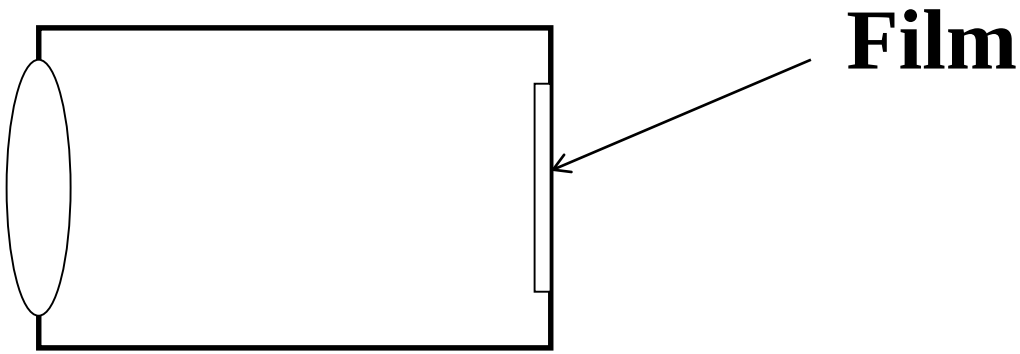
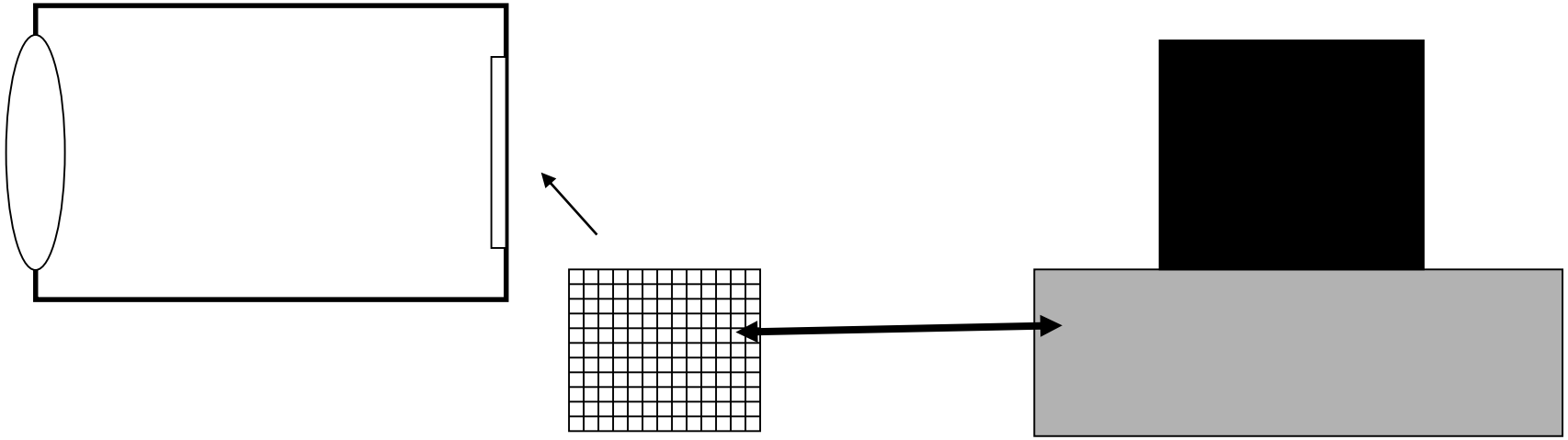
Seeing the light…

