

FYI: The origins of quantum mechanics

- 1900 Planck “solves” the blackbody problem by postulating that the oscillators that emit light have quantized energy levels.
 - “Until after some weeks of the most strenuous work of my life, light came into the darkness, and a new undreamed-of perspective opened up before me...the whole procedure was an act of despair because a theoretical interpretation had to be found at any price, no matter how high that might be.”
- 1905 Einstein proposes that light energy is quantized with quanta called “photons” - waves behave like particles
 - Photoelectric effect for which he got the Nobel Prize
- 1913 Bohr proposes that electron orbits are quantized
 - Idea that electrons act like waves - “explained” H atom, but wrong in crucial ways
- 1923 de Broglie proposes that particles behave like waves
 - The step that paved the way for understanding all of nature
- 1925 Pauli introduces “exclusion principle” – only 2 electrons/orbital
 - The step that leads to understanding of electrons in atoms, molecules, solids
- 1926 Schrödinger introduces the wave-formulation of QM
 - The fundamental equation that predicts the nature of matter
- 1927 Heisenberg uncertainty principle
 - The principle that shows the fundamental uncertainty in any one measurement
- 1928 Dirac combines quantum mechanics and special relativity
 - The step that made QM “the most successful theory in the history of physics” – description of atoms, nuclei, elementary particles, prediction of antimatter, . . .