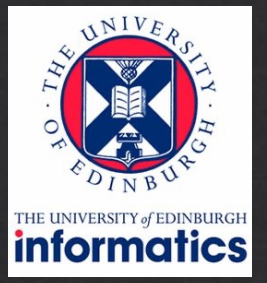


Computer Graphics:Rendering

Lecture 3: Radiometry, Photometry

Kartic Subr

Recap.

Real

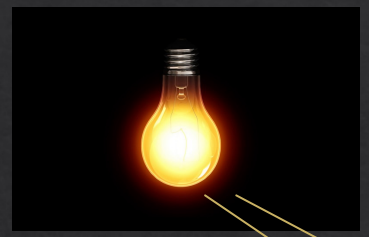
photography

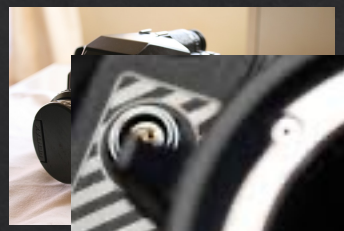
image manipulation

rendering

Virtual

Energy in the scene





Cool visualization in this video

What do cameras record?

luminosity

brightness

intensity

light

photons

colour

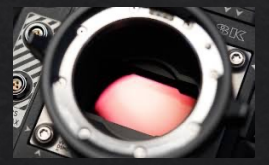
wavelength

energy

ray

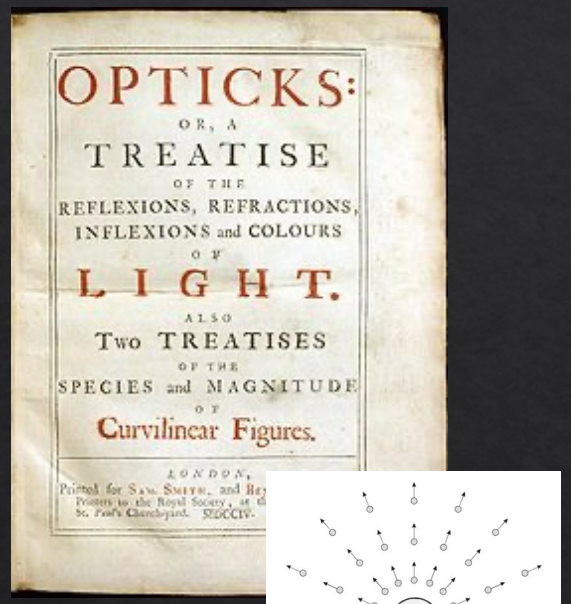
Obviously, it is …ehmm

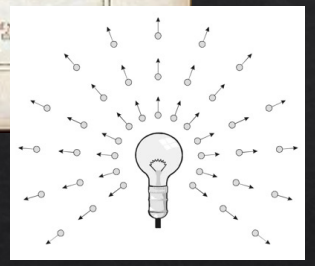
…'light stuff'?



What is light?

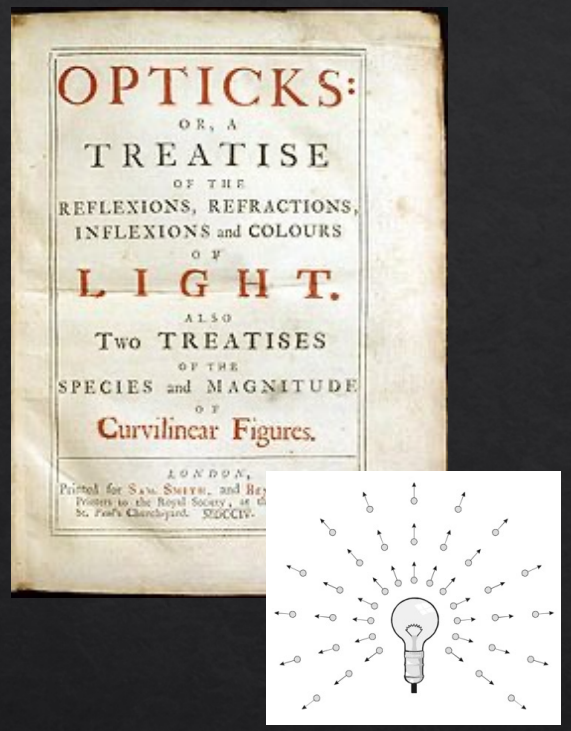
What is light?



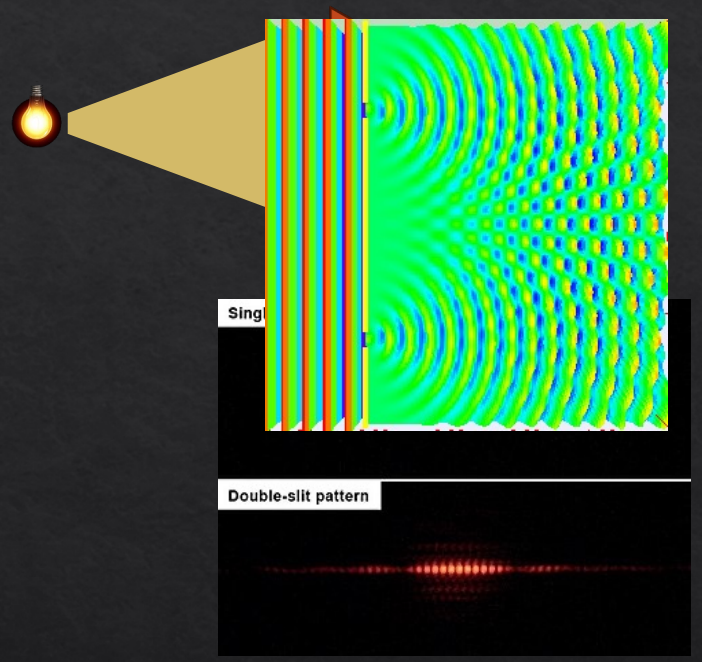


Isaac Newton 1704

What is light?

