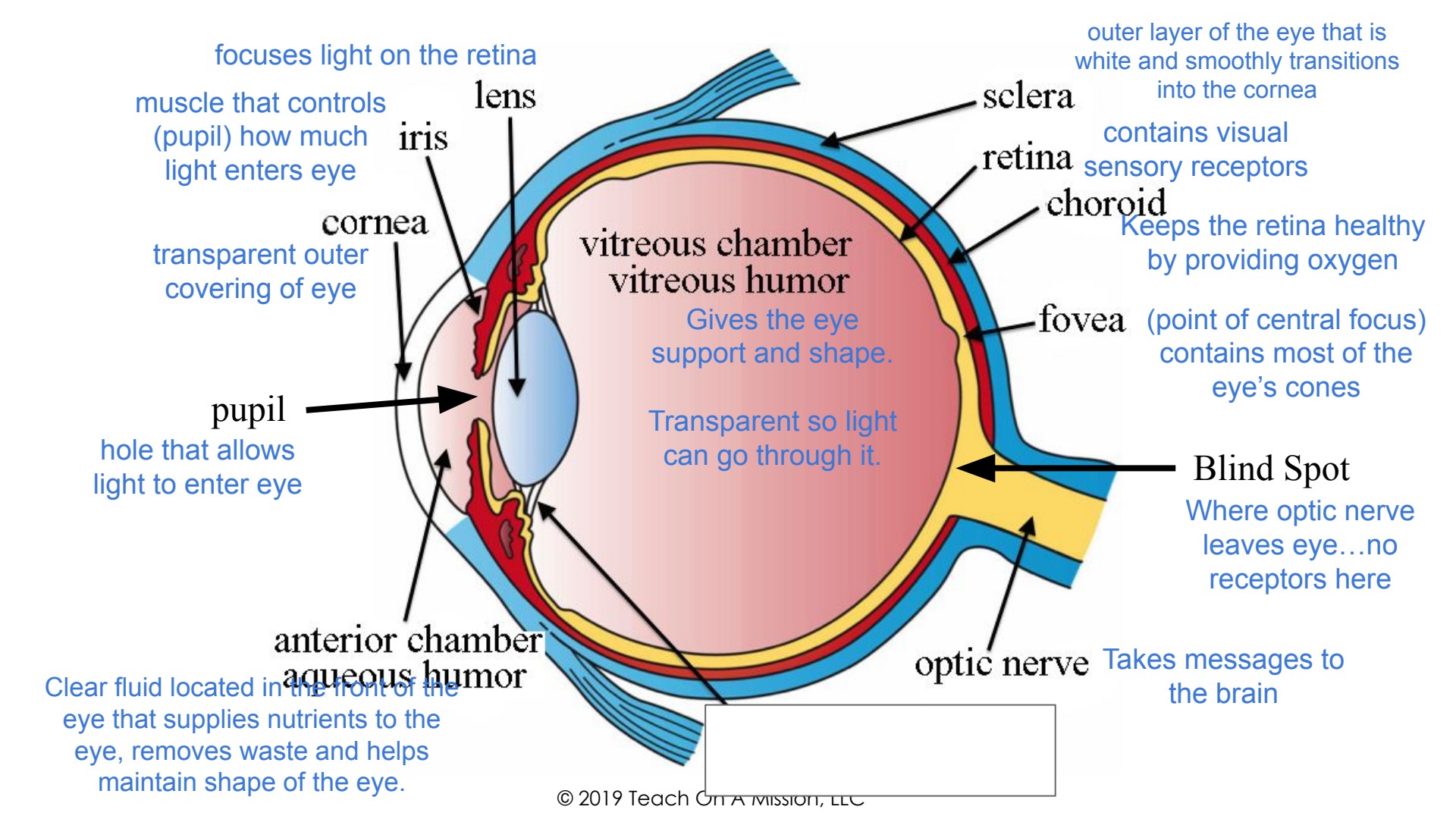
The signal detection theory predicts when we will detect weak signals (stimuli).

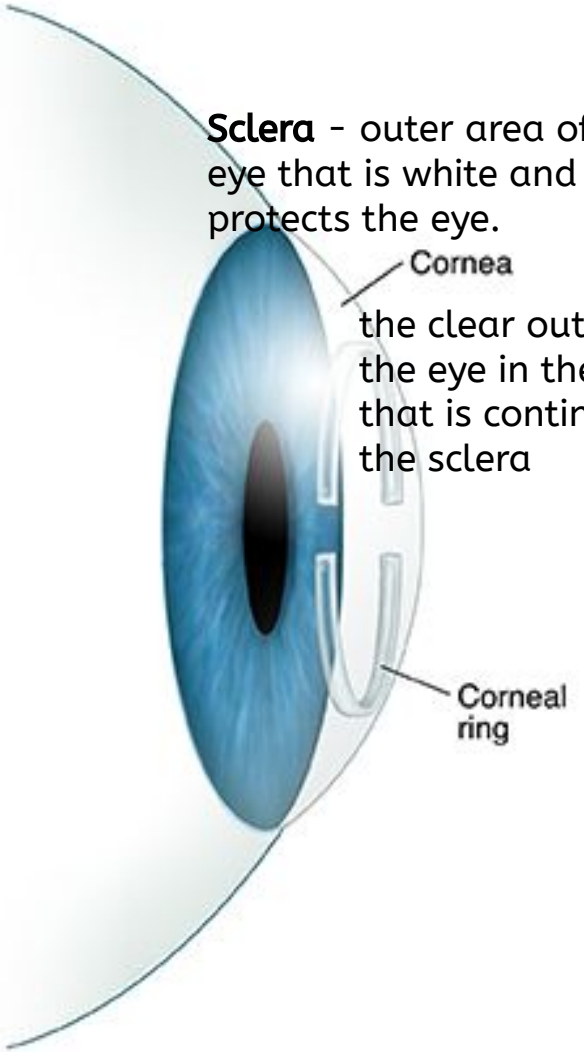
This theory disagrees the idea of absolute thresholds because the purpose is to ascertain why individuals react to the same stimulus differently. Additionally, it seeks to understand why one individual may perceive a stimulus differently based on circumstances.

	RESPONDS YES	RESPONDS NO
SIGNAL PRESENT	HIT	Type II Error MISS
SIGNAL ABSENT	Type I Error FALSE ALARM	CORRECT REJECTION

Vision

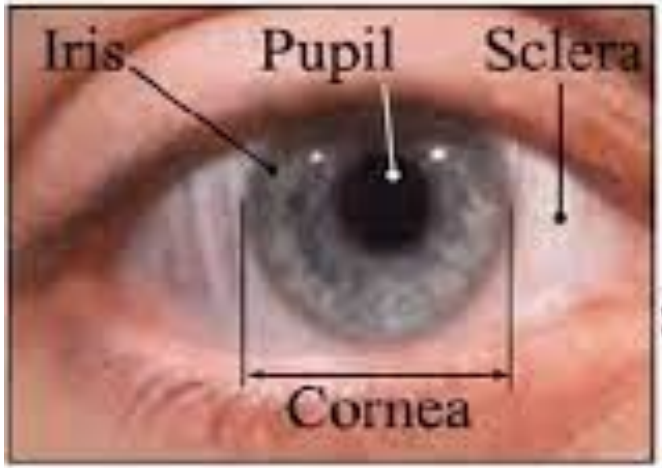


Sclera - outer area of the eye that is white and protects the eye.

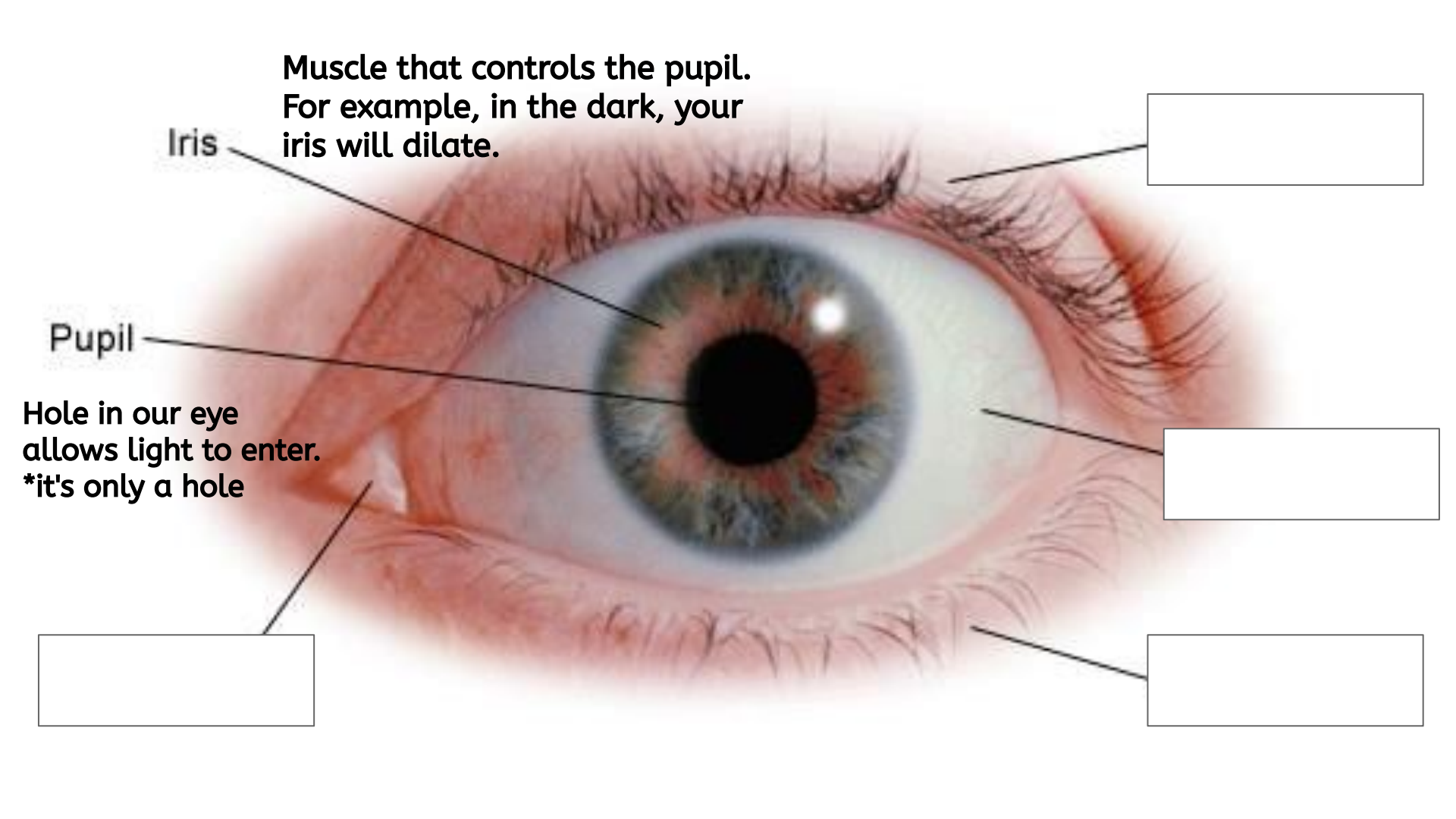


the clear outer layer of the eye in the center that is continuous with the sclera

