K7.1.2 K7.1.2

K7.1.2 The Role of Our Brain in Reading Visual Information Through the Eyes

Photoreceptor cells change the light from objects that reach the retina of our eye into electrical signals. These signals are sent to the brain through the optic nerve. The brain then identifies what the object is. This is how we can see objects through our eyes.

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The Role of Our Brain in Reading Visual Information Through the Eyes

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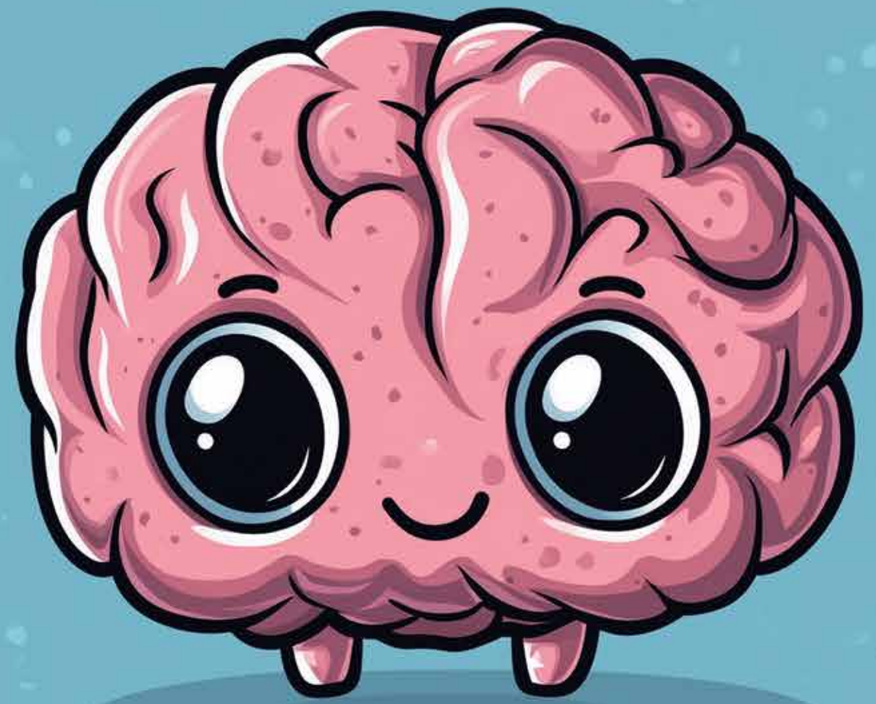
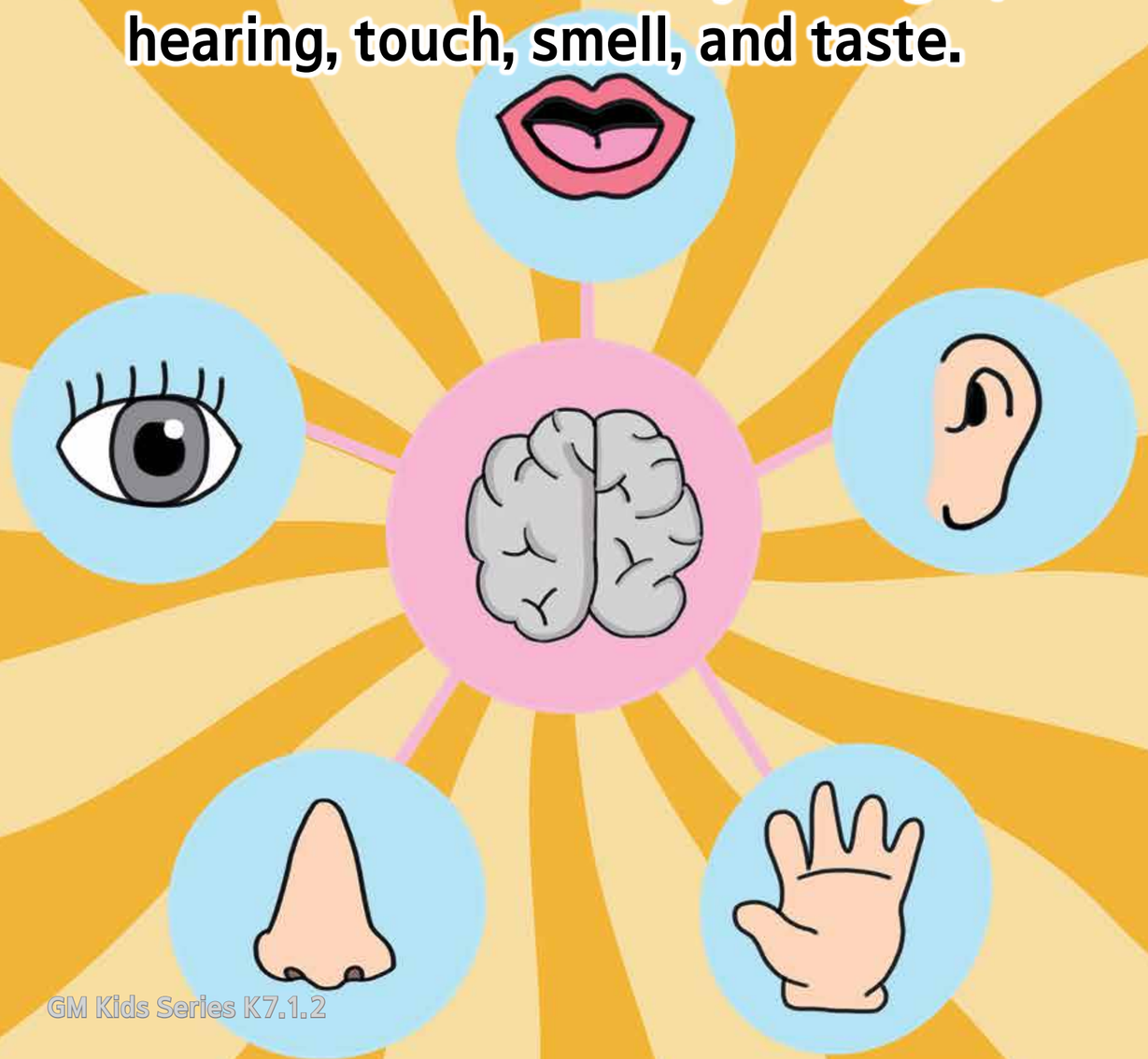
Our eyes are the essential pathways for understanding the world.

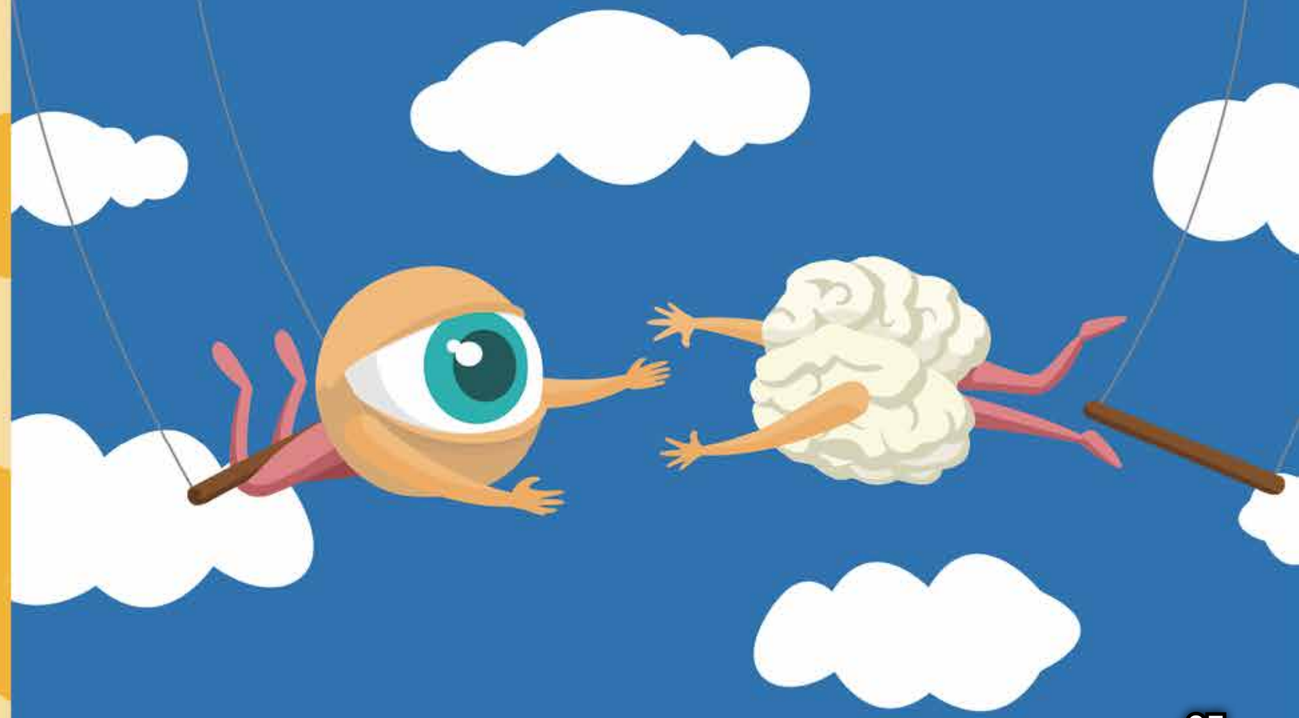
The brain interprets the images we get through our eyes. So, how does the brain understand the world?



