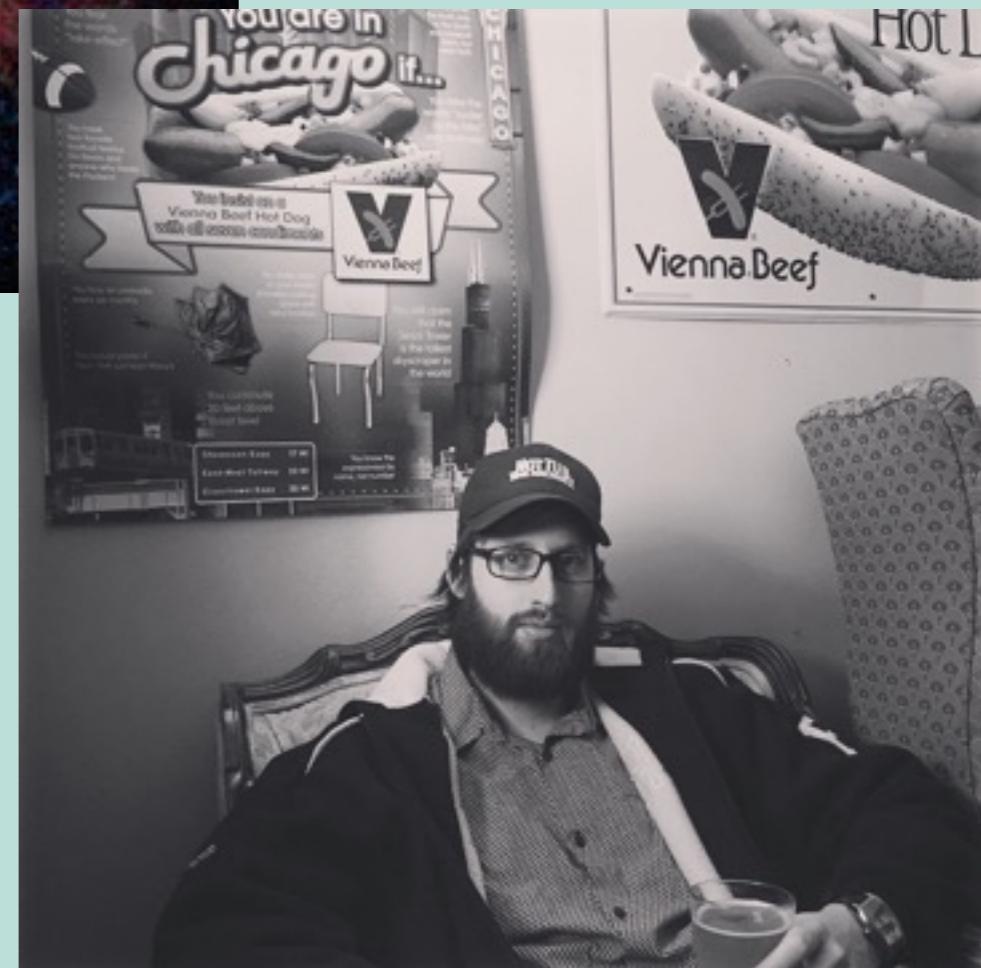




Lecture 3: Radiation



with your host:



Coop

Radiation: Ch 3



Even the CLOSEST galaxy is 2500000 years away

The only way we learn about the cosmos is through energy propagating in the form of a wave

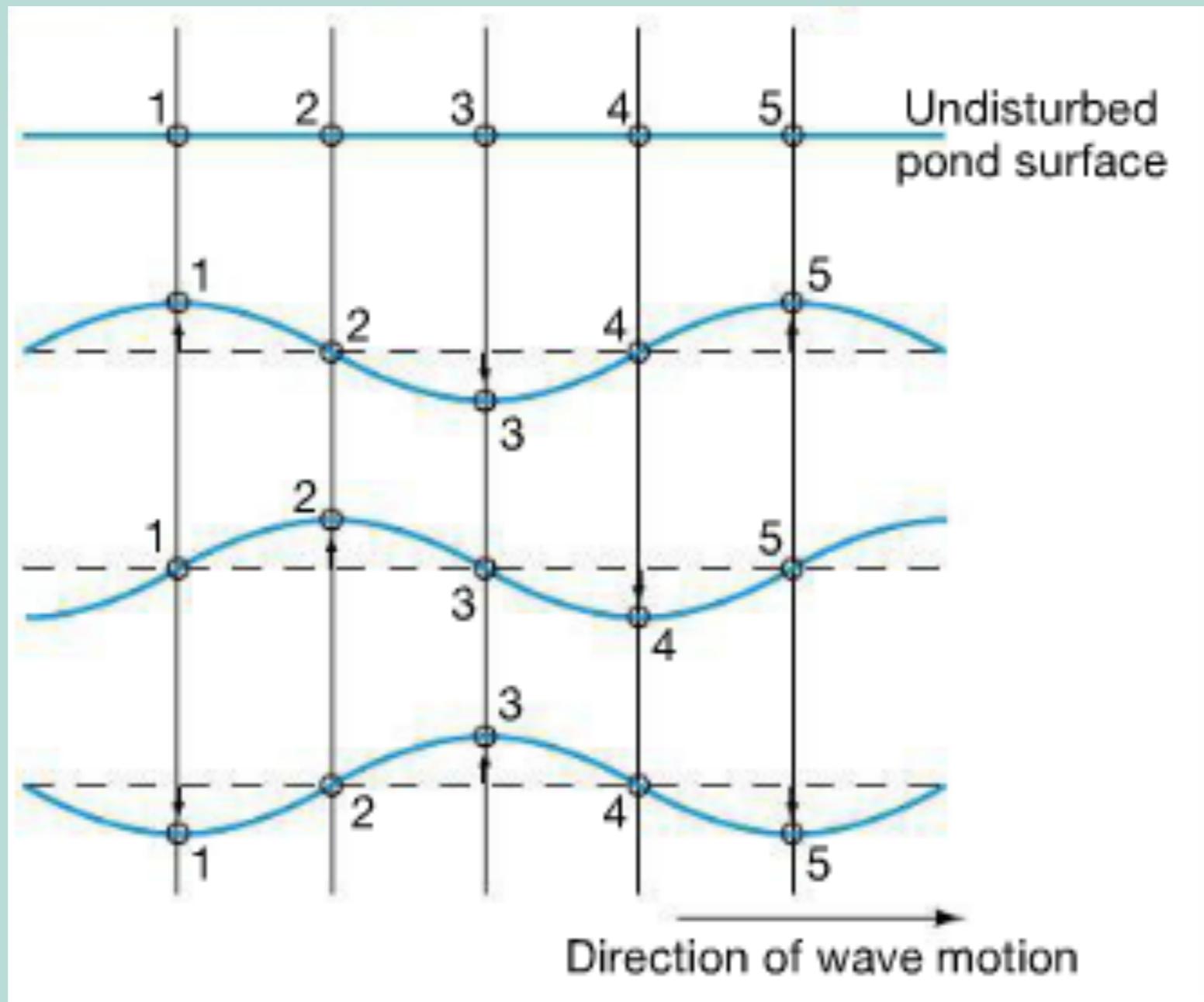
Any energy transfer without mass transfer* is known as *radiation*

from 10,000 BCE - 2016 AD we have only had one kind of wave sent to us from the heavens...

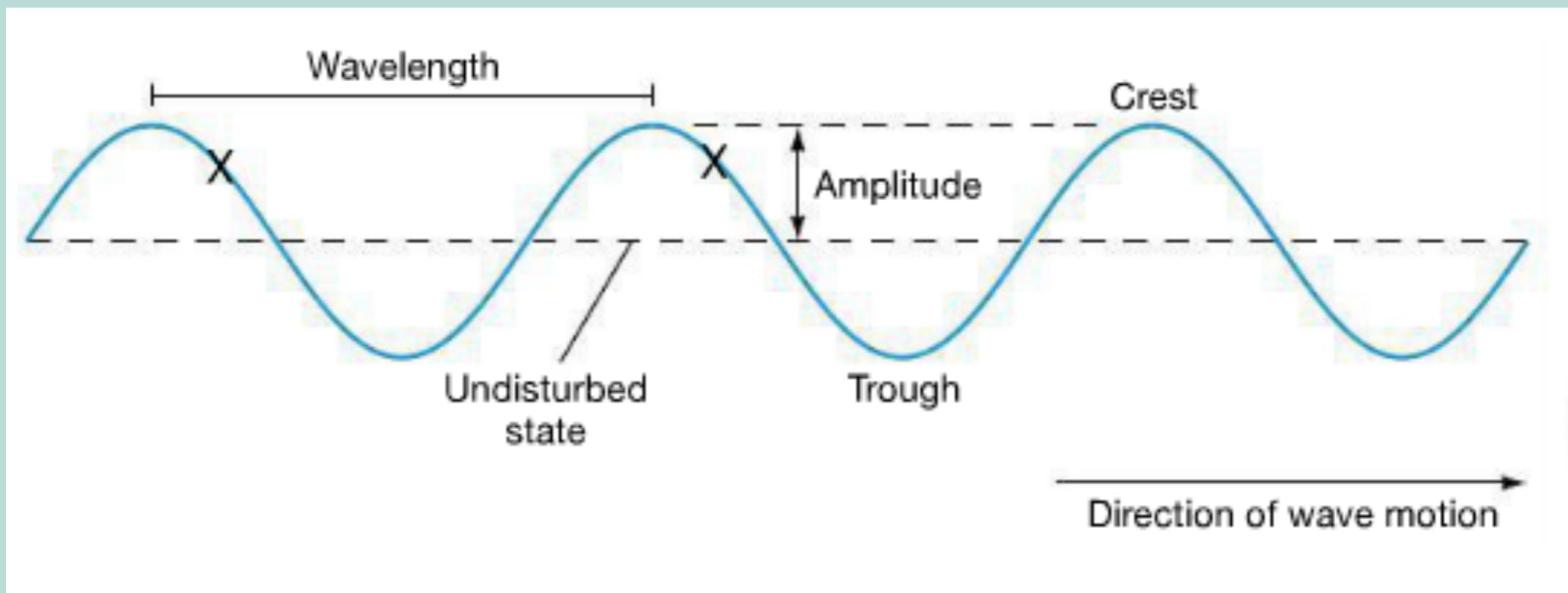
Radiation: Ch 3



Radiation: Ch 3



Definitions



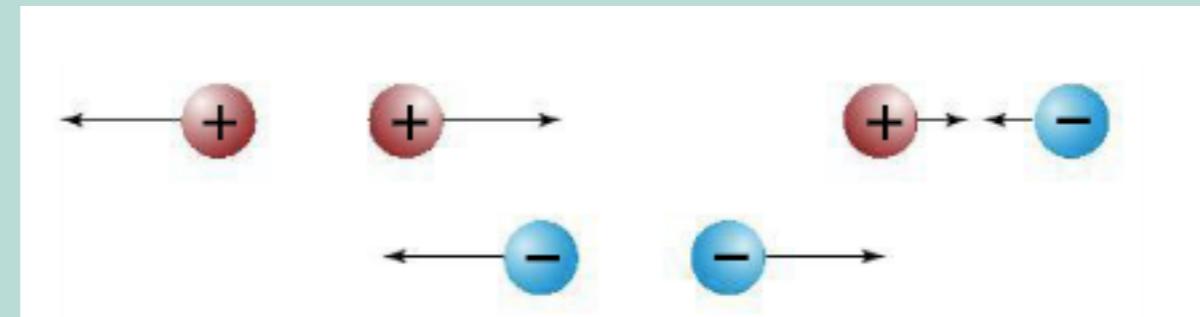
Radiation: Ch 3

But between us and the stars is empty space



So what's doing the “waving”

