with your host:

Lecture 3:
Radiation

Coop

Radiation: Ch 3

Even the CLOSEST galaxy is 2500000 years away

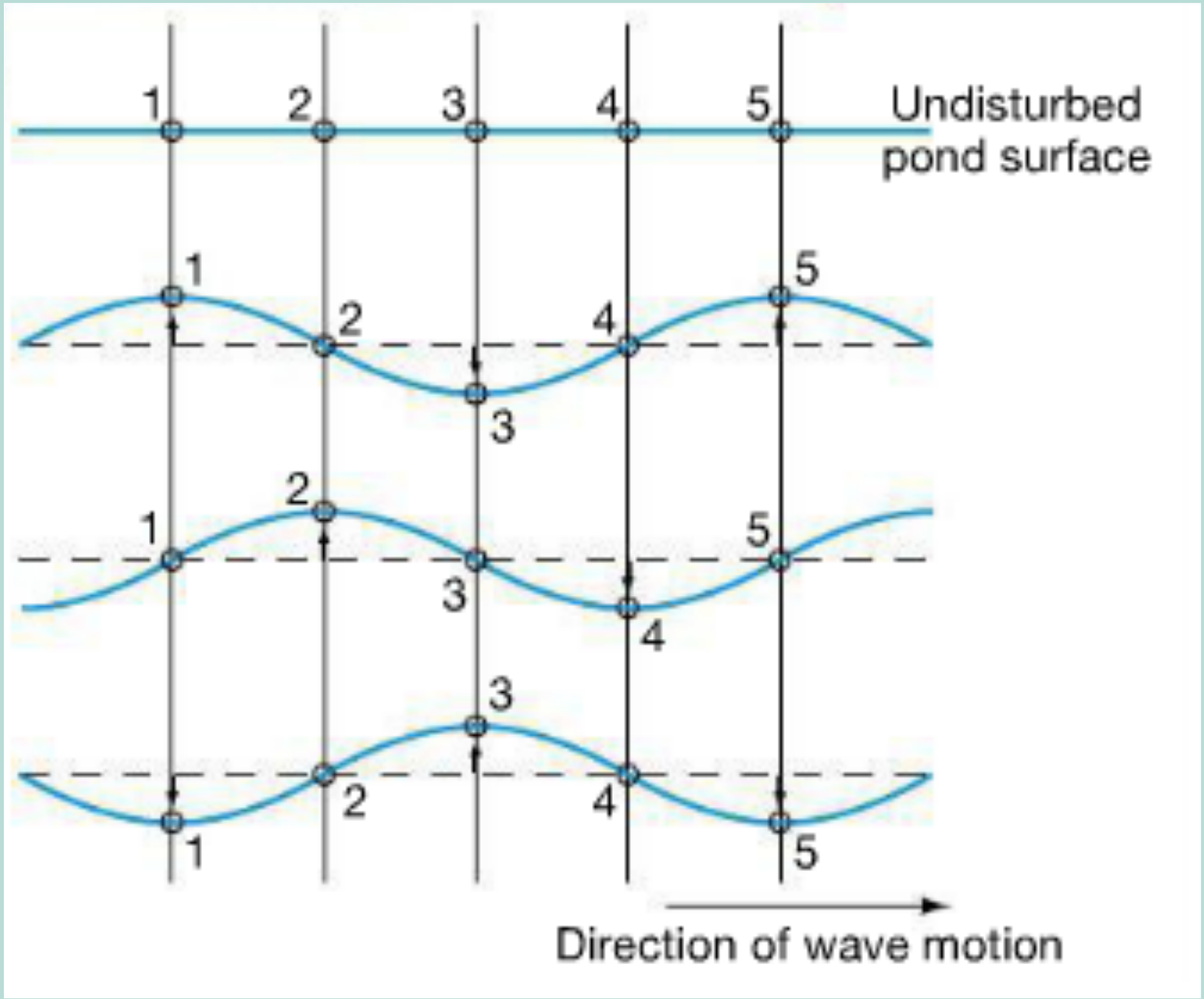
The only way we learn about the cosmos is through energy propagating in the form of a *wave*

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…

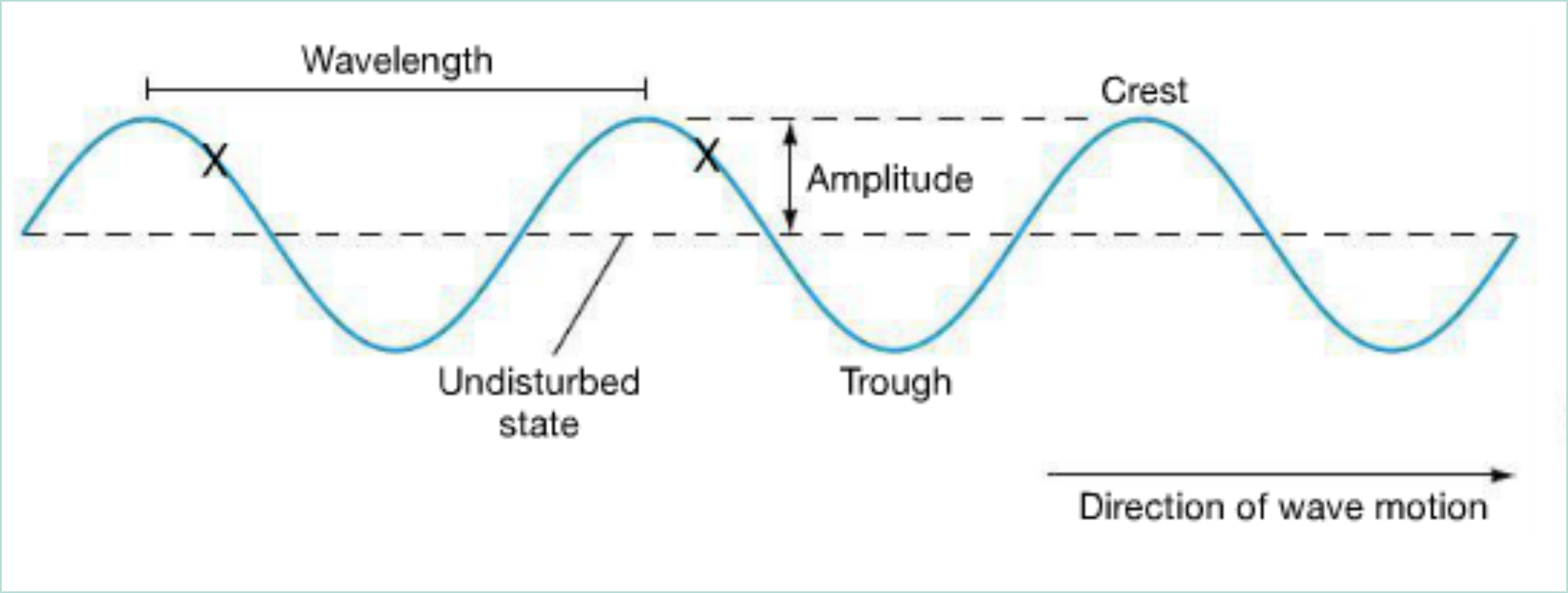
Radiation: Ch 3

Radiation: Ch 3



Radiation: Ch 3

Definitions



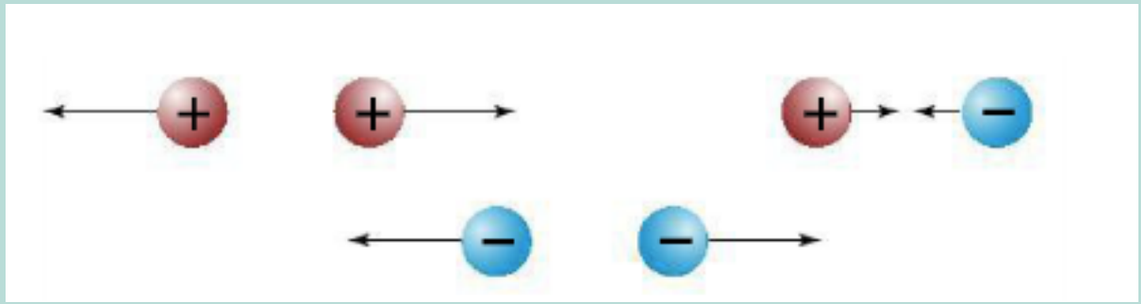
Radiation: Ch 3

But between us and the stars is empty space

So what's doing the "waving"

Radiation: Ch 3

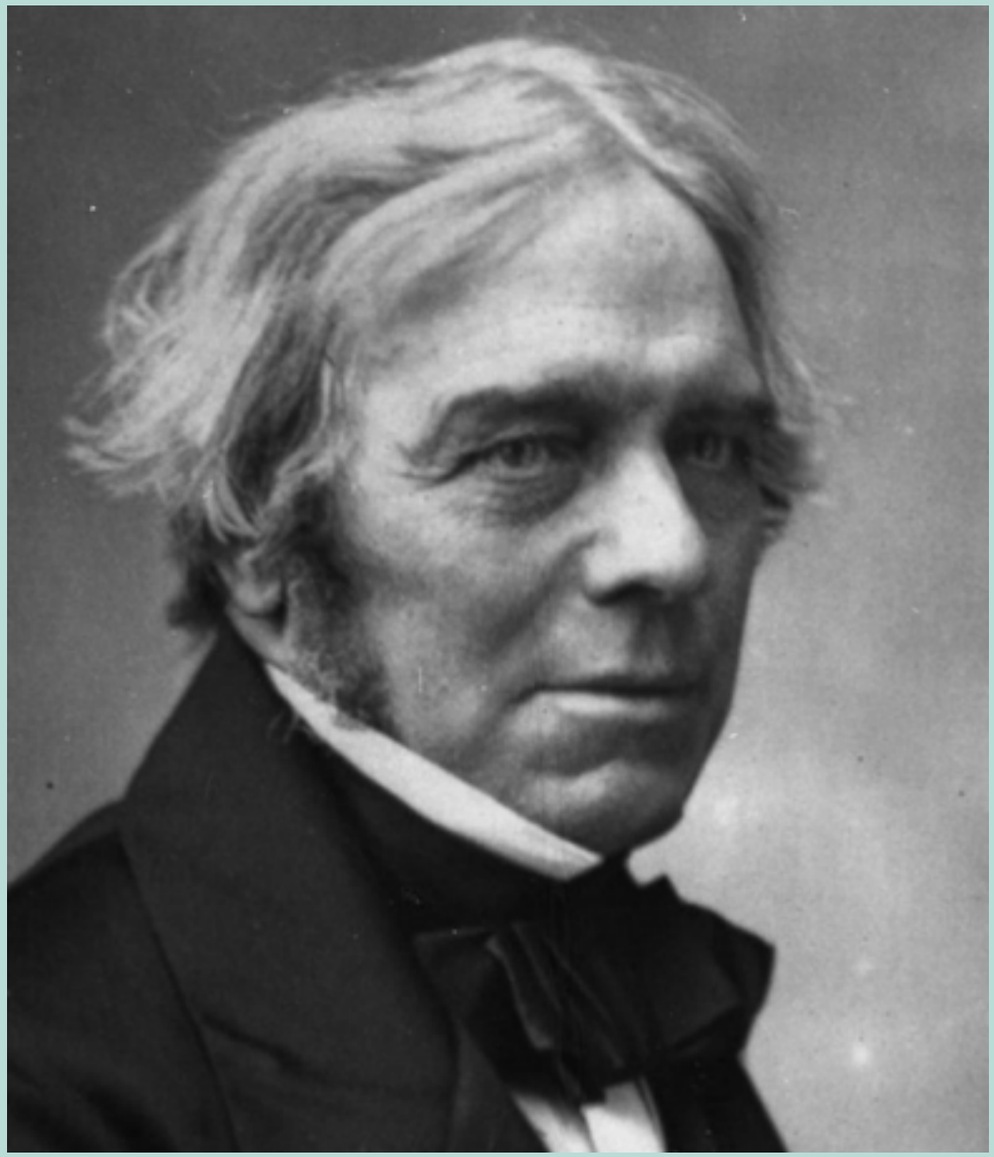
Electricity



$$F_{\text{grav}} = -\frac{\mathcal{G} m_1 m_2}{r^2} \qquad F_{\text{electric}} = \frac{\mathcal{K} q_1 q_2}{r^2}$$