We use five main senses to understand the outside world. They are sight, hearing, touch, smell, and taste.

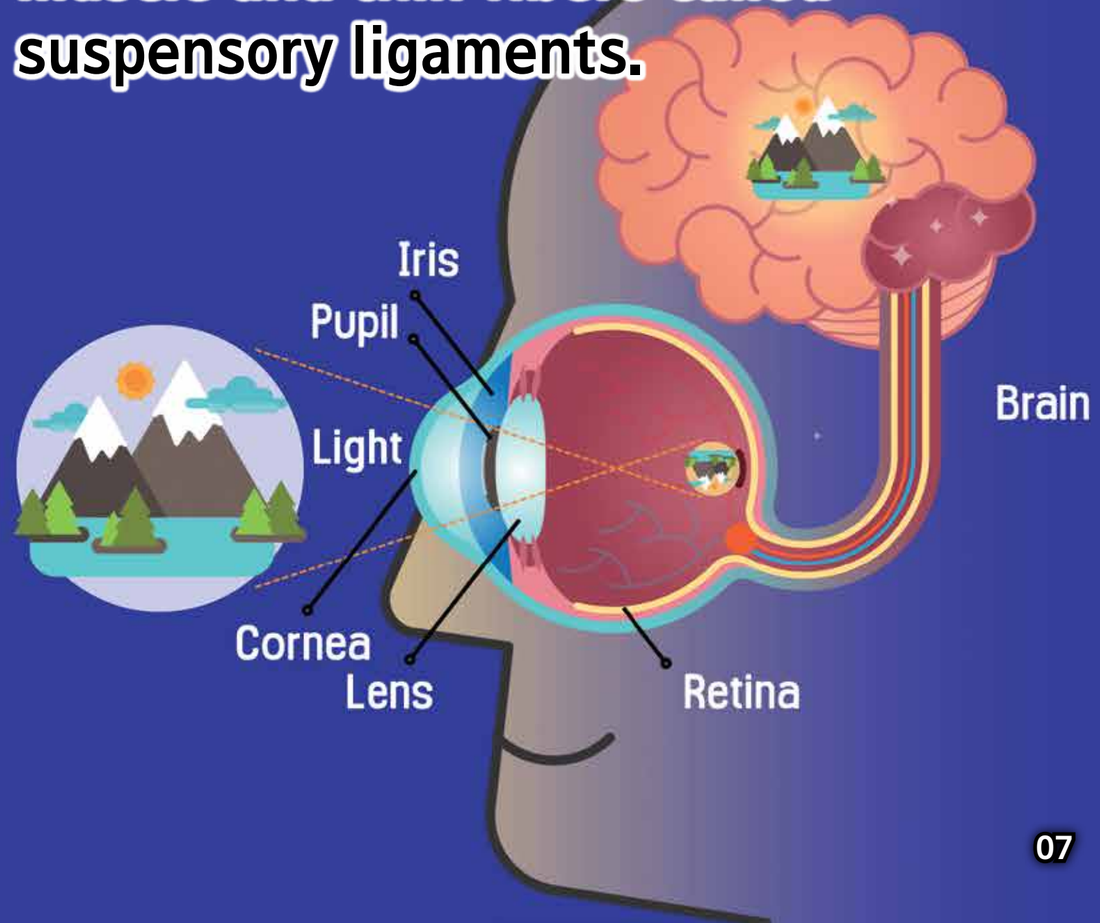


Our brain ranks visual information as the most important out of all the senses.

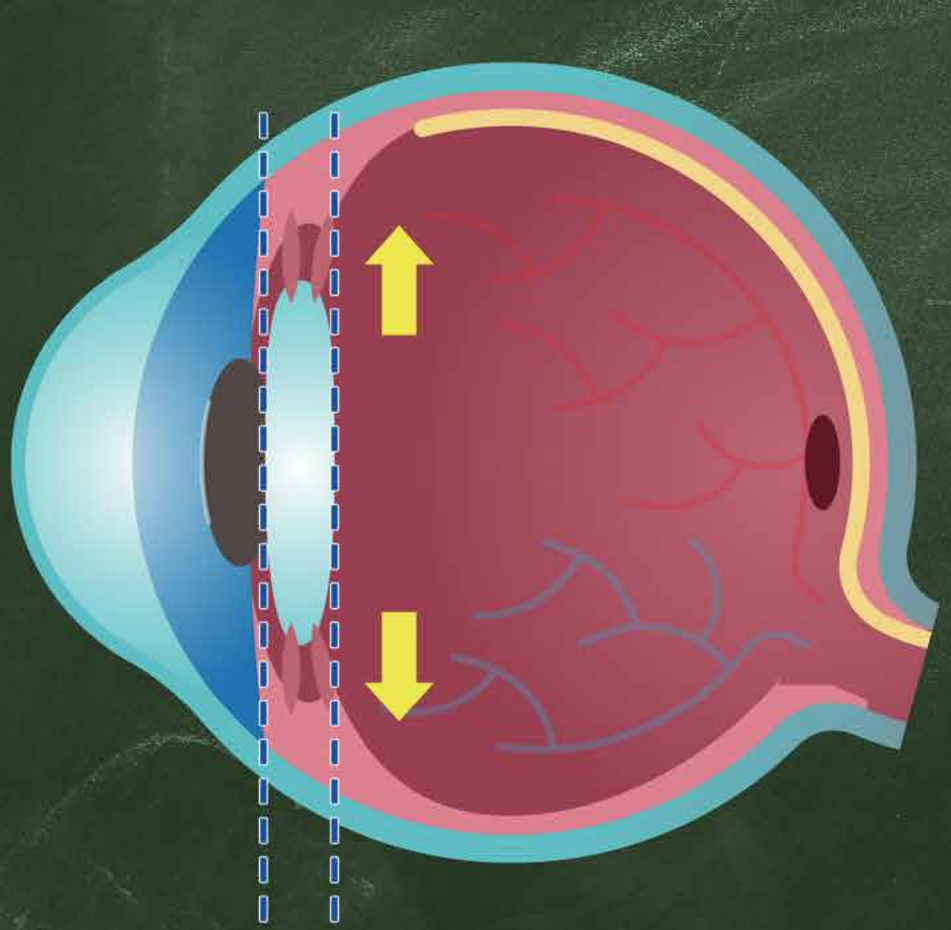


So, how is the visual information sent to the brain? And how does our brain process this information?