"Outside area"

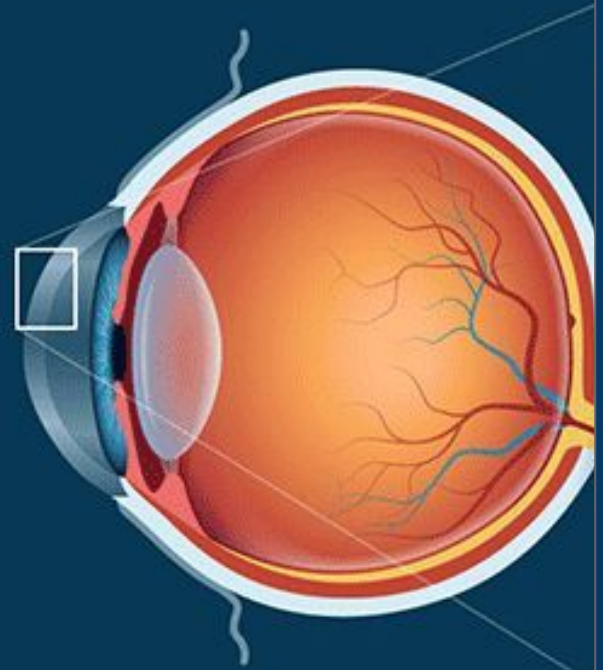


(a) External View


Muscle that controls the pupil. For example, in the dark, your iris will dilate.
Iris
Pupil
Hole in our eye allows light to enter. *it's only a hole


IRIS decides
eye color too!

Cornea



Lens to the retina!

*flips image to retina

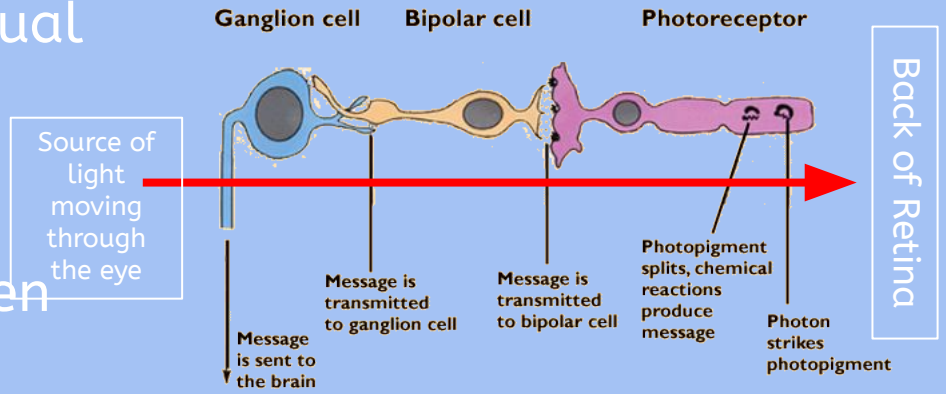
A clear curved structure just behind the iris that allows vision to focus

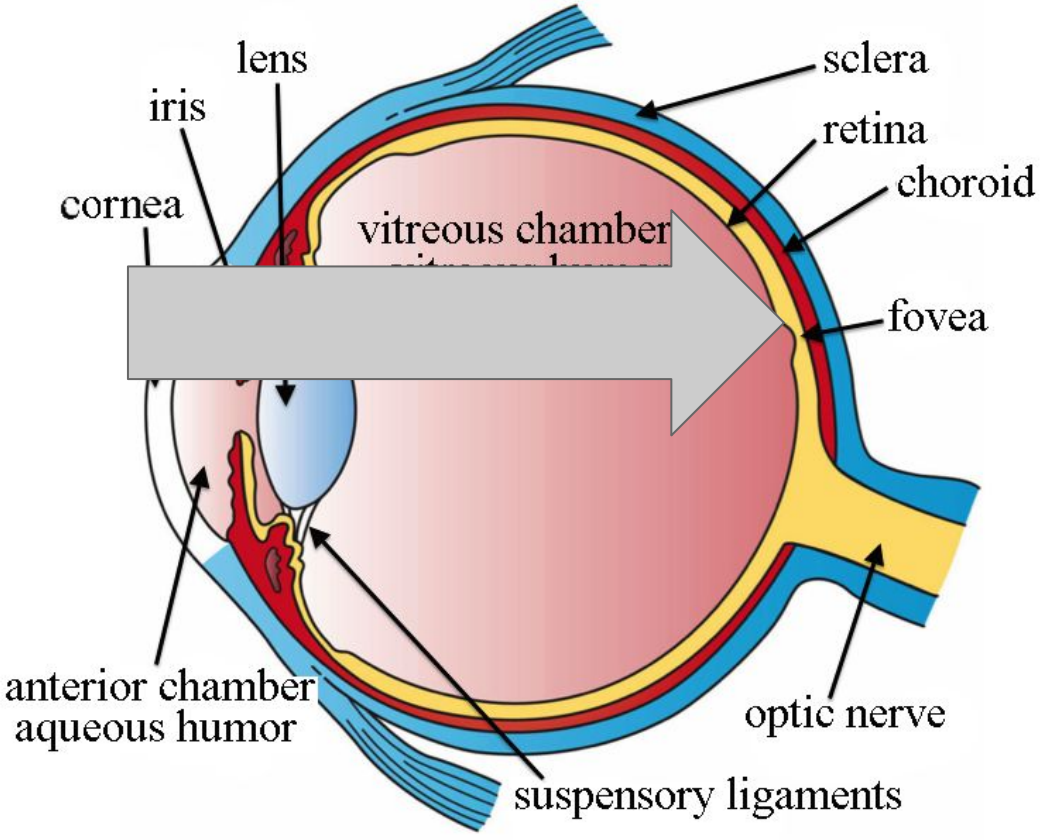
A gelatinous clear fluid that fills the area behind the lens to the back

Retina (where transduction occurs)

The light-sensitive inner surface of the eye, containing receptor rods and cones plus layers of other neurons (bipolar and ganglion cells) that process visual information.

Light travels to the back of the retina, then moves forward, then to the optic nerve.





Most of the eyes cones.

