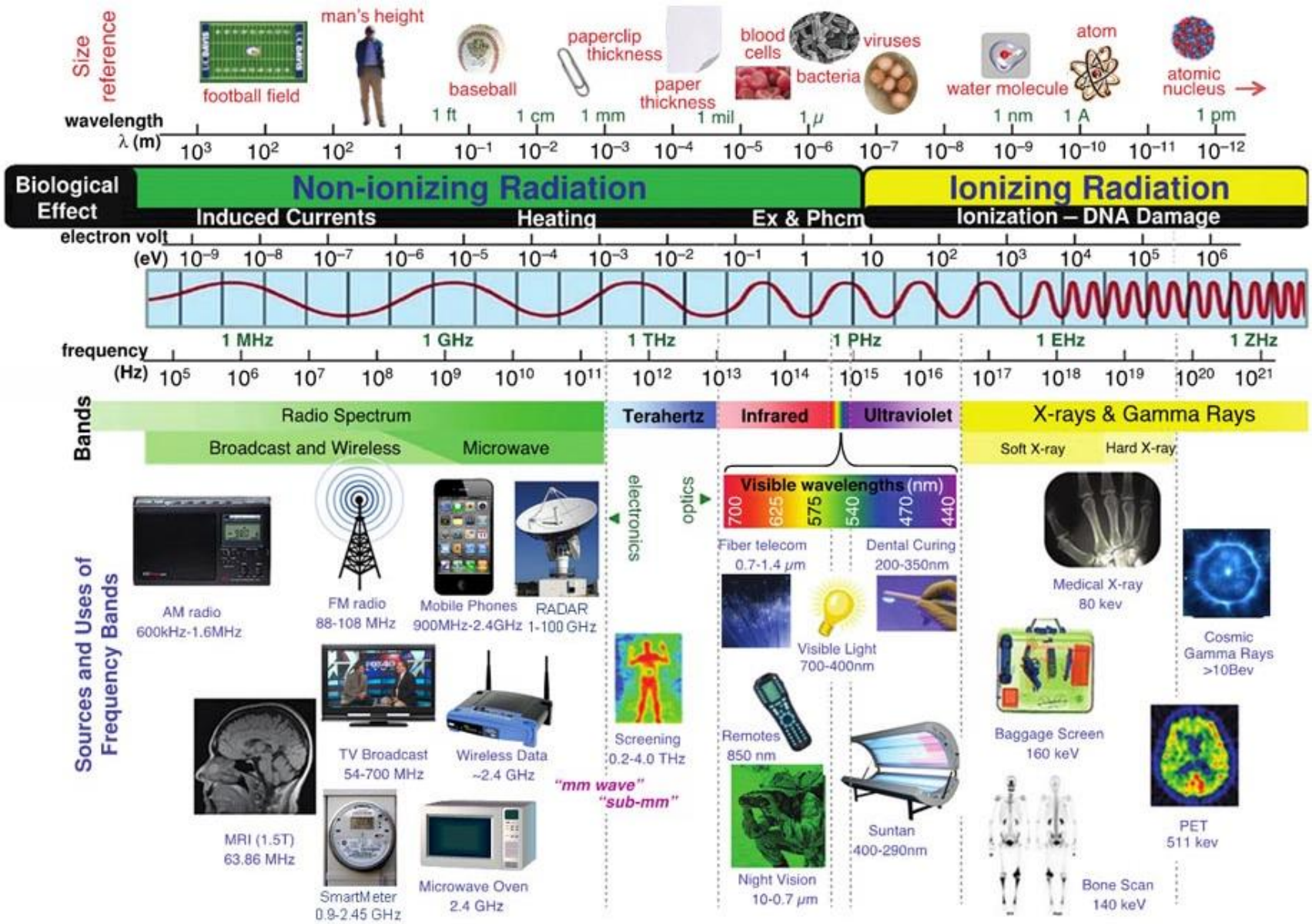
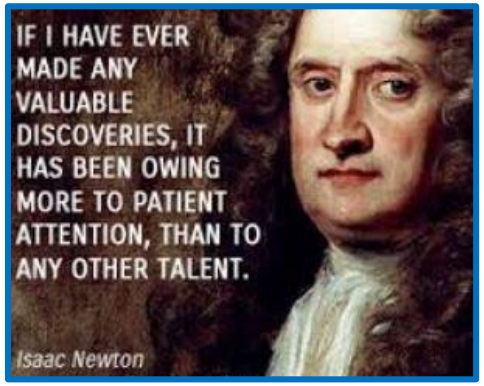
Light Emission Part 1



