

Welcome to CSC 2019!

Get to Know Our 2019 Cannabis Science Conference East Emcees



CANNABIS
SCIENCE
CONFERENCE

Baltimore Convention Center
April 9th & 10th, 2019



CANNABIS
SCIENCE
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What can these two days at CSC mean to you?



The Essential Photon

Jacklyn Green, PhD

Meaning of AGATE

- Agriculture
- New Beginnings
- Prosperity



AGATE
Biosciences

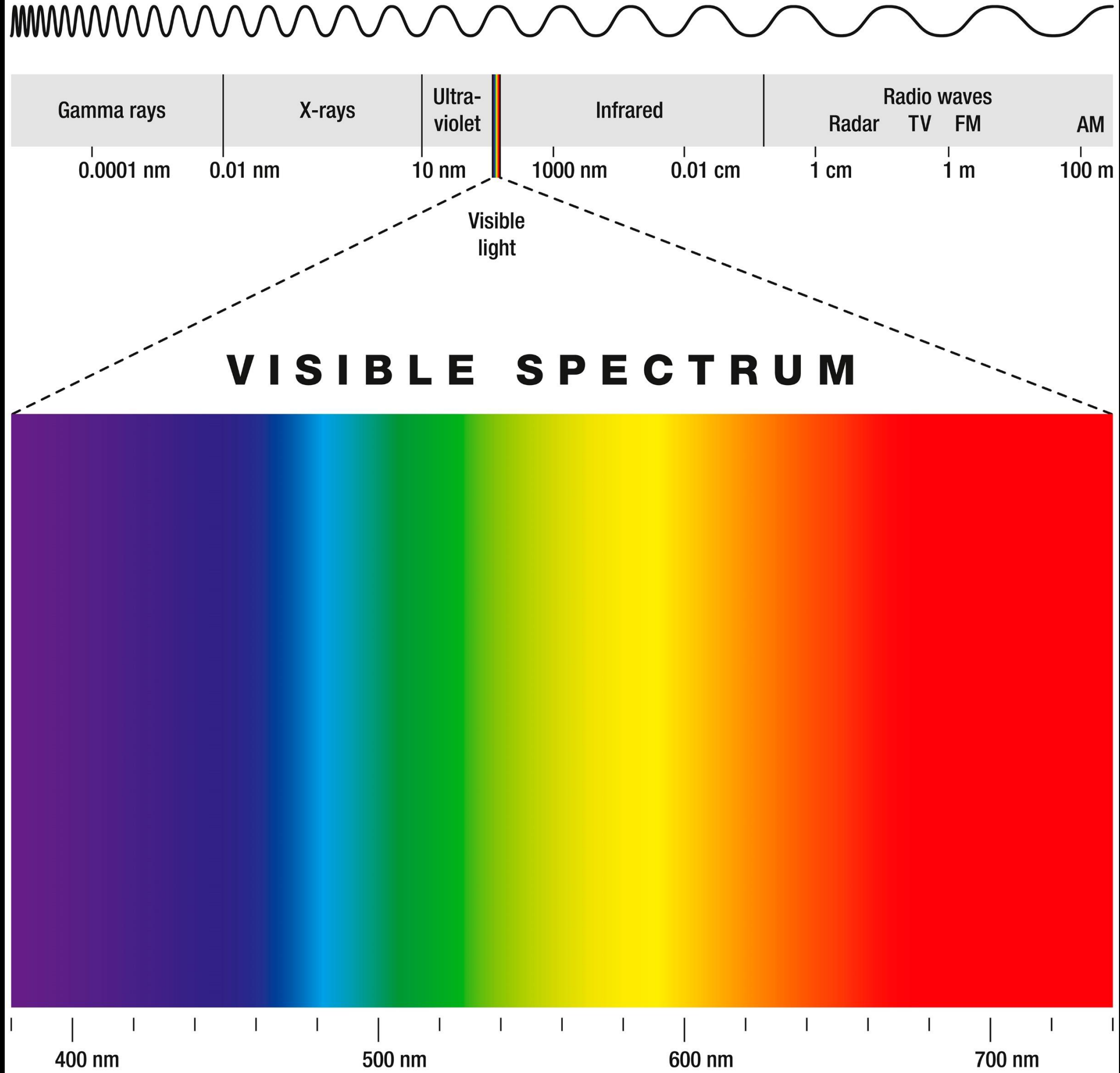


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Cannabis Science Conference



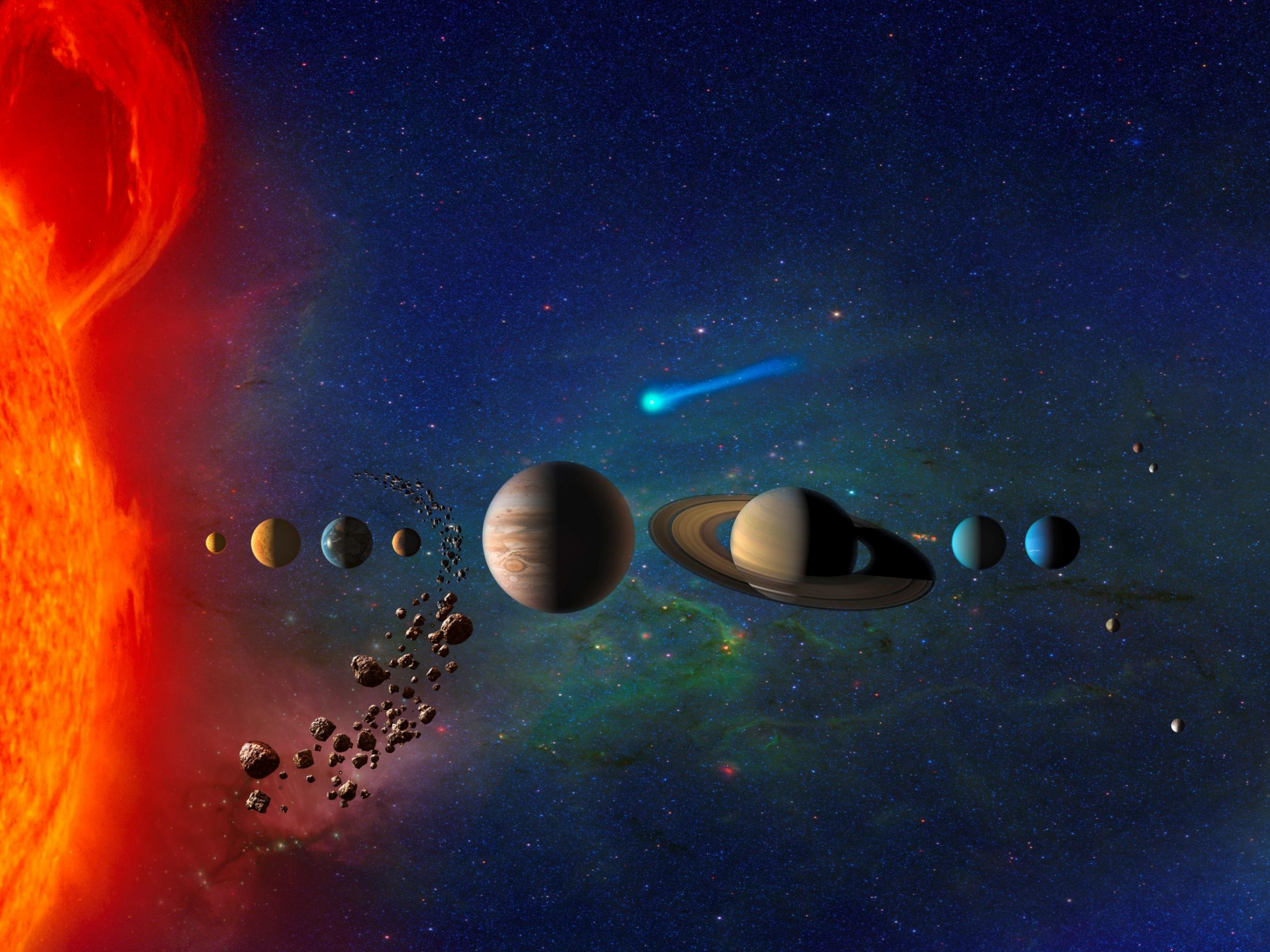


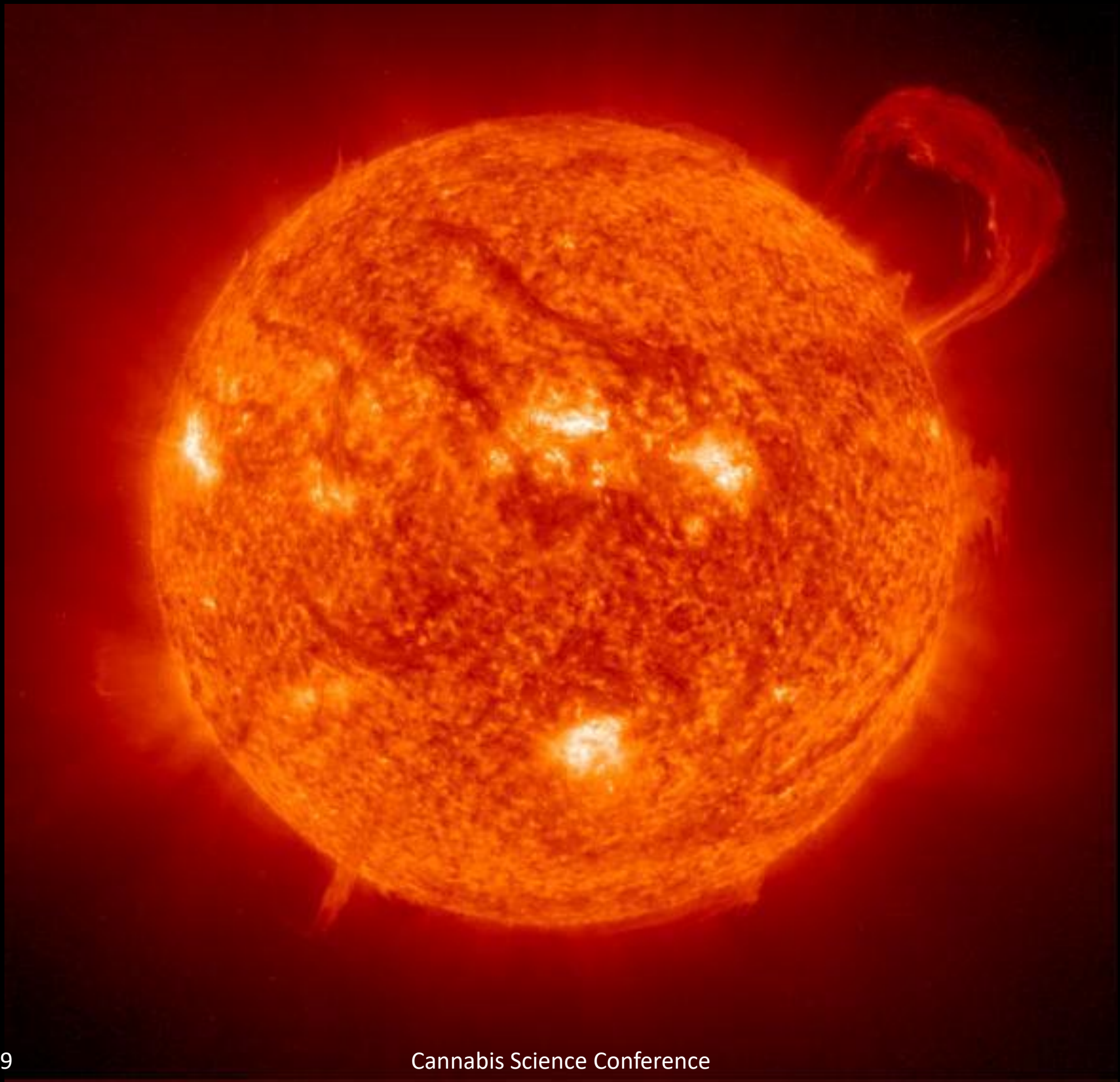


