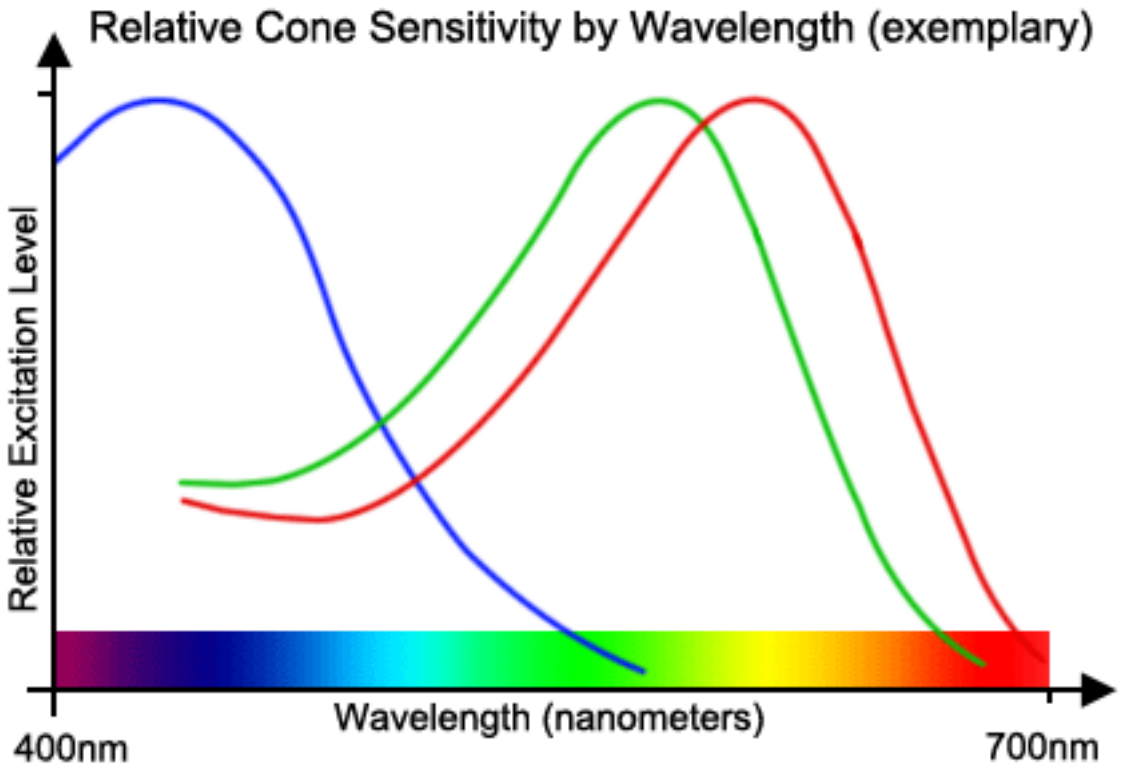
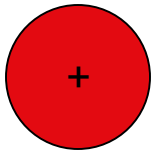
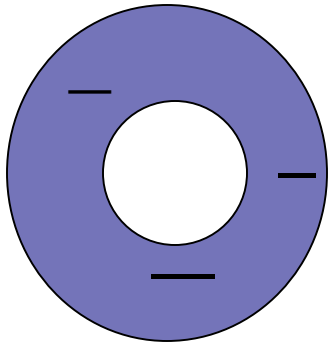
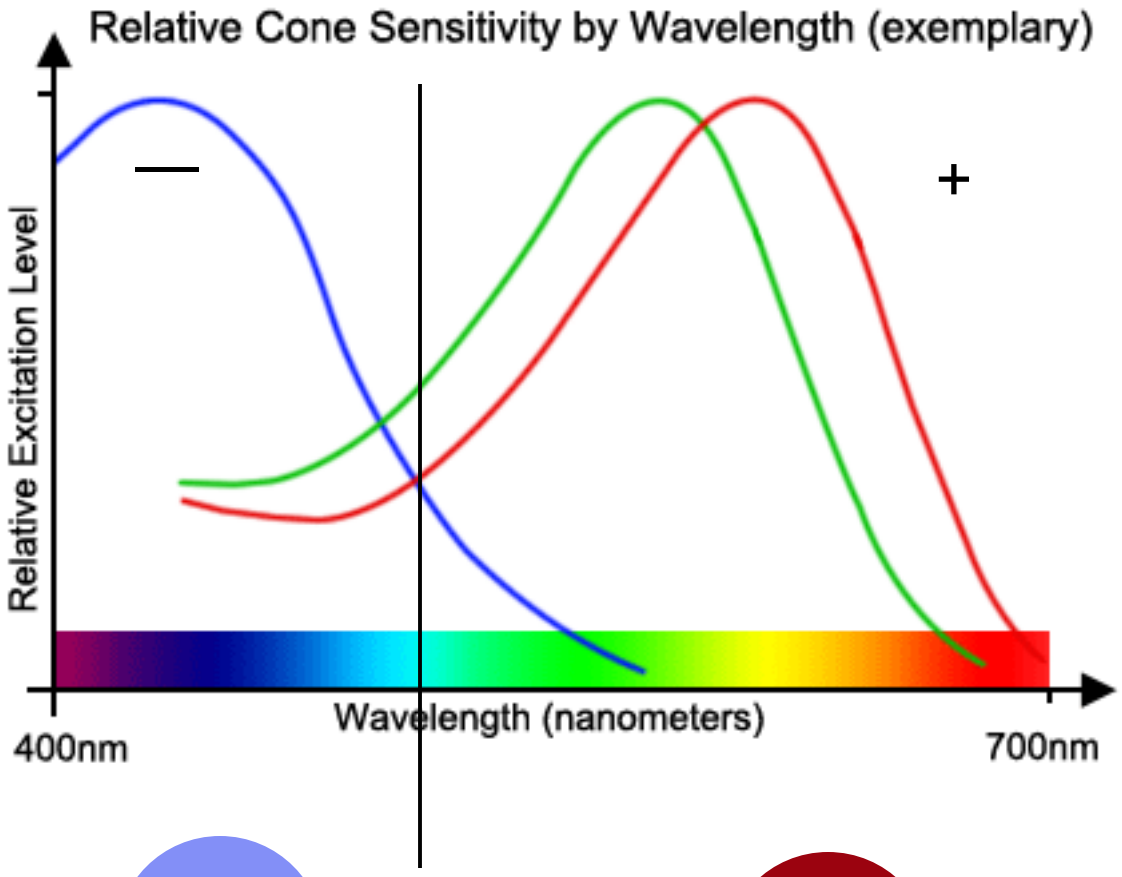




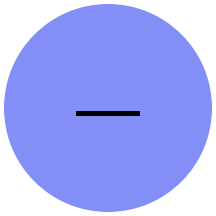


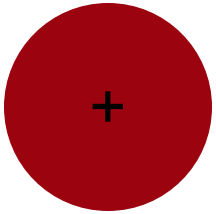
In a center-surround cell of any kind, you have two receptive fields, one the small center region, the other the surround region.

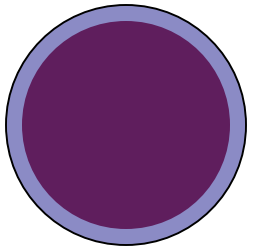
In a chromatic center-surround field, each in innervated by one class of receptor, and their signals are antagonistic

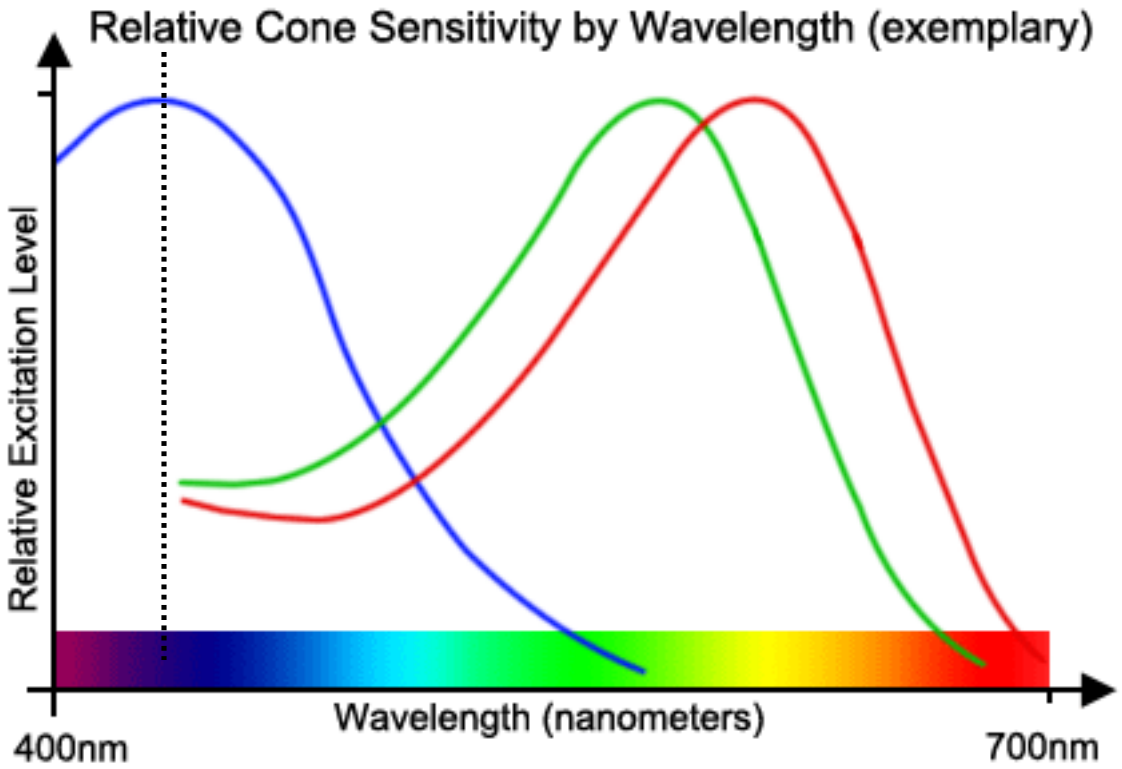


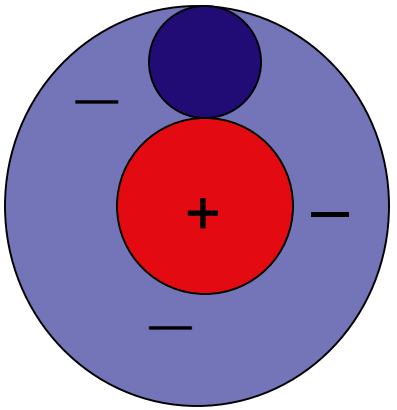
If you took the input from 2 different cones, each with the same receptive field, and connected them to single neuron, you would have a neuron that signaled *wavelength contrast (but not across any space.)*