Radiation: Ch 3

Michael Faraday



Born in Newington Butts, England

1791 - 1867

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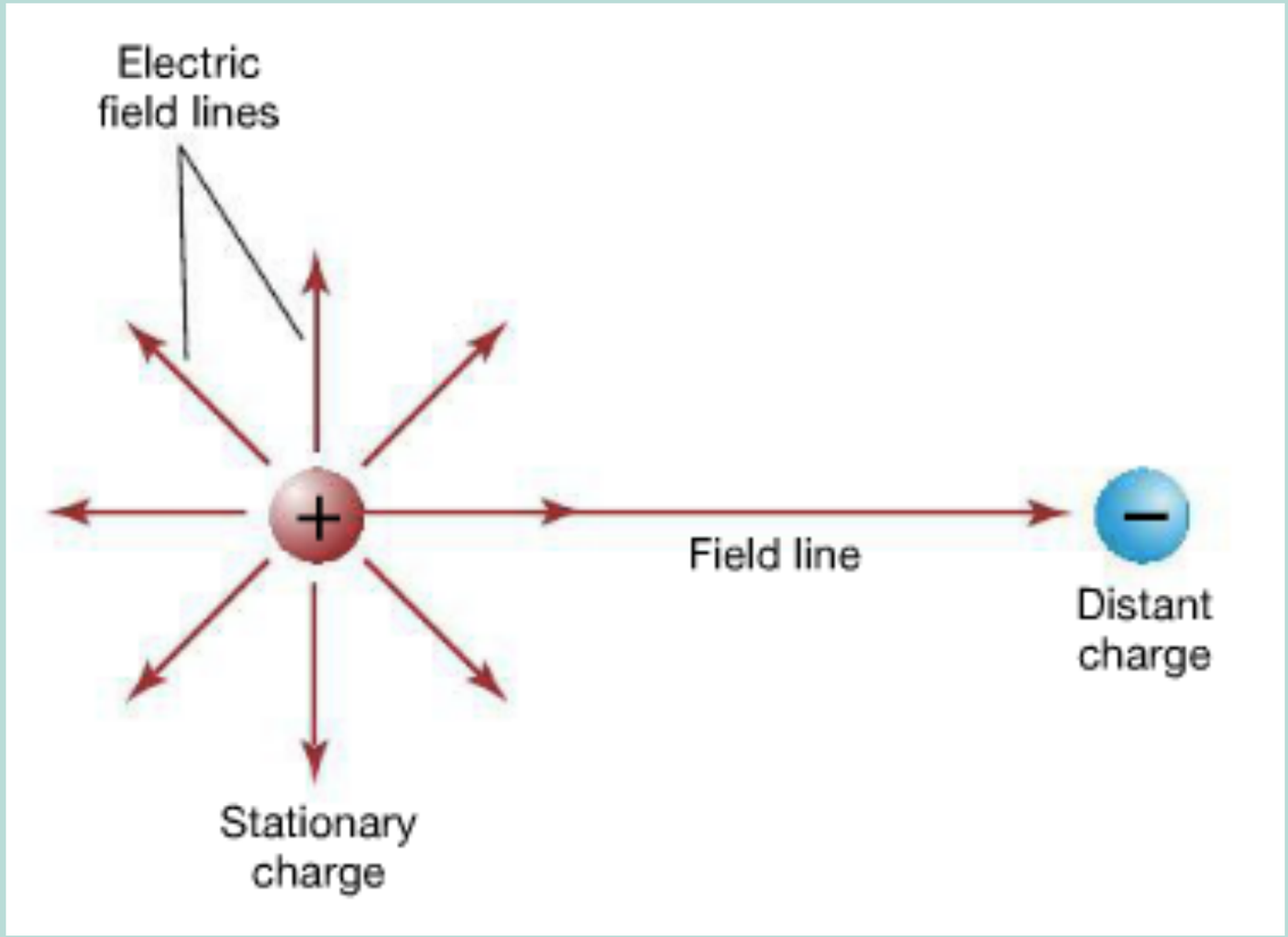
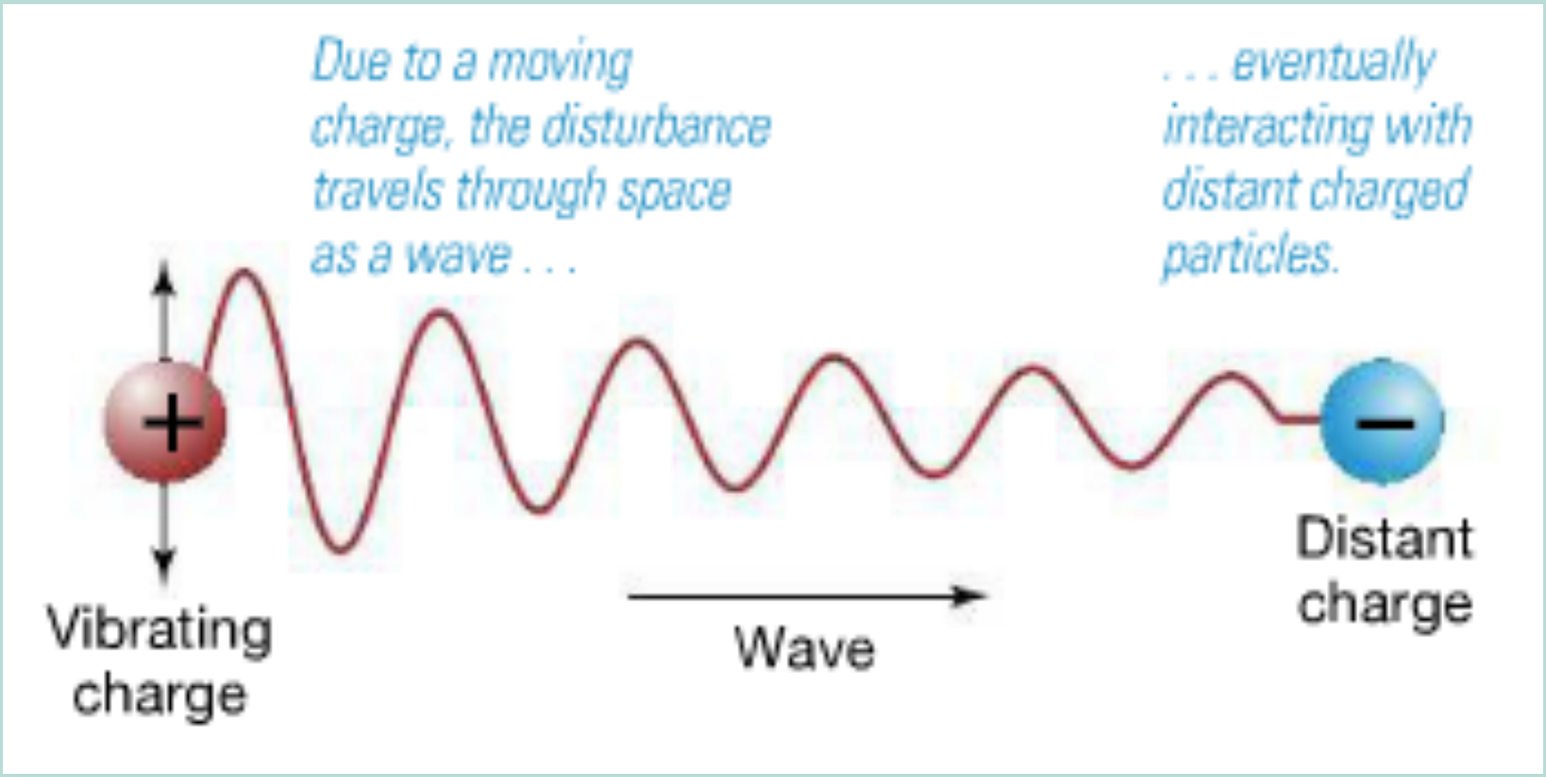


Radiation: Ch 3



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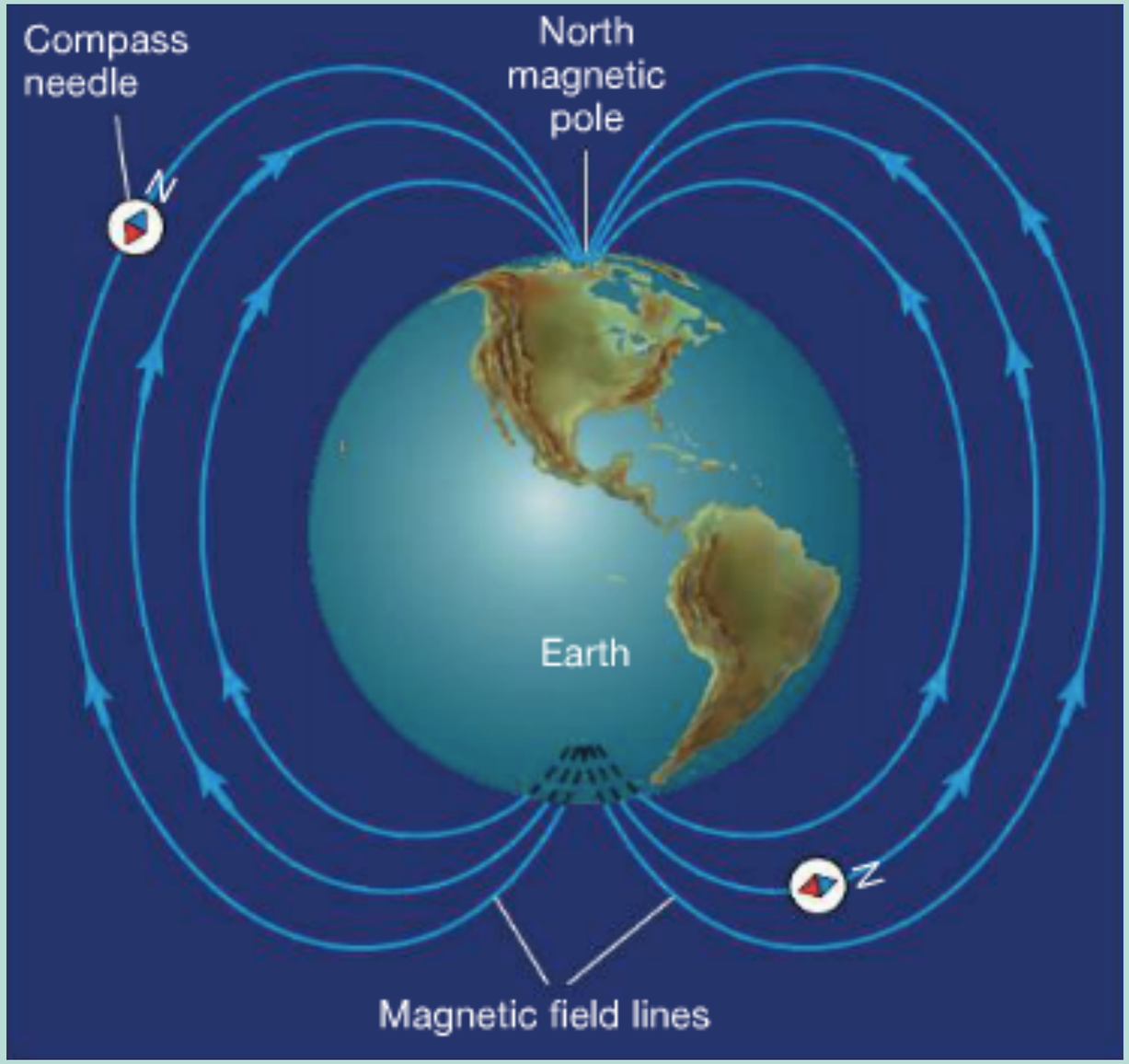
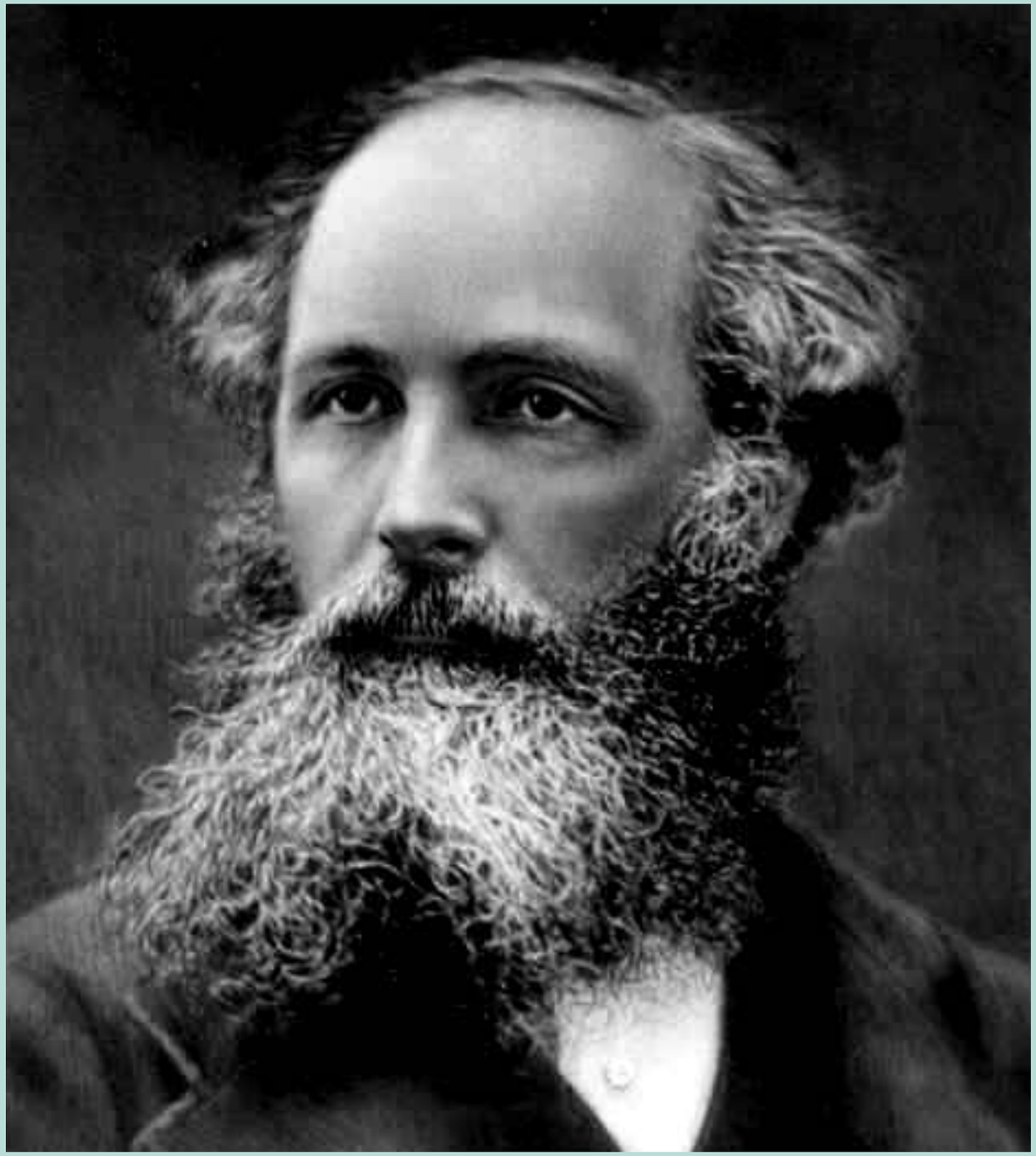
Magnetism



