

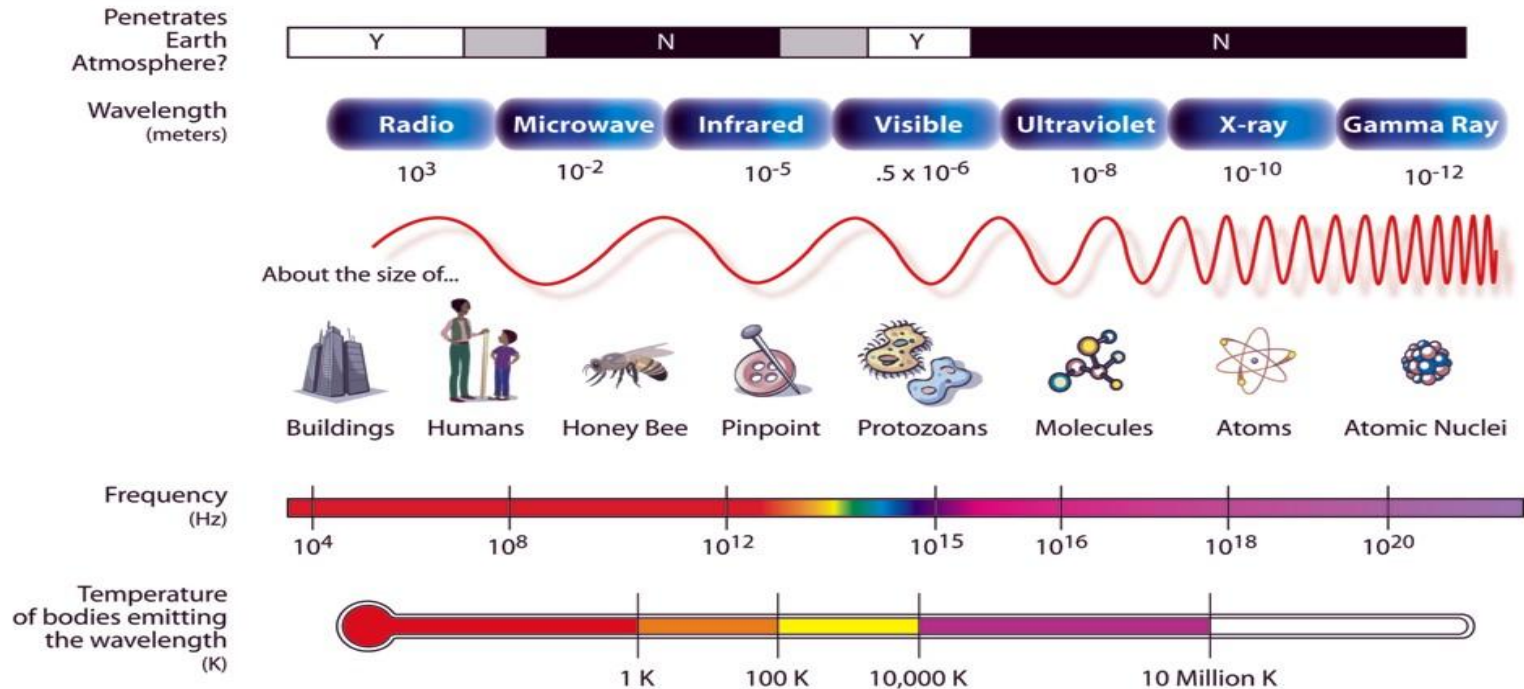
Light and Astronomical Observations

Dr. Michael J Passow

Understanding stars means understanding their EM emissions

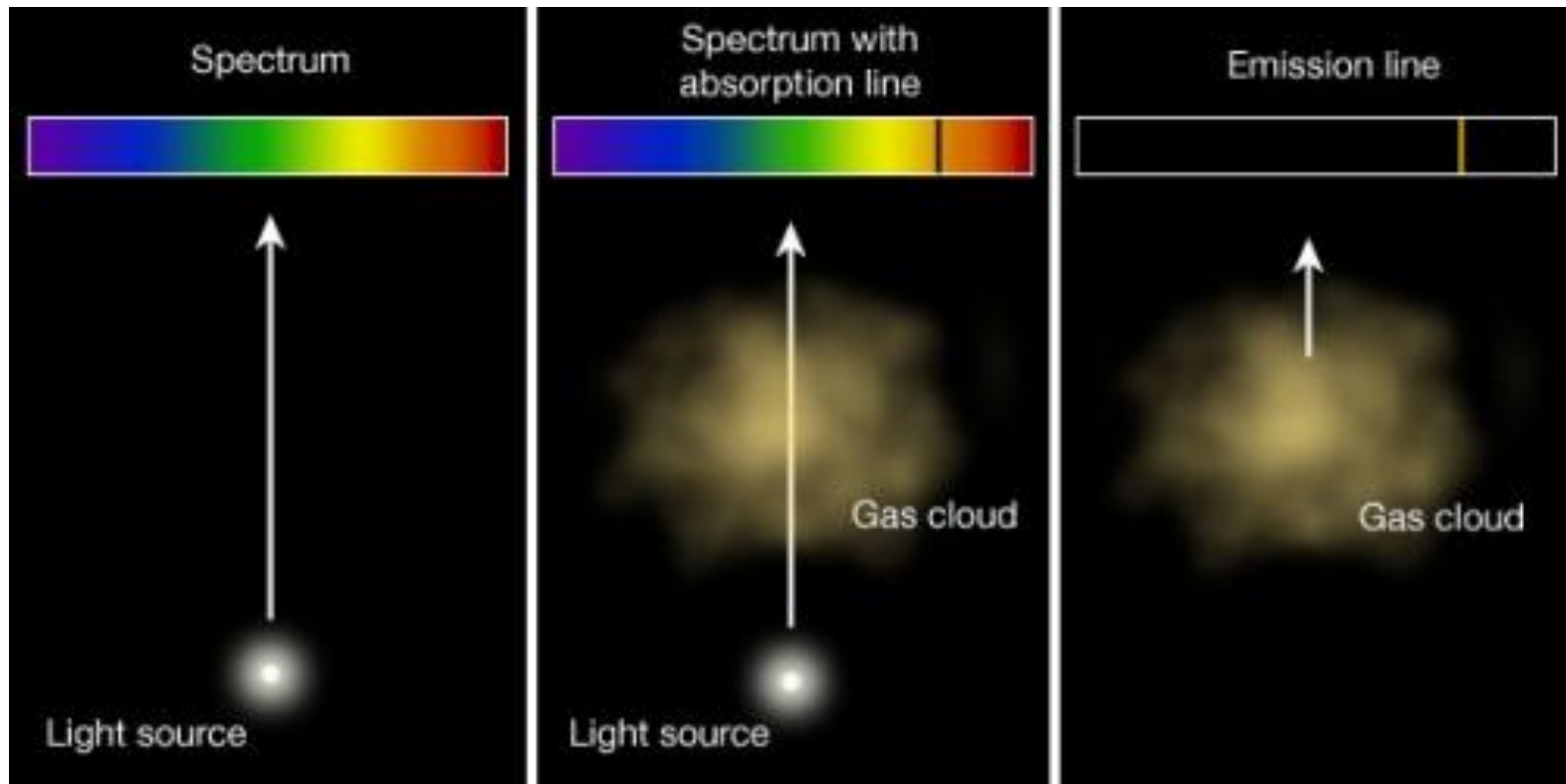
- Light is one form of **electromagnetic (EM) radiation**
- Stars emit light and other types of EM energy which we can detect with the right **receptors**
- We have learned a lot about stars through **spectroscopy** – studying wavelengths of energy, beginning with light

THE ELECTROMAGNETIC SPECTRUM



Types of Spectra

- **Continuous** – uninterrupted band of color which may produce “white light”; common lightbulb emits such a pattern
