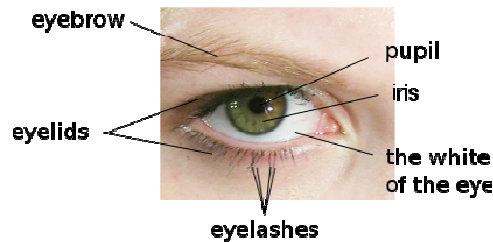
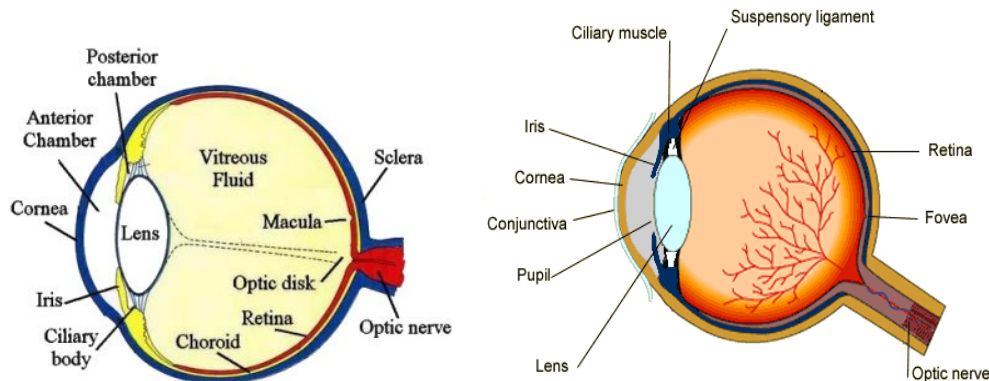


1. External Structure of the eye



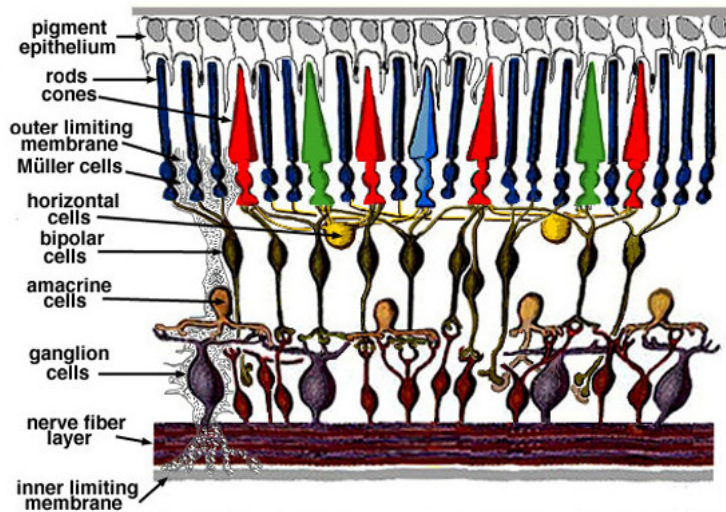
- **Eyelids:** (a) protect the cornea (b) partially closed to prevent excessive light from damaging the retina (c) Blink to spread tears and wipe off dust from cornea.
- **Eyelashes:** to shield the eyes from dust particles.
- **Tear Gland which secretes tear** to (a) wash off dust (b) lubricate and reduce friction of eyelid movement (c) allow oxygen to dissolve & diffuse into cornea.

2. Internal Structure of the eye:



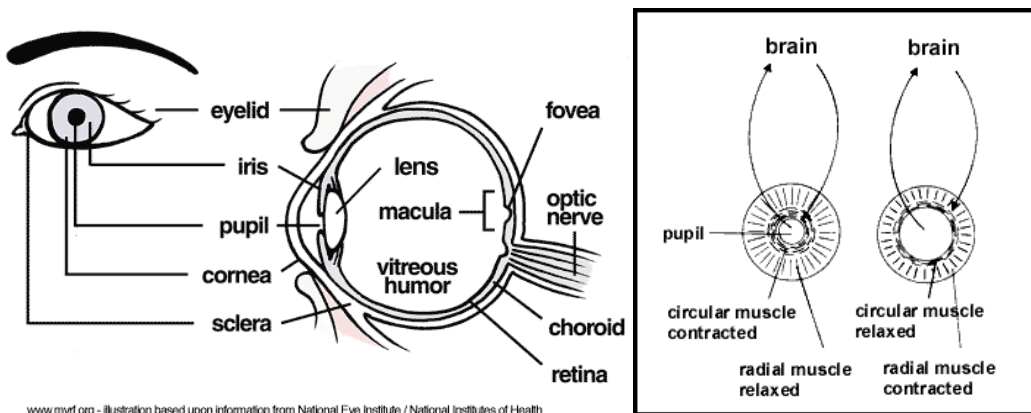
- **Cornea:** Transparent dome shaped layer to refract light rays into the eye.
- **Iris:** A circular sheet of muscle to regulate size of the pupil & amount of light enter the eye.
- **Sclera:** White of eye to protect the eyeball from mechanical damage.
- **Choroid:** (a) Black pigment layer to prevent internal reflection of light (b) contain blood vessels to supply oxygen & nutrients and remove waste products from eyeball.
- **Retina:** a light sensitive layers contains the light sensitive cone & rod cells
- **Lens:** a circular transparent biconvex structure to focus light onto the retina.
- **Ciliary Muscle:** to control the curvature thus the focus length of the lens.
- **Suspensory ligament:** a tissue that attached the lens to the ciliary muscle.
- **Fovea:** a yellow spot contain the greatest concentration of cone cells but no rod cells to enable us to see detail color vision in bright light.
- **Rectus muscle:** to control the movement of the eyeballs