What is Light?

- James Clerk Maxwell discovered that electric and magnetic forces were linked
 - He called the combined force the electromagnetic force
 - One of the four fundamental forces in the Universe
- Electromagnetic force is transmitted through light
 - Light brings the two forces of magnetism and electricity together in a dance that travels at 186,000 miles/sec or ~300,000 km/sec
 - This is the speed of light you always hear about or “c”
 - It is a constant in our Universe







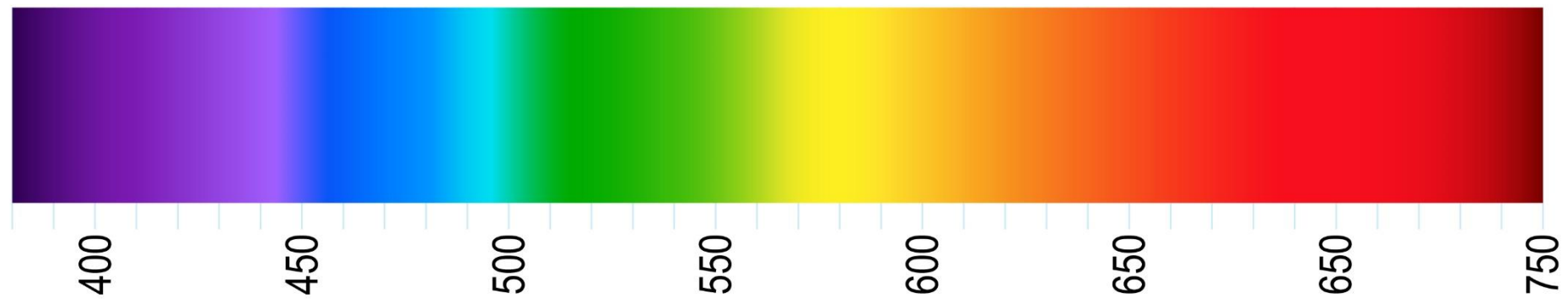
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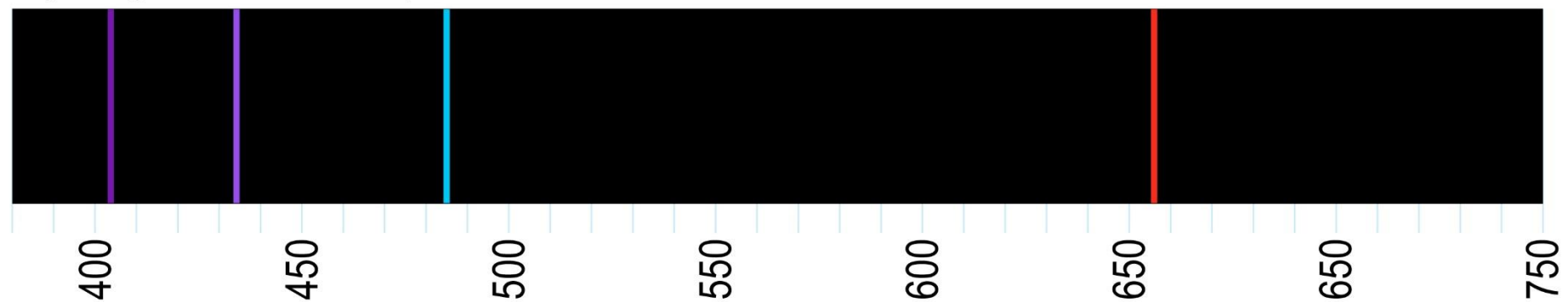