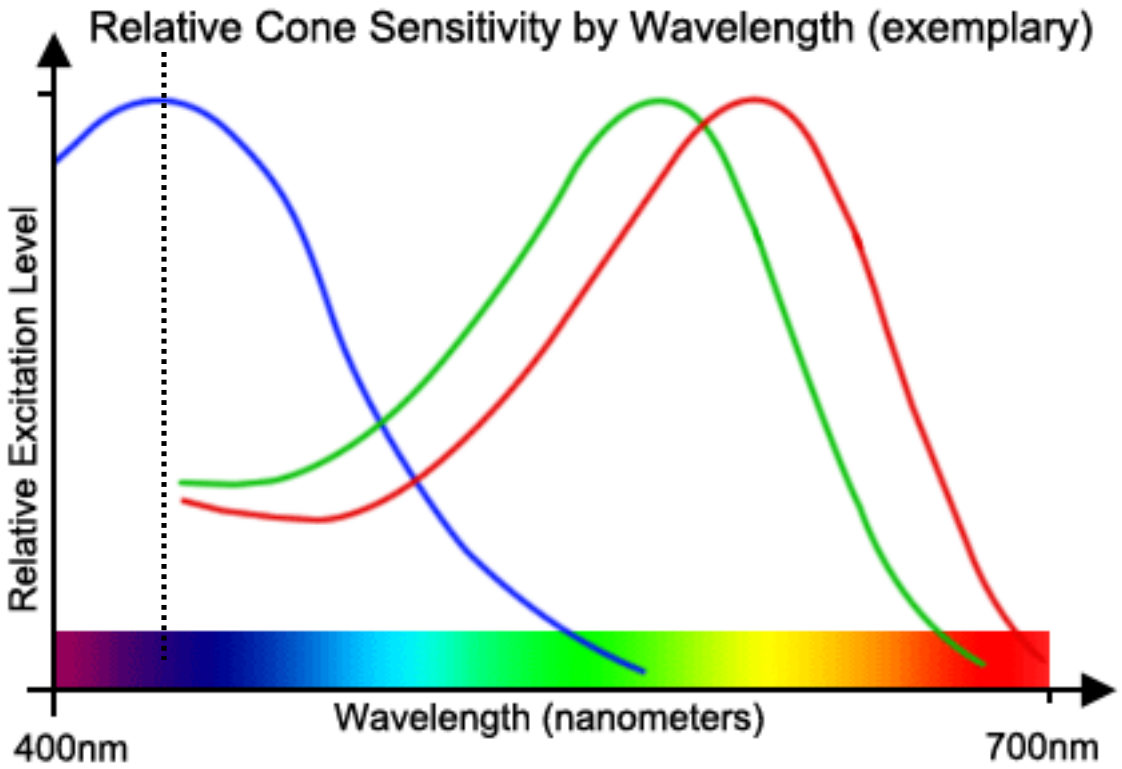


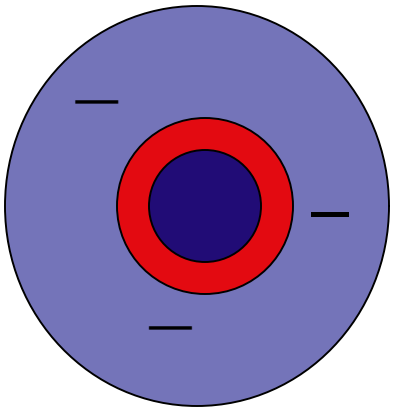


With a blue light in the surround, the surround provides inhibition.

100% blue surround inhibition; no center excitation.

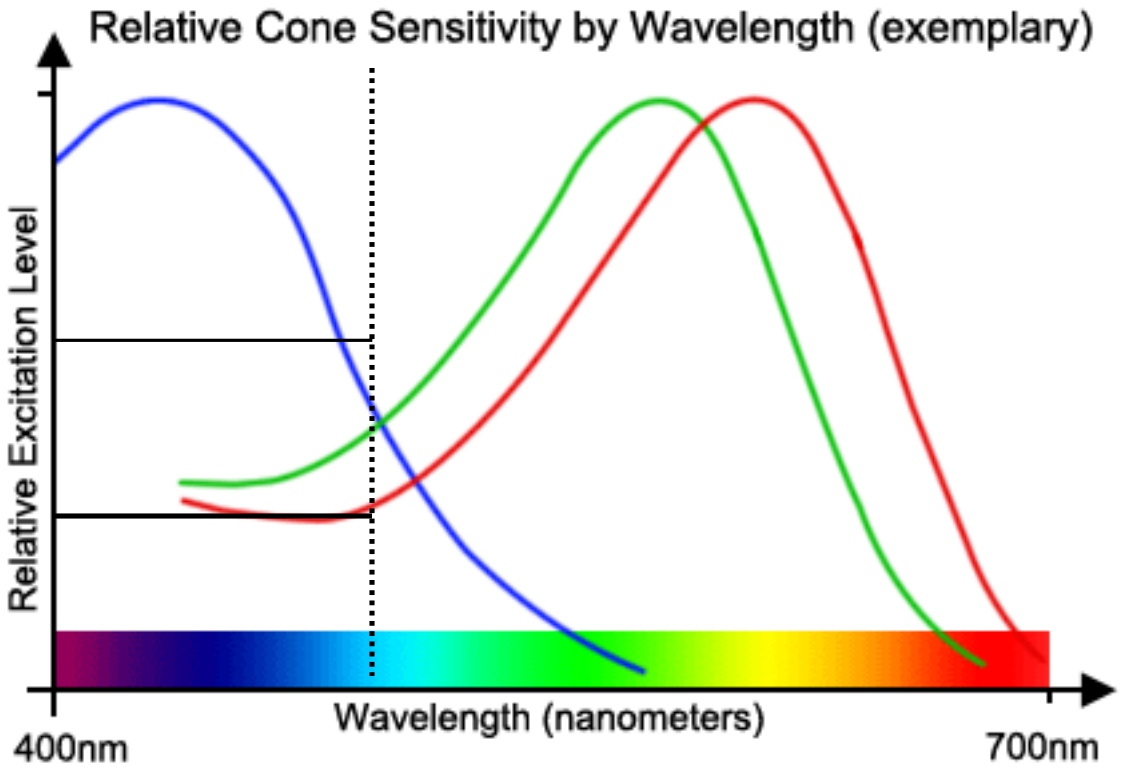
Entire cell = No firing (-100%)

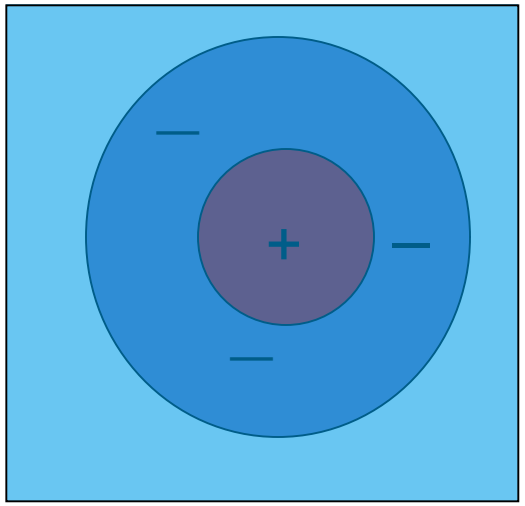




With a blue light in the center, there is no excitation.

Entire cell = no change to base rate

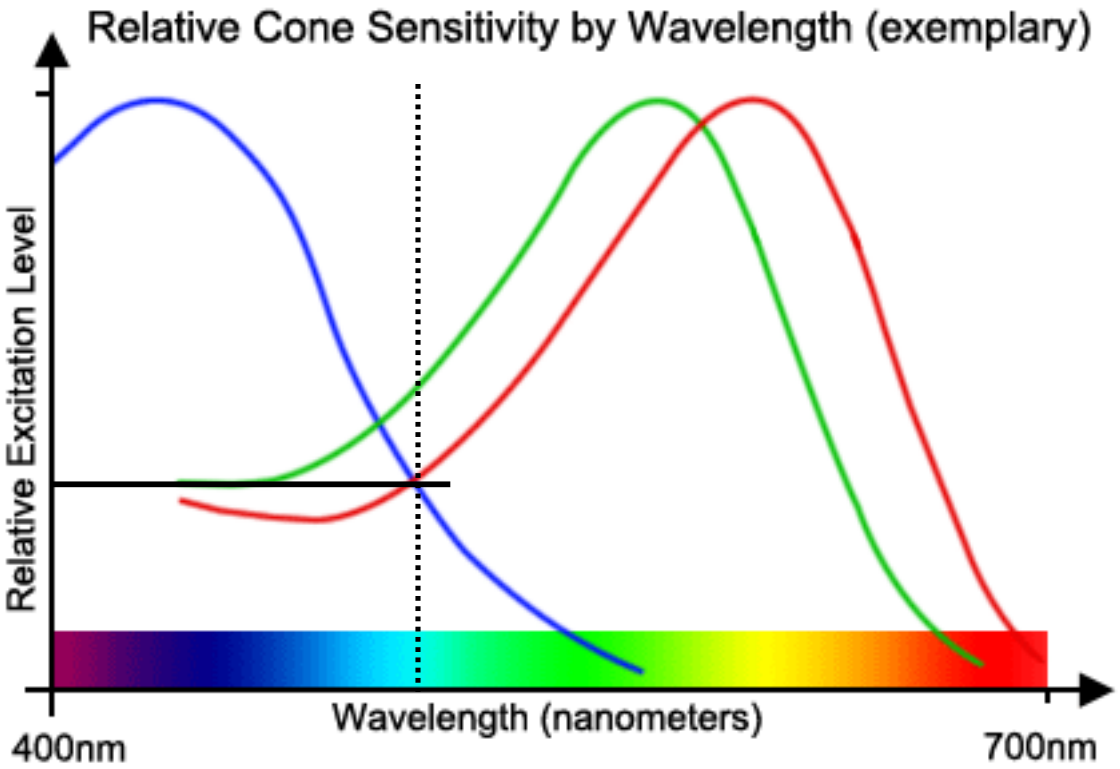


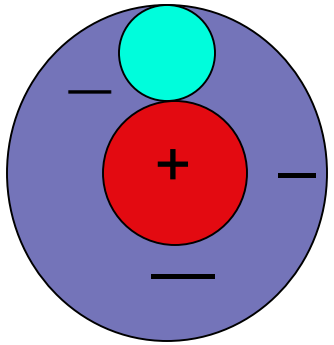


With a sky blue light in the surround, the surround provides inhibition (55%).

With the sky blue light in the center, the center provides 10 % excitation

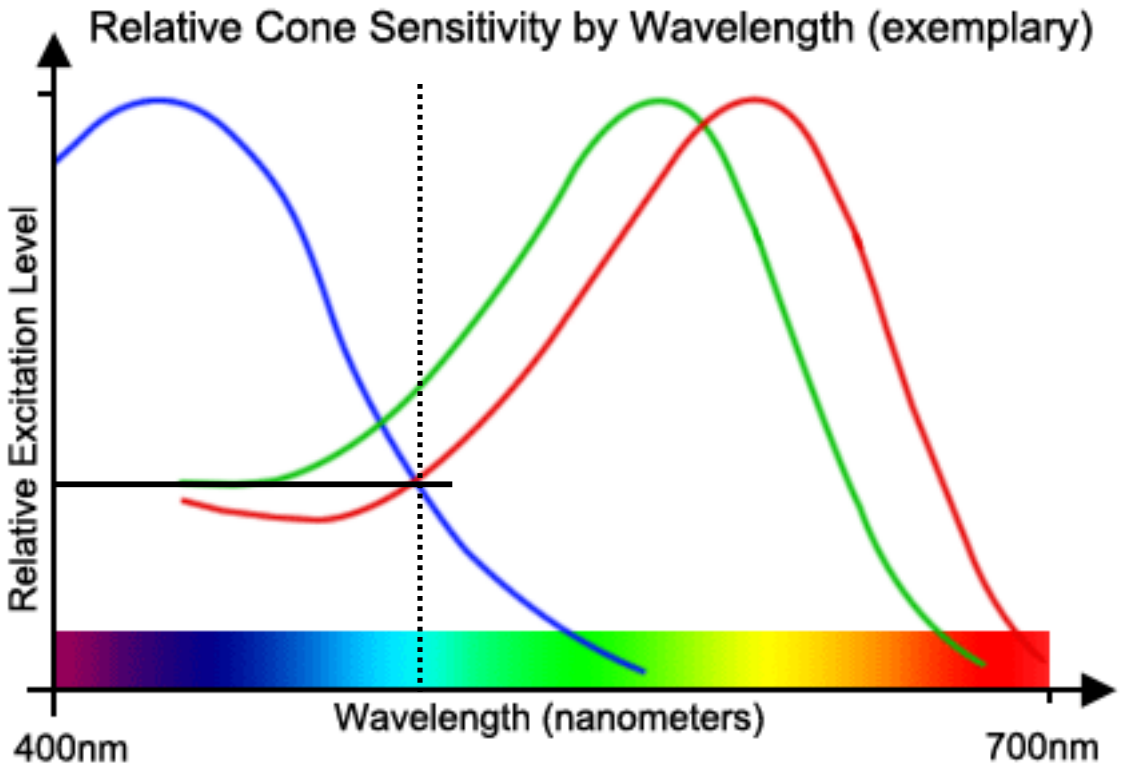
Entire cell = - 40%

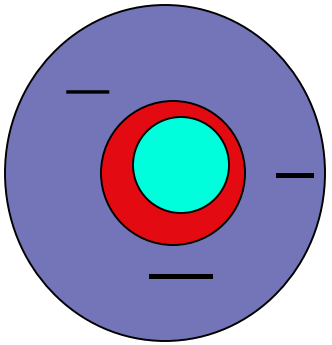




If only the surround is illuminated, then the surround provides inhibition (30%)

