

EE 193 Imaging systems: **Human color perception**

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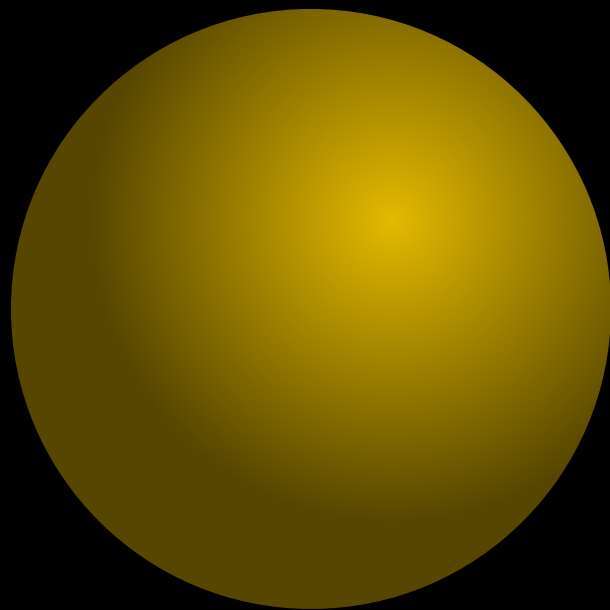
Objectives

Given a multispectral image of a scene and a spectral response curve, predict the appearance of the scene.

Roughly sketch the spectral response curves for L, M and S cones.

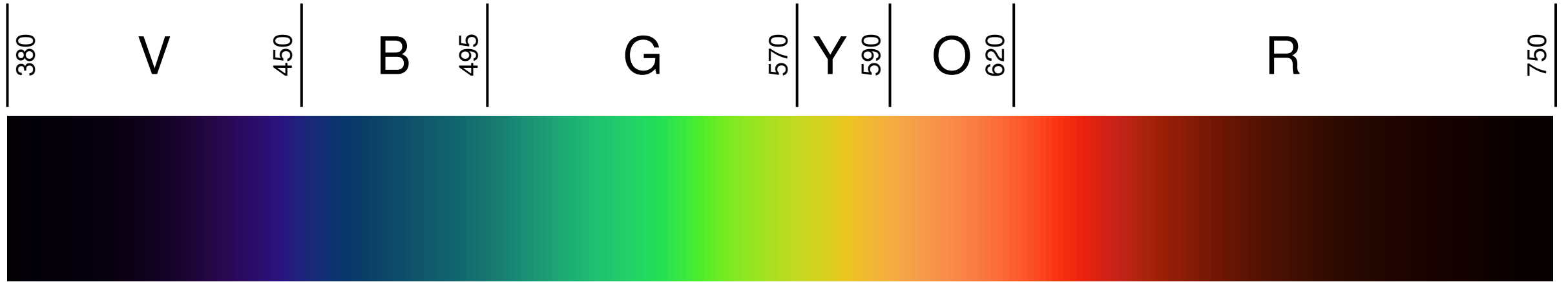
Explain what metamers are and why they occur.

Predict the effect of various forms of color blindness.



