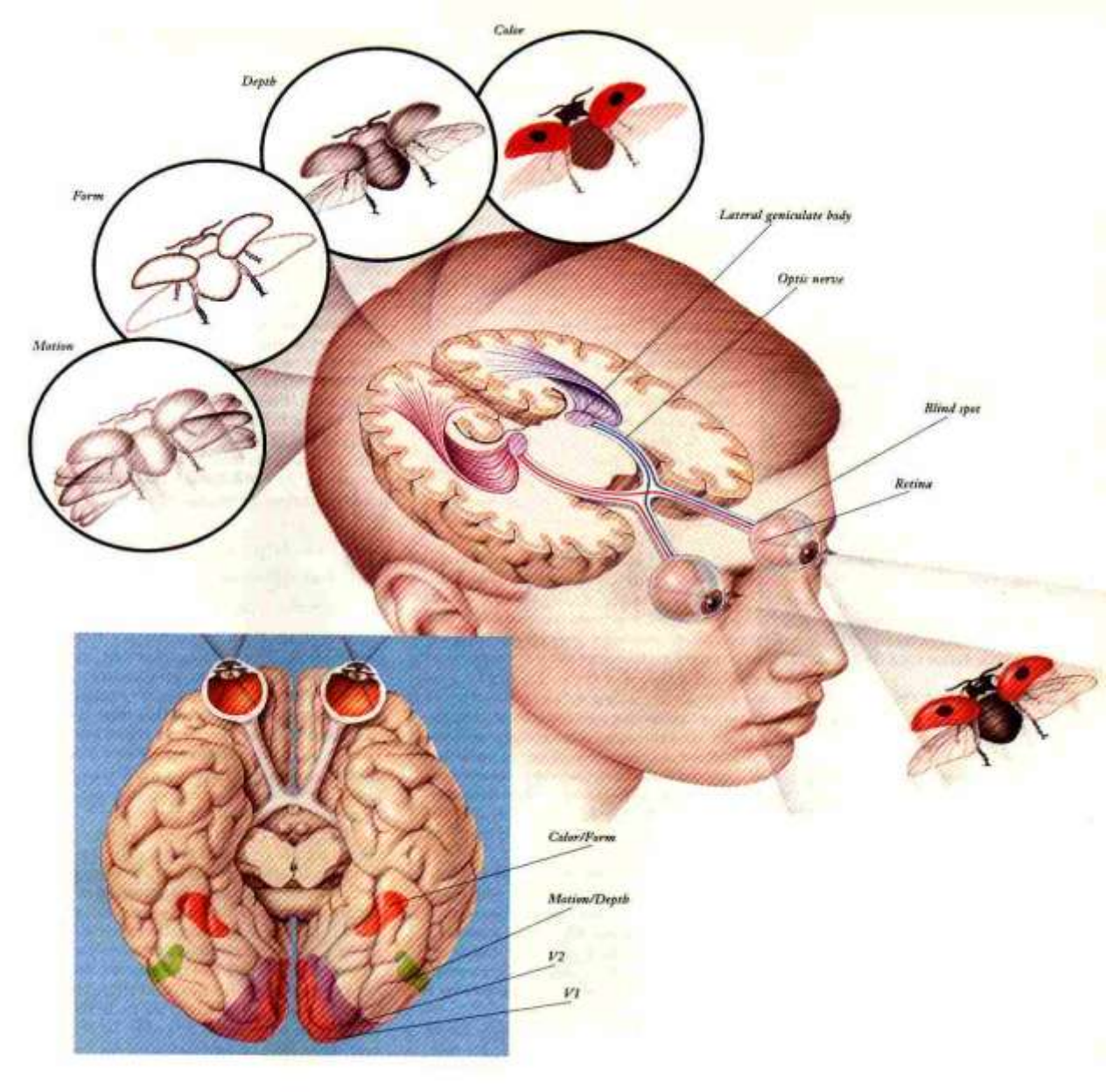
I SEE YOU

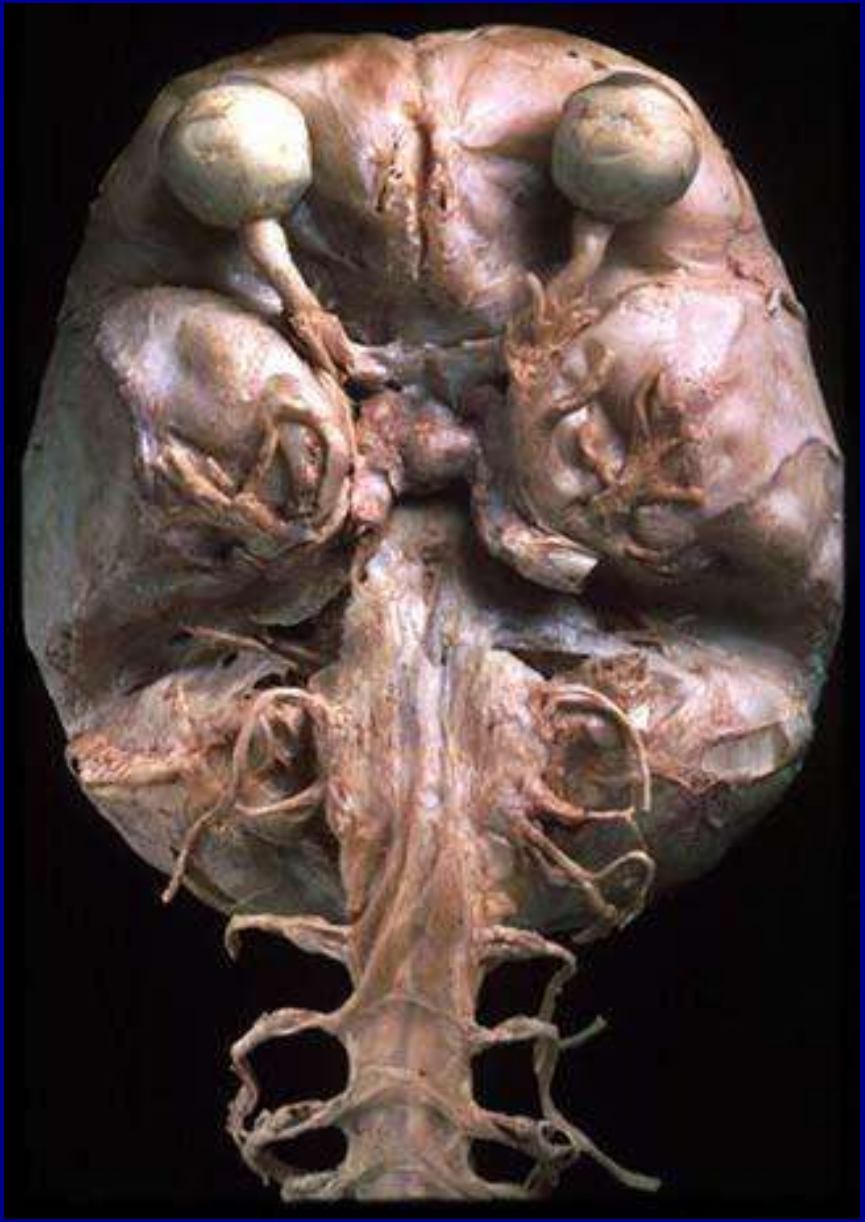
EYE

The eye is an extension of the brain



Eye brain proxomity

- Can you see :
- the optic nerve bundle?
- Spinal cord?

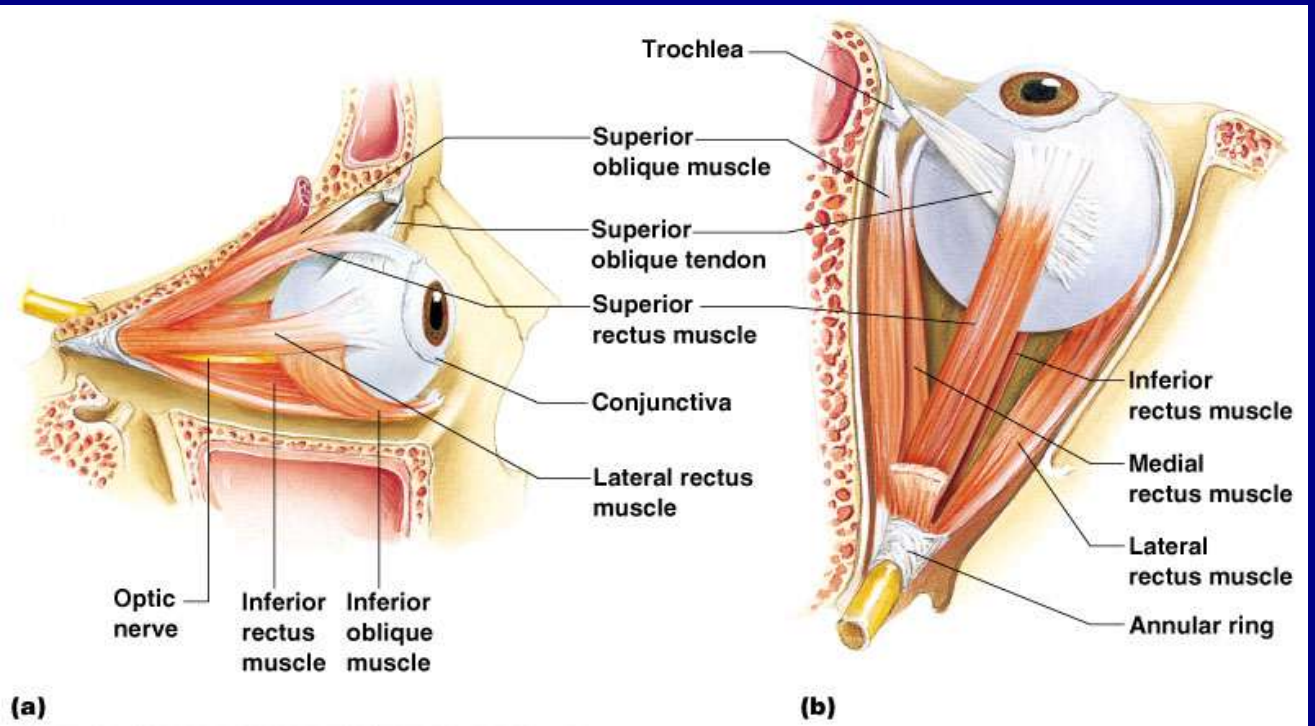


The human Eye

- The eye is the sense organ for light.
- Receptors for light are found in the RETINA. This is found at the back of the eye.
- The rest of the eye is there to protect the eye or to focus light on to it.
- There is no easy way round learning the parts of the eye. You just have to do it…

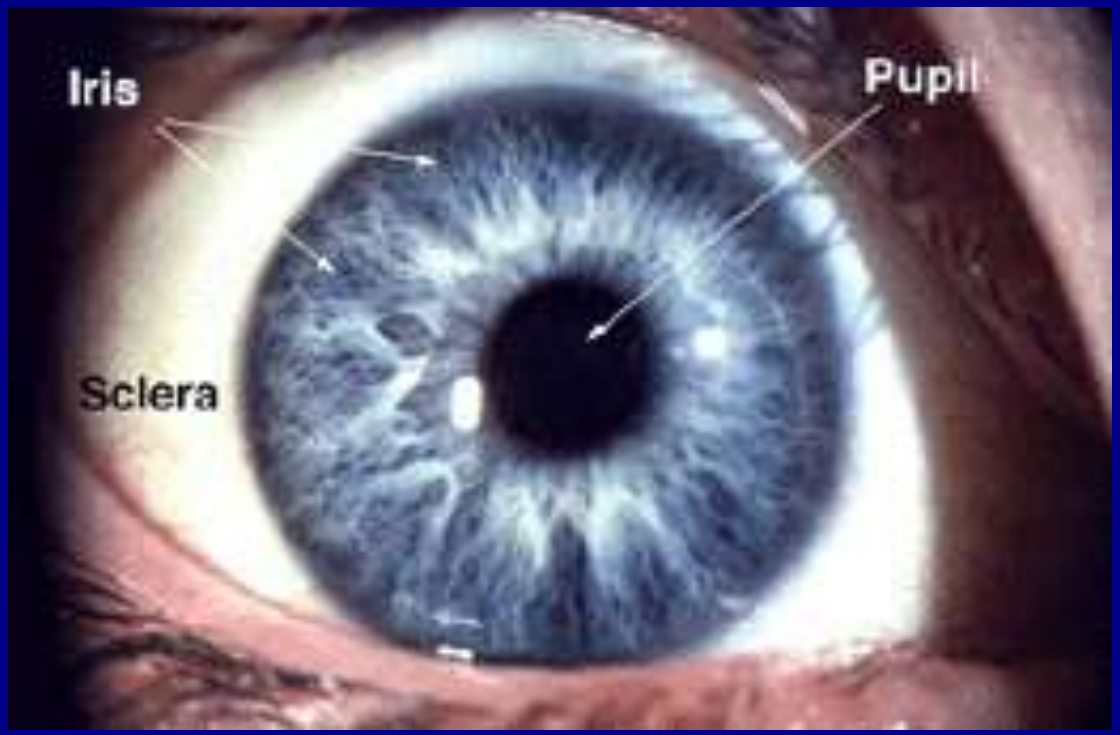
Eye Muscles

- Muscles attach to the outer surface of the eye
- Produce eye movements



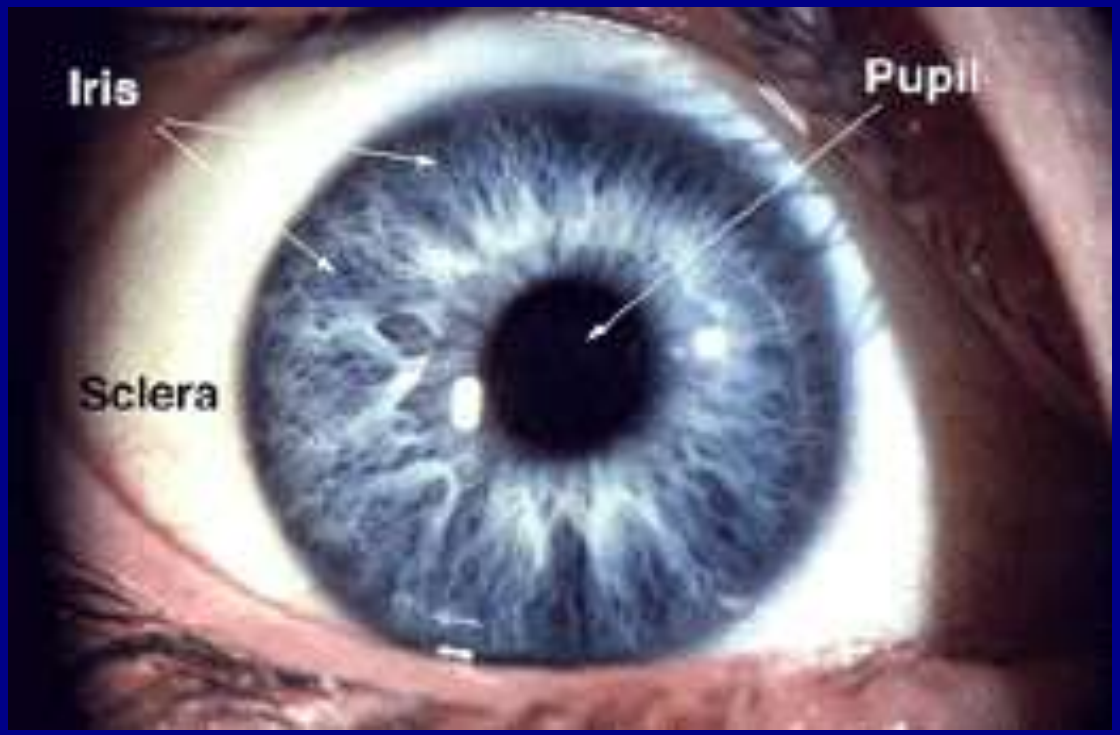
The human Eye

Sclera – this is a tough, white coat surrounding the eye. It is there to protect the eye