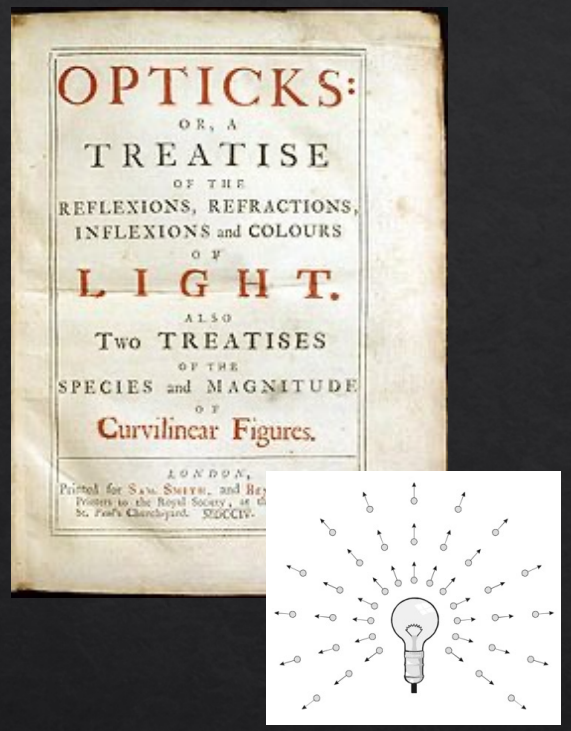


Isaac Newton 1704

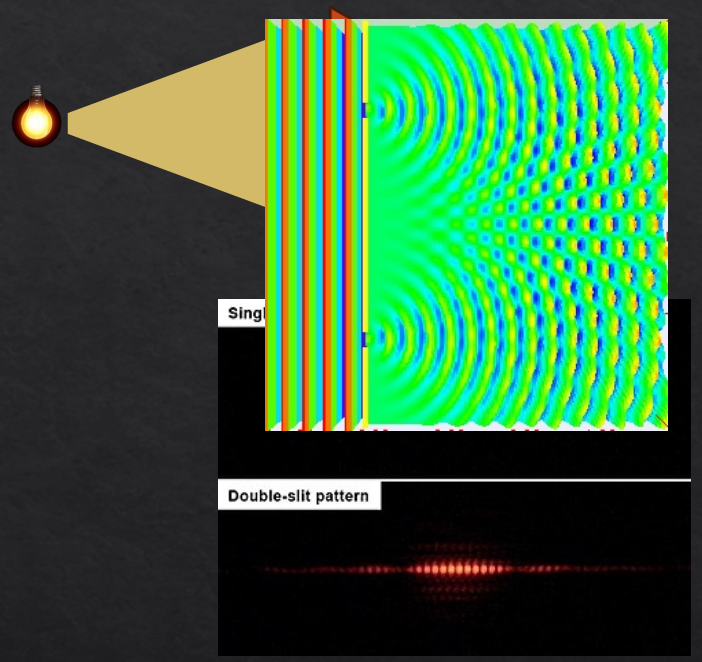


Thomas Young 1801

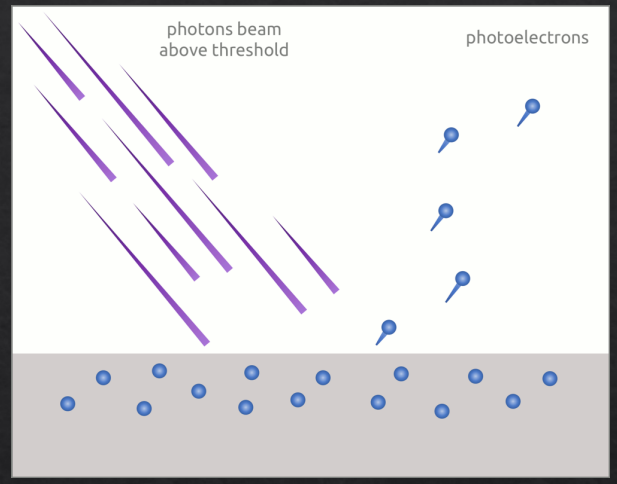
What is light?



Isaac Newton 1704

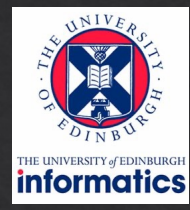


Thomas Young 1801

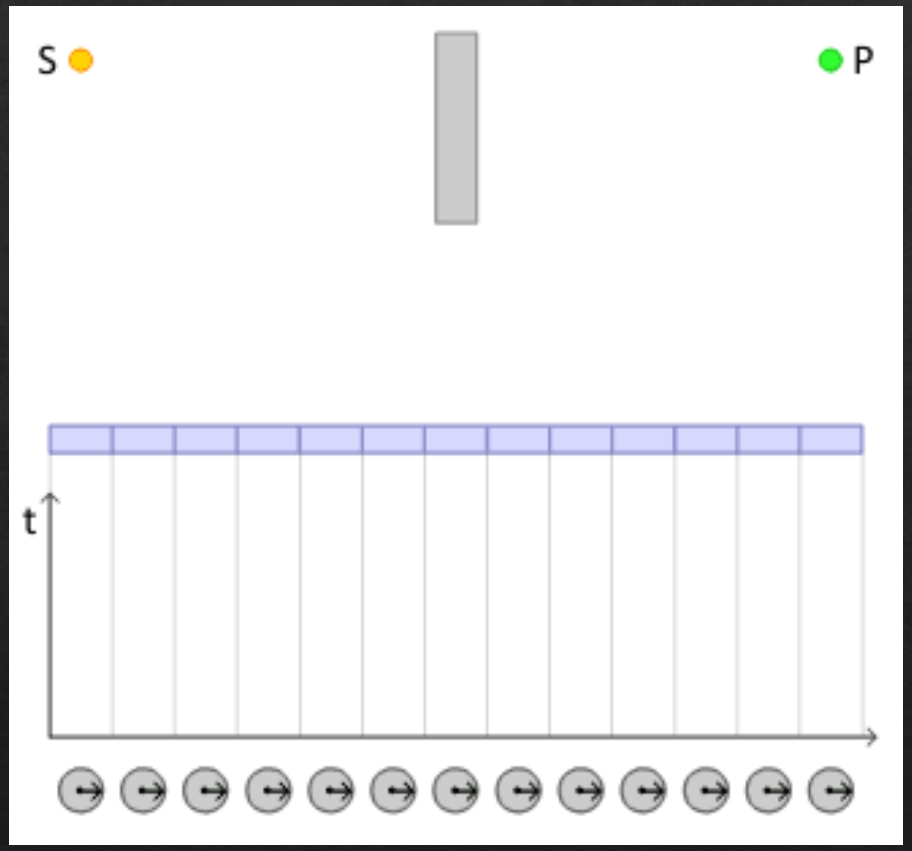


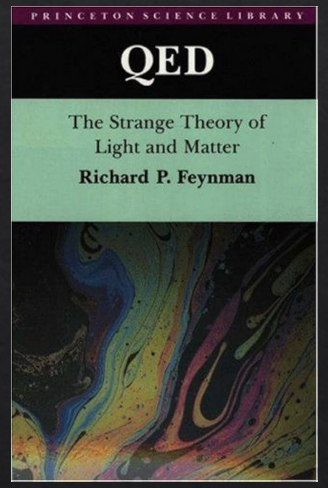
1887 Hertz, 1902 Lenard, 1905 Einstein

Does light travel in straight lines? Explain?



Straight lines?



