Chapter 38

Photons: Light Waves Behaving as Particles

38.1 Early Evidence for Light as a Particle

8/24:

- Einstein proposes the Special Theory of Relativity in 1905.
- Wave theory predicts that light scattered off of graphite (Compton scattering) should have the same wavelength and frequency as the incident light, but wavelength varies.
  - Einstein proposes photons to account for this: Assume that photons relativistically collide with electrons and exchange energy.
  - The momentum of the photon is proportional to the light's wavelength ($p \propto 1/\lambda$), and is equal to Planck's constant over the wavelength.
- When light does something involving exchange of momentum, it behaves like a particle. When it does something involving exchange of energy, it behaves like a wave.
  - Thus, light has a wave-particle duality.
- Reviews bright line spectra and intro to the Bohr Model, as described in Chapter 7 of Labalme (2021).