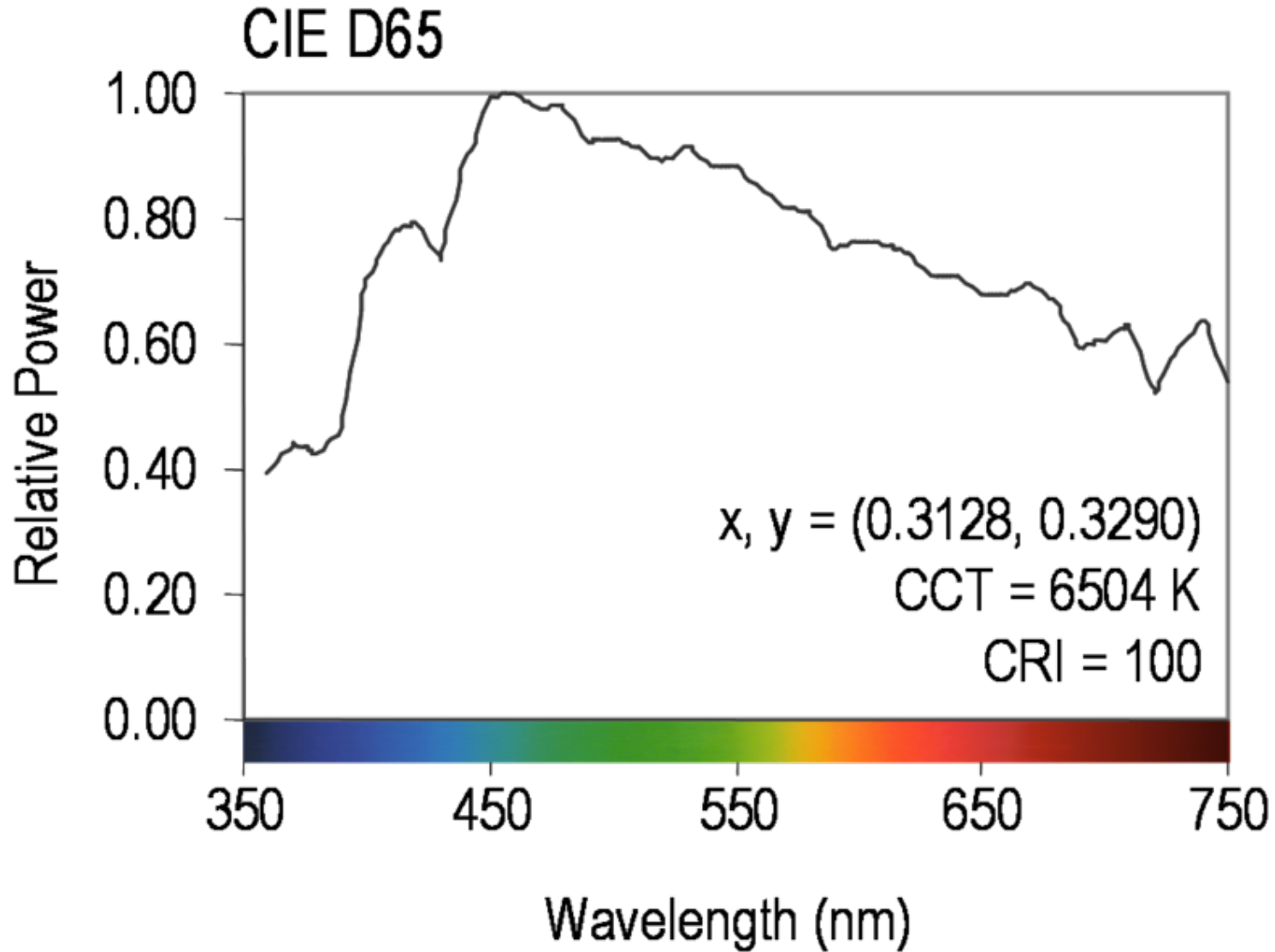
This is a ball.

Wavelength (nm)



(wikipedia)

Daylight (D65)



(wikipedia)