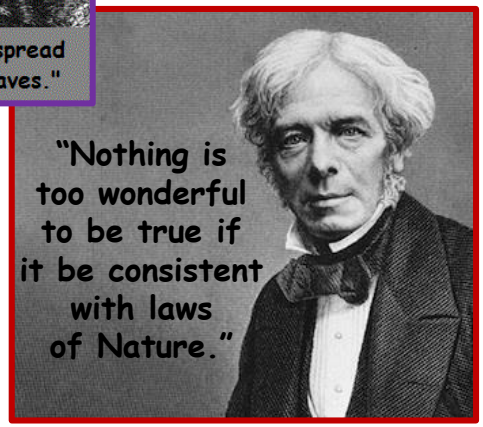
Nature of Light Debate

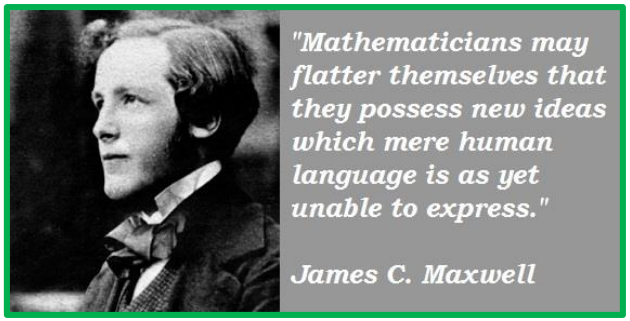
Isaac Newton, 1675:
light is made of particles of energy (corpuscles). Explained reflection, shadows, traveling in straight lines.



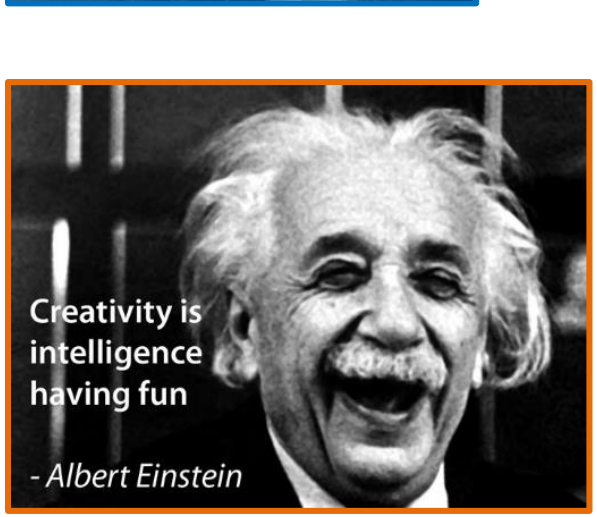
Christiaan Huygens, 1678:
light is made of waves in ether. Explained diffraction, interference.

Michael Faraday, 1847:
light is a high-frequency electromagnetic vibration, which could propagate even in the absence of a medium.





James Maxwell, 1864:
light is an electromagnetic wave.