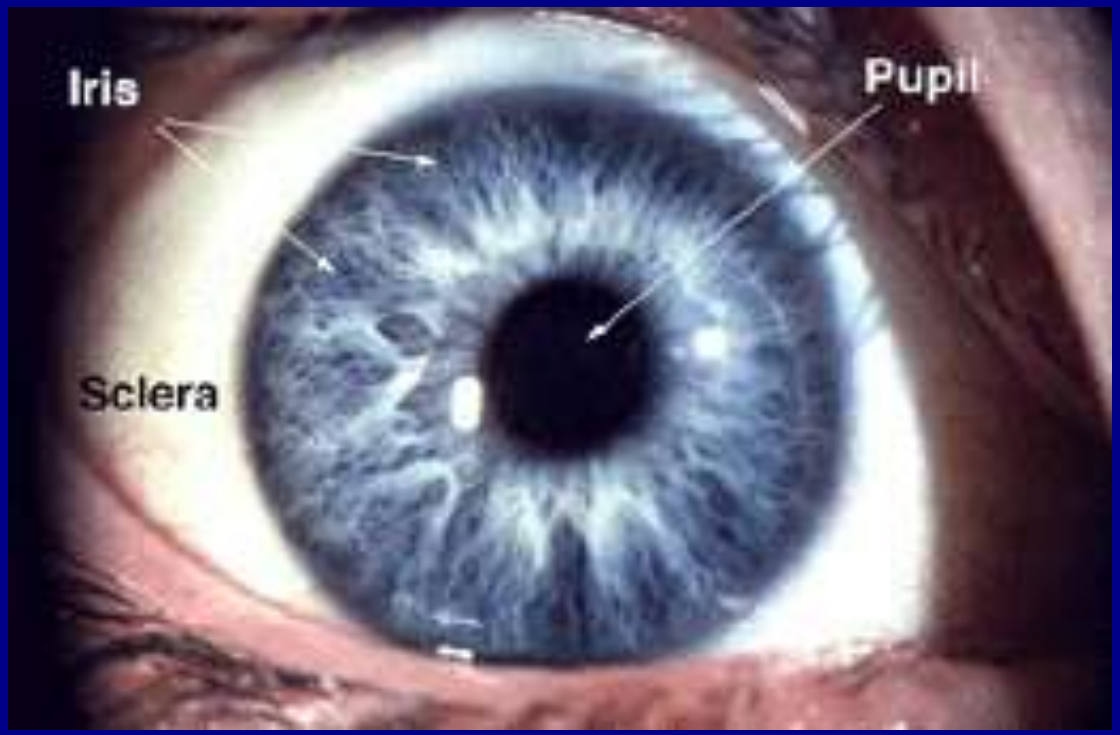
The human Eye

Pupil – this is the hole which lets light into the eye.



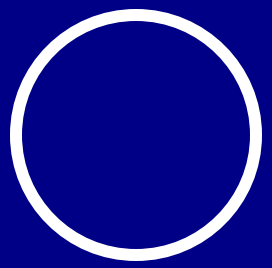
The human Eye

Iris – This is a circular ring of muscle that controls how much light gets into the eye through the pupil.

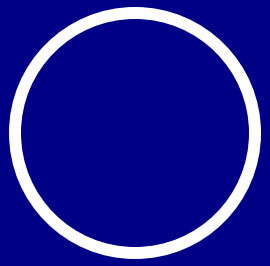


How circular muscles work

- All circular muscle in the body work in the same way:

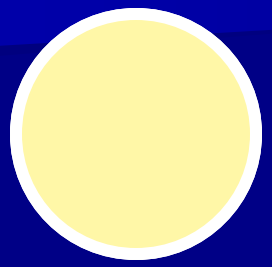


When the muscle is relaxed, the hole in the middle is large

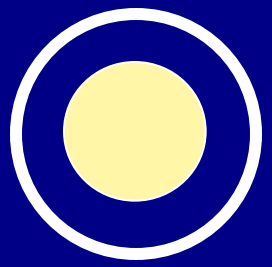


But when the muscle contracts, the hole gets smaller.

How the iris works



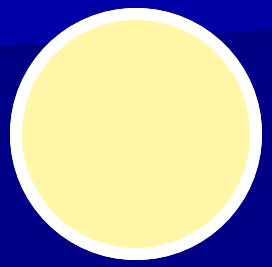
With the iris, when the hole is open, lots of light can get in.



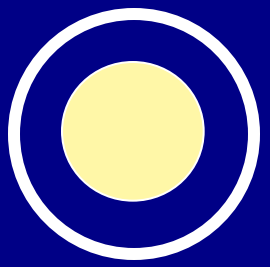
But when the muscle contracts, less light can get in.

In what sort of situations would your iris be relaxed?

How the iris works



Circular muscles relax
Radial muscles contract



Circular muscles contract
Radial muscles relax

In what sort of situations would your iris be relaxed?

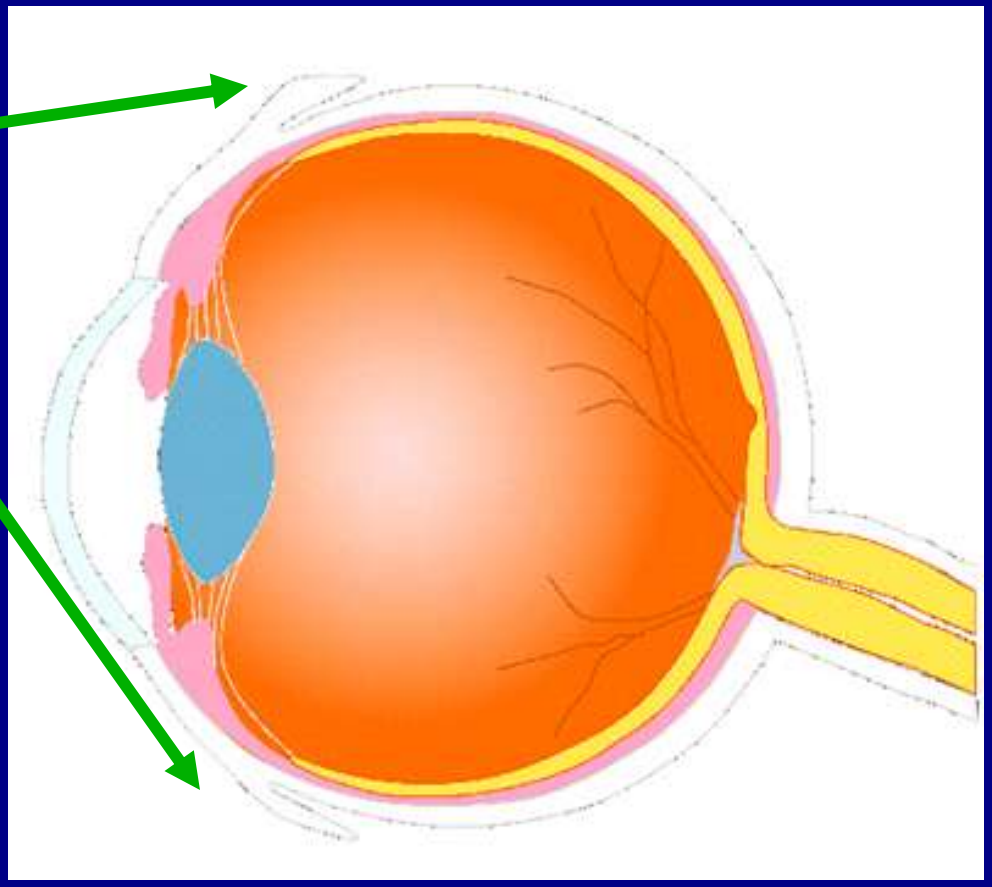
Try it!

- Work in pairs.
- When the lights have been off for a minute, carefully turn on the light so it shines into the side of your subjects face.
- Watch the pupil carefully!

- This is an example of an automatic reflex response.

Inside the eye

Conjunctiva

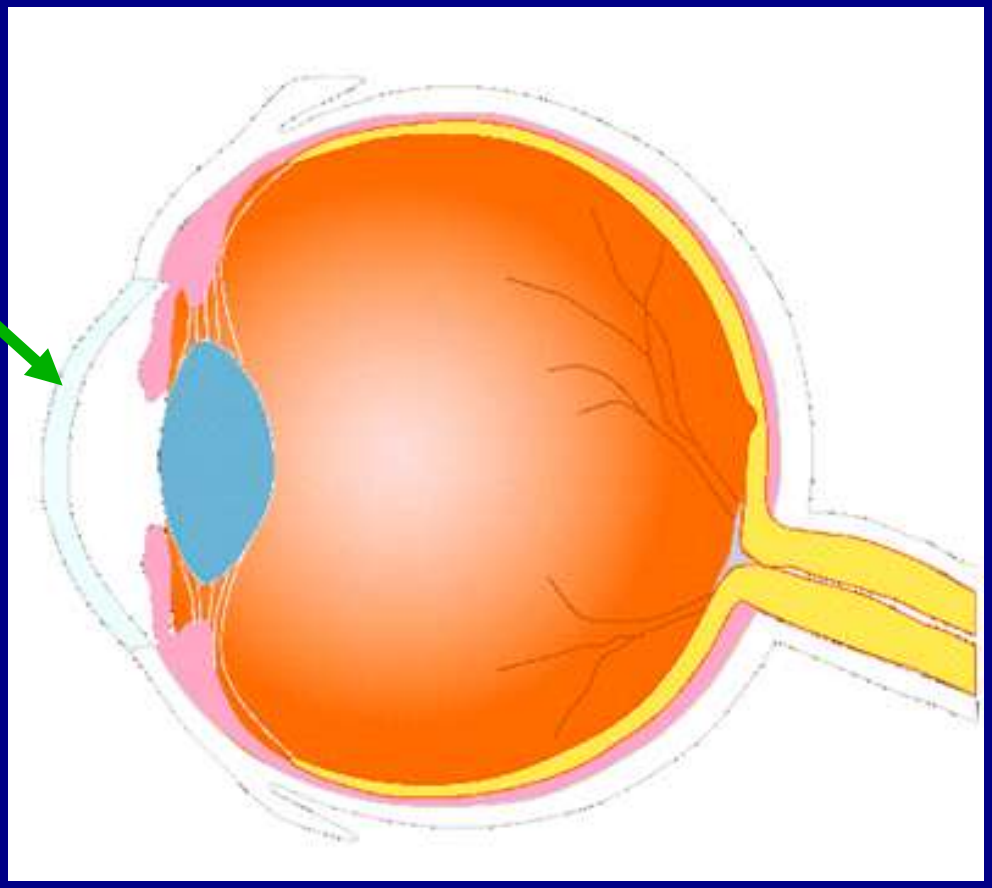


A thin clear skin which covers the front of the eye.

Inside the eye

Cornea

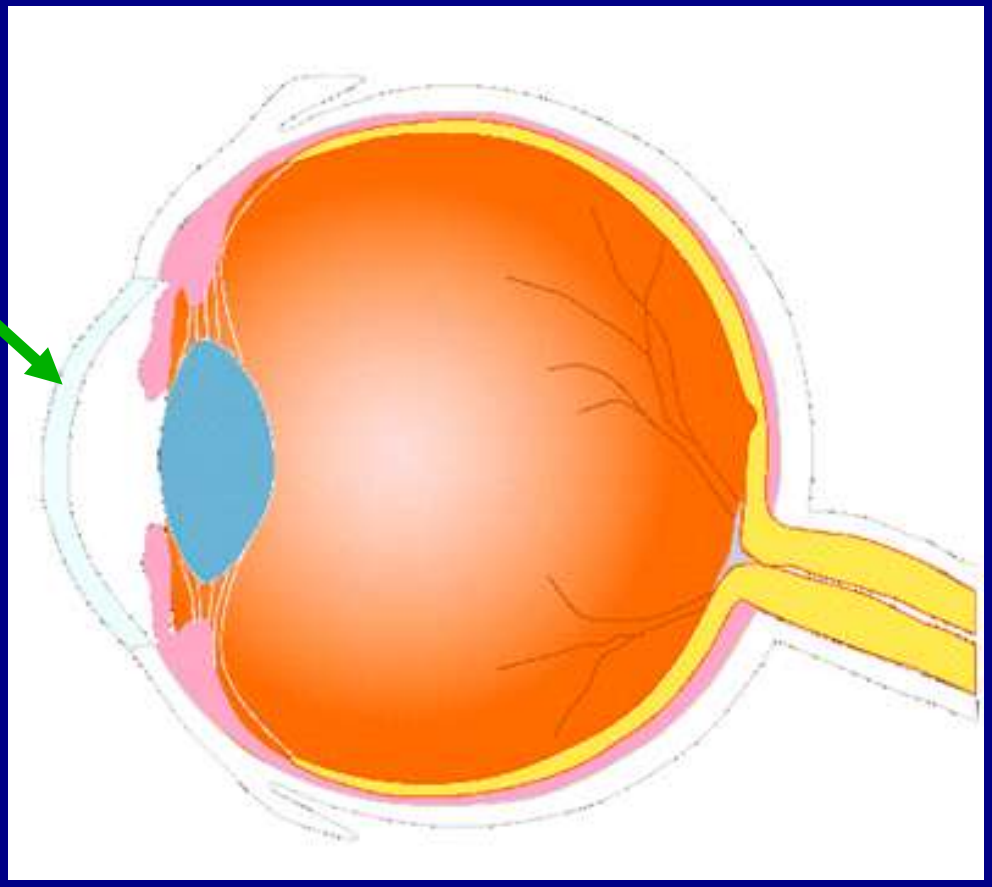
A clear window in the sclera which lets light into the eye. Also helps to refract (bend) the light to focus it onto the retina