Radiation: Ch 3

James Clerk Maxwell

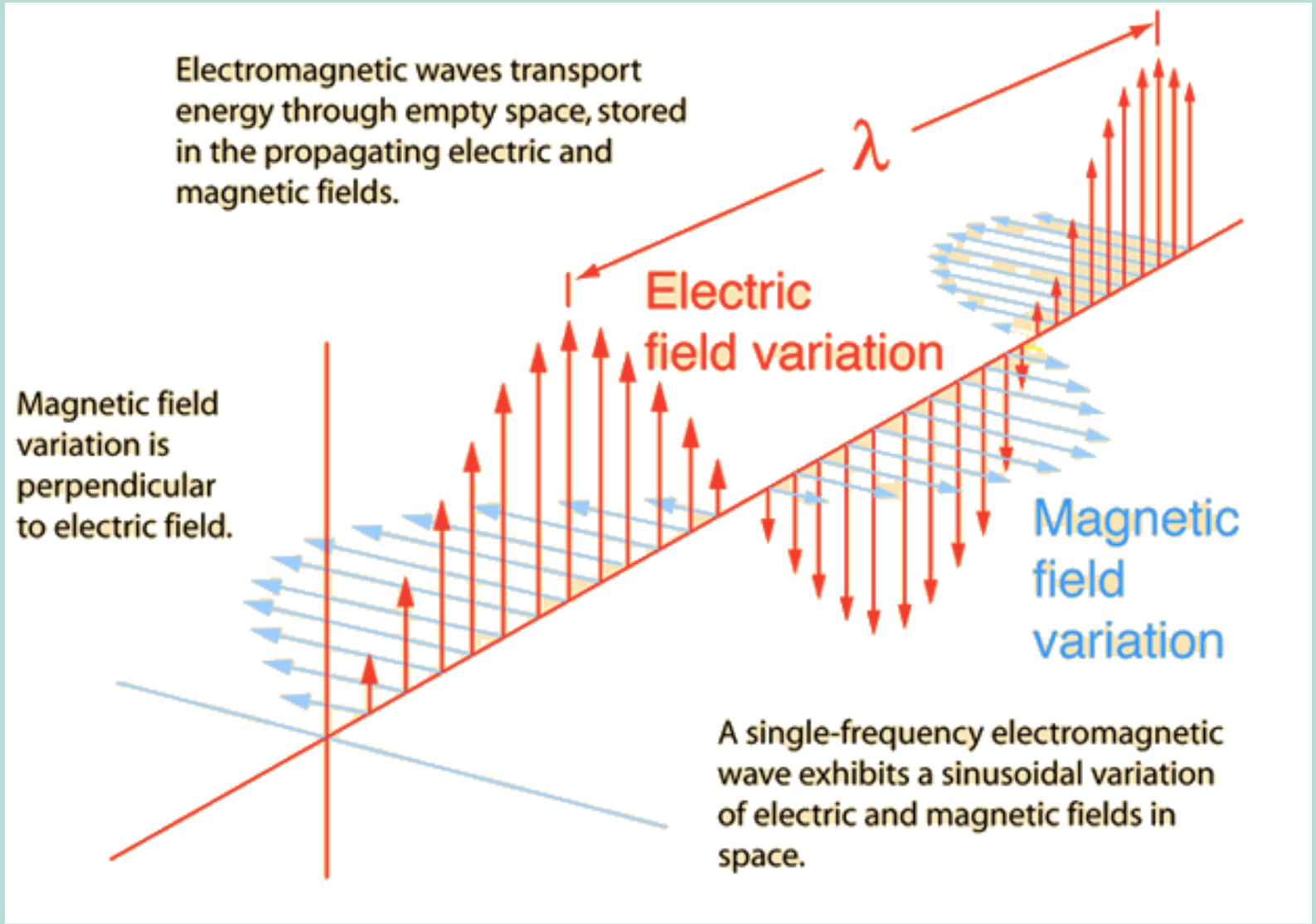


Born in Edinburgh, Scotland

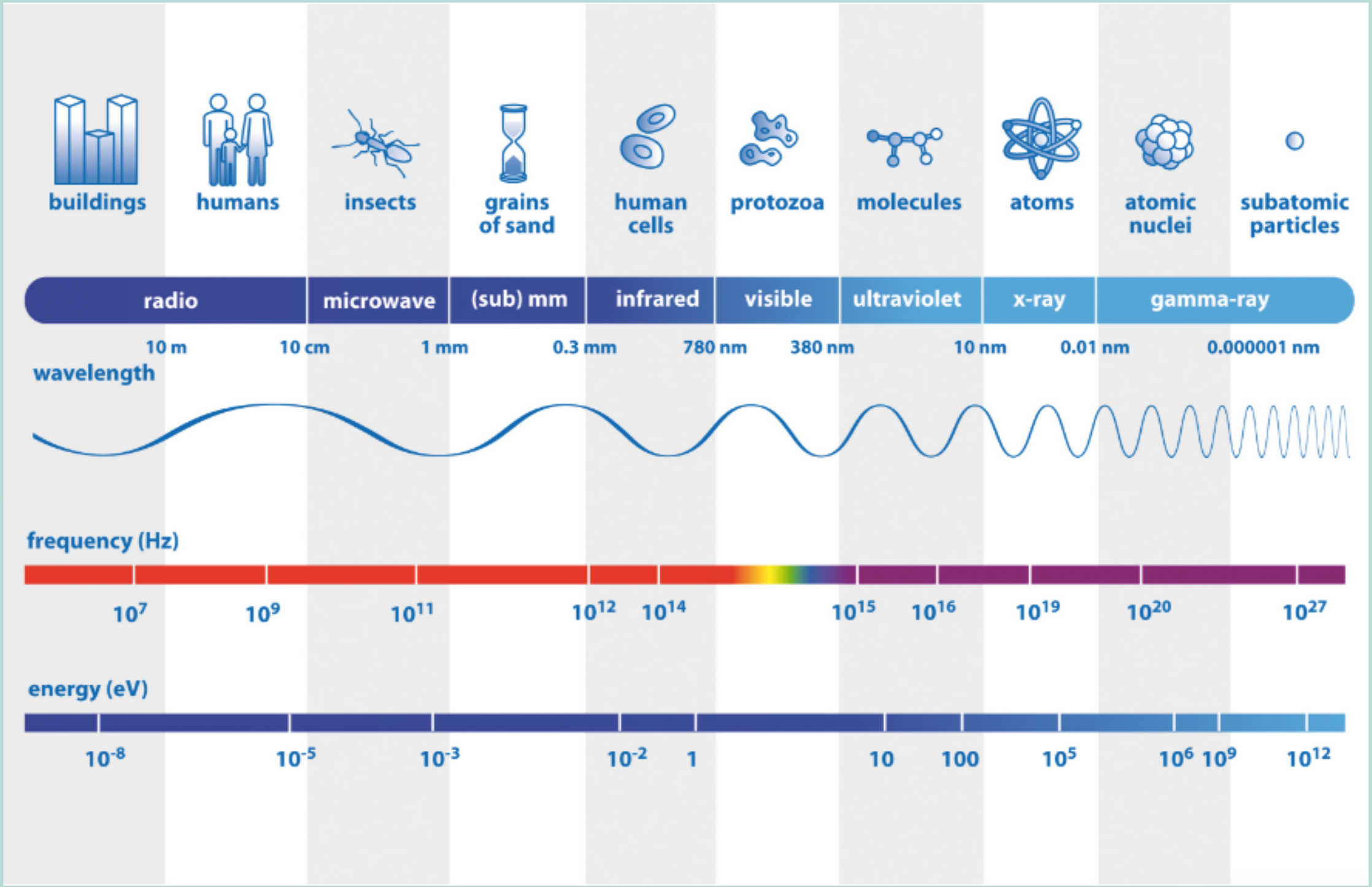
1831 - 1879

Radiation: Ch 3

Electromagnetic Radiation

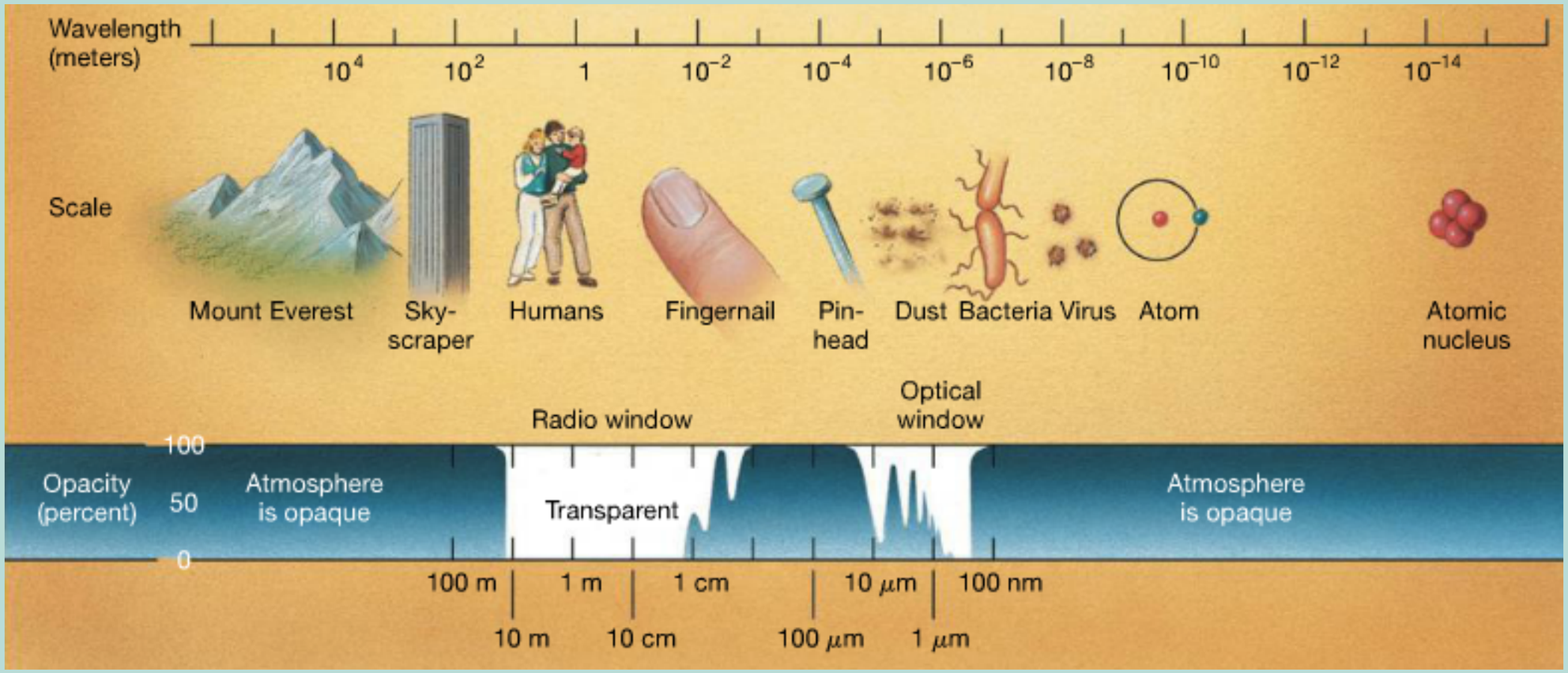


Radiation: Ch 3



Radiation: Ch 3

Earth's Atmosphere as a window