Other spectra

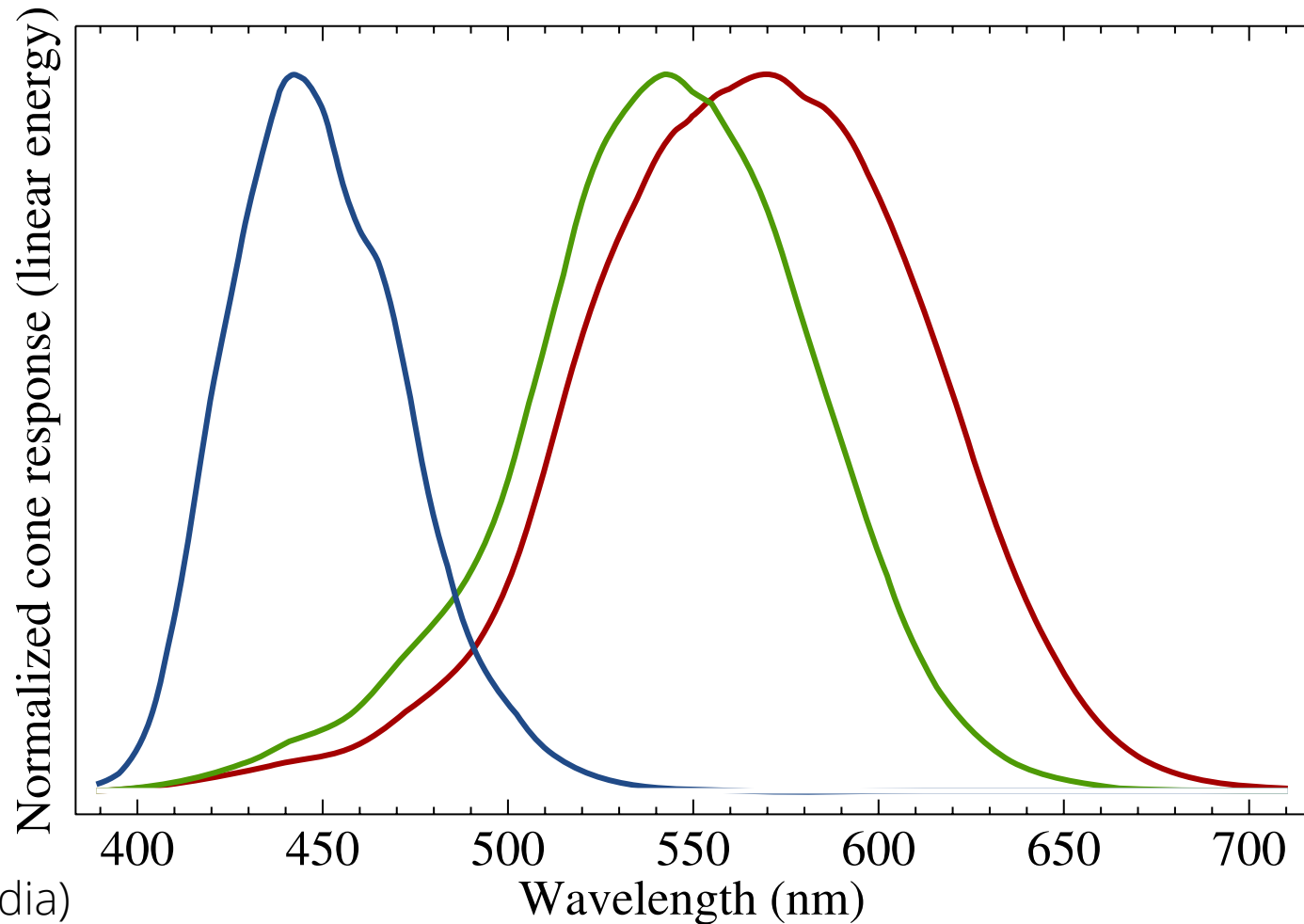
[http://www.chemistryland.com/CHM107Lab/
Exp7/Spectroscope/Spectroscope.html](http://www.chemistryland.com/CHM107Lab/Exp7/Spectroscope/Spectroscope.html)