SPECTRUM

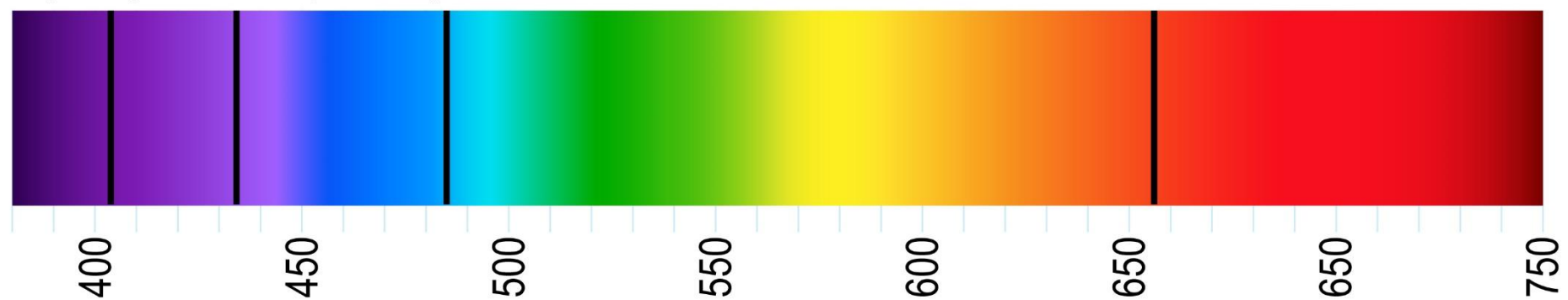
Continuous spectrum



Hydrogen Emission spectrum

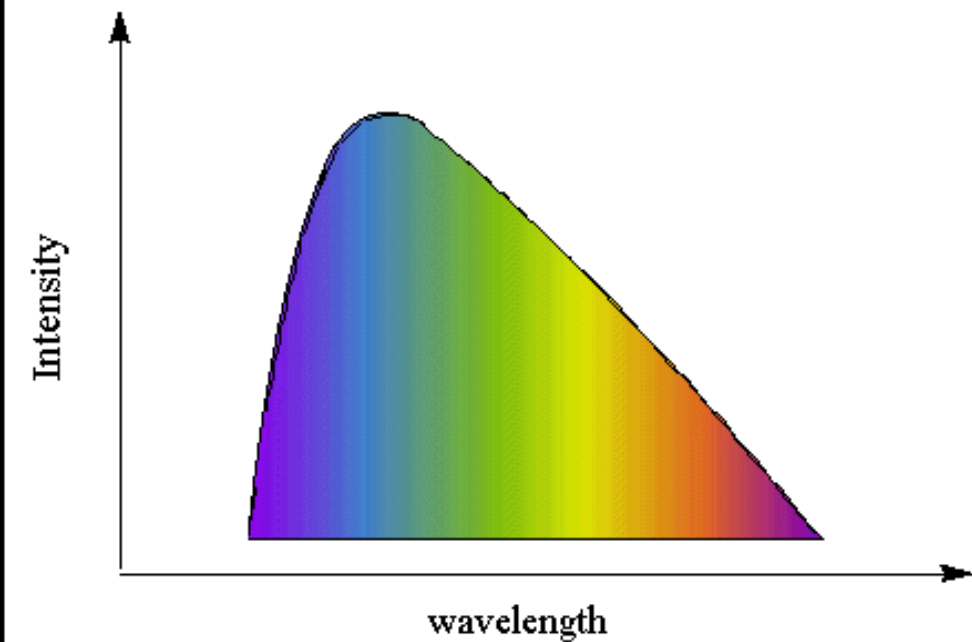


Hydrogen Absorption spectrum

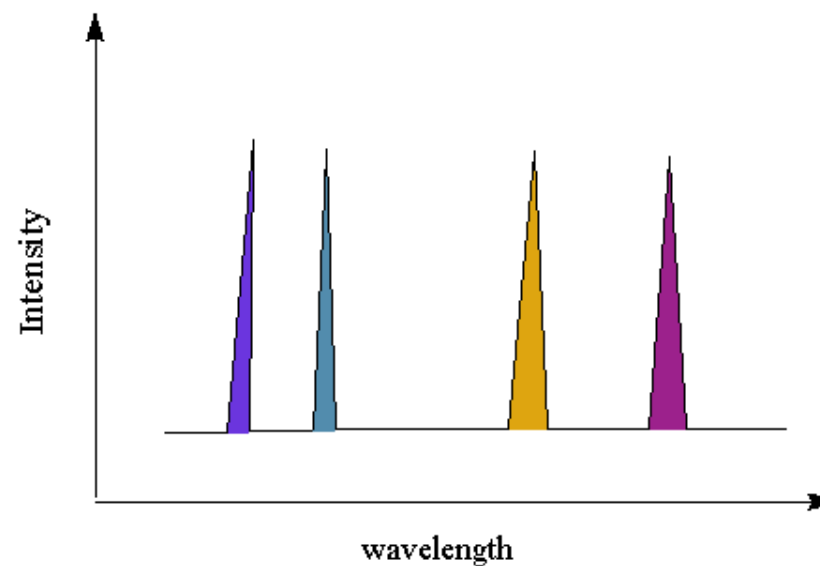


Kirchhoff's Laws – more info

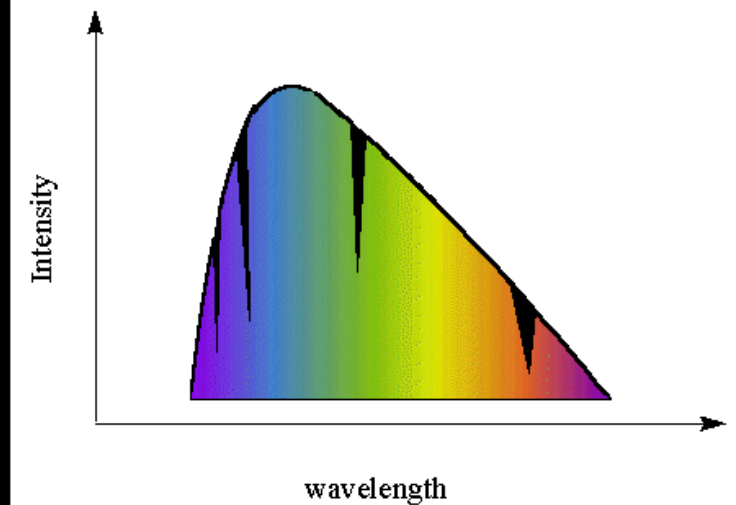
Continuous Spectrum



Bright Line (emission) Spectrum



Dark Line (absorption) Spectrum



Continuum or Rainbow Spectrum