… Vision and Illusion

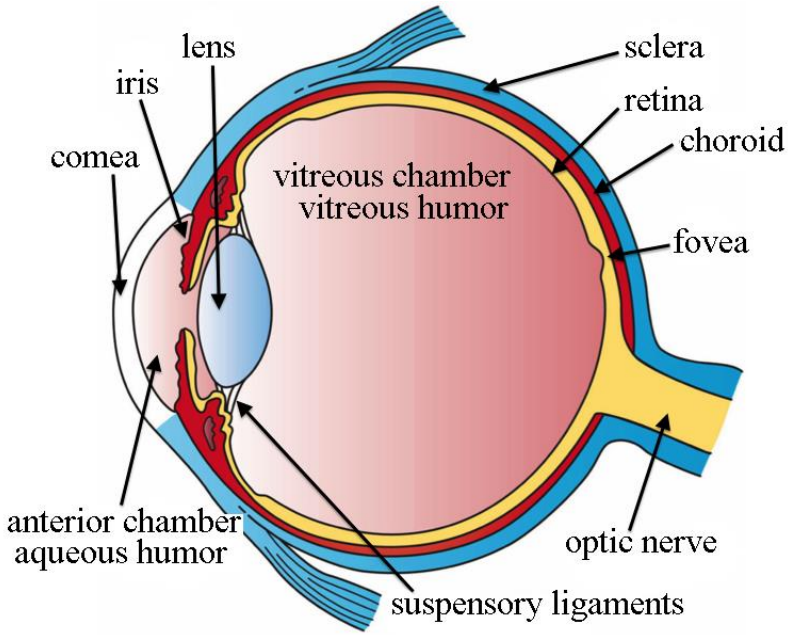
Camera





Basic Structure of the eye

The human eye is shaped roughly like a ball.



The cornea and lens act together to produce an image on the screen called the retina.

Focus is accomplished by adjusting the shape of the lens.

The iris adjusts the amount of light entering.

The retina is a remarkable piece of work that produces electrical signals sent to the brain for interpretation.

The Retina

The retina is covered with light detectors of two types.

Rods and Cones Image:

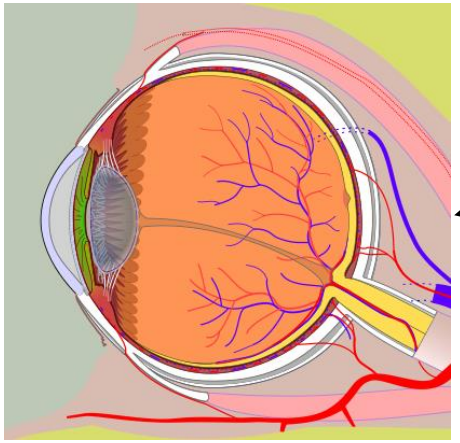
https://commons.wikimedia.org/wiki/File:1414_Rods_and_Cones.jpg

Rods can detect low intensity light but see only intensity – not color. 120 million of them!

Cones detect color but need brighter light. 6 million.

Cones are more concentrated near center of vision in the area called the fovea. Rods are more concentrated further from the fovea.

Your eye is a camera!



Retina: Millions of light detectors (rods and cones)

Optic Nerve

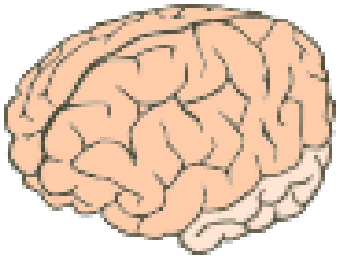
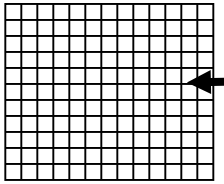
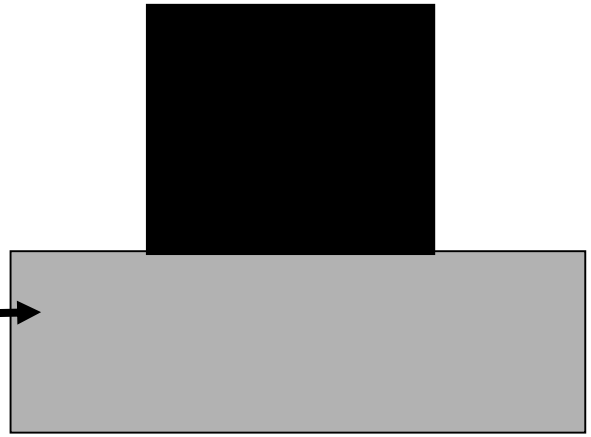