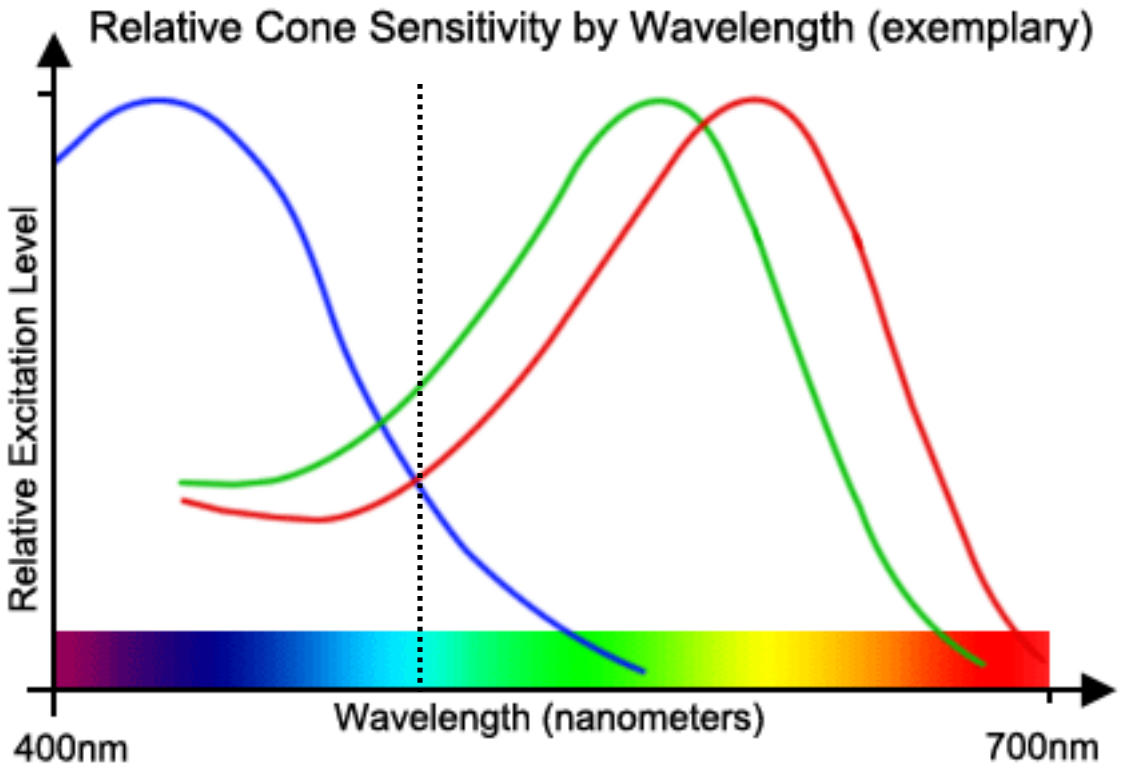
Entire Cell: -30%.

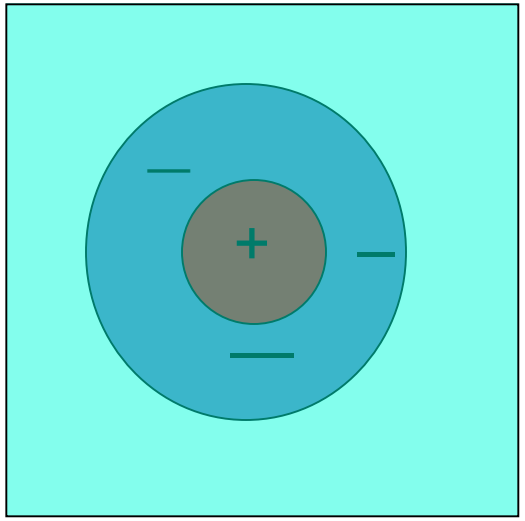




If only the center is illuminated, then the center is excited by 30%.

Entire Cell: +30%.

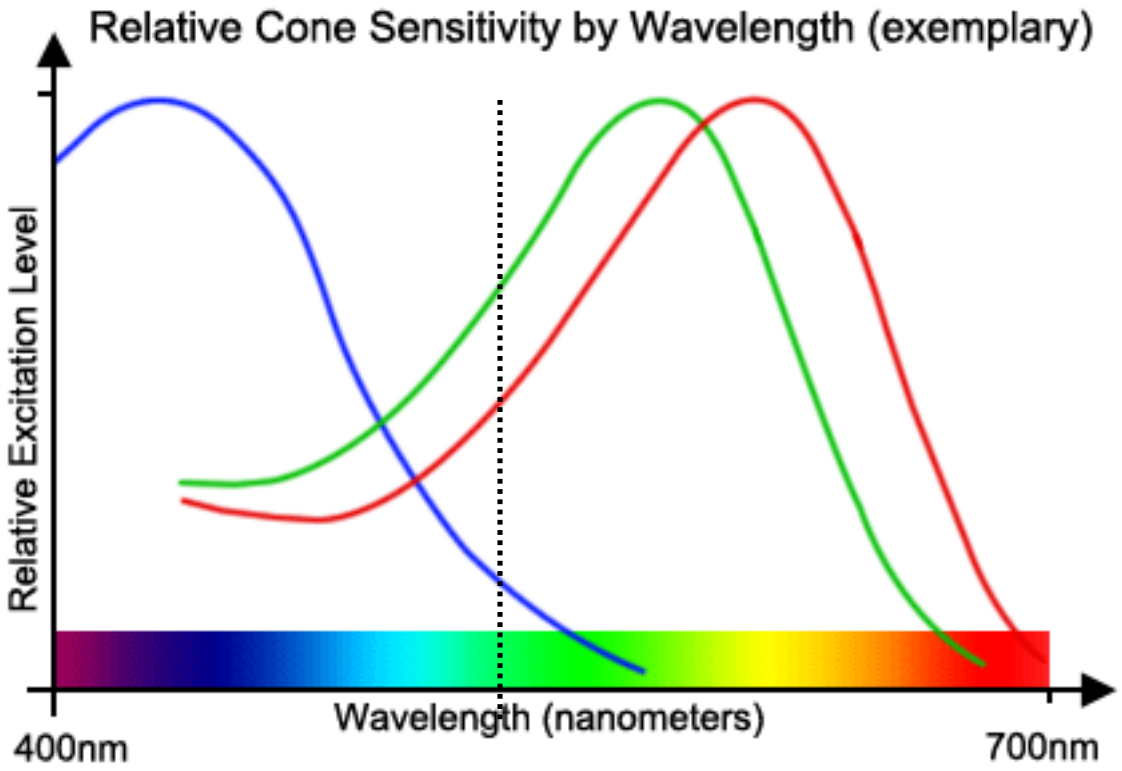


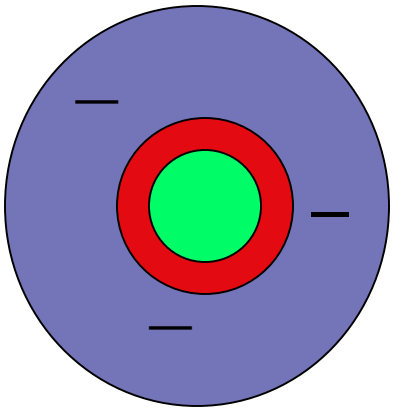


1:1 ratio of excitation

The Null Point: if both the center and the surround were illuminated by light at this wavelength, there would be no change to the base firing rate of the cell.

Entire cell = Base rate firing

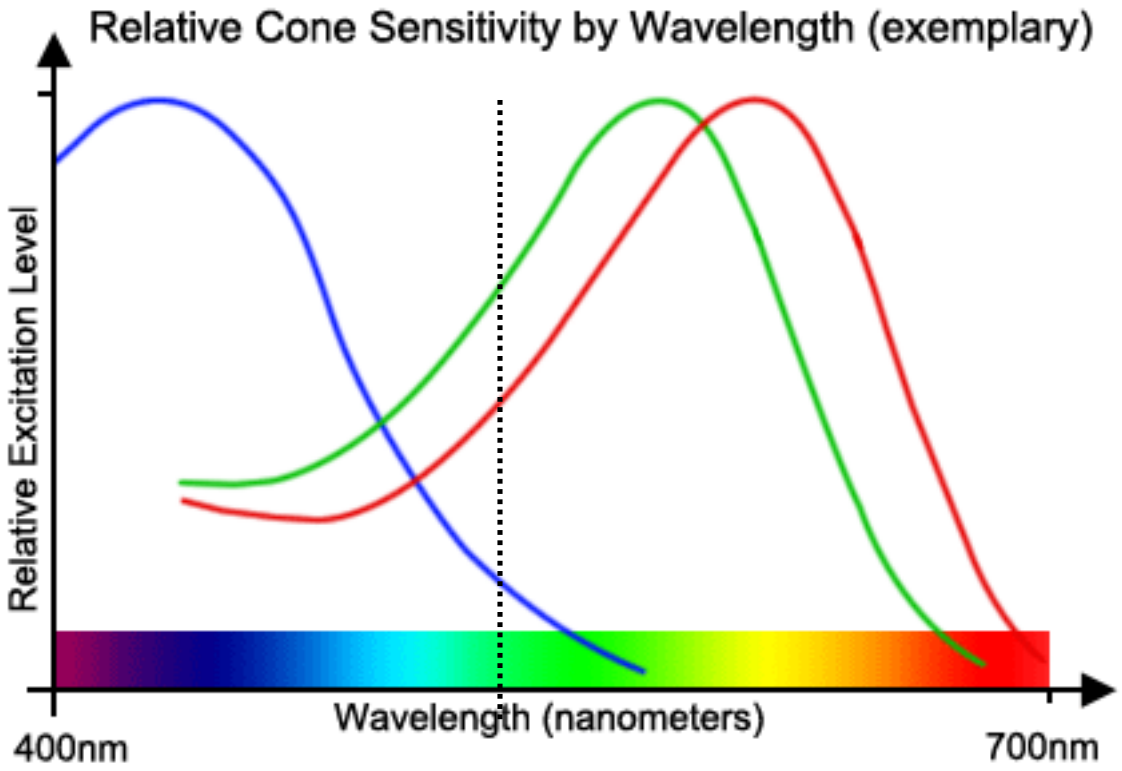


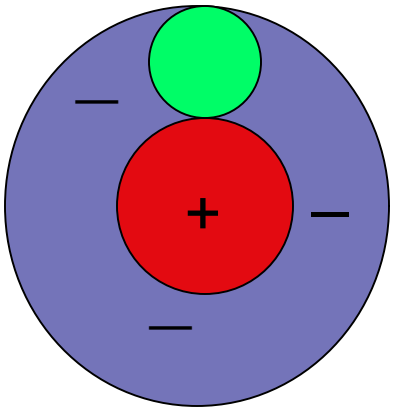


With green light in the center; the center is excited (45%).