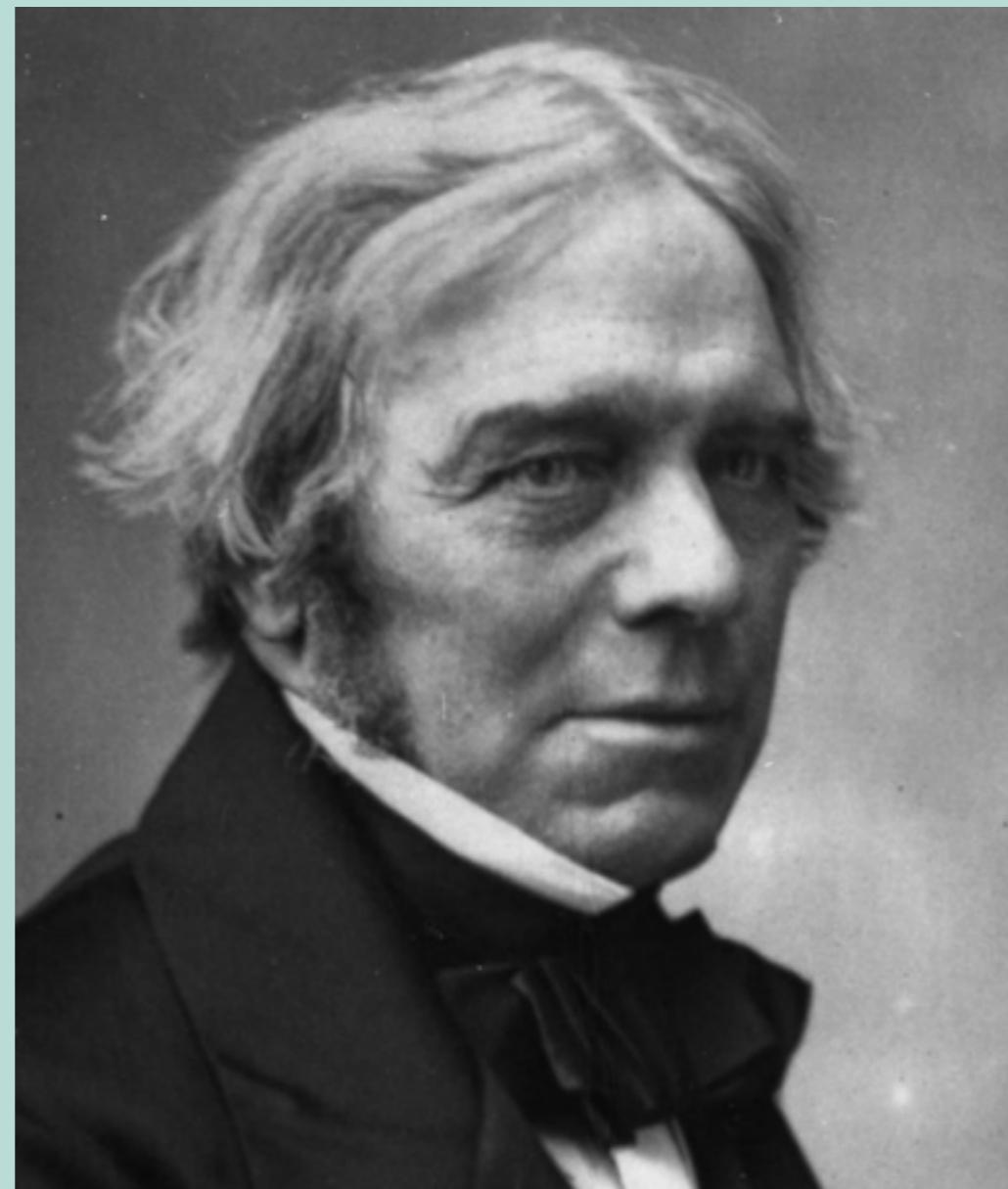
Electricity



$$F_{\text{grav}} = -\frac{\mathcal{G}m_1 m_2}{r^2}$$

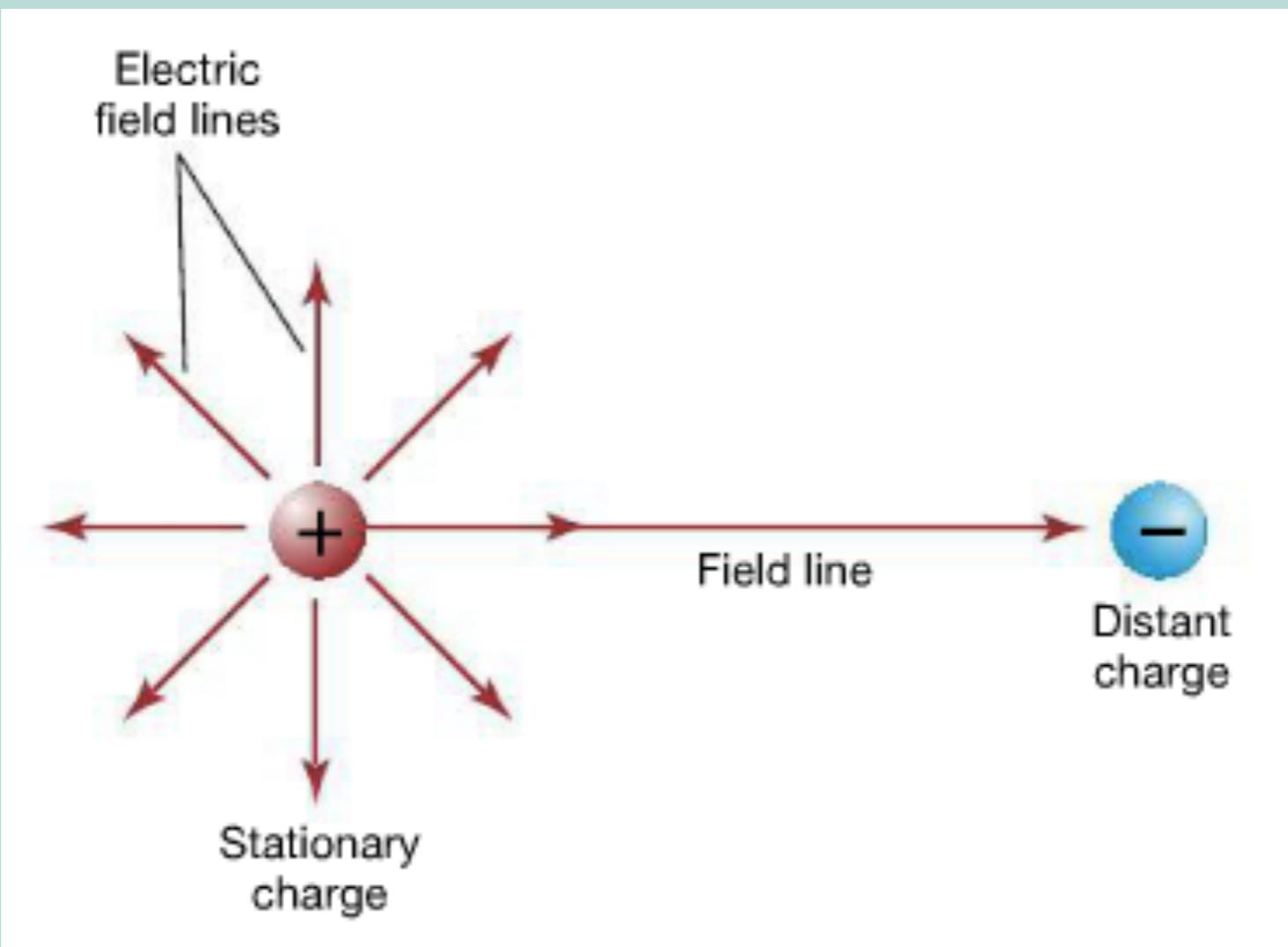
$$F_{\text{electric}} = \frac{\mathcal{K}q_1 q_2}{r^2}$$