Reflectance

Surfaces reflect wavelengths differently

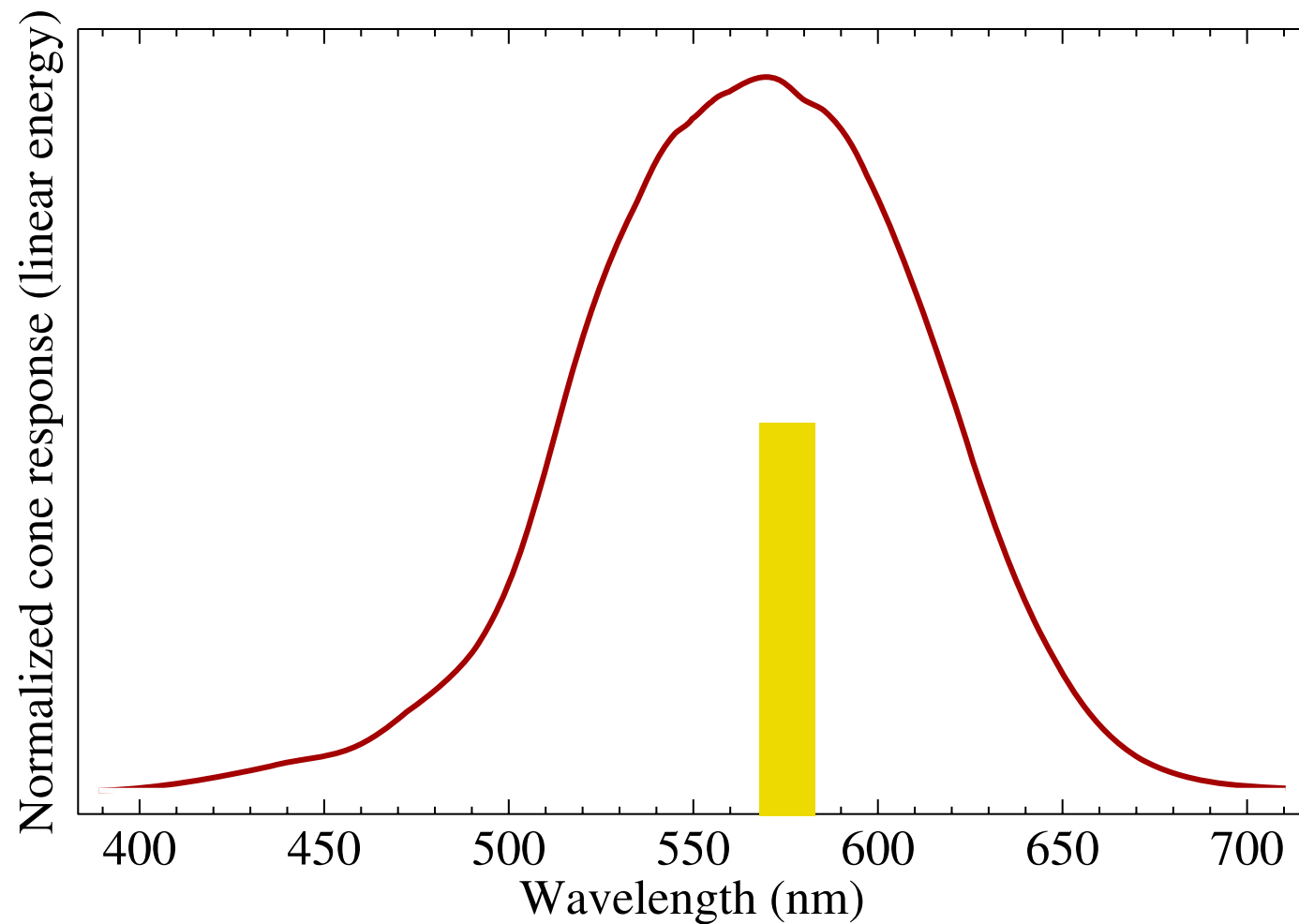
Seeing color

The eye has 3 types of cones: "long", "medium", and "short"



(modified from Wikipedia)

