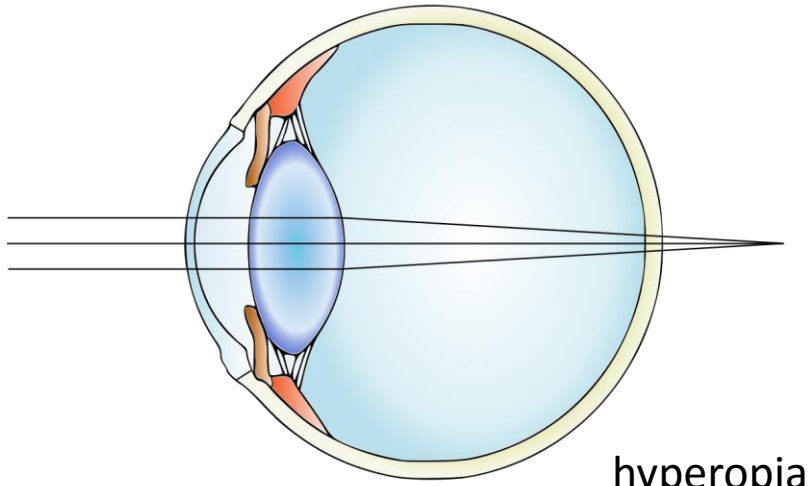
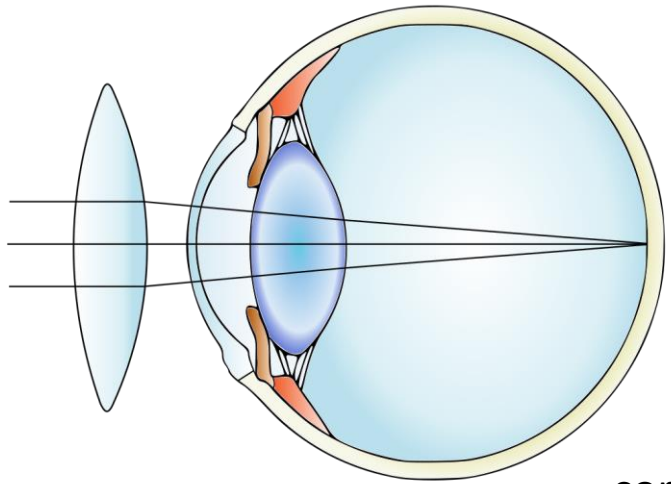
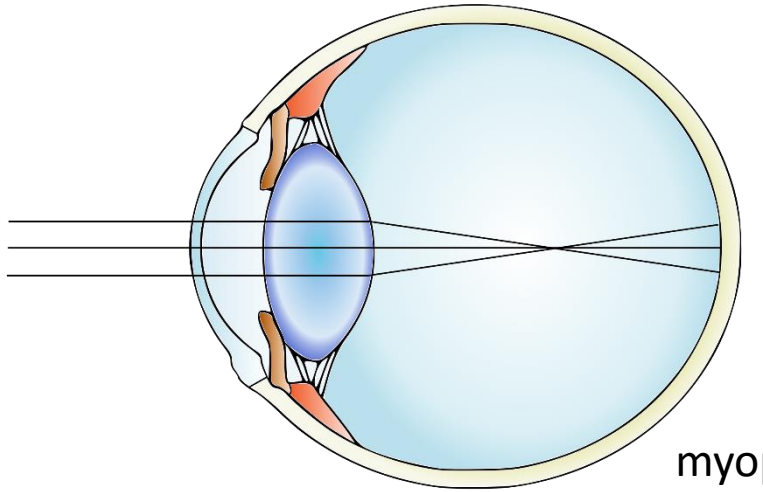
Farsightedness (Hyperopia) and Nearsightedness (Myopia)