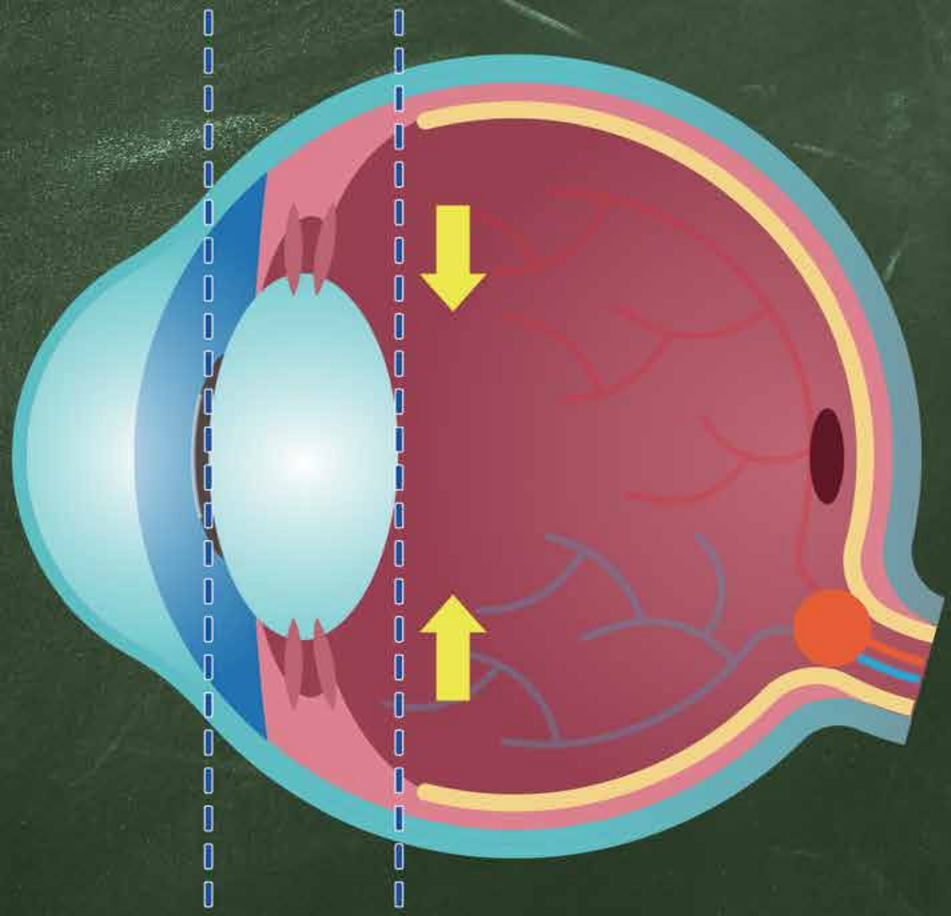
Light from an object passes through the cornea, then through the pupil and lens, and reaches the retina. The lens is connected to the ciliary muscle and thin fibers called suspensory ligaments.



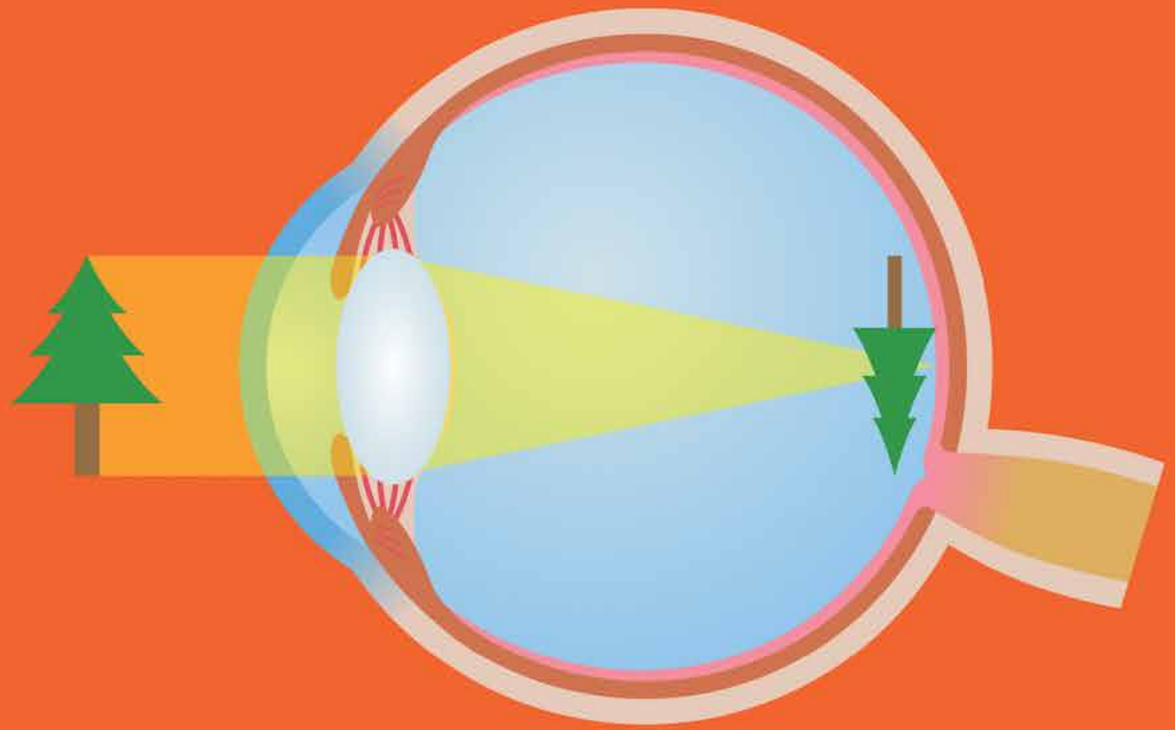
When these two tissues tighten or loosen, the lens changes thickness.



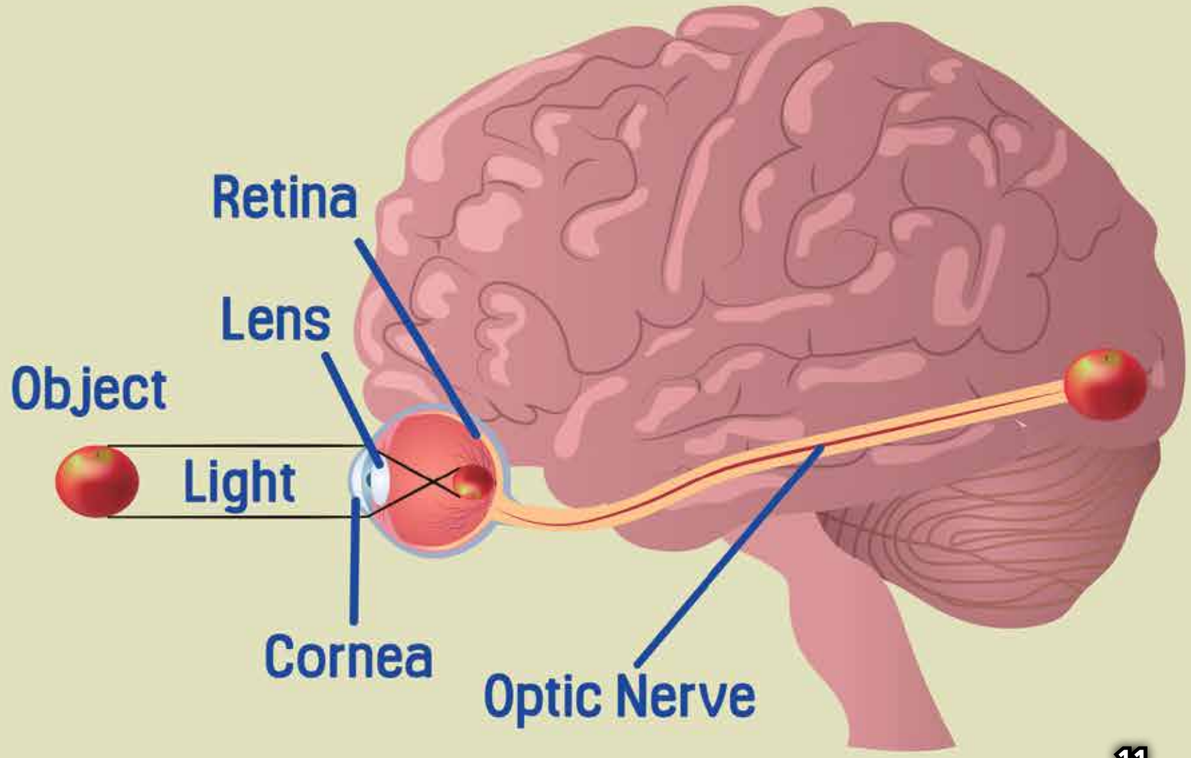
This helps the lens bend the light to focus properly on the retina.