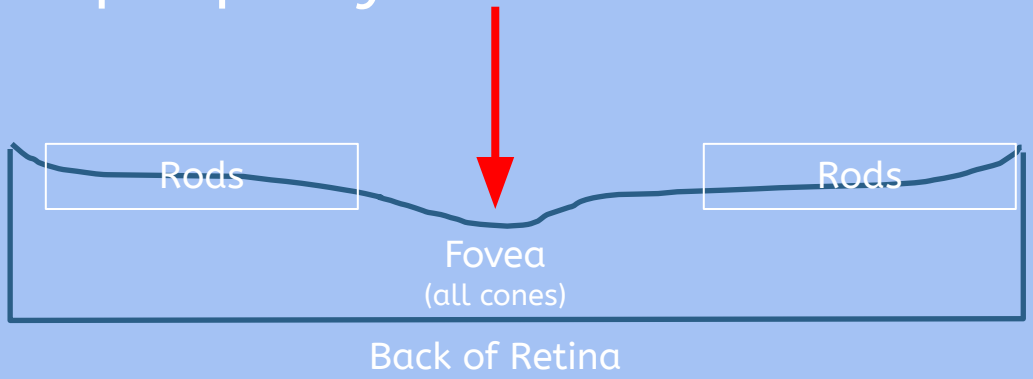
Whatever we are focusing on =

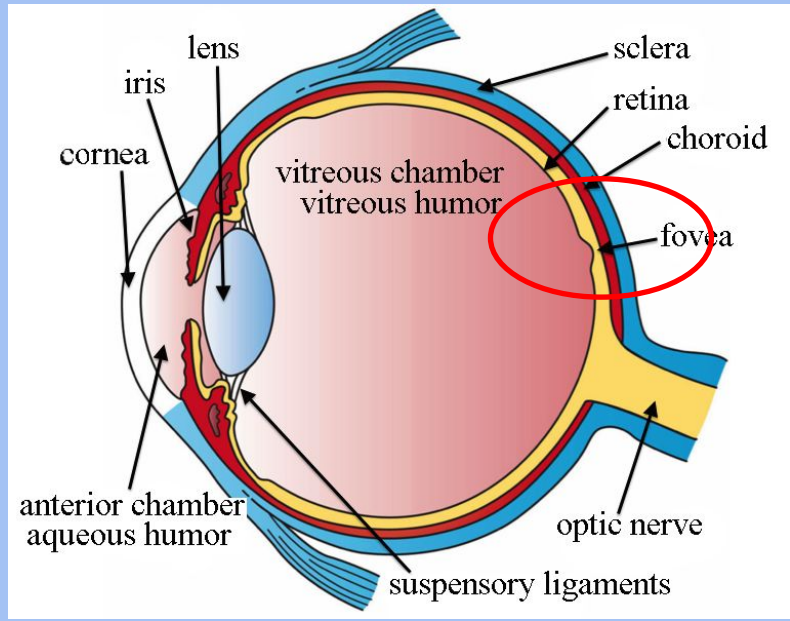
fovea

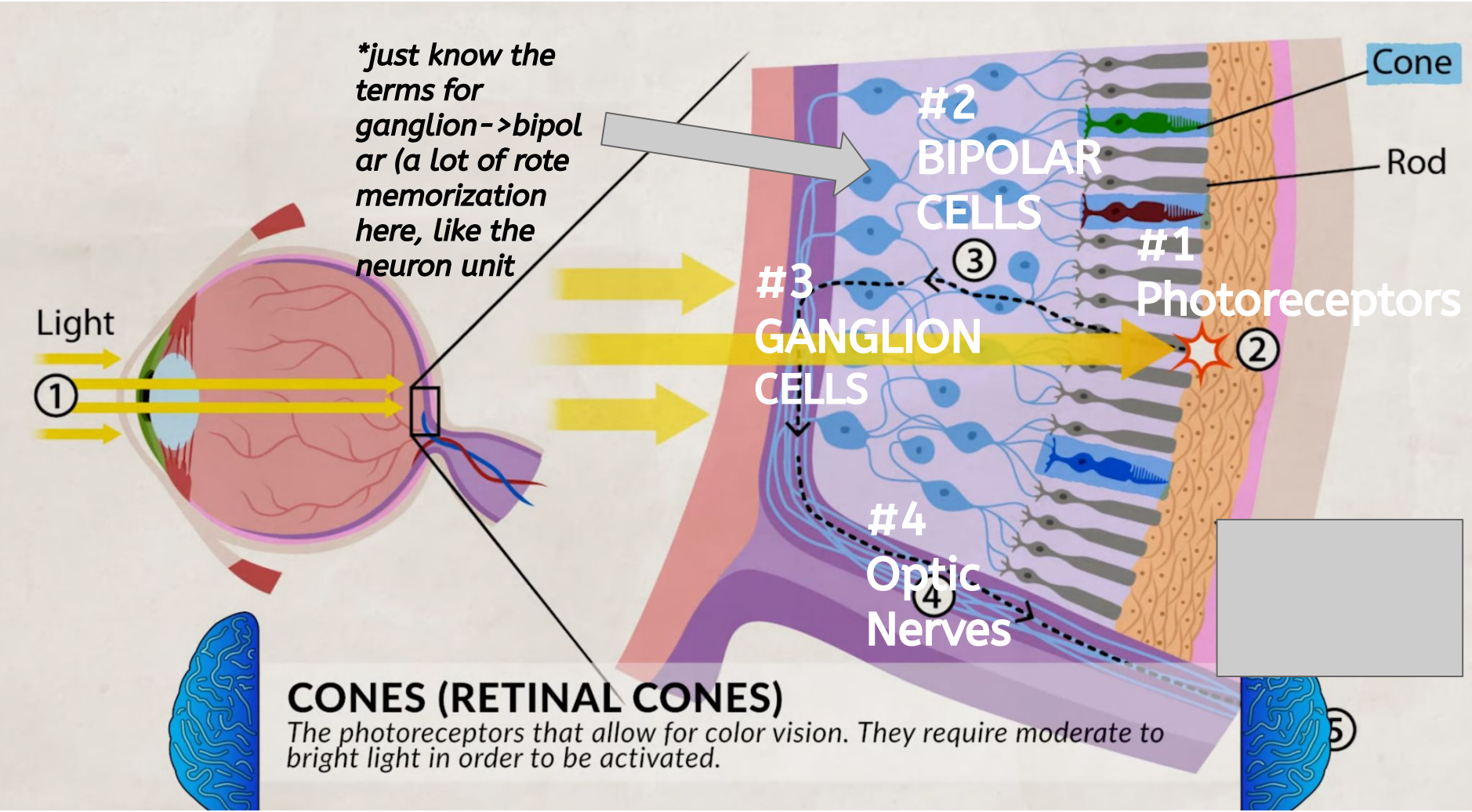
part of retina

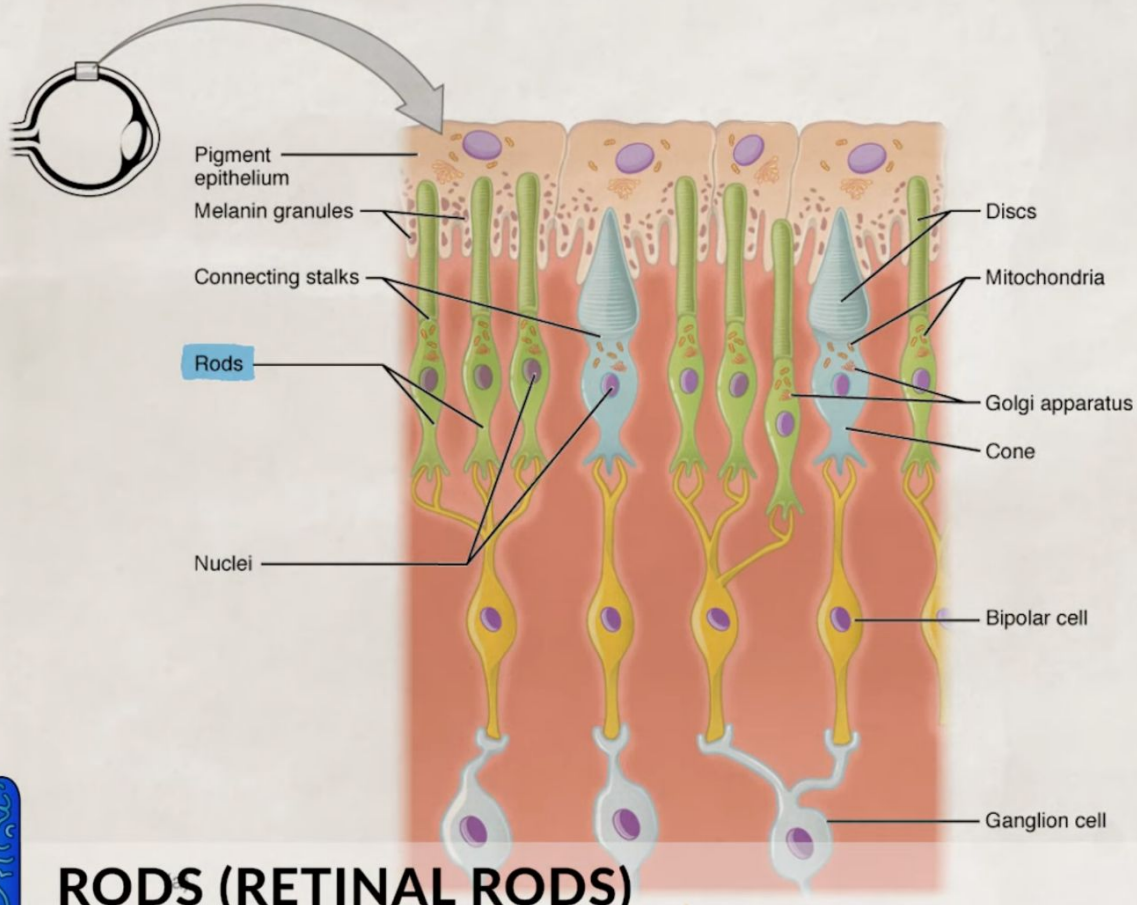
Fovea

Central point in the retina, within which the eyes cones cluster together… because of the cones here, there are little color vision in the farthest periphery of our vision.






*just know the terms for ganglion->bipolar (a lot of rote memorization here, like the neuron unit
Light
①
#2
BIPOLAR
CELLS
③
#3
GANGLION
CELLS
#1
Photoreceptors
②
Cone
Rod
#4
Optic
Nerves
④
⑤
CONES (RETINAL CONES)
The photoreceptors that allow for color vision. They require moderate to bright light in order to be activated.



RODS (RETINAL RODS)

The photoreceptors that allow for black and white vision. They are able to be activated in lower light but do not allow very detailed vision.

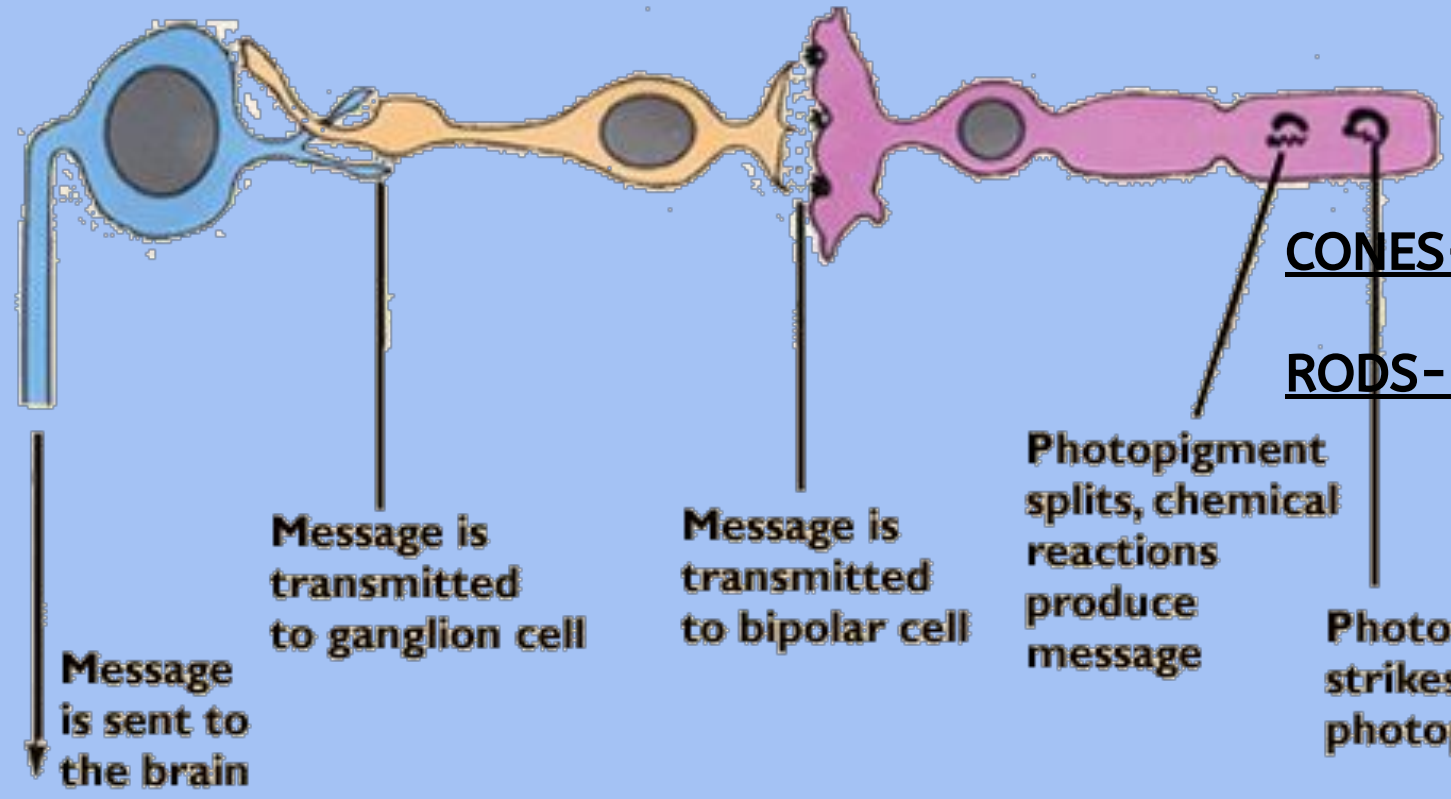
LIGHT

The difference between Cones and Rods

Rods are responsible for vision at low light levels. They do not mediate color vision, and have a low spatial acuity.
Cones are active at higher light levels, are capable of color vision and are responsible for high spatial acuity