There is no light on the surround; so the surround provides no inhibition.

Entire cell = +45%

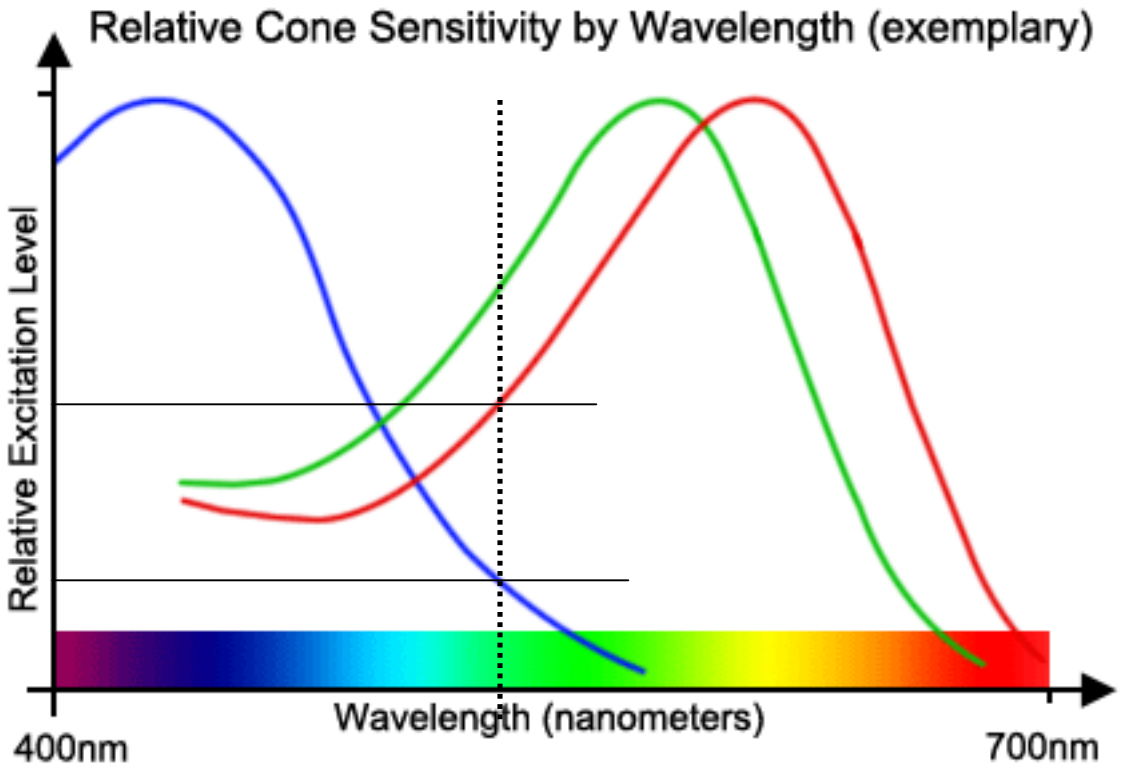


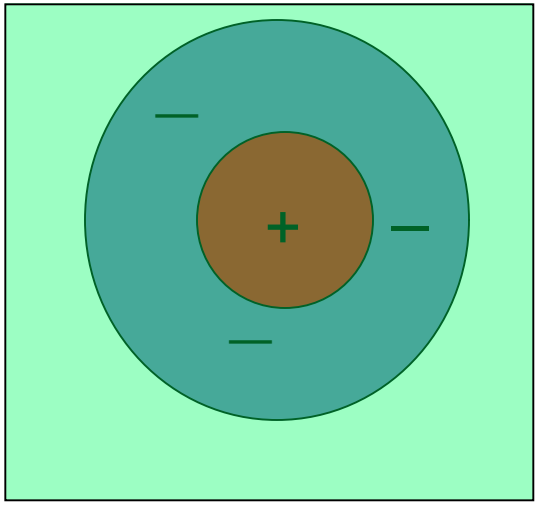


With green light in surround inhibits the surround 10%

There is no light on the center; so the center provides no excitation.

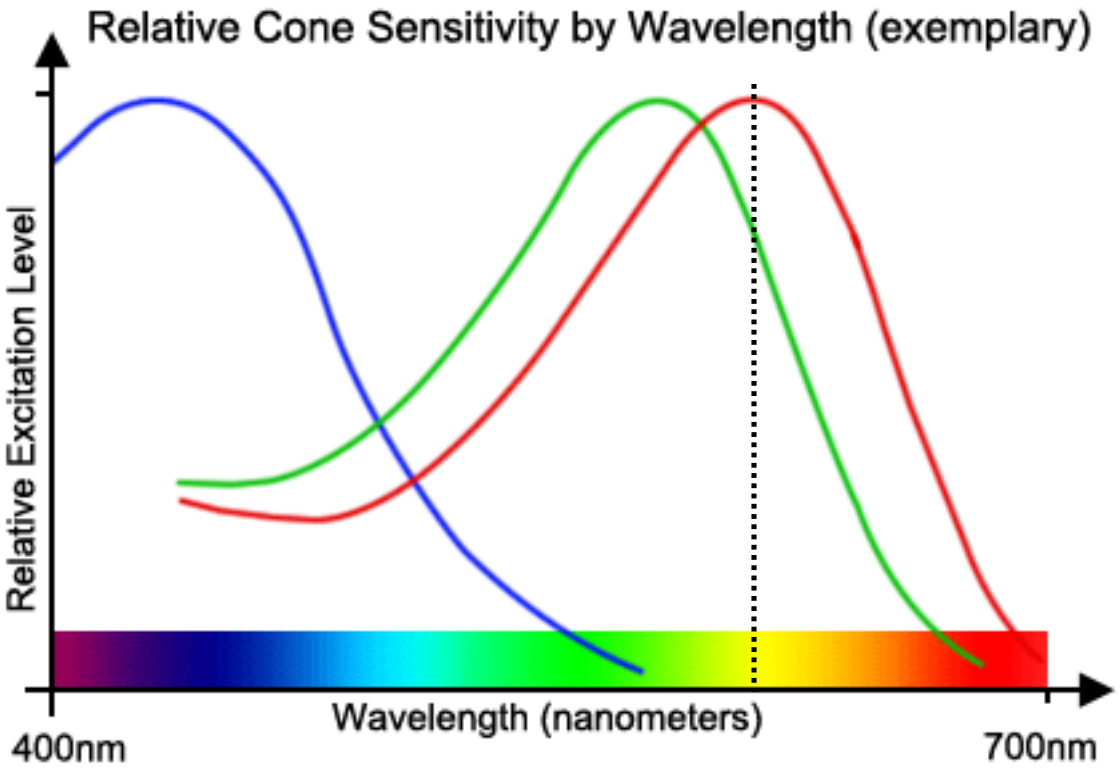
Entire cell = - 10%

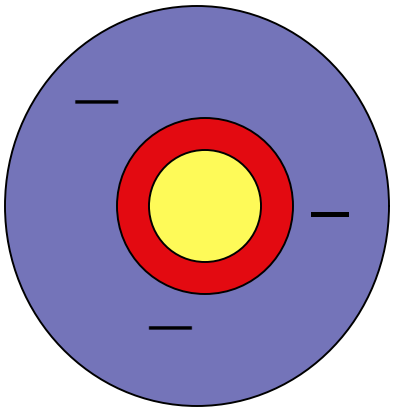




With green light over the entire receptive field, the center is excited (45%) and the surround provides inhibition (10%).

Entire cell = + 35%

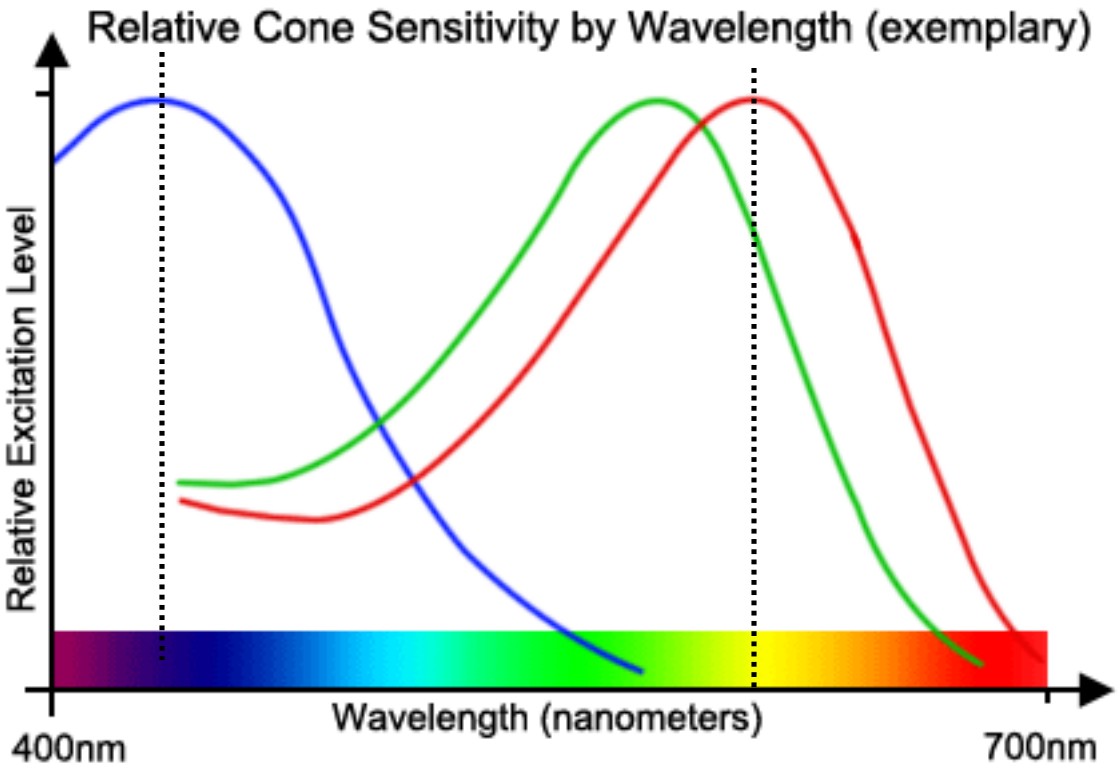


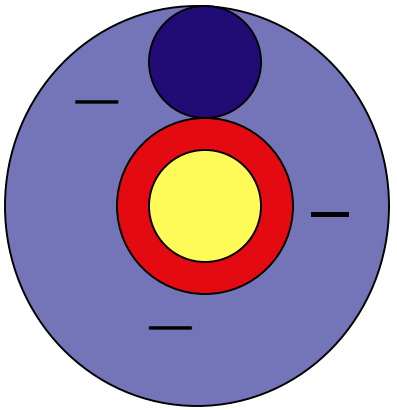


With a yellow light in the center, the cell is excited; there is no inhibition from the surround.