- **Dark-line (absorption) spectrum** – a series of dark lines that reveal different elements; useful for study of stars
- **Bright-line (emission spectrum)** – a series of bright lines indicating the gases that produced them



https://www.e-education.psu.edu/astro801/files/astro801/image/kirchoffs_laws_KL.jpg

Spectroscopes

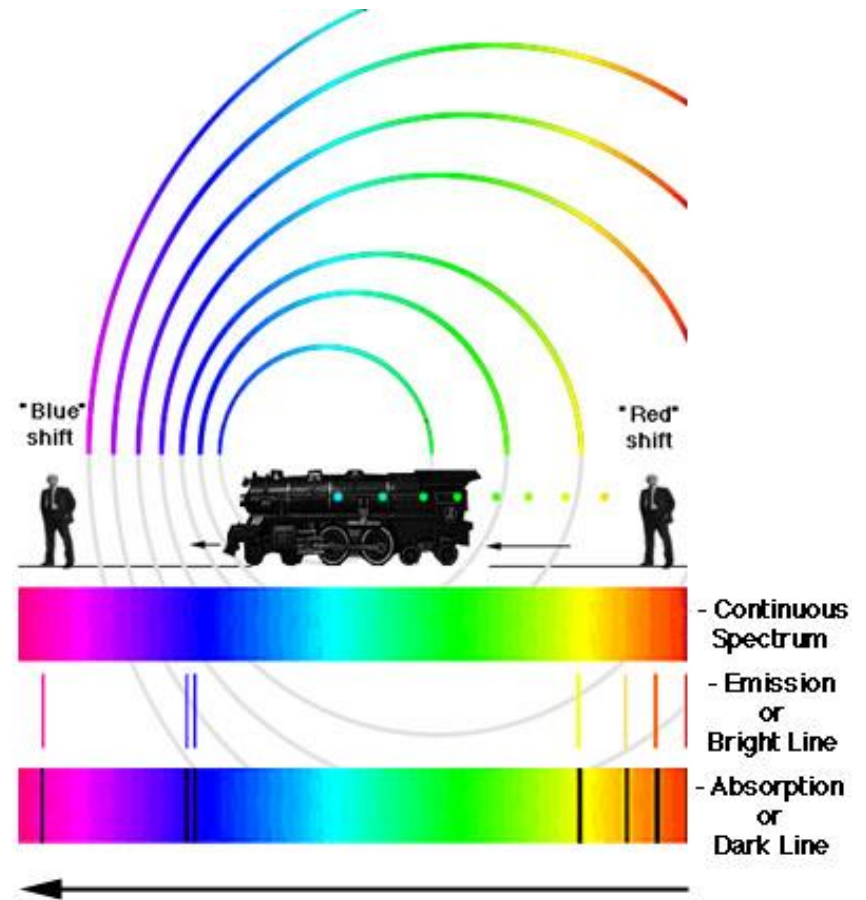
- Prism disperses wavelengths so that characteristic lines can be identified
- Over 60 elements have been matched to such patterns, notably He (named for its discovery in the Sun in the 1860s)
- Can also be used to identify elements in planets and their moons

