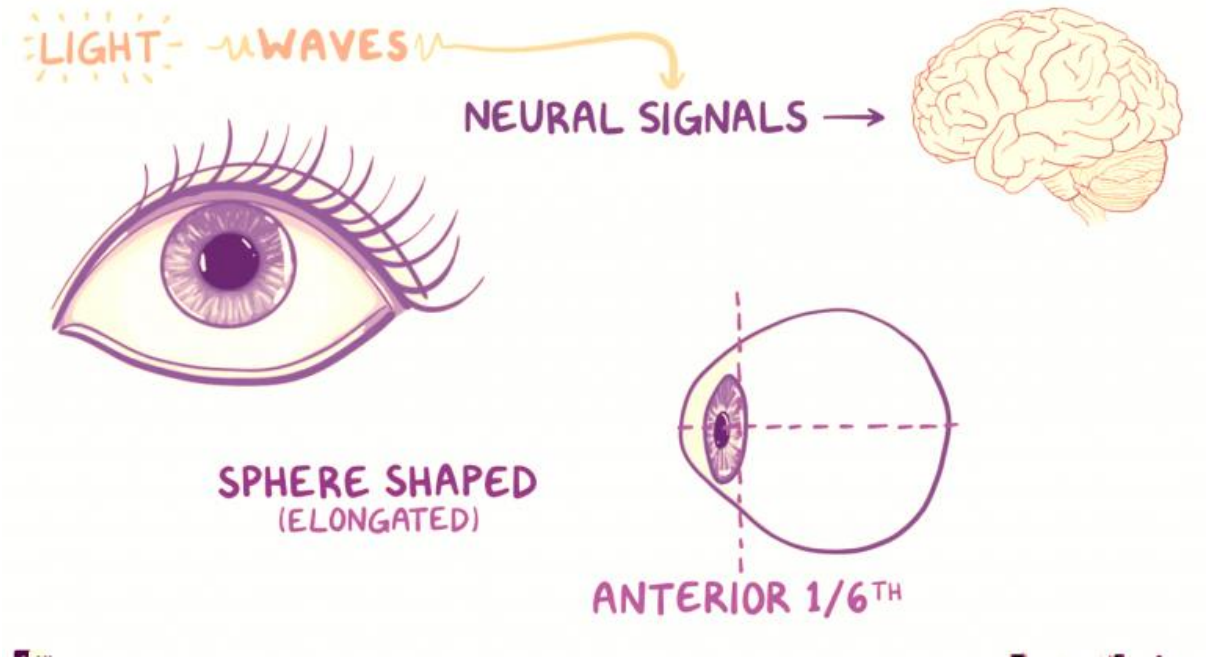
Anatomy and Physiology of the eye



Our eyes allow us to visualize the world around us. They do this by converting light waves into neural signals so that our brain can process them. The eye is sphere-shaped and elongated horizontally, as opposed to being round. As a result, only the anterior one-sixth of the eye is visible. The rest of the eye is inside the eye socket or orbit of the skull.

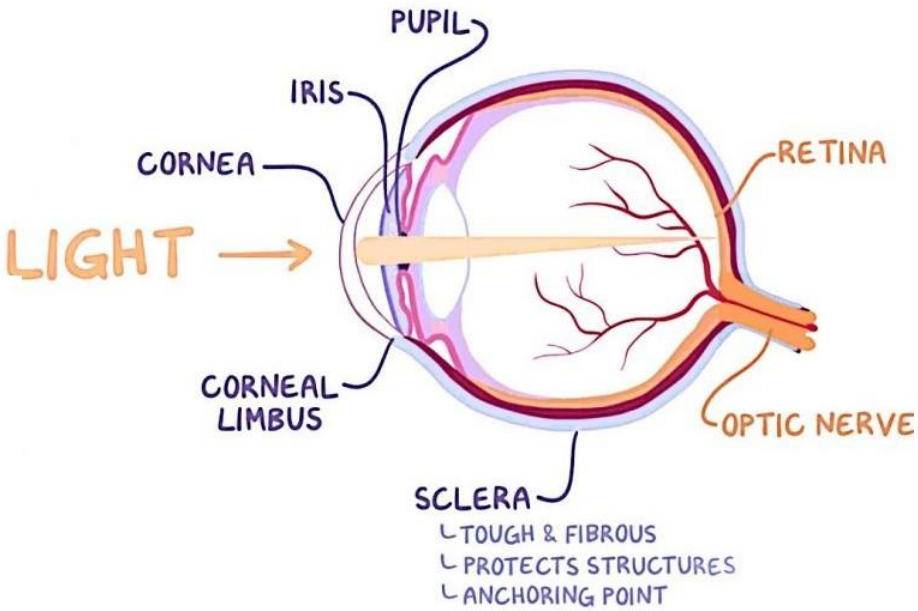
Layers Of The Eye

There are three major layers to the eyewall.