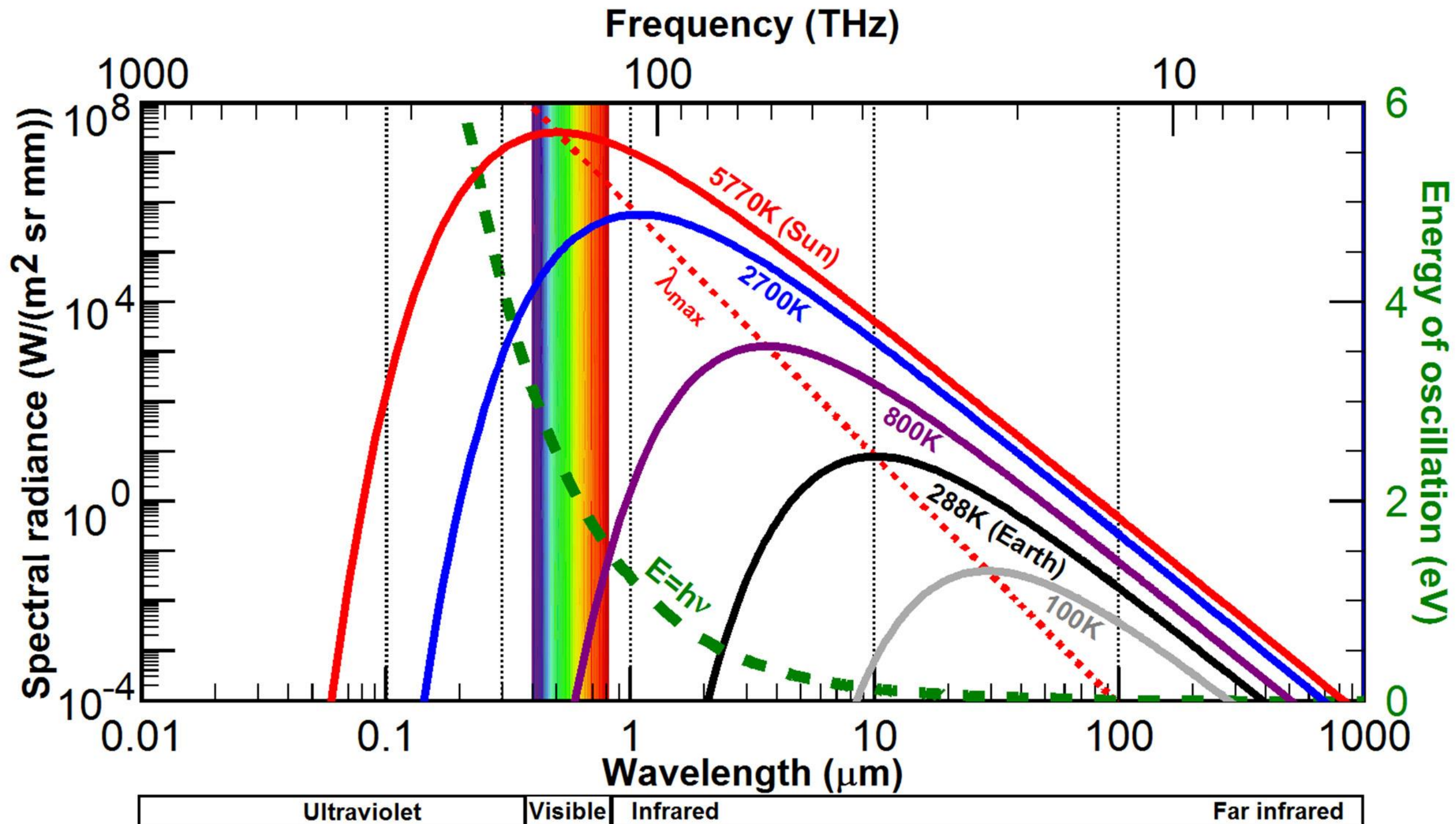
Emission Spectrum

Absorption Spectrum

Credit to astro.cornell.edu

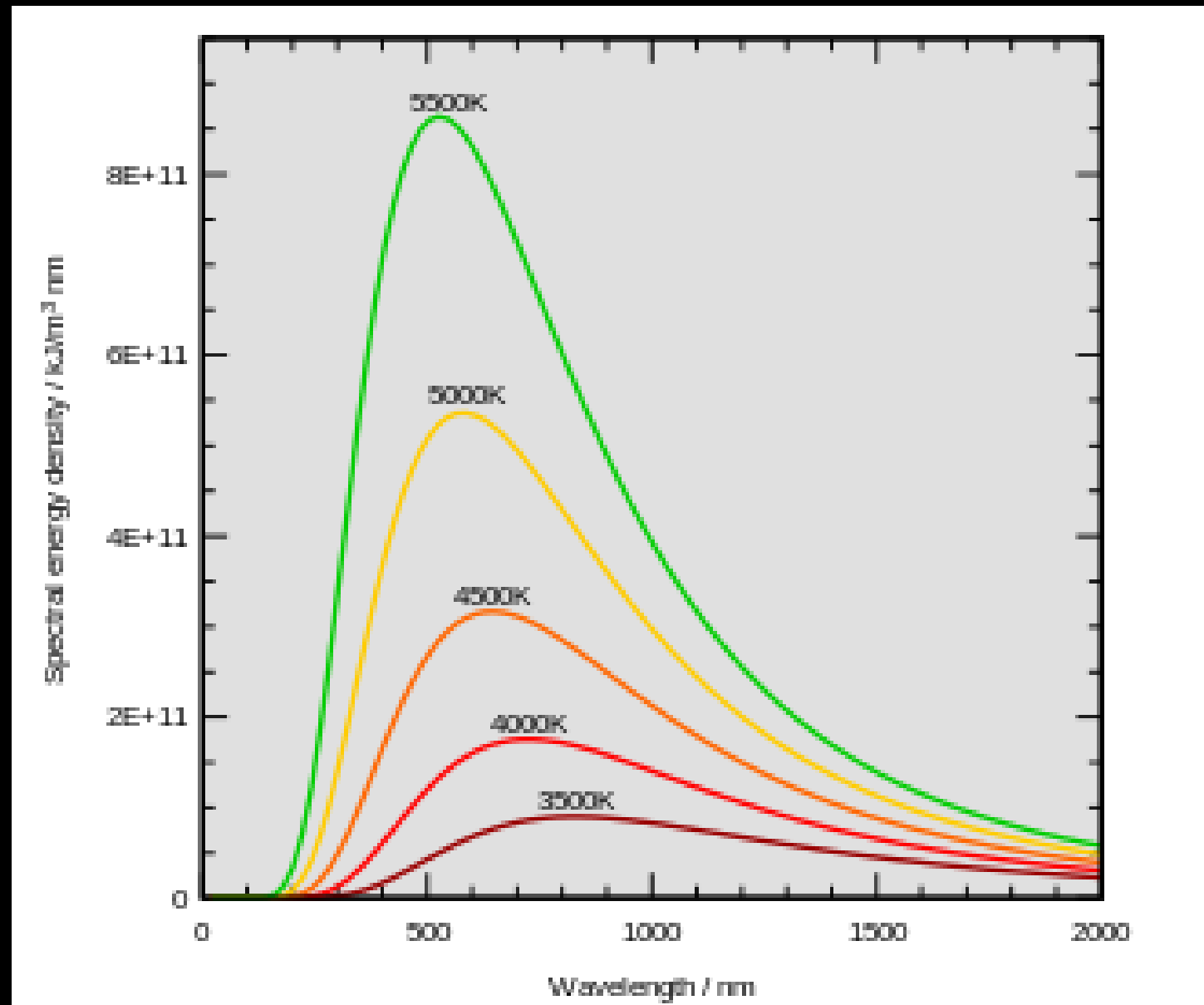


Continuous Spectrum



The Sun

The effective temperature of the Sun is **5778 K**. Using Wien's law, one finds a peak emission per nanometer (of wavelength) at a wavelength of about 500 nm, in the green portion of the spectrum near the peak sensitivity of the human eye.