Inside the eye

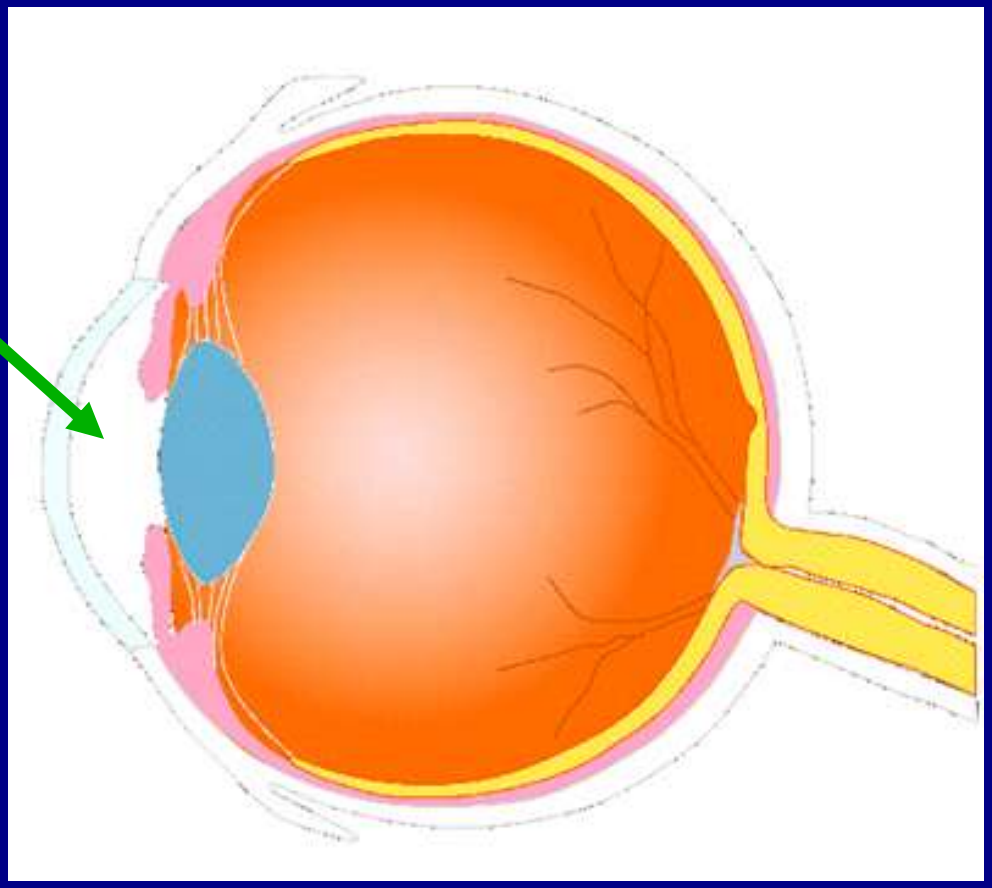
Cornea

- Repairs itself easily
- The only human tissue that can be transplanted without fear of rejection



Inside the eye

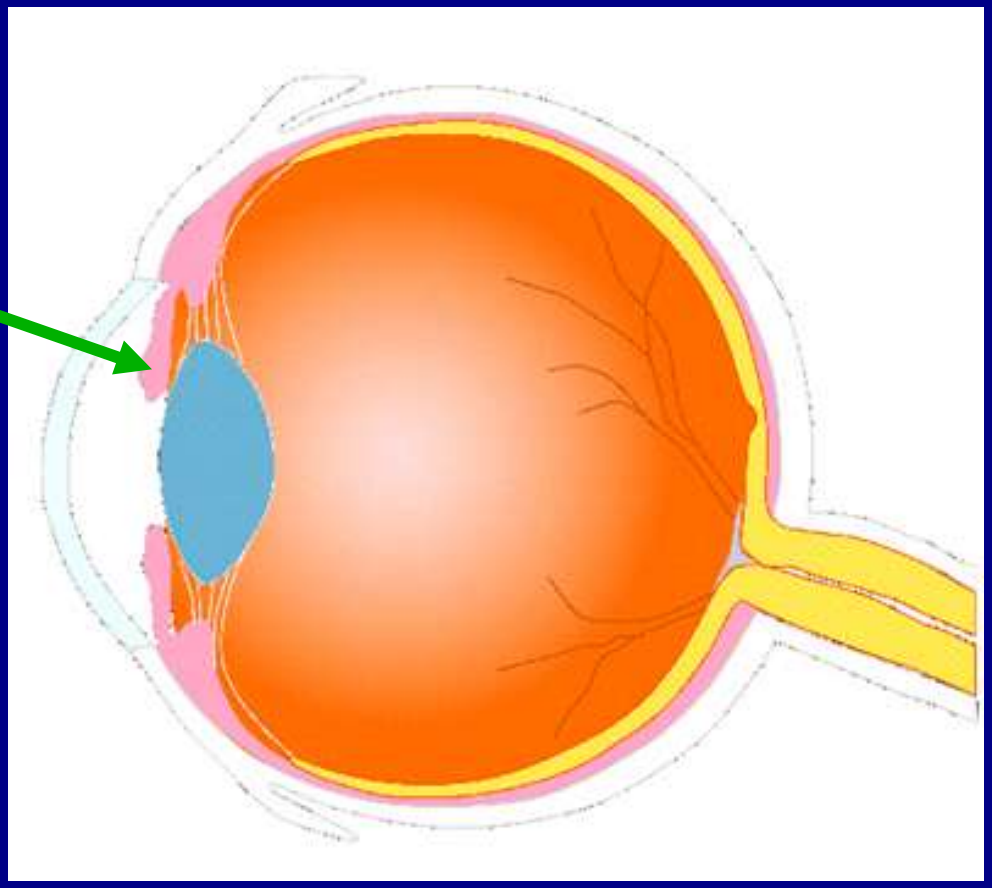
Aqueous Humour



This is a watery liquid that fills the front of the eye

Inside the eye

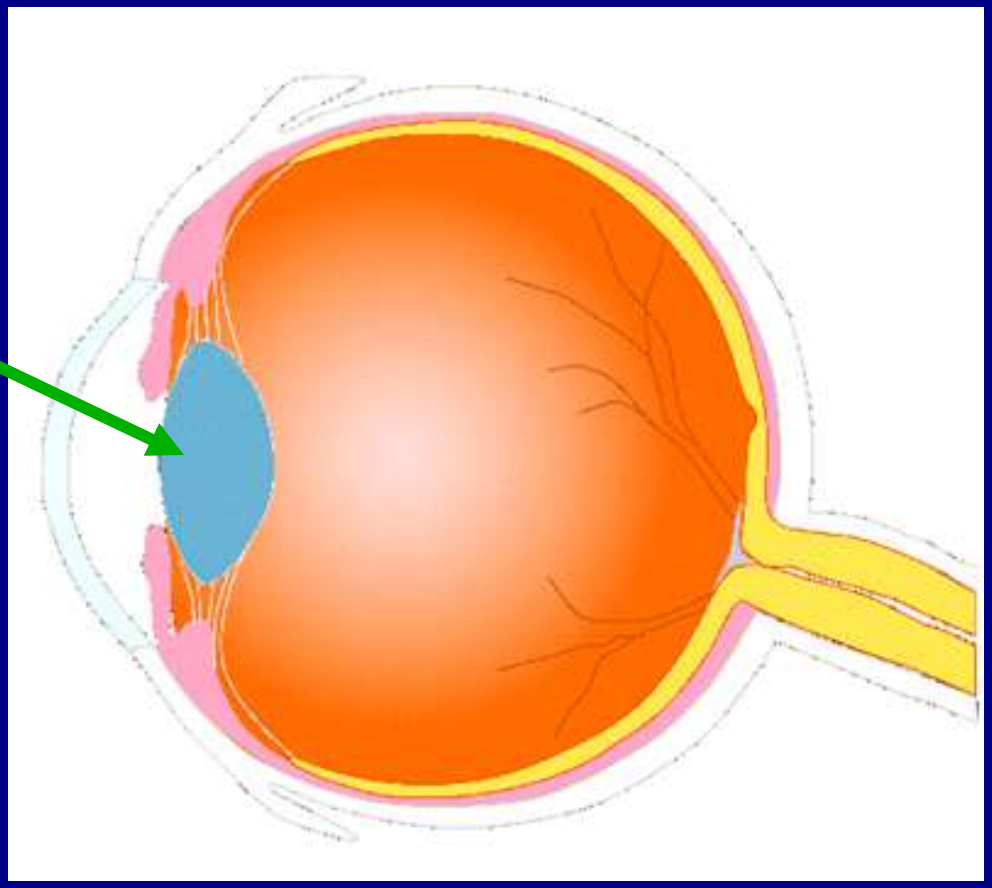
Iris



Controls how much light gets into the eye

Inside the eye

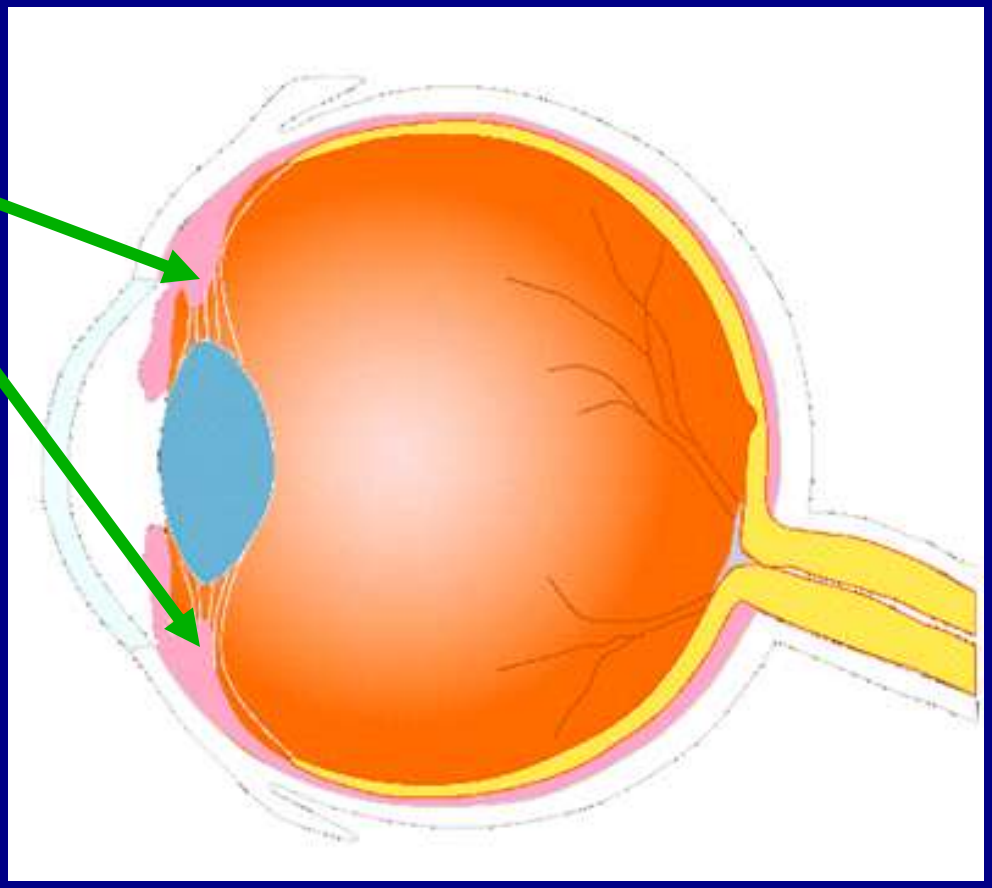
Lens



This refracts the light to focus the image on to the retina. It can change shape.

Inside the eye

Ciliary muscle

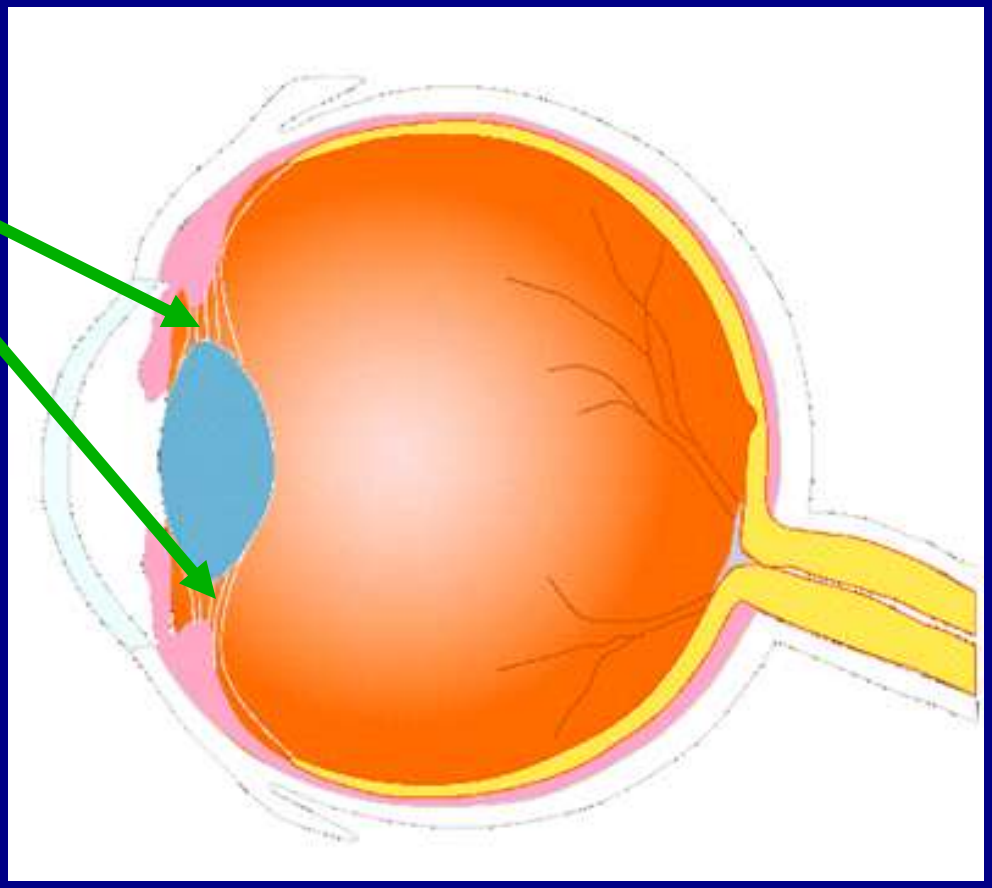


This changes the shape of the lens during focusing.