Outer Fibrous Layer

This layer contains two main structures, the sclera, and the cornea.

The ***sclera*** is the white portion of the eye and makes up most of the outer layer. This fibrous covering protects the delicate structure of the eye. In addition, it serves as an anchor for extrinsic eye muscles. The sclera is like a wall built around the eye and has a tiny opening at the back to let the optic nerve through. Finally, the anterior portion of the eye, the sclera, reaches a point of transition called the corneal limbus, where it becomes the cornea.

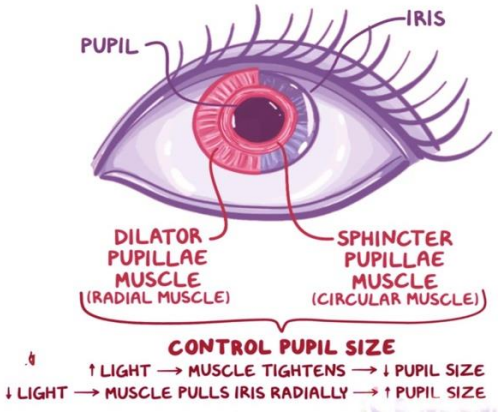


The ***cornea*** allows light to enter the eye, and its curved shape helps focus the light on the retina. The stratified epithelial squamous cells divide and regenerate the cornea and help heal a corneal injury or abrasion. Because the cornea lacks blood vessels, immune cells cannot access it. As a result, it is considered “immune privileged.” But it can be transplanted without the fear of organ rejection.

Vascular Layer(UVEA)

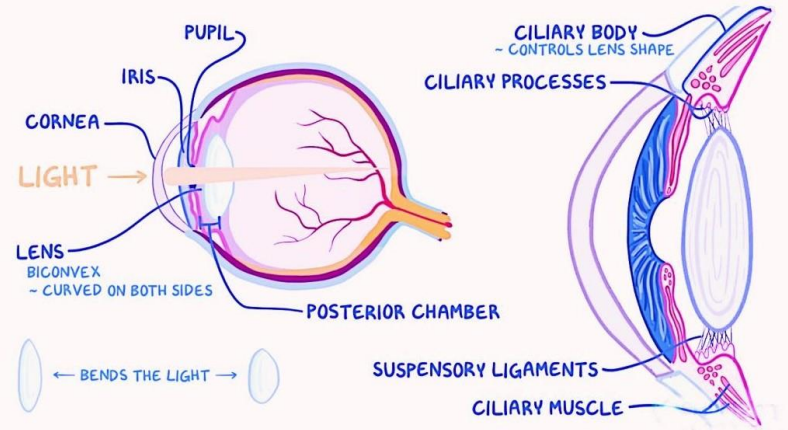
Structures in this layer include the iris, pupil, choroid, and ciliary body. The word “***iris***” is a Greek word meaning “rainbow,” which means the iris is the colorful part of the eye. It is the amount of melanin that determines the color of the eye. People with a high concentration of melanin have dark brown eyes, and those with medium amounts have green eyes. A person with a low concentration of melanin has blue eyes. The iris sits behind the cornea and has two groups of muscle:

- sphinciter pupaillae muscle or circular muscle
- dilator pupaillae muscle or radial muscle



These muscles help control the size of the ***pupil***, which is the central opening at the center of the iris. In addition, the sphincter papillae muscle surrounds the iris-like tiny

circle, and in bright light, this muscle tightens around the pupillary opening, reducing the size of the pupil. When it's dark, the dilator papillae muscle pulls the iris outward increasing the pupil's diameter. As light passes through the cornea and pupillary opening of the iris, it reaches the biconvex lens in the posterior chamber. Biconvex means that the lens is curved on both sides. When the lens bends, it can become flattered or rounder, which bends the light entering the eye. A ***ciliary body*** controls the degree to which the lens becomes flattered or rounder.