As a result, an image of the object forms on the retina.



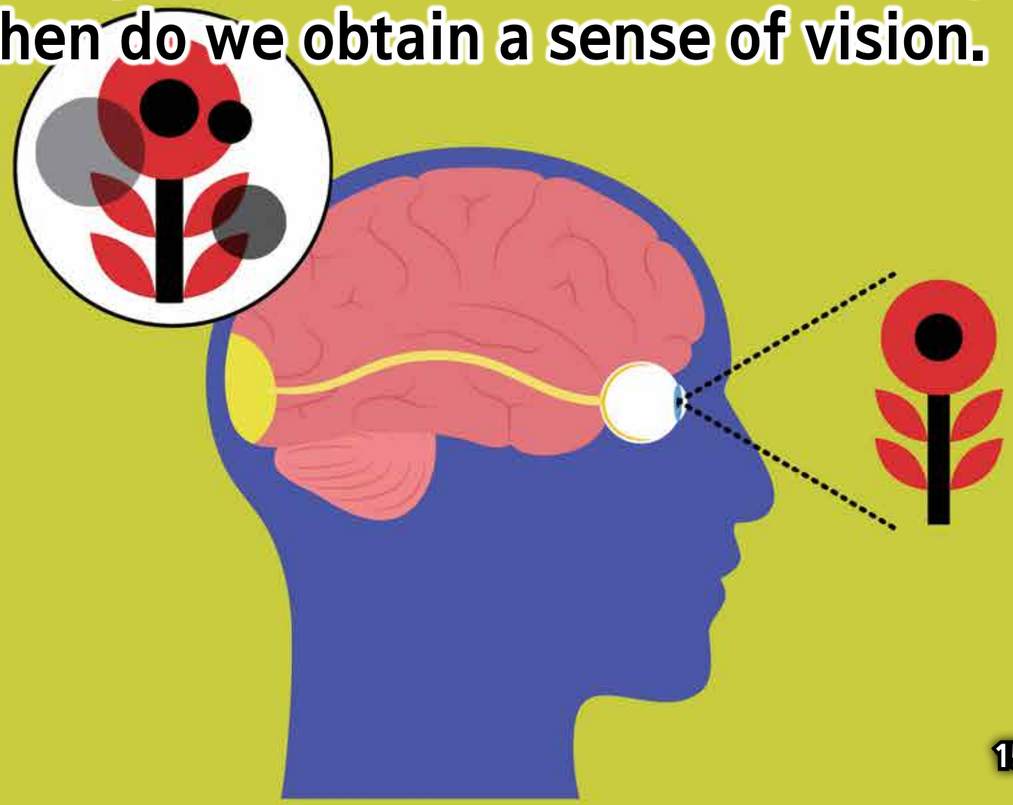
The cells in the retina convert this light into electrical signals. These signals are sent to the brain through the optic nerve. The brain then identifies what the object is.



This is how we can see objects through our eyes.

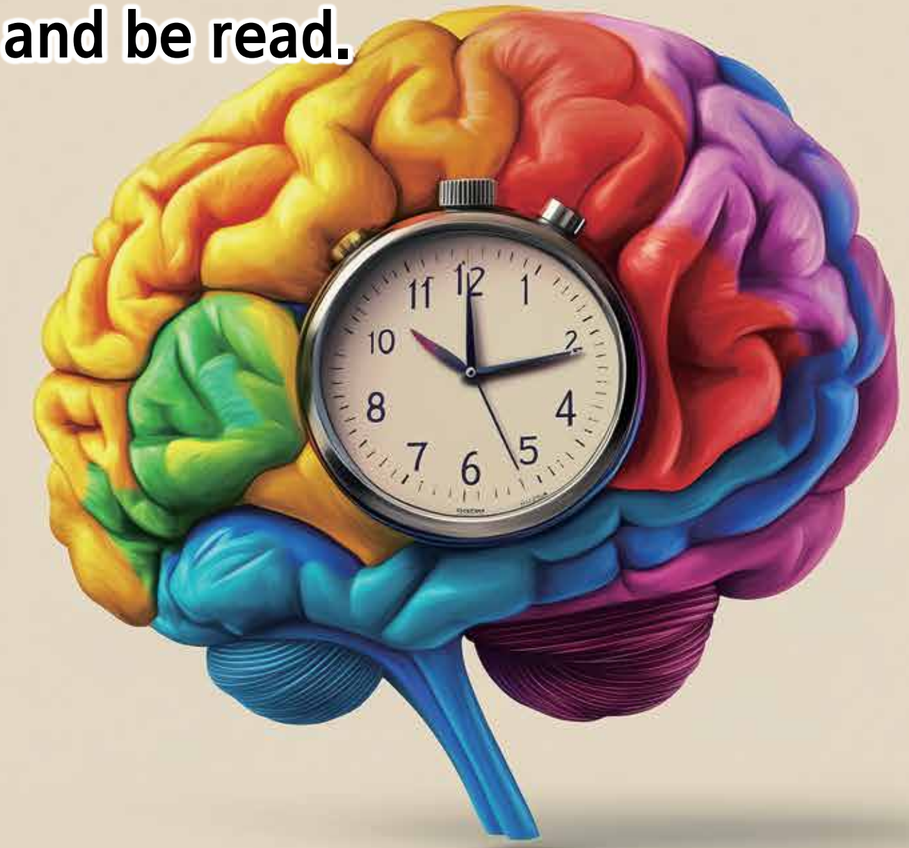
Humans do not immediately perceive sight as soon as our eyes receive information.

The optic nerves detect visual information in the retina and convert it into electrical signals, which are then transmitted to the brain. Then, the brain comprehensively interprets this information, and only then do we obtain a sense of vision.