Two Other Important Discoveries

- Stefan-Boltzmann Law :
As temperature increases, total amount of energy released increased to the 4th power
- As temperature increases, a larger proportion of the energy is emitted at shorter wavelengths
- Chandra X-ray Observatory
<http://chandra.harvard.edu/>

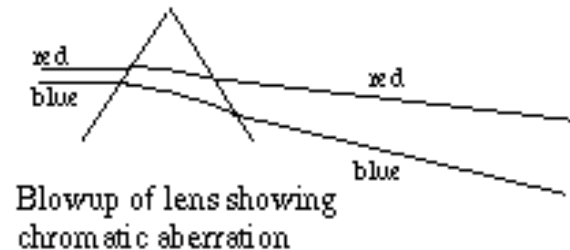
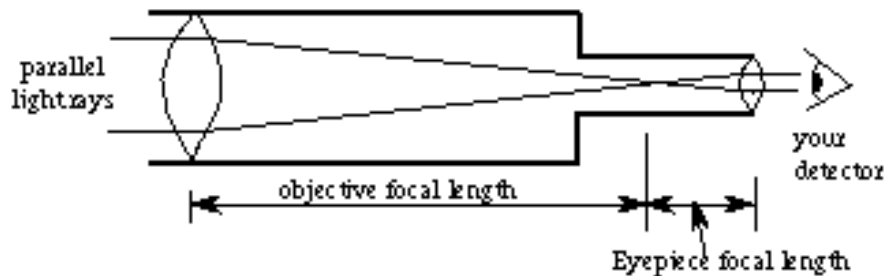
Doppler Effect (Red Shift)

- Objects moving away from observer produce longer wavelengths
- Shift toward the red end of the spectrum
- Further away → greater the shift
- Measure dark-line spectra



Refracting Telescope

- Developed for astronomy by Galileo

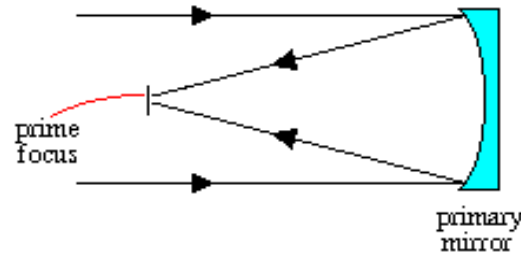


Reflecting Telescope

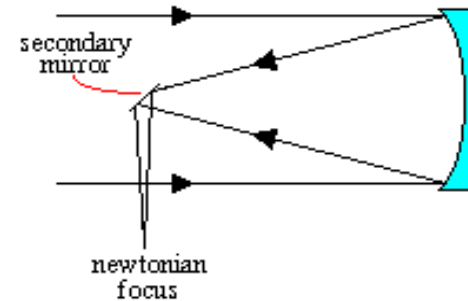
- Uses mirror to avoid chromatic aberration

Reflecting Telescopes

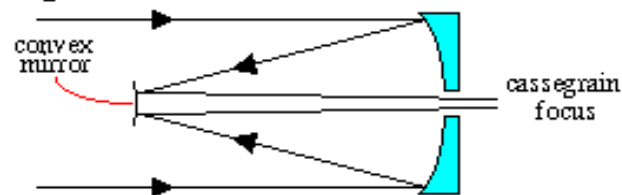
Prime



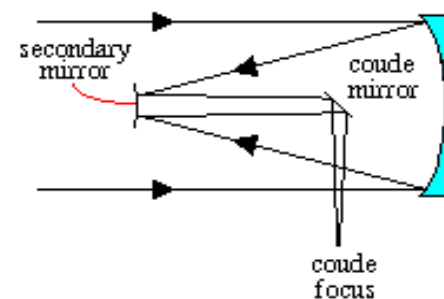
Newtonian



Cassegrain



Coude



Other types of telescopes

- Radio telescopes
 - Can be very large (Puerto Rico, Green Bank WV, Socorro NM, etc.)
- Infrared astronomy
- Microwave telescopes
- NASA'S IMAGINE THE UNIVERSE
<http://imagine.gsfc.nasa.gov/>