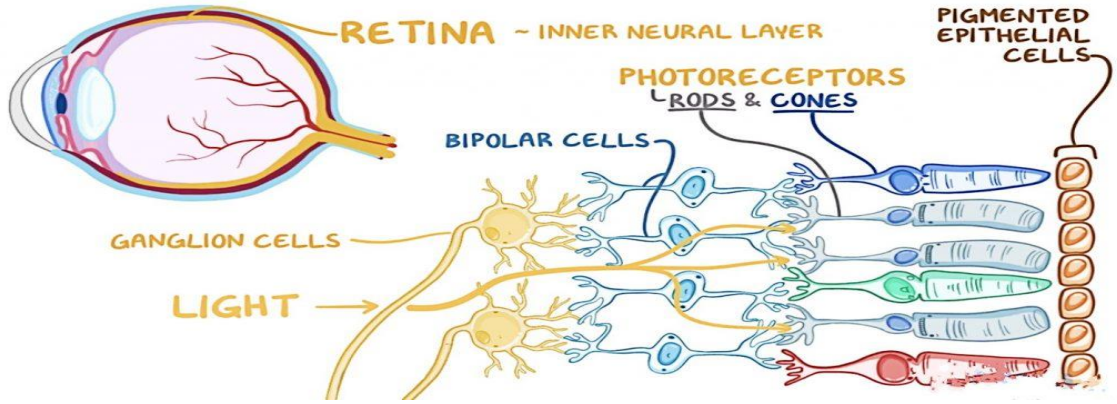


A ciliary body consists of ciliary muscles and ciliary processes. These ciliary processes hold the lens in place by attaching to the suspensory ligament. In addition, the ciliary processes pull on the suspensory ligament during relaxation, flattening the lens.

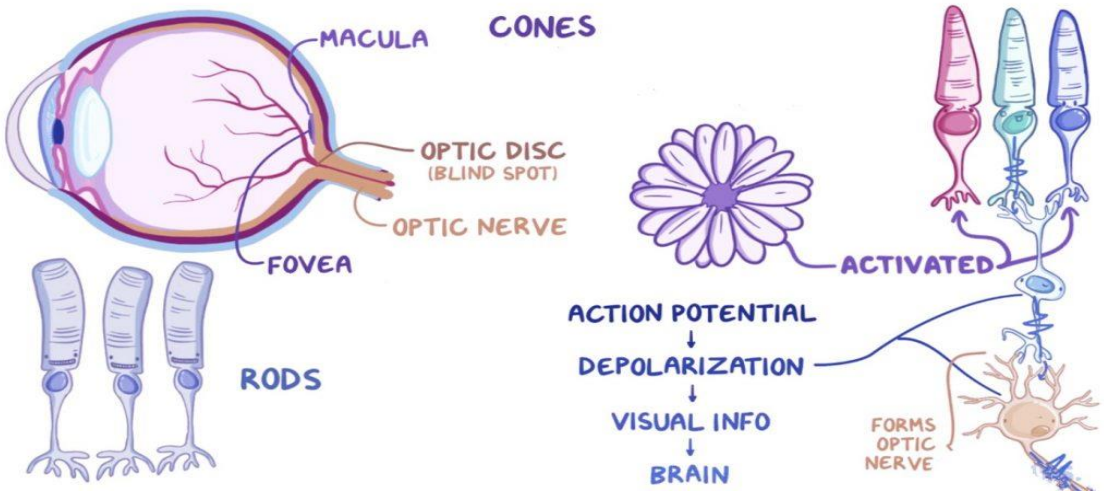
Additionally, the vascular layer has a membrane called a ***choroid*** full of blood vessels that provide nutrients to the eye. The choroid is dark brown, which allows it to absorb light. Without a choroid, the light would reflect and scatter, making it hard to focus on the retina, which plays a big role in vision.

