

# OCULAR ANATOMY

Assistant Professor

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# LECTURES OBJECTIVES

- \*Describe the anatomy of ocular appendages.

- Orbit , paranasal sinuses, precorneal tear film, lids , extraocular muscles and conjunctiva.

- \*Mention the anatomy of the eyeball.

- eyeball coats, sclera, episclera, cornea, lens, uveal tract , vitreous and retina .

- \* Describe the blood supply of visual system.



# THE AIM OF LECTURE

By the end of this lecture all students should be able to describe the ocular anatomy.

# \* THE ORBITAL CAVITY

\* **Def. :** - pair of large pear-shaped bony sockets.  
- contain the eyeballs , extra ocular muscles , nerves , vessels , fat , and most of the Lacrimal apparatus.

## \* **Bones Forming The Orbit : ( 7 Bones )**

1. Sphenoid B.

2. Maxillae.

3. Palatine B.

4. Frontal B.

5. Zygomatic B.

6. Ethmoid B.

7. Lacrimal B.

Supraorbital notch

Optic canal

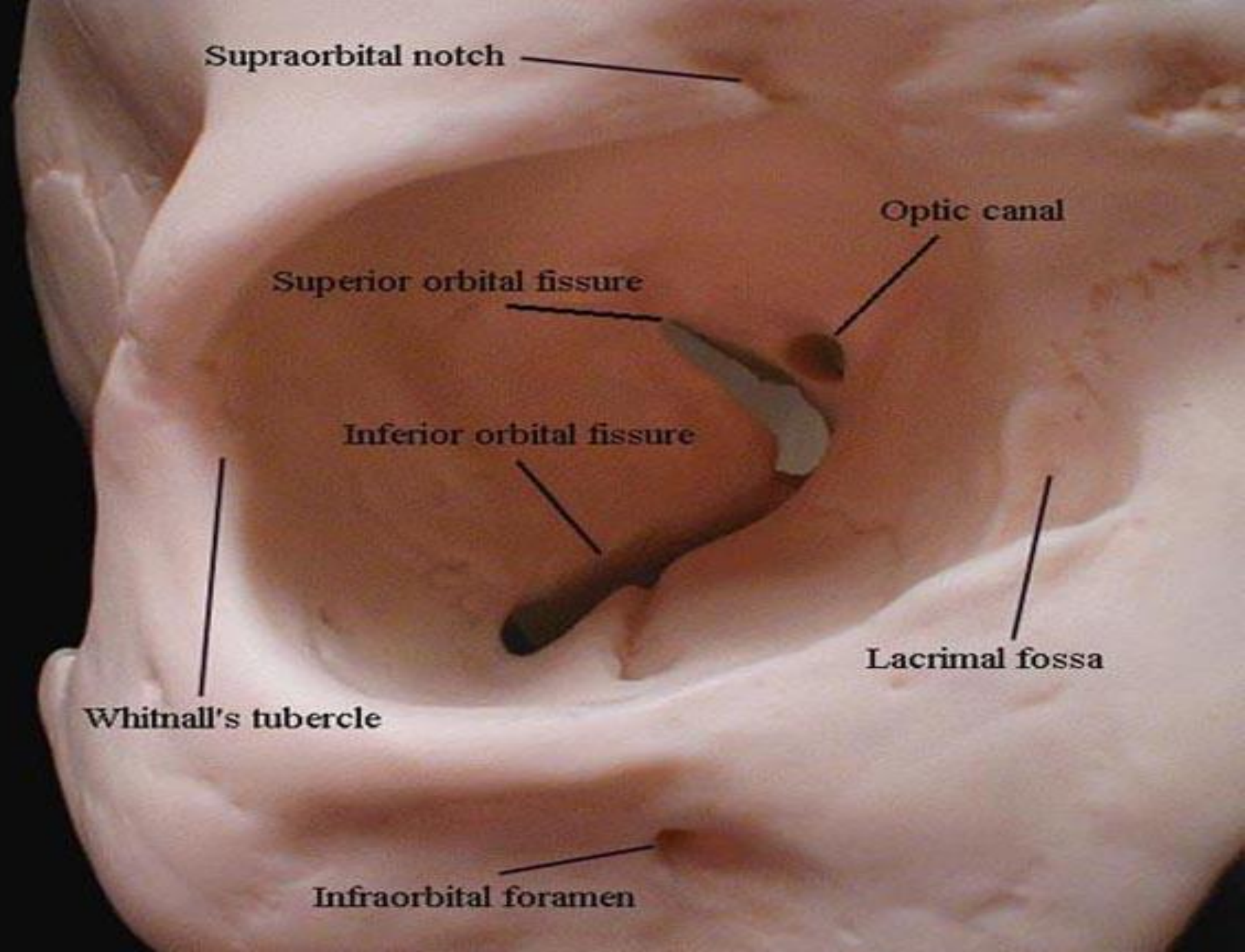
Superior orbital fissure

Inferior orbital fissure

Lacrimal fossa

Whitnall's tubercle

Infraorbital foramen



## \* PARTS :

- 1– Orbital apex.
- 2– orbital roof.
- 3– Orbital floor.
- 4– lateral wall.
- 5– Medial wall.