Michael Faraday

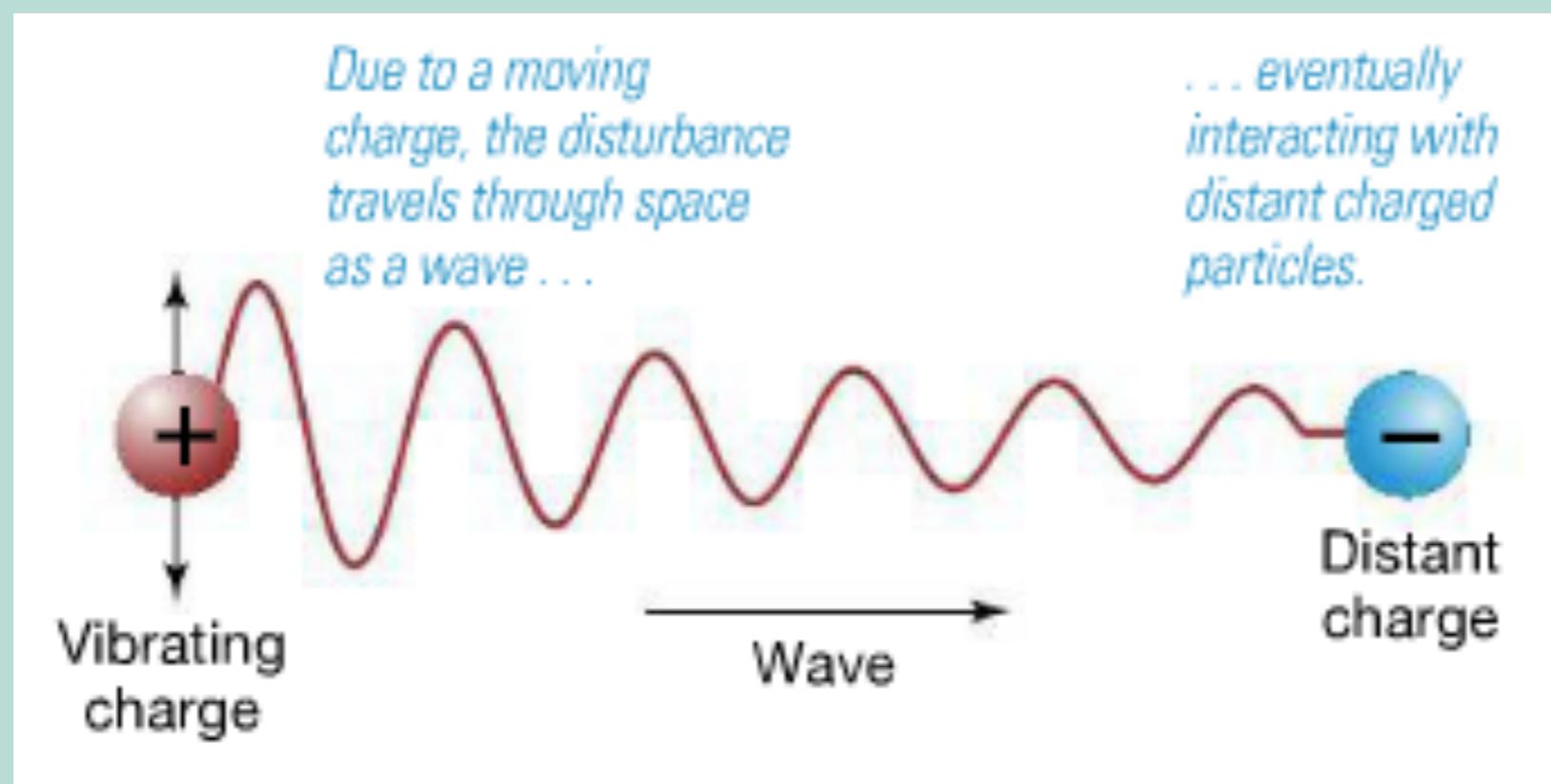


Born in Newington Butts, England
1791 - 1867

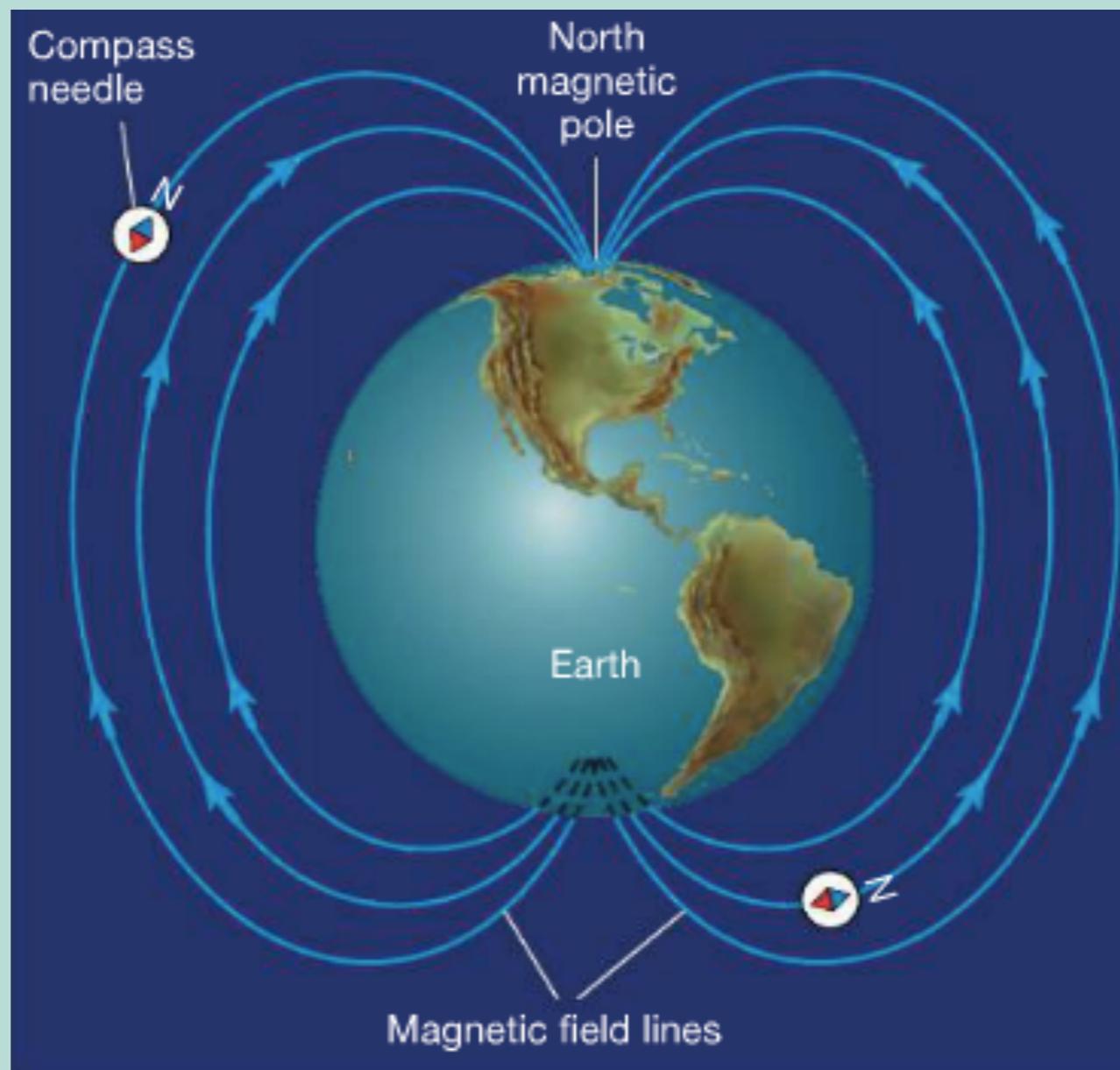
Radiation: Ch 3

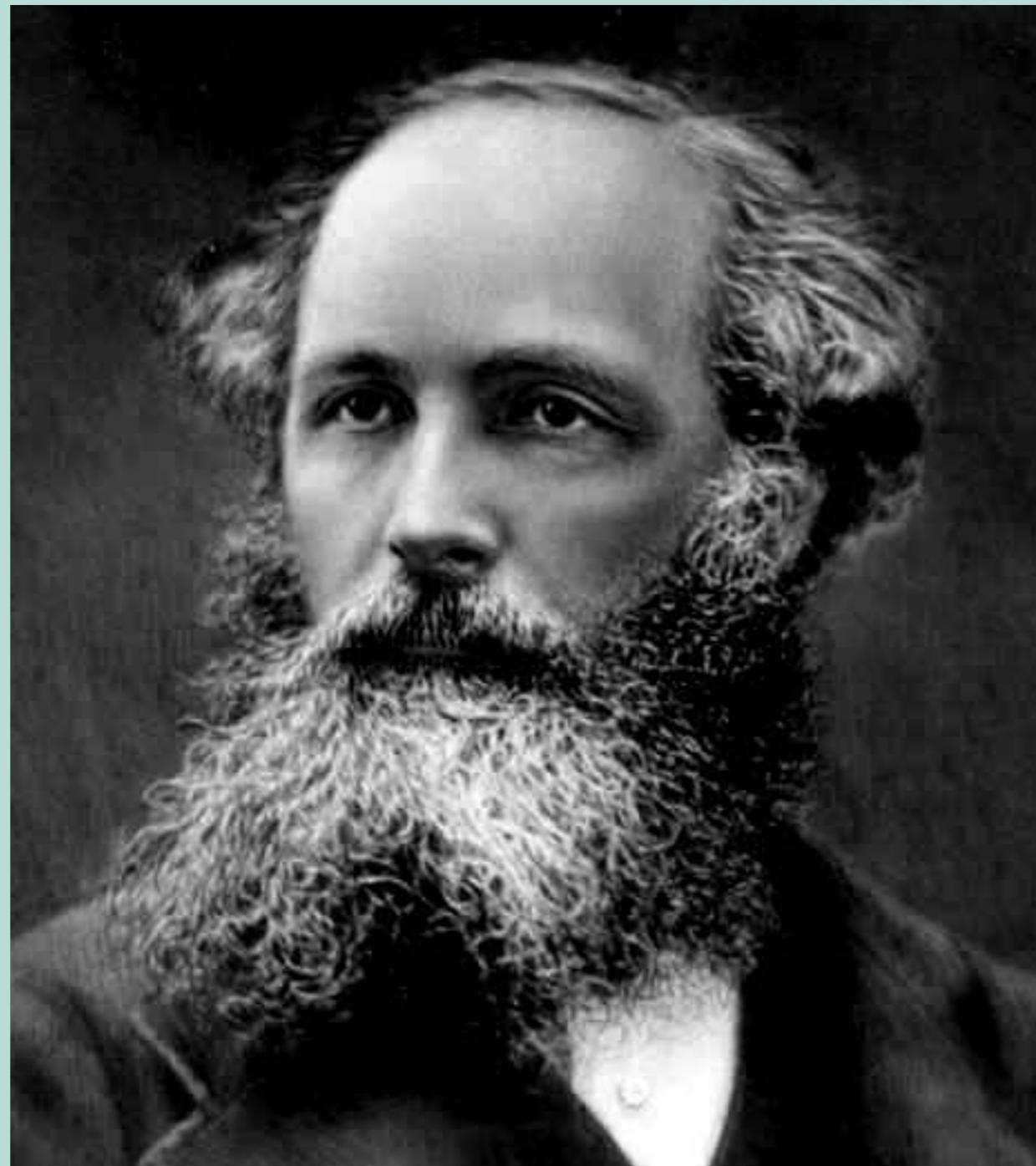


Radiation: Ch 3



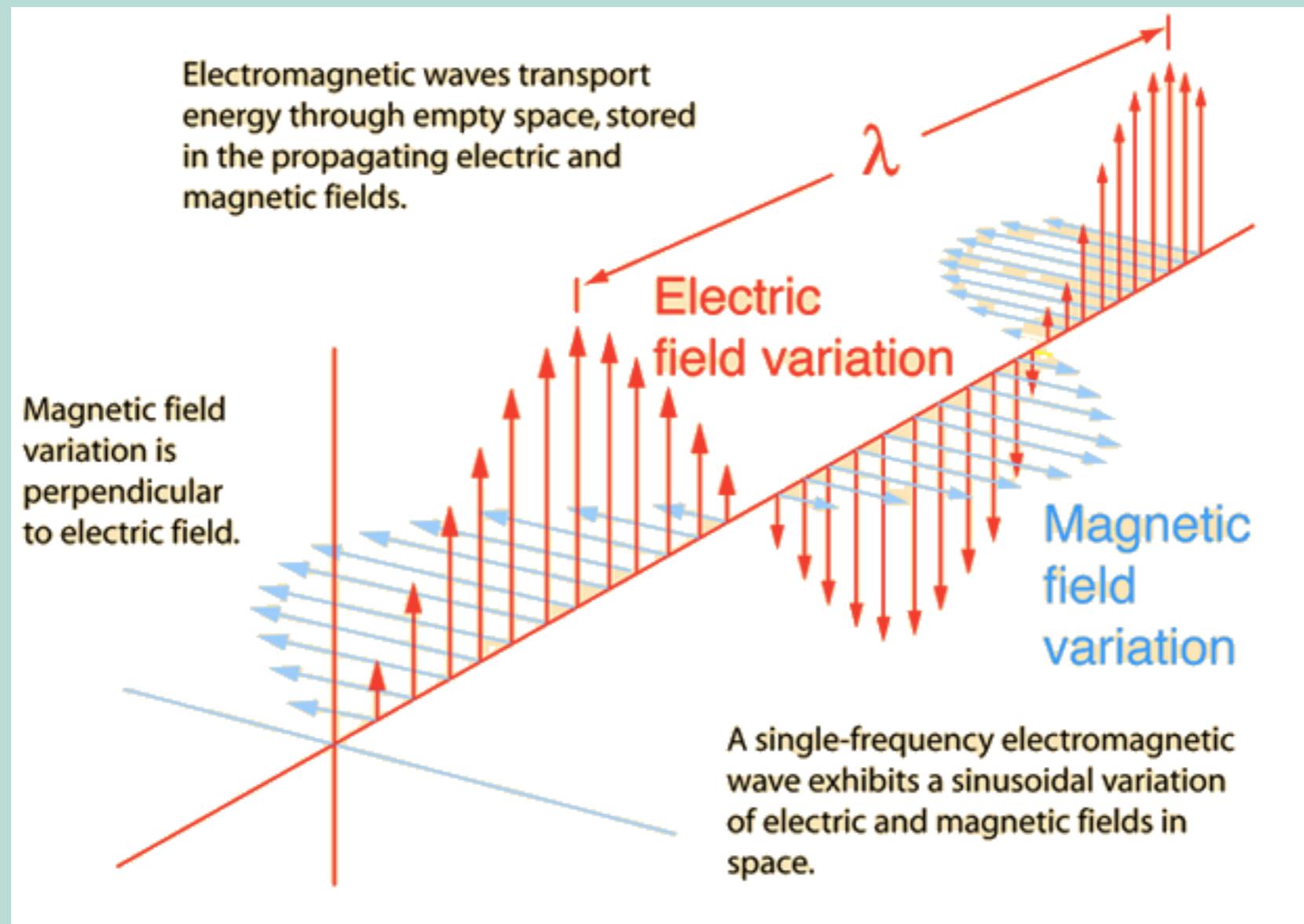
Magnetism



