

Pratt Institute
Science of Light: MSCI-220C Fall 2020

Early Greeks [200 BC-400 BC]

Plato > *Intuitive View*

- Light is a substance created by burning process [i.e., fire, sun, and our body]
- Burning Body to Eyes to Objects (1) gentle light; and (2) pure fire
- External light + internal light > Soul > Sight

Aristotle > *Objective View*

- Light is a function of motion caused by fire > needs a diaphanous medium > when actualized through eyes > Second Light

Euclid > *Geometric View*

- Light is a cluster of straight visual rays emitted from eyes

Middle Ages [~1000 AD]

Ibn al-Haytham (Alhazen) “*Book of Optics*” [965- 1040]

- His views run parallel to Aristotle as light emanates from external object, not from eyes.

Galileo Galilei > [1564-1642]

- **Use of Refractive Telescope > Birth of Modern Astronomy along with the work of Copernicus**

Rene Descartes [1596-1650]

- Light as pressure transmitted through elastic medium (the aether) and diverse colors come into view due to rotary motion of different particles in this medium. Snell’s Law – below – is often called Snell–Descartes Law

Willebrord Snellius (Snell) [1580-1626 AD; formulated in 1626]

- **Snell’s Law of Refraction** (bending of light as it changes medium)

Pierre de Fermat [1601-1655]

- “Principle of Least Time” wanted to explain refraction

Maria Grimaldi [1618-1663]

- Diffraction (bending in the same medium) of light

Sir Isaac Newton: [1642-1727]

- Corpuscular Theory of Light
- Refrangibility

Olaf Romer [1644-1710; 1675]

- Finite speed light from the observation of the Jupiter's satellites

Christian Huygens [1629-1695]

- Wave Theory of Light

Thomas Young [1773-1829]

- Interference Phenomena and explanations of the colors of thin films

Malus [1775-1812]

- Theory of Polarization

Research on Electricity and Magnetism (Independent of Optics)

Michael Faraday [1791-1867]

Rudolph Kohlrausch [1809-1858] and Wilhelm Weber [1804-1891]

- Experimental studies of the velocities of EM showed that it was equal to the velocity of light.

James Clerk Maxwell [1831-1879]

- Light as EM radiation
- Limitations of Maxwell's EM Theory > emission and absorption which involve light and matter interactions

Joseph von Fraunhofer [1787-1826]

- Birth of Spectroscopy > discovery [1814-1817] dark lines in solar spectrum.
 - Absorption of those lines (wavelengths) by cooler gases of the sun's atmosphere that are emitted by gas
 - Every gaseous element possesses a characteristic line spectrum

Max Planck [1858-1947]

- Black Body Radiation [1900] > energy is discrete as opposed to continuous > Birth of Quantum mechanics

Albert Einstein [1879-1955]

- "light quanta" or "photons," > **Photoelectric Effect** [1905]
- Light energy independent of intensity, but dependent on frequency > Basis to photochemistry

OTHER MAJOR OPTICAL EVENTS:

LASER [1960] Inception of directional, coherent, intense light source. (LASER = Light Amplification by Stimulation of Emitted Radiation)

- Field Quantization > Quantum Optics > Light-Matter interaction > quantum-electronics, non-linear optics, fiber optics, etc