## \* Main Orbital Openings :

- a. Optic canal---- optic nerve, meninges , sympathetic plexus.
- b. Superior orbital fissure---lacrimal, frontal, trochlear, nasociliary, Abducent nerves & superior ophthalmic vein.
- c. Inferior Orbital Fissure.
- d. Foramina .

## \* RELATIONS :

- a. Superior--- meninges , frontal lobe of C.H.
- b. Inferior --- maxillary air sinus.
- c. lateral --- temporal fossa , temporal lobe of C.H.
- d. Medial --- nasal cavity , ethmoidal & sphenoidal sinuses.

## \* THE PARANASAL SINUSES :

- Def.---- bony cavities within the interior of the maxilla , sphenoid, frontal , and Ethmoid bones.

- Types :

1. Maxillary S.
2. Frontal S.
3. Sphenoidal S.
4. Ethmoidal S.







## \* THE LACRIMAL SYSTEM:

- \* **Def. :** - that system which is responsible for tear secretion and excretion.

\* PARTS:

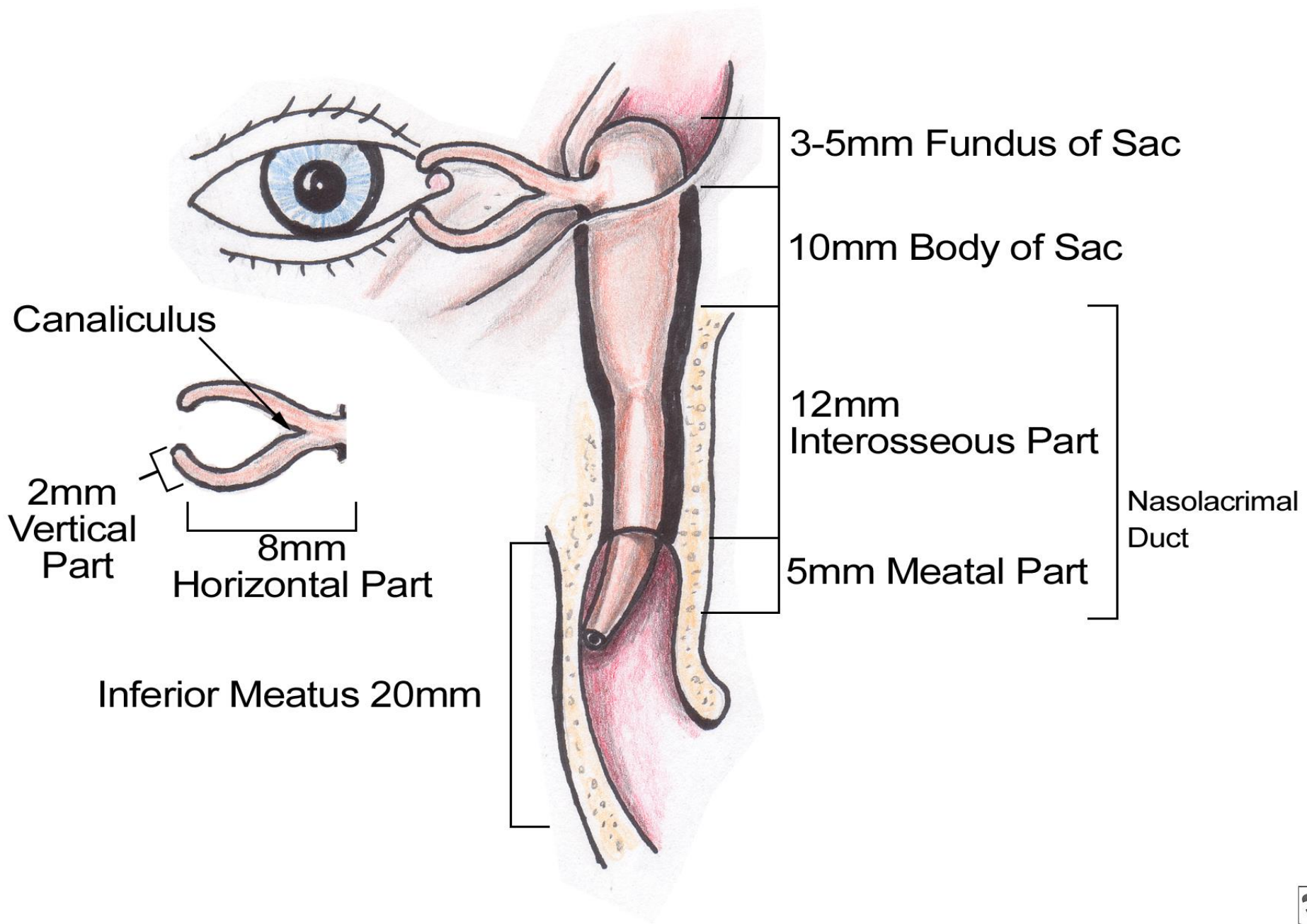
- A- The secretory portion: main and accessory lacrimal glands.
- B- The collecting portion:
  - the puncti.
  - lacrimal canaliculi.
  - lacrimal sac.
  - nasolacrimal duct.
  - inferior nasal meatus--- nasal cavity.