Cone response

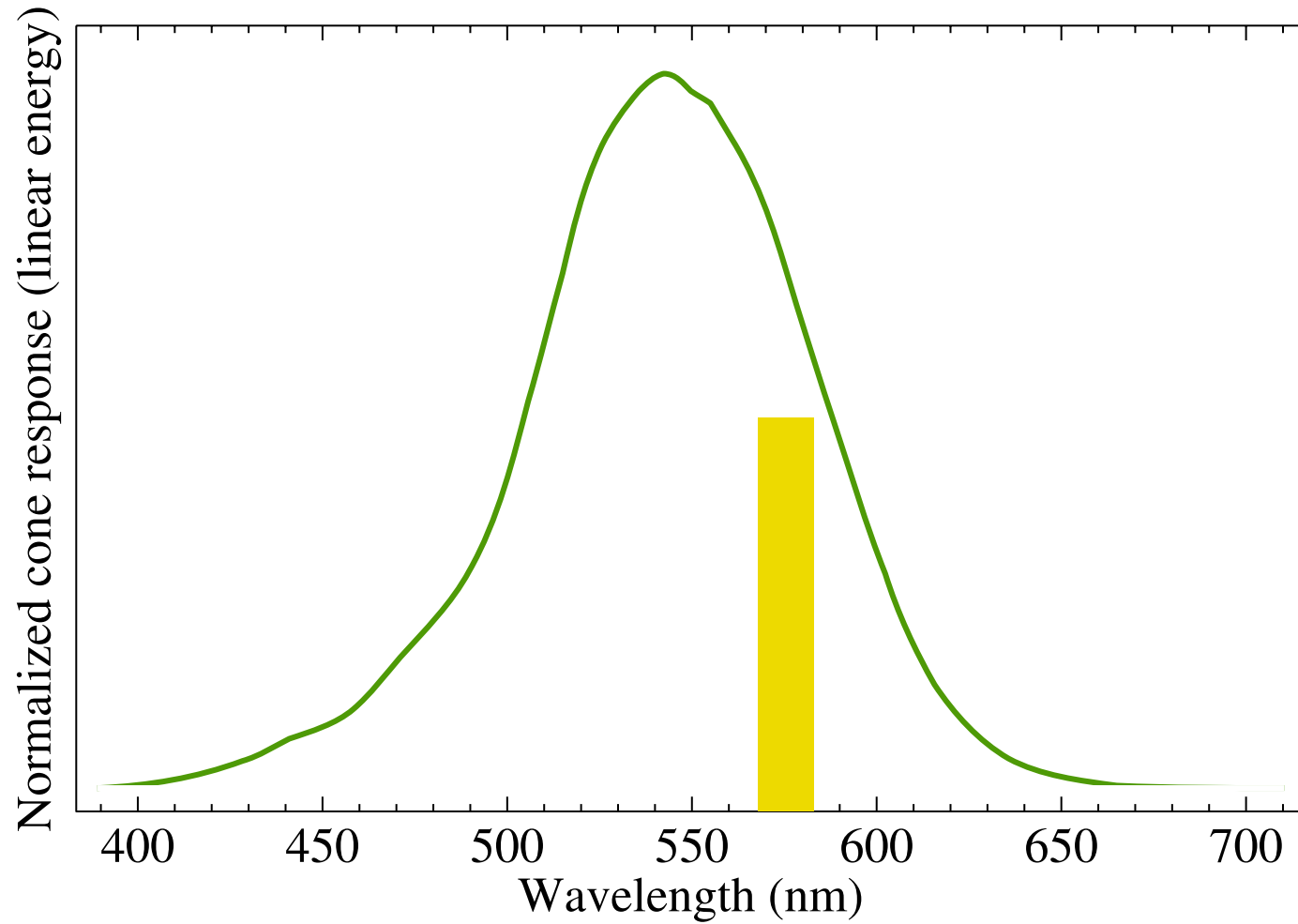


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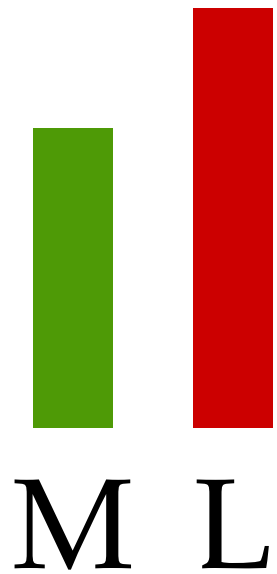