CONES=COLOR - RODSDARKRODSDARK

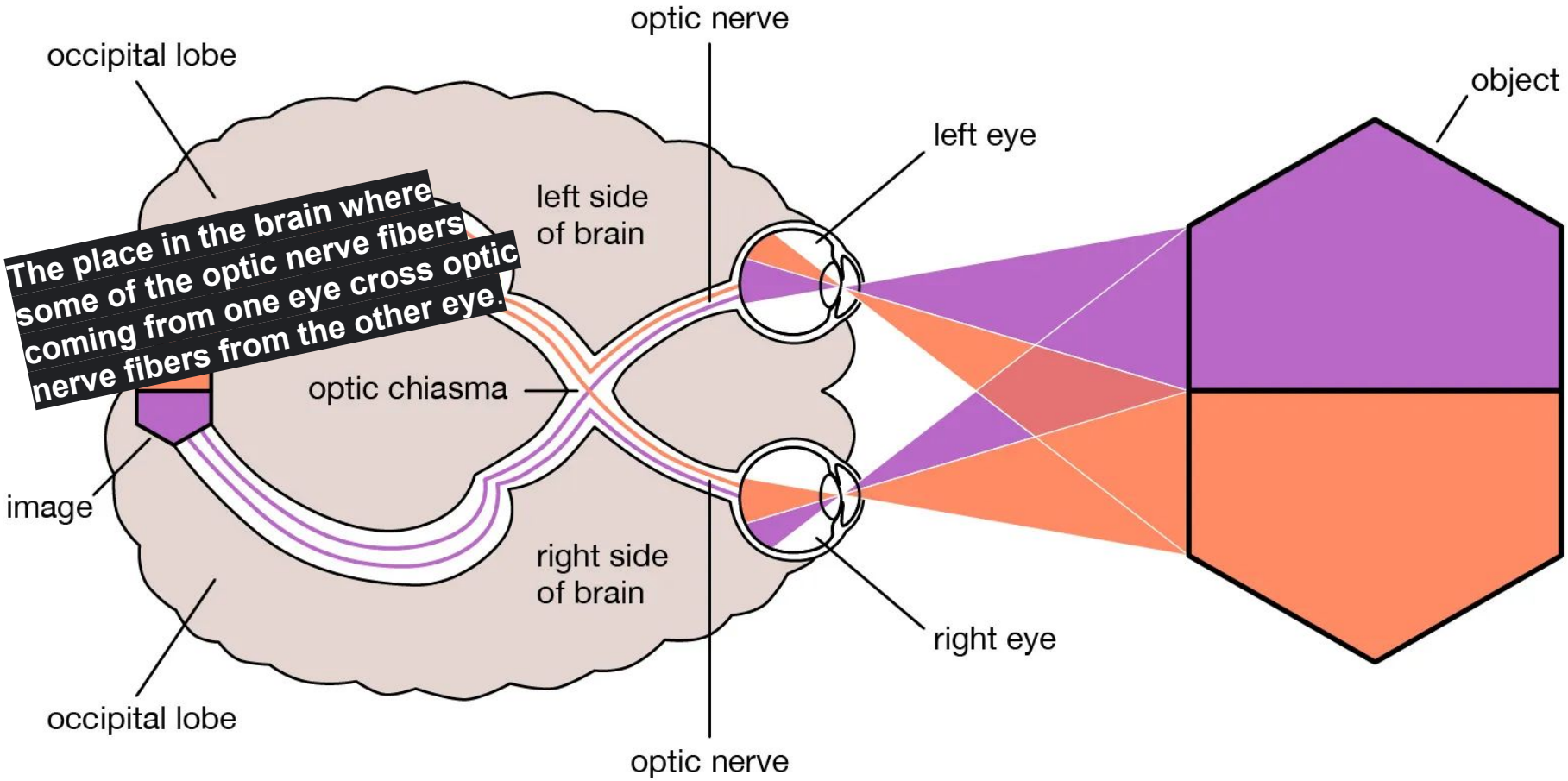
Rods	Both	Cones
• Stimulated by light intensity	• Photoreceptors	• Stimulated by color
• Found all over retina	• Connected to bipolar cells, ganglia, and optic nerve	• Found mostly in fovea
• Work under any amount of light	• Cooperate to make 1 image that is processed in the visual cortex of brain	• Only work under high-light conditions (not in the dark)
• 1 type		• 3 types: blue, green, red
• Rod shaped		• Cone shaped