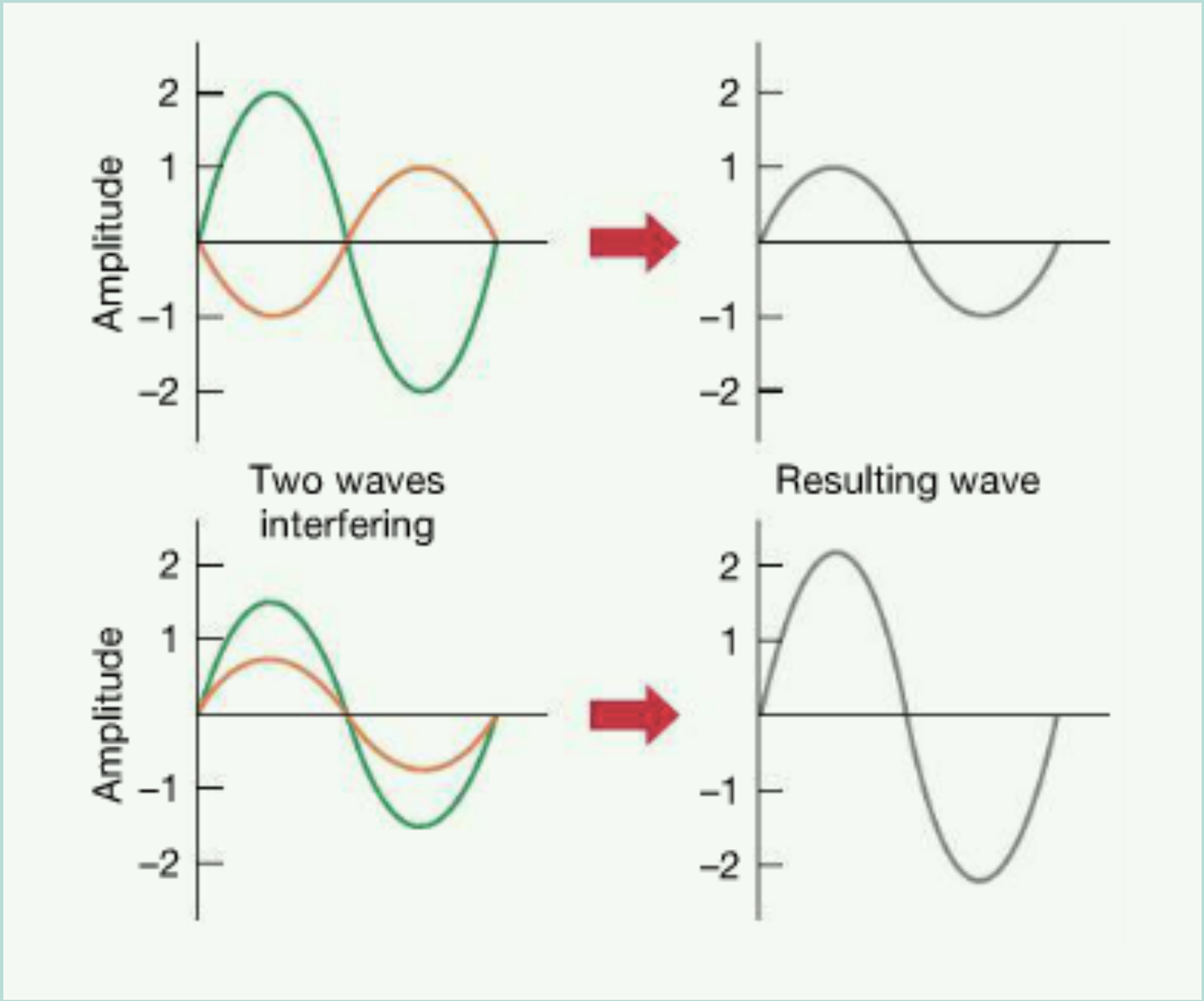
IR absorbers: H2O, CO2

UV absorbers: O3 (ozone)

Radiation: Ch 3

DISCUSSION

Superposition



Thomas Young

Born in Milverton, England

1773 - 1829

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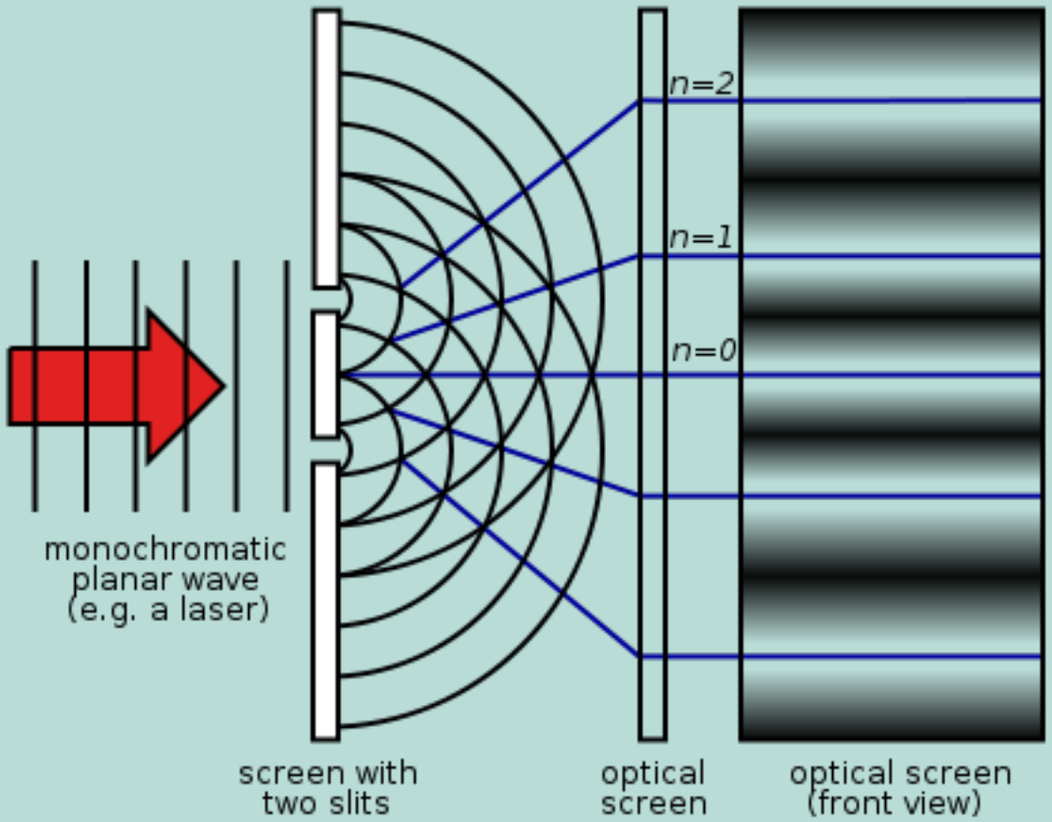
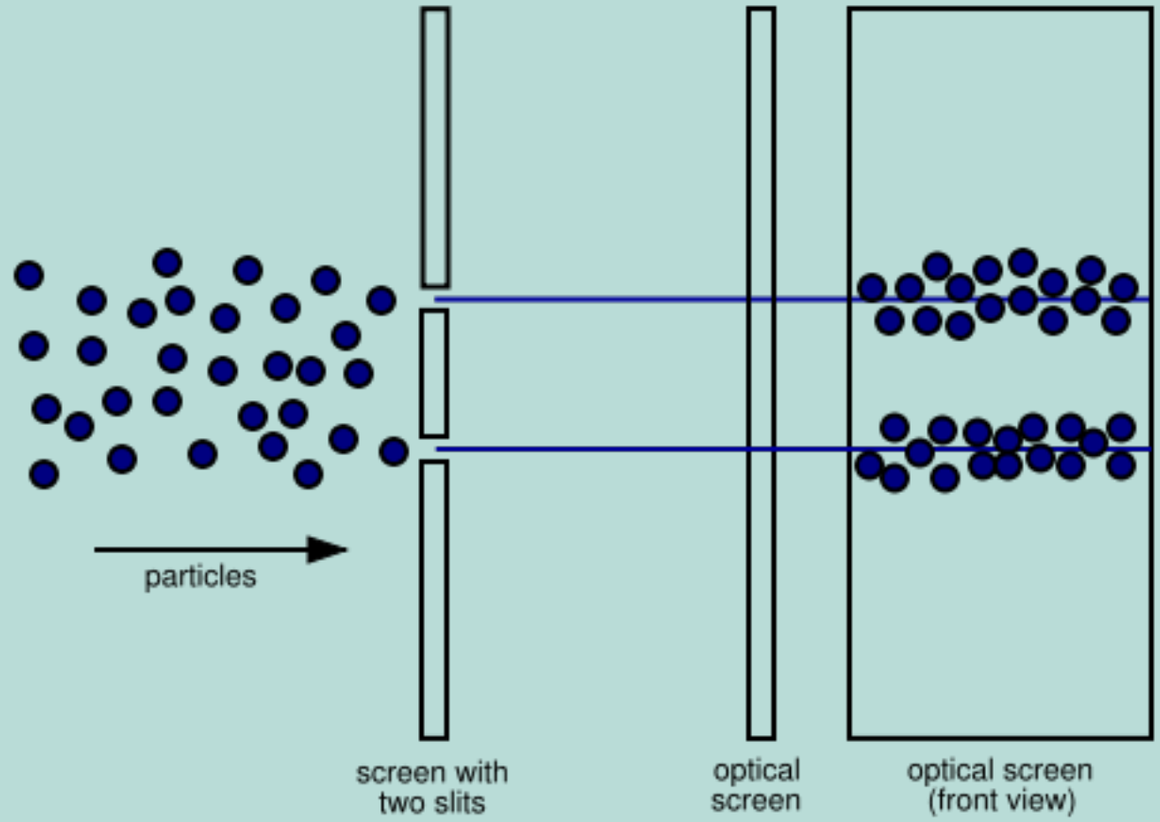
Wave Phenomenology

