Quantum Physics 2005

Notes-9

What I failed to cover

(and that you should know something about)

Treatment of multiple identical particles

- Fermions (spin ½) – examples include electrons, neutrons, protons
  - only two particles (spin up/spin down) per eigenstate
- Bosons (integer spin) – examples include photons and helium.
  - any number of particles per eigenstate
- Exchange symmetry and the consequences of identity of particles

Atomic Structure

- Linear combination of atomic orbitals (LCAO) as an approximation for the bonded state of two or more neighboring atoms.

Approximation techniques for molecules

- Linear combination of atomic orbitals (LCAO) as an approximation for the bonded state of two or more neighboring atoms.

Condensed matter

- How the properties of metals, insulators, and semiconductors can be deduced from simple quantum physics considerations.

Two state systems

- Lasers!

Fundamental issues in quantum mechanics

- How might (or should) we think about macroscopic behavior using quantum theory?
- Locality and the speed with which information can travel. (EPR paradox)
- Macroscopic quantum states. (superfluids, superconductivity, Bose-Einstein fluids)
- What are some of the ramifications of quantum theory for measurement and knowledge?
- Ramifications of entangled quantum states.
- Bell's theorem

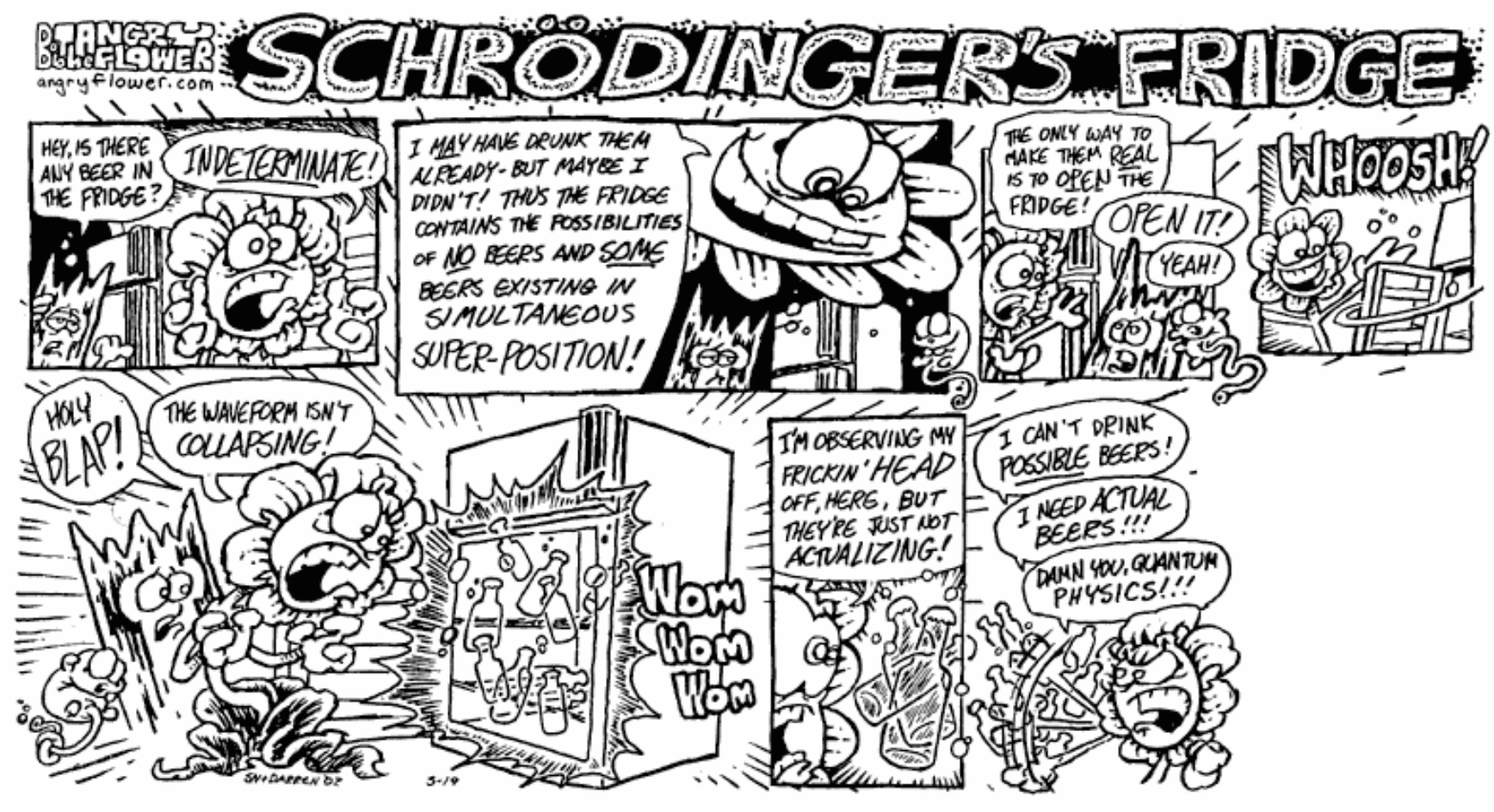
Readings on fundamental issues

- Morrison, Chapter 13
- D. Lindley, “Where does the weirdness go?”
- G. Greenstein and A Zajonc, “The Quantum Challenge”
- R. Feynman, “The Feynman Lectures, Volume III”

Feynman on Quantum Mechanics

"On the other hand, I think it is safe to say that no one understands quantum mechanics…Do not keep saying to yourself, if you can possibly avoid it, 'But how can it be like that?' because you will get 'down the drain' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that."

The relevance of quantum mechanics to your real life



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