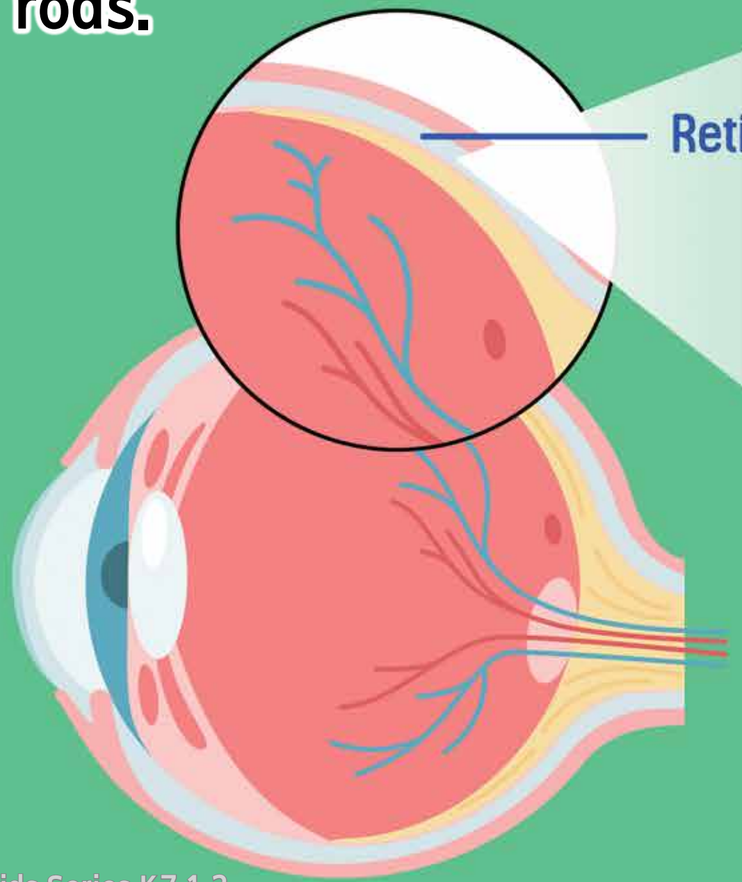


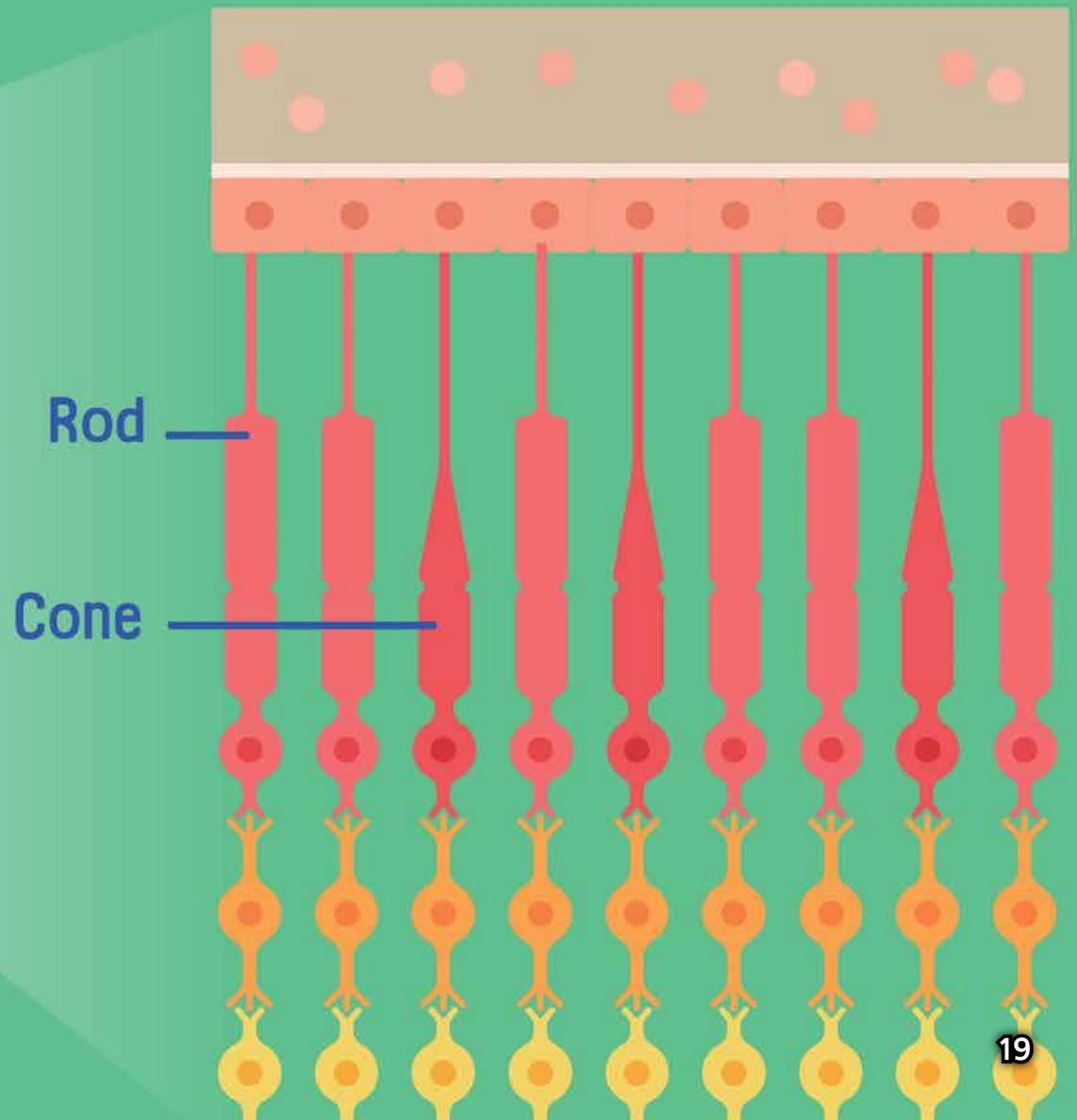
So, are we seeing things as they are now or as they were in the past? Our eyes always see things from the past.

This is because it takes time for the information to reach our brain. According to scientists, it takes about 0.15 seconds for the information to travel from our eyes to the brain and be read.

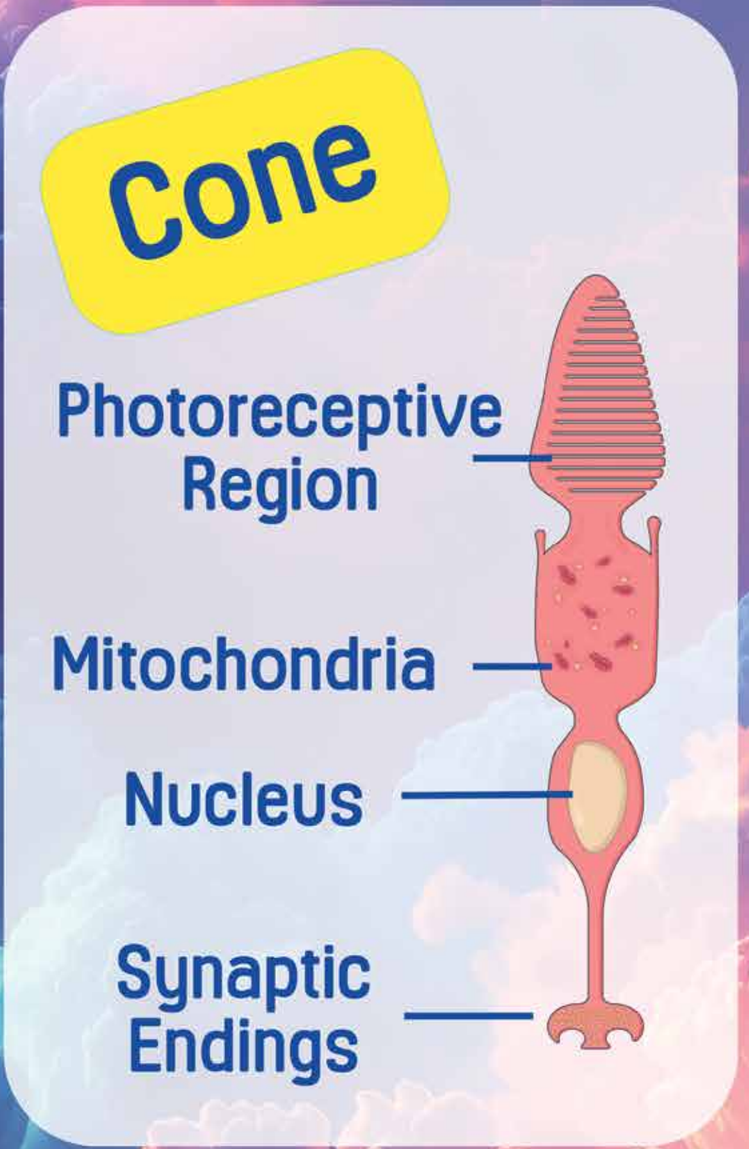


The retina has special photoreceptor cells. These cells are called cones and rods. The human retina contains about 6 million cones and 120 million rods.