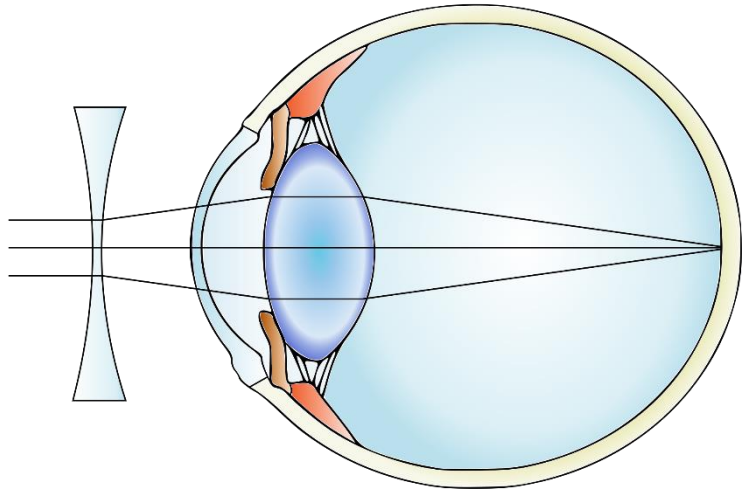
hyperopia



correction



myopia



correction

Definitions

What is hyperopia?

Hyperopia, also known as farsightedness, is a common type of refractive error where distant objects may be seen more clearly than objects that are near. For people with significant hyperopia, vision can be blurry for objects at any distance, near or far.

What is myopia?

Otherwise known as nearsightedness, myopia occurs when the eye grows too long from front to back. Instead of focusing images on the retina, the lens of the eye focuses the image in front of the retina. People with myopia have good near vision but poor distance vision.

What is binocular vision???

Fluid System of the EYE – Intraocular Fluid

- ✓ Keeps the eyeball round and distended by maintaining pressure.
- ✓ Two chambers – Aqueous and Vitreous.

- Aqueous humor – free flowing fluid in front of the lens.
- Vitreous humor – gelatinous mass with little flow of fluid at the back of the lens.

VITREOUS HUMOR

- A clear avascular gel which occupies the posterior compartment of the eye.

- ***It has the following composition:***
  - Water (99%)
  - Network of collagen fibrils
  - Large molecules of hyaluronic acid
  - Peripheral cells (hyalocytes)
  - Inorganic salts, sugar and ascorbic acid

Aqueous Humour

- It is a clear, colourless, watery fluid filling the anterior chamber and posterior chamber of the eyeball.
- Volume: 0.31ml
  - Anterior chamber- 0.25ml
  - Posterior chamber- 0.06ml
- Refractive Index: 1.336
- Density : 1.025-1.040 (greater than water)
- pH : 7.2 (acidic)
- Rate of formation: 2.3µl/min

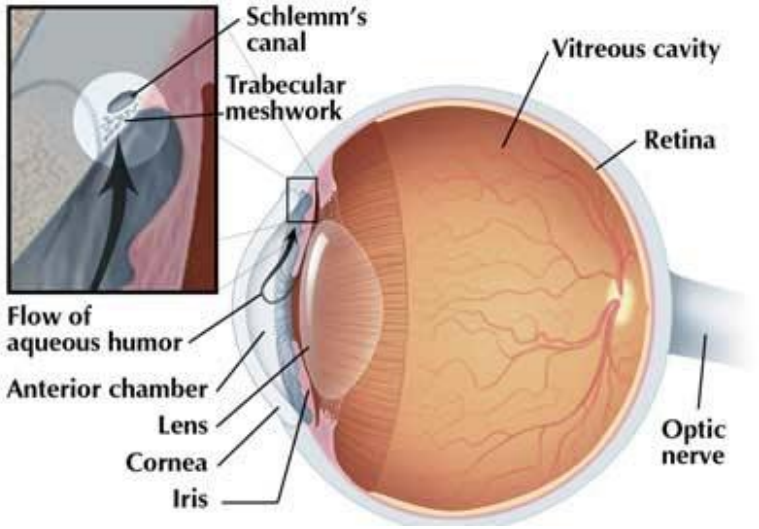
Ocular tonometry

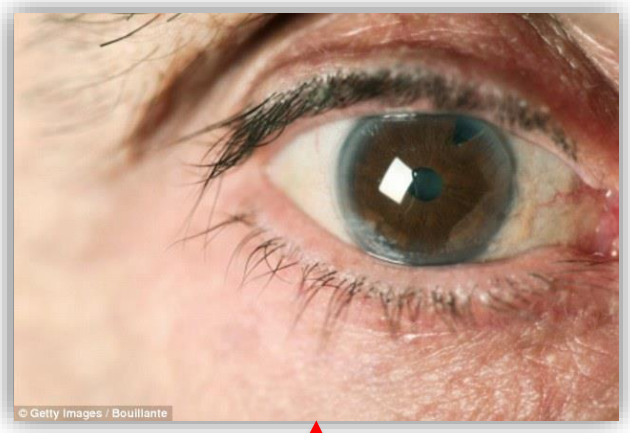
- Procedure to measure intraocular pressure (IOP), i.e. the fluid pressure inside the eye.
- Important test to evaluate the risk of glaucoma.
- Different types of tonometers are available based on various techniques.

