




EyeSystems


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Anatomy of the Eye

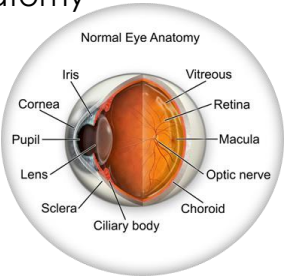


Its parts and how they function

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Anatomy



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The Protective – Fibrous Tunic

- Sclera - very few nerve endings – tough fibers, tightly laced.
- Limbus - junction between sclera and cornea

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The Protective – Fibrous Tunic

● CORNEA:

- 40 diopters of power supplies
- 80% of the eye's refracting power.
- No blood supply.
- Bathed in the front by tears and on the back by aqueous.
- Exquisitely sensitive.
- 5 distinct layers.
- Acts as a barrier to injury and infection.
- Amazing ability to regenerate.

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Anterior Chamber and Aqueous

- Bathes and feeds the cornea. Fluid renews every 4 hours.
- Chamber becomes more shallow with age, adding to susceptibility to glaucoma. The angle where the iris and the cornea meet is the critical one.
- Trabecular meshwork is the drainage system. Canal of Schlemm. Discuss glaucoma, impacted area early warning signs.

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Nourishing Tunic or Vascular or Uveal Tunic



- o Pupil – opening in the iris.
- o Iris – pigmented muscle.
 - o Less pigment = Less color.
- o Regulates amount of light coming into the eye with Dilator and Sphincter muscles.
- o Dilator and Sphincter muscles – regulate amount of light entering the eye.


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Nourishing Tunic or Vascular or Uveal Tunic

- o Three pupillary responses:
 - o Direct – pupil constricts in light.
 - o Consensual – pupil in one eye constricts when a light is shone in the opposite pupil constricts.
 - o Bilateral – both pupils constrict when looking at a near target.

HUMAN EYE
(size of the pupil)

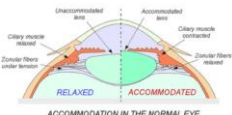


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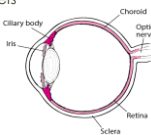
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Nourishing Tunic or Vascular or Uveal Tunic

- o Ciliary body, ciliary muscle – as muscle tightens the lens bulges for near vision.



- o Choroid – blood vessels under retina which supply blood and nutrients.

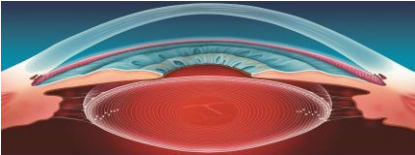


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Nourishing Tunic or Vascular or Uveal Tunic

- Crystalline Lens
 - 16 -20 diopters of power.
 - Layered like an onion.
 - No nerve or blood supply.
 - Continues to put down layers with age.
 - Anterior chamber gets shallower.
 - Any opacity within the lens is a cataract.
 - Lens becomes less elastic with age leading to presbyopia.



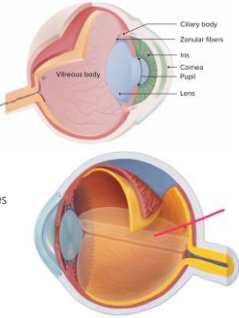
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Nourishing Tunic or Vascular or Uveal Tunic

- Vitreous – gel like fluid.
 - Does not change though life.
 - Acts as shock absorber and holds the retina to the choroid.
 - Shrinks and collapses with age.
- Floaters - Debris in fluid causes floaters.

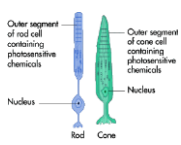


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Light Sensitive - Inner Tunic



- Retina, rods and cones – very thin sheet of interconnected nerve cells and blood vessels. It CANNOT regenerate. All information exits through the optic nerve.
- Rods and cones convert light into electrical pulses because of photosensitive chemicals that they contain. The optics of the cornea and the crystalline lens bring an image of an object into focus on the retina.

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Light Sensitive - Inner Tunic

- Cones – give color vision
 - Function in daylight.
 - Packed into the fovea.
 - About 6 million cones per retina.
 - Provides "photopic" vision, vision in bright light.
- Rods – function under low light & gives shades of grey.
 - About 120 million rods per retina.
 - Provides "scotopic" vision, vision in dim light.

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Light Sensitive - Inner Tunic

- Macula
 - Cones are concentrated here, no rods.
 - Devoid of blood vessels.
 - Macular degeneration.
- Fovea
 - Center depressed area of the macula.
 - It gives best visual detail – packed with cones.
 - Size of a pinhead!