Diagram by Jmarchn

CCD: Millions of light detectors



USB

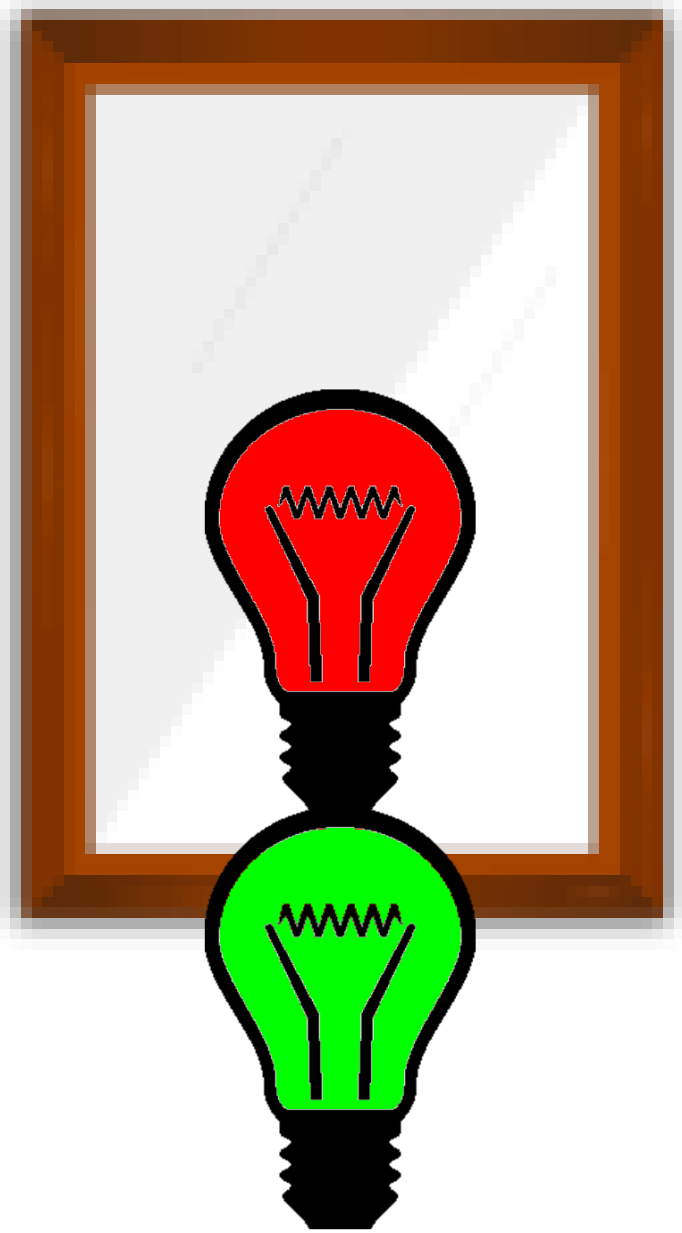


One Way Mirror

Impossible! Can't make a mirror that lets light go one way but not the other. Reversibility of light rays!

So how do they work?

Can you explain this one now?

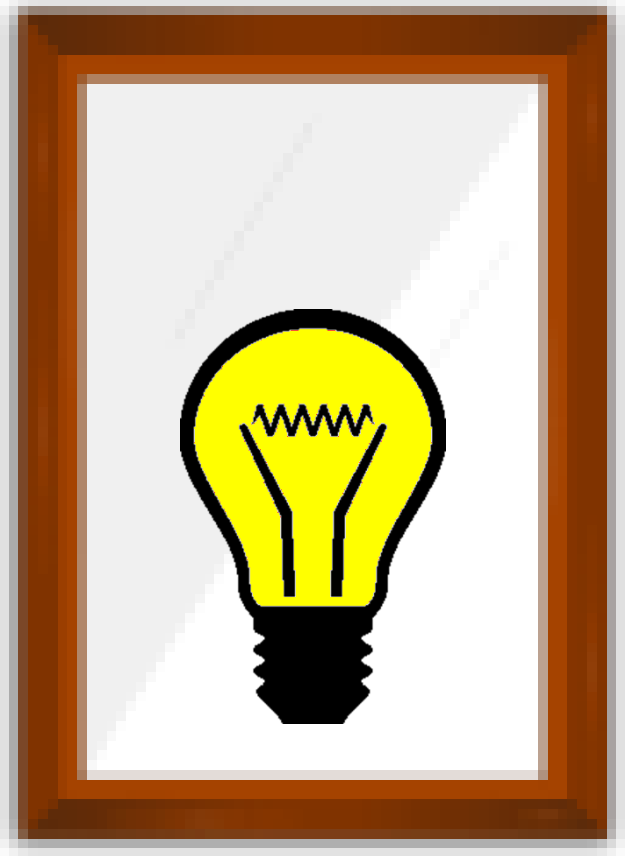


Can you explain this one now?