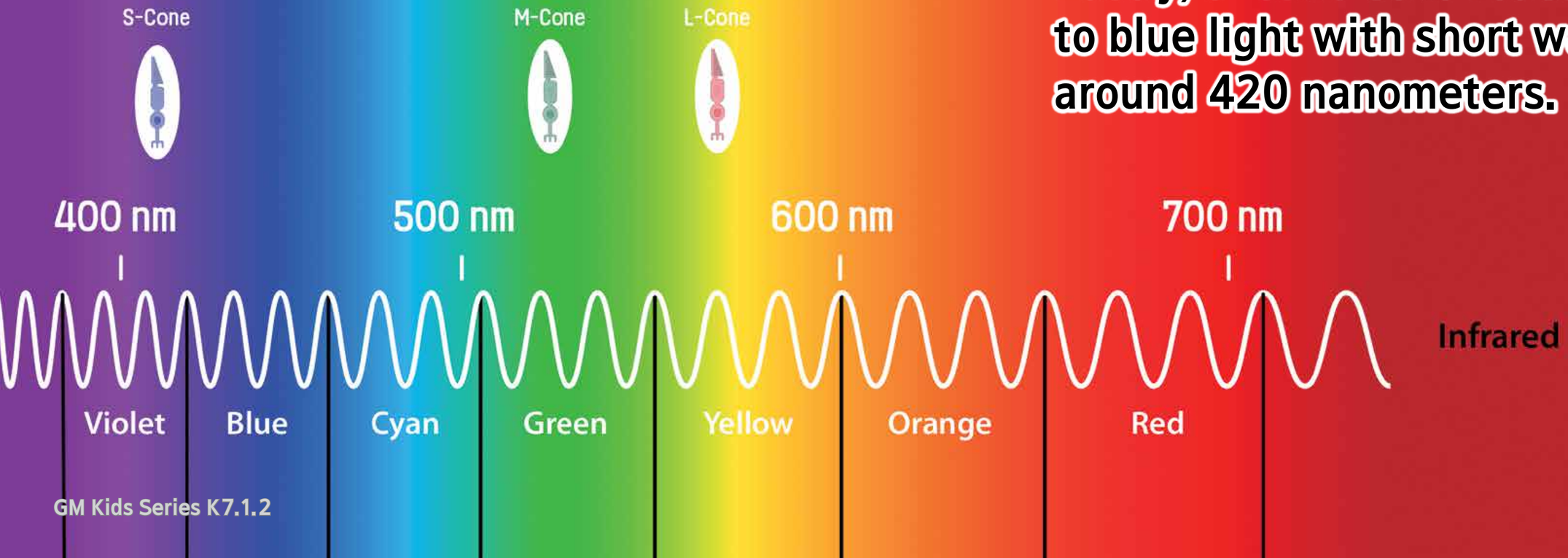


Cone cells, shaped like little party hats, process light information and help us see colors. When more light comes in, cone cells work harder to distinguish colors.

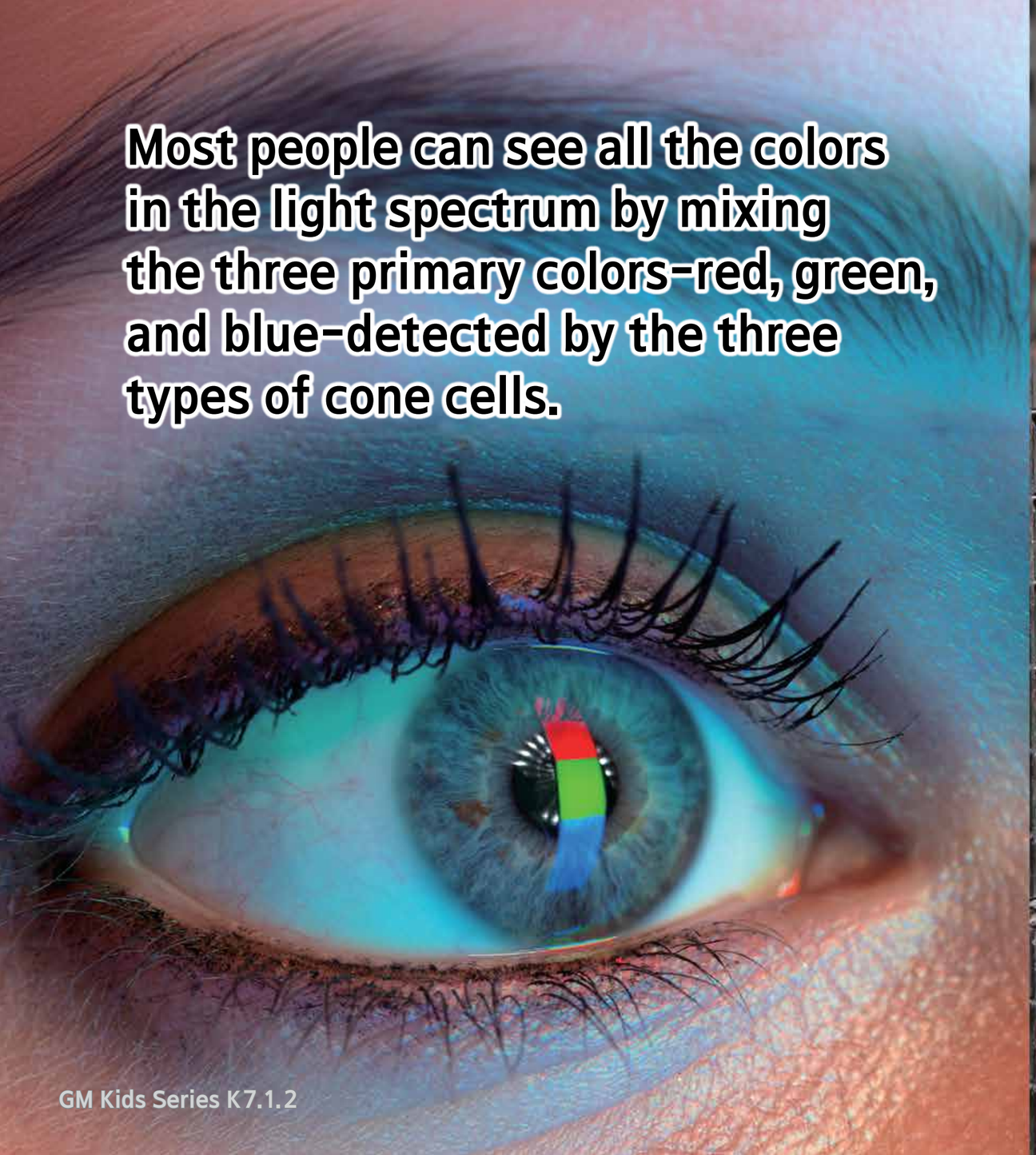


Cone cells are divided into three types based on the wavelength of light they detect.

L-cone cells react strongly to red light with long wavelengths, around 560 nanometers. M-cone cells are most sensitive to green light with medium wavelengths, around 530 nanometers.
Lastly, S-cone cells react strongly to blue light with short wavelengths, around 420 nanometers.