100% center excitation; no blue surround inhibition.

Entire cell = + 100%

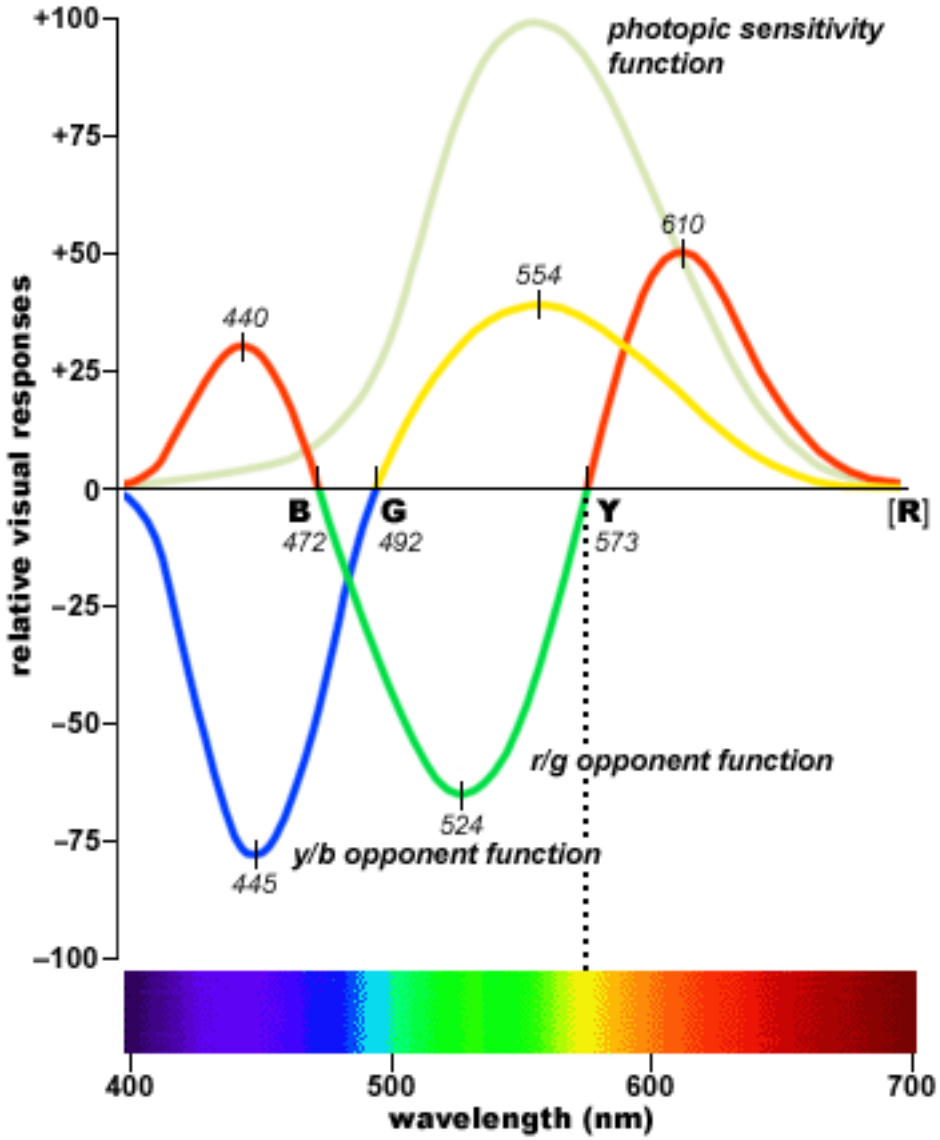


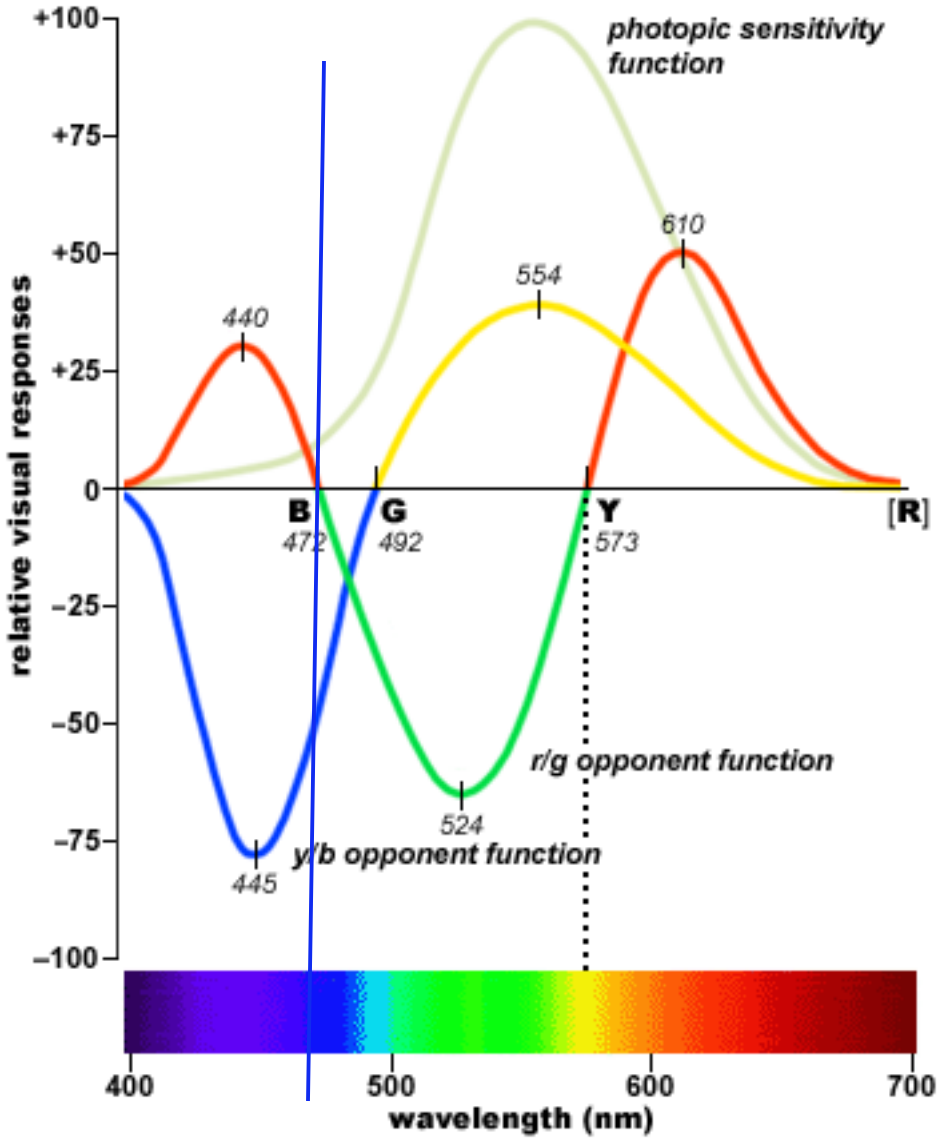


With a blue light in the surround, the surround provides inhibition. With yellow light in the center, the center provides excitation.

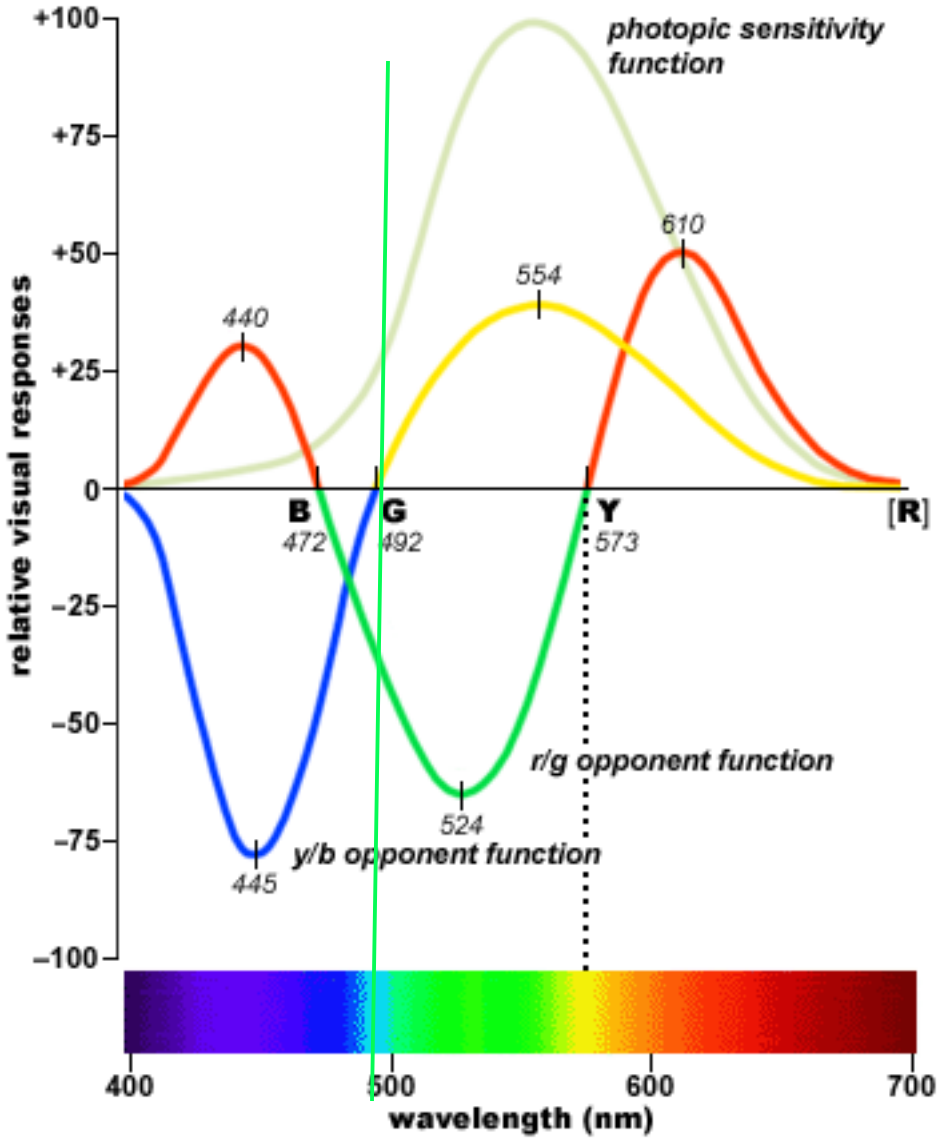
100% blue surround inhibition; 100% center excitation.