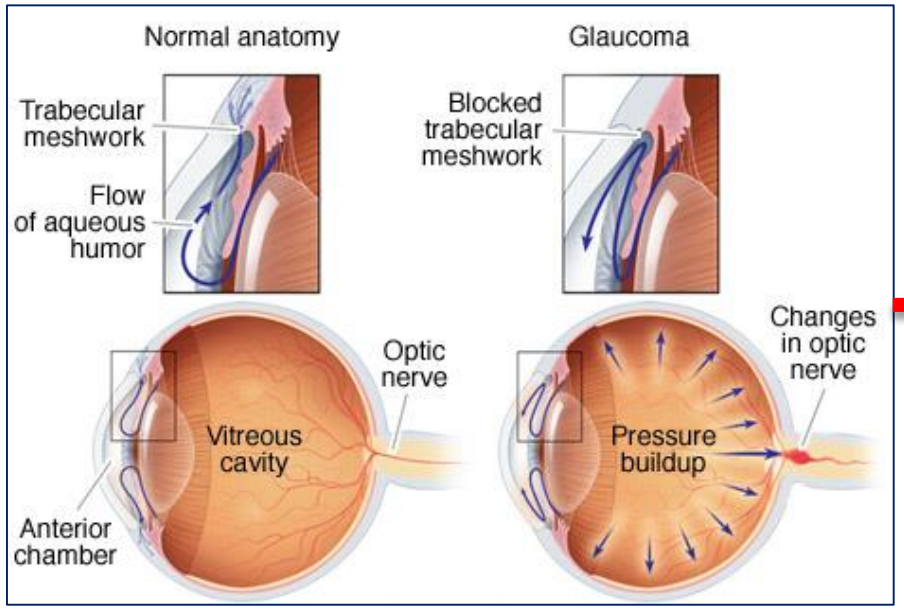
What is tonometer?

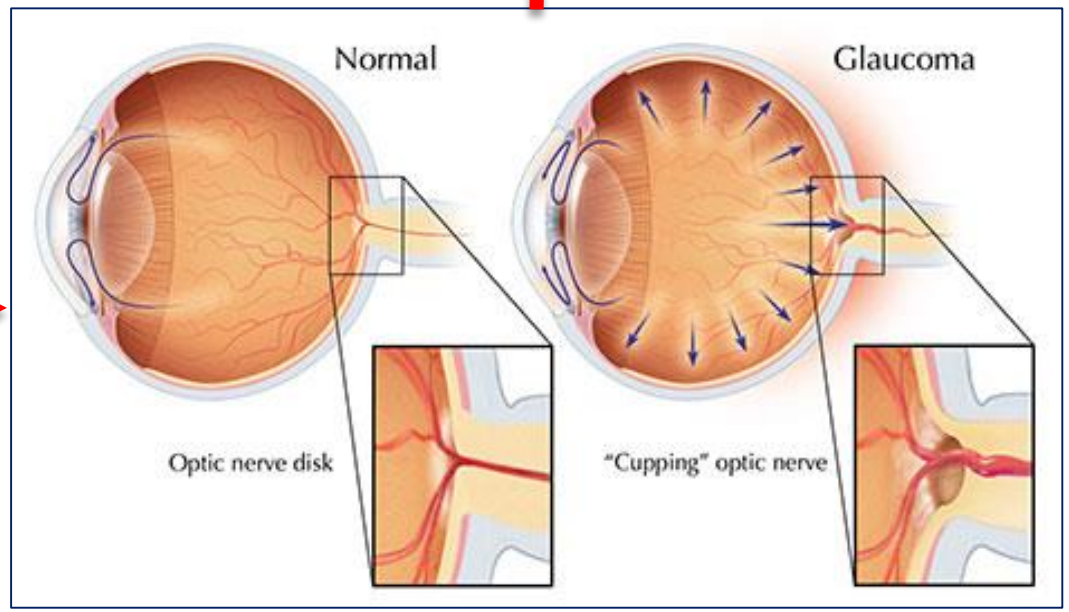
Tonometer is a device that measures intraocular pressure (IOP).