L

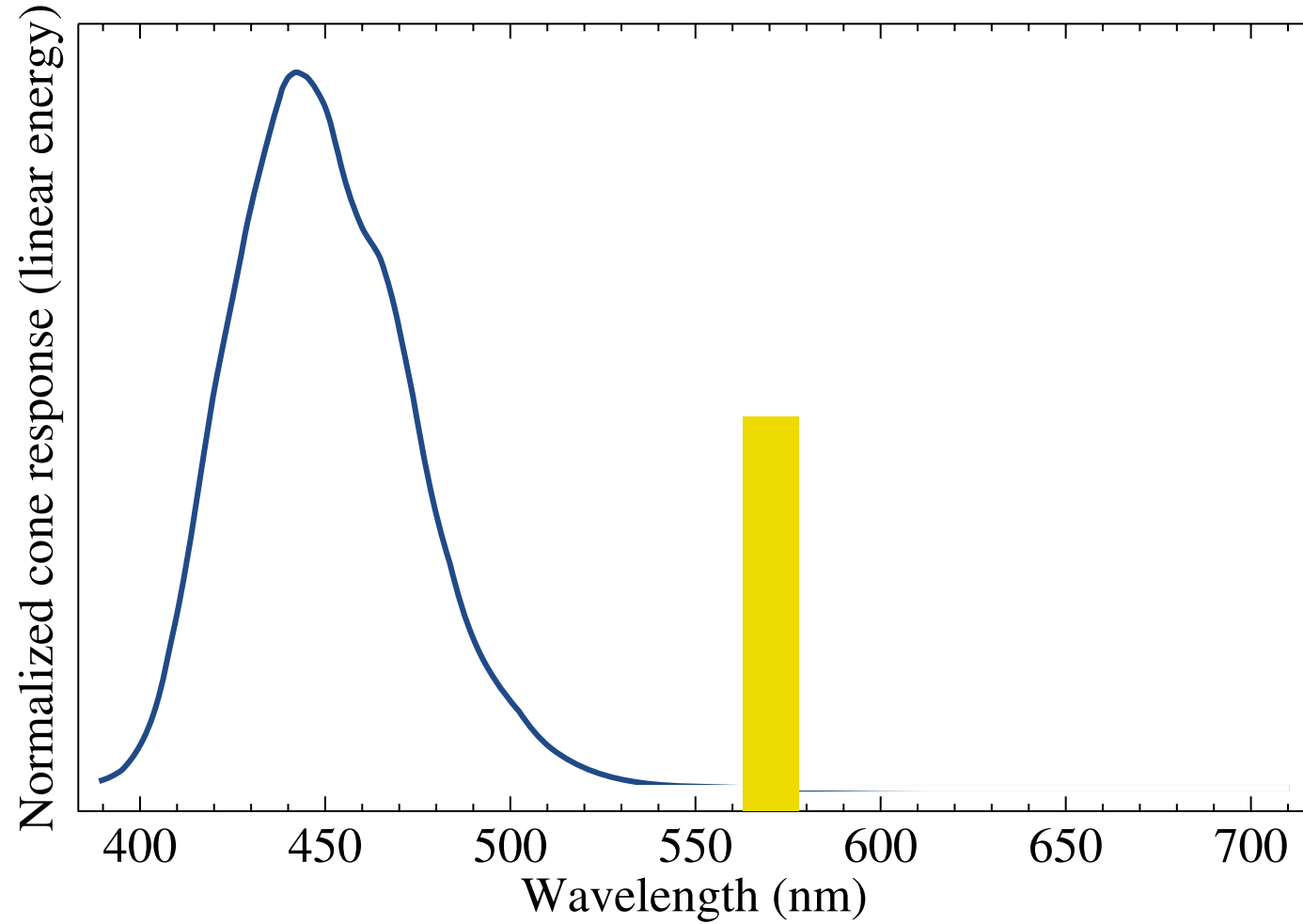
Medium cone response



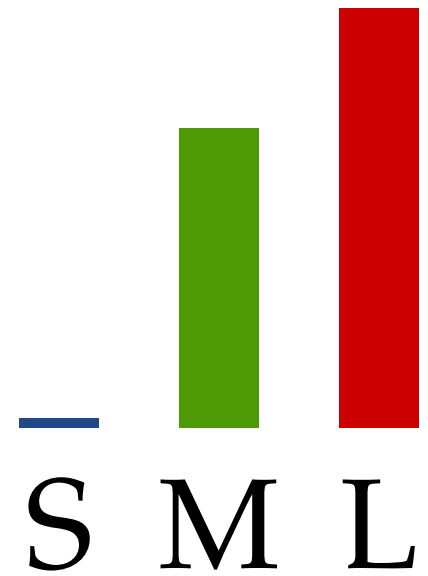