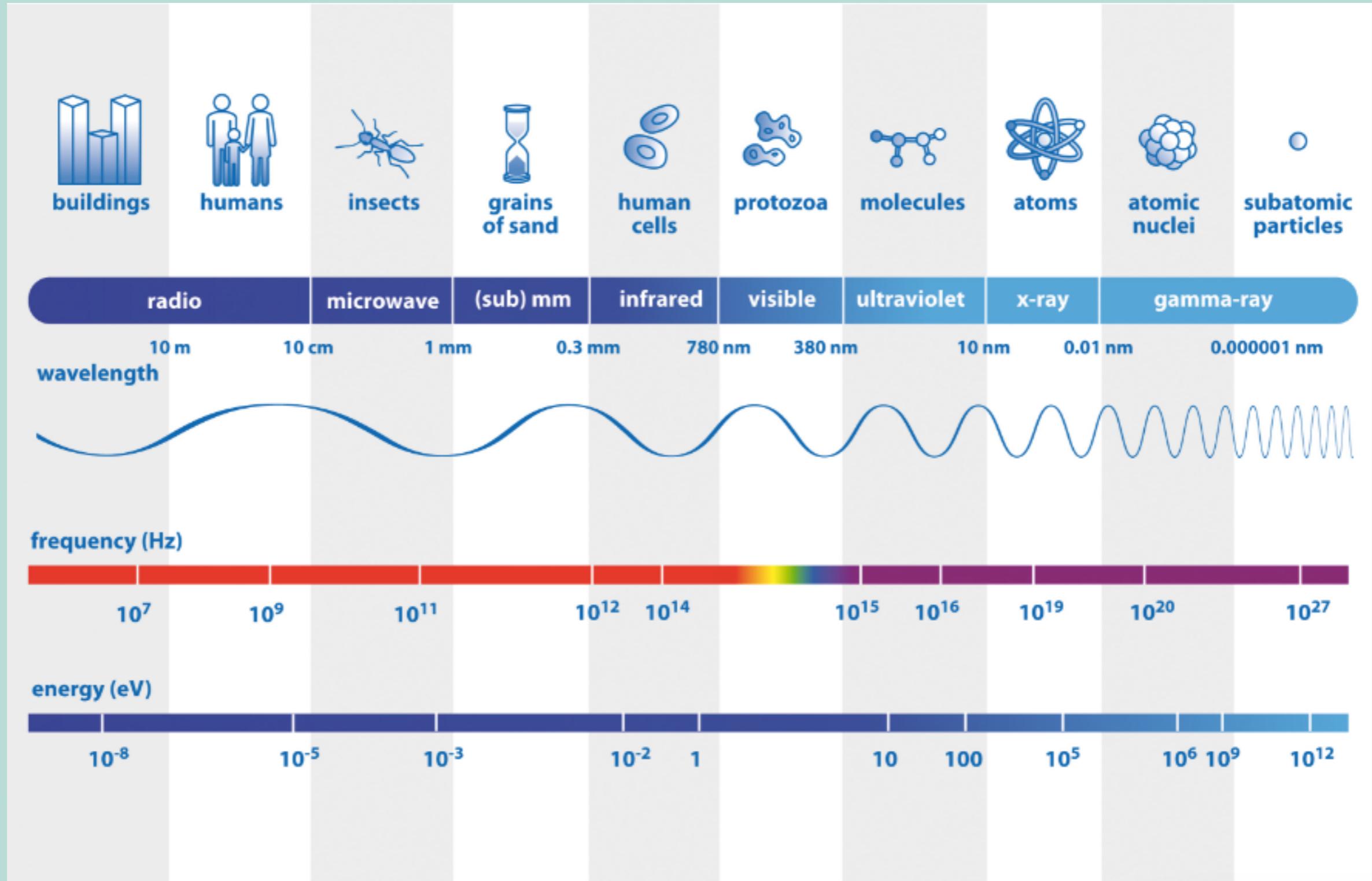


Born in Edinburgh, Scotland
1831 - 1879

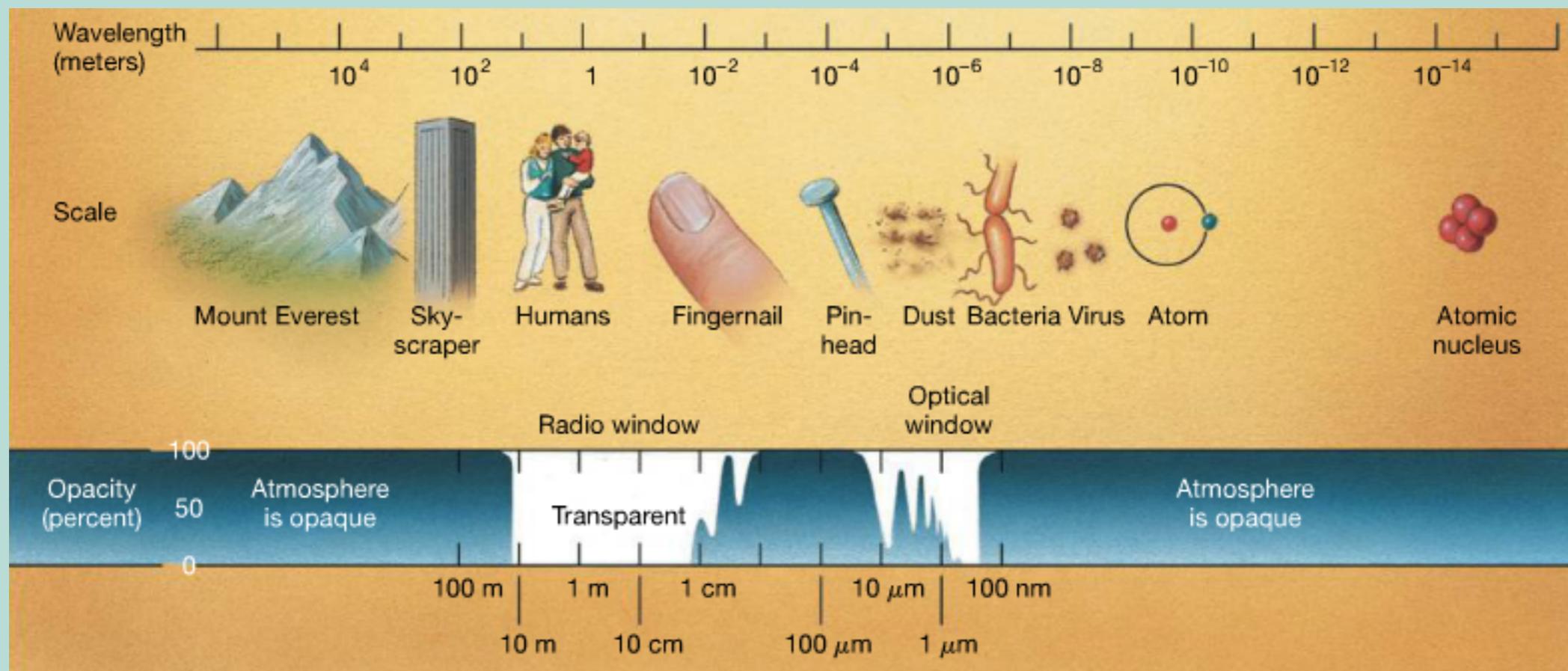
Electromagnetic Radiation



Radiation: Ch 3



Earth's Atmosphere as a window



IR absorbers: H₂O, CO₂

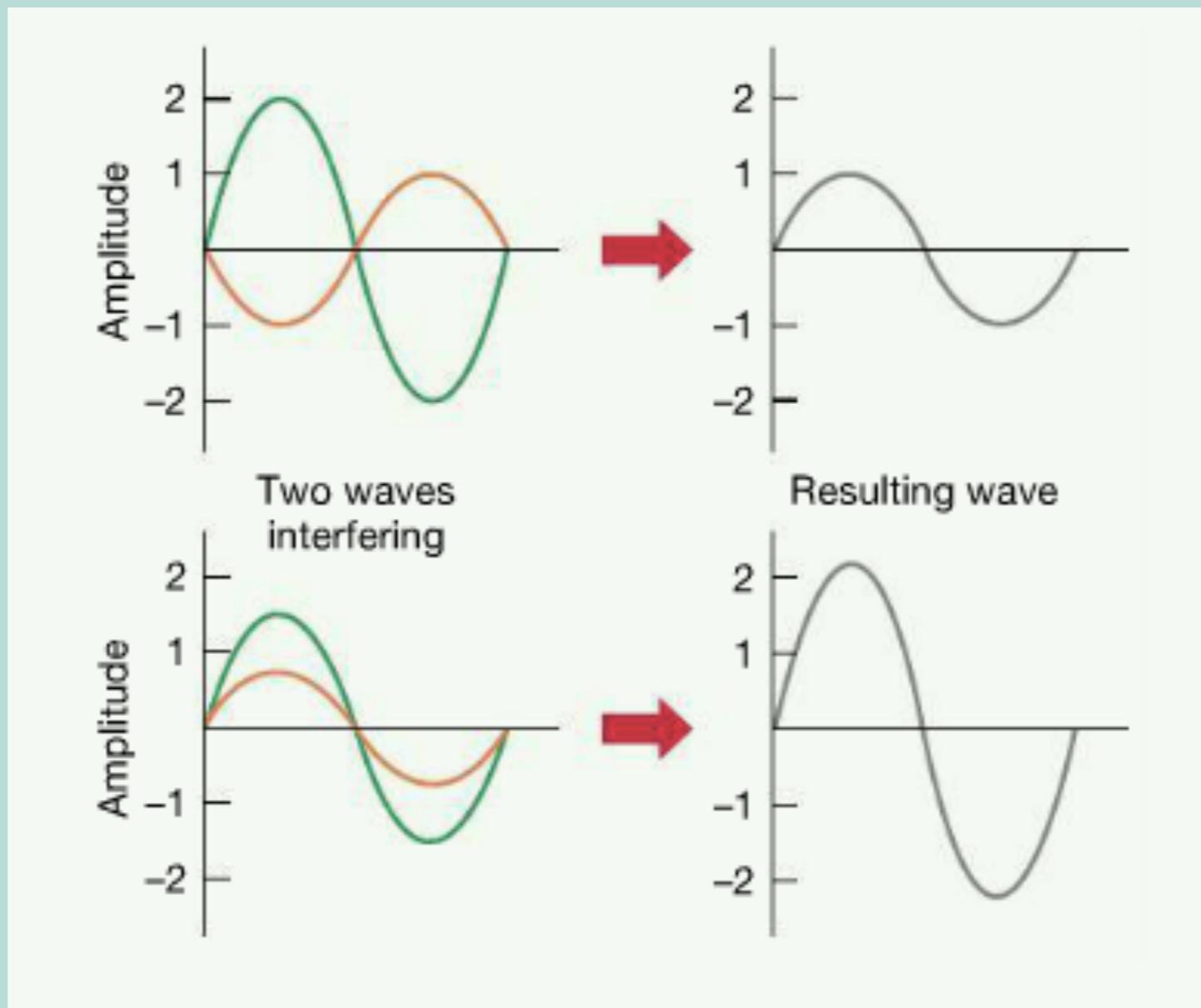
UV absorbers: O₃ (ozone)