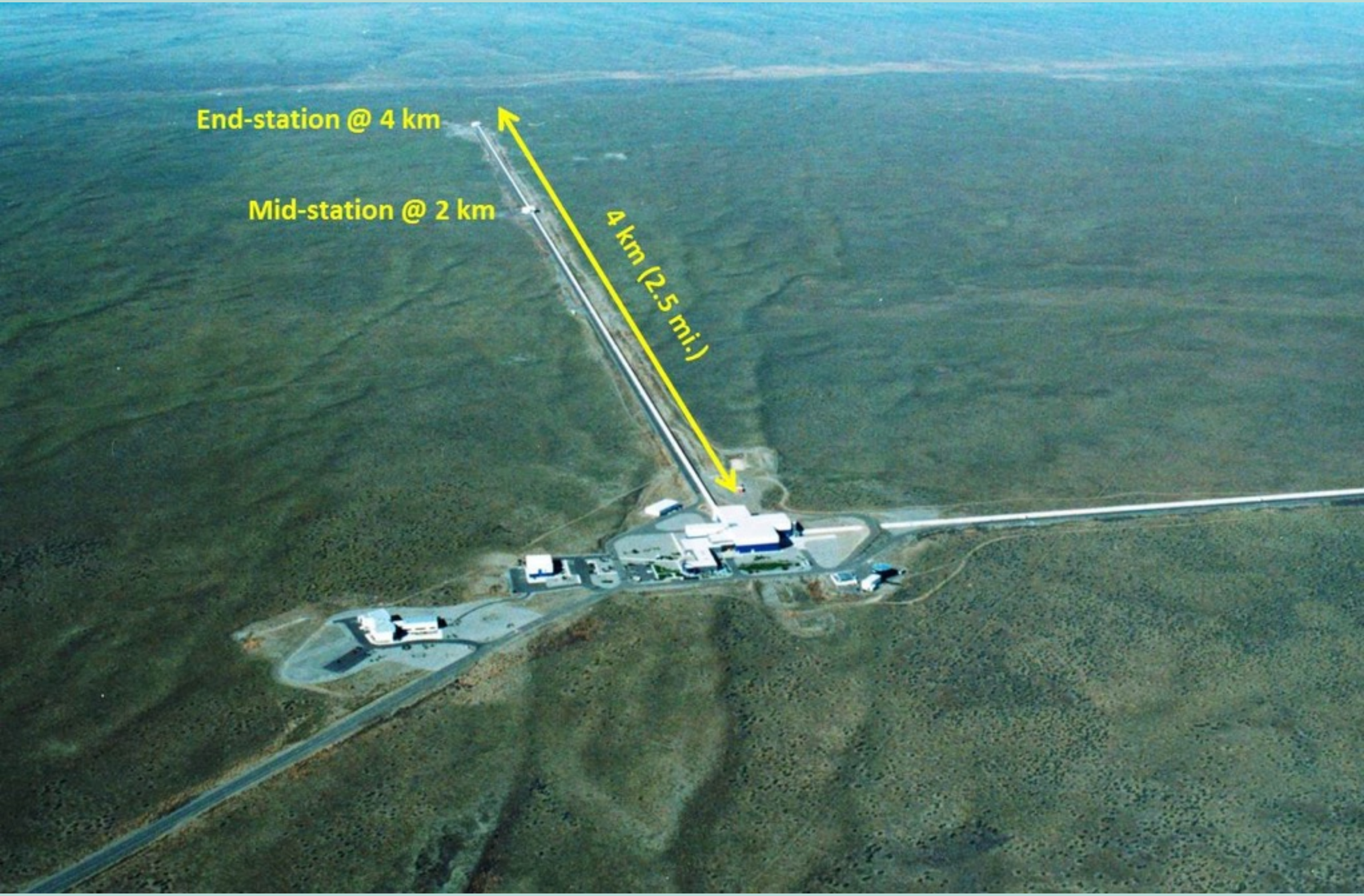


Particle Phenomenology

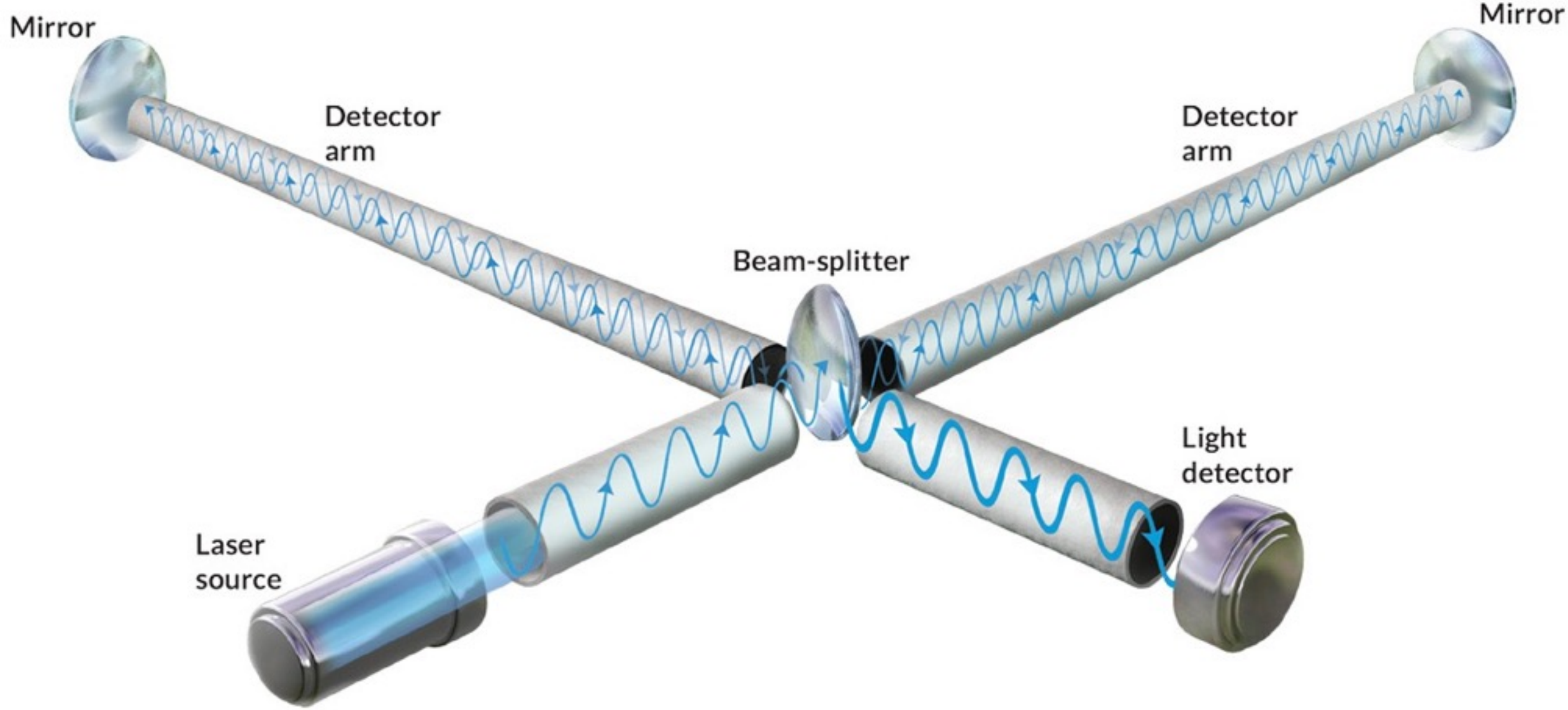


Light must be a wave! (…to be continued)