R + G = Y

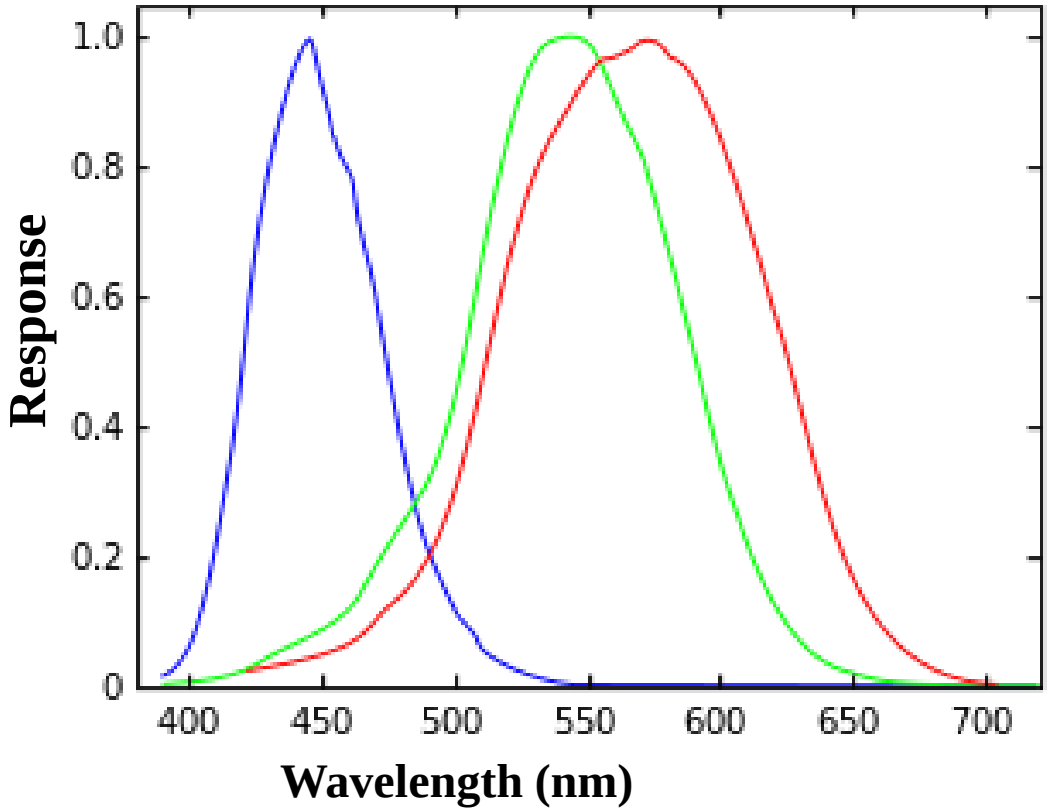
But they don't! This is FAKE yellow!

("perceptive" yellow)