Radiation: Ch 3



DISCUSSION

Superposition

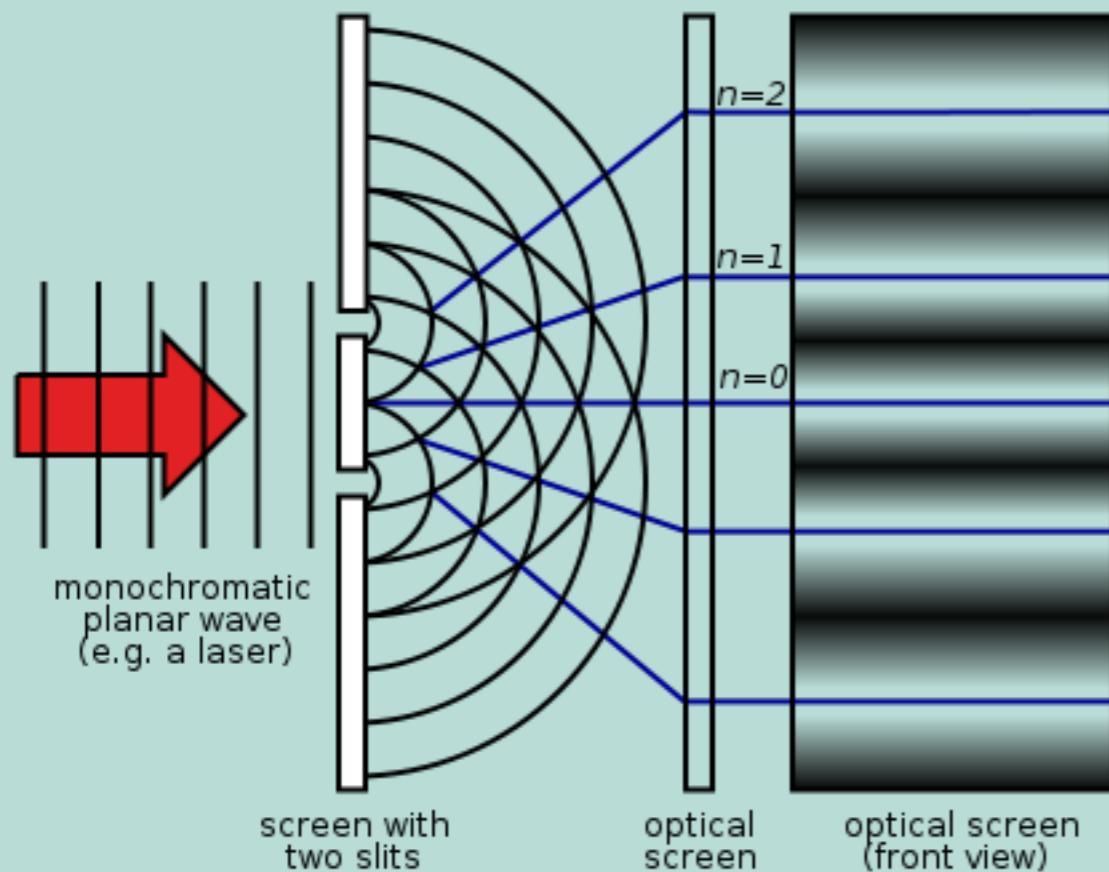


Thomas Young

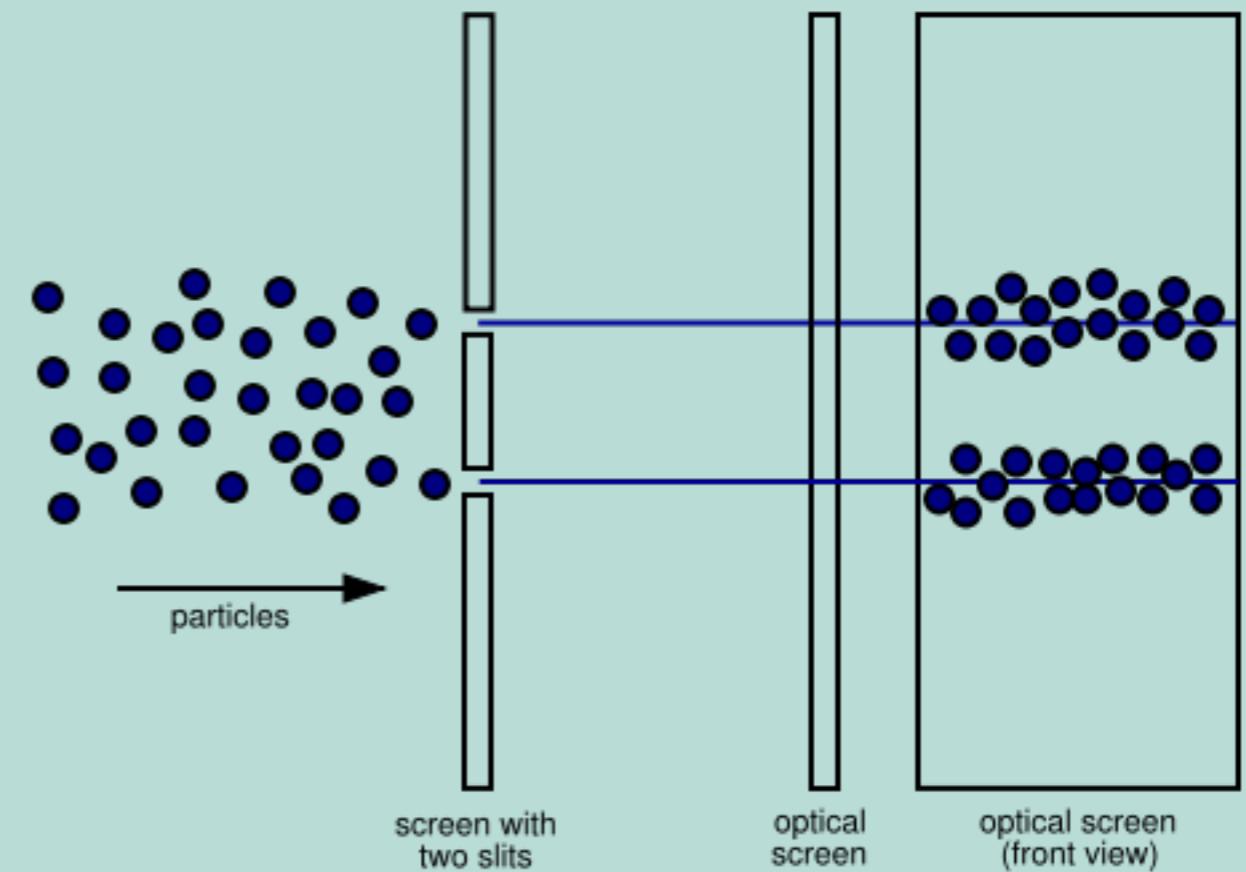


Born in Milverton, England
1773 - 1829

Wave Phenomenology

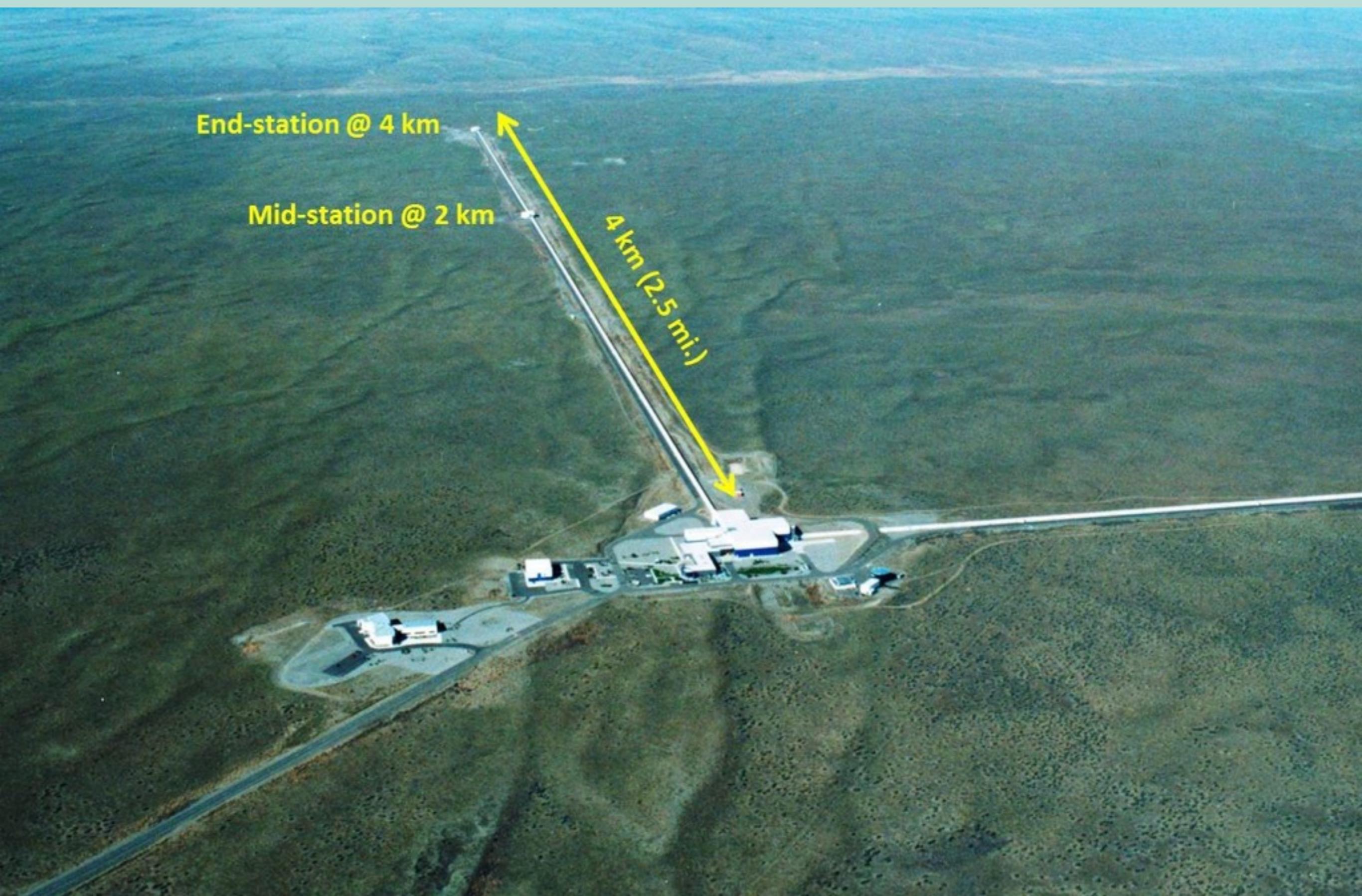


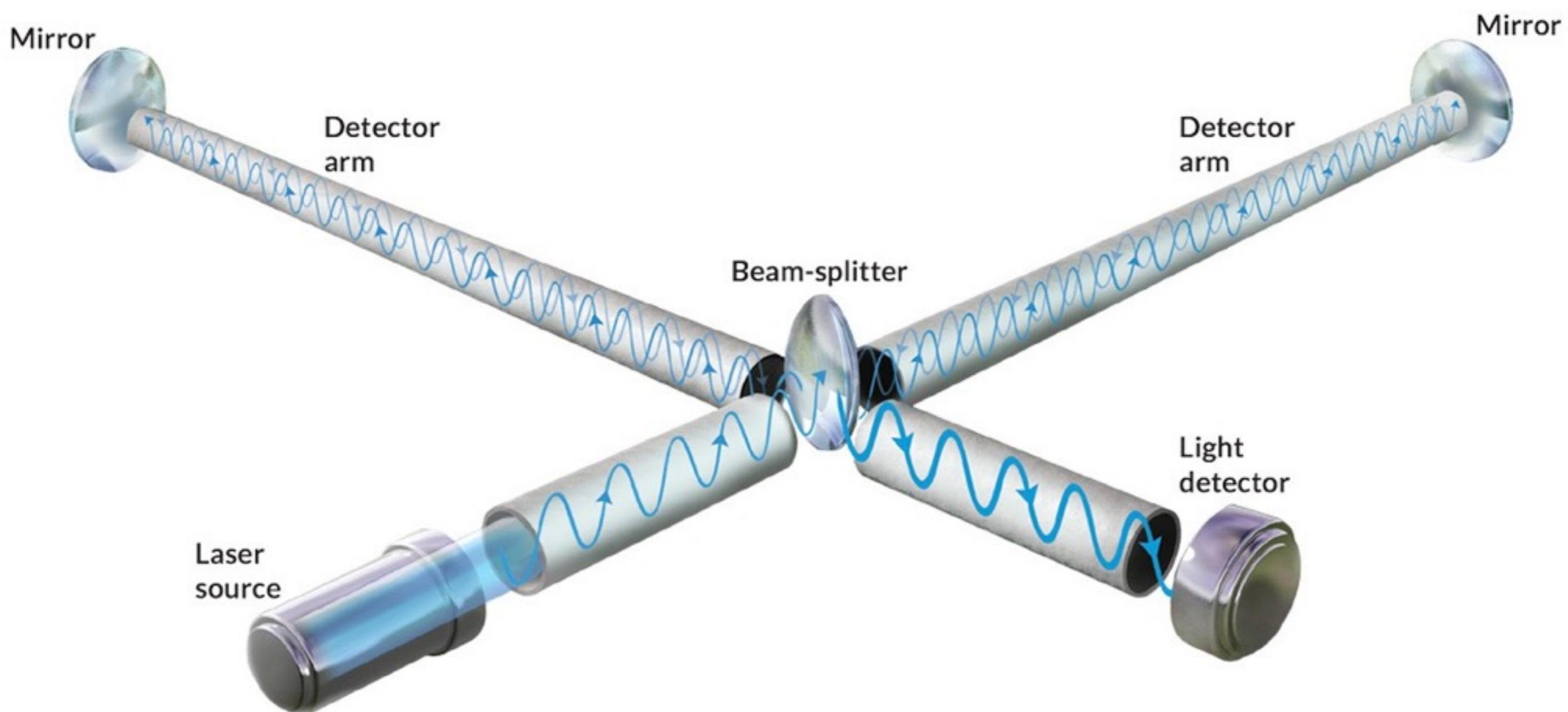
Particle Phenomenology



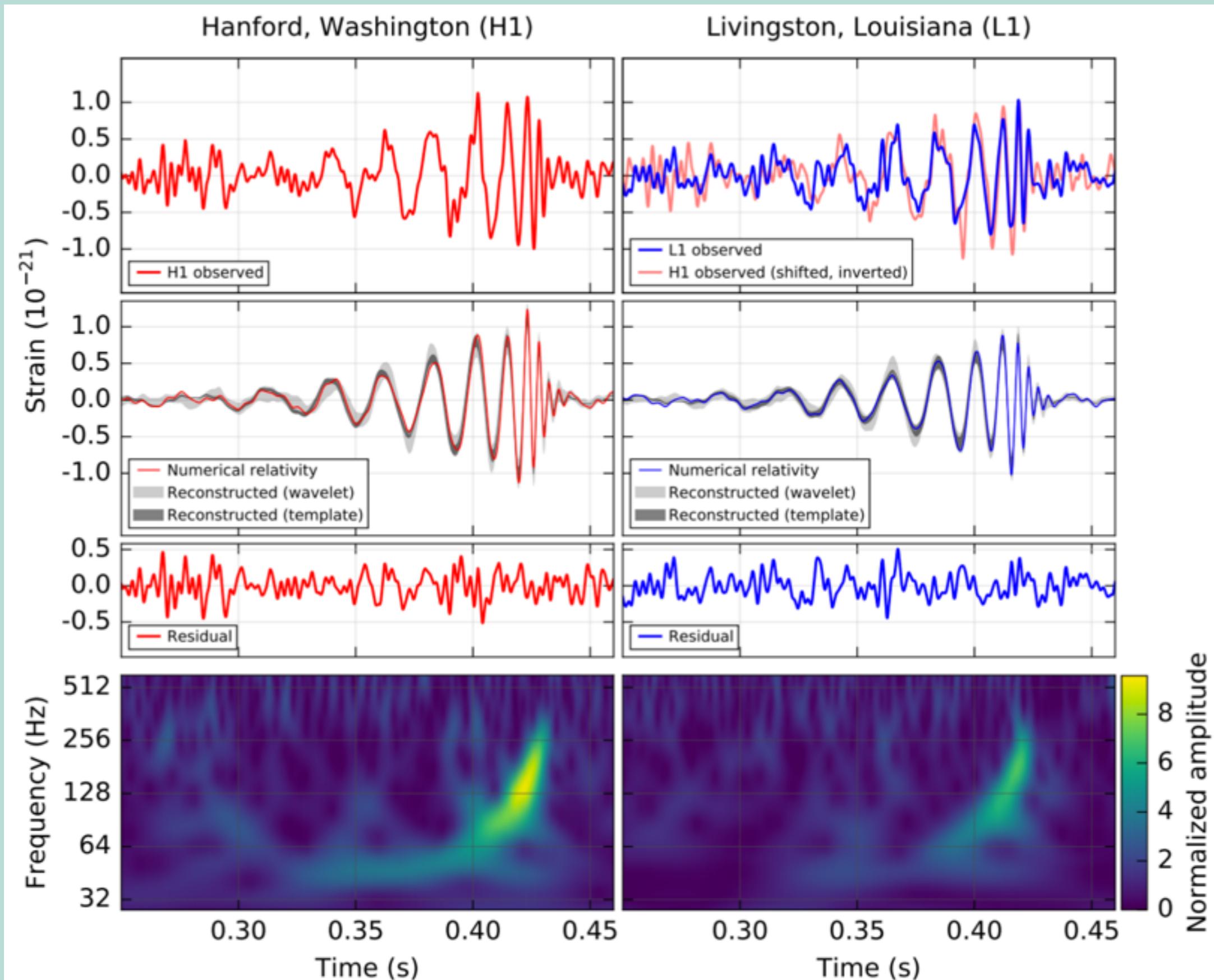
Light must be a wave! (...to be continued)