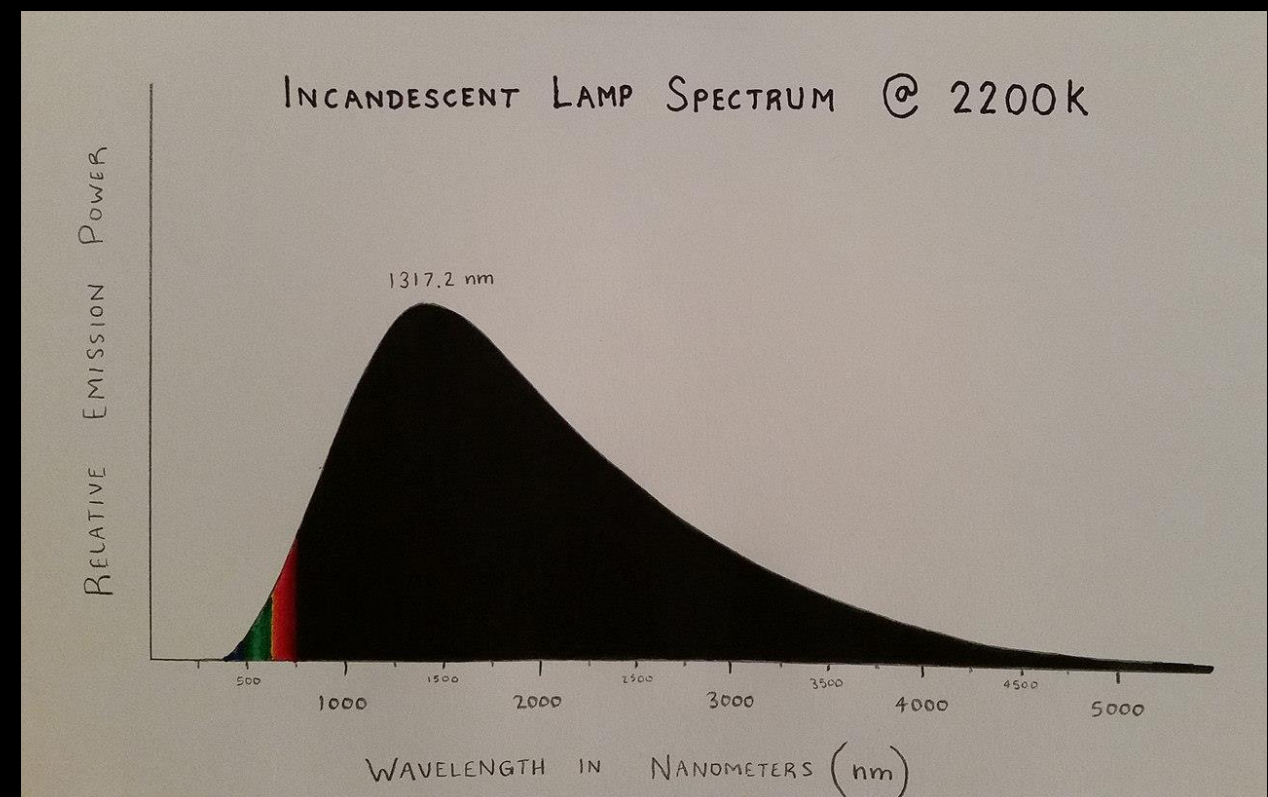


A Sampling of Lighting Types

Type	Spectrum	Example
Incandescent	Continuous	Old-fashioned light bulb
Fluorescent	Fluorescence	Overhead in offices
High Intensity Discharge	Emission with pressure broadening	Many cultivations
LEDs	Electroluminescence	Commercial Sustainable cultivation



Incandescence

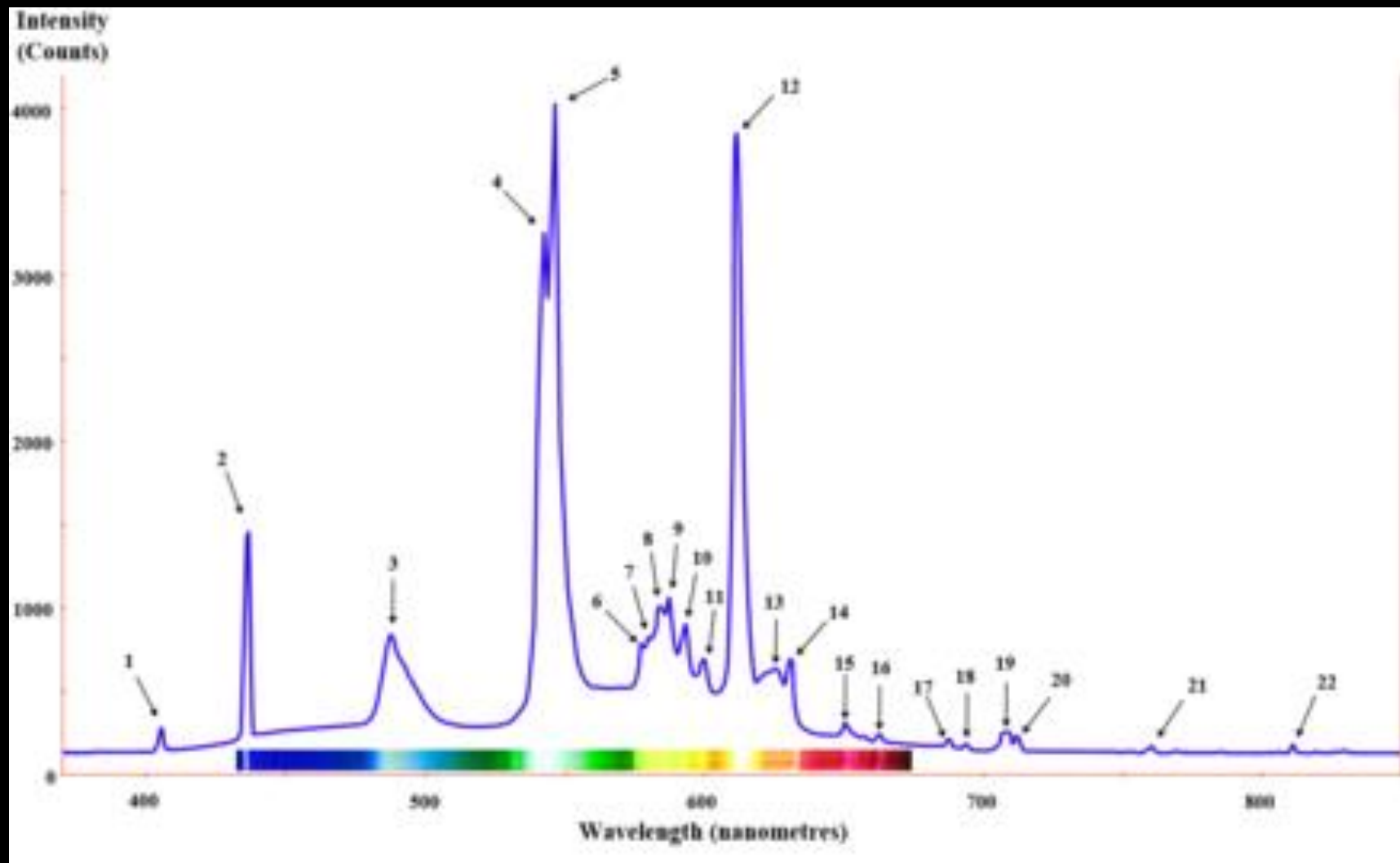


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Fluorescence

- Fluorescent bulbs operate with a mercury emission spectrum and solid phosphor powder compound that glows when illuminated