Retina (Inner Layer)

Ganglion cells synapse with bipolar cells in the inner neural layer, synapsing with photoreceptors, rods, and cones. Moreover, the retina has an outer pigmented layer consisting of pigment epithelial cells. So, when light hits the retina, it passes to the ganglion cells, and bipolar cells finally hit the rod and cones. Photoreceptors absorb light that doesn't pass through them, so it won't scatter and bounce back.



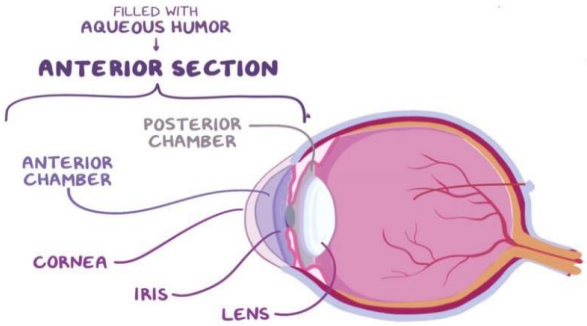
The rods are numerous in number more than 120 million of them in each eye. Rods are highly sensitive to the eye even a single photon can cause them to activate. Rods only offer black and white vision. There are only 6 million cons in each eye most are located in the macula. The fovea or focal point of the macula contains a high concentration of cones. The fovea is a part of the retinal that provides the highest visual acuity. A cone is less sensitive to light than a rod and can detect either red, green, or blue wavelengths.



For example, When you see red apples that activate only red cones. Purple flowers activate both red and blue cones. When rods and cones activate, they are hyperpolarized and generate an action potential. This will depolarize the bipolar cells, which triggers the depolarization of ganglion cells. This AP travels from the ganglion cells to the posterior part of the retina to form the optic nerve. The optic nerve leaves the eye through the optic disc medial to the macula. The optic disc is called the blind spot since it lacks photoreceptors. This nerve sends visual information to the brain for recognition and processing.

A cross-section of the eye shows that it has different chambers.

Anterior Chamber



Includes:

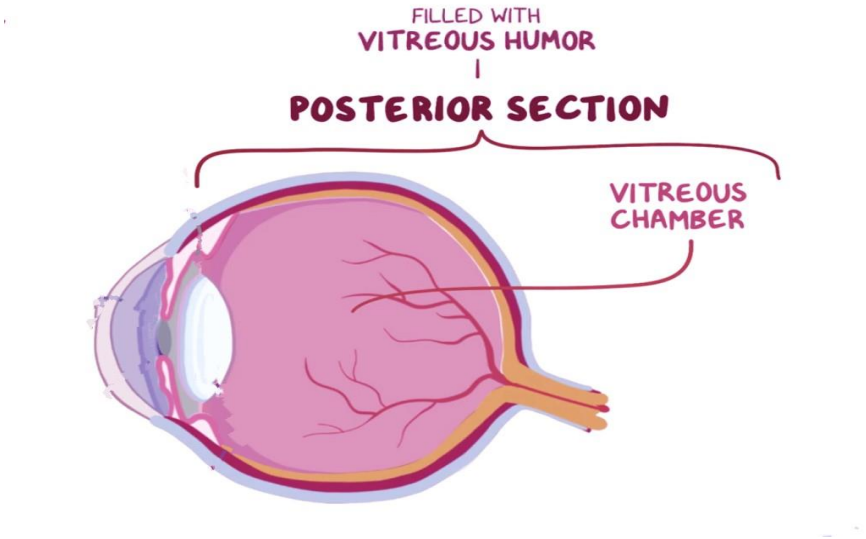
- cornea
- iris

Posterior Chamber

Is the narrow space between the iris and lens.

Vitreous Chamber

Is the space between the lens and the back of the eye.



Both the anterior and posterior chambers are located in the anterior section of the eye. And the vitreous chamber is the part of the posterior section of the eye. All of the chambers of the eye are filled with fluid. Typically the chambers in the anterior section are filled with a liquid called aqueous humor and the posterior section is filled with vitreous humor.

Ciliary epithelium secretes aqueous humor that is watery fluid, which nourishes the lens and cornea. It also provides structural support and helps to keep the shape of the eye. This fluid then goes into the posterior chamber of the eye and travels through the pupil to the anterior chamber. Normally, aqueous fluid leaves the eye via the trabecular meshwork, which acts as a drain to direct fluid into a circular channel called schlemm, then eventually into episcleral veins.