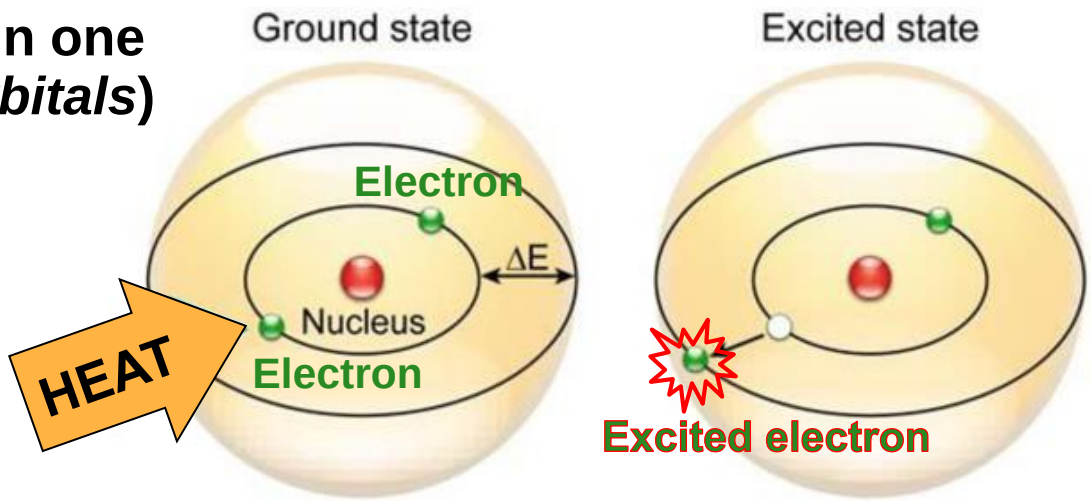
Albert Einstein, 1905:
a beam of light is not a continuous wave propagating through space, but rather a collection of discrete wave packets, photons.

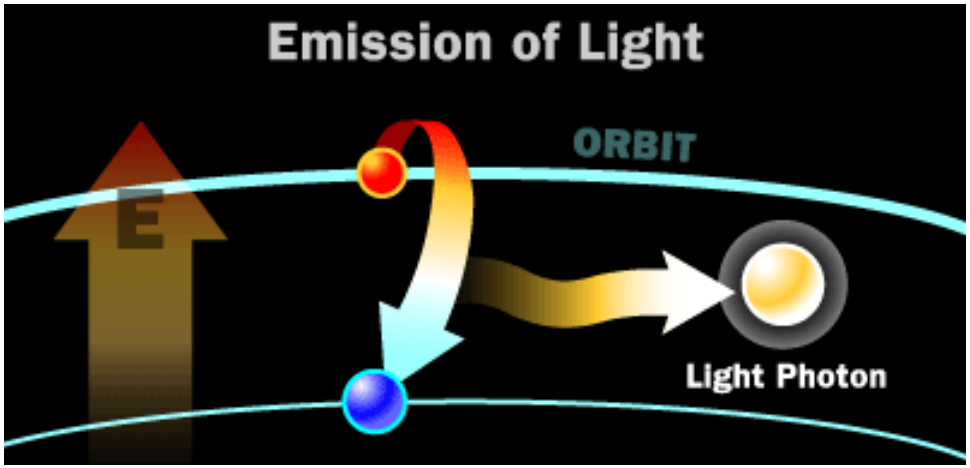
How to Make Light?

Light Emission

Emission of light results from oscillations of electrons ("jumps" between energy levels within an atom).

- **Electrons in atoms exist in one or more energy levels (*orbitals*) around the nucleus.**
- **When the electrons are excited, for example by being heated, the additional energy pushes the electrons to higher energy orbitals.**
- **When the electrons fall back down and leave the excited state, energy is emitted in the form of a *particle-like packet of electromagnetic radiation* called a photon.**





What is Light: Current View

- **Light is a form of energy that travels.**
- **Light has a dual nature:**
  - **wave properties (propagation)**
  - **particle properties (emission/absorption)**
- **Light waves do not need a medium to propagate.**
- **Light waves are electromagnetic radiation.**
- **Light particle, called a photon, has *zero mass*.**

The actual nature of the photon is not really describable in terms that are very descriptive… …and not fully understood yet.