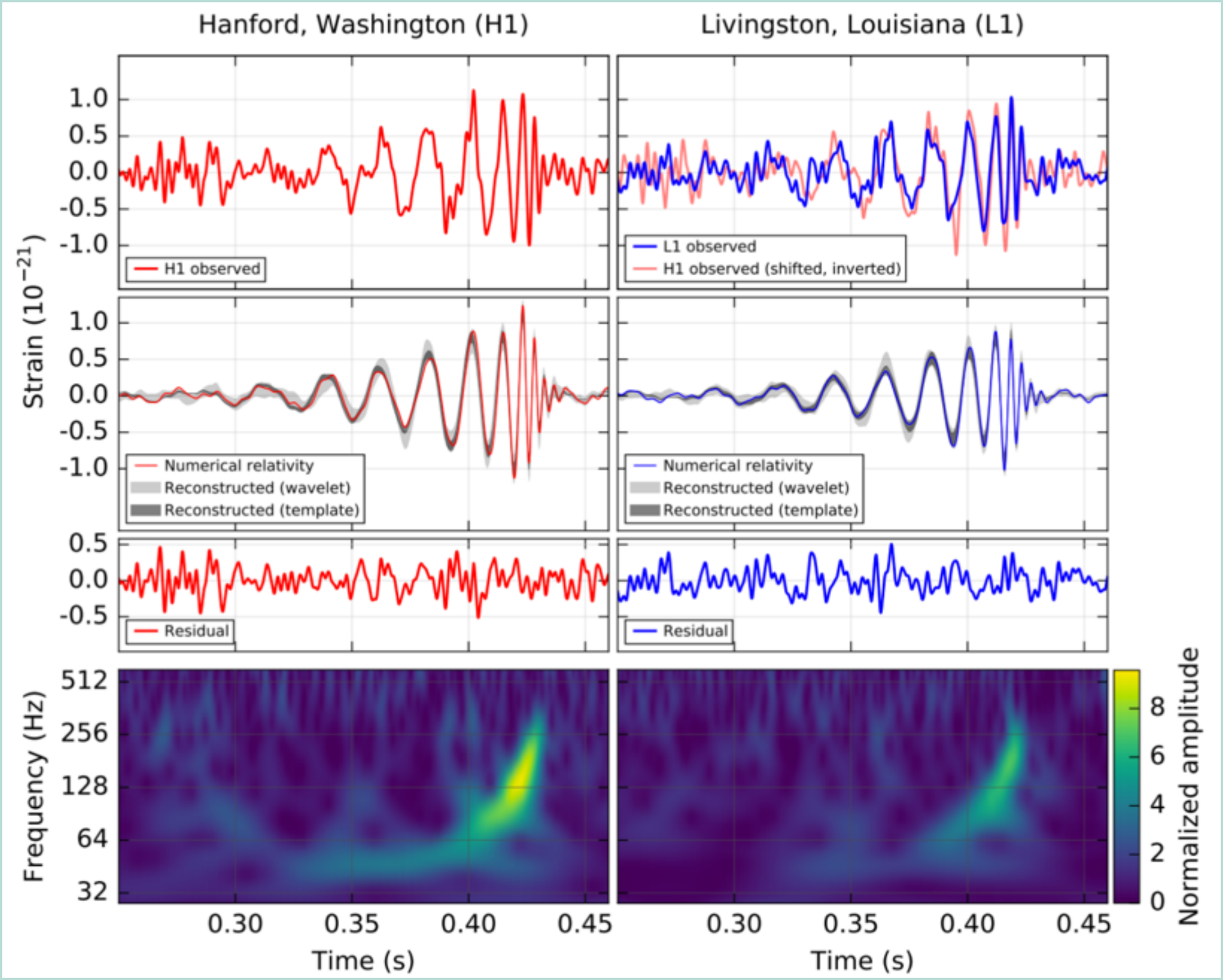
Radiation: Ch 3



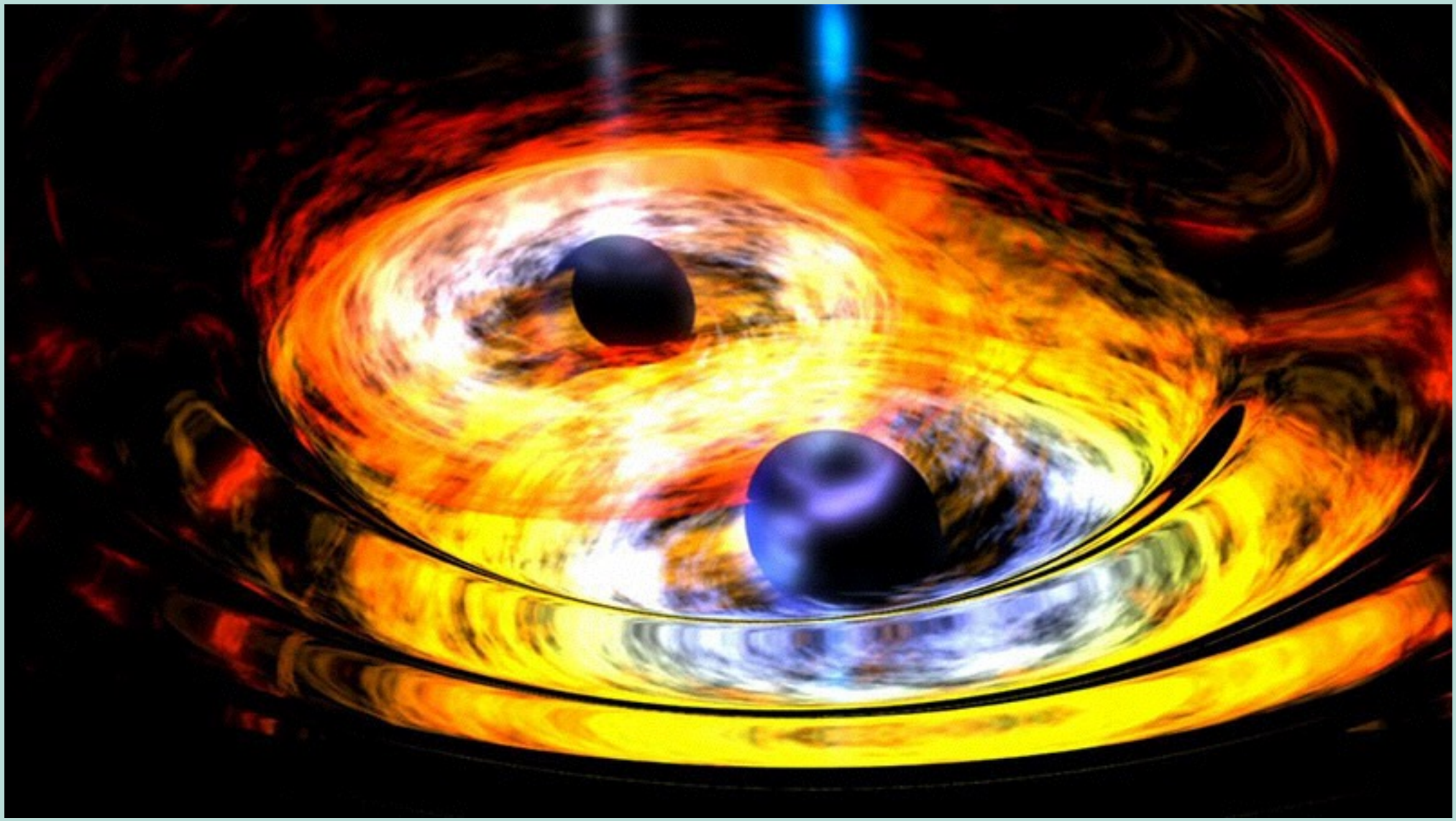
Interferometry



Radiation: Ch 3



Actual picture!!!!



just kidding…

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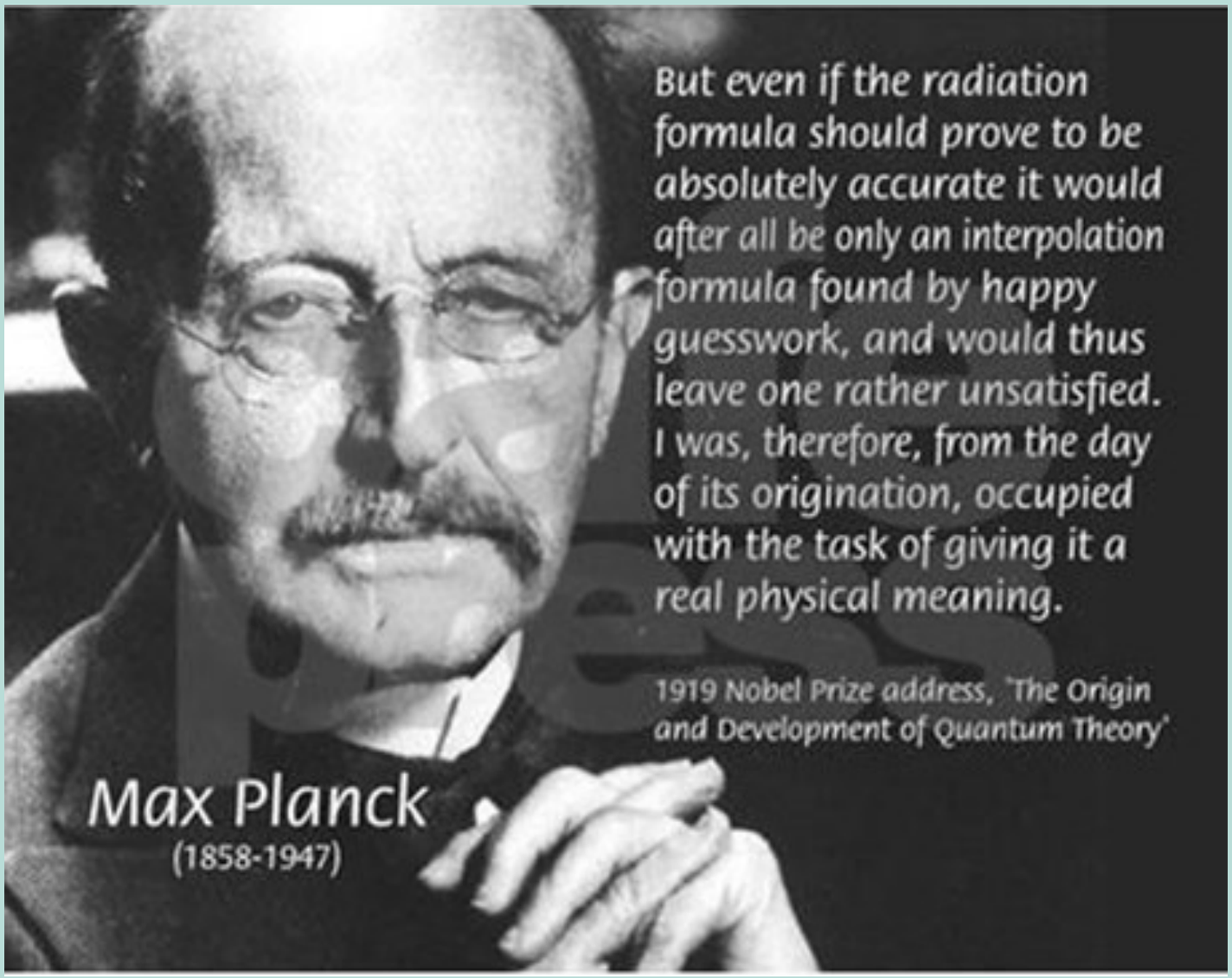
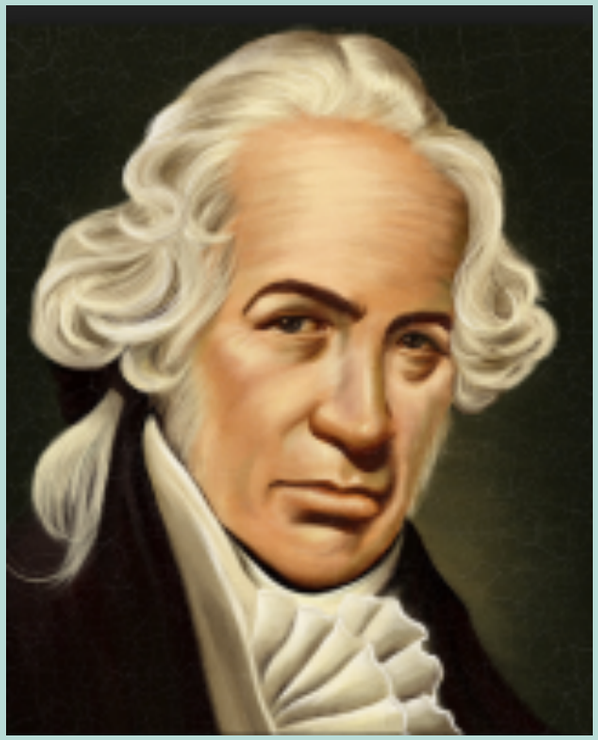
Max Karl Ernst Ludwig Planck



Born in Kiel, Duchy of Holstein

Radiation: Ch 3

Daniel Gabriel Fahrenheit



Danzig
1686-1736

<

Anders Celcius

Uppsala
1701-1944

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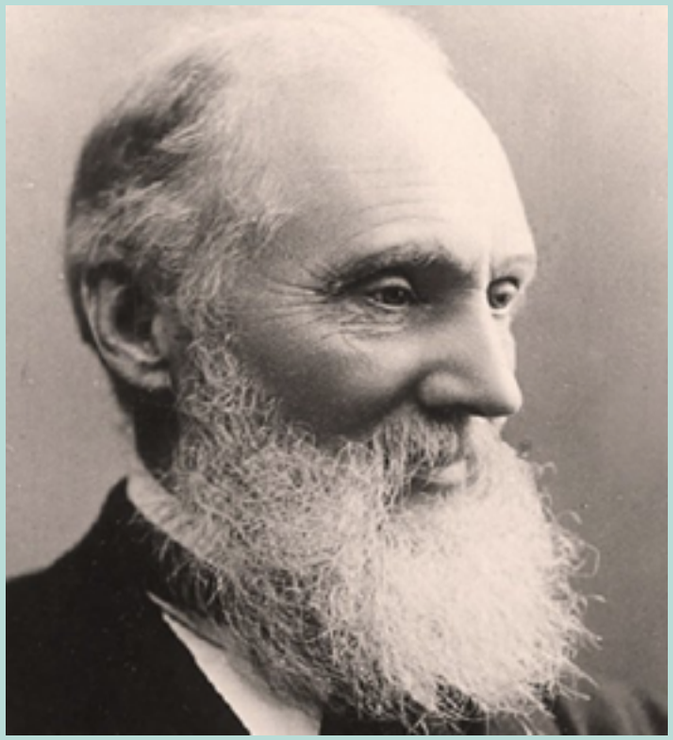
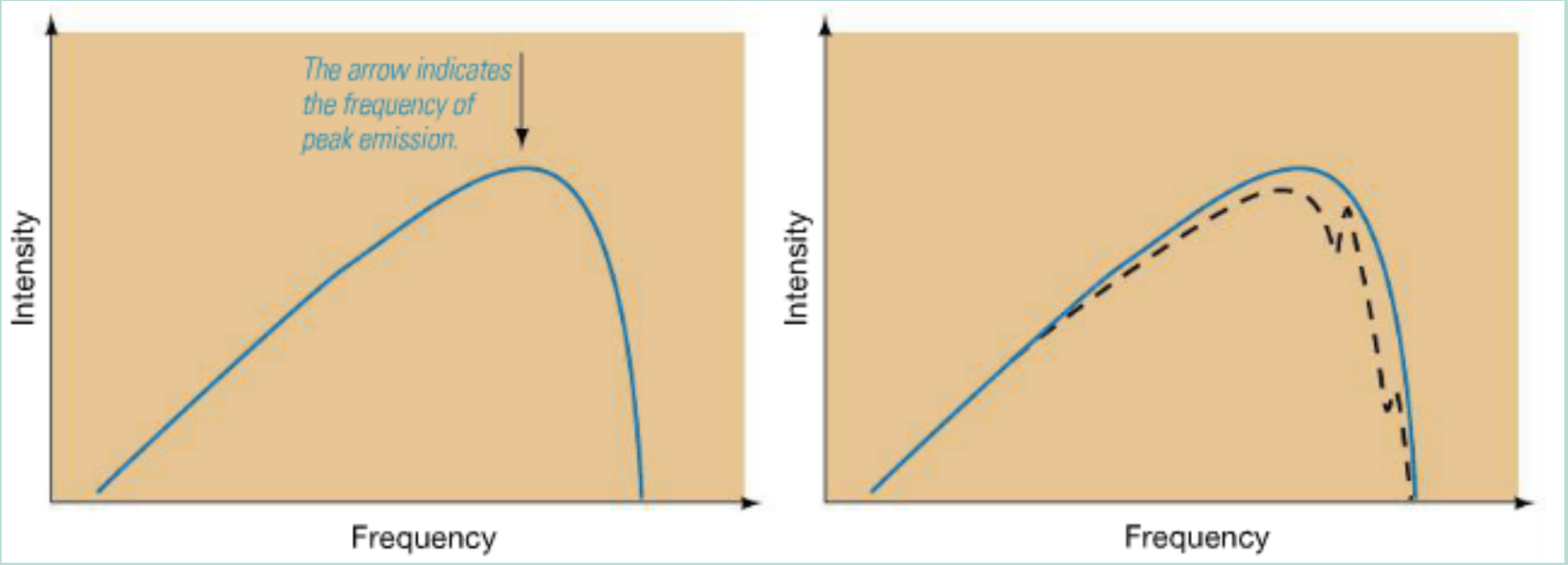
William Thomson, 1st Baron Kelvin

