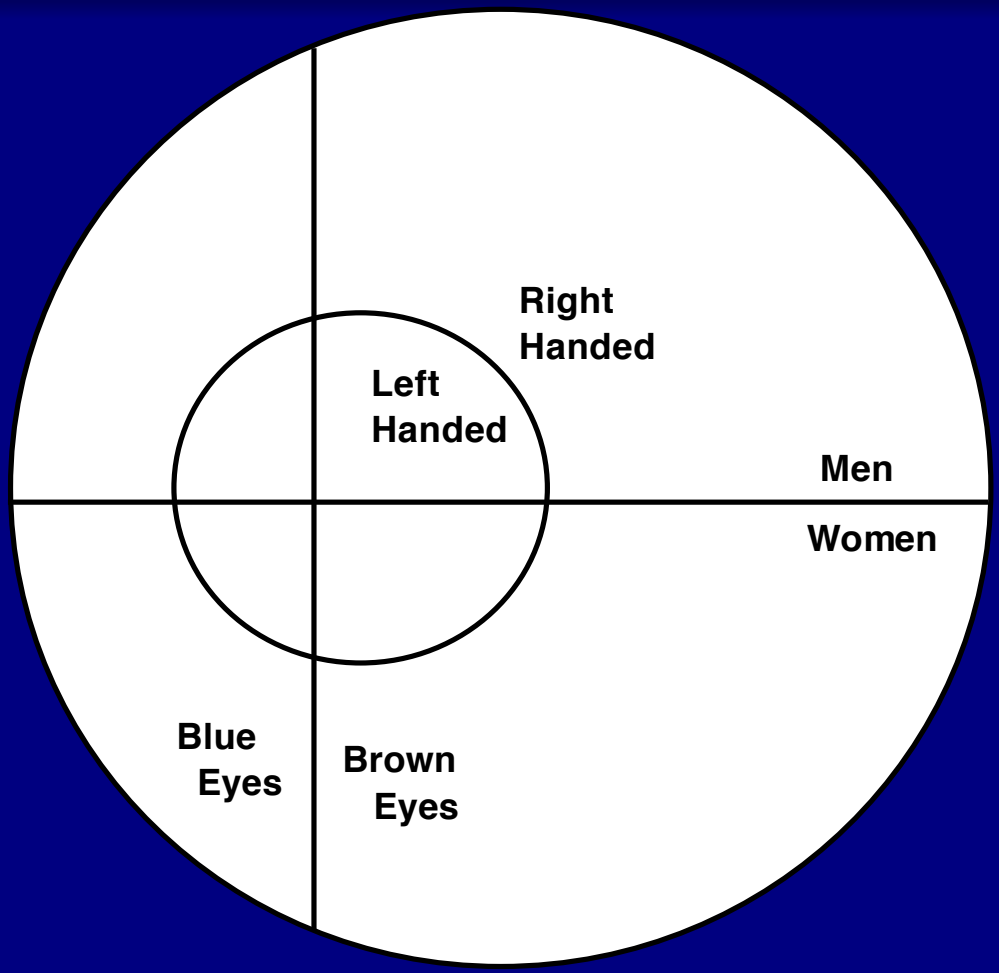

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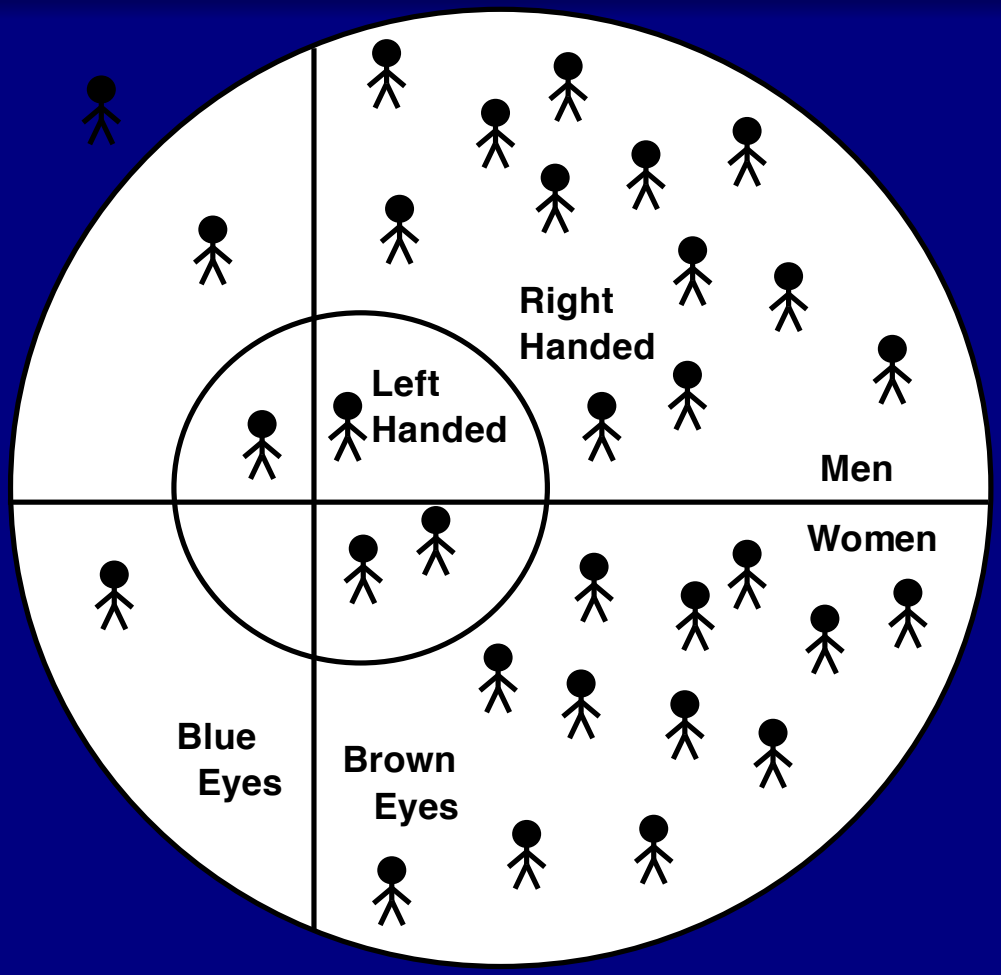