Inside the eye

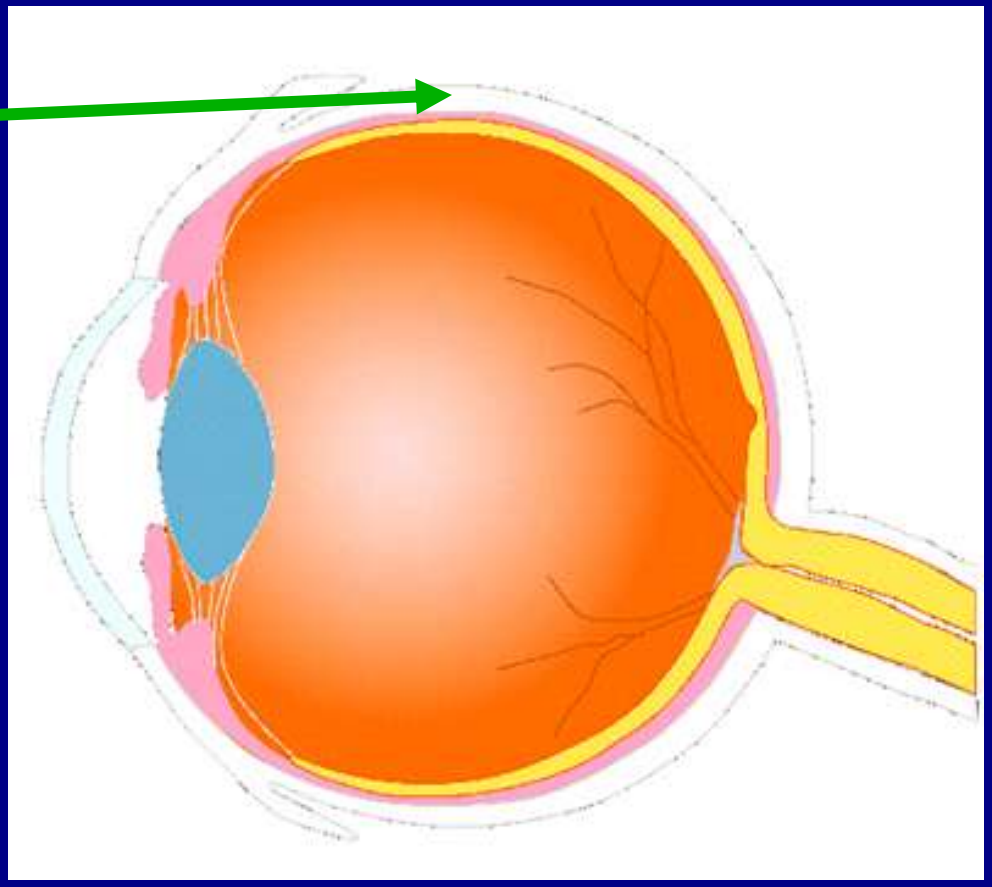
Suspensory Ligaments

Connects the lens to the muscle



Inside the eye

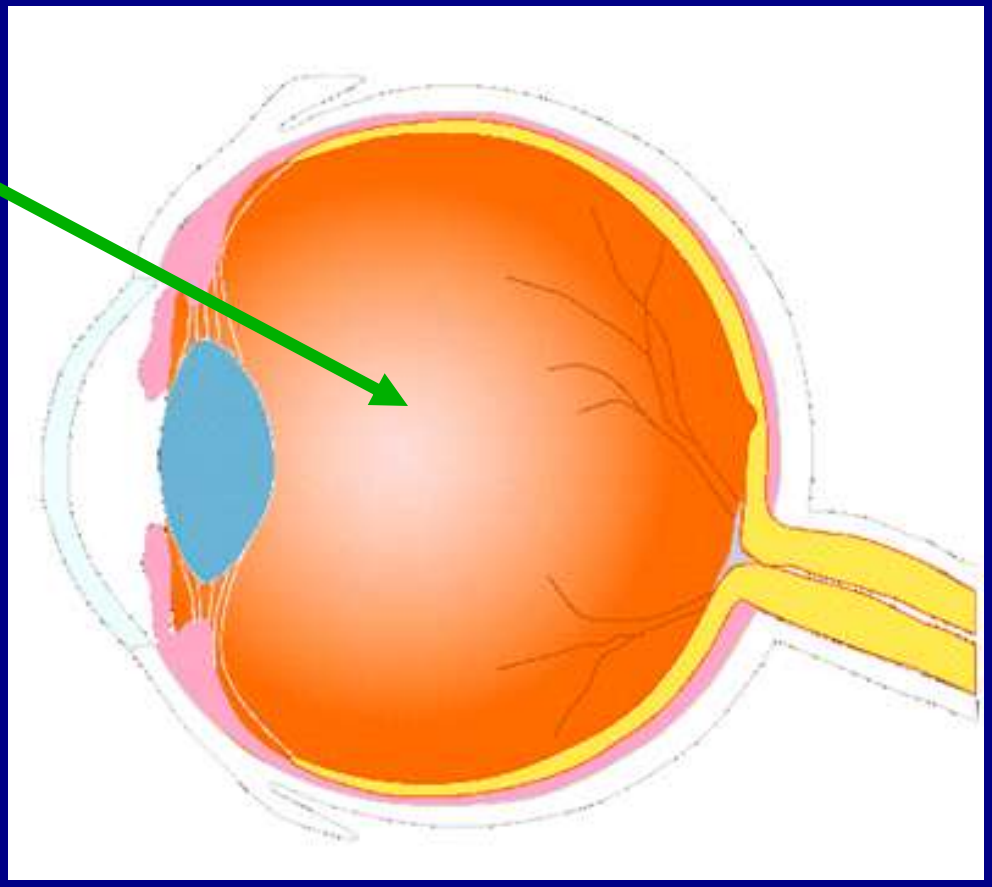
Sclera



Protects the eye.

Inside the eye

Vitreous Humour



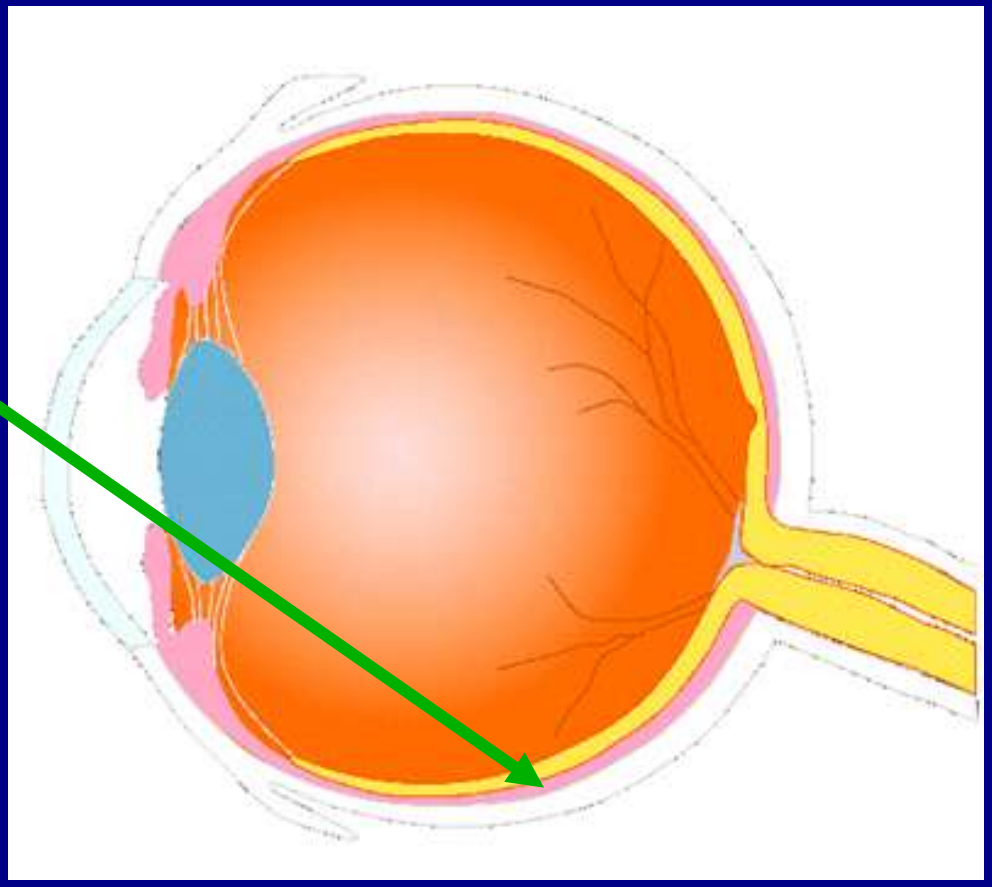
This is a jelly that fills the back of the eye.

Inside the eye

Choroid

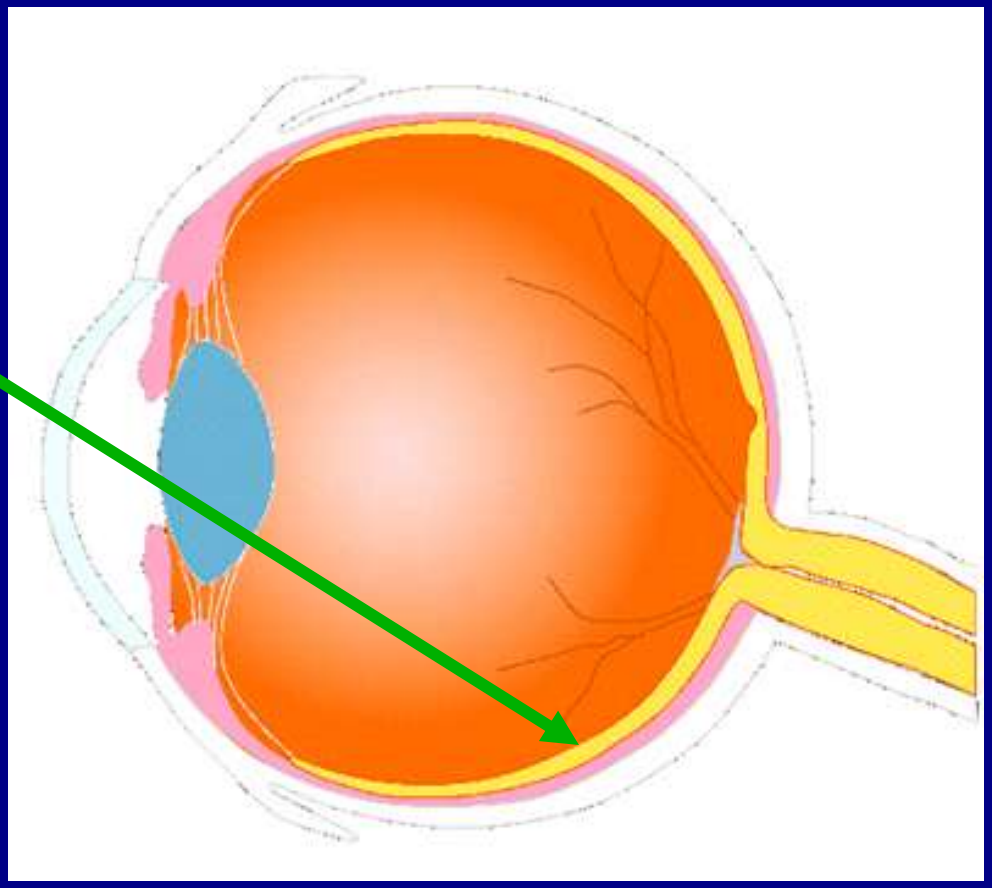
A black layer that stops light being reflected inside the eye.

Contains a cluster of capillaries.