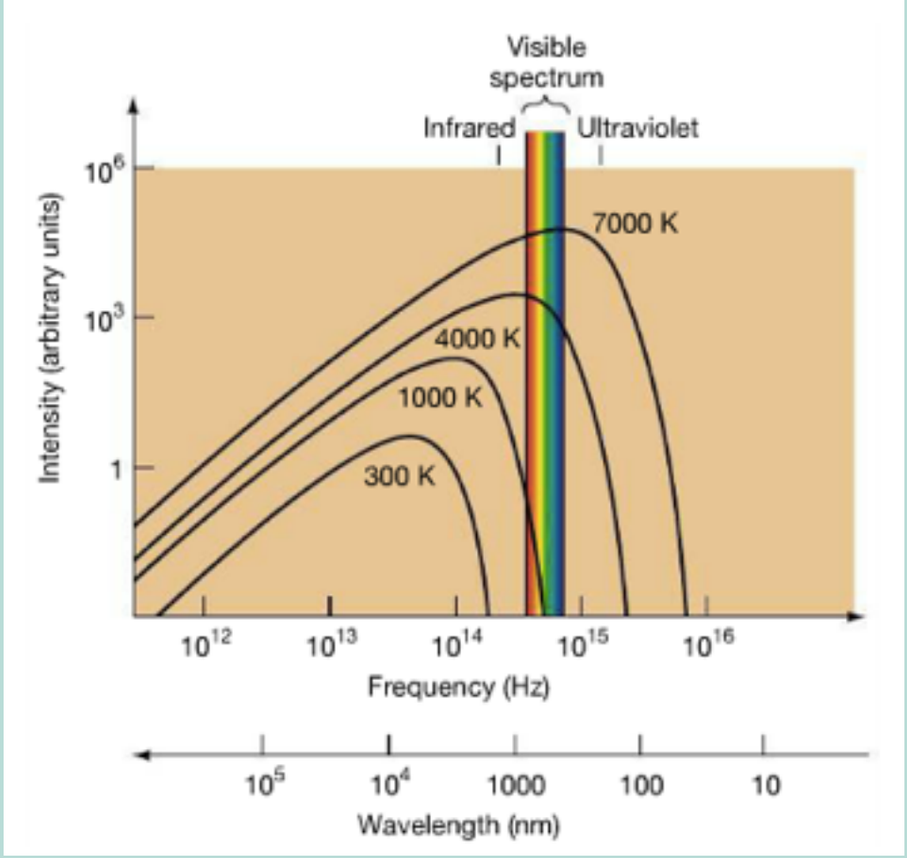


Belfast
1824-1927

Radiation: Ch 3

Black Body Spectrum





Radiation: Ch 3

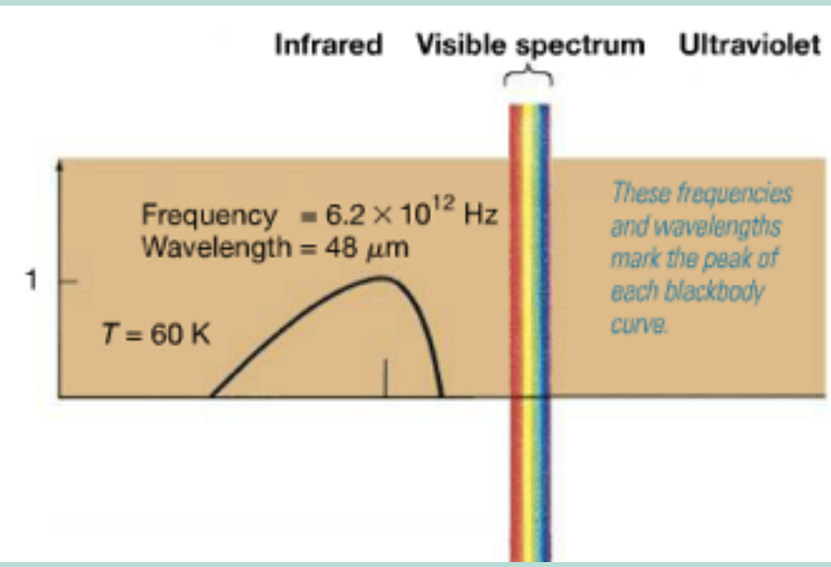
Wien's Law

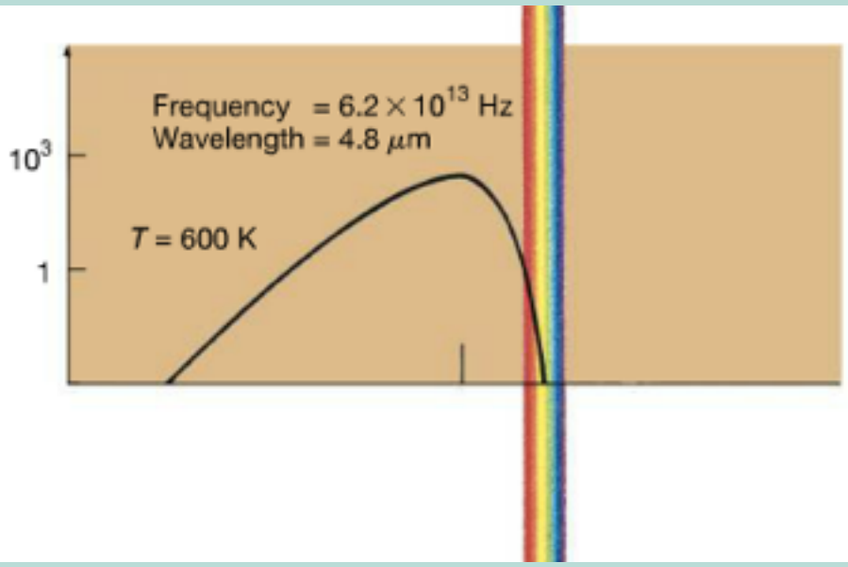
$$\lambda_{\max} \sim \frac{1}{T}$$

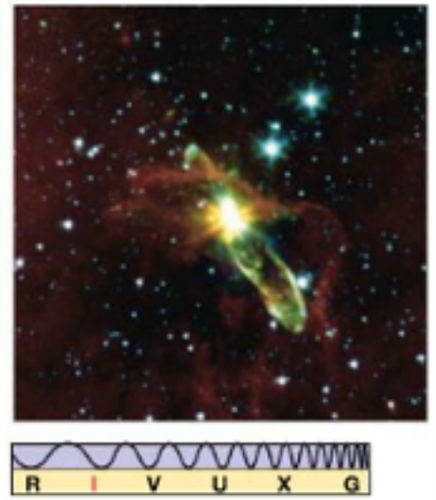
Stefan's Law

$$E \sim T^4$$

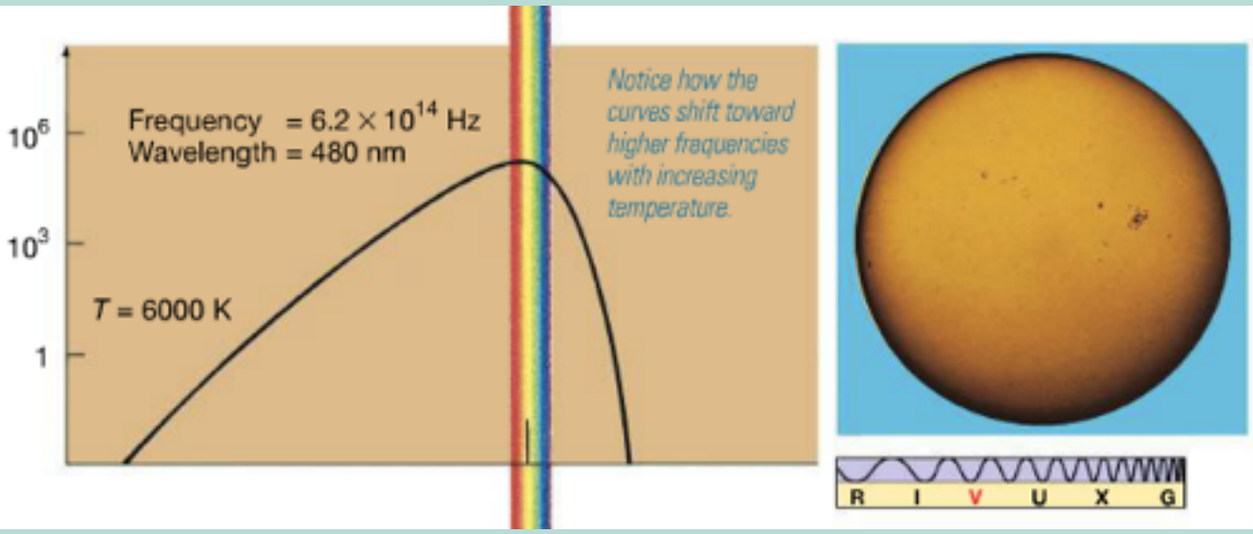
Radiation: Ch 3

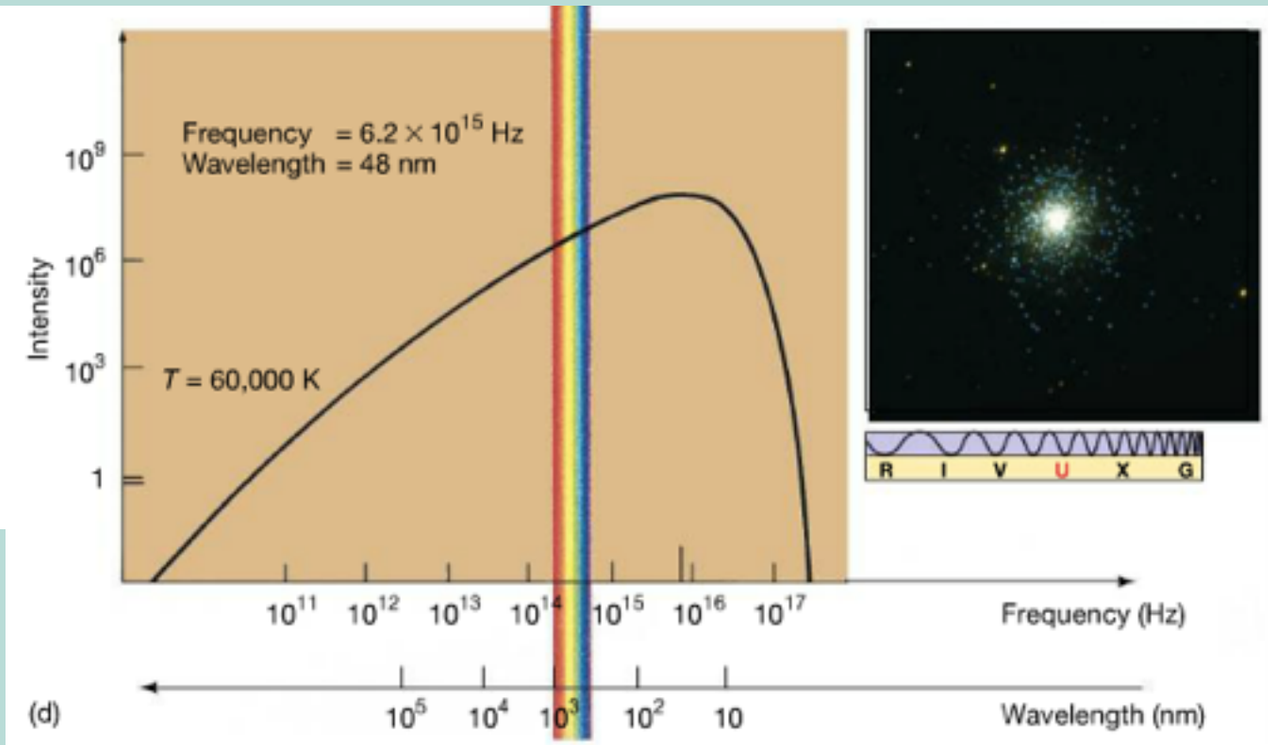