Rods and Cones

Most people have three kinds of cones: RGB

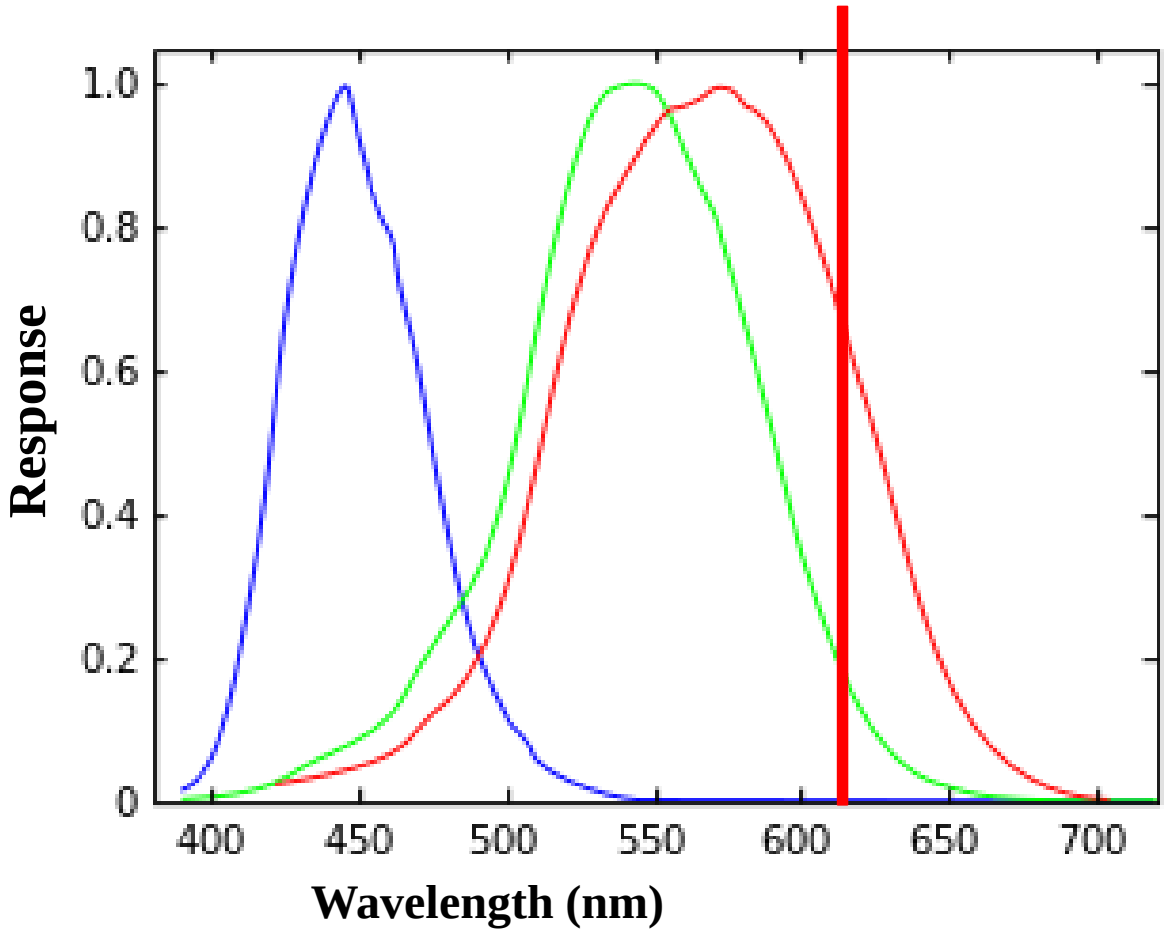


Colours are identified by the response they cause in these three kinds of cones.

Can thus imitate the colours by causing the same response in the cones.

Diagram adapted from the Wikipedia article on cone cells. Vanessaezekowitz at en.wikipedia