Inside the eye

Retina

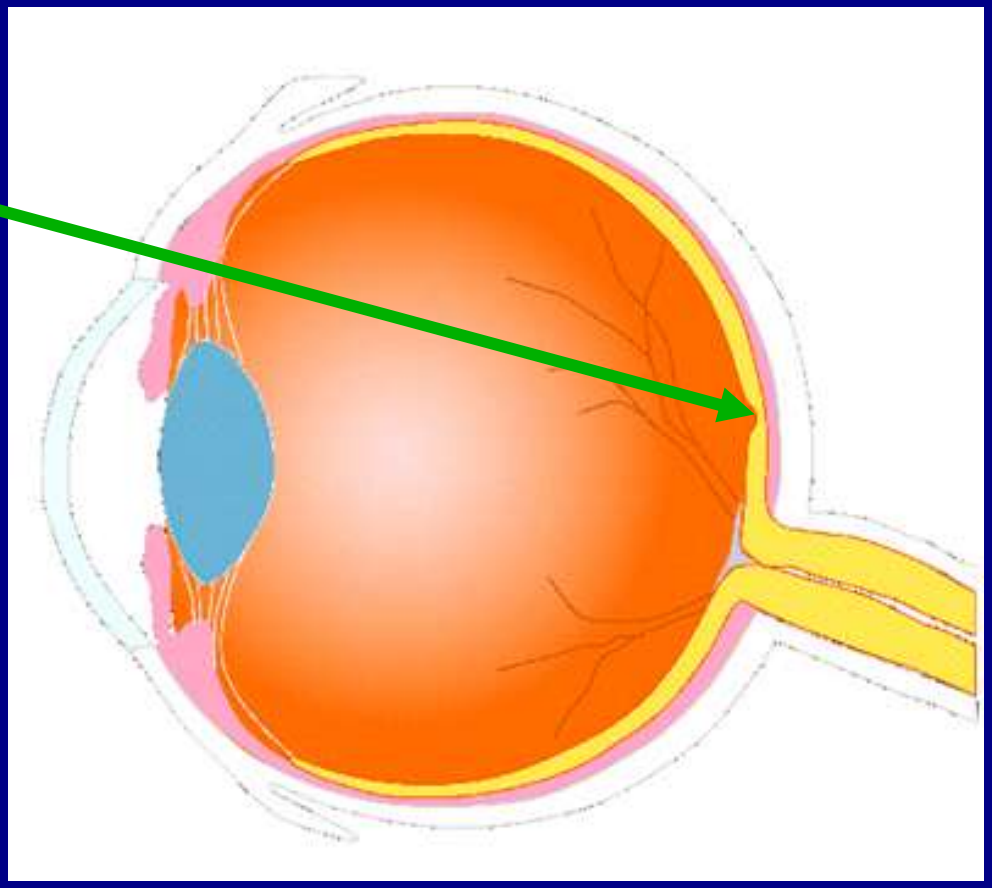


A layer of cells which are sensitive to light. They send messages to the brain

Inside the eye

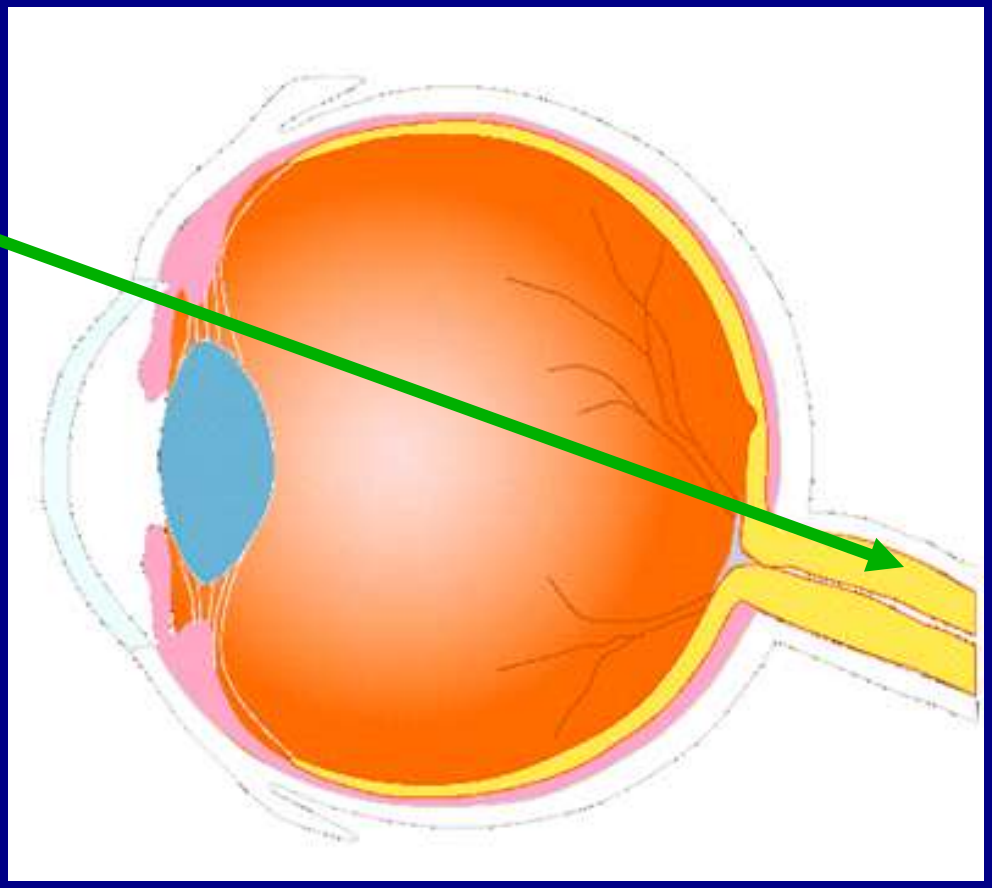
Yellow spot
(Fovea)

The most sensitive part of the retina. It lets you see in colour



Inside the eye

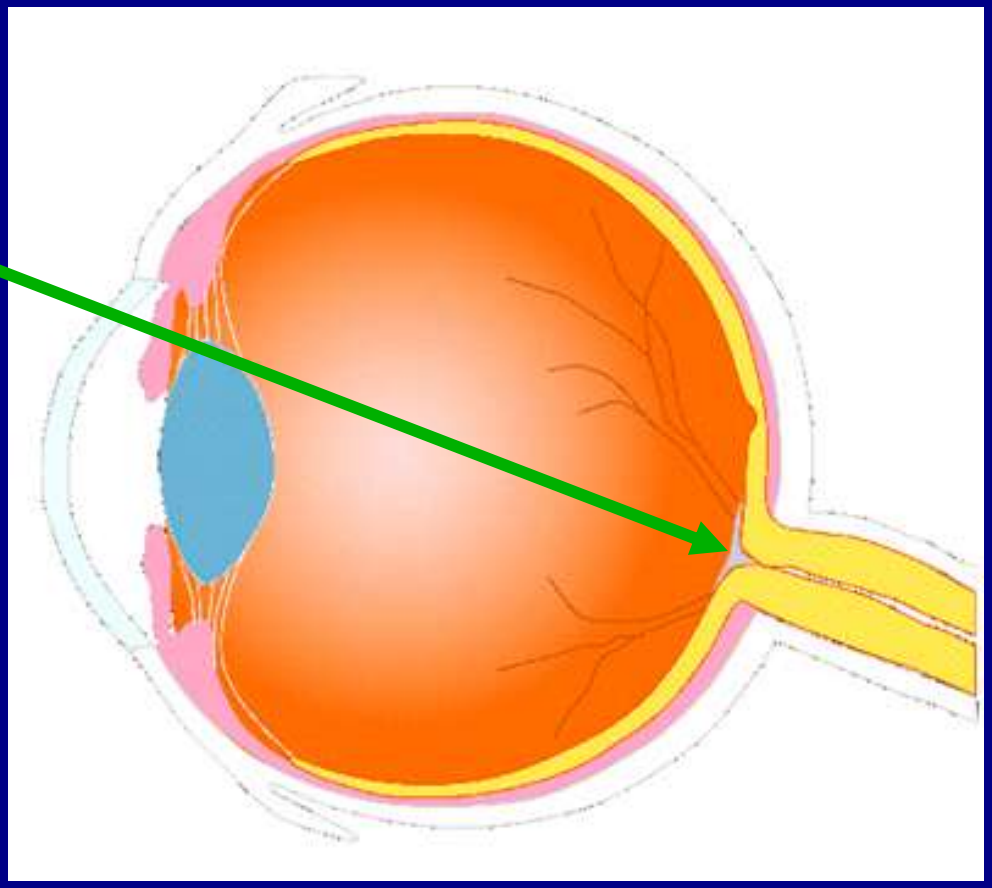
Optic Nerve



The nerve that sends the impulses from the retina to the brain.

Inside the eye

Blind spot



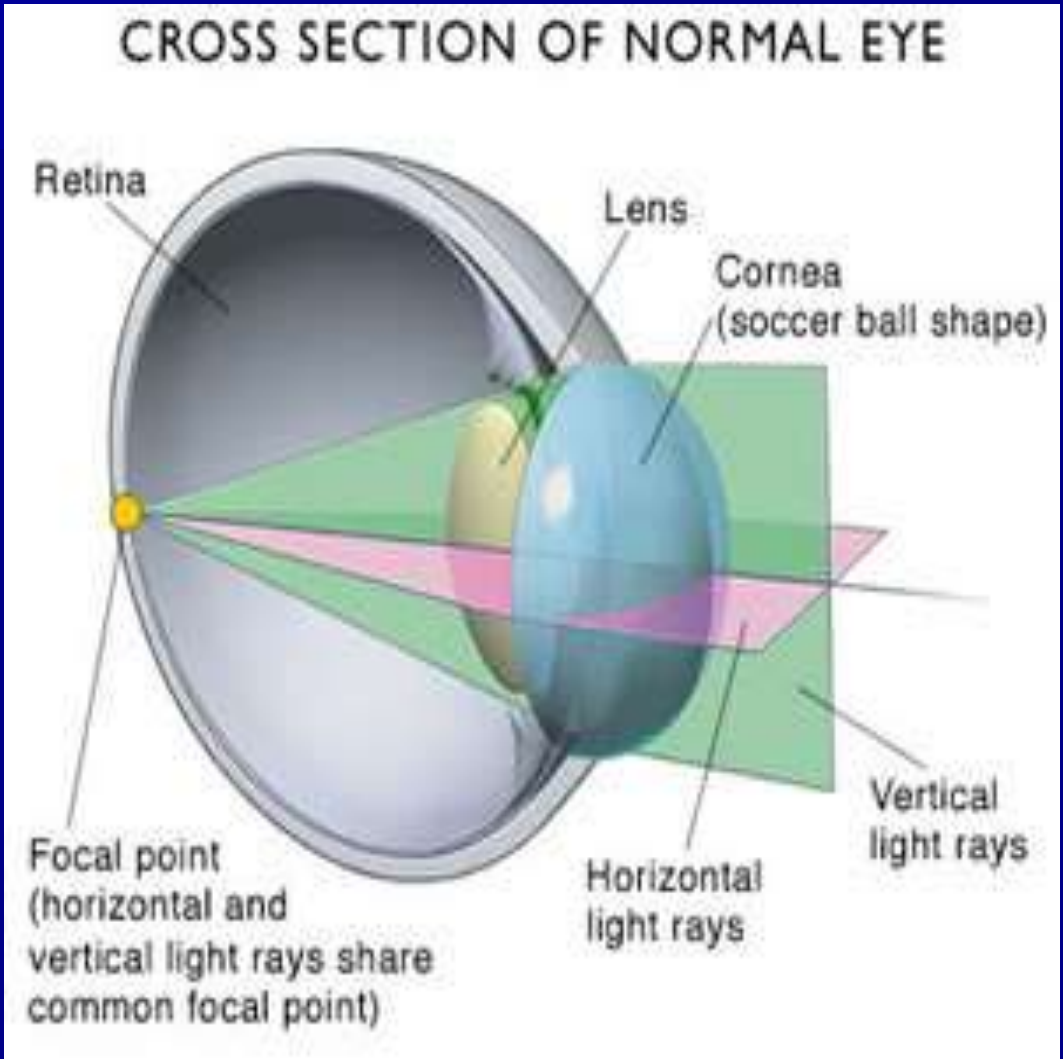
Where blood vessels and nerves join the eye ball. No image can be formed here.