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Light Sensitive - Inner Tunic

- Optic nerve – a direct extension of the retina. Feeds messages to the brain. It is located about 3.5 mm nasal to the macula. No vision in this area, so projects as a blind spot. This is the area affected by glaucoma.
- Visual Pathway – as the retinal fibers leave the optic nerves, half of them cross to the other side at the optic chiasm.

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Light Sensitive - Inner Tunic

Visual pathways

The diagram illustrates the visual pathway. Light from an object enters the left and right eyes. The optic nerves from each eye meet at the optic chiasma. From there, the pathways lead to the occipital lobes of the brain, which are shown on both the left and right sides of the brain.

Labels: occipital lobe, left side of brain, optic chiasma, right side of brain, image, optic nerve, left eye, right eye, object.

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External Muscles

- Extra-ocular muscles
 - 6 rotate the globe in all possible directions. All muscles cooperate in each movement. Some contract while others relax. Likewise, the muscles of both eyes cooperate, so that neither eye moves alone.

The diagrams show the lateral and anterior views of the right eye. Labels include: Superior oblique muscle, Trochlea, Superior oblique tendon, Superior rectus muscle, Lateral rectus muscle, Common tendinous ring, Inferior rectus muscle, Inferior oblique muscle, Superior rectus, Trochlea, Superior oblique, Lateral rectus, Medial rectus, Inferior oblique, and Inferior rectus.

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External Muscles

The diagram shows the eye with arrows indicating the movement of various extra-ocular muscles:

- superior rectus (upward movement)
- lateral rectus (outward movement)
- inferior oblique (upward and outward movement)
- inferior rectus (downward movement)
- medial rectus (inward movement)
- superior oblique (downward and outward movement)

1. Medial Rectus (nasal, internal) – IN
2. Lateral Rectus (temporal, external) – OUT
3. Superior Rectus UP & IN
4. Inferior Rectus DOWN & IN
5. Superior Oblique rotates DOWN & OUT
6. Inferior Oblique rotates UP & OUT

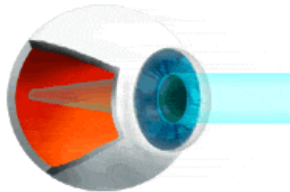
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VISUAL FUNCTION

- Emmetropia – measurement of the normal eye.



Normal Vision

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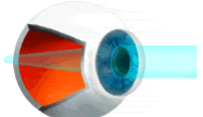
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VISUAL FUNCTION

Ammetropia – measurement of an abnormal eye.

- Hyperopia – light rays focus **behind** the retinal
- Axial hyperopia – may be because the eye is not long enough
- Curvature hyperopia – the curve of the cornea or lens is improper
- Index hyperopia – index of refraction of the lens has changed due to cataracts or diabetes.



Hyperopic Vision

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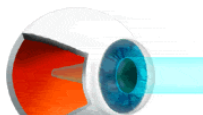
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VISUAL FUNCTION

Ammetropia – measurement of an abnormal eye.

- Myopia – light rays focus in **front** of the retina.
- Axial myopia – may be because the eye is too long enough
- Curvature myopia – the curve of the cornea or lens is improper
- Index myopia – index of refraction of the lens has changed due to cataracts or diabetes.



Myopic Vision

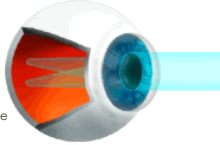
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VISUAL FUNCTION
Ammetropia – measurement of an abnormal eye.

- o Astigmatism – light rays do not come to a point on the retina.
- o Can be corneal or lenticular astigmatism.
 - o Simple – on point on the retina and the other off.
 - o Simple hyperopic or simple myopic.
 - o Compound – both points of focus off the retina.
 - o Compound hyperopic or compound myopic astigmatism.
 - o Mixed – one point in front and one point behind the retina.



Astigmatic Vision

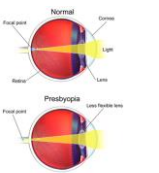
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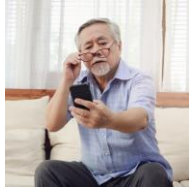
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VISUAL FUNCTION

- o Presbyopia – can no longer see clearly up close. Ability to accommodate for near vision decreases due to loss of elasticity of the crystalline lens and weakness of the ciliary muscle.



The lens gets stiff and thickens, bringing the focal point behind the retina and causing blurry vision.




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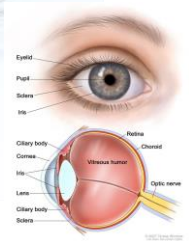
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The Human Eye is Amazing



o Questions?



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