Entire cell = Base Rate firing

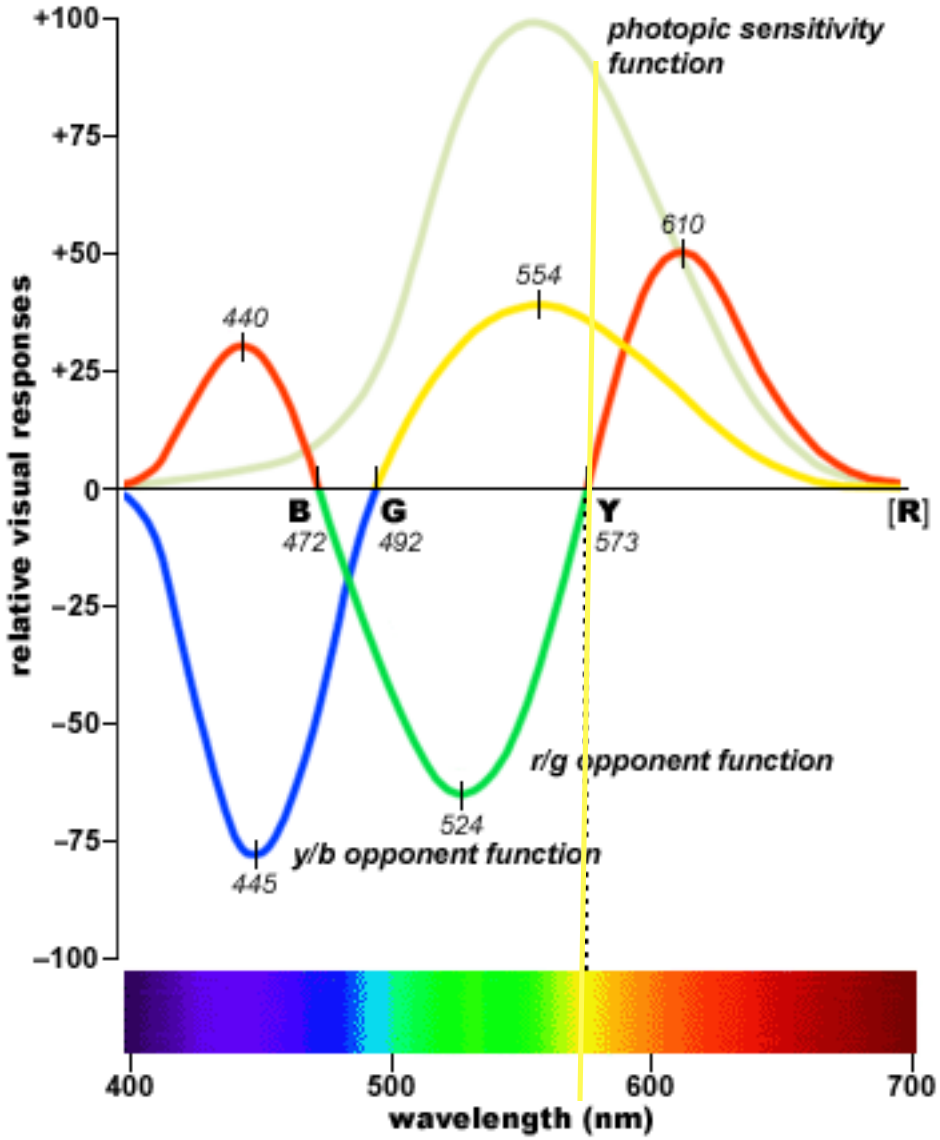

+100
+75
+50
+25
0
−25
−50
−75
−100
relative visual responses
photopic sensitivity function
440
554
610
B
472
G
492
Y
573
[R]
r/g opponent function
524
y/b opponent function
445
400
500
600
700
wavelength (nm)


+100
+75
+50
+25
0
−25
−50
−75
−100
relative visual responses
photopic sensitivity function
440
554
610
B
472
G
492
Y
573
[R]
r/g opponent function
524
y/b opponent function
445
400
500
600
700
wavelength (nm)