Blind Spot

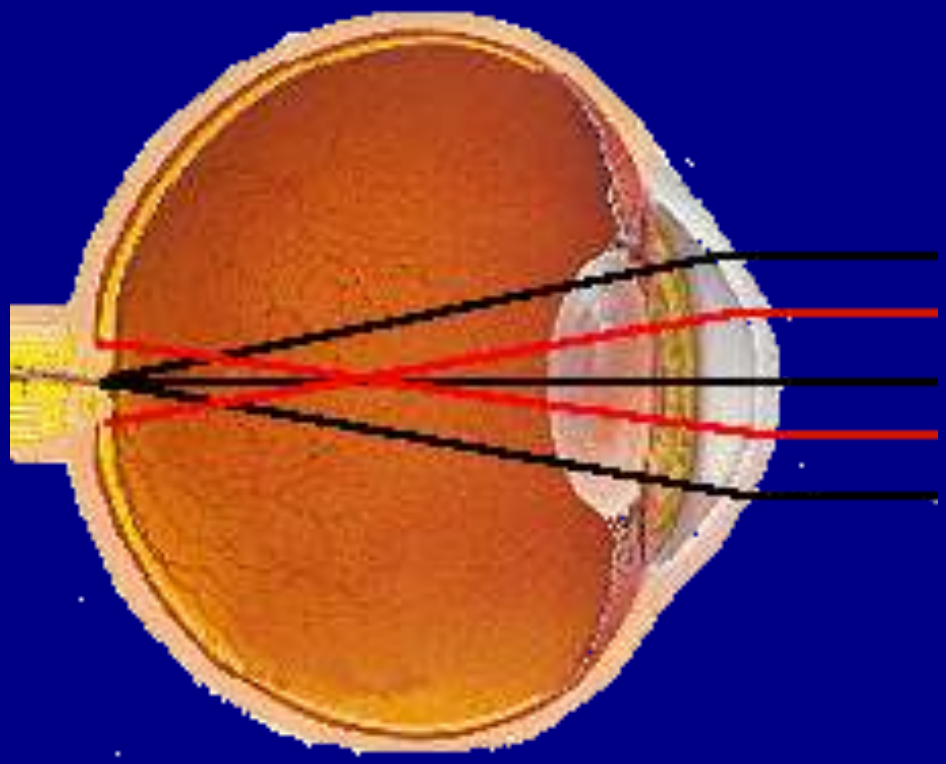
- See testing strip on paper

How you see things

- The lens and cornea focus the light on the retina



Focusing

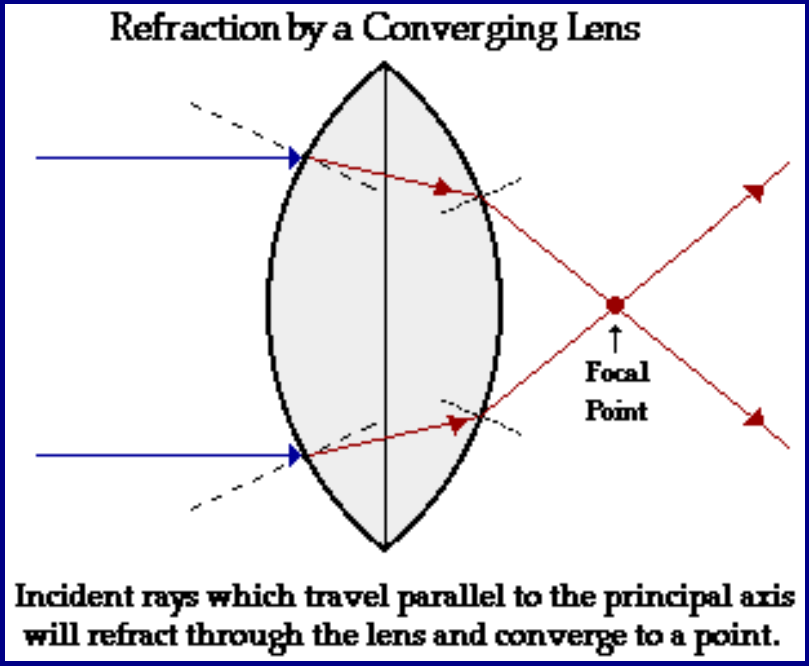


- The lens job is to make the rays hit the same point

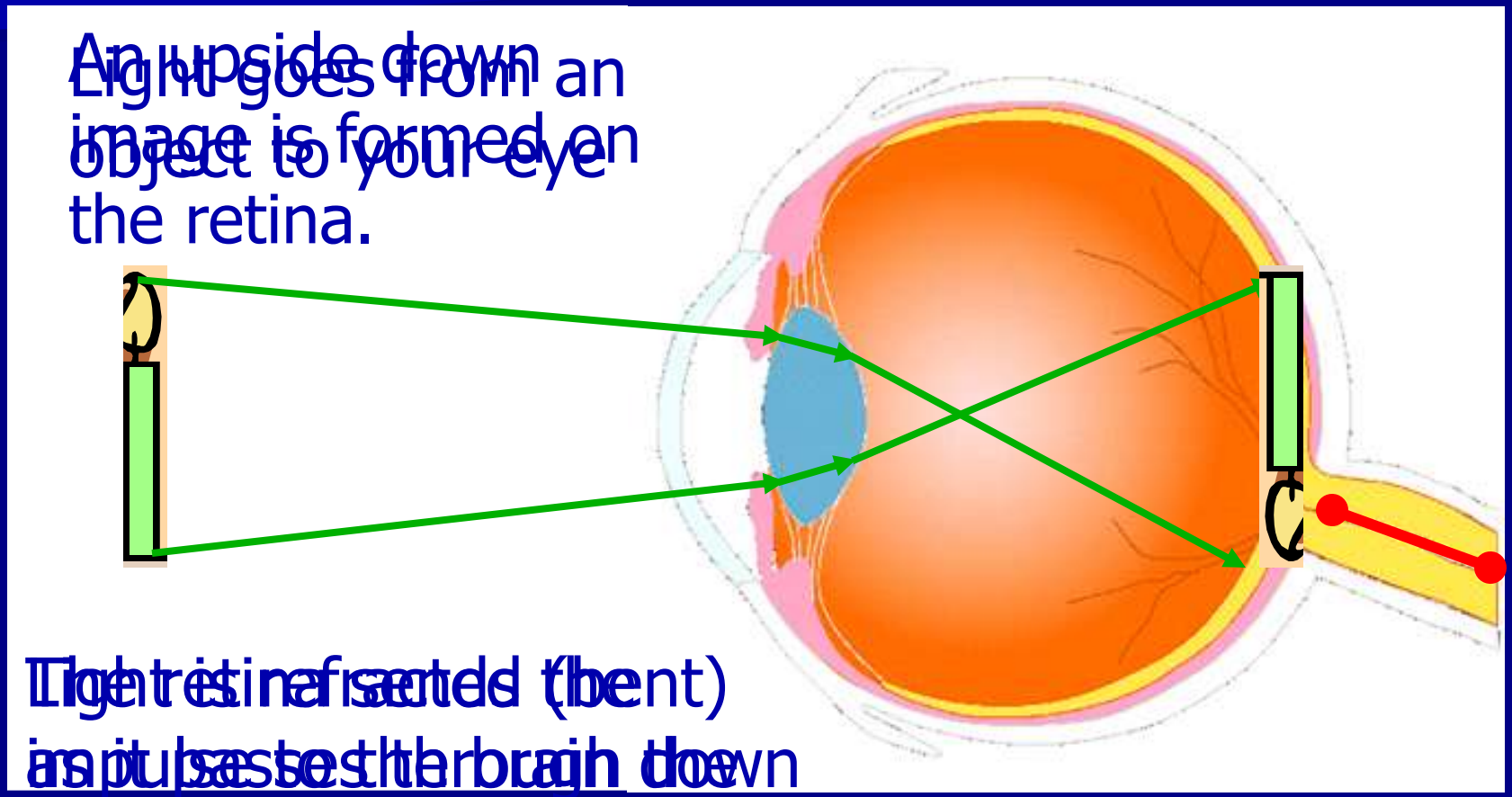
The red rays will be out of focus

Bending light

- Light is refracted and bent to focus it as it passes through the lens
- Lens thickness can be changed so the amount of bending is changed



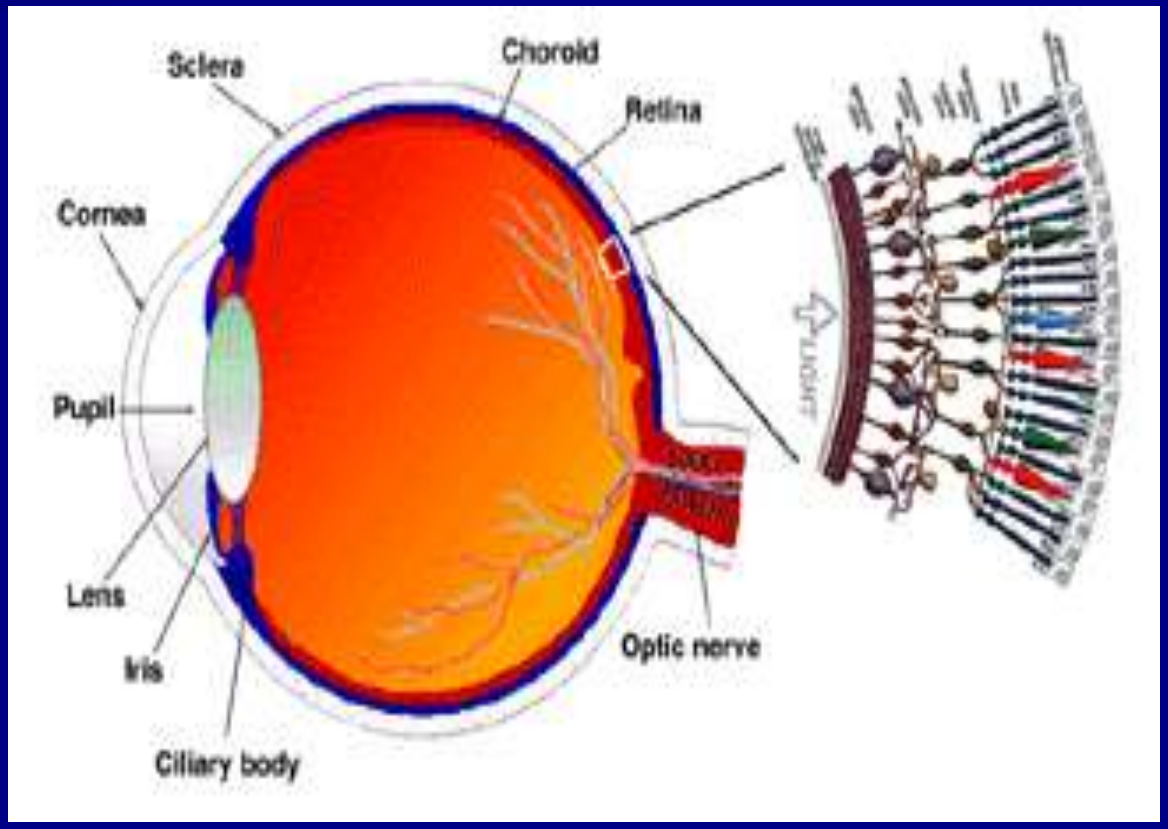
How you see things



How you see things

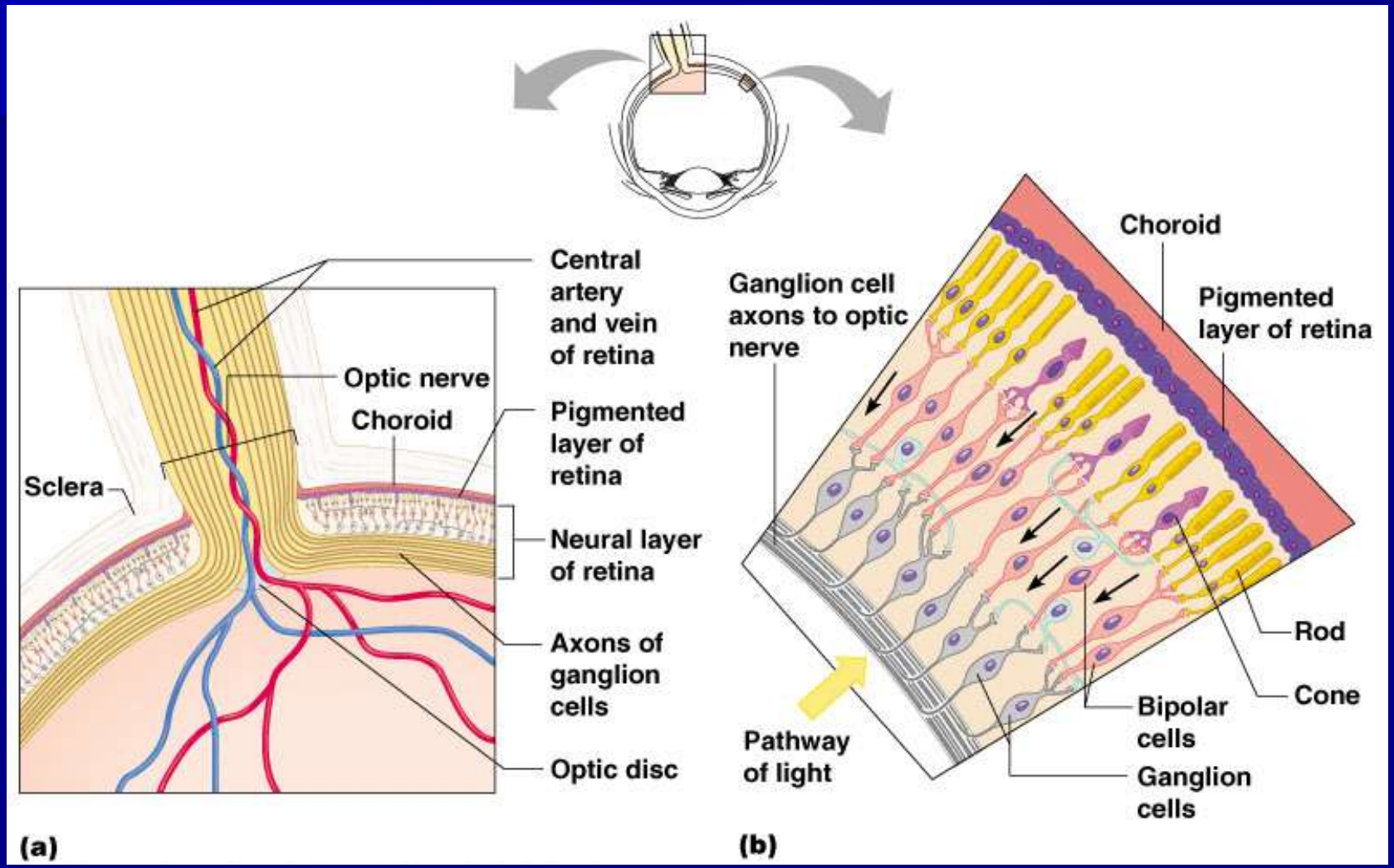
- The image that is formed on the retina is called a “real image”.
- This means it is formed where the light rays meet and it is upside down.
- The brain turns the image the right way up when it receives the impulses.
- Clever huh?!

Retina receptors



- Light receptors are called rods and cone

Neurons of the Retina



How do you see things? (The retina)

- The retina has two kinds of light sensitive cells called RODS and CONES.

- Clever CONES
  - Only work in bright light
  - Give a very clear picture
  - Are sensitive to colour
  - Make up the whole of the yellow spot
  - A few are also scattered around the rest of the retina

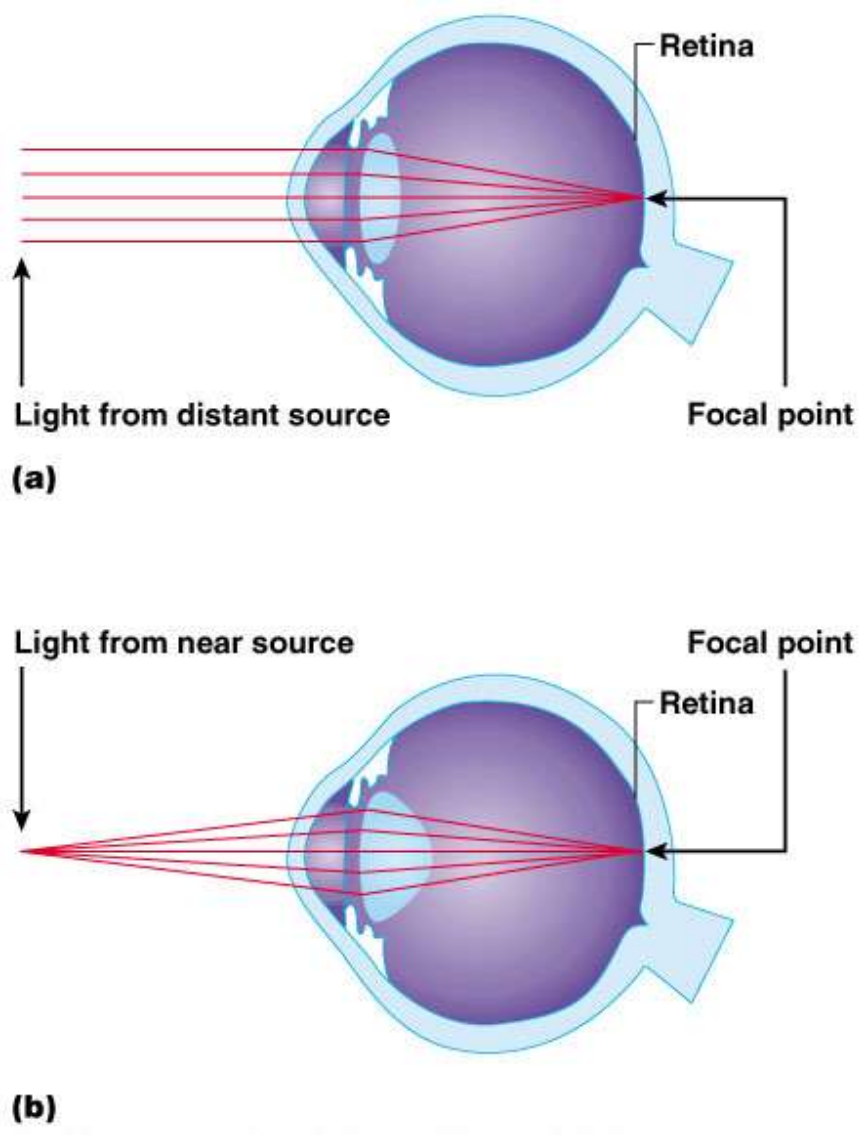
- Rough RODS
  - Work in dim light
  - Do not give a clear picture
  - Are not sensitive to colour
  - Are found in the rest of the retina (not in the yellow spot)

How do you see (The retina)

- Cones – 3 types detect different colors
  - Densest in the center of the retina
  - Lack of one type = color blindness

Accommodation

- Light must be focused to a point on the retina for optimal vision
- The eye is set for distance vision (over 6 m away)
- The lens must change shape to focus for closer objects

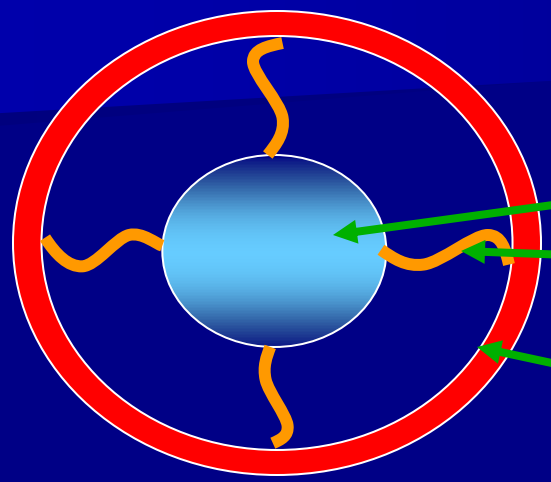


Accommodation

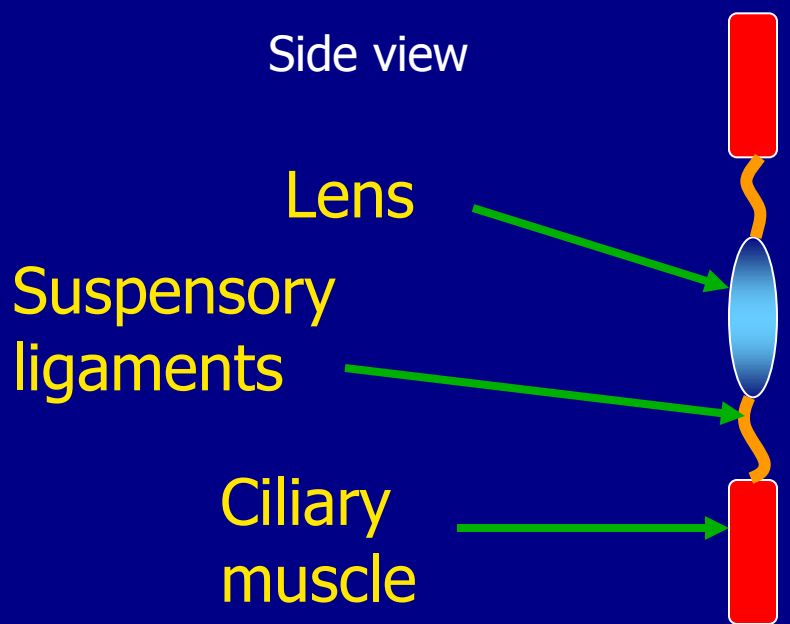
- For a clear image to form on the retina, the light needs to be focussed.
- This happens by refracting (bending) the light.
- Most of the refraction occurs in the cornea and aqueous humour. The lens just “fine tunes” the focusing.
- Accommodation is the way the lens changes shape to focus at objects near and far away from the eye.