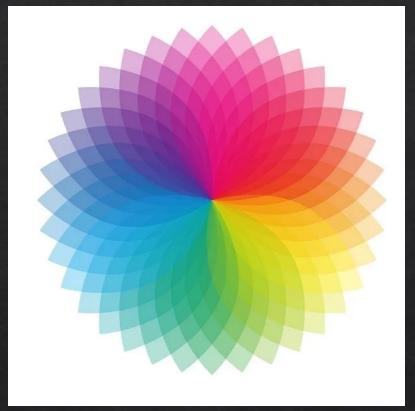


Feynman 1985

The study of light

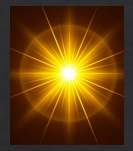
radiometry

photometry

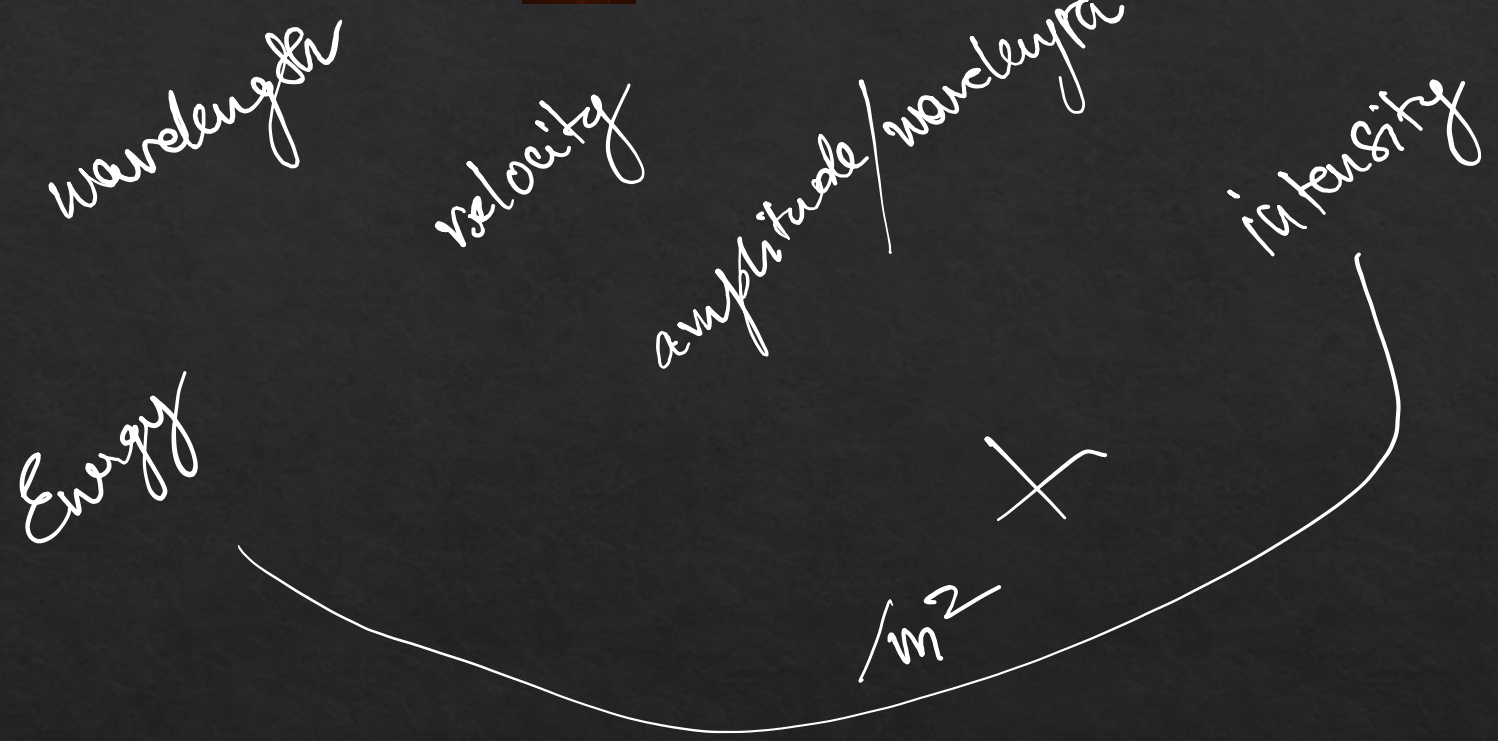


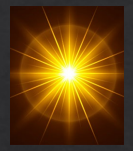
colorimetry

Interested in knowing more? Read this



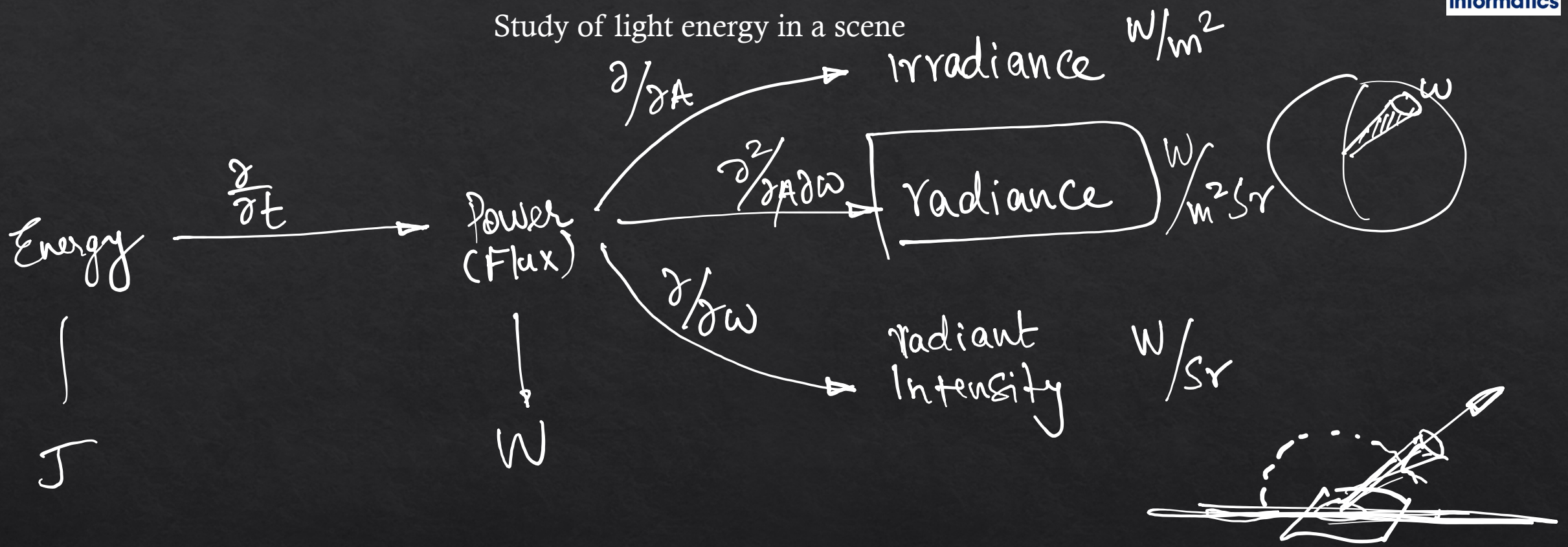
Radiometry

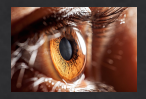

wavelength
velocity
amplitude/wavelength
Energy
intensity
1/m²



Radiometry