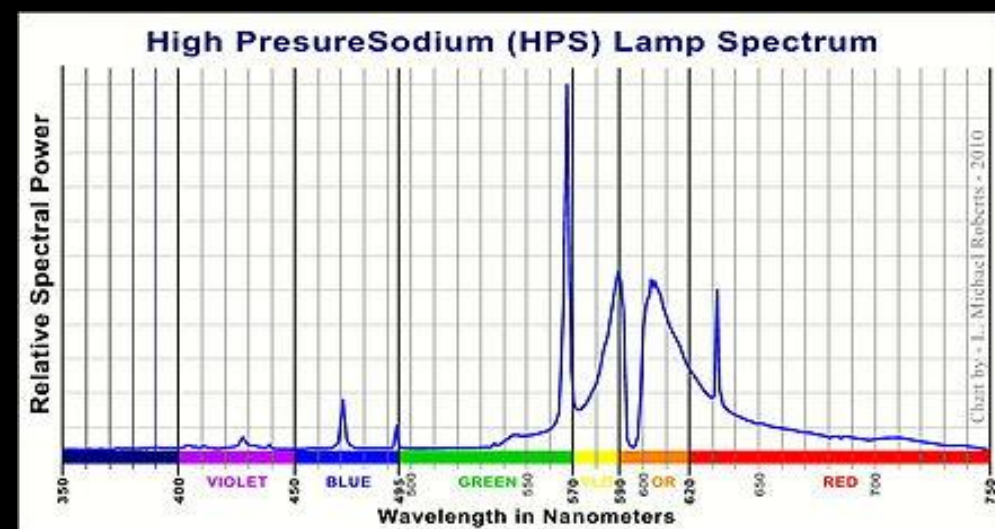
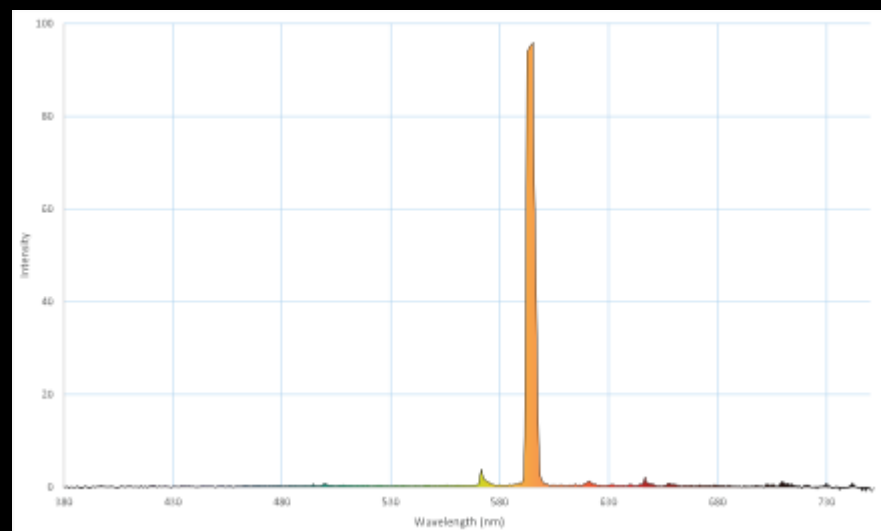


Emission Spectrum with Pressure Broadening Example

- Sodium High Intensity Discharge Bulb (Emission Spectrum)



The **sodium** spectrum is dominated by the bright doublet known as the **Sodium D-lines** at 588.9950 and 589.5924 nanometers.



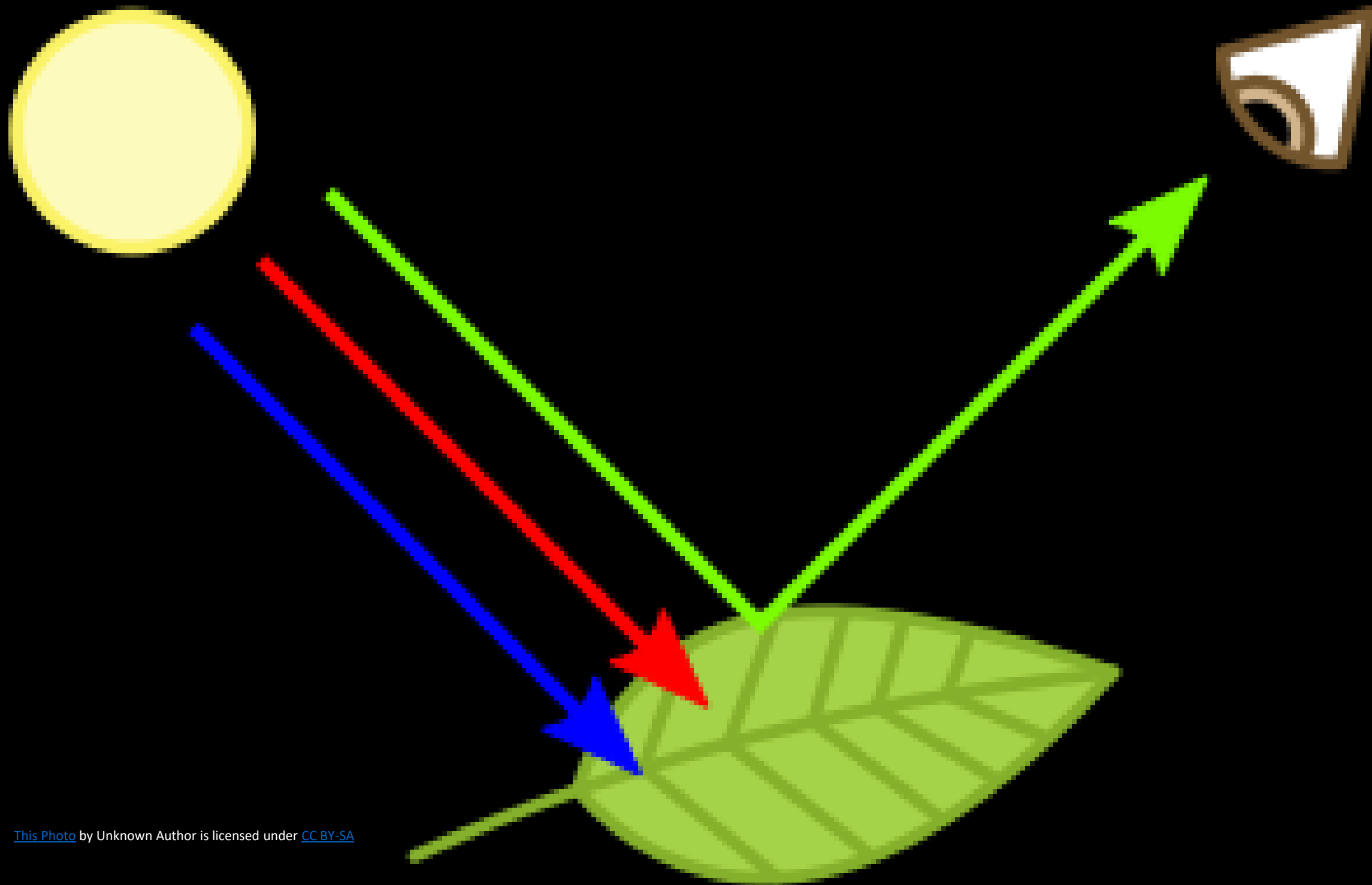
Electroluminescence with LEDs



Electroluminescence is a solid-state light emission process that is based on the elements and compounds that make up the LED materials. Current in the solid state initiates light emission related to the electron configuration of the materials.

The spectrum is still an emission-type of spectrum.