Glaucoma


Schlemm's canal
Trabecular meshwork
Vitreous cavity
Retina
Flow of aqueous humor
Anterior chamber
Lens
Cornea
Iris
Optic nerve


© Getty Images / Bouillante


Normal anatomy
Glaucoma
Trabecular meshwork
Flow of aqueous humor
Blocked trabecular meshwork
Optic nerve
Vitreous cavity
Anterior chamber
Pressure buildup
Changes in optic nerve


Normal
Glaucoma
Optic nerve disk
"Cupping" optic nerve

Glaucoma – the process

Eye pressure rises

↓

The axons of the optic nerve are compressed

↓

Block axonal flow of cytoplasm from the neuronal cell bodies in the retina to the extended optic nerve fibres entering the brain

↓

Lack of appropriate nutrition of the fibres

↓

Causes death of the involved fibres

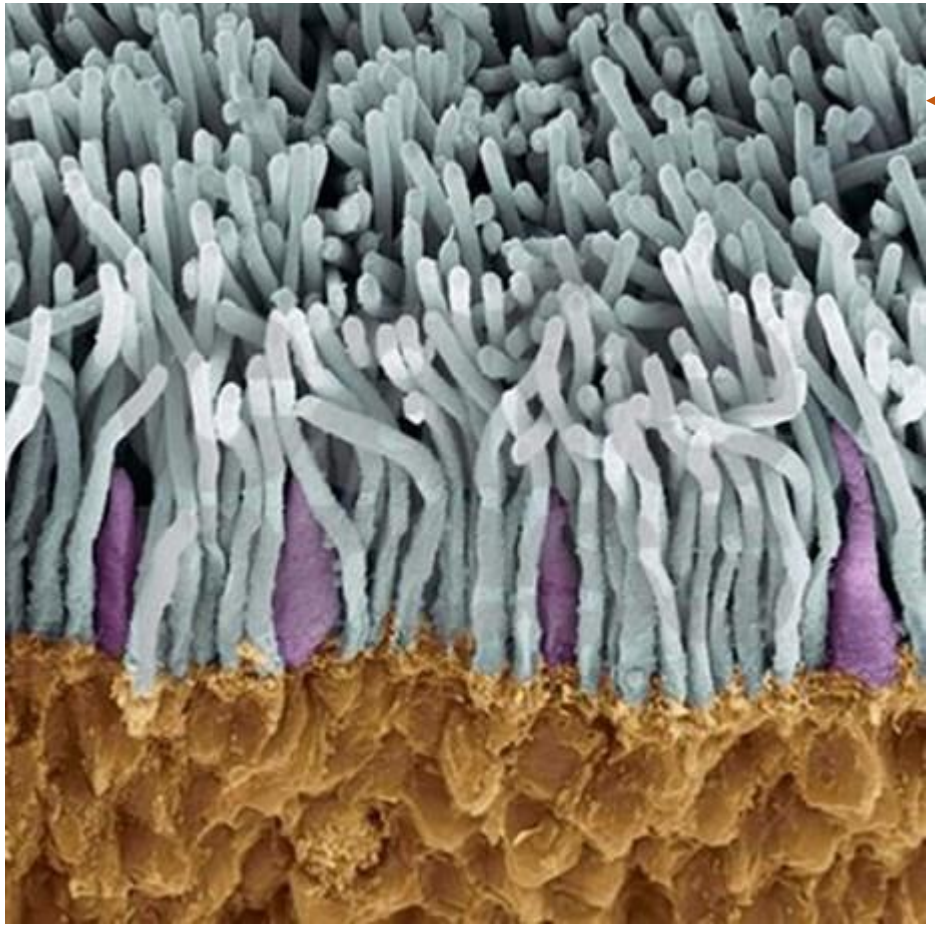
→

Surgical treatments:

1. **Laser Trabeculoplasty**
2. **Trabeculectomy**

What is a cataract then?