Radiation: Ch 3

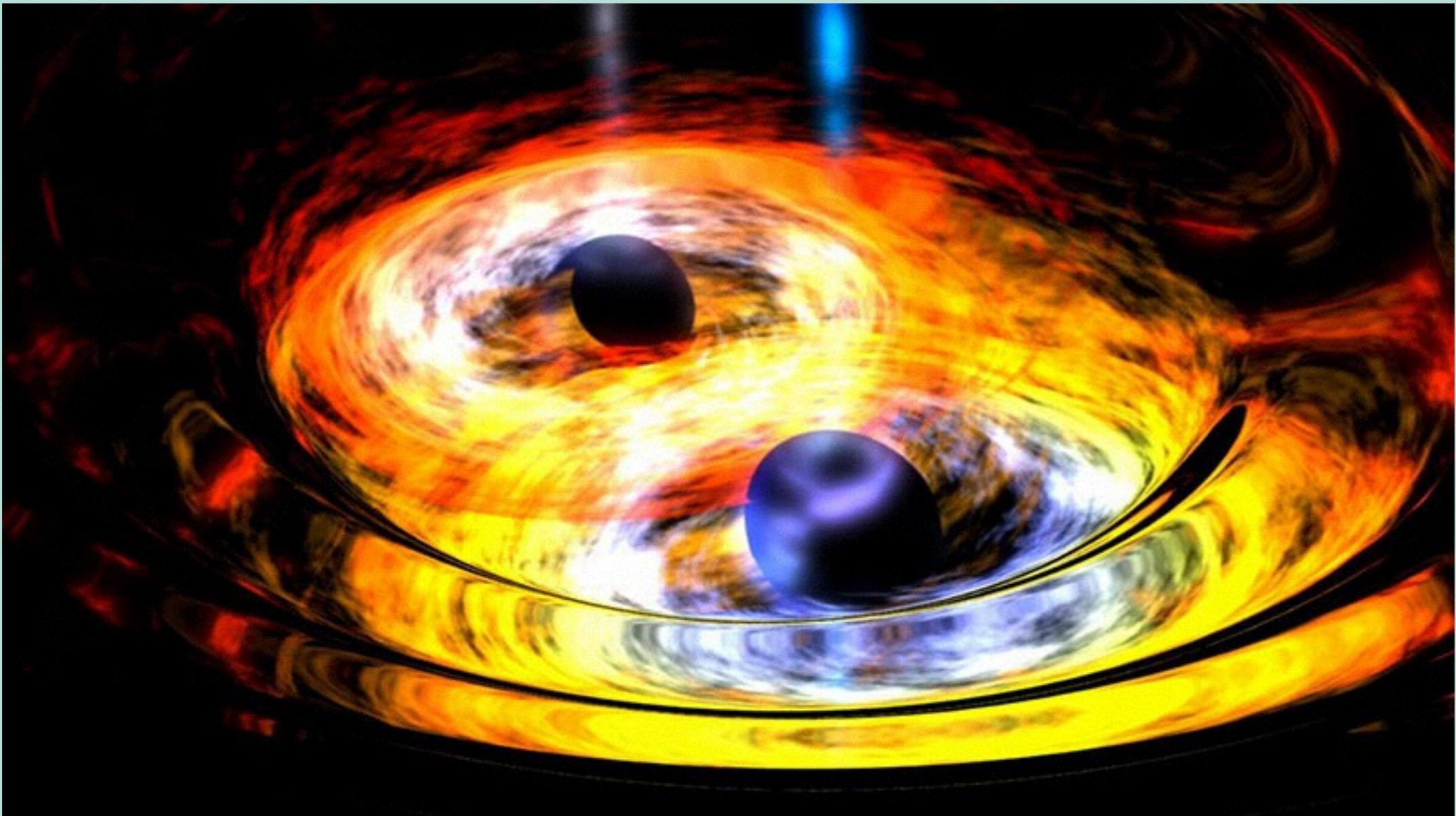




Radiation: Ch 3

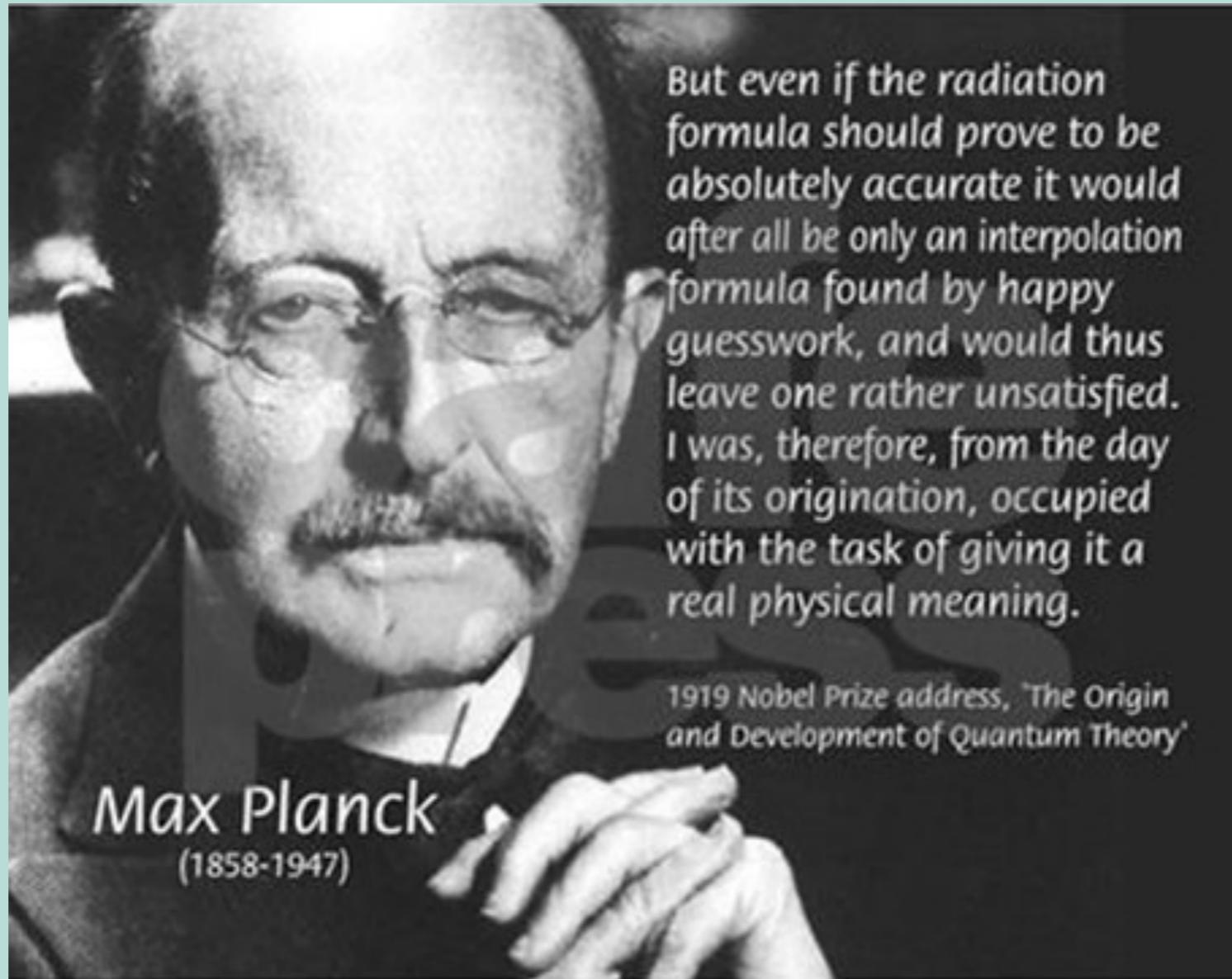


Actual picture!!!!



just kidding...

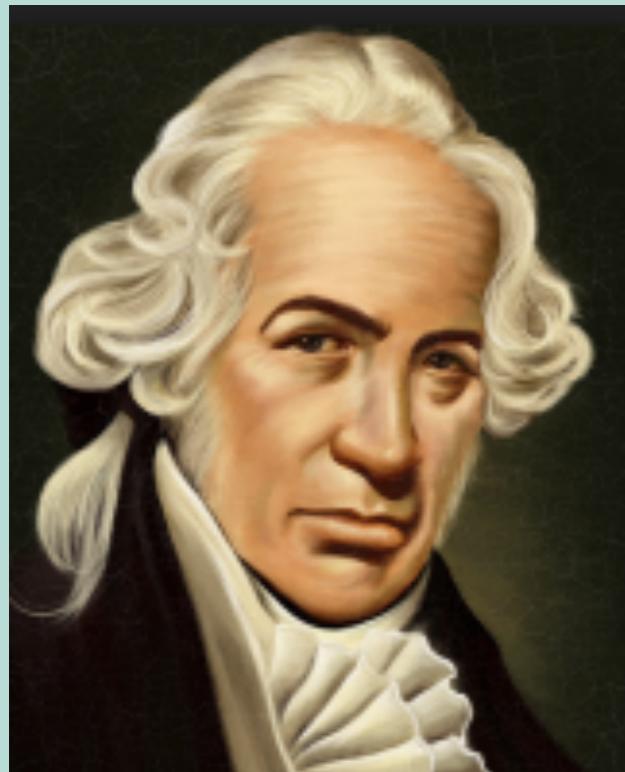
Max Karl Ernst Ludwig Planck



Born in Kiel, Duchy of Holstein

Radiation: Ch 3

Daniel
Gabriel
Fahrenheit



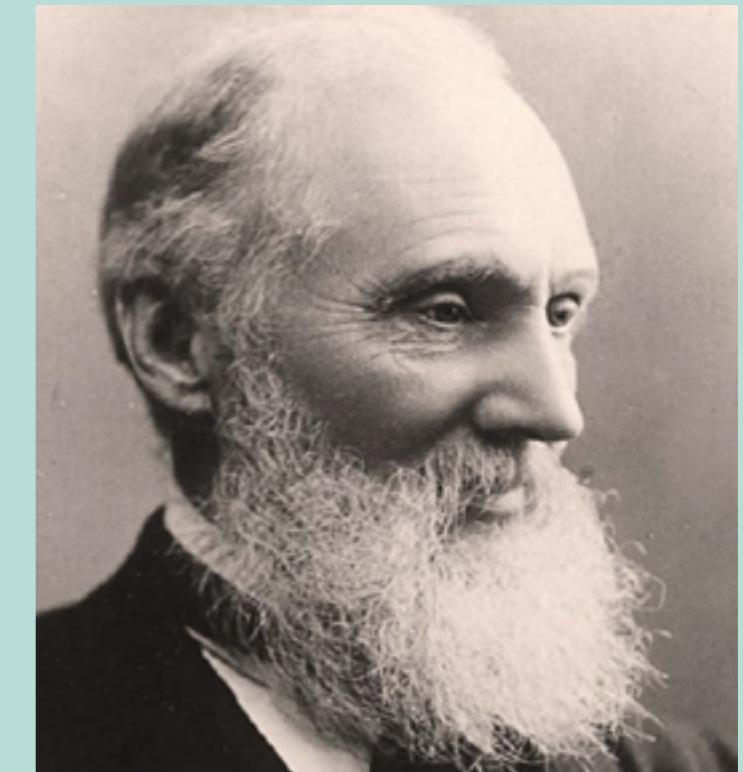
<

Anders
Celcius



<

William Thomson,
1st Baron Kelvin

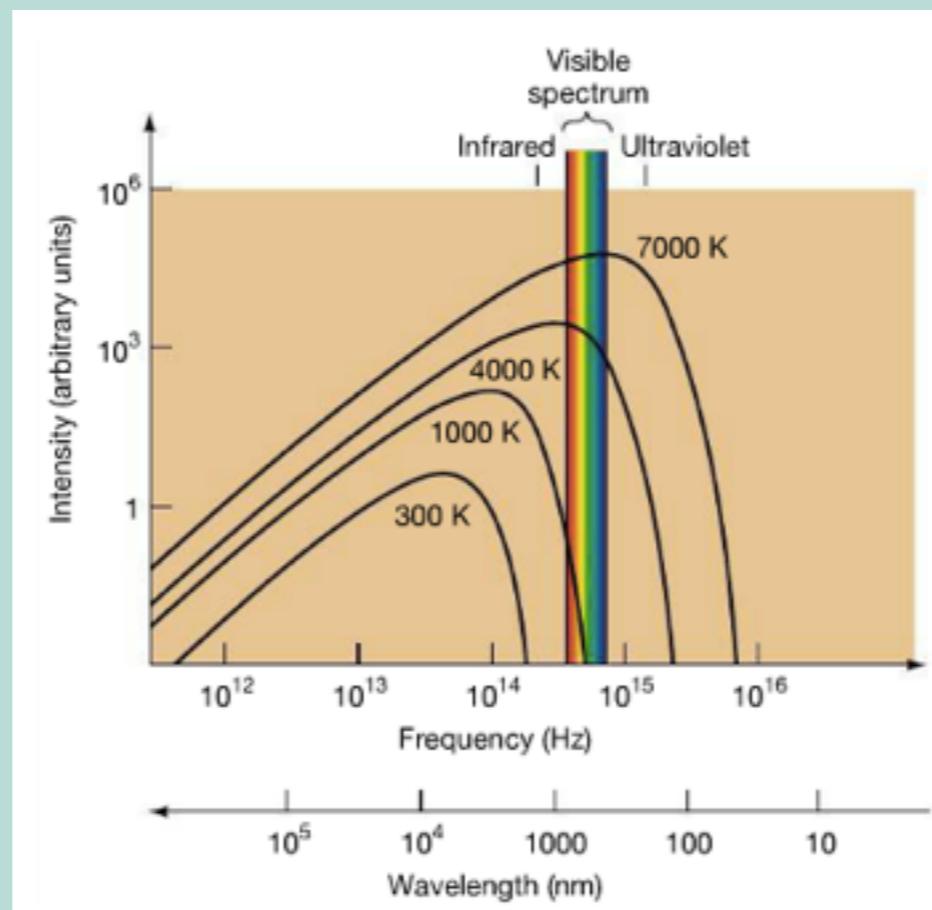
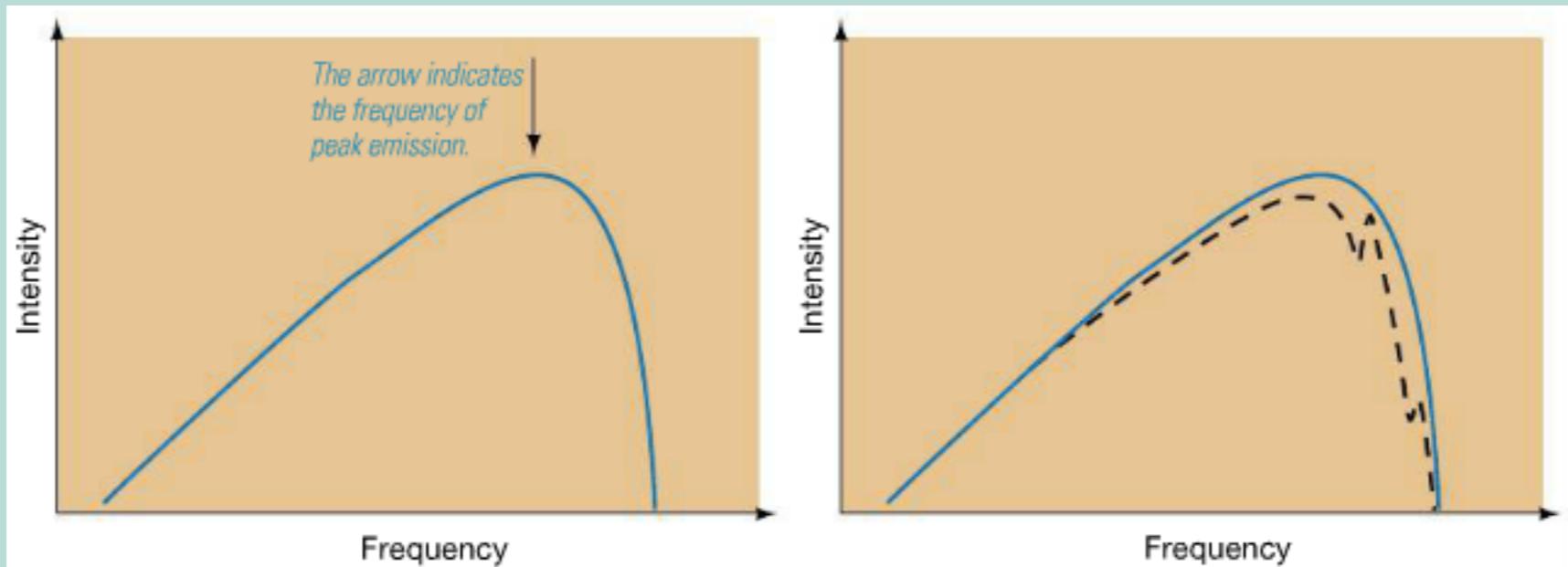