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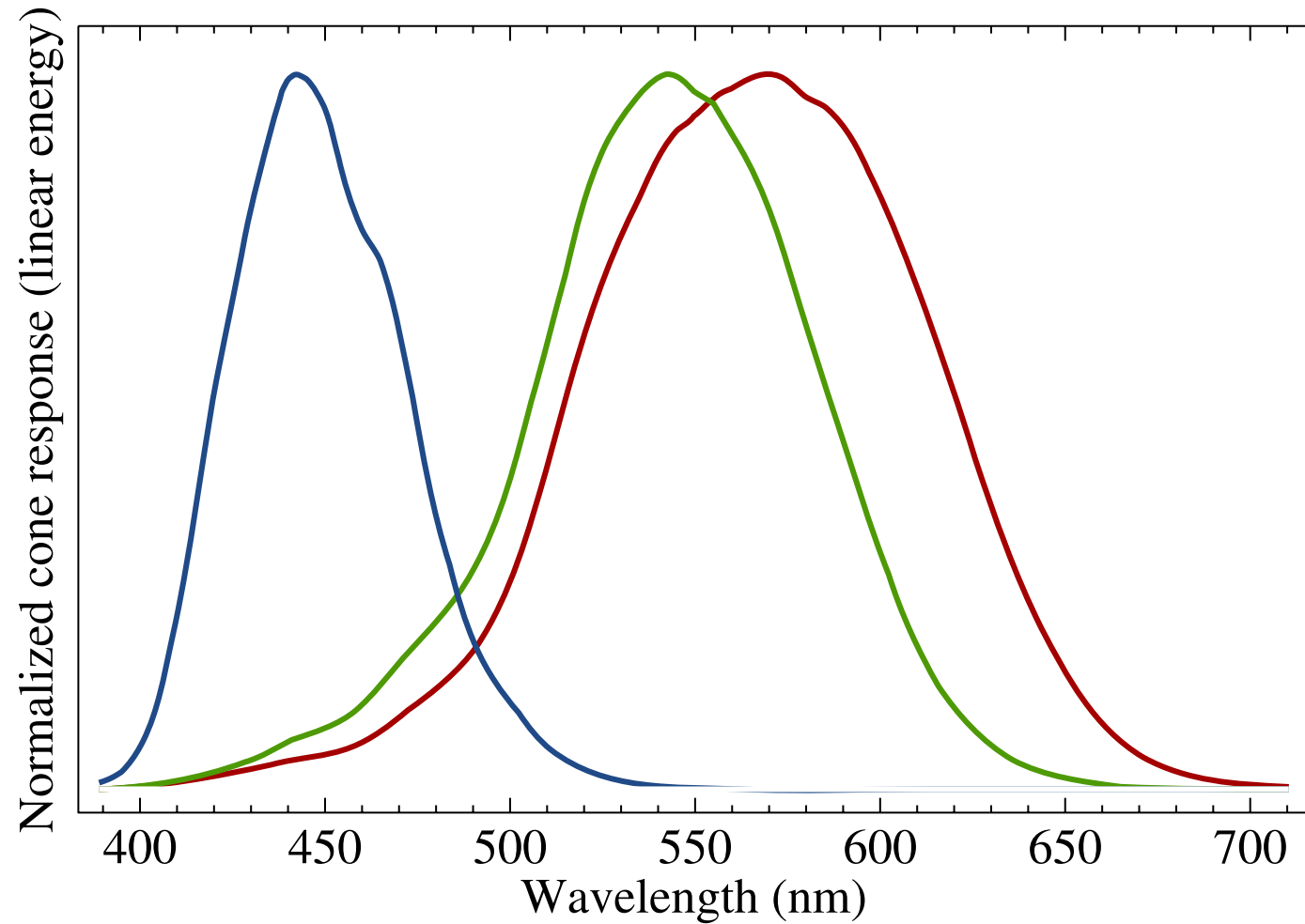
Short cone response