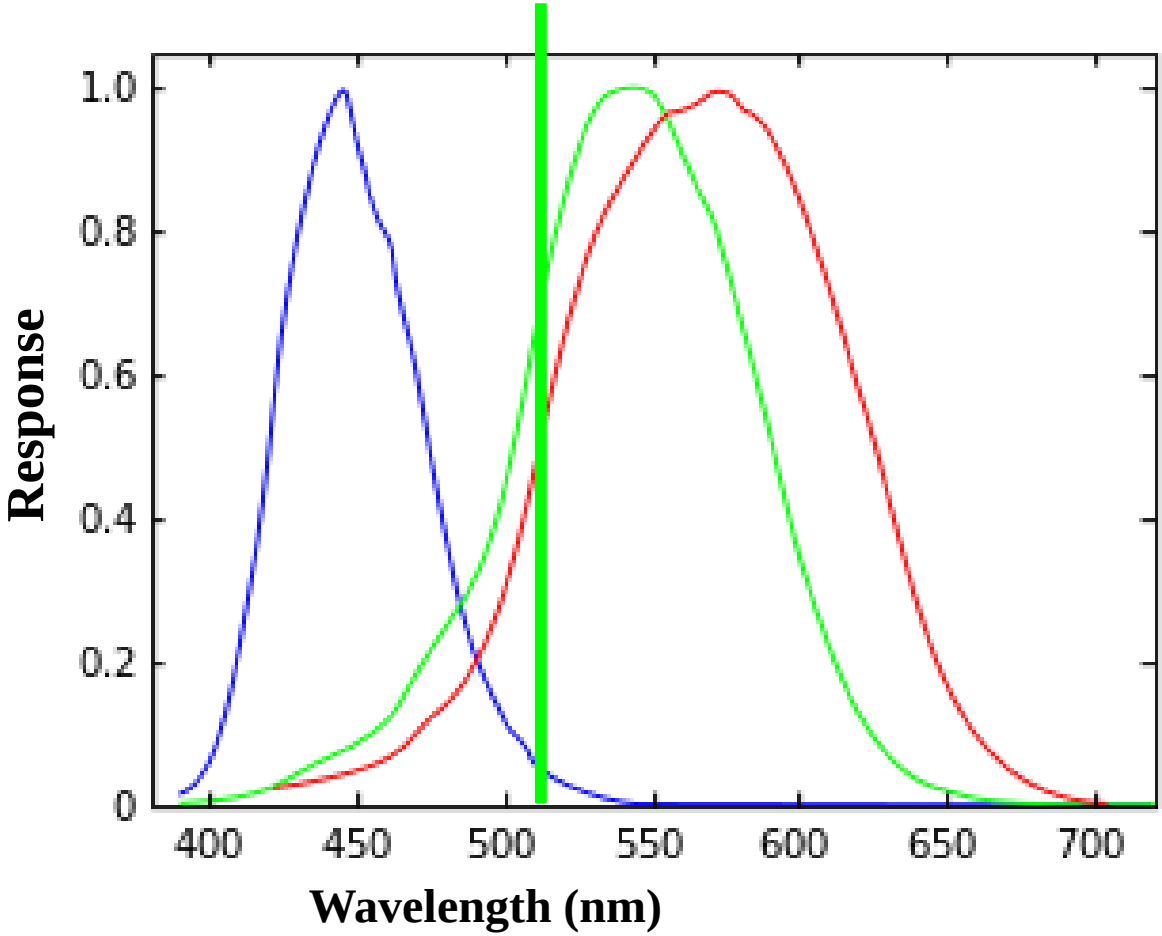
Rods and Cones



Red cones send data to the brain.

<u>Diagram</u> adapted from the Wikipedia article on cone cells.
Vanessaezekowitz at en.wikipedia