Danzig
1686-1736

Uppsala
1701-1944

Belfast
1824-1927

Black Body Spectrum



Radiation: Ch 3

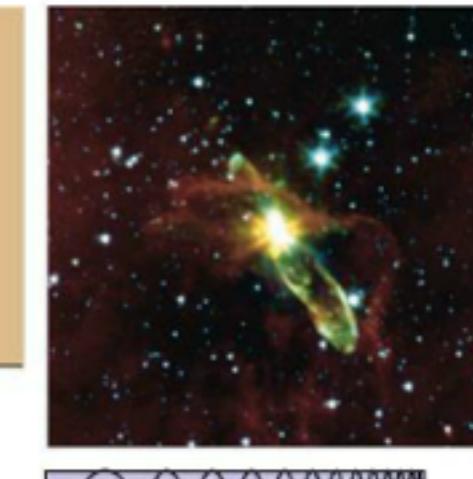
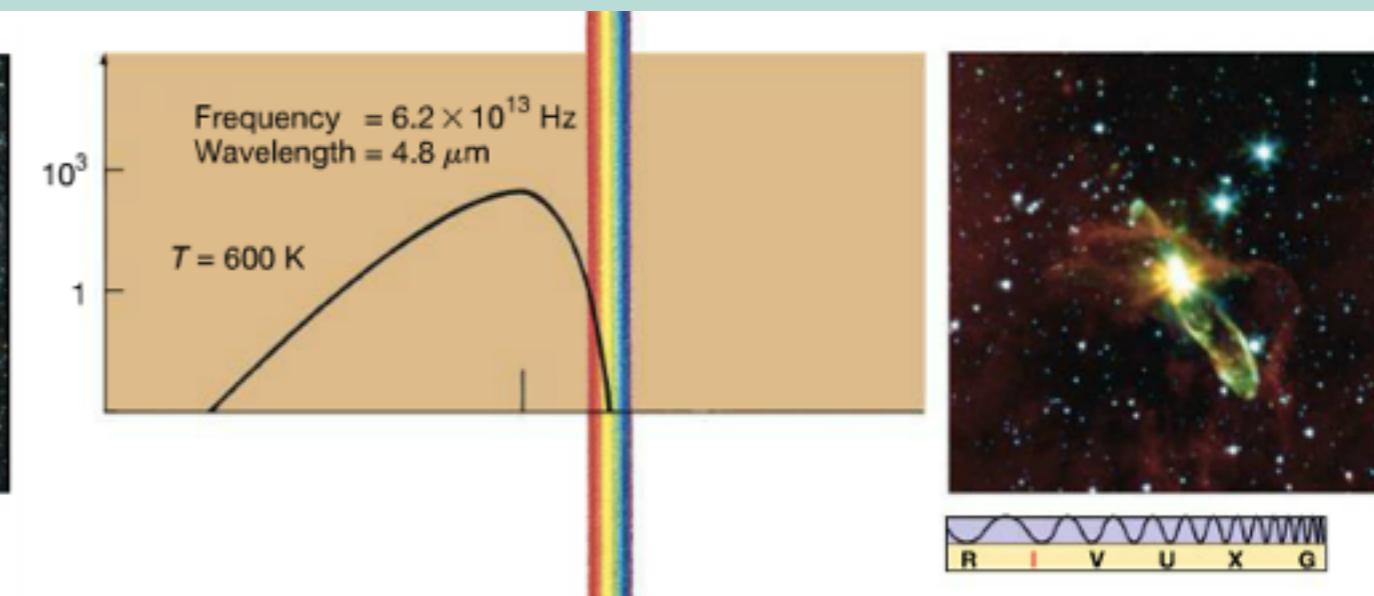
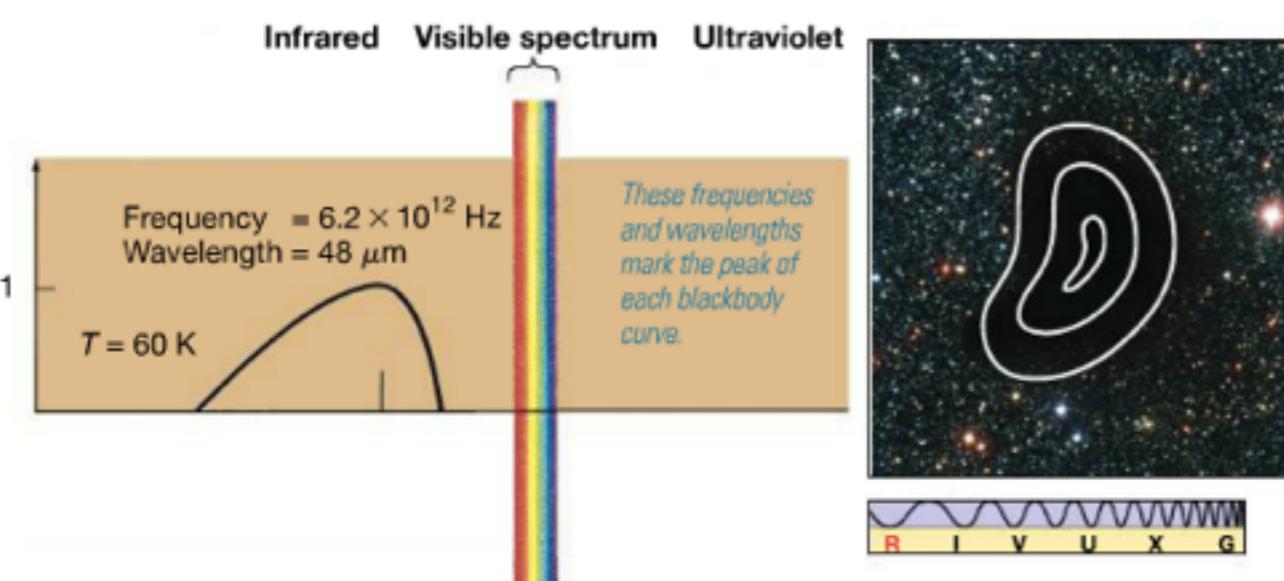
Wien's Law

$$\lambda_{\max} \sim \frac{1}{T}$$

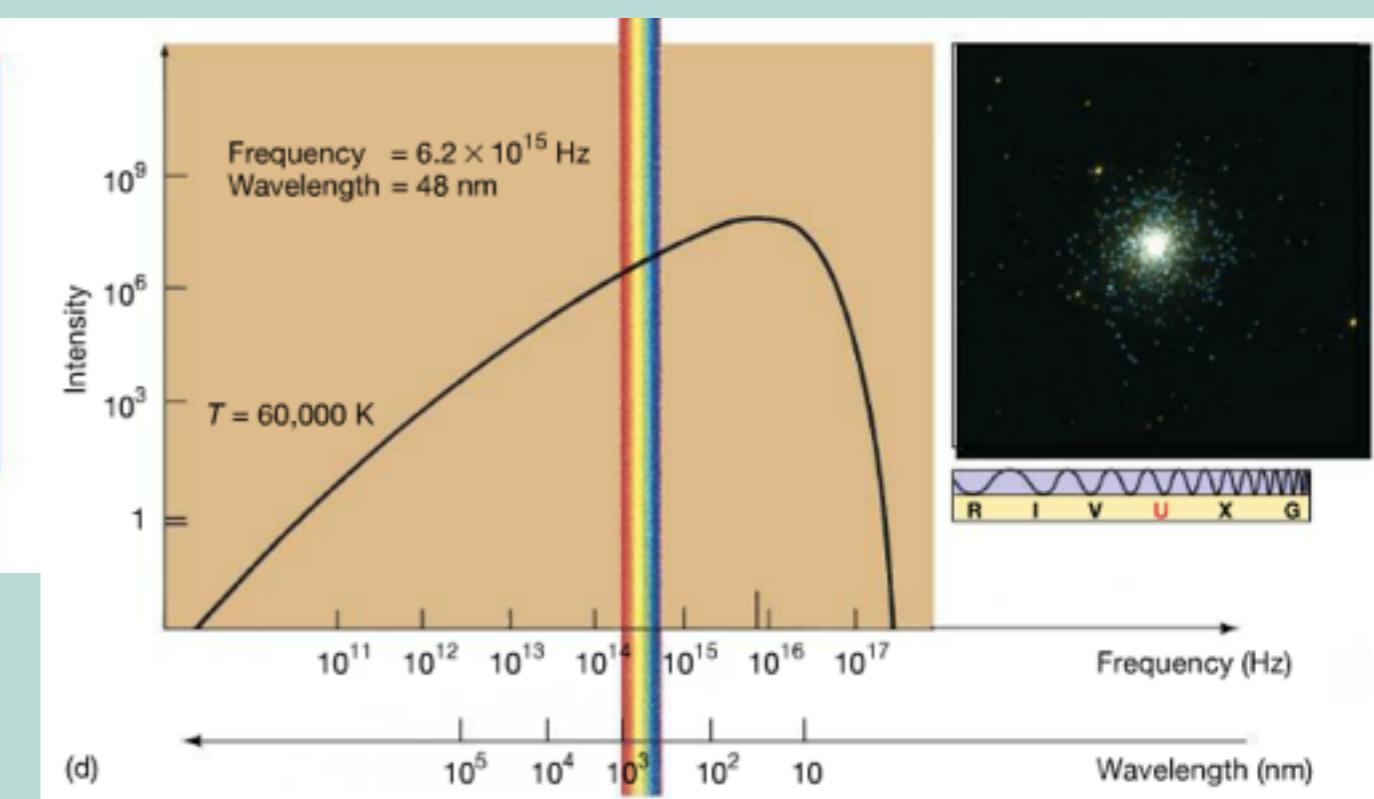
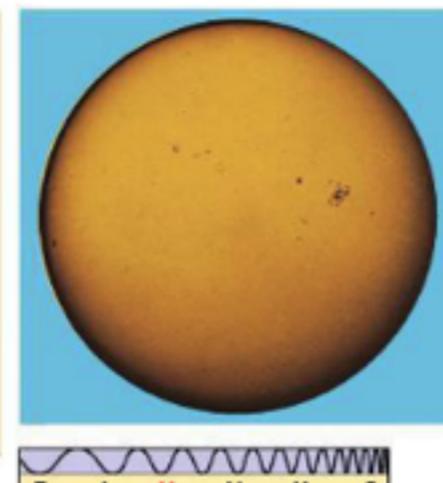
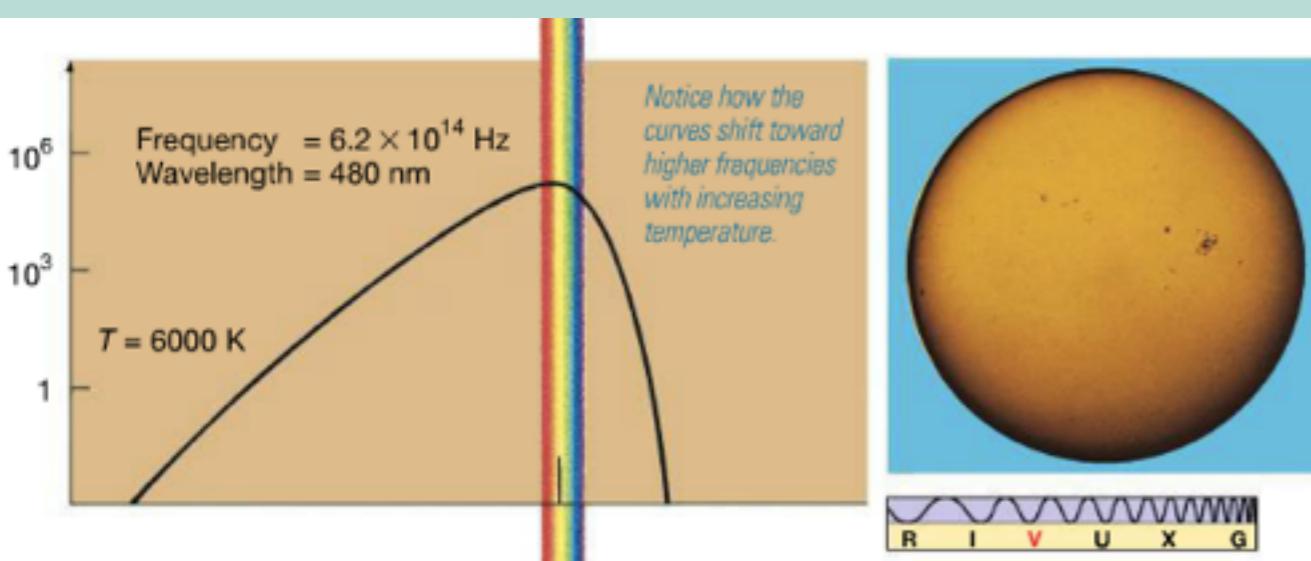
Stefan's Law