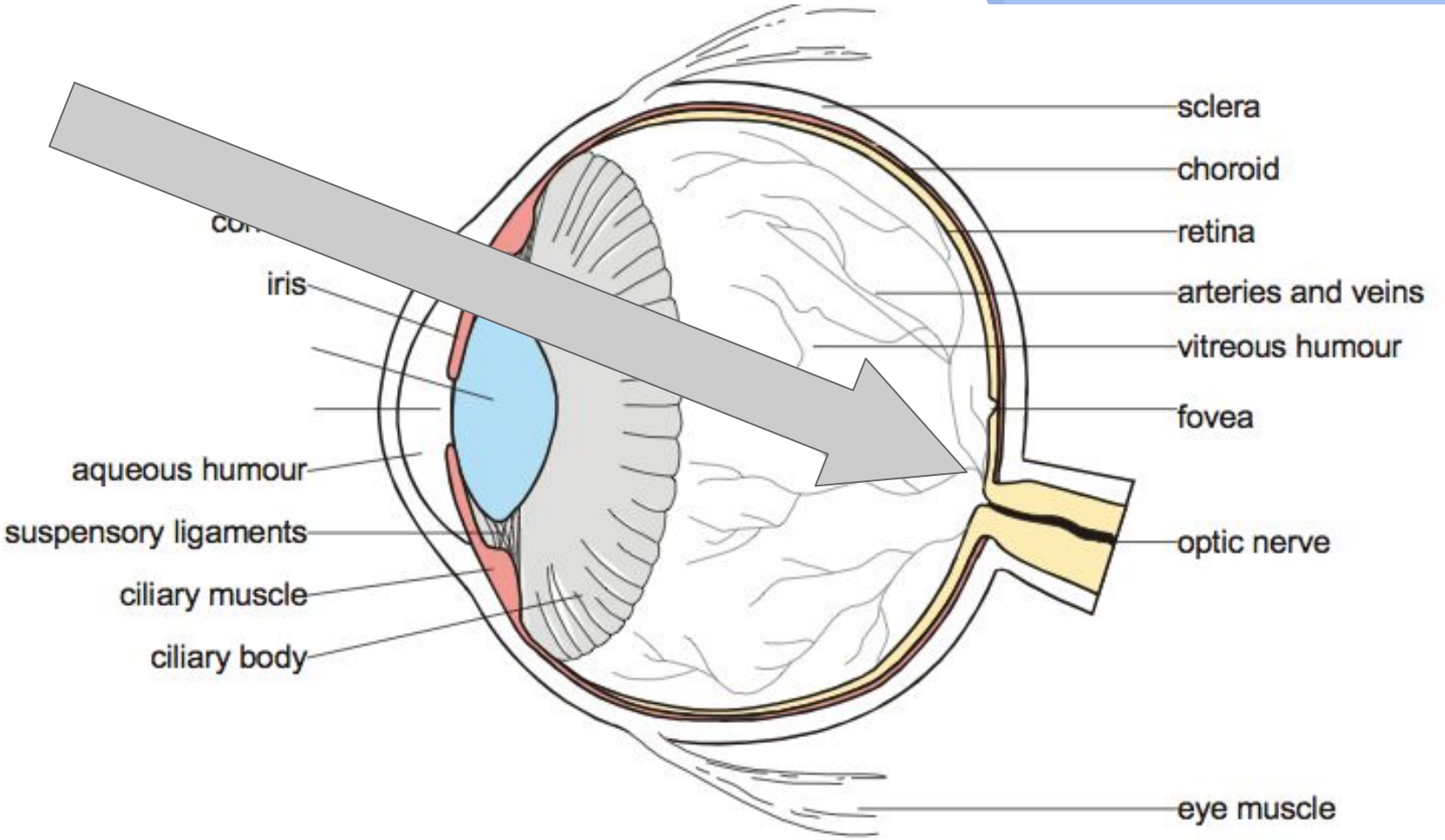
CONES-COLOR

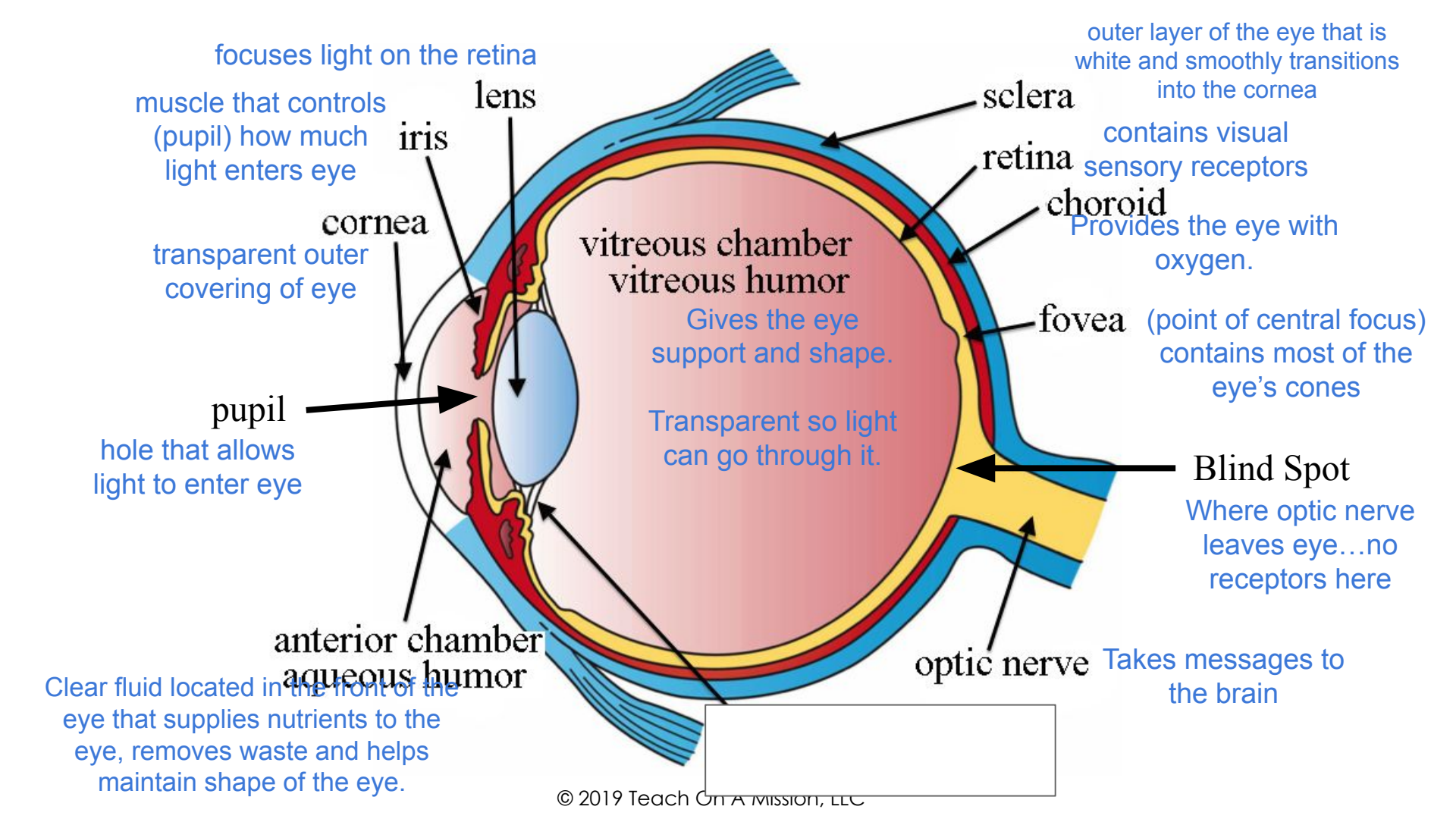
RODS-RODSDARK

Visual pathways



Test Your Blindspot


sclera
choroid
retina
arteries and veins
vitreous humour
fovea
optic nerve
eye muscle
iris
aqueous humour
suspensory ligaments
ciliary muscle
ciliary body



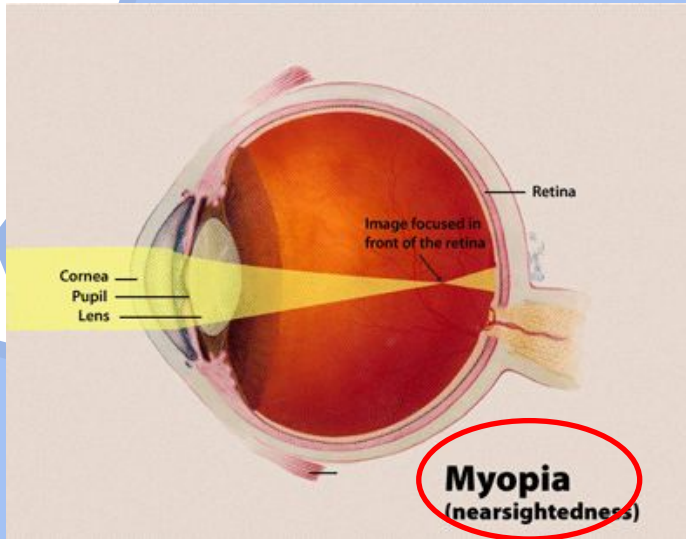

TAKE
A
BREAK

Nearsightedness

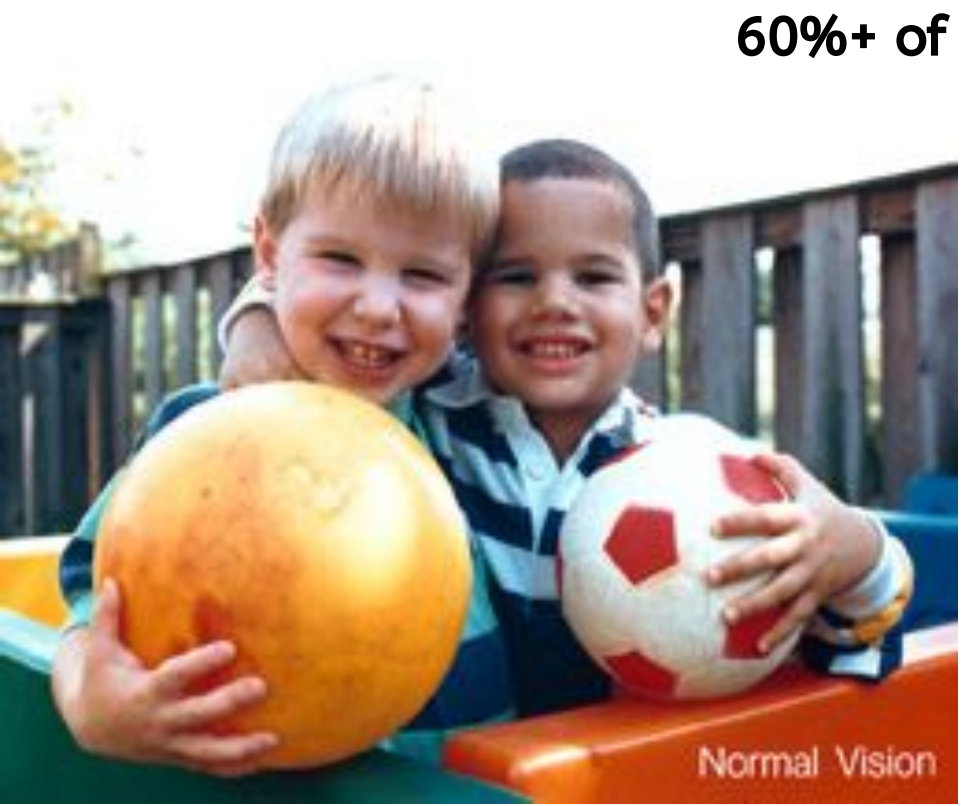
A condition in which nearby objects are seen more clearly than distant objects because eye is elongated in shape, so the image focuses before it hits the retina.

Shape of typical eye

Shape of nearsighted eye



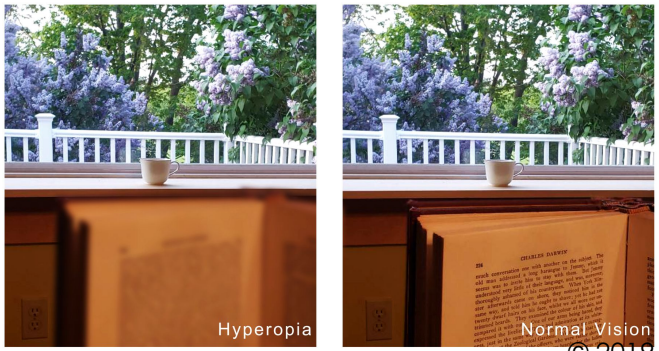
40%+ of Americans
60%+ of Koreans

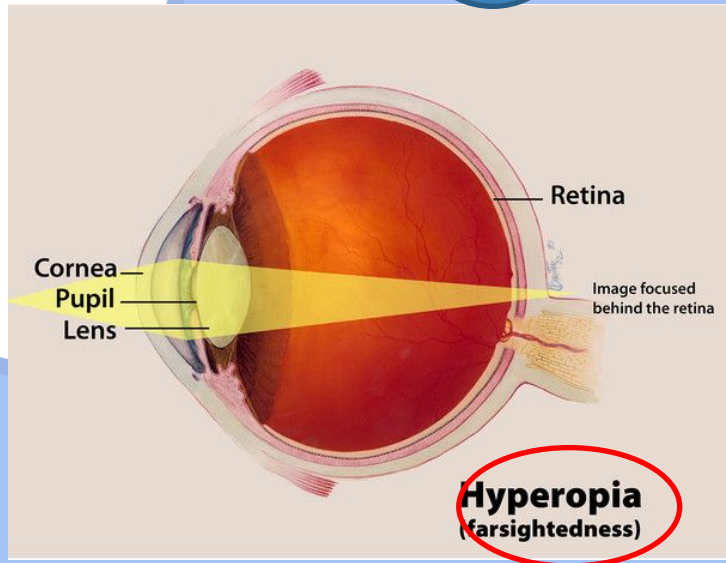


Farsightedness

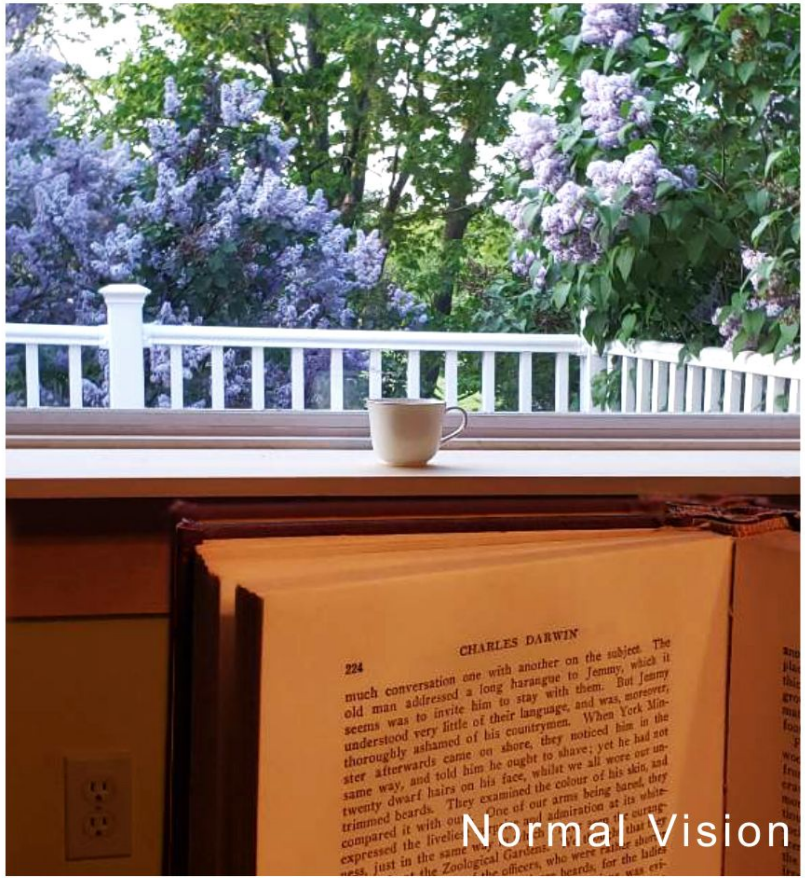
A condition in which faraway objects are seen more clearly than near objects because the eye is shortened and the image focuses after it hits the retina.

10% of Americans!