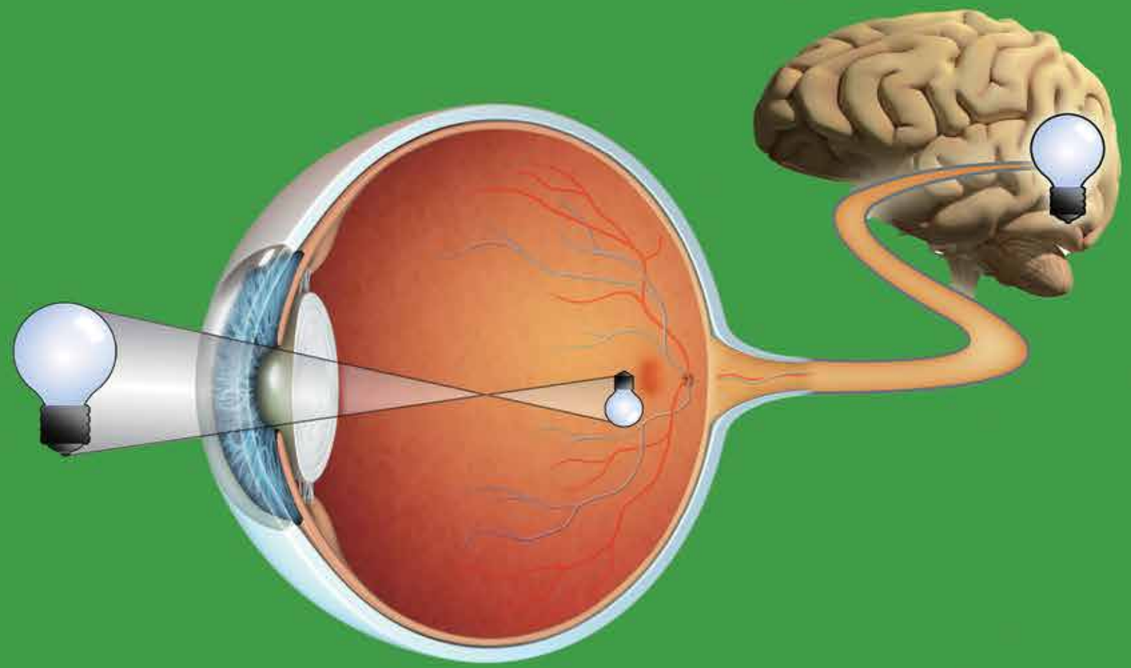


Most people can see all the colors in the light spectrum by mixing the three primary colors–red, green, and blue–detected by the three types of cone cells.



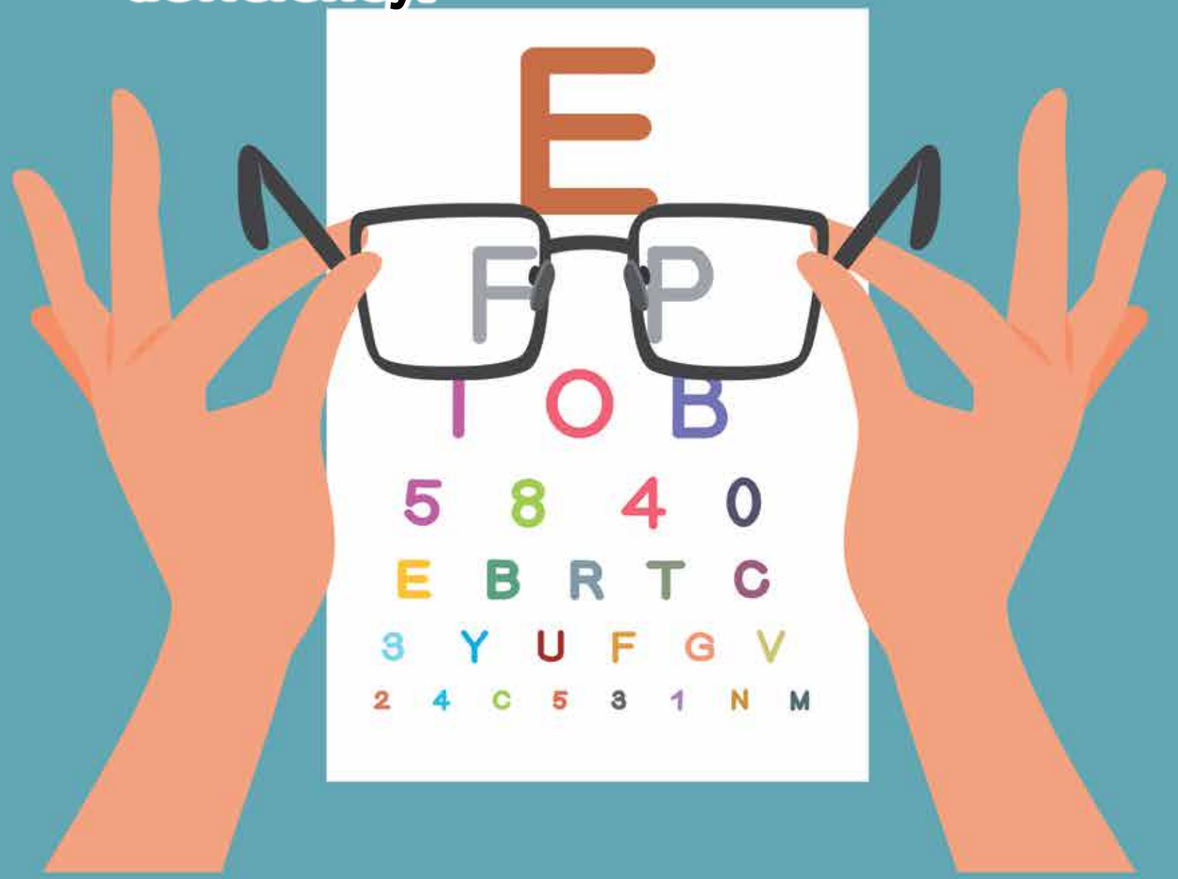
This is similar to how TVs and computer monitors create all kinds of colors by mixing red, green, and blue pixels in the right amounts.

The information about the light wavelengths sensed by these cone cells is sent to the brain through the optic nerve.

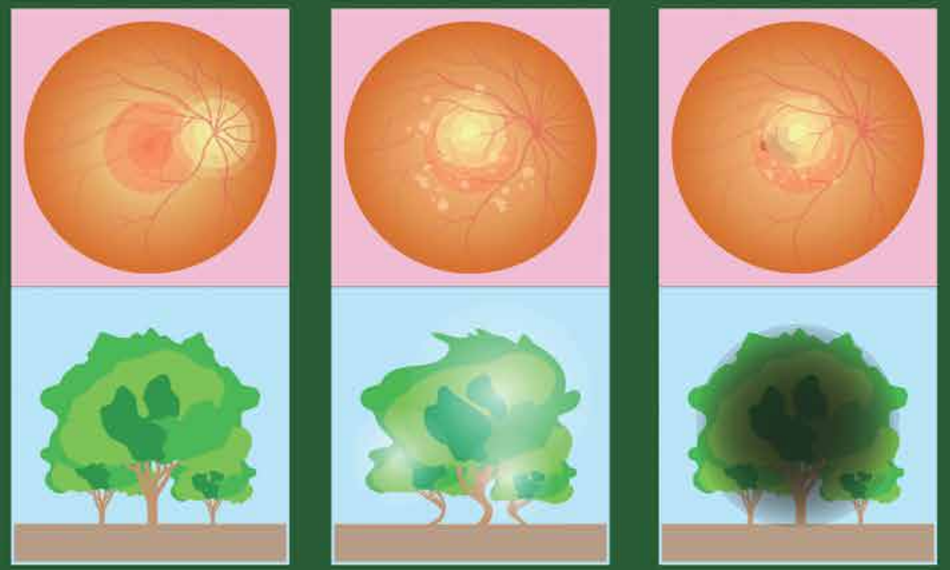


Through this process, we can see the different colors that objects have in the visible light spectrum.