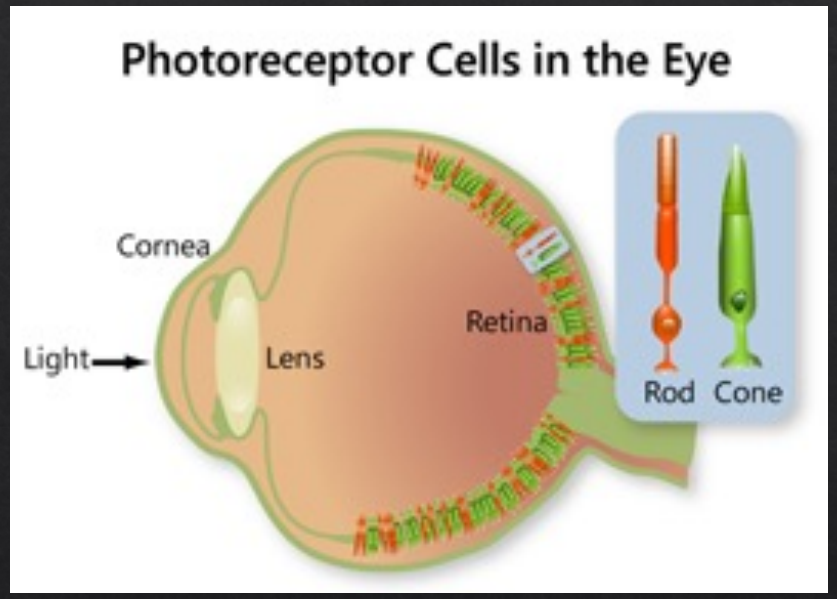
Study of light energy in a scene



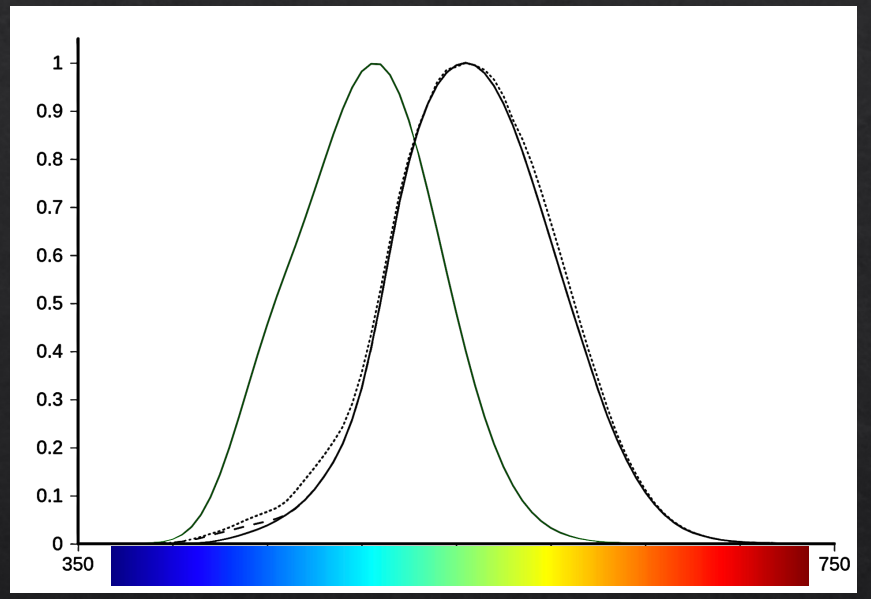


Photometry

Study of perceived light energy in a scene



rods cones

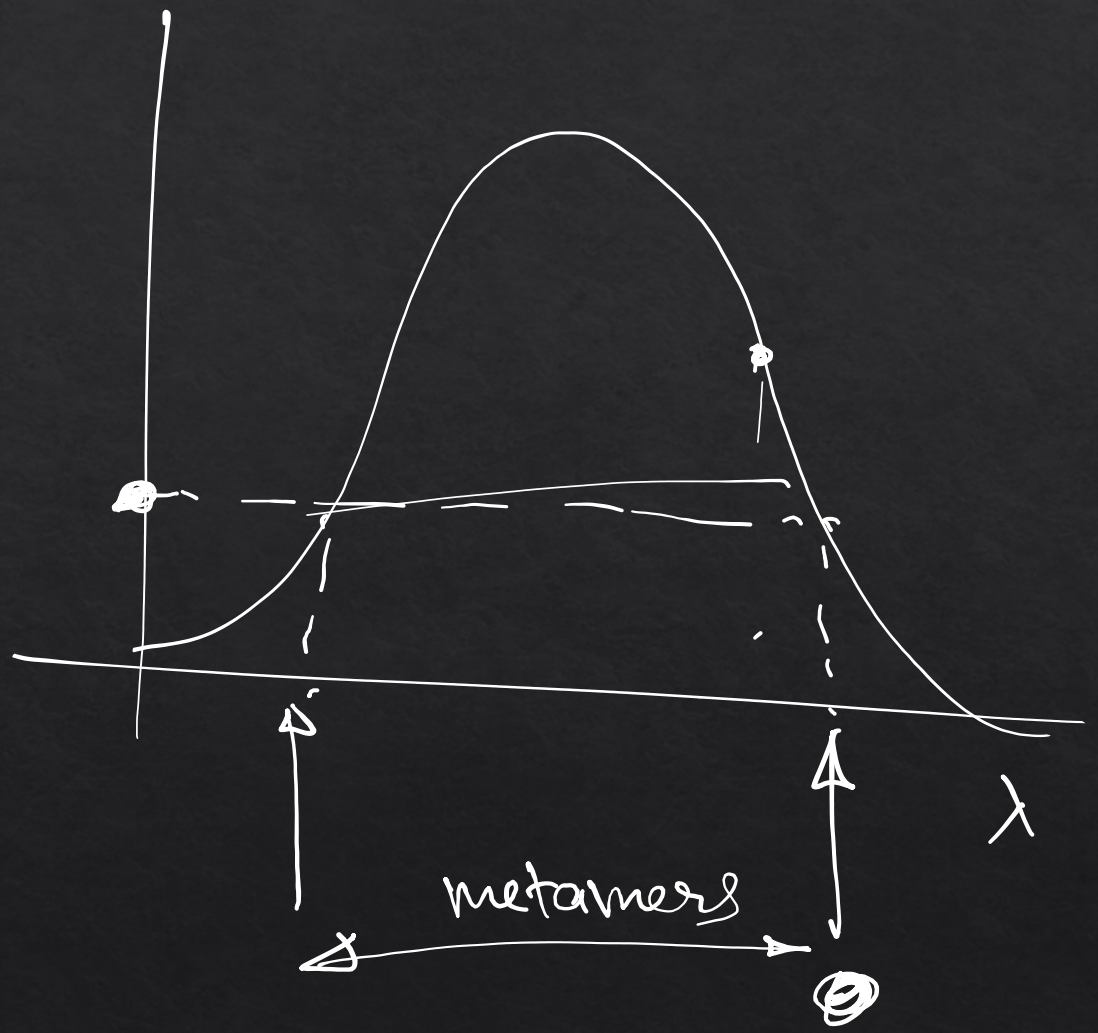


luminous flux

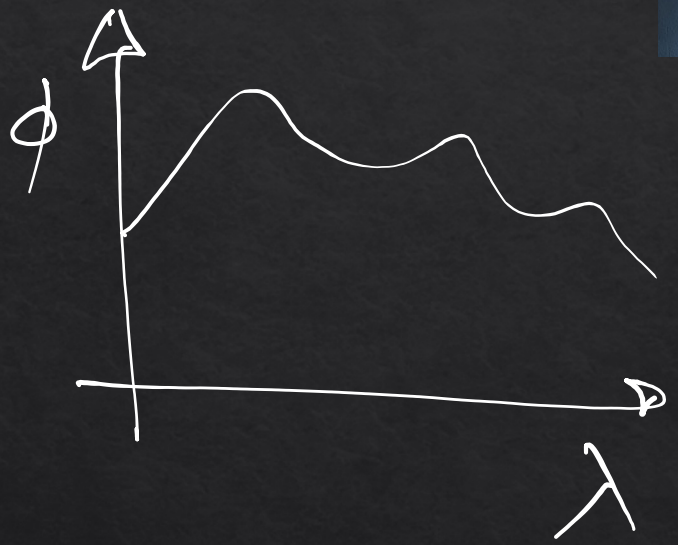
$$\Phi_v = \int \Phi(\lambda) V(\lambda) d\lambda$$

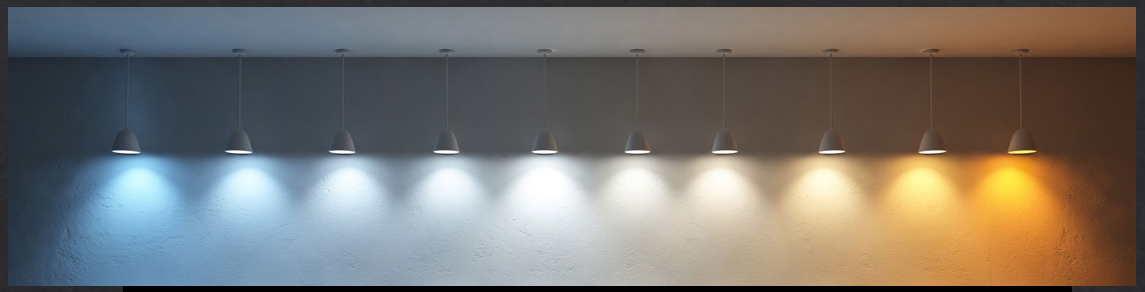
Φ radiant flux

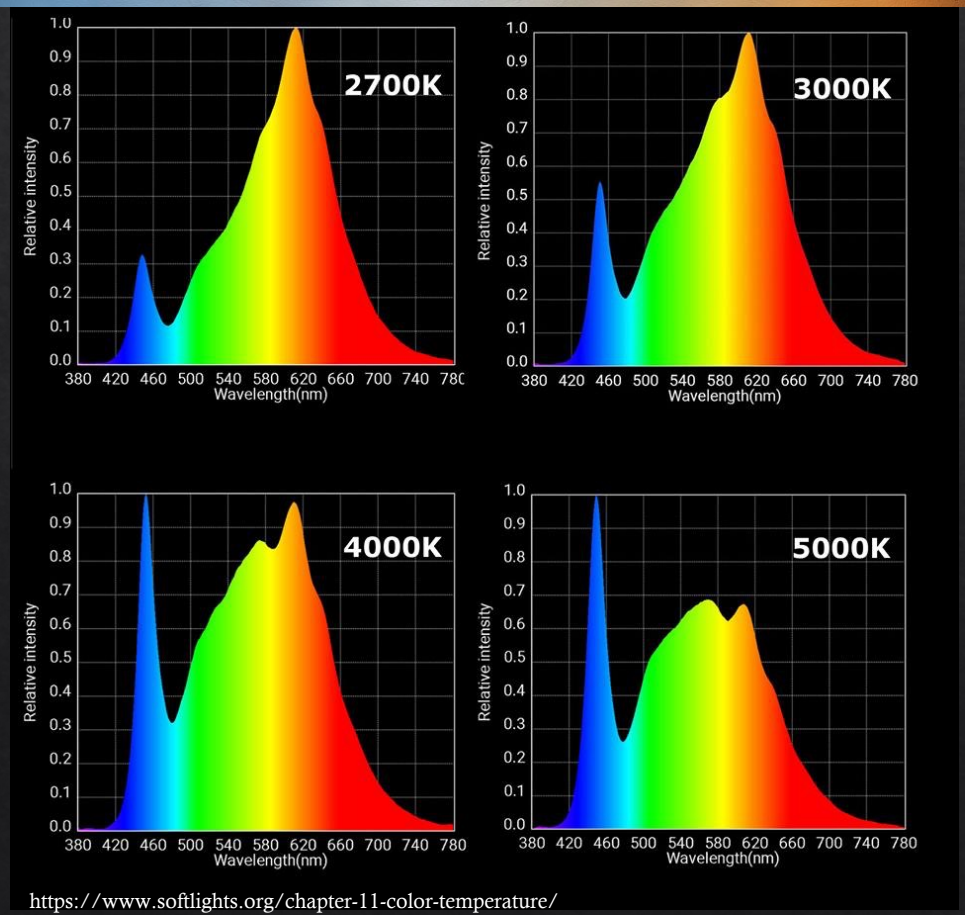
V luminous efficiency function
luminosity function