Photoreceptors – Rods and Cones



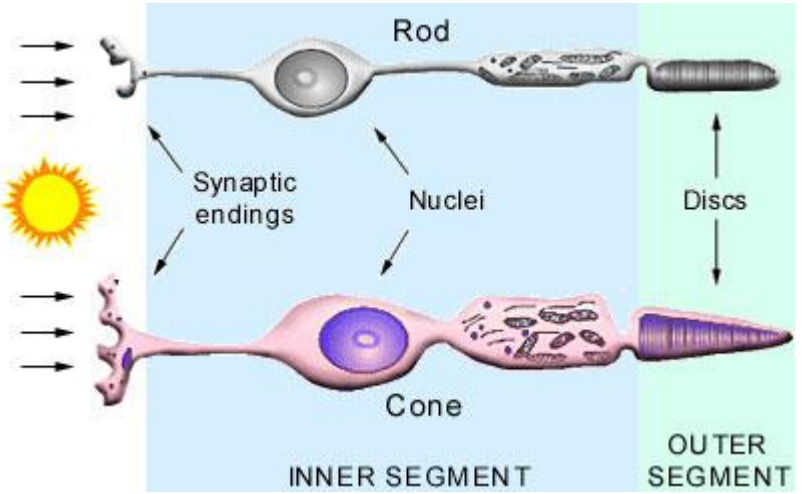
SEM image of rods and cones

6 million cones and 120 million rods

Why no colour in dim light!!!

Rods are responsible for night vision; Cones provide colour vision in brighter light.