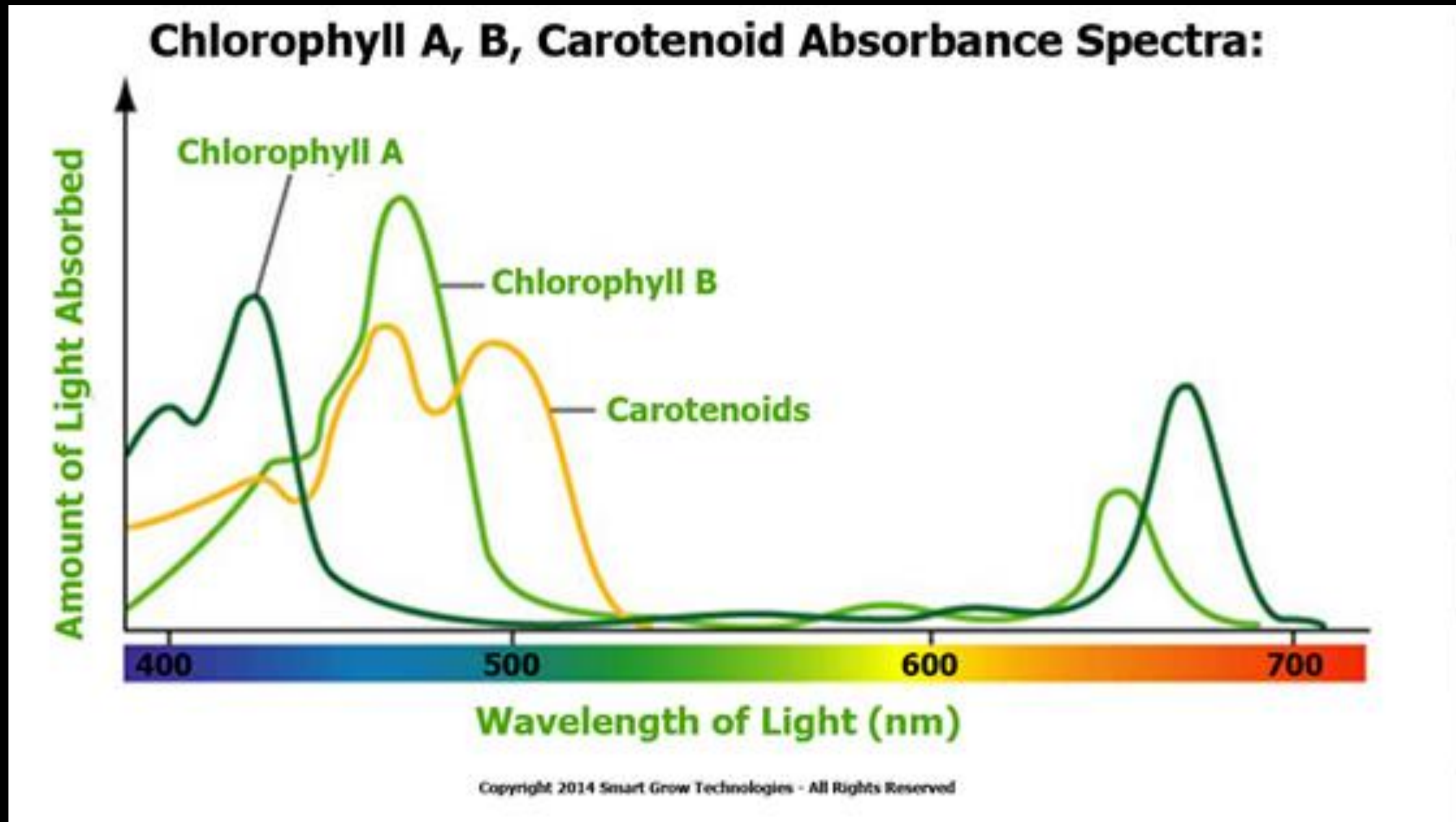




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Visible Spectrum Absorption by Plants

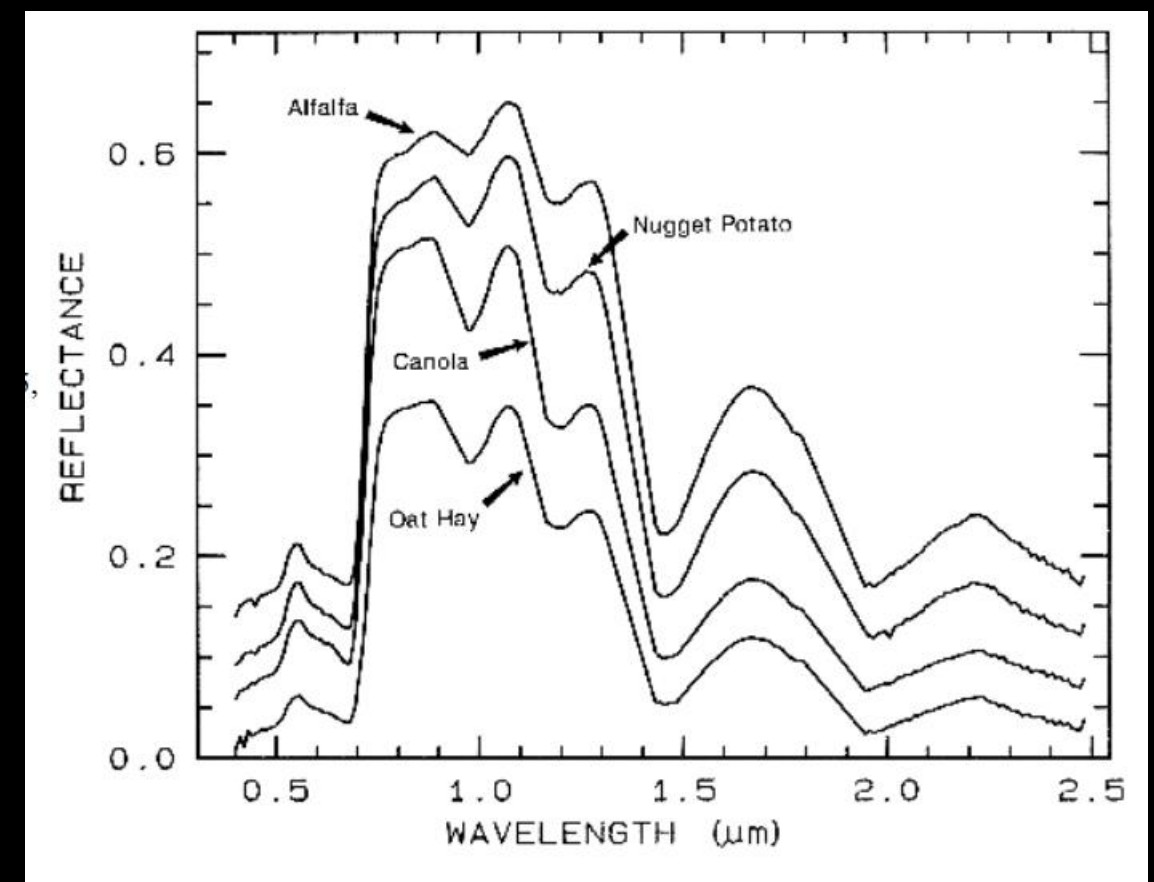
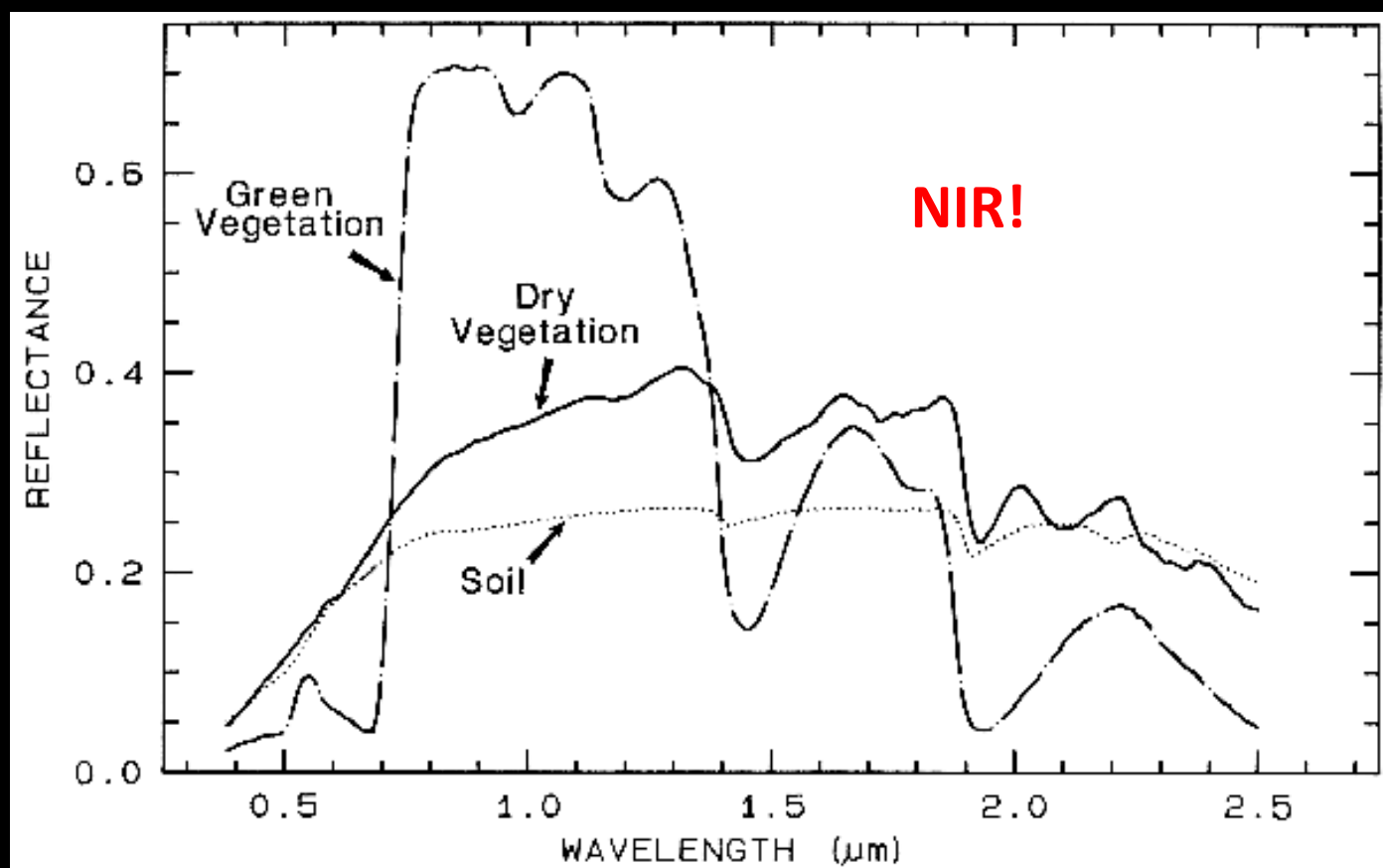