λ
metamers

Spectrometry: radiometric qty. per wavelength







https://www.softlights.org/chapter-11-color-temperature/

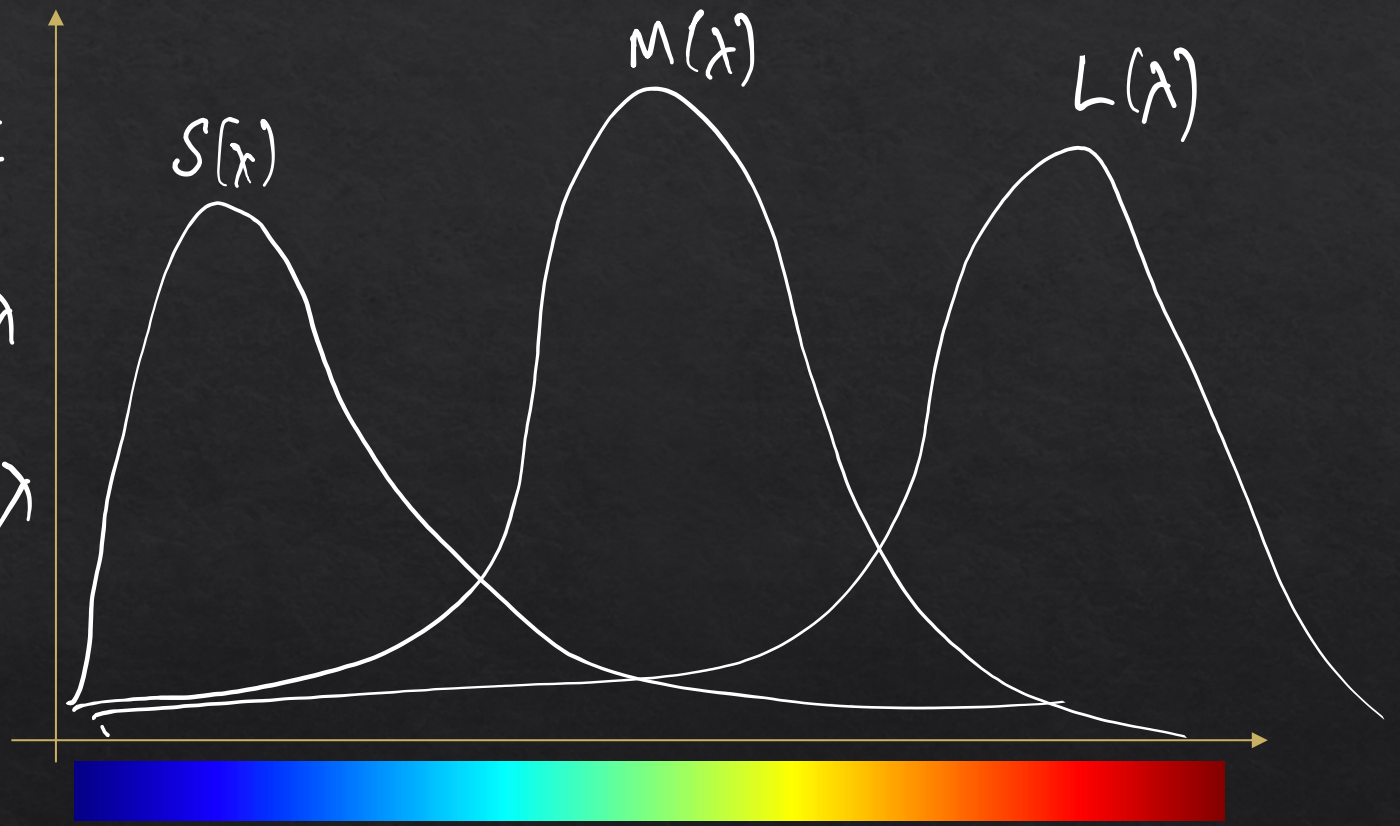
Interested in modelling this? Look here

Spectral sensitivity of our eyes

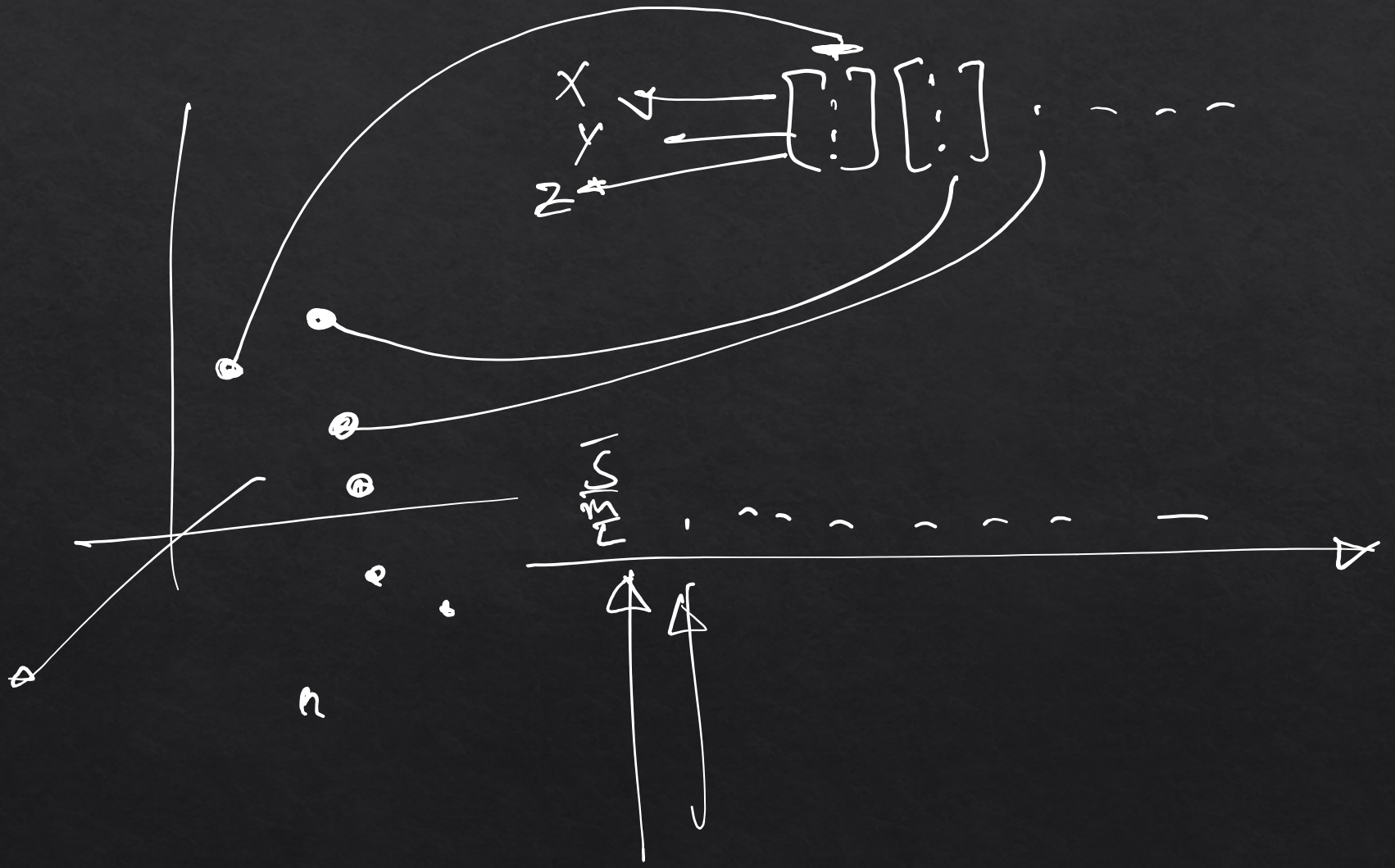
$$\bar{S} = \int \phi(\lambda) S(\lambda) d\lambda$$