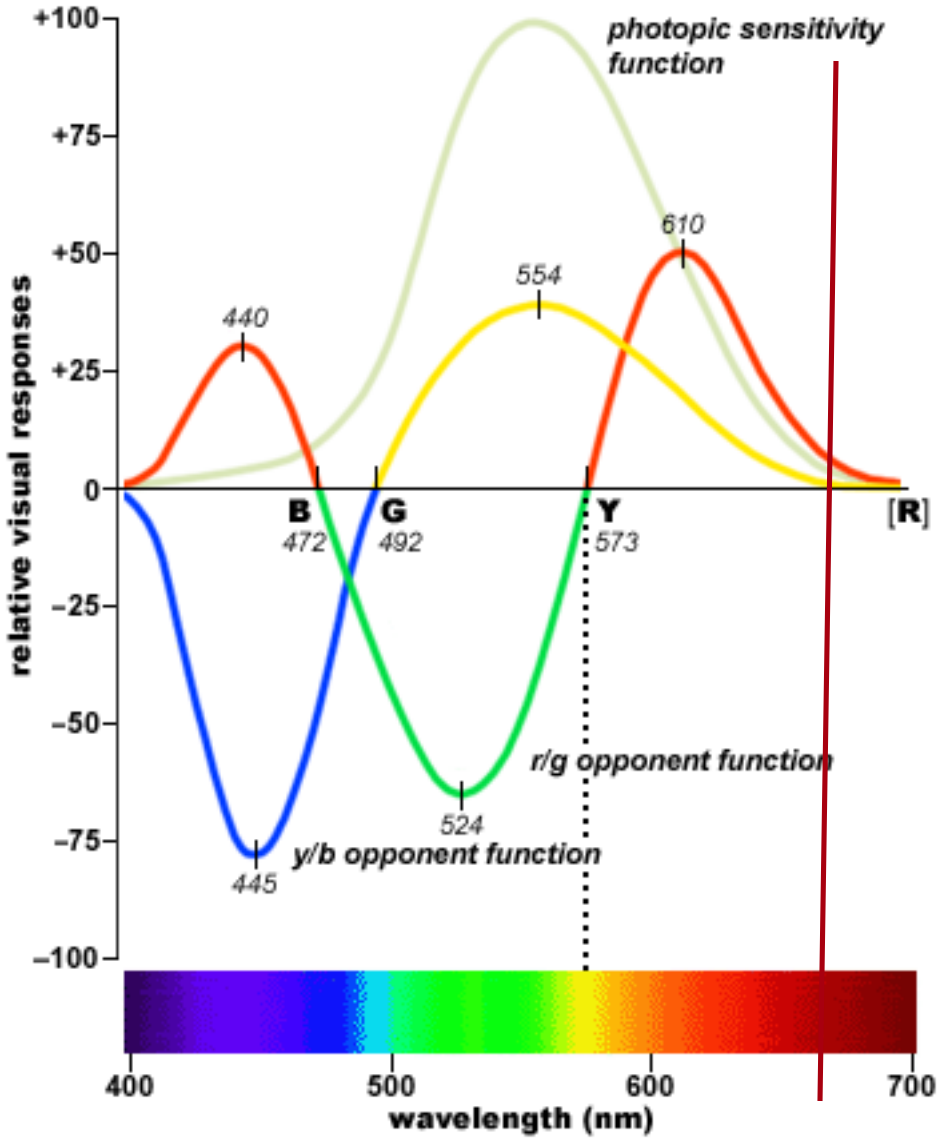
Unique Blue



Unique Green

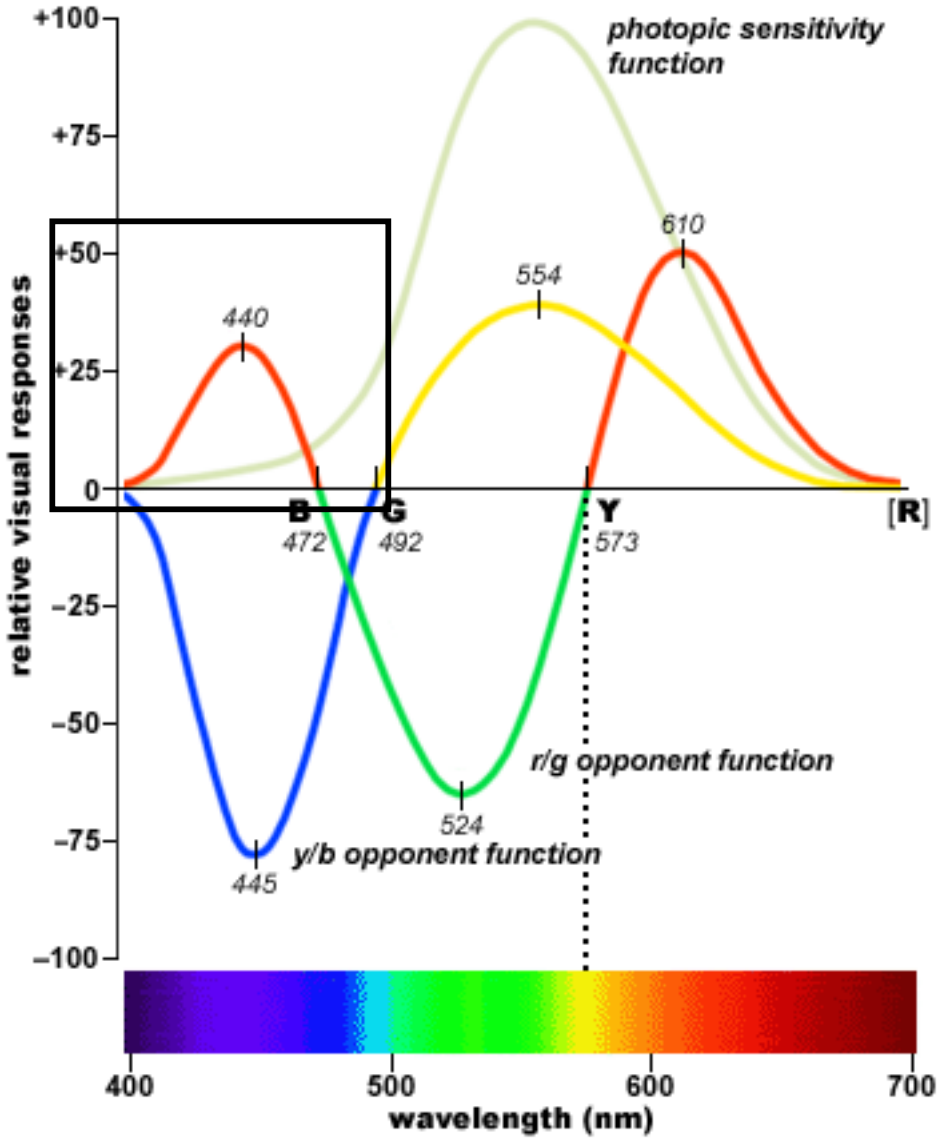


Unique yellow



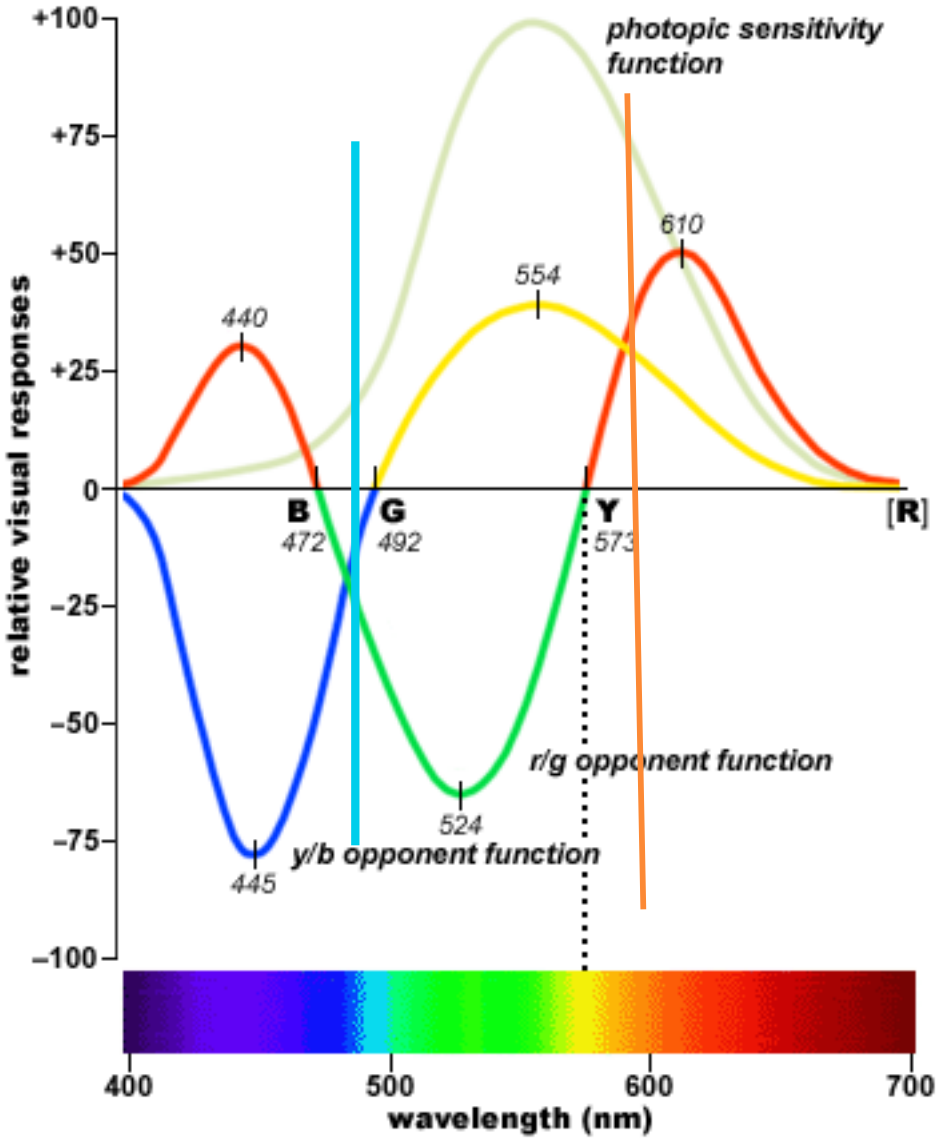
Unique red???

The yellow channel remains positive until the end, so a unique red can only be obtained by adding blue light (which cancels the yellow contribution).

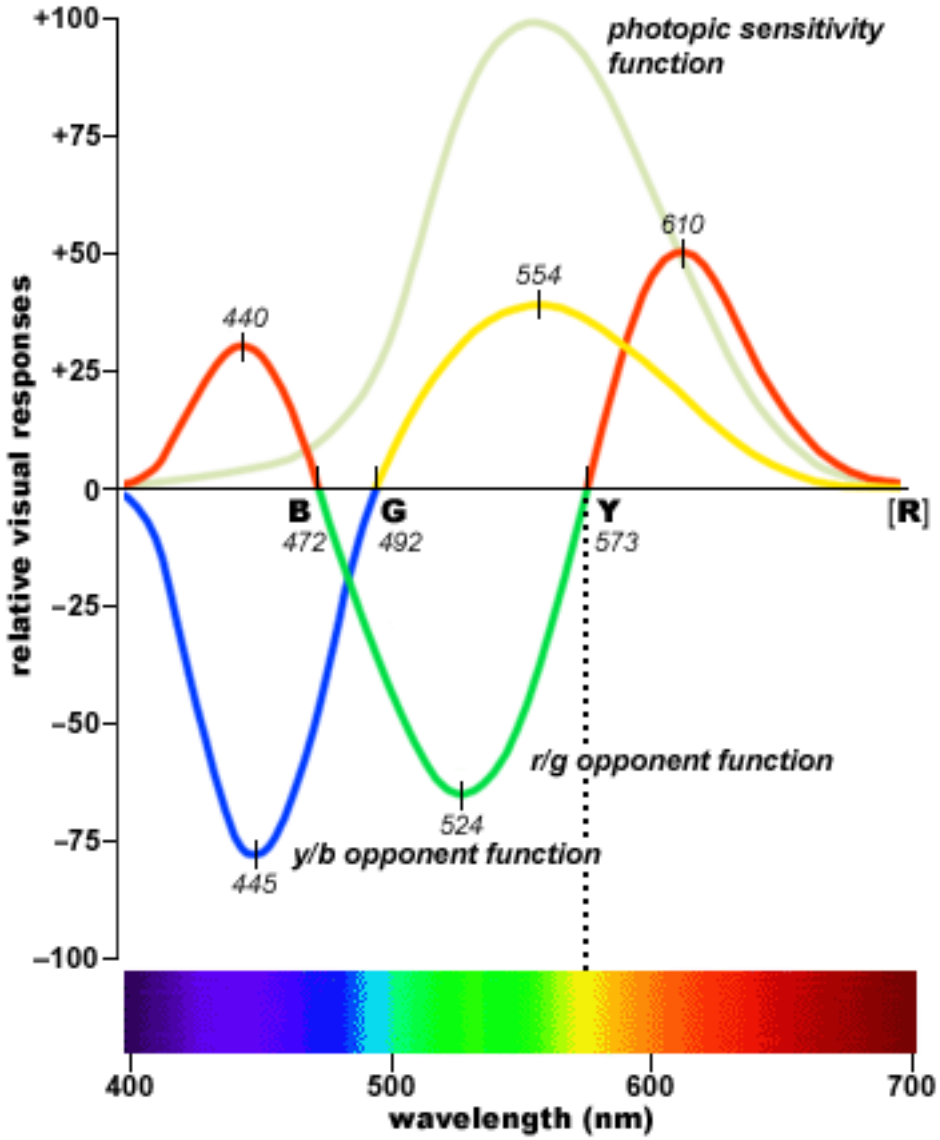


Why is there a positive signal in the red-green channel below 472 nm? (This is the part of the spectrum that appears violet.)

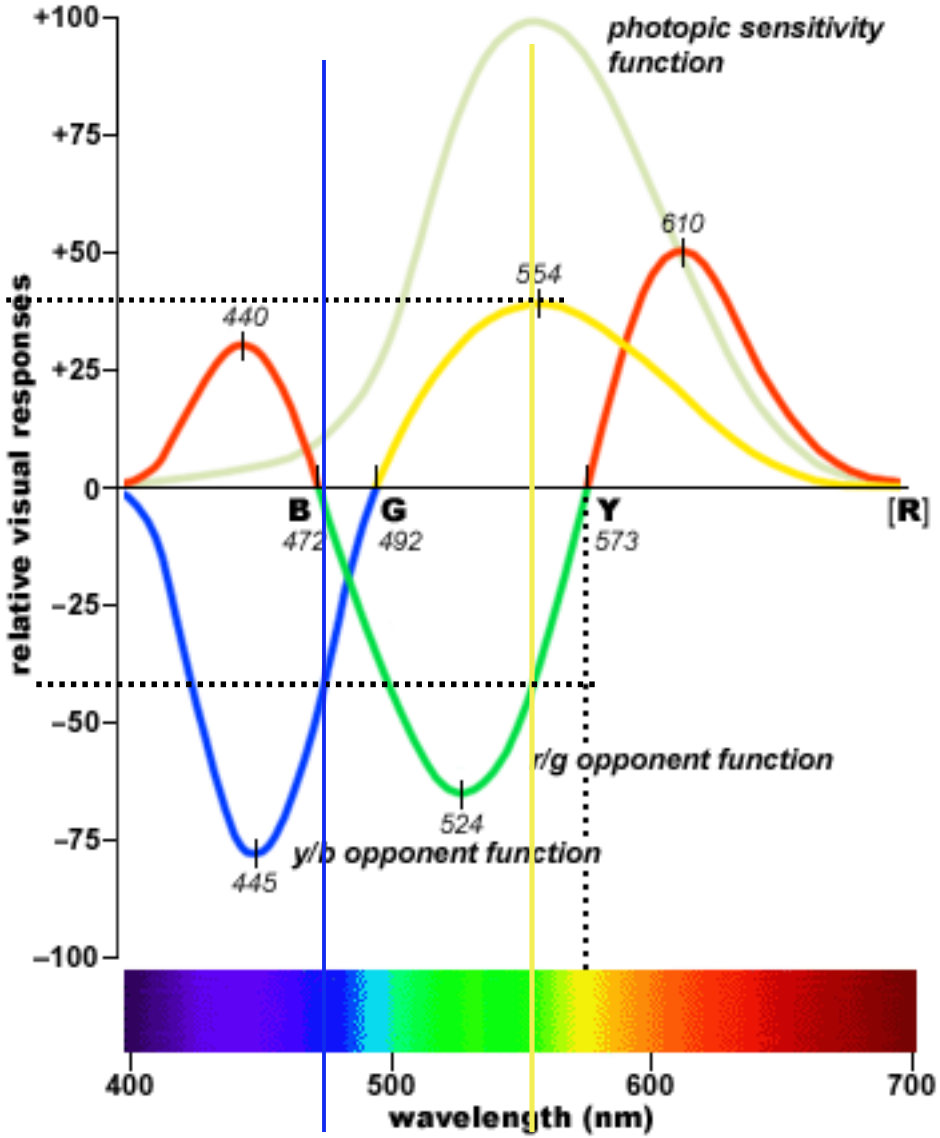
Possibly an inhibitory effect of S cones on M cones, thus altering the balance of M and S signals.



Where channels cross (or where they would cross if this program had finer spatial resolution), again one gets colour mixtures — cyan and orange.



Colour discrimination: One gets the best wavelength discrimination when comparing wavelengths that occur at the “steep” portions of curves. Thus right where the B and G channel cross, there is very good wavelength discrimination.



Pairs of lights that, when added together to yield an achromatic perception, are called *colour complements*.

Cancellation Technique (Jamieson & Hurvich)

Subject sits in front of a dual monochromator which create a single wavelength stimulus over a wide range of intensities, or combine two wavelengths over the same range.

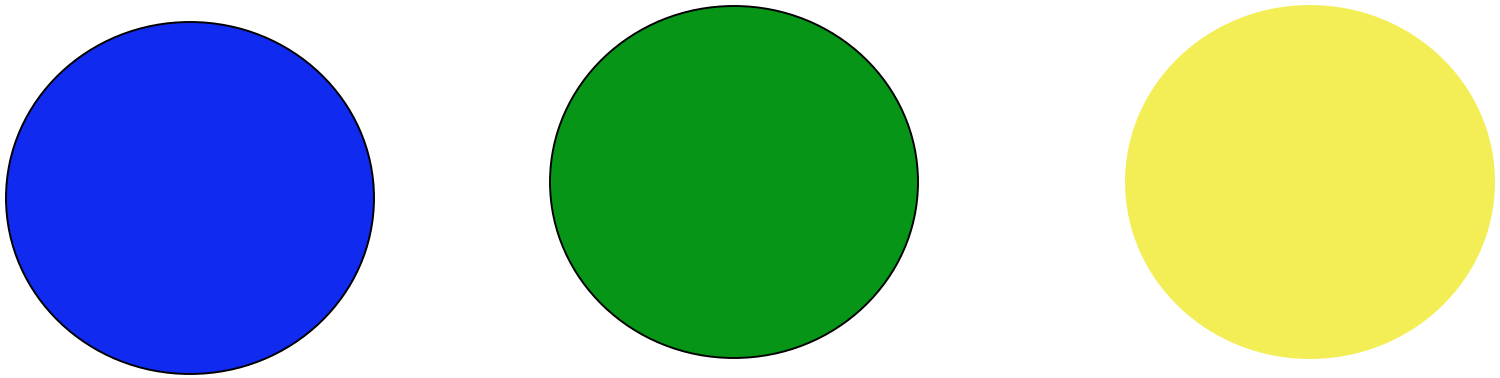
Subject first finds her unique hues, for blue, green and yellow by looking through the spectrum (single wavelength). At moderate intensities there is no unique red.