The lens set up

Front view

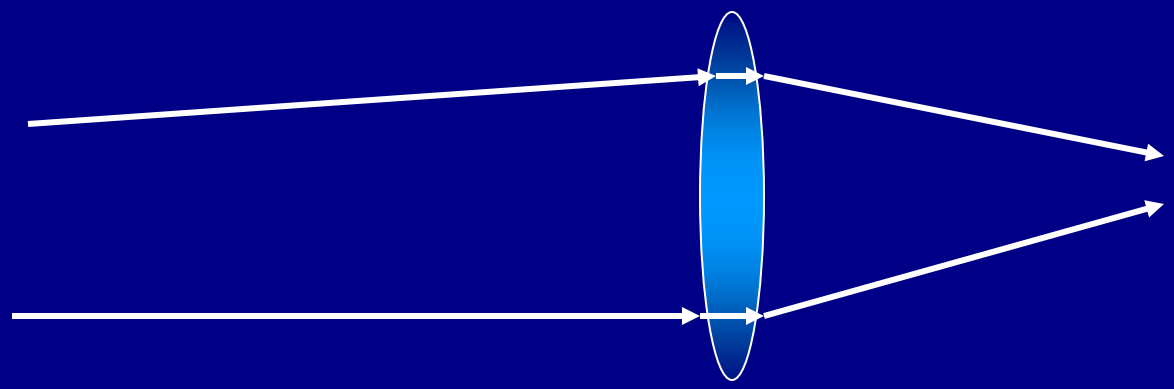


Side view



- The lens is held in place by suspensory ligaments which are attached to the ciliary muscle.
- The ciliary muscle is another circular muscle.
- To make it easier to see, the diagram has fewer suspensory ligaments

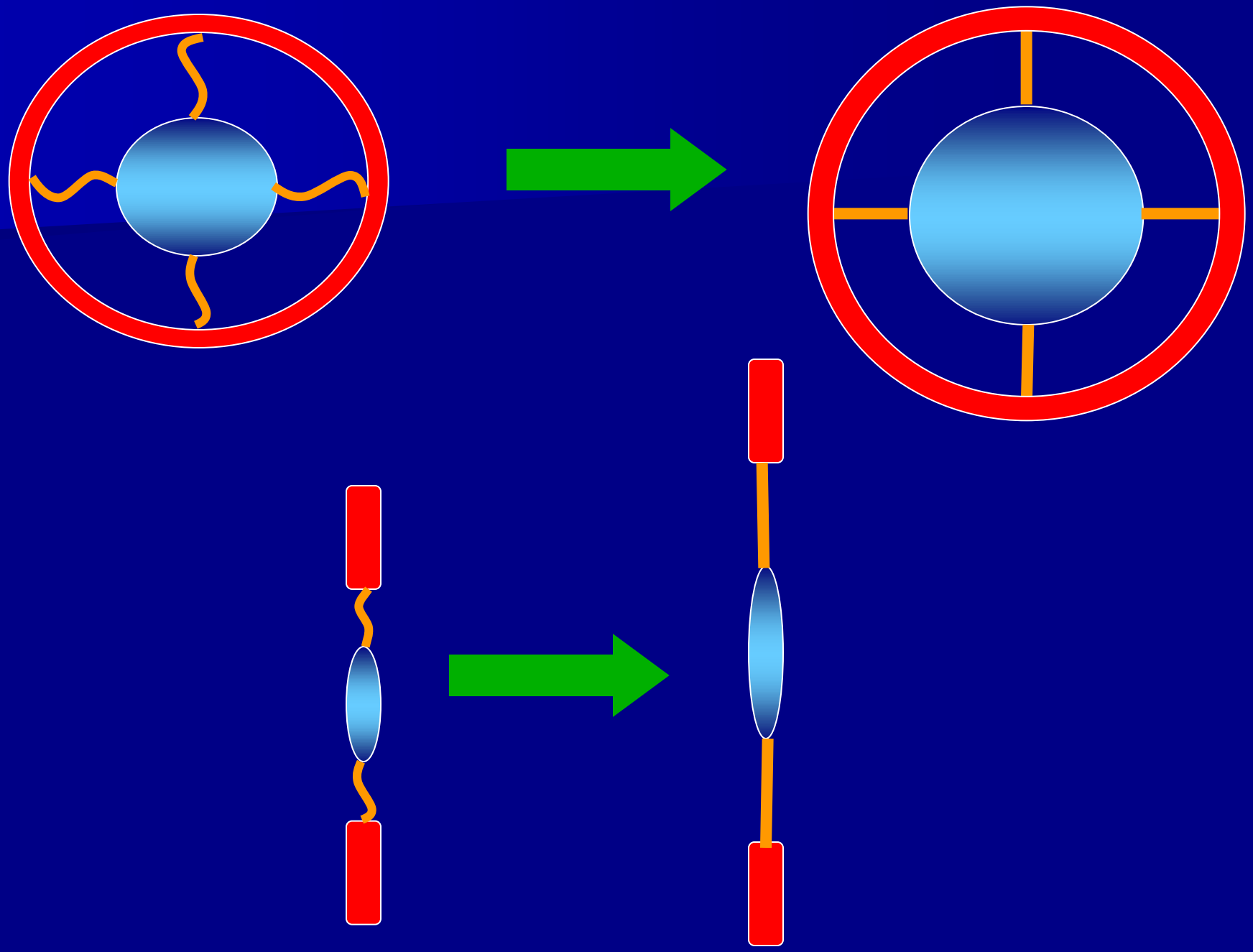
Looking at objects far away



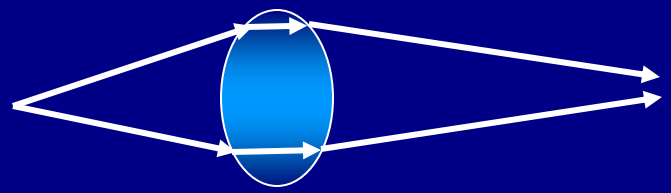
Light rays from distant objects do not need to be bent much. They need a thin lens.

Looking at objects far away

- To look at objects in the distance, the suspensory ligaments need to pull the lens flatter.
- To do this the ciliary muscle needs to relax so the hole inside is wider.
  - The ciliary muscle relaxes (hole gets wider)
  - The suspensory ligaments get tighter
  - The lens gets flatter.



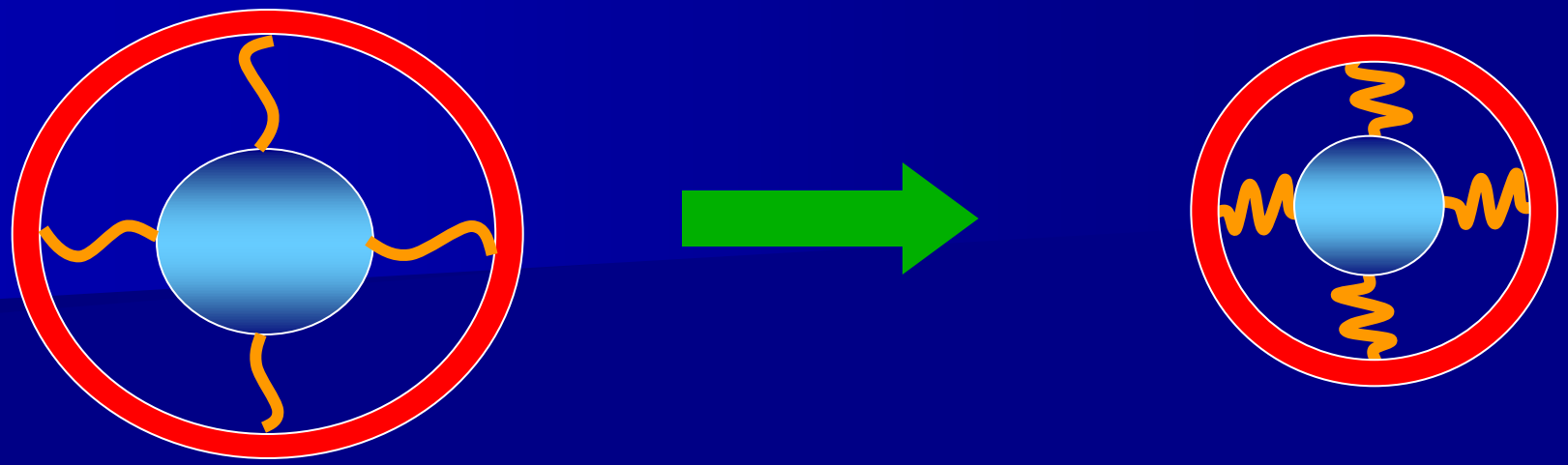
Looking at near objects

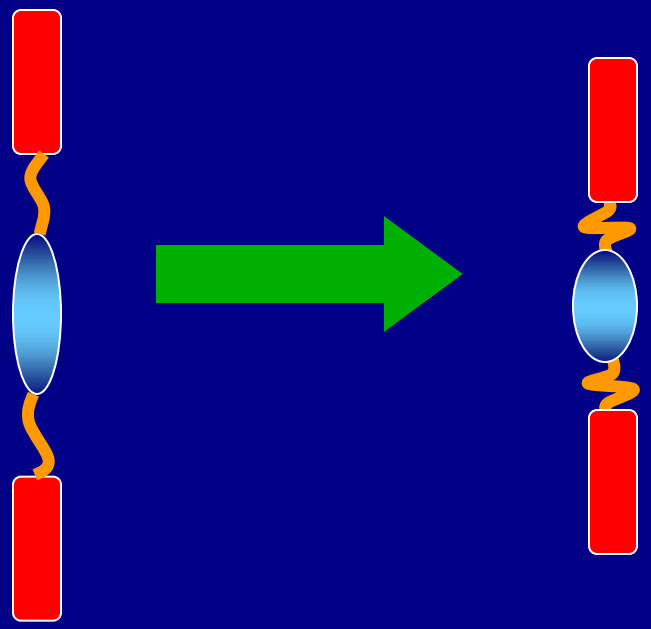


Light rays from near objects need to be bent much more. They need a thick lens.

Looking at near objects

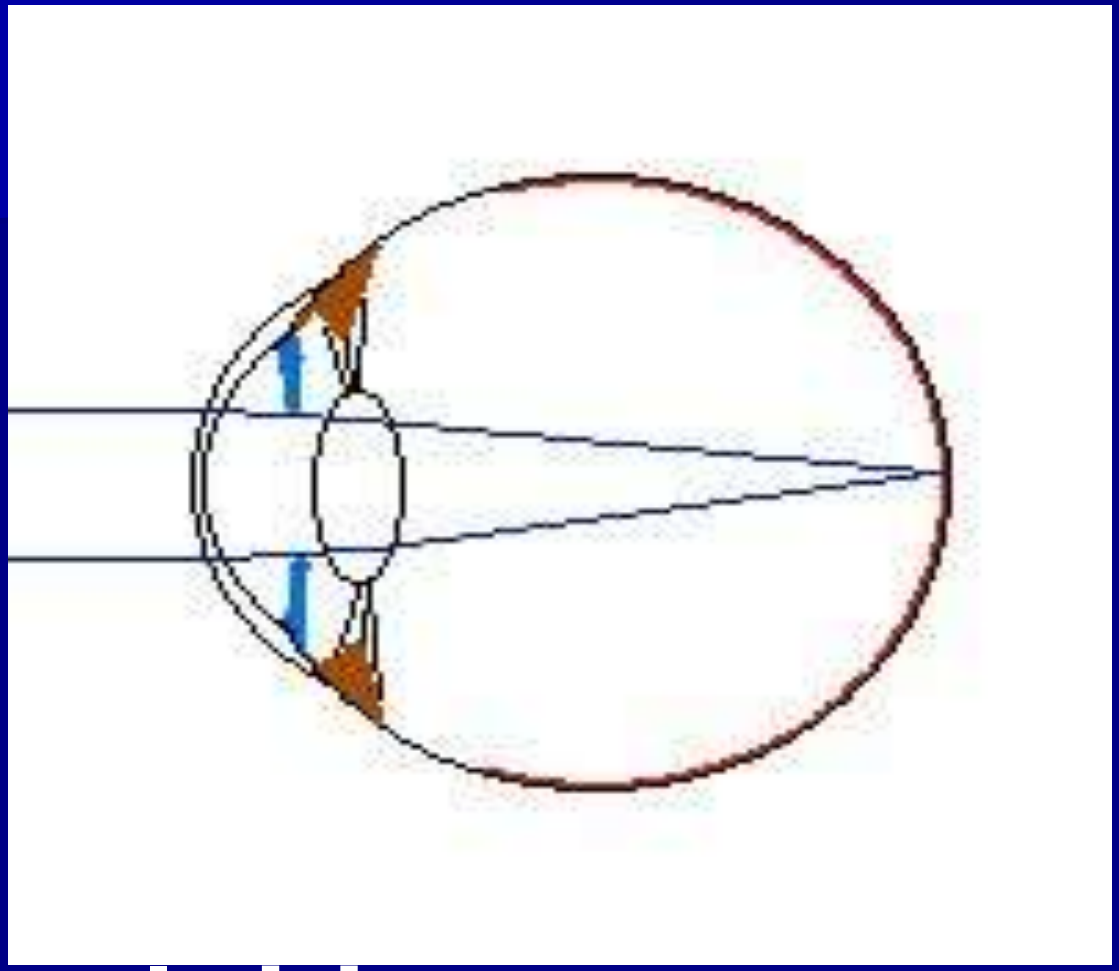
- To look at near objects, the suspensory ligaments need to let the lens go rounder.
- To do this the ciliary muscle needs to contract so the hole inside is smaller.
  - The ciliary muscle contracts (hole gets smaller)
  - The suspensory ligaments get slacker
  - The lens gets rounder.