Hyperopia


224 CHARLES DARWIN
much conversation one with another on the subject. The
old man addressed a long harangue to Jemmy, which it
seems was to invite him to stay with them. But Jemmy
understood very little of their language, and was, moreover,
thoroughly ashamed of his countrymen. When York Min-
ster afterwards came on shore, they noticed him in the
same way, and told him he ought to shave; yet he had not
twenty dwarf hairs on his face, whilst we all wore our un-
trimmed beards. They examined the colour of his skin, and
compared it with one of our arms being bared, they
expressed their admiration at its white-
Normal Vision

Myopia simulator

See myopia through your child's eyes.

Launch simulator

Diseases

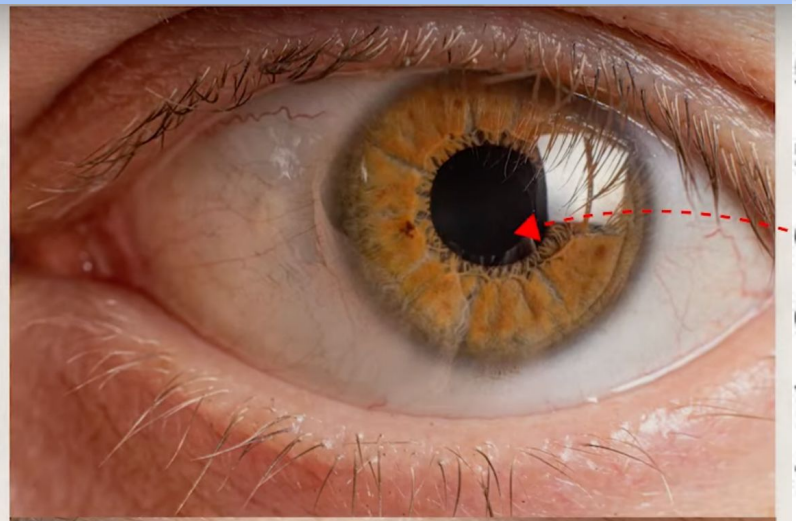
Astigmatism

- Occurs if the cornea is irregularly shaped and could impact a person's ability to focus

Cataracts

- Occurs when the lens of the eye becomes cloudy, causing vision to become blurry

About one in three people has some degree of astigmatism.



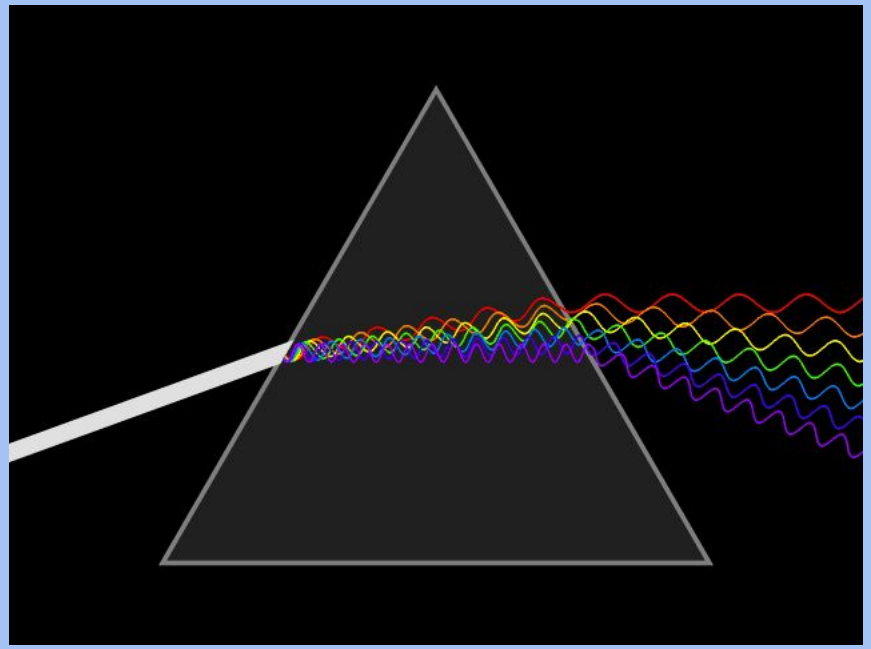
Age Group	Percentage With Cataracts
50-54	5.2%
55-59	9.1%
60-64	15.4%
65-69	24.7%
70-74	36.5%
75-79	49.5%
80+	68.3%

Source: National Eye Institute (NEI), U.S. National Institutes of Health

CATARACTS

A condition where the lens of the eye is cloudy. Vision can progressively get worse due to aging, but this condition can also happen by injury or disease.

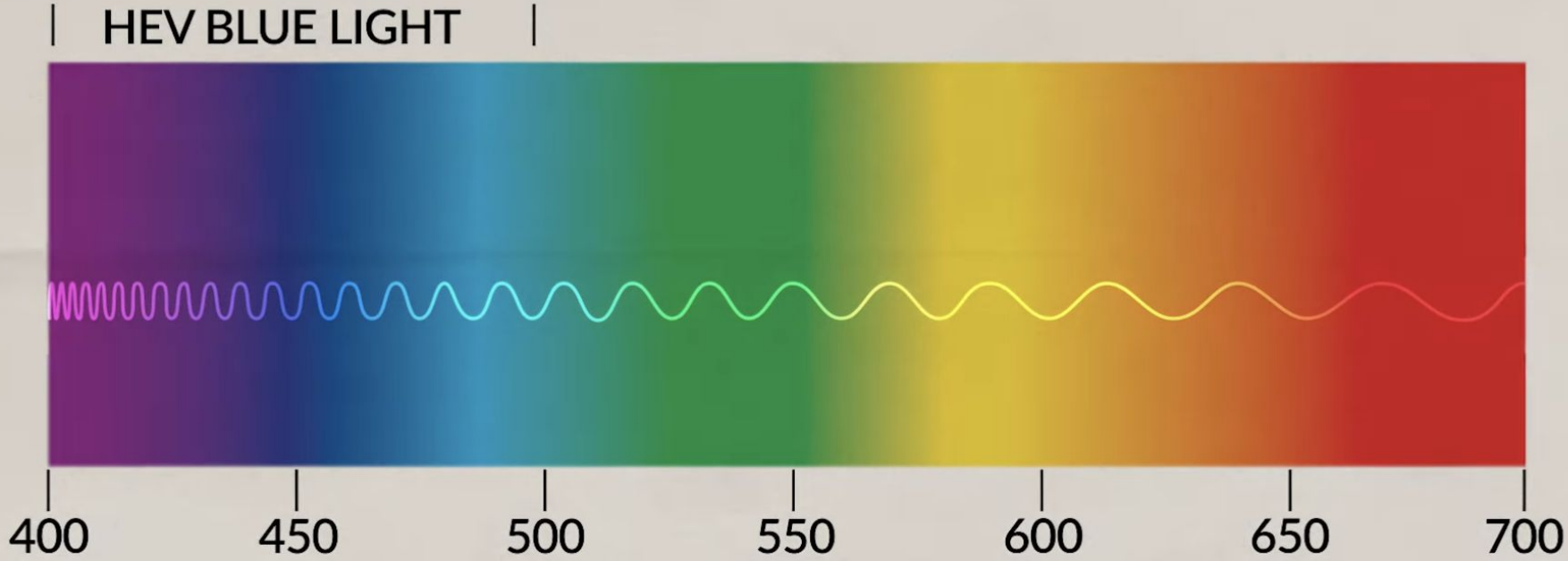
Wavelength (Hue)



Hue (color): dimension of color determined by wavelength of light.

Wavelength is the distance from the peak of one wave to the peak of the next.

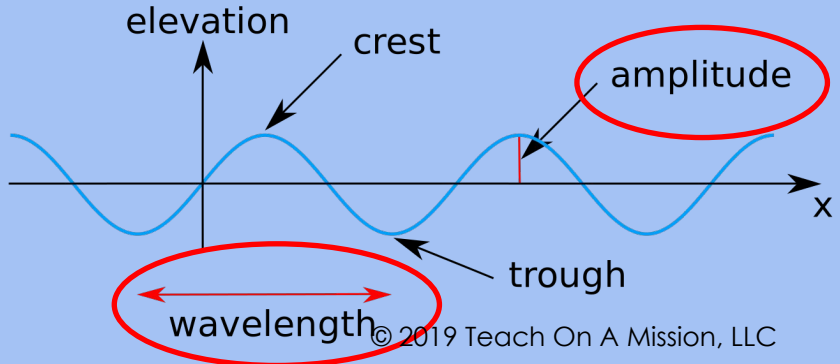
VISIBLE LIGHT SPECTRUM CHART



Intensity (Brightness)

Intensity: amount of energy in a wave determined by amplitude; related to perceived brightness.

Amplitude: how high each wave is.



Vision- Physical Properties of Waves

Short wavelength=high frequency
(bluish colors, high-pitched sounds)

Long wavelength=low frequency
(reddish colors, low-pitched sounds)

(a)

Great amplitude
(bright colors, loud sounds)

Small amplitude
(dull colors, soft sounds)

(b)

Feature Detectors

Nerve cells in the visual cortex that respond to specific features, like edges, angle, length and movement.