$$\bar{M} = \int \phi(\lambda) M(\lambda) d\lambda$$

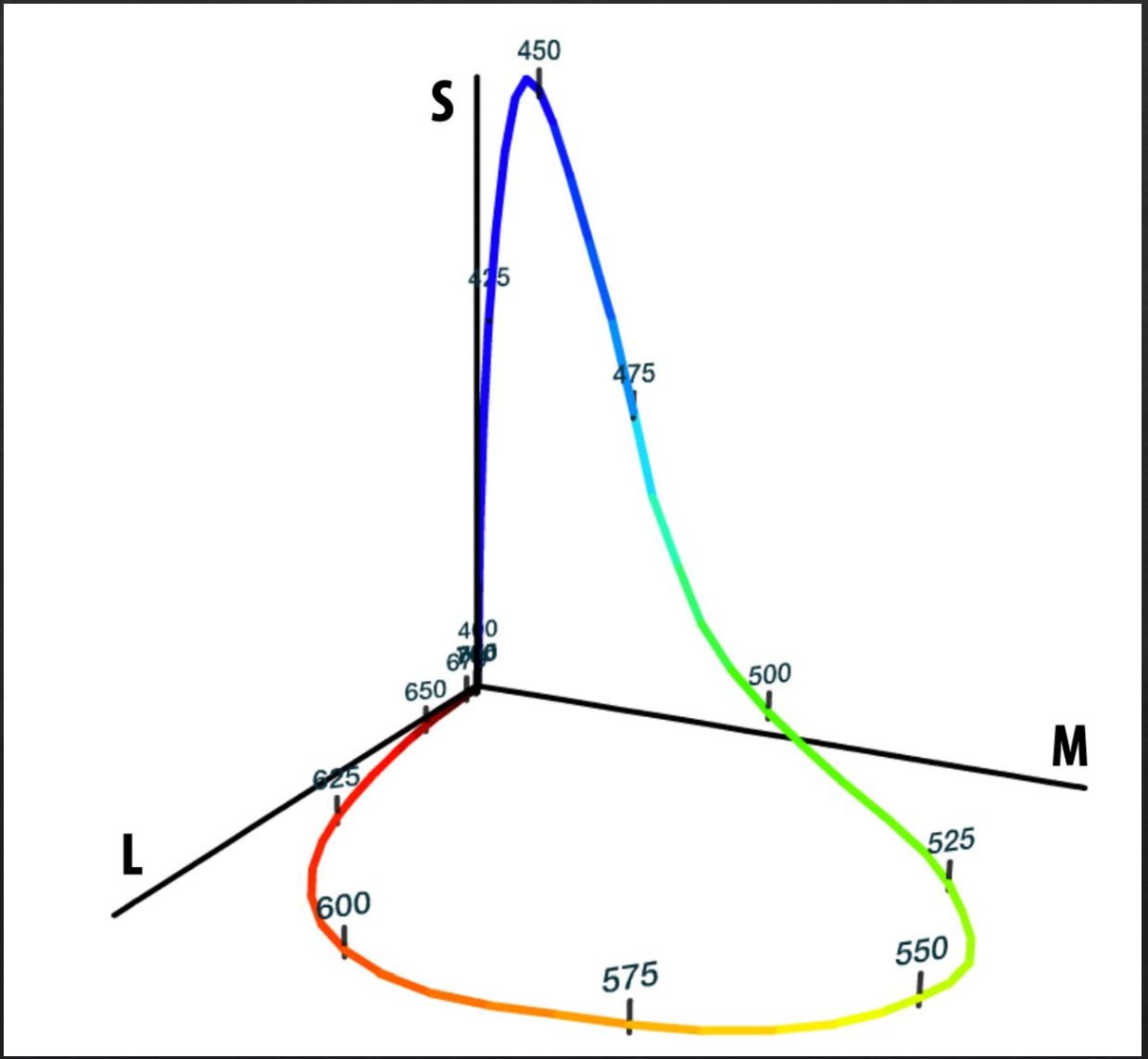
$$\bar{L} = \int \phi(\lambda) L(\lambda) d\lambda$$



