

## The Eye

Sight, hearing, taste, touch, and smell are all senses. They alert us to our surroundings. We will study the eye and ear in detail as sense organs.

The human eye has three layers:

**Sclera** - the thick white outer layer. In the front of the eye it bulges and becomes transparent. This transparent section is called the **cornea**. The cornea is covered by a thin membrane called the **conjunctiva**.

**Choroid Layer** - a coloured layer that absorbs light and prevents internal reflection. At the front the choroid becomes the muscular **iris** which controls the size of the **pupil**. Behind the iris, the choroid thickens forming the ciliary body. It controls the shape of the **lens**.

**Retina** - the inner layer. It is made of two types of photoreceptors - **rods**, for general light, and **cones**, for colour. Cones need more light to stimulate them.

In addition, the eye has two chambers, one in front of the lens and one behind it. In front of the lens is the **aqueous humour**. Its function is to help focus the light before the lens. The second chamber is larger, the **vitreous humour**. It is more jelly-like and is used to keep the eyeball from collapsing.

How the eye works:

- light passes through the cornea
- light passes through the pupil, which changes size according to the amount of light
- the shape of the lens changes to focus the light on the retina (called **accommodation**)
- image focuses on the retina
- The retina has three layers: **1) rod cells and cone cells** synapse with **2) bipolar cells** which synapse with **3) ganglion cells**
- light hits a special pigment in the rod and cone cells, called **rhodopsin**. Rhodopsin breaks down into two proteins - **retinal** (made from vitamin A) and **opsin** (which triggers bipolar cells)

- bipolar cells synapse with ganglion cells
- all the ganglion cells join together and become the **optic nerve** as they exit the eye.

Each cone is connected to a separate bipolar cell, but many rods are attached to one bipolar cell. This is why night vision is blurry and only in shades of grey.

Cones are concentrated in an area called the **fovea**, directly behind the lens. This area produces the best image.

The area where the optic nerve is located has no rods or cones. It is known as the **blind spot**.(See page 413)

### **Eye Disorders**

1. **Cataracts** - clouding of the lens that increases over time, causing blindness
2. **Glaucoma** - caused by a build-up of aqueous humour. This produces pressure that can destroy nerve fibres. Damage cannot be repaired but can be controlled.
3. **Myopia** - also called near-sightedness. The person can't see far away because the eyeball is too long or the ciliary muscles too strong. The light falling on the retina is therefore not in focus
4. **Hyperopia** - also called far-sightedness. The person can't see close up because the eyeball is too short or the ciliary muscles too weak
5. **Astigmatism** - an uneven cornea or lens causes the image to be out of focus

## Correcting Disorders:

Corrective lenses can be used for myopia, hyperopia, and astigmatism. The extra lens, either eyeglasses or contact lenses, focus the image on the retina.

Laser surgery can also be used to correct the problems.

If the cornea is diseased or badly damaged a **corneal transplant** from donors may be done.