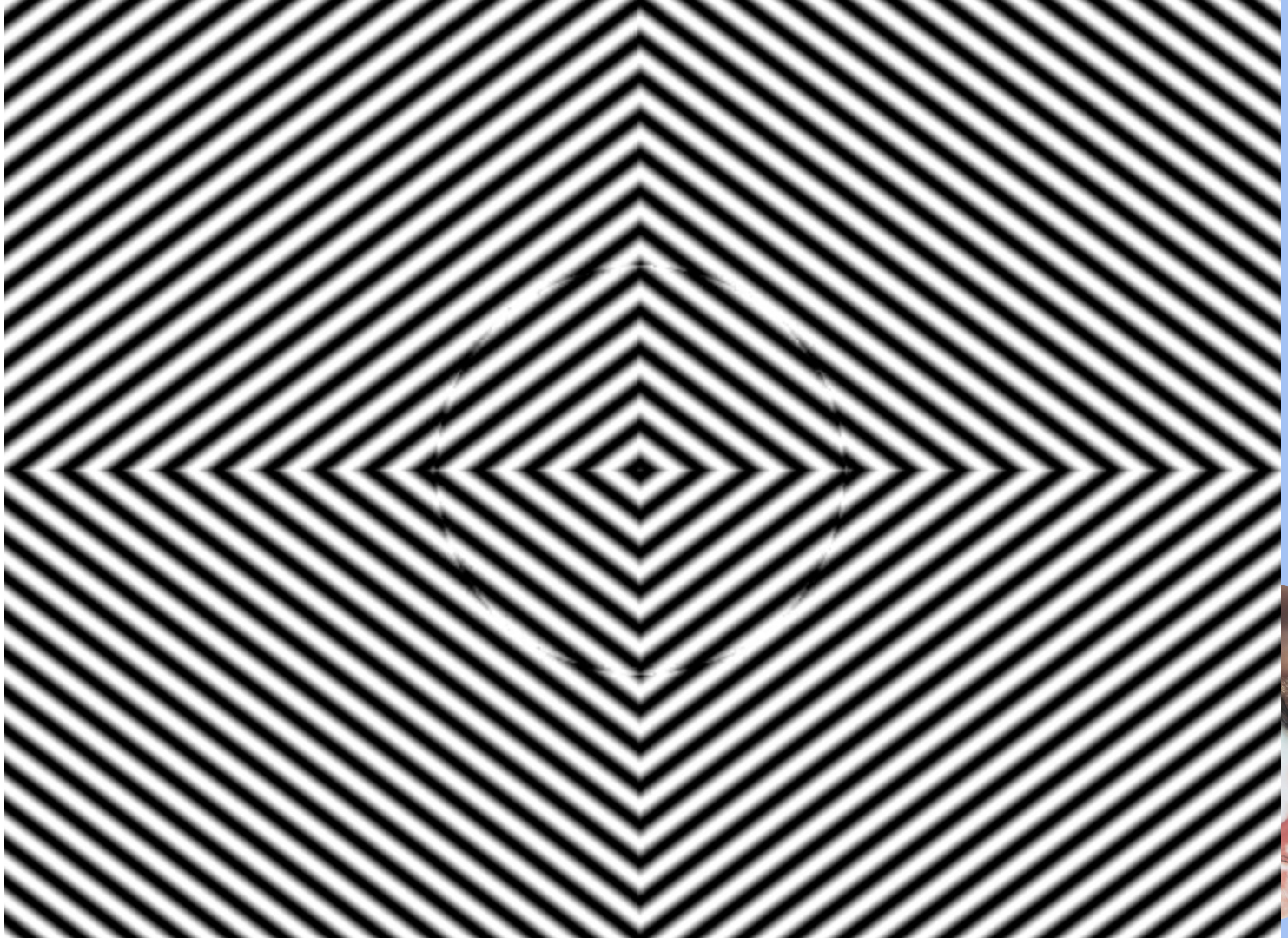
There are even some feature detectors that are specifically sensitive to the human face!

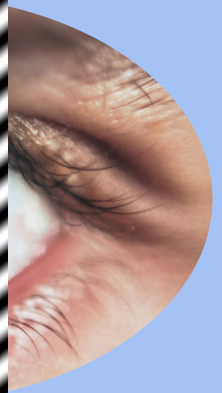
Would feature detectors be a sensory or perceptual experience?

Visual Information Processing

Processing several aspects of the stimulus simultaneously is called **parallel processing**.
The brain divides a visual scene into subdivisions such as color, depth, form and movement, etc.

Let's demonstrate by isolating your movement feature detector…
Go here, enlarge the video, watch for 30 seconds, then look at something else (anything that is stationary)





Motion aftereffect

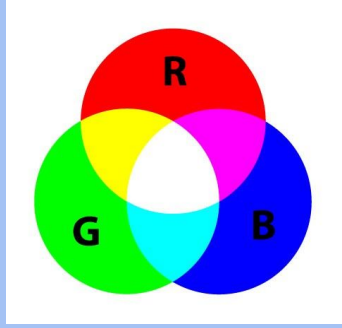
From Wikipedia, the free encyclopedia

The **motion aftereffect** (**MAE**) is a visual illusion experienced after viewing a moving visual stimulus for a time (tens of milliseconds to minutes) with stationary eyes, and then fixating a stationary stimulus. The stationary stimulus appears to move in the opposite direction to the original (physically moving) stimulus. The motion aftereffect is believed to be the result of motion adaptation.

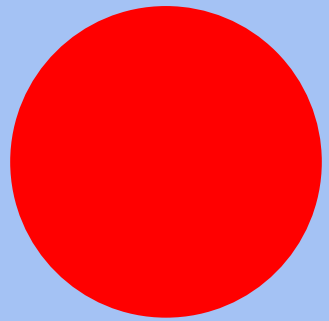
Explanation [edit]

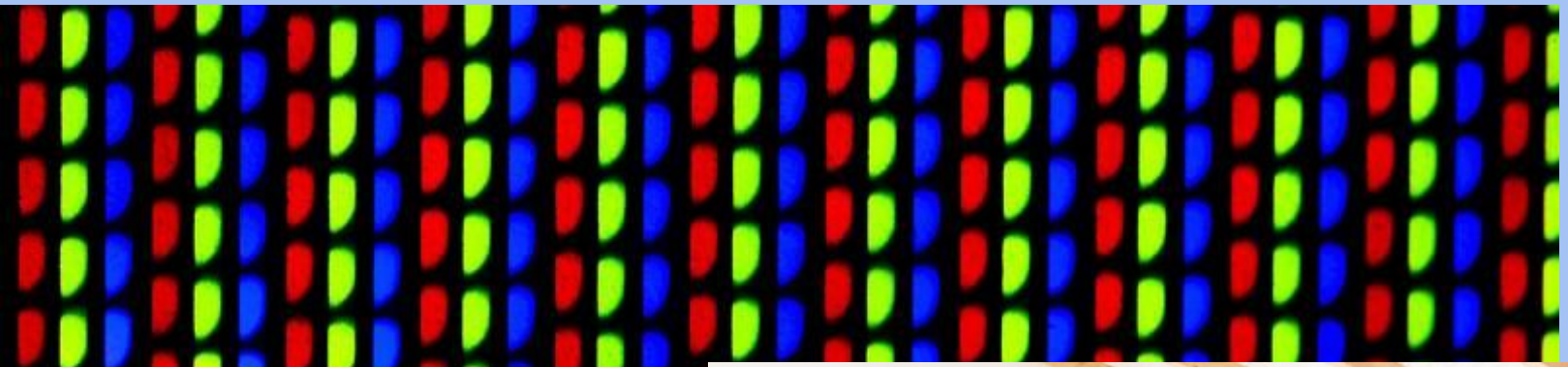
Neurons coding a particular movement reduce their responses with time of exposure to a constantly moving stimulus; this is neural adaptation. Neural adaptation also reduces the spontaneous, baseline activity of these same neurons when responding to a stationary stimulus (see, for example, Barlow & Hill, 1963; Srinivasan & Dvorak, 1979; Glasser, Tsui, Pack, & Tadin, 2011). One theory is that perception of stationary objects, for example rocks beside a waterfall, is coded as the balance among the baseline responses of neurons coding all possible directions of motion. Neural adaptation of neurons stimulated by downward movement reduces their baseline activity, tilting the balance in favor of upward movement.

Theories of Color Vision



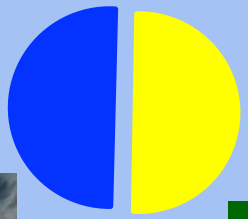
Trichromatic theory (Young-Helmholtz): Based on behavioral experiments, Helmholtz suggested that the retina contains three receptors (cones) sensitive to red, blue, and green colors.

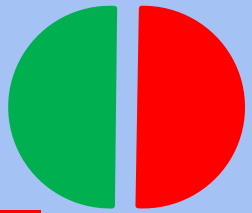


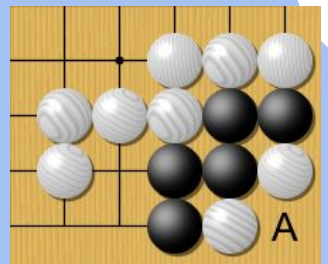


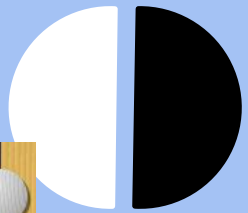
Theories of Color Vision

Opponent Process Theory: Hering, proposed that we process four primary colors opposed in pairs of red-green, blue-yellow, and black-white.