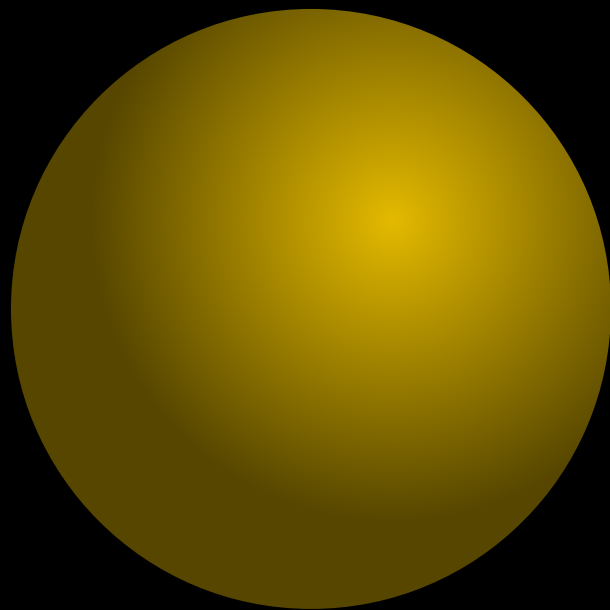


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More cone responses

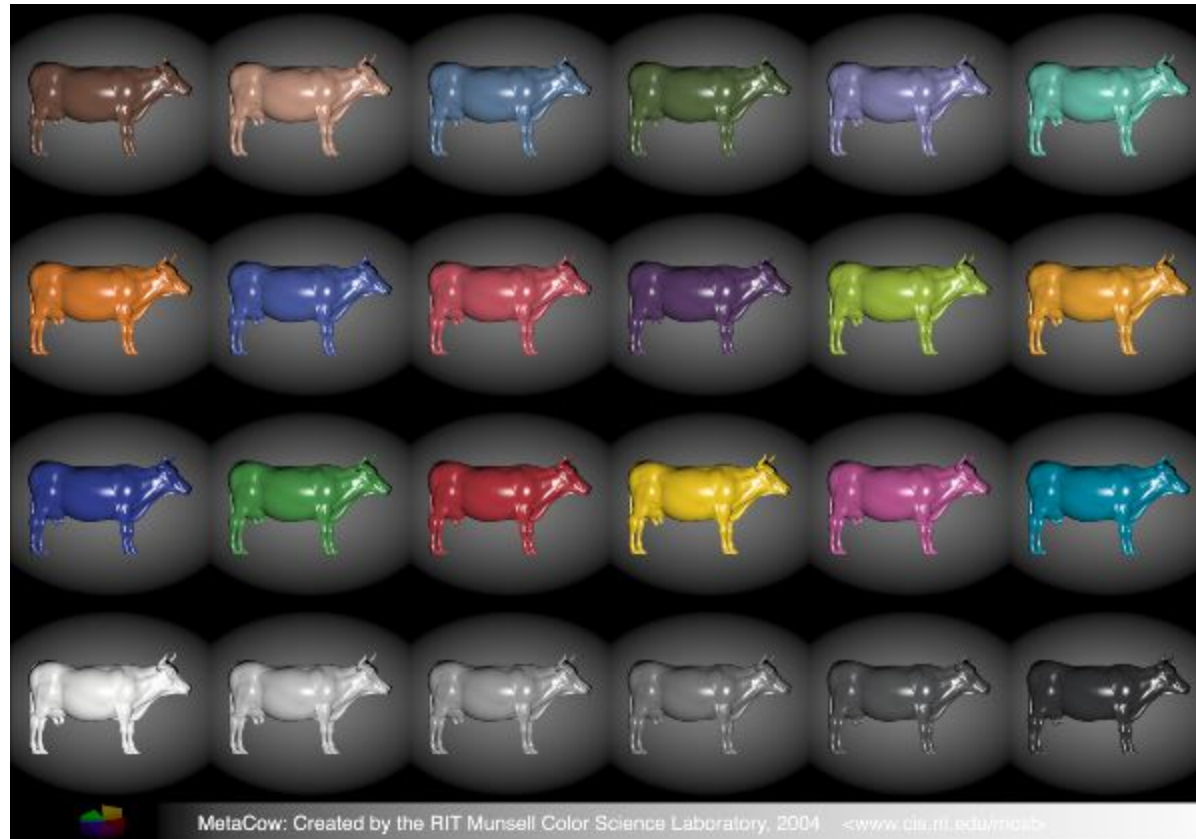




This is a ball.

Metamers

Any two objects with different spectra but identical cone responses are called metamers.



(MetaCow under
D65 illumination)

Metamers

Any two objects with different spectra but identical cone responses are called metamers.



(MetaCow under
Illuminant A)

Metamers and lighting

Given what you know about metamers and light, how should we design lighting to make things "look good"?

What are "good spectra" for our light bulbs to have?

Fluorescent spectra

Fluorescent bulbs work by exciting a mix of gases.

LED spectra

LEDs emit more or less pure wavelengths.

How do we get white?

Color blindness

What would happen if you were missing your L cones?