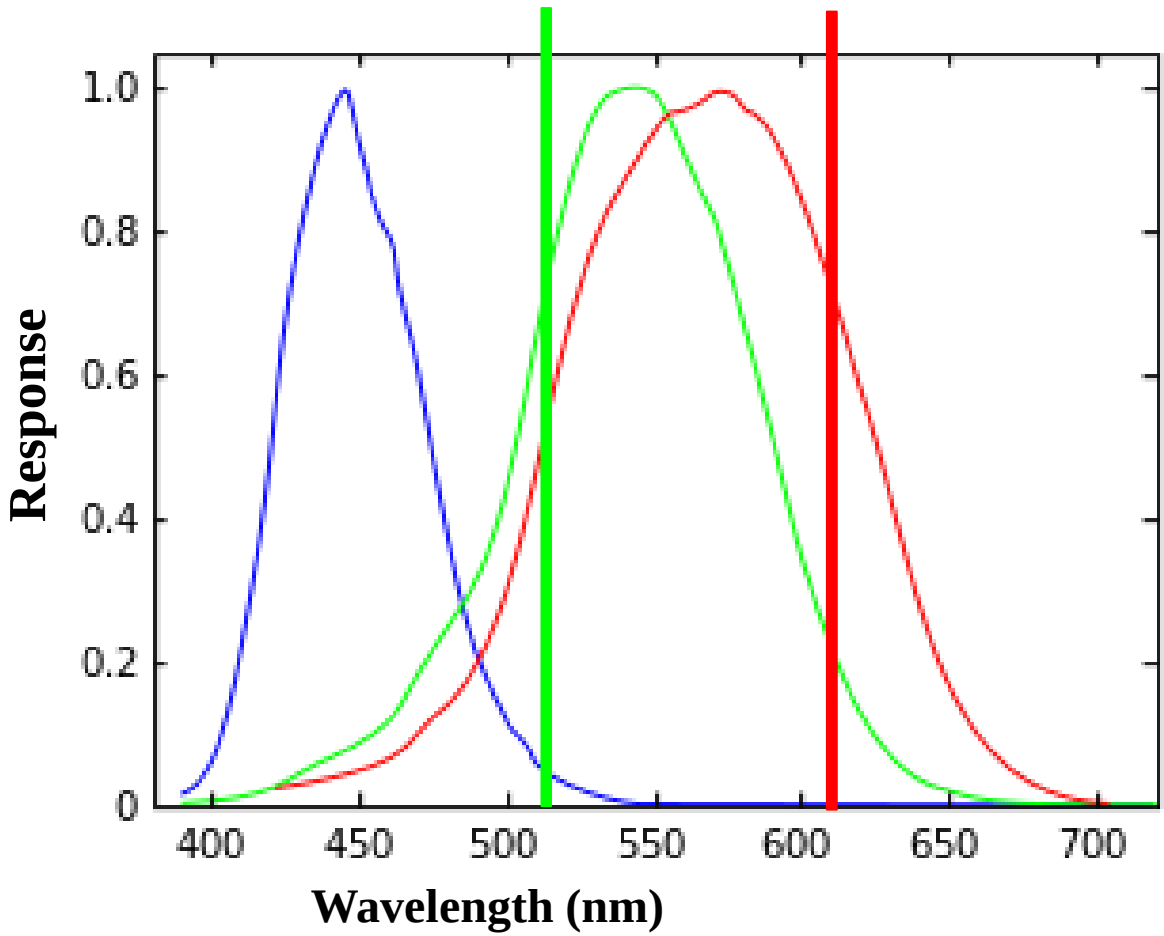
Rods and Cones



Green cones send data to the brain.

<u>Diagram</u> adapted from the Wikipedia article on cone cells.
Vanessaezekowitz at en.wikipedia