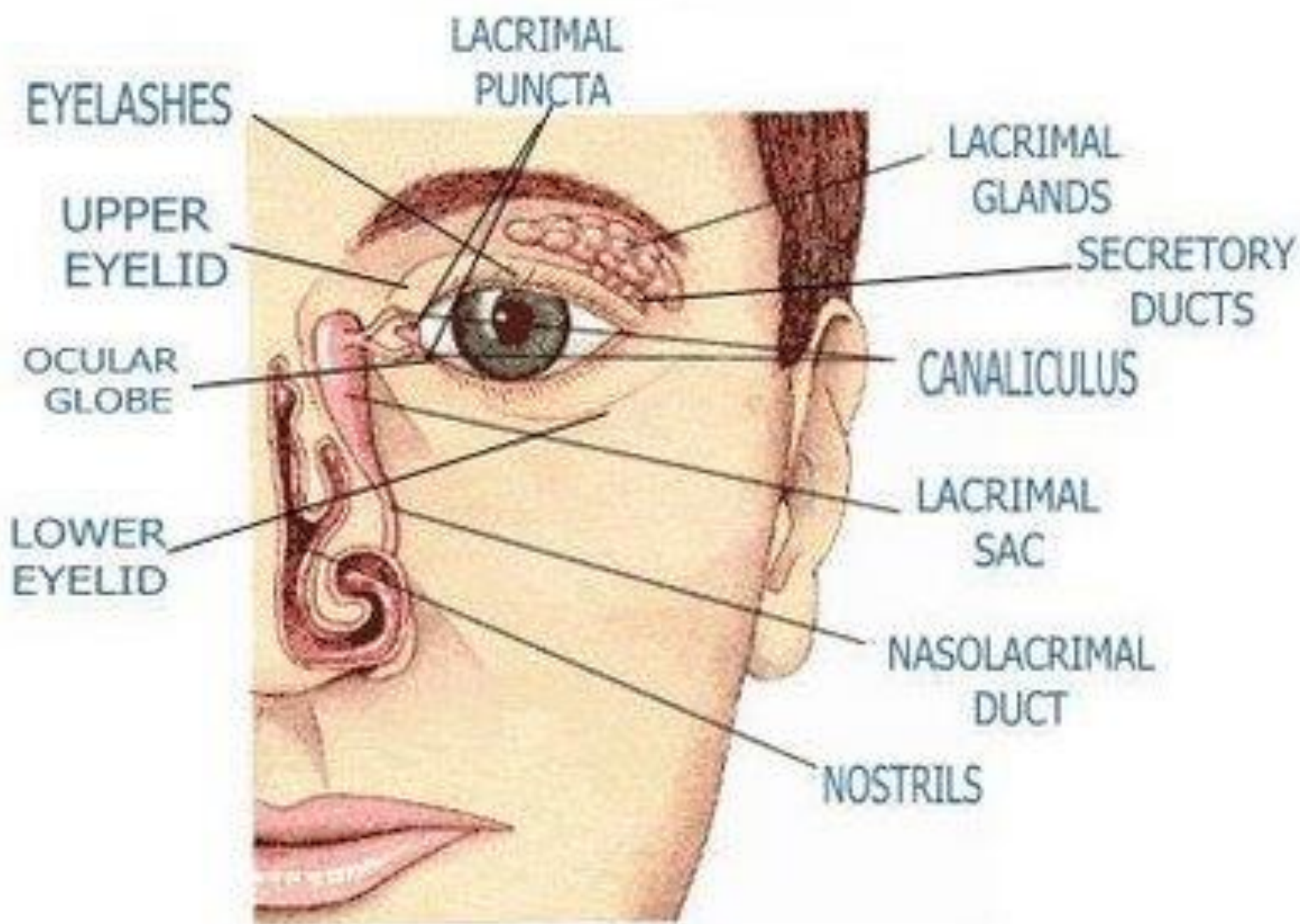
## \* PRECORNEAL TEAR FILM:

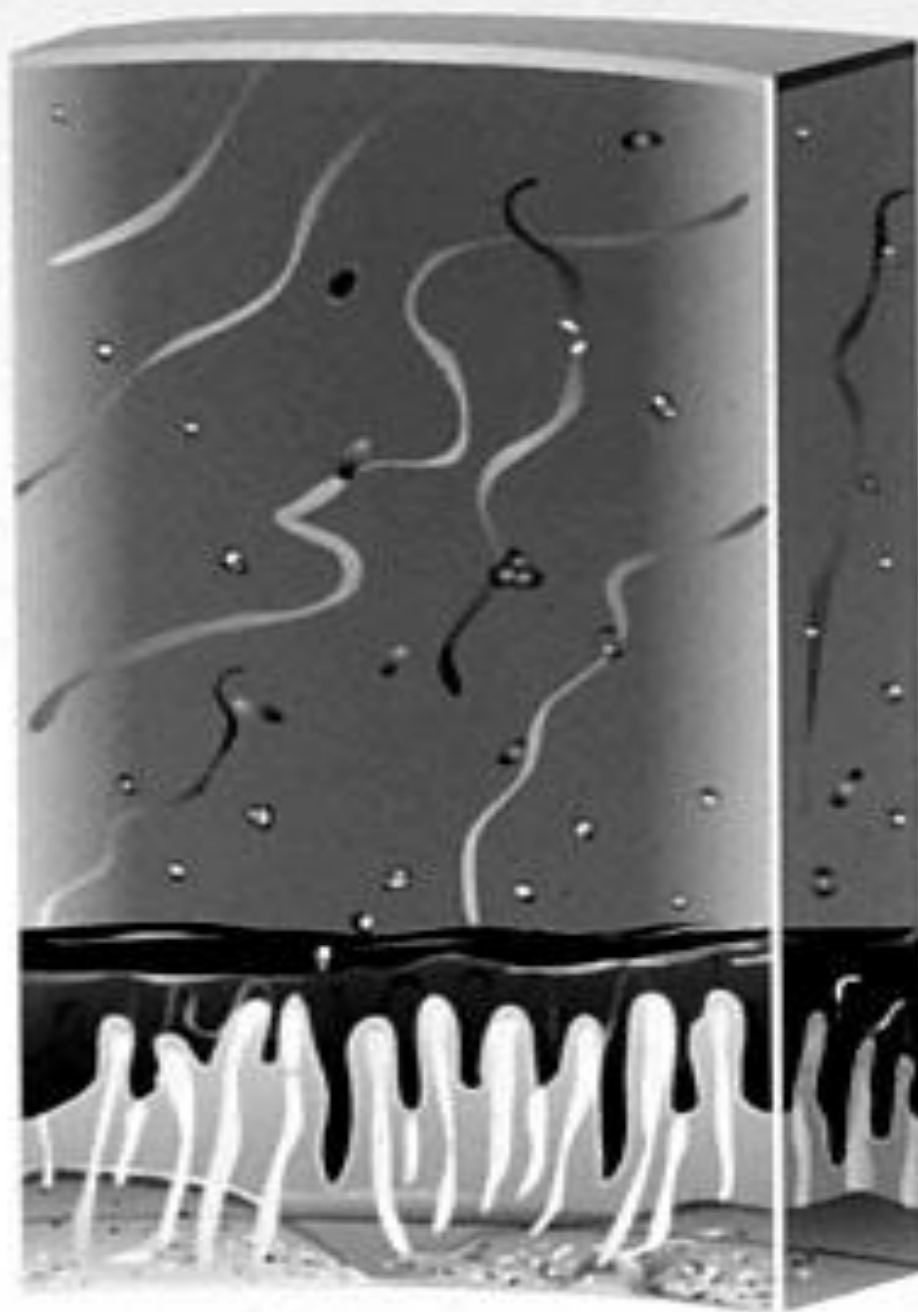
( layers )

(functions )

1. outer lipid L. .reduce evaporation.
2. middle aqueous L .antimicrobial.
3. inner mucinous L. .lubrication.







**Superficial Lipid Layer**  
~ 0.1 - 0.2 microns thick

**Aqueous Layer**  
~ 7-8 microns thick

**Adsorbed Mucin Layer**  
over 1 micron thick

**Microvilli of epithelium**  
extend into and stabilize  
mucin layer

# \*EXTRA OCULAR MUSCLES:

## (A) RECTI MUSCLES :

MUSCLE	NERVE SUPPLY	ACTION
1. superior rectus	oculomotor n.(3)	Elevation
2. Inferior r.	Oculomotor n.	Depression
3. Medial r.	Oculomotor n.	Adduction
4. Lateral r.	Abducent n.(6)	Abduction