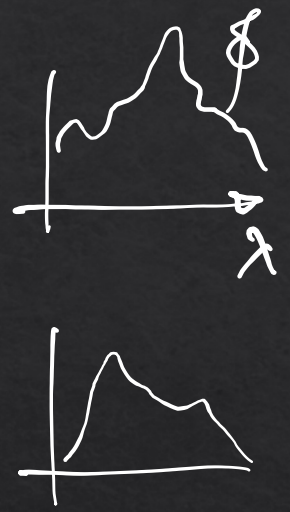
Spectral response of cones



plotting S,M,L as 3D points as a function of wavelength

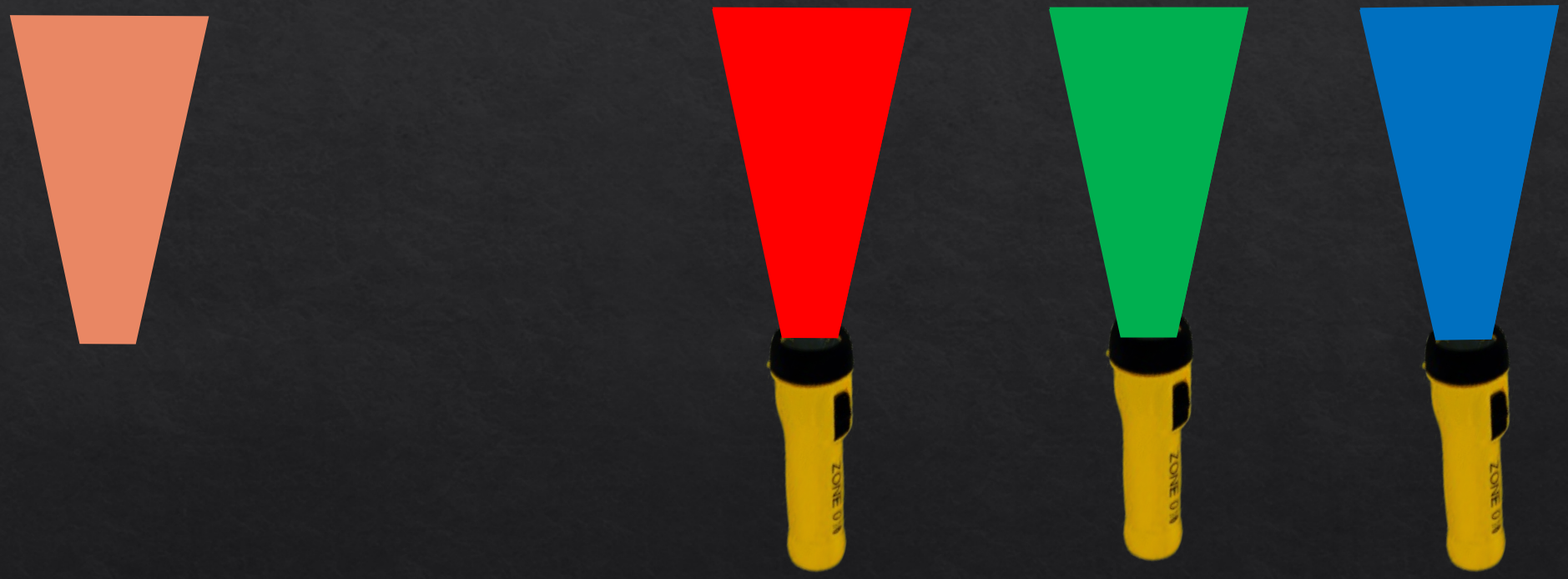


Metamers

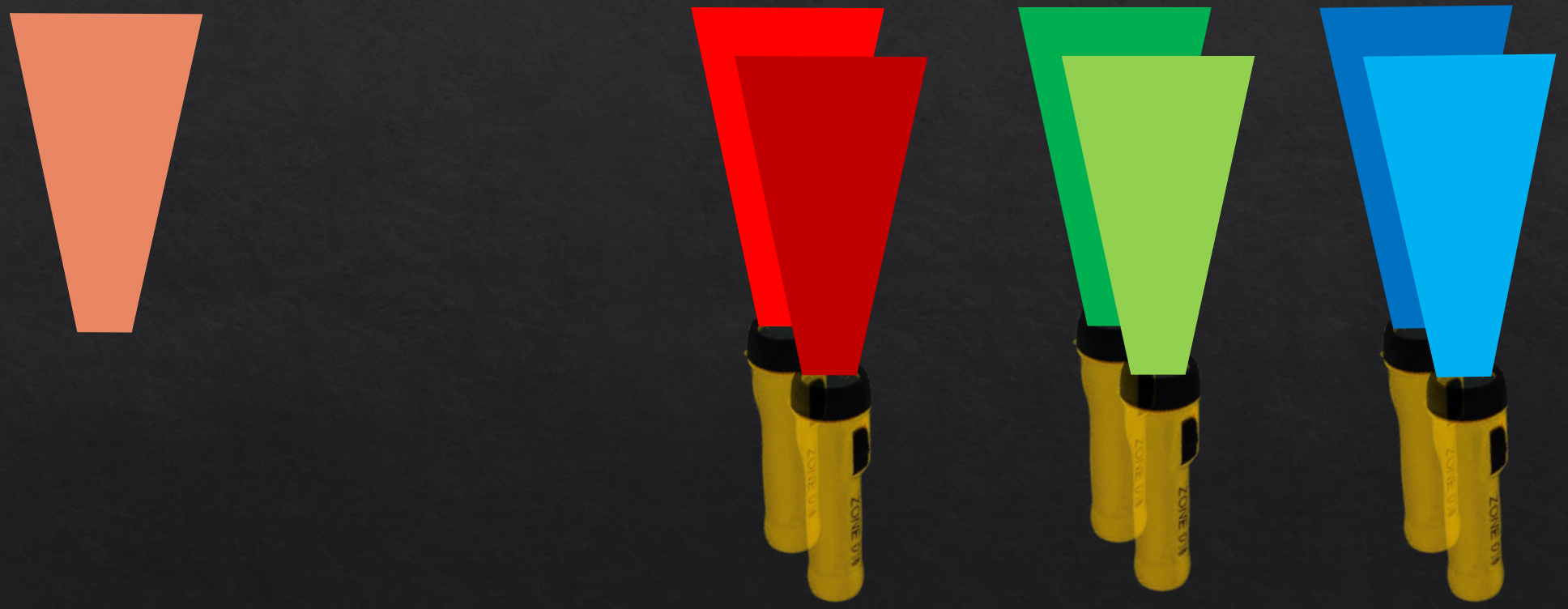


http://persci.mit.edu/people/adelson/checkershadow_proof

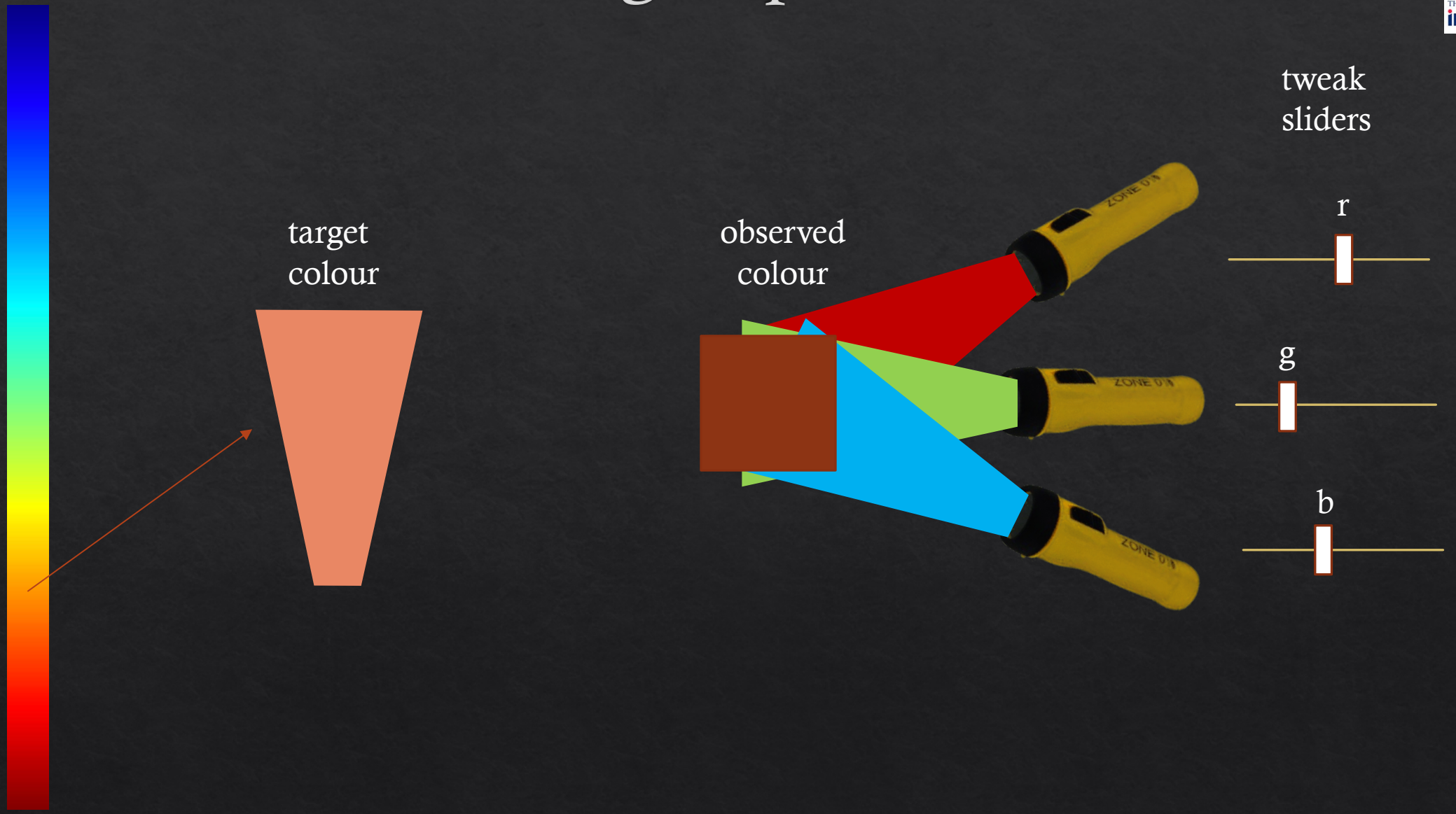
Trichromatic theory of light



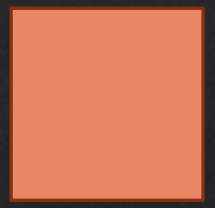
Trichromatic theory of light



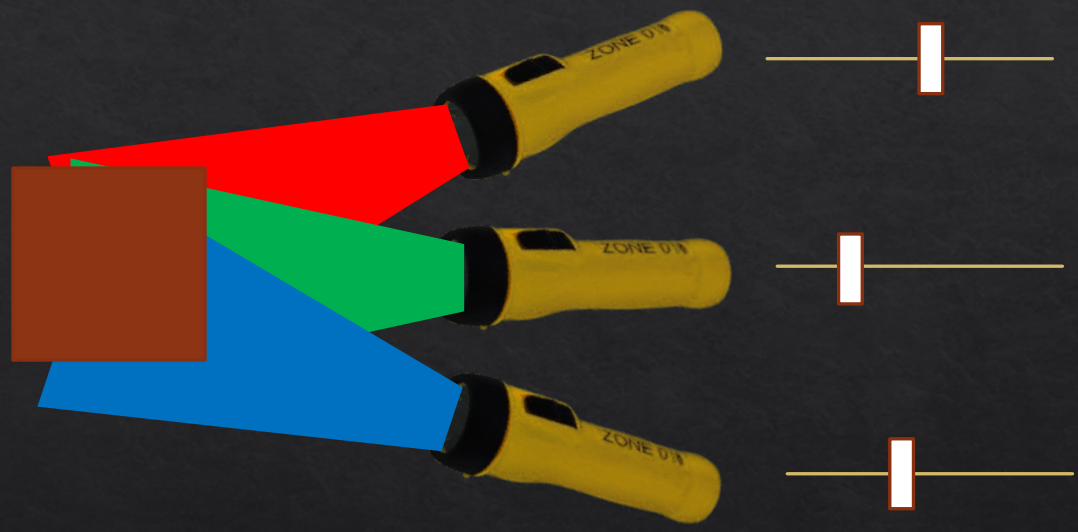
Matching Experiment