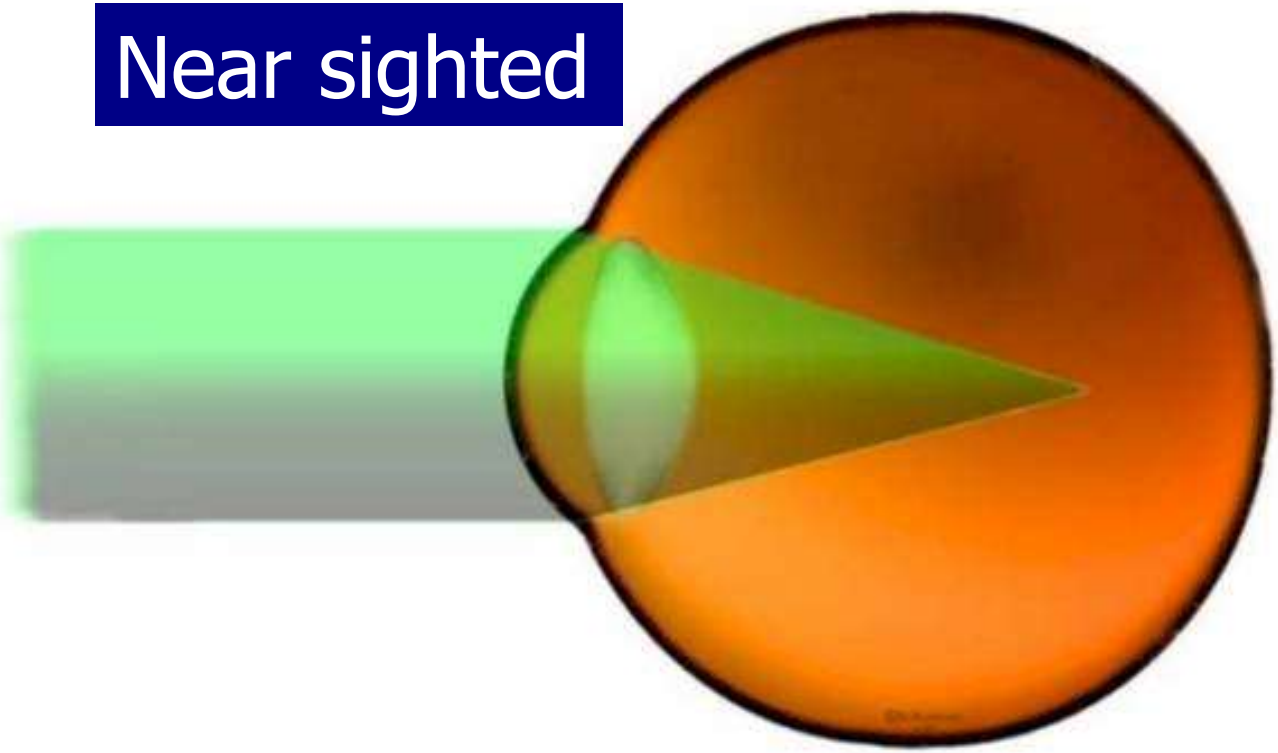
Correcting the Eye

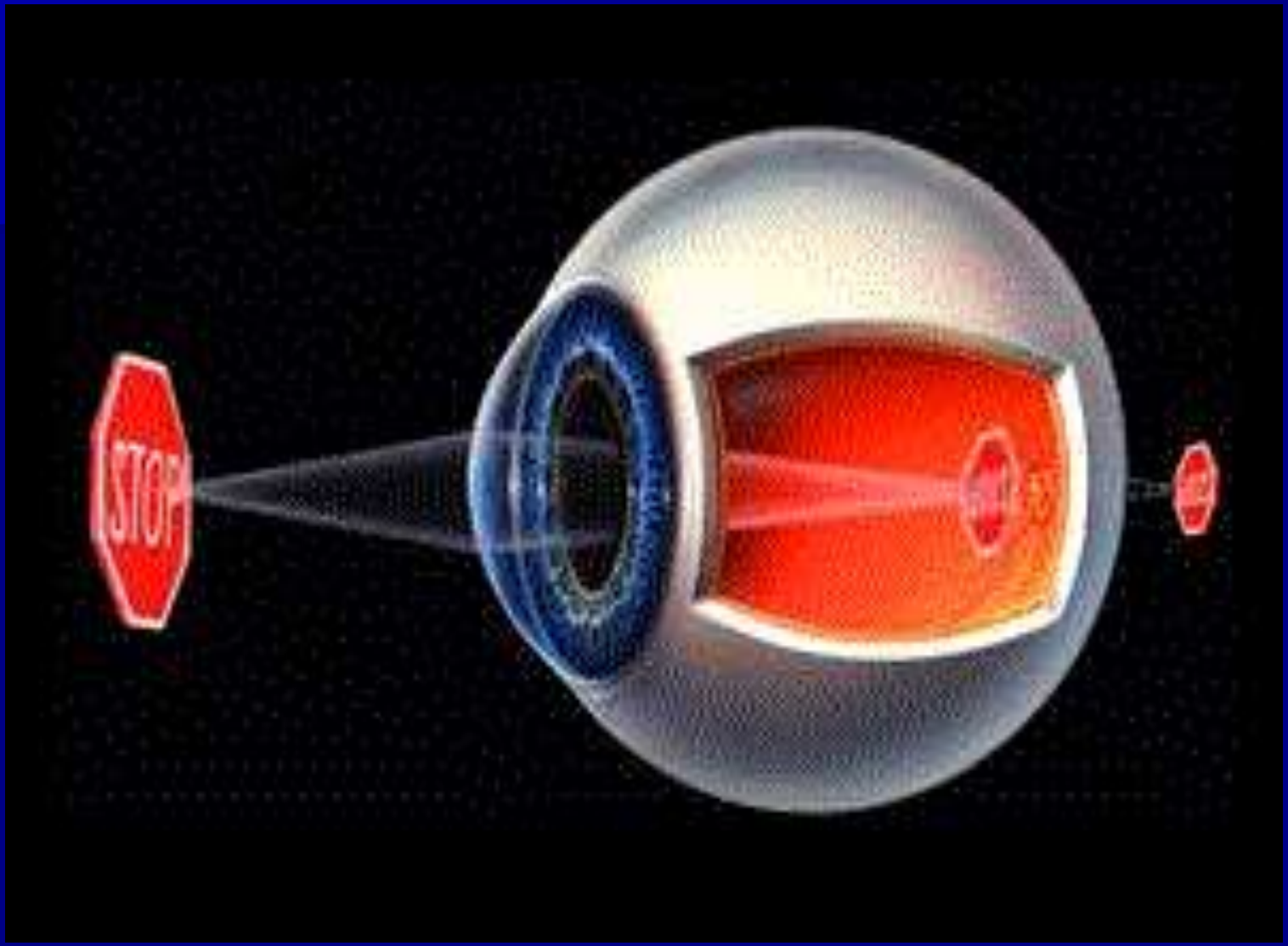
- Nearsightedness = myopia
  - Focus of light in front of retina
  - Eyeball too long or lens too strong
  - Distant objects are blurry
- Farsightedness = hyperopia
  - Focus of light beyond the retina
  - Short eyeball or lazy lens
  - Near objects are blurry.



Normal vision

Near sighted

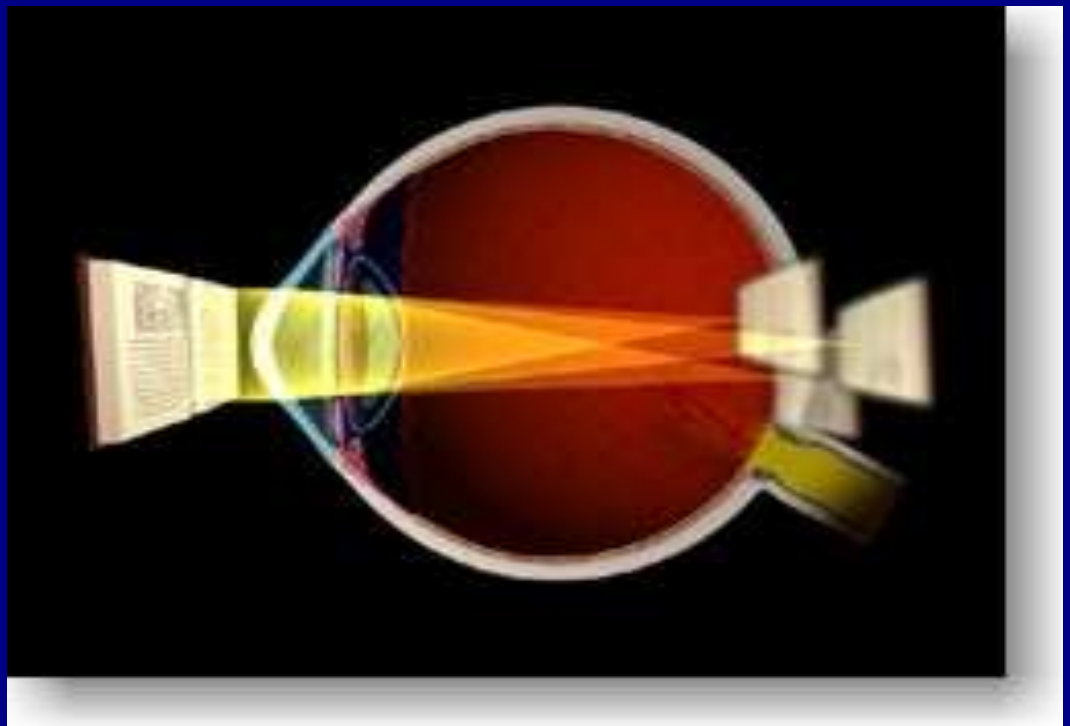




Far Sighted

Astigmatism

- Unequal curvatures in cornea & lens

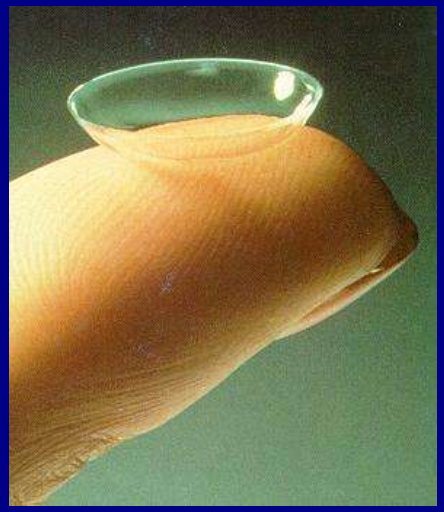


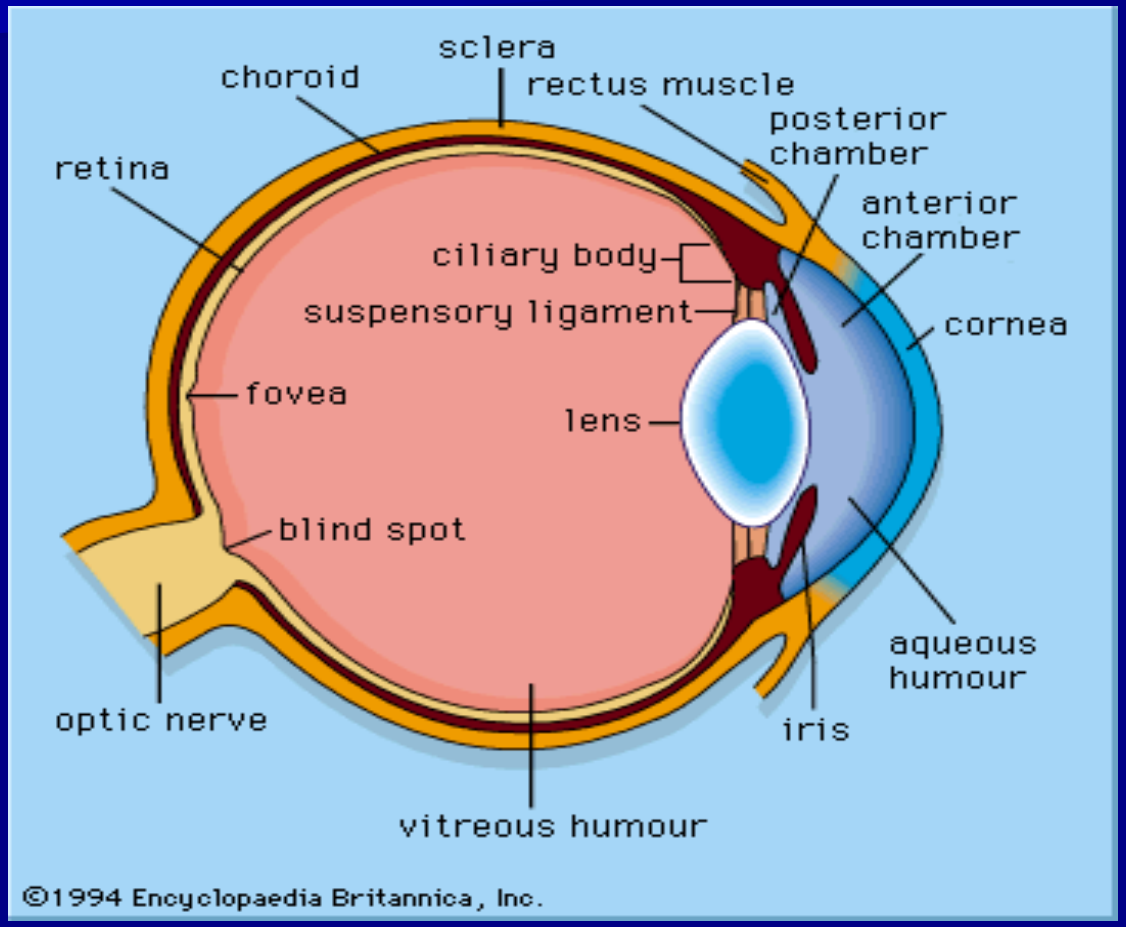
Eye Problems

- Genetic
- Age
- Cataracts – cloudy lens
- Glaucoma – disease of the optical nerve
- Detached retina

Correcting the Problem

- Artificial lenses
- Laser surgery
- Eye exercises
- Cornea transplant




sclera
choroid
rectus muscle
posterior chamber
retina
anterior chamber
ciliary body
suspensory ligament
cornea
fovea
lens
blind spot
aqueous humour
optic nerve
iris
vitreous humour
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