### 3. Photoreceptors in the retina



- **Red, Blue** and **Green** cones allow us to see colors in bright light.
- **Rods** are more sensitive to light than cones and enable us to see **black & white** in dim light.
- Rods contain pigment called **visual purple** which were bleached in bright light and needed to be reformed again in dim light. **Vitamin A** deficient person will suffer **night blindness** due to inability to form visual purple.

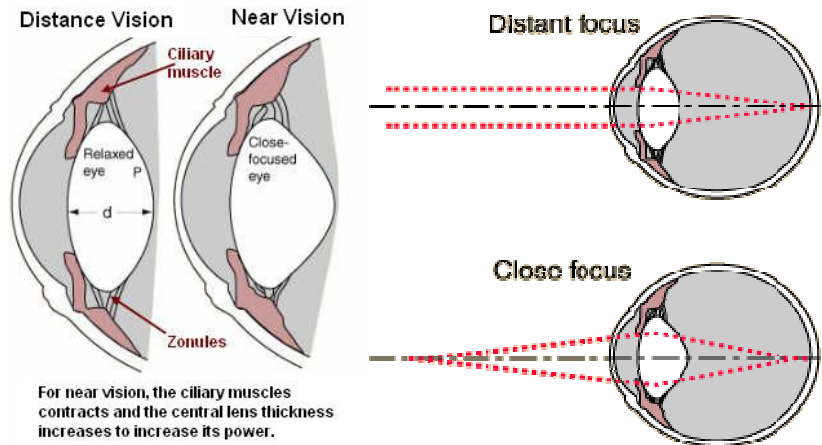
### 4. Pupil reflex control the amount of light enter into the eye



www.mvrf.org - illustration based upon information from National Eye Institute / National Institutes of Health

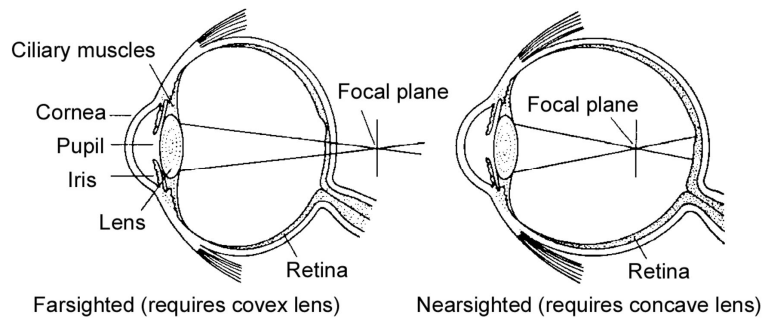
- Stimulus → Receptor → Sensory neuron → brain → Motor neuron → Effector  
(Light) (Retina) (Optic nerve) (Iris)
- In bright light, circular muscle contracts, radial muscle relax, the pupil **constricts**.
- In dim light, radial muscle contracts, circular muscle relax, the pupil **dilates**.

5. **Accommodation of the eyes:** is the adjustment of the lens of the eyes so that clear images of objects at different distances are formed on the retina.



- The incoming light rays are refracted by the **cornea** onto the lens.
- The **lens** further refracts the rays converge to focus on the retina.
- The image on the retina is:
  - Upside down
  - Laterally inverted
  - Smaller in size than the actual object.
- The **brain** interprets the nerve impulse from the eye so that we see objects right way up, front to back, and the right size.
- **Focus on distance objects:**
  - Ciliary muscles **relax** → Suspensory ligament **taut** → Lens become **thinner** → focal length **increases**.
- **Focus on near objects:**
  - Ciliary muscles **contract** → Suspensory ligament **slacken** → Lens become **thicker** → focal length **decreases**.

## 6. Farsighted and Shortsighted Vision Correction



- When the shape of the eyeballs are not round, the images of distance objects formed will not be exactly on the retina and corrected lens needed to be used.