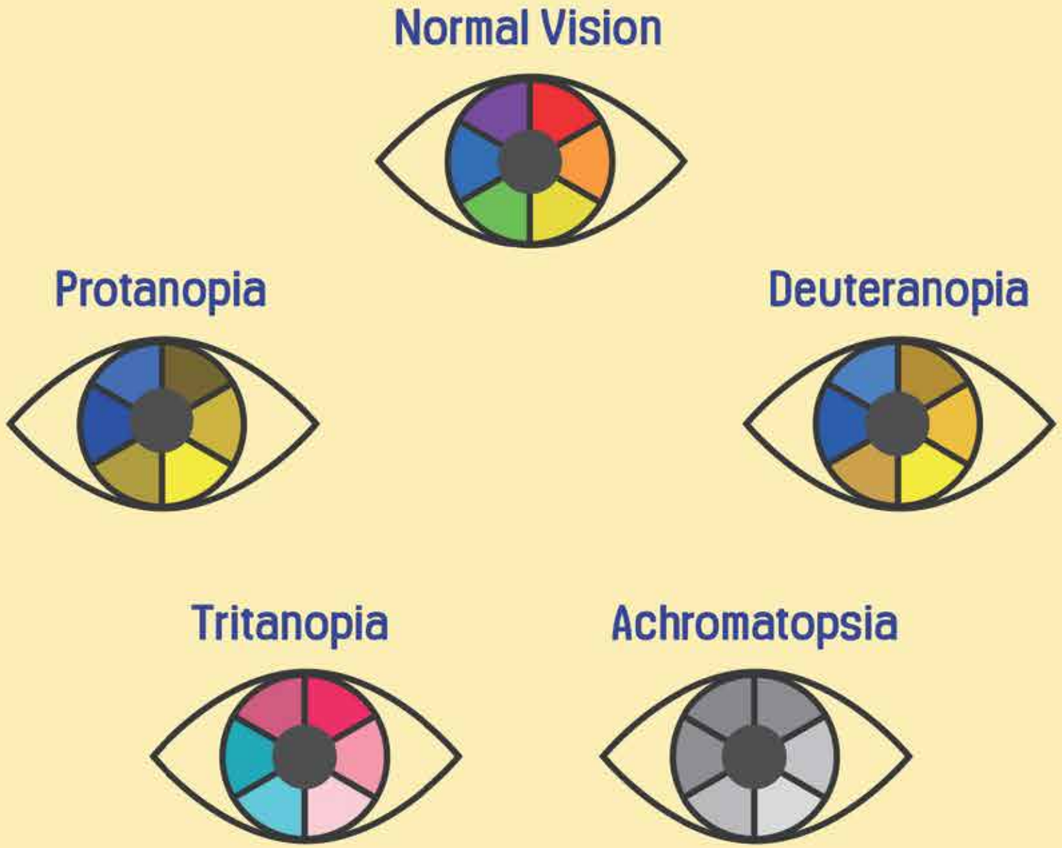
When someone cannot tell apart colors because of problems in their eyes, it is called "color vision deficiency."



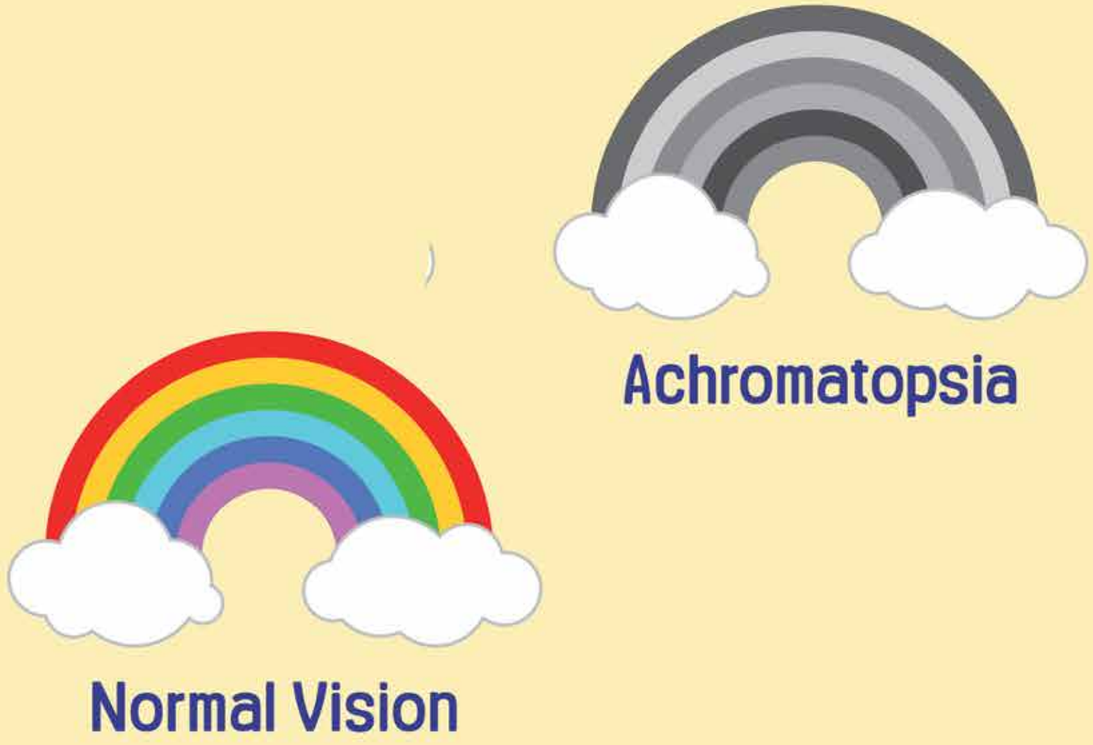
Color vision deficiencies are caused mainly by genetic factors. But they can also happen because of eye diseases like macular degeneration or glaucoma, which people can get later in life.



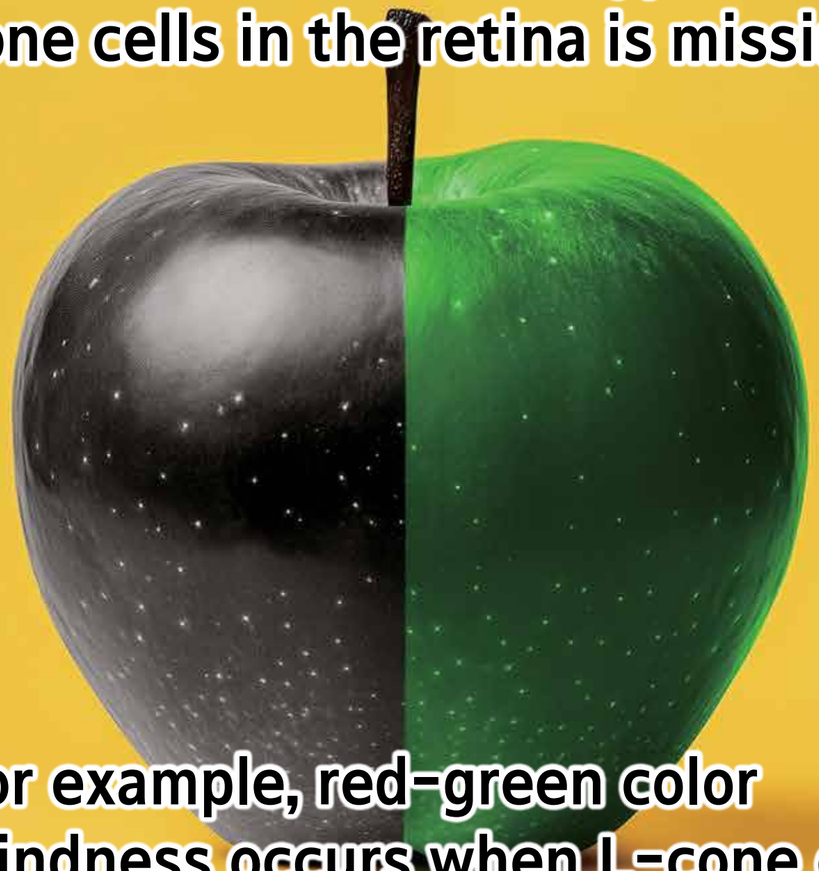
Color vision deficiency can be categorized into total color blindness, partial color blindness, and color weakness.



Total color blindness occurs when cone cells that detect colors are not in the retina, so the person cannot see any colors at all.



Partial color blindness happens when one of the three types of cone cells in the retina is missing.



For example, red-green color blindness occurs when L-cone cells, which detect red, are absent.

People with this condition cannot distinguish between red and green and see red as a darker color.

Color weakness means having trouble seeing faded colors or taking a long time to tell colors apart.

However, people with color weakness can see bright colors just fine. Most color weakness is either red or green and is caused by a change in the cone cells.