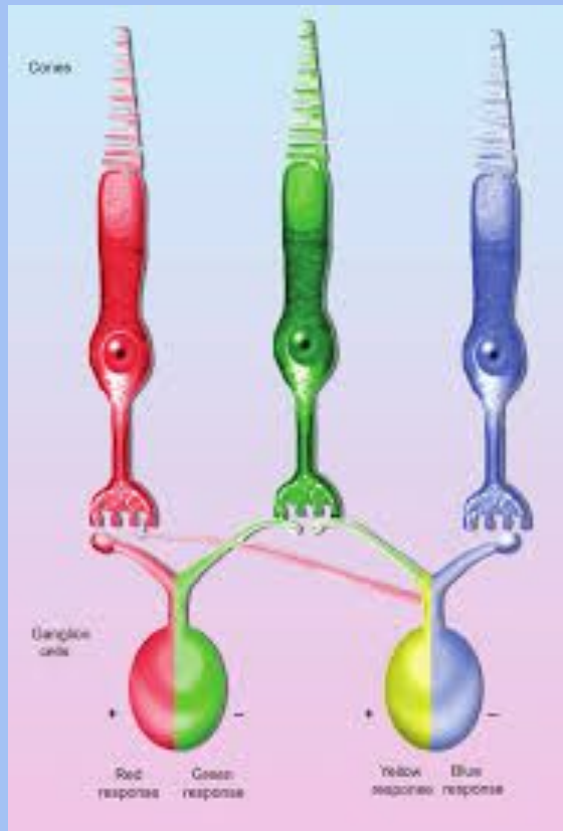




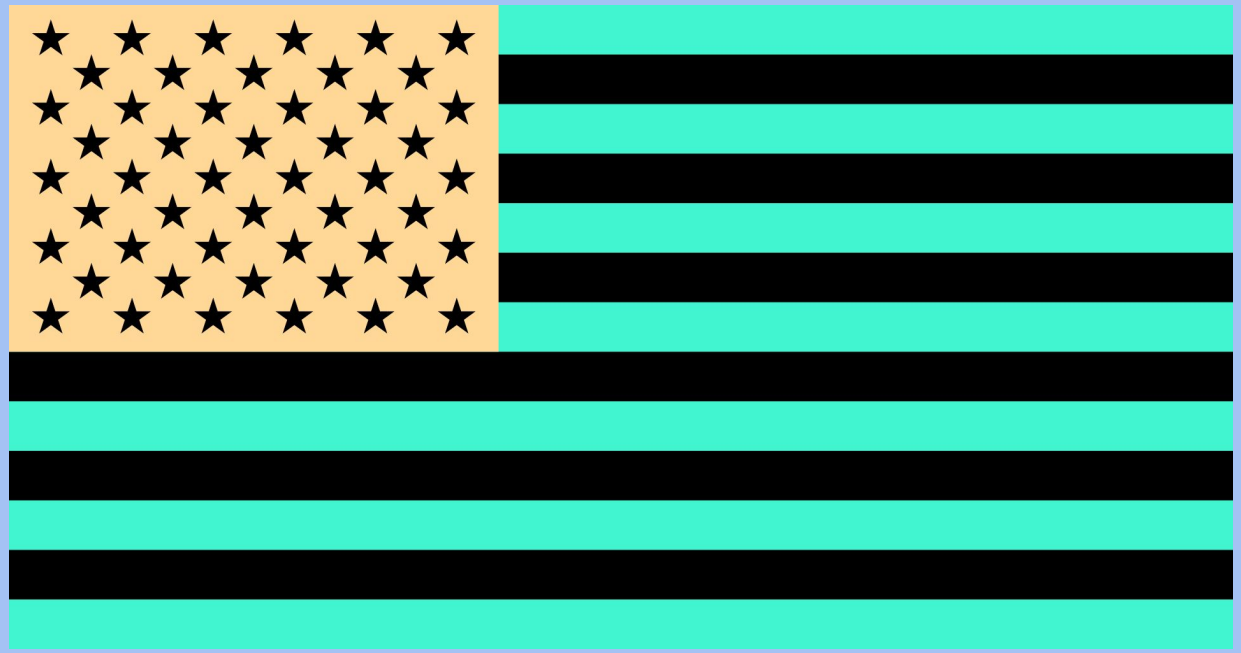


Theories of Color Vision

According to the opponent process theory, the mind can only register the presence of one color of a pair at a time because the two colors oppose one another.

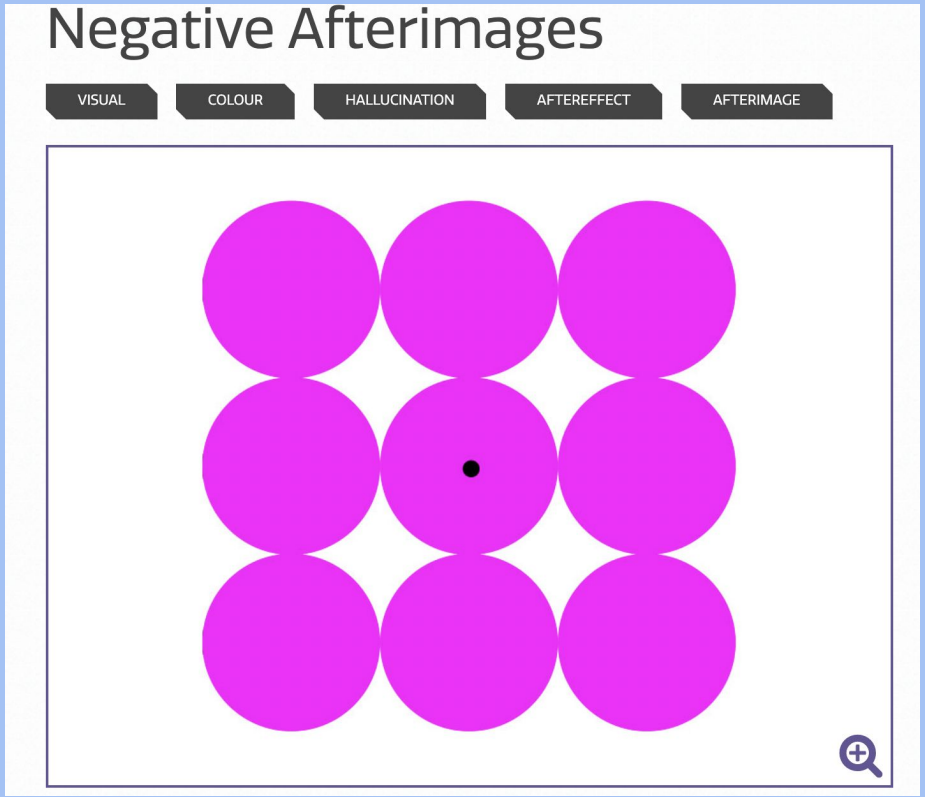


Afterimages

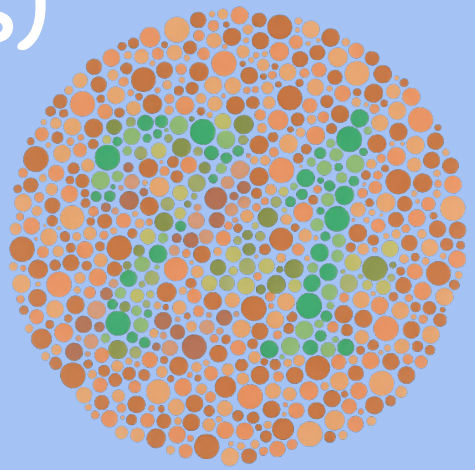


Gaze at the middle of the flag for 30 seconds. When it disappears star in the middle of the screen and report what you see.

Afterimages part 2

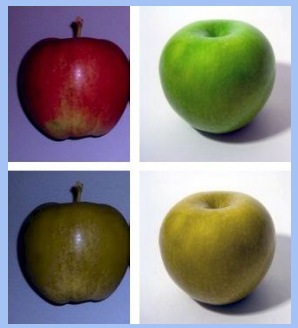


Color Deficiencies (blindness)



Genetic disorder which prevents individuals from discriminating between certain colors due to a weakness in or lack of one of the cones

Most common form of color “blindness” is difficulty distinguishing between red and green



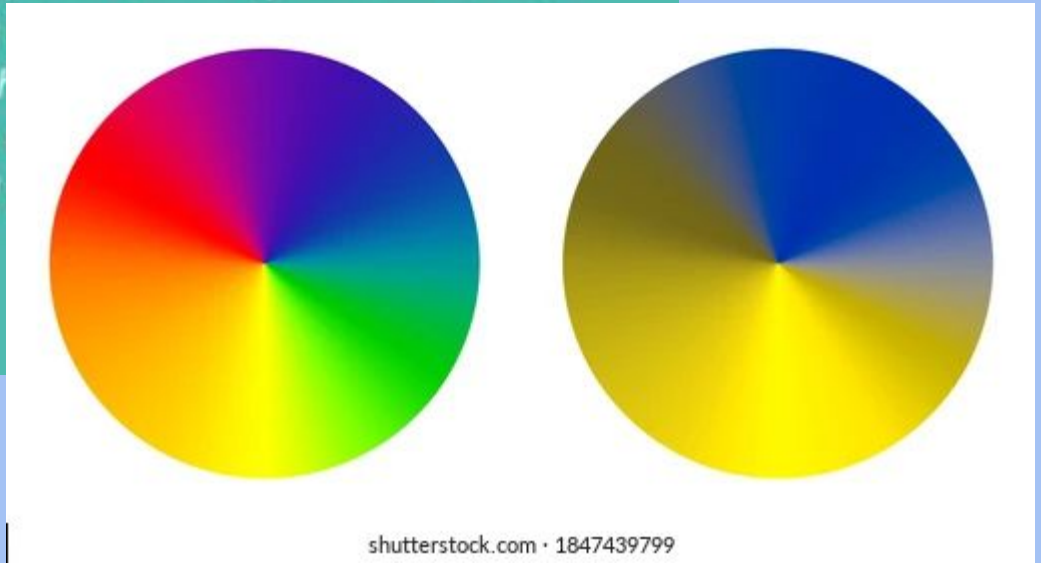
Complete color deficiency does exist but is very rare…it would be like watching a black and white movie.

ANOMALOUS TRICHROMACY

In anomalous trichromacy, all three types of cones are present, however, one cone's light sensitivity is altered, creating a reduced color spectrum. This is one of the most common types of color blindness, as it creates an impairment in hue differentiation of colors rather than a complete loss of colors.

DICHROMATISM

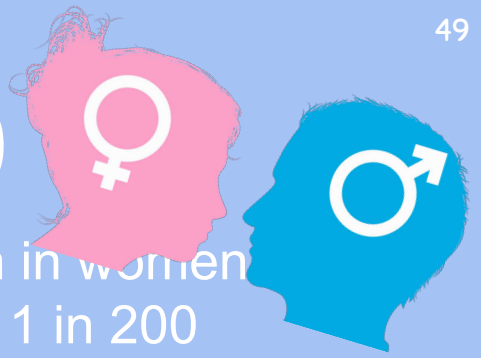
Dichromatism refers to when only two different cone types are available to perceive color. In this case, people are unable to see the colors related to the missing cone. People with tritanopia dichromatism are unable to see
deuteranopia dich
colors, and those
unable to see red



MONOCHROMATISM

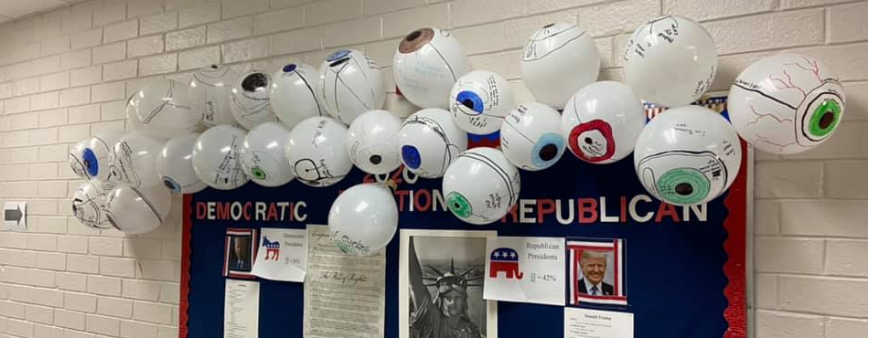
Monochromatism exists when no cones or just one type of cone is available. Monochromatism is also known as complete color blindness, resulting in vision that can only utilize shades of gray, black, and white.

Color Deficiencies (blindness)



Color blindness is more commonly expressed in men than in women.
Nearly 1 in 12 men experience color blindness, while only 1 in 200 women experience colorblindness.

Color blindness is a genetic condition that is expressed on our X-linked chromosomes.
Men have one X chromosome and one Y chromosome, while women have two X chromones. To experience color blindness, **the genetic mutation for colorblindness must be present on the X chromosome, but for women, this means it must be present on both X chromones. Men only need to mutation to be present on their singular X chromosome,** making it much easier for them to inherit color blindness.



Create your own eyeball! Sorry, I could not find white balloons...