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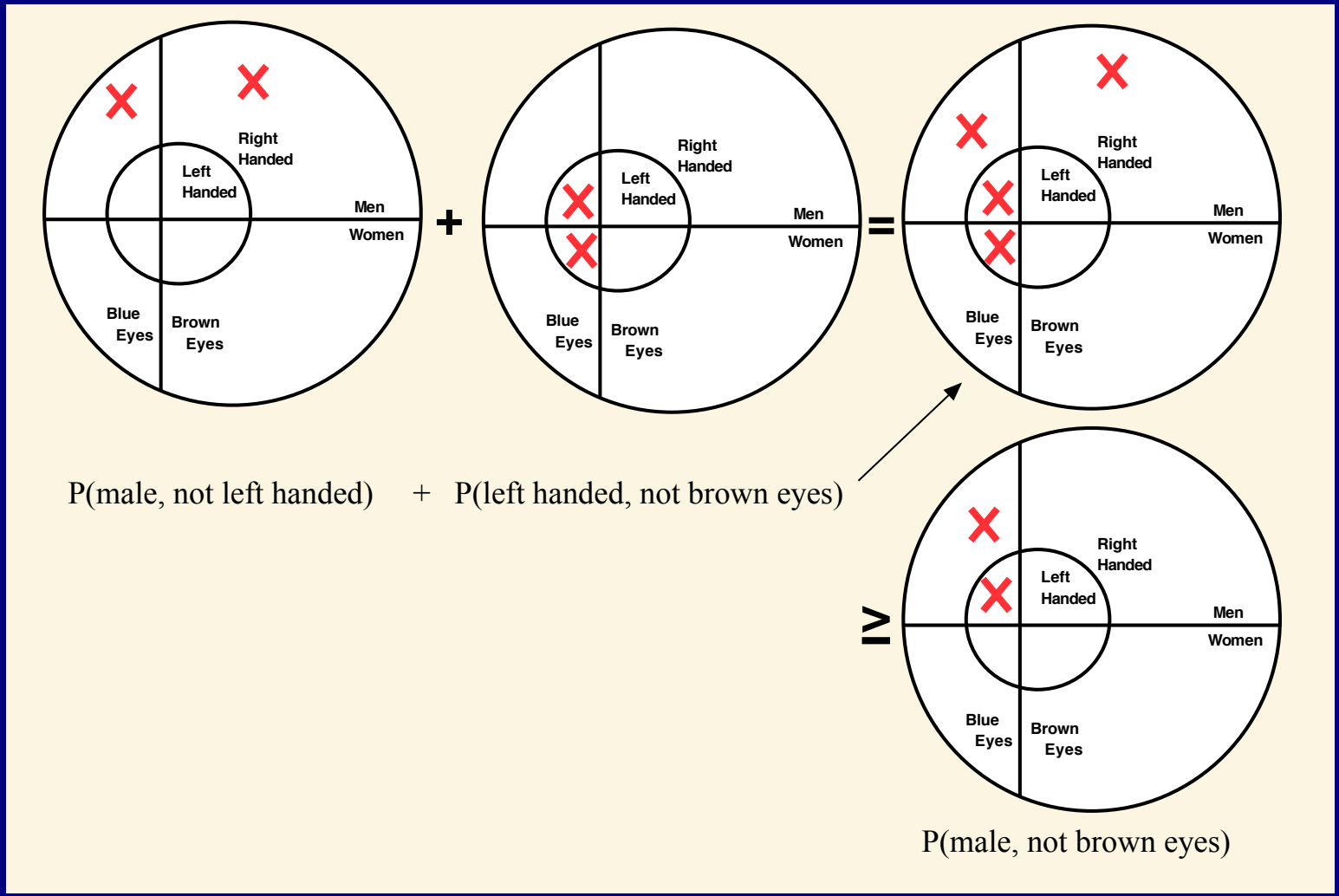

Back to the spins

Similarly P(up at 20°, not up at 0°) + P(up at 0°, not up at -20°) $\geq$ P(up at 20°, not up at -20°)
Of course, we cannot make two measurements on the same particle, but we CAN use Einstein's trick that because of conservation of spin, if a particle were measured up on the left, at the same angle its partner would always be measured down on the right.

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Consider the following quote from a recent paper arguing for psychological determinism:
"According to some incompatibilists, morally significant freedom requires ultimate indeterminacy of the act (or according to some compatibilists, indeterminacy of some relevant prior act) by antecedent events and/or states of affairs. The problem is that a causally underdetermined event, such as an act of choice that is free in the sense required by the incompatibilist, would ultimately be inexplicable." (Wingard, 6)

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Without further evidence, why presume the states of affairs for psychological phenomena to be settled (i.e. "explicable") any more than are the states of the quantum world? One answer might be that it follows from the assumption of a mechanistic ontology . . .

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  $\Rightarrow$"Openness" in an analogous way to the quantum world.

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- God is free to interact at all levels of openness, through his Spirit-presence in the world.

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  $\Rightarrow$My own view is a Calvinist view in which God brings about all of his intended purposes, but there is genuine creaturely freedom in his creation.

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