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NIR Reflectance Spectroscopy

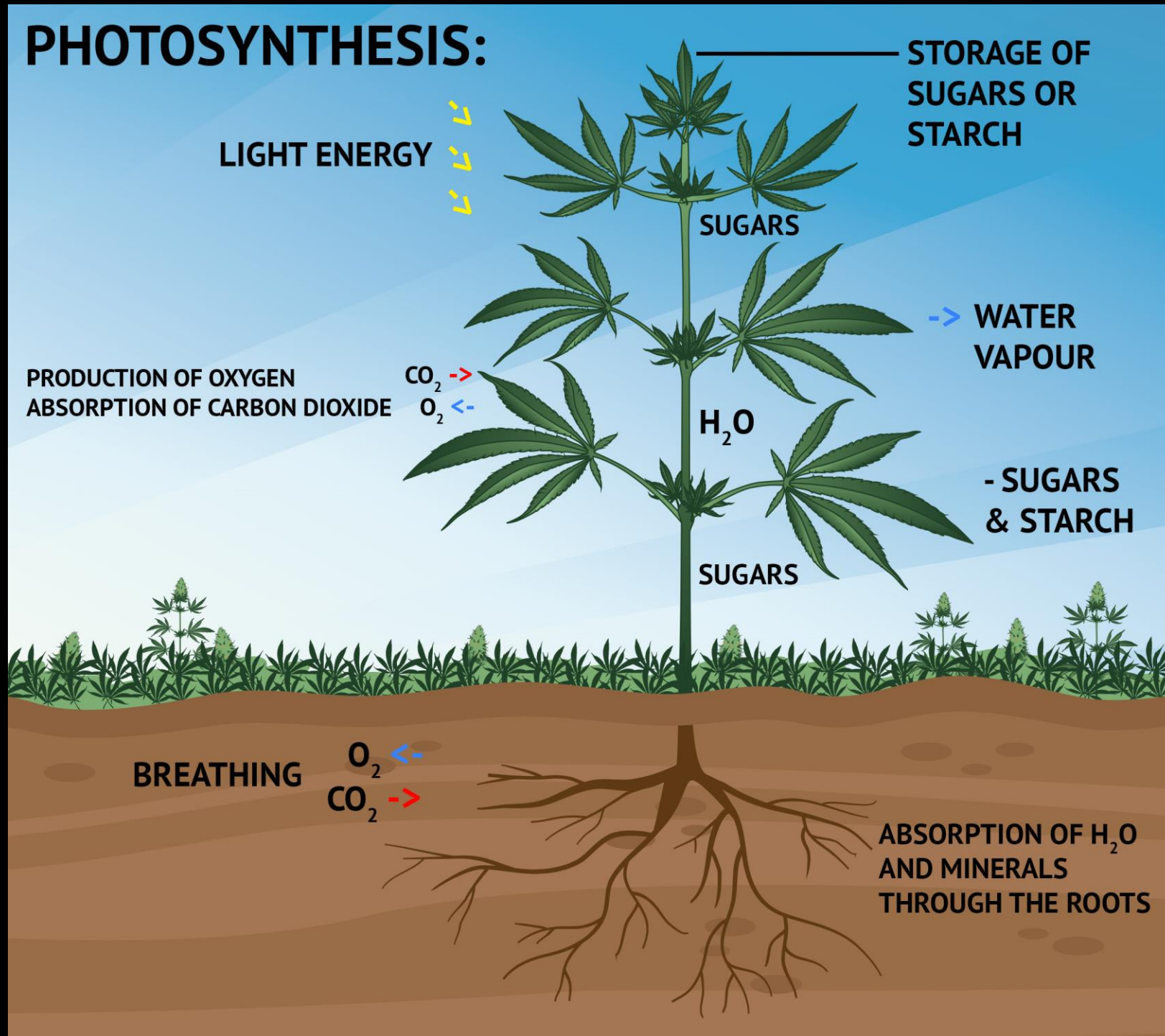
- **Reflectance spectroscopy** is the study of light as a function of wavelength that has been reflected or scattered from a solid, liquid, or gas.



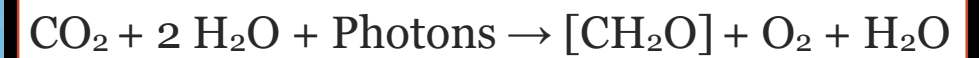
<https://speclab.cr.usgs.gov/PAPERS.refl-mrs/refl4.html>



PHOTOSYNTHESIS:



Light is an essential plant nutrient



CO_2 = Carbon Dioxide

H_2O = Water

Photon is light

CH_2O = Carbohydrate

O_2 = Oxygen



Remember the Essential Photon





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Booth #226 in the Expo Hall

Thanks Wikipedia