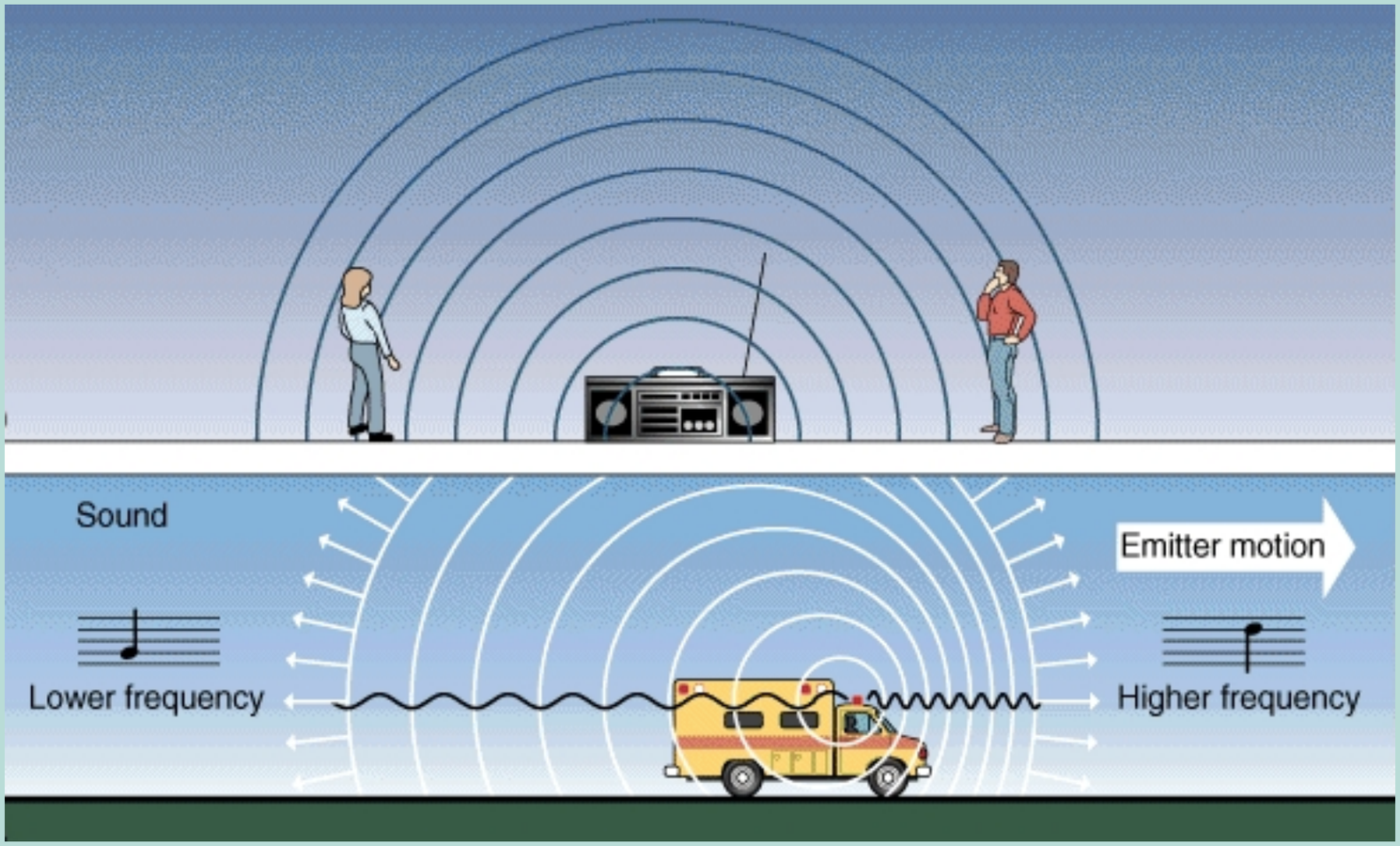
SCIENCE IS ALL A LIE!!!





Radiation: Ch 3

Doppler Effect



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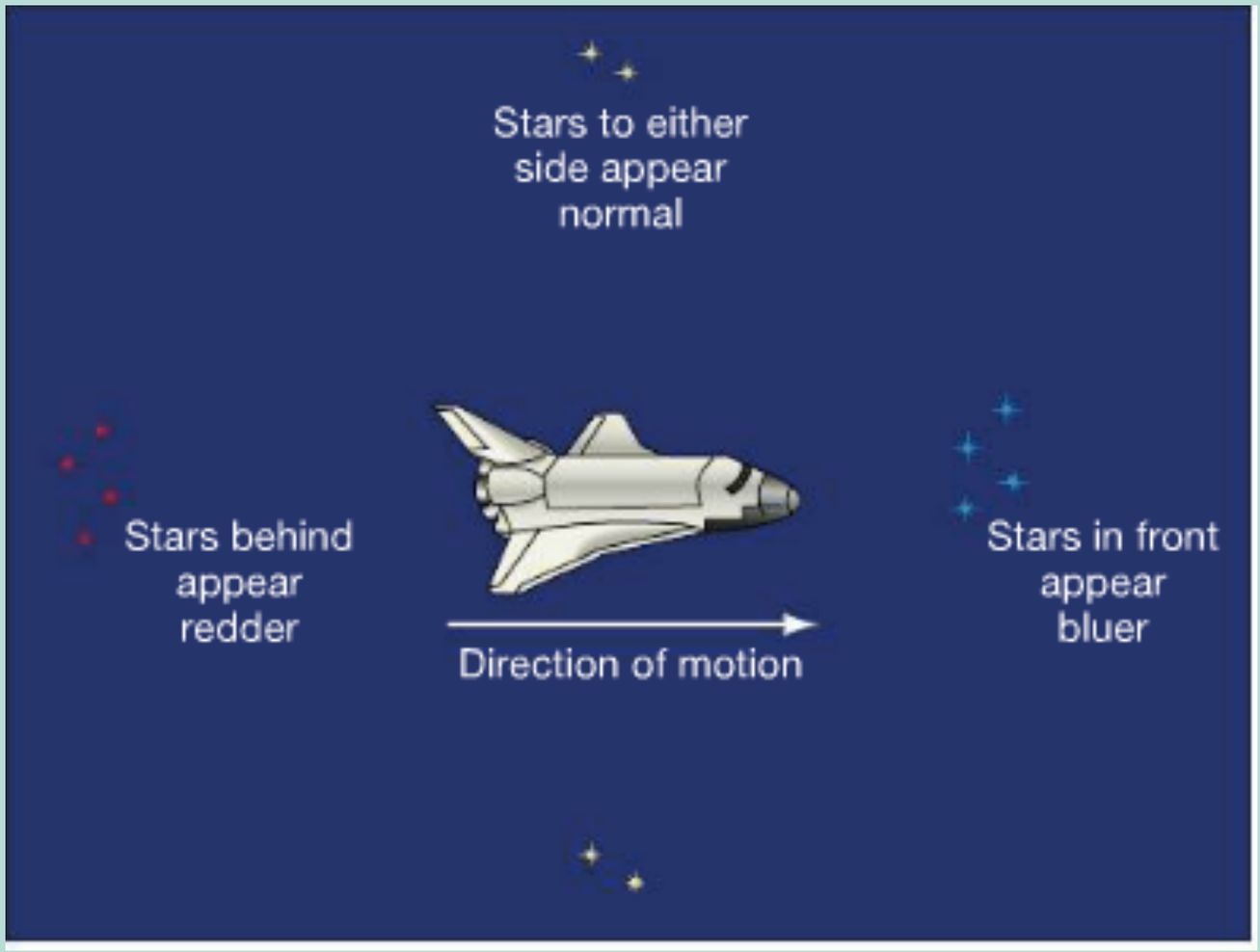
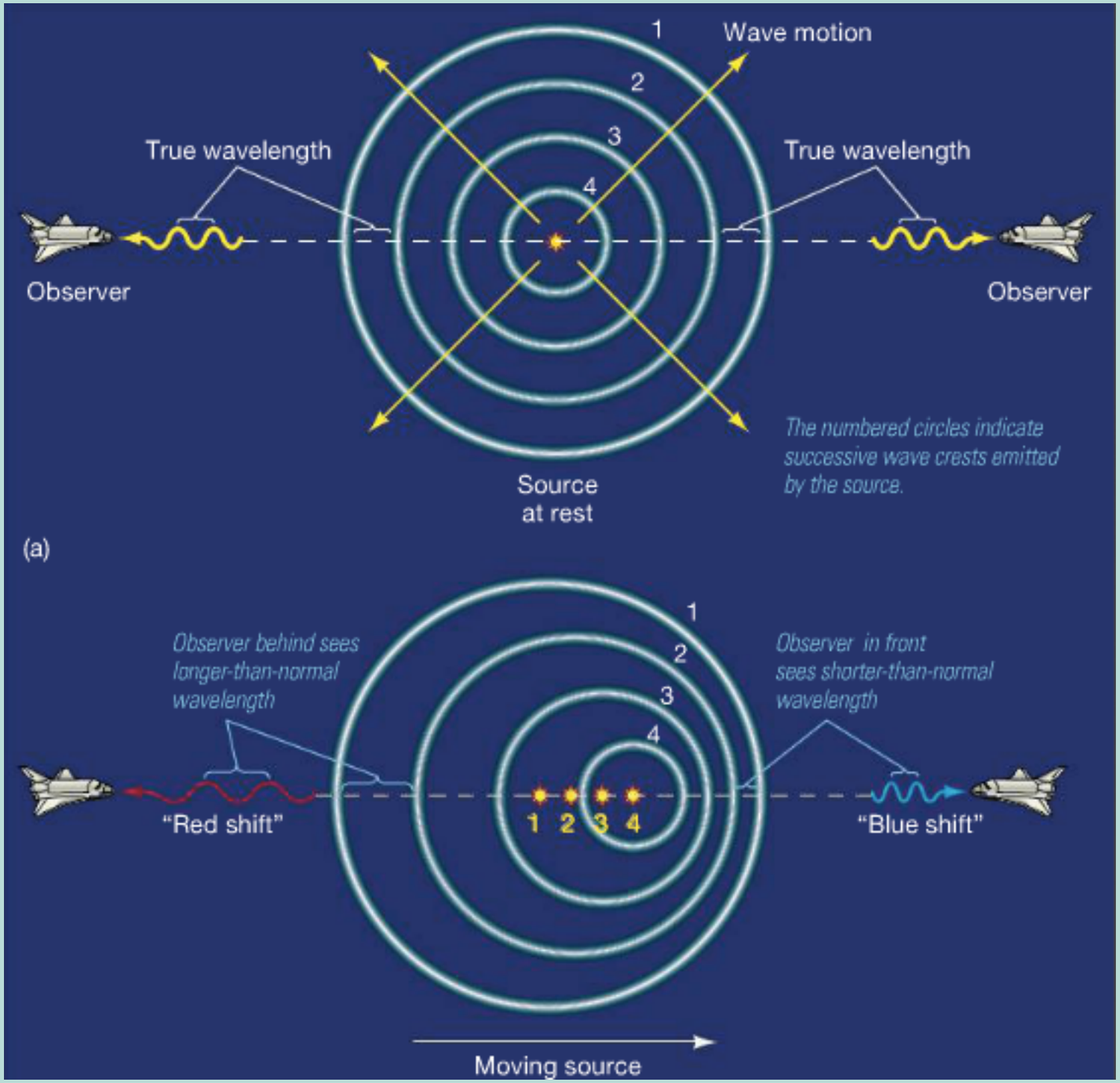


$$\frac{\text{apparent } \lambda}{\text{true } \lambda} = \frac{\text{true } f}{\text{apparent } f} = 1 + \frac{\text{recession } v}{c}$$

Radiation: Ch 3



Radiation: Ch 3

QUIZ