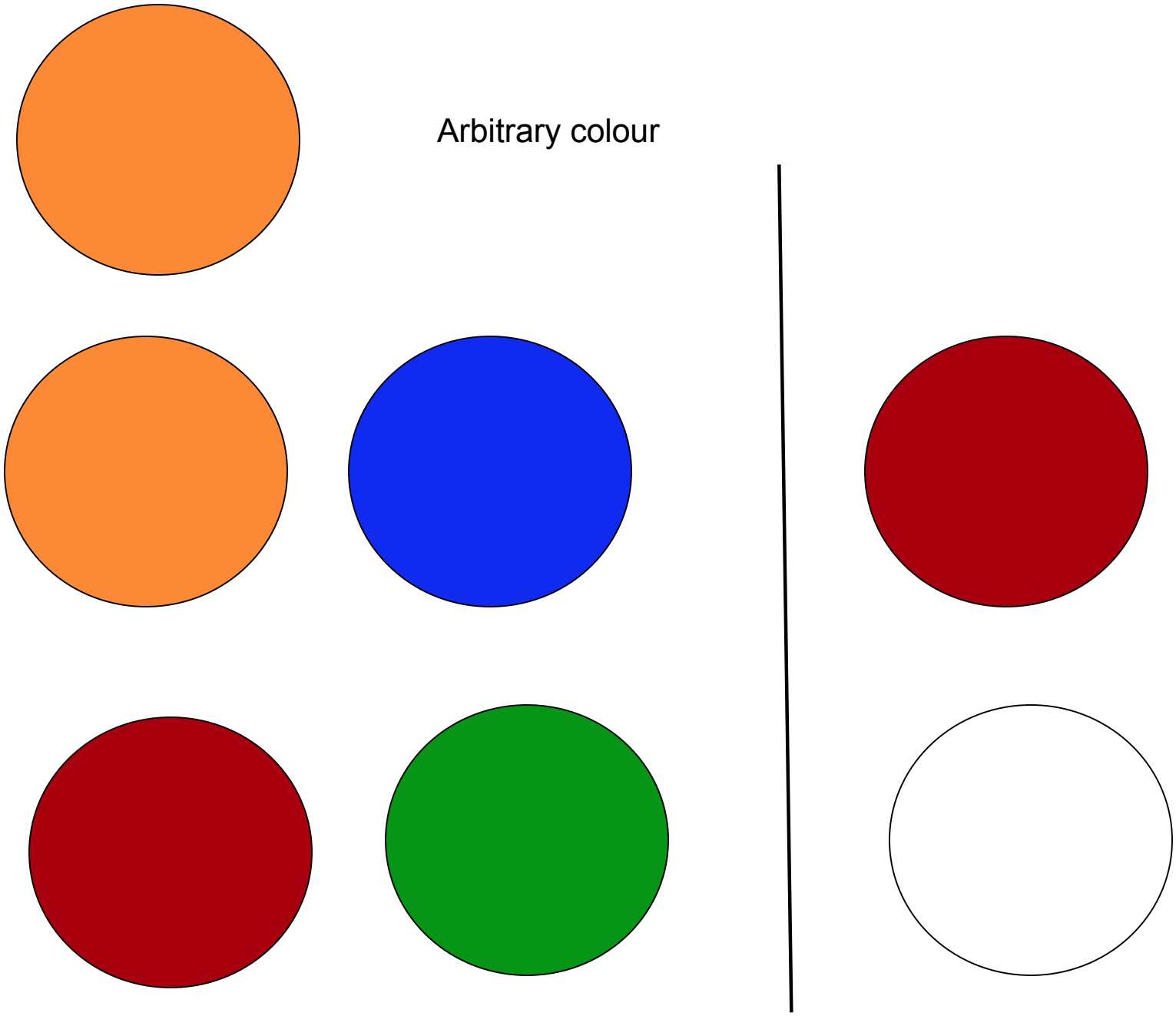
Subject is then given a series of monochromatic lights, each separate by 10 nanometers. The question to be answered: for any given wavelength of light (at a set intensity), how much

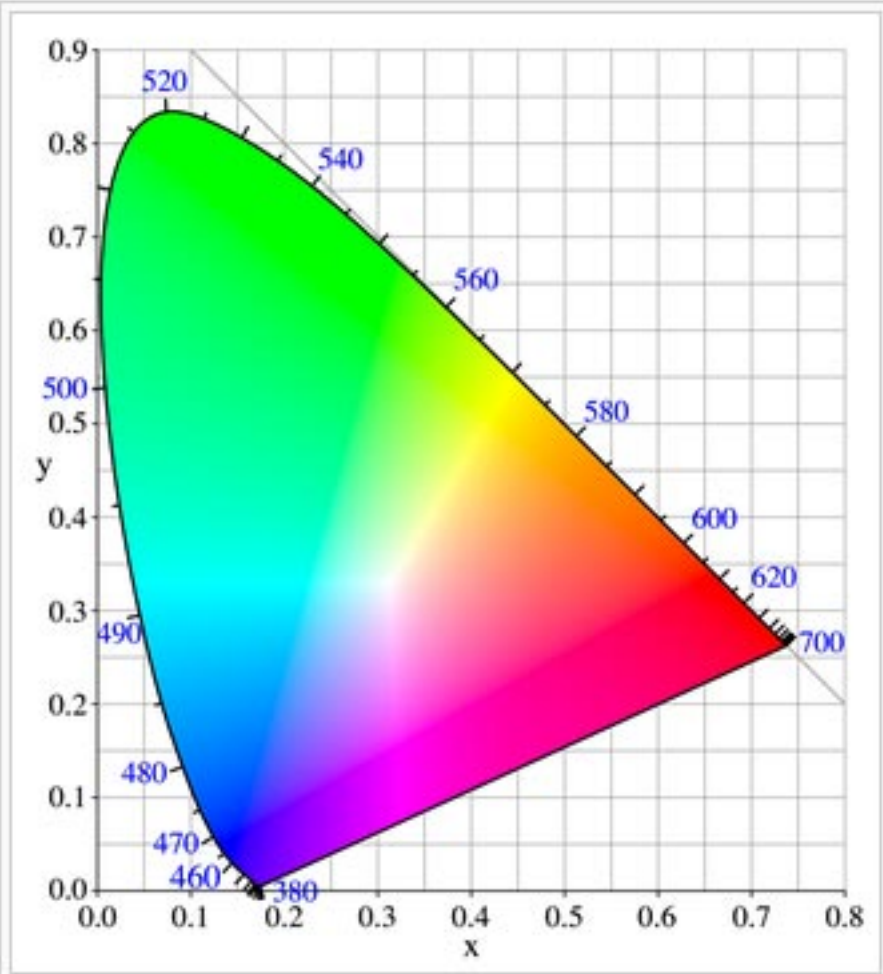
> Suppose the subject begins with light at 600 nm, or what appears to be an orange colour.
>
> > Now the subject must adjust the intensity of a light that matches her unique blue to the sample until all of the yellow 'disappears'. Energy of blue light is recorded.
> >
> > > Now the sample appears red. The subject then cancels the red by adjusting the intensity of her unique green. Energy of green light is recorded.
>
> In this way, the subject has establish the relative blue-yellow and green-red activations at he wavelength 600 nm.

The subject now proceeds through each wavelength, each 10 nms. Apart, to establish the relative activities of each channel at that specific wavelength (and set intensity).

Three Unique Colours




Arbitrary colour

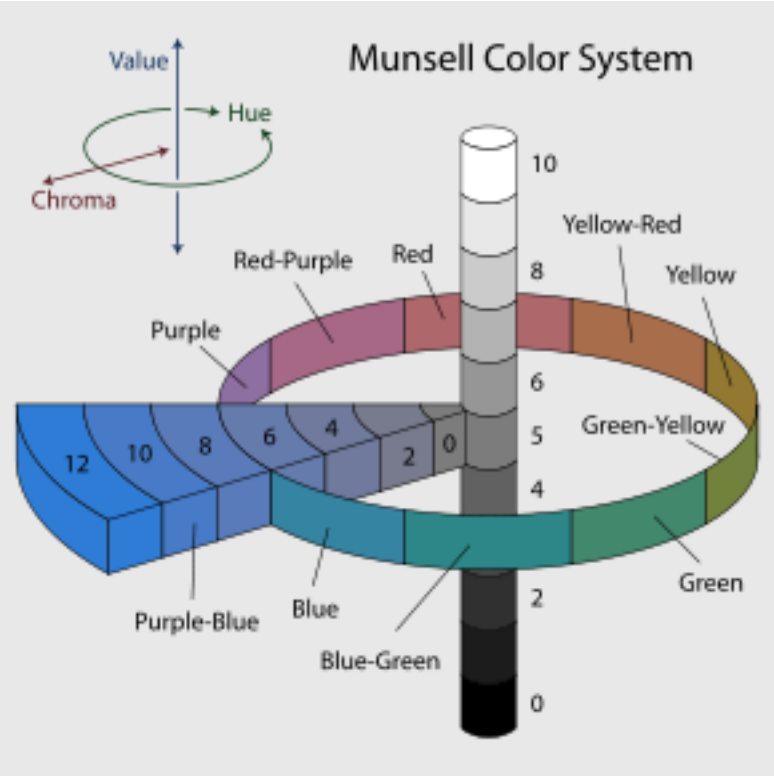


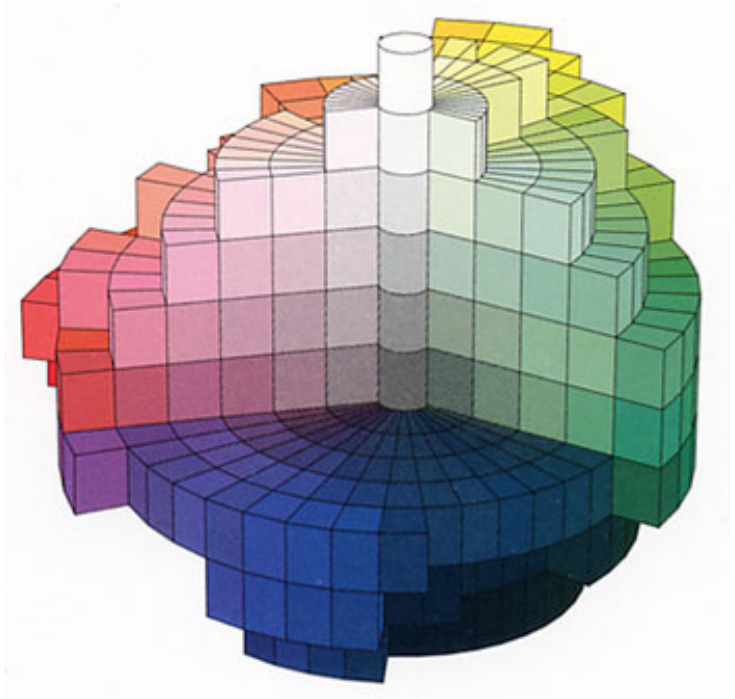
The CIE 1931 color space chromaticity diagram. The outer curved boundary is the spectral (or monochromatic) locus, with wavelengths shown in nanometers. Note that the colors depicted depend on the color space of the device on which you are viewing the image, and no device has a gamut large enough to present an accurate representation of the chromaticity at every position.

CIE colour space.

Uses addition of 3 different lights, in three color primaries (x,y,z) to determine a unique value for each point.

The chromaticity is represented in two dimensions (with luminance differences excluded).





Munsell Colour Space (3 values of hue, lightness, and saturation)

Behavioral Evidence that establishes “the primacy of the unique hues”

1. Infant experiments.
2. Dani Experiments
3. Adult qualitative experiments
4. Colour Naming experiments