$$E \sim T^4$$

Radiation: Ch 3

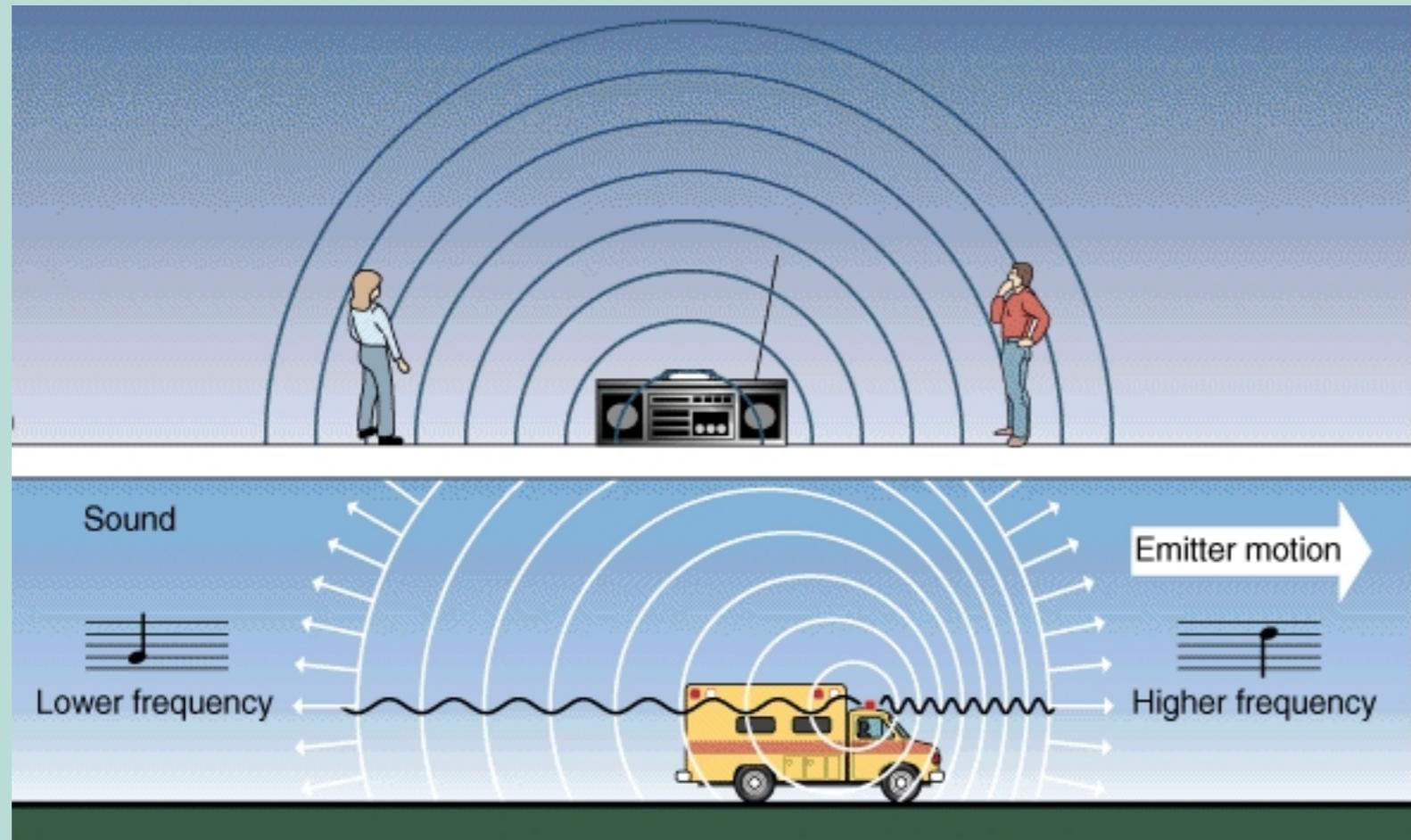


SCIENCE IS ALL A LIE!!!

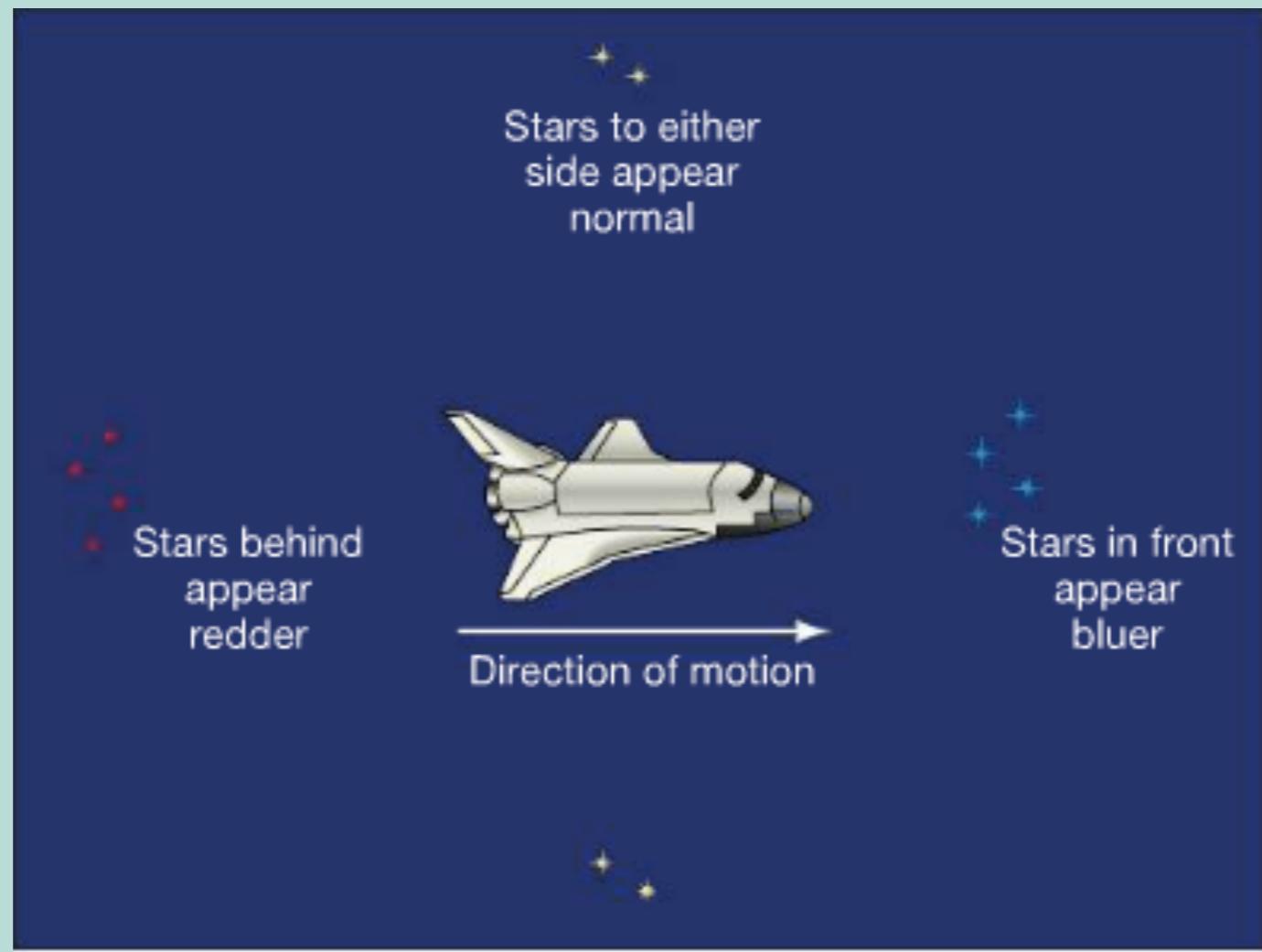




Doppler Effect

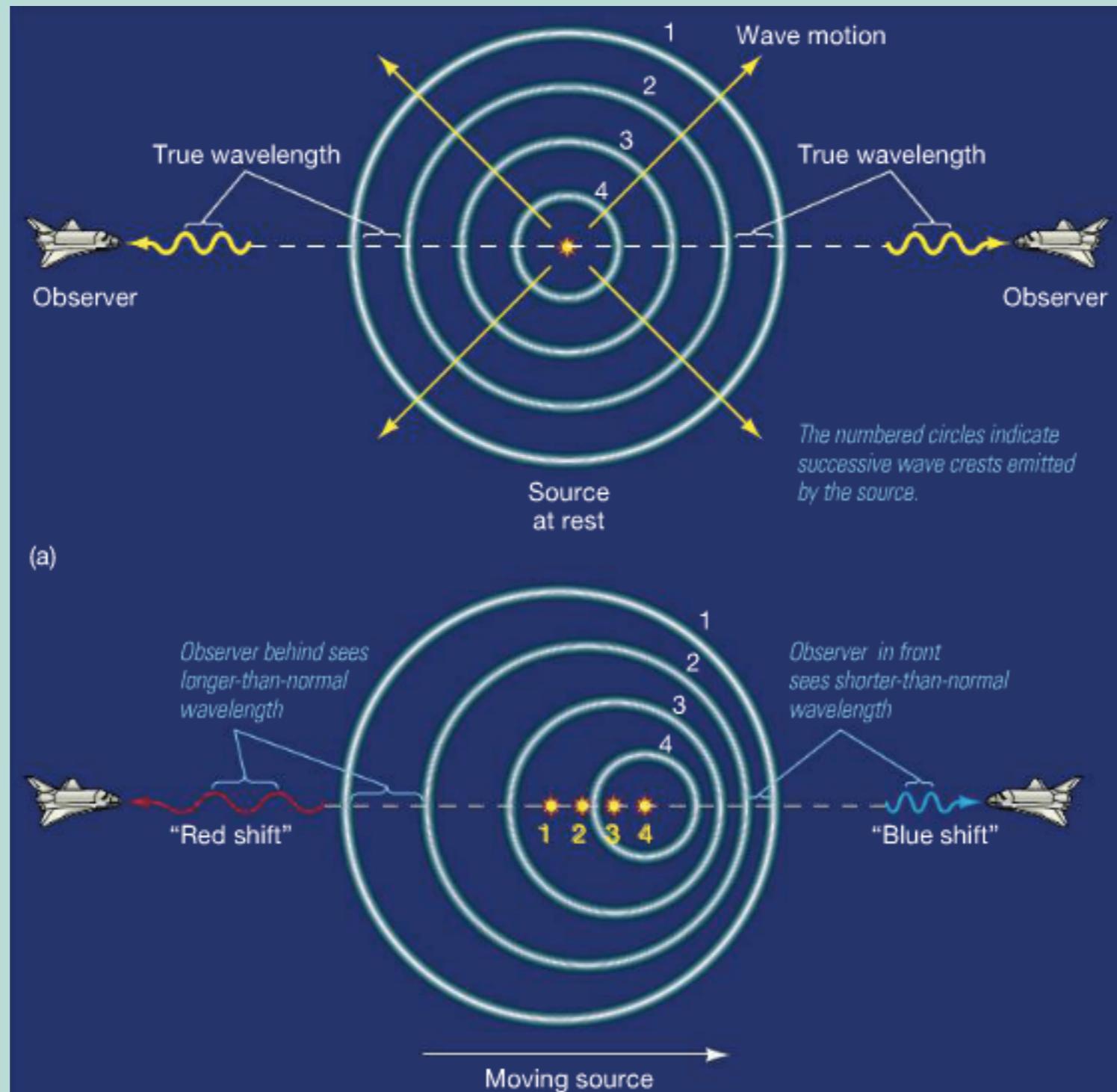


Radiation: Ch 3



$$\frac{\text{apparent } \lambda}{\text{true } \lambda} = \frac{\text{true } f}{\text{apparent } f} = 1 + \frac{\text{recession } v}{c}$$

Radiation: Ch 3



Radiation: Ch 3



QUIZ