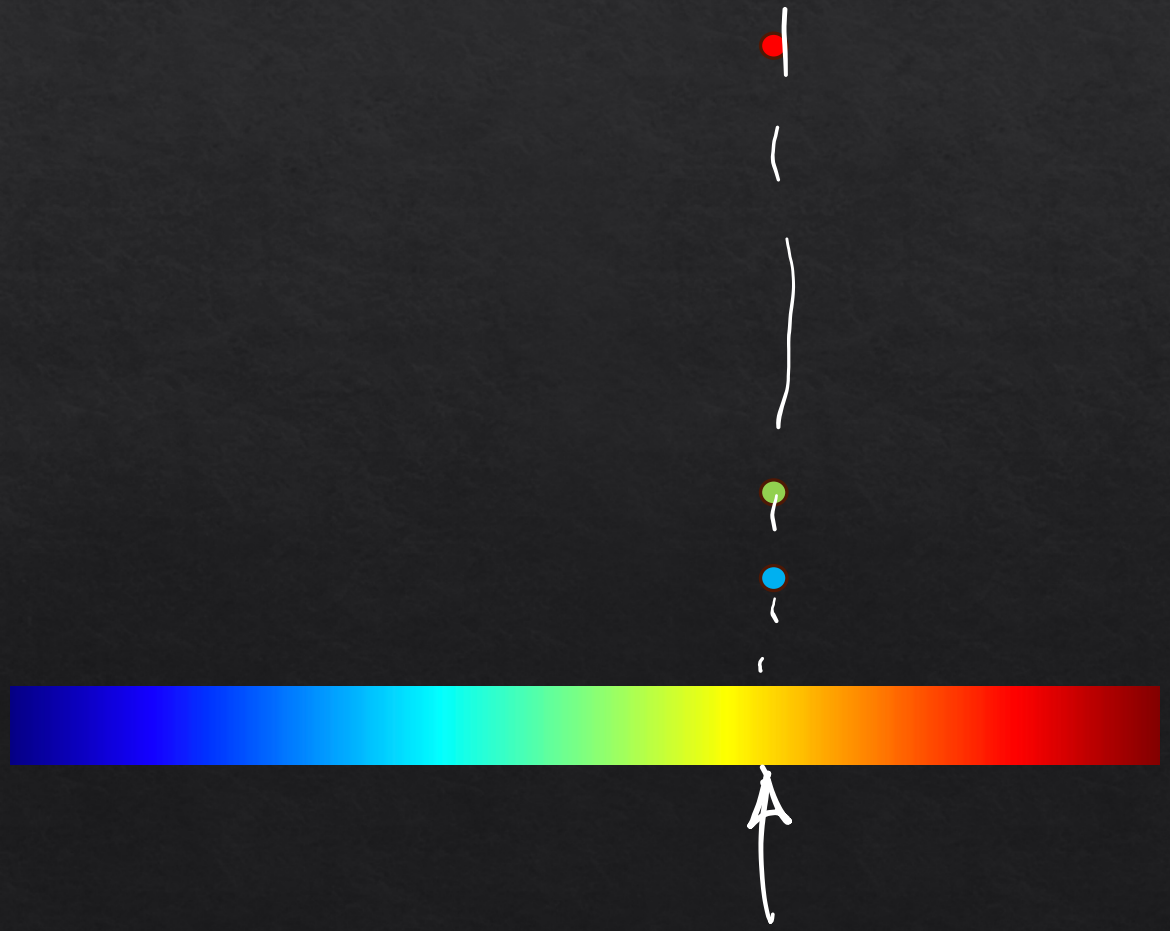
Matching Experiment



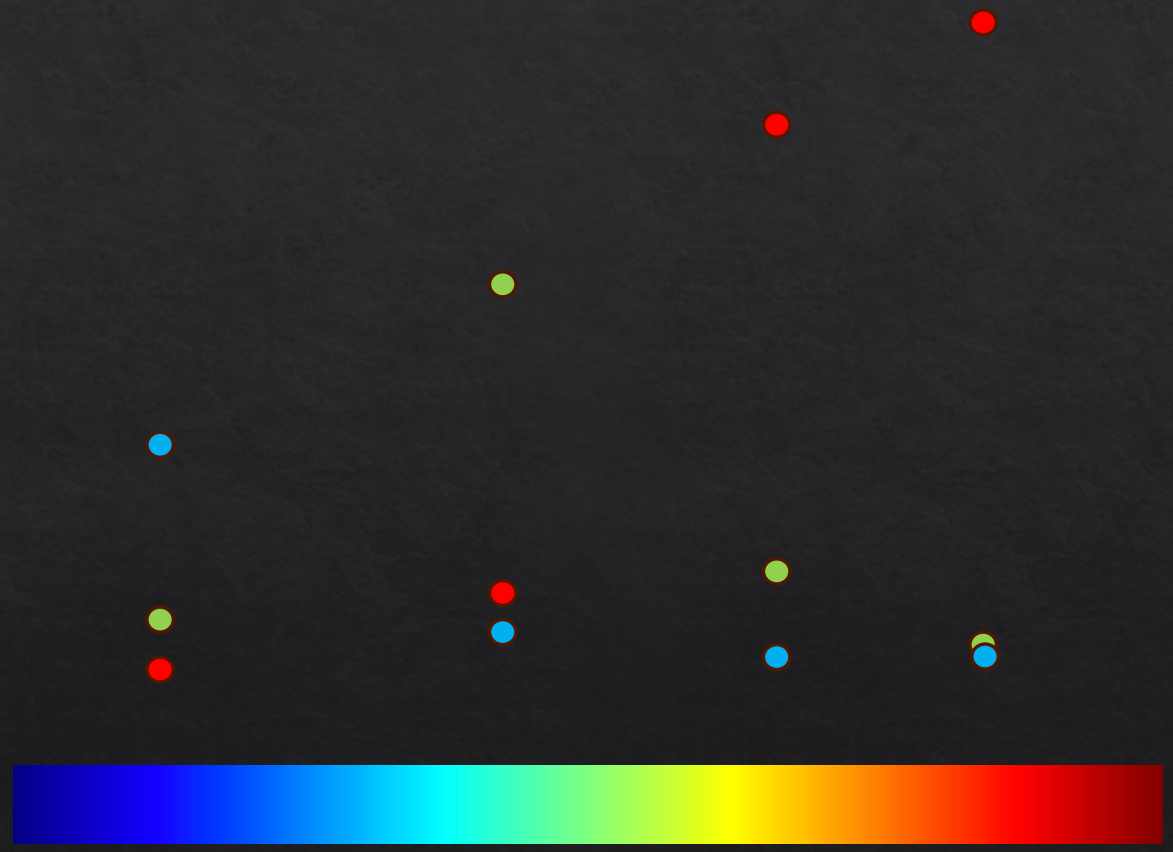
r g b



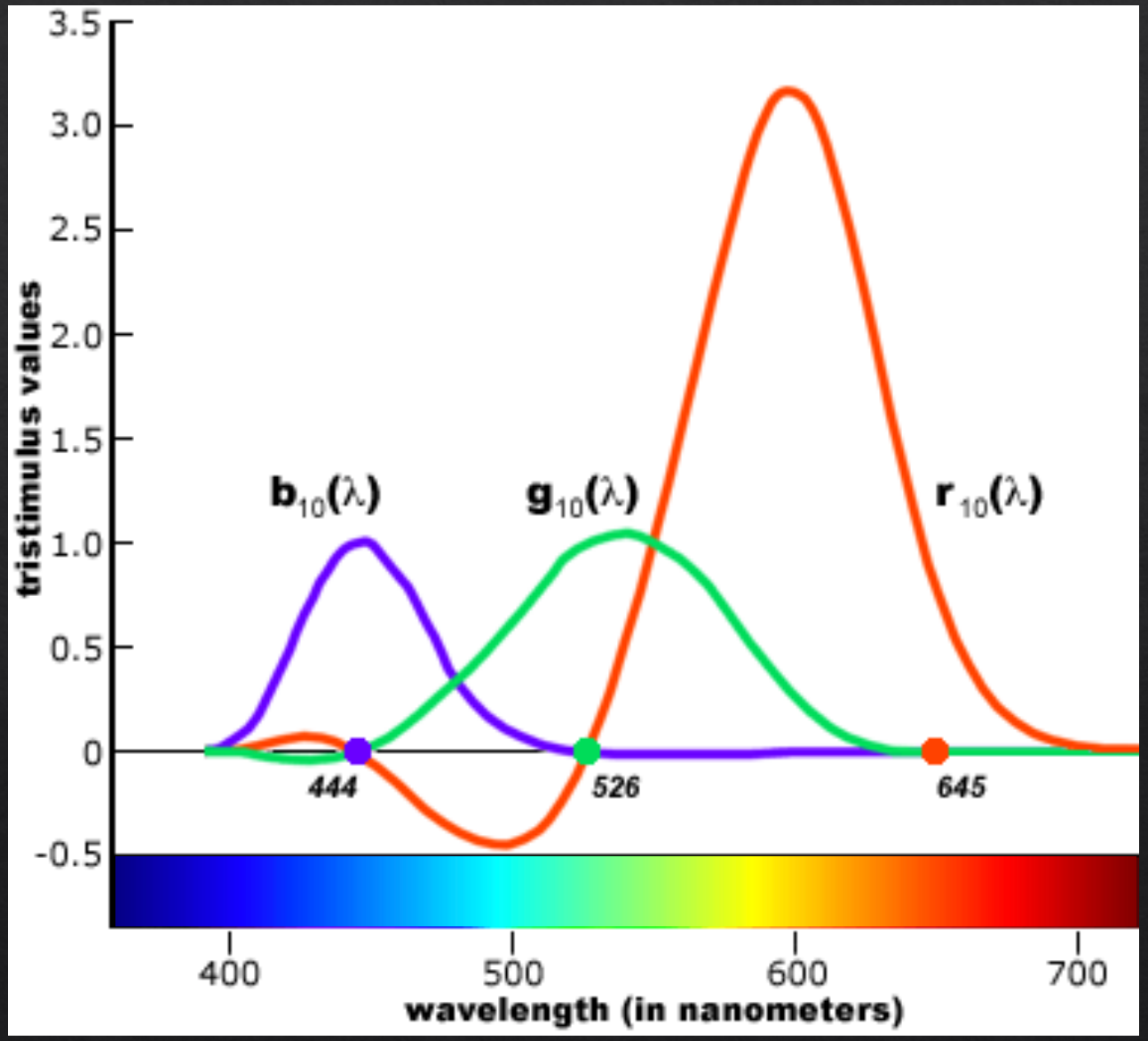
Tristimulus values



Tristimulus values



Tristimulus values



Confusing? Read more here (search for 'Maxwell' on the page) or here

CW1 is out …

Office hours:

Tomorrow, Tue 1-3pm. IF 1.10A

Tutorials:

Week 3 (date/time to be confirmed)

Piazza:

Please use freely. Post privately if necessary …

Next lecture …