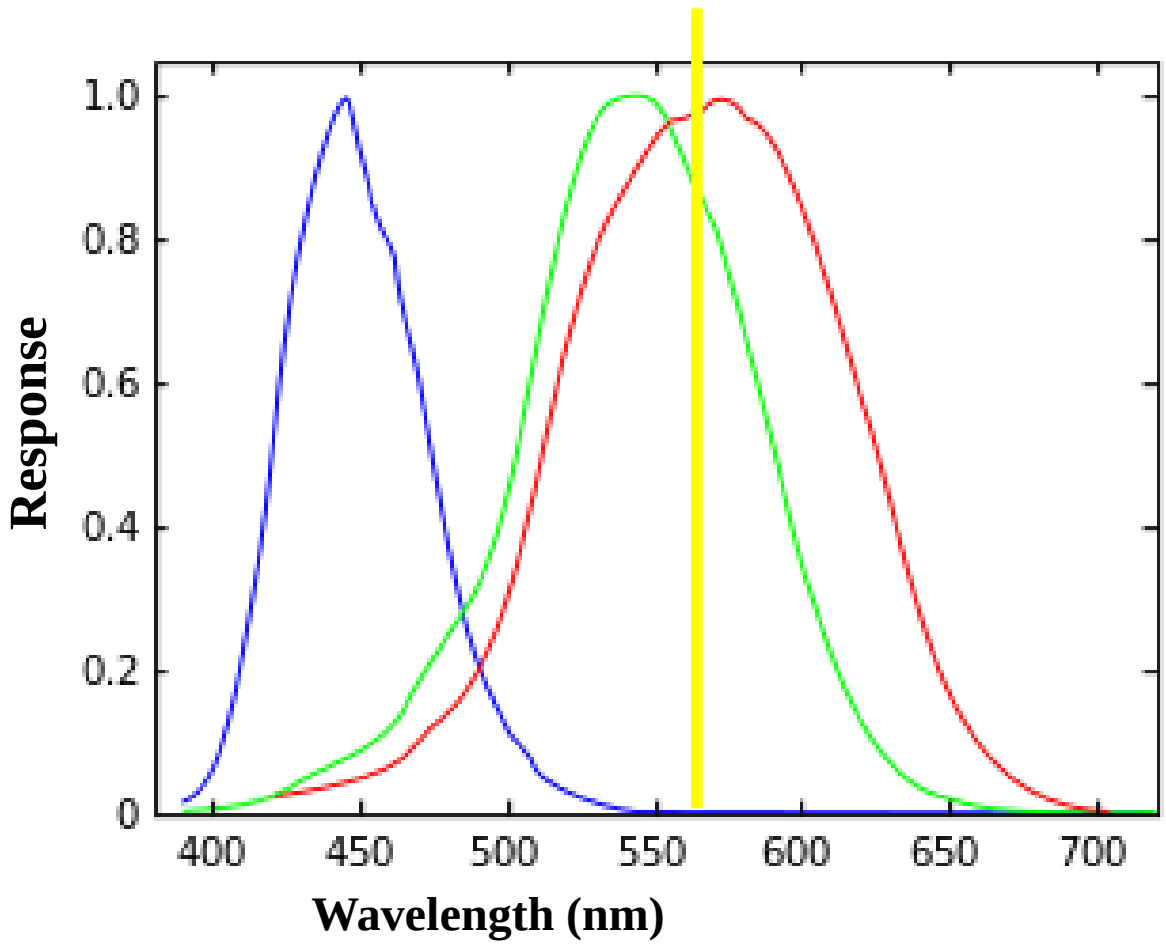
Rods and Cones



Red and Green cones send data to the brain.

<u>Diagram</u> adapted from the Wikipedia article on cone cells. Vanessaezekowitz at en.wikipedia

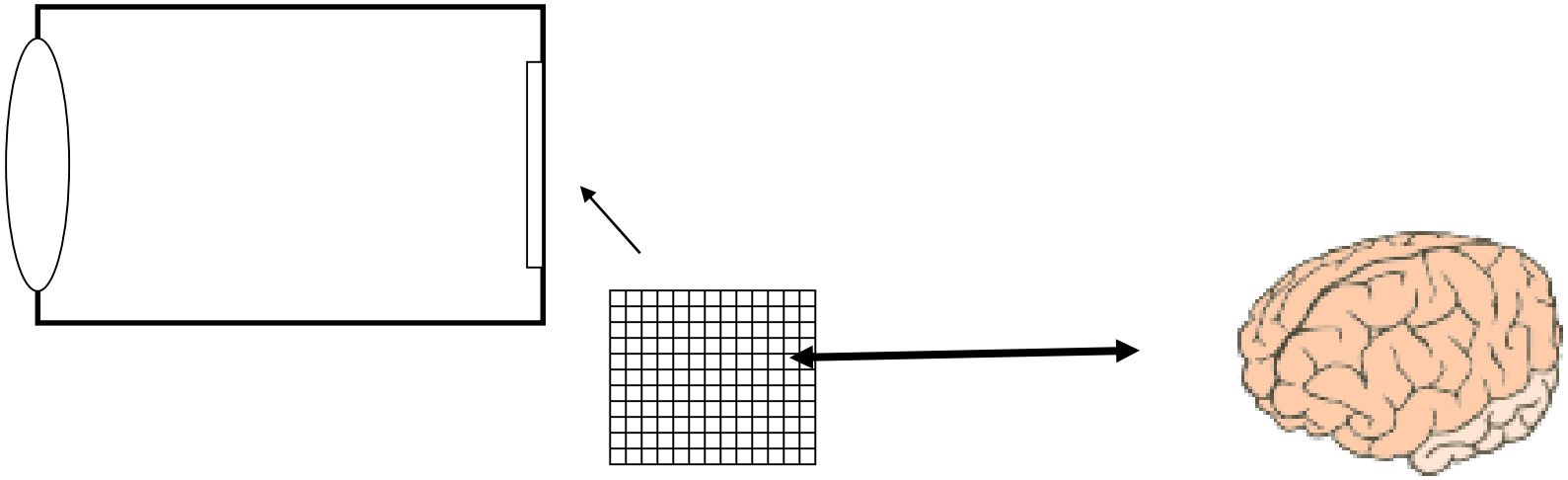
Rods and Cones



Red and Green cones send data to the brain.

Diagram adapted from the Wikipedia article on cone cells. Vanessaezekowitz at en.wikipedia

Why we need engineers



Seeing the light…

… Vision and Illusion