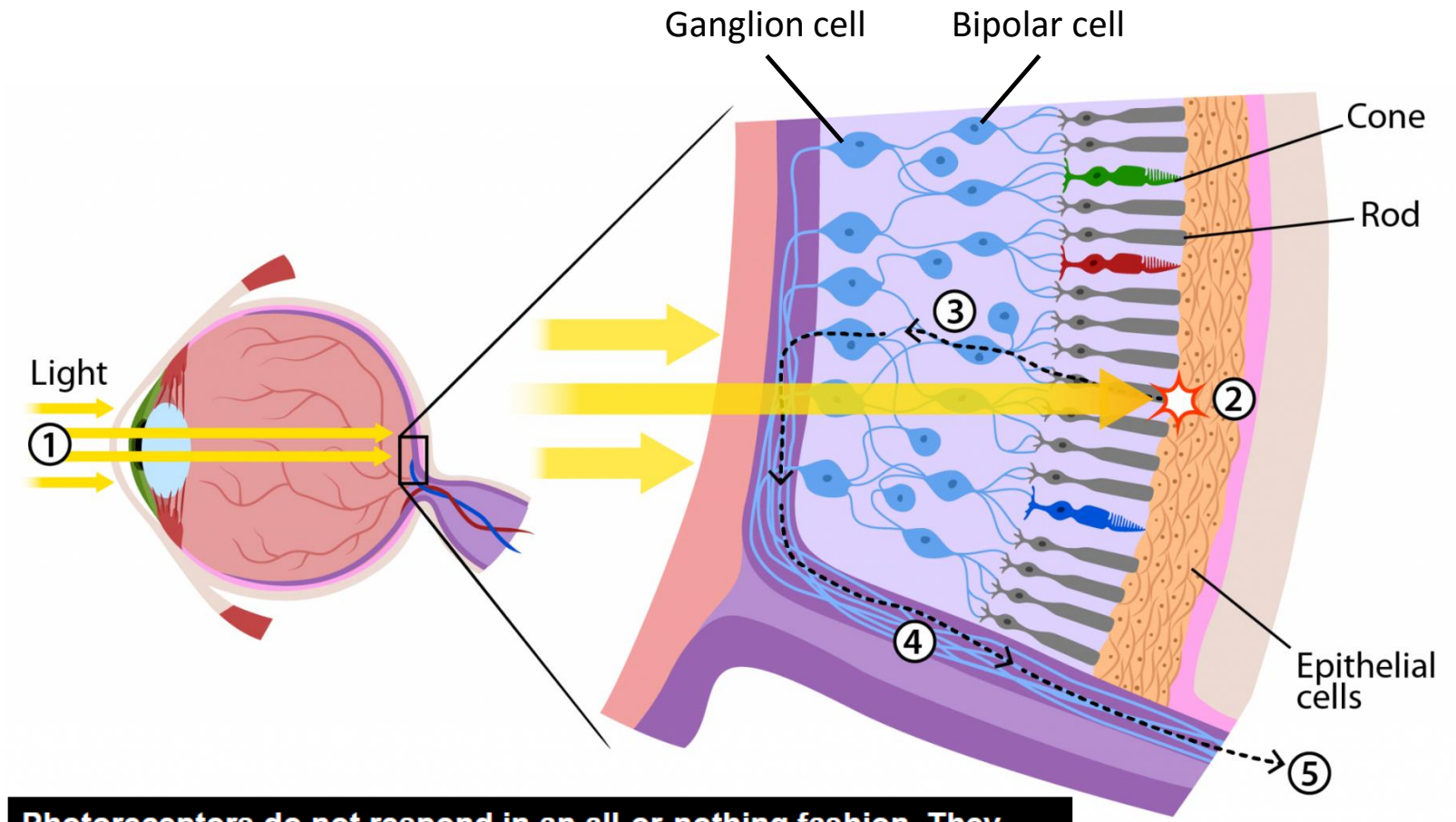
Blue
Green
Red



Lost rod vision? Should not drive at night.

Lost cone vision? Should not drive at all !

Flow of image information



Photoreceptors do not respond in an all-or-nothing fashion. They pass their information on to the bipolar cells via graded potentials instead of action potentials.

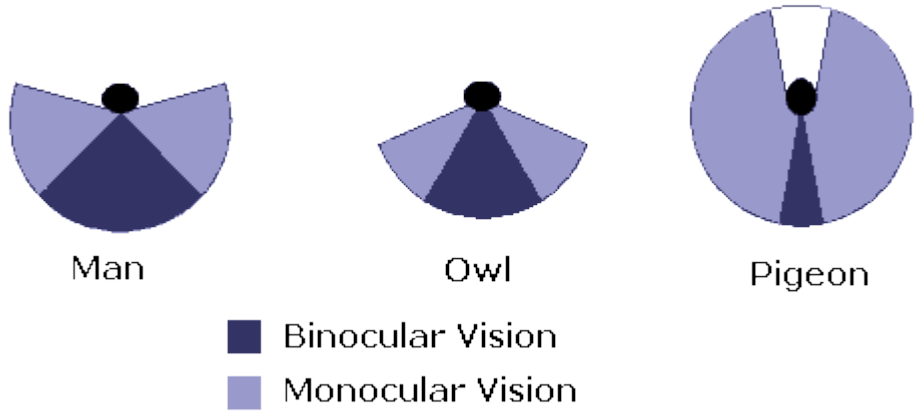
Graded potential: An electrical potential that can vary continuously in amplitude.

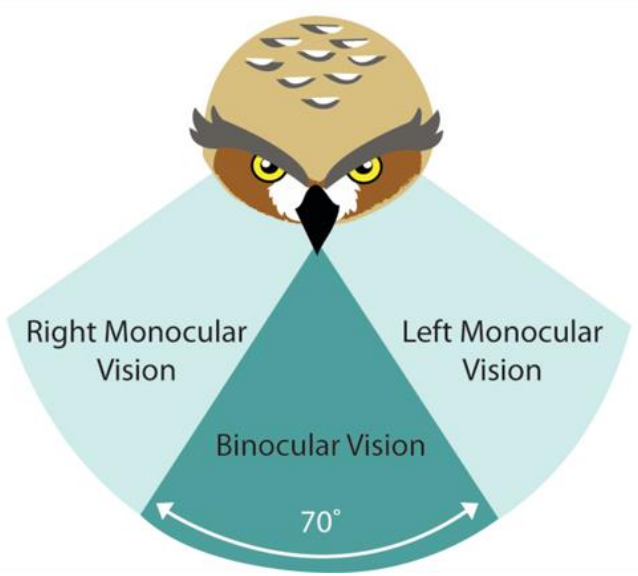
Chromophore: The light-catching visual pigments of the retina found in cones.

Rhodopsin: The visual pigment found in rods.

Bird vision

Good eyesight is essential for safe flight!





- Avian eye resembles that of a reptile, with ciliary muscles that can change the shape of the lens rapidly and to a greater extent than in the mammals.
- Birds have the largest eyes relative to their size in the animal kingdom.
- Avian eye is protected by a third transparent movable membrane.
- Birds of prey have a very high density of receptors to maximise visual acuity.
- Nocturnal birds have tubular eyes, low no. of colour detectors, but a high density of rod cells to function well in poor light.

Let’s try something interesting …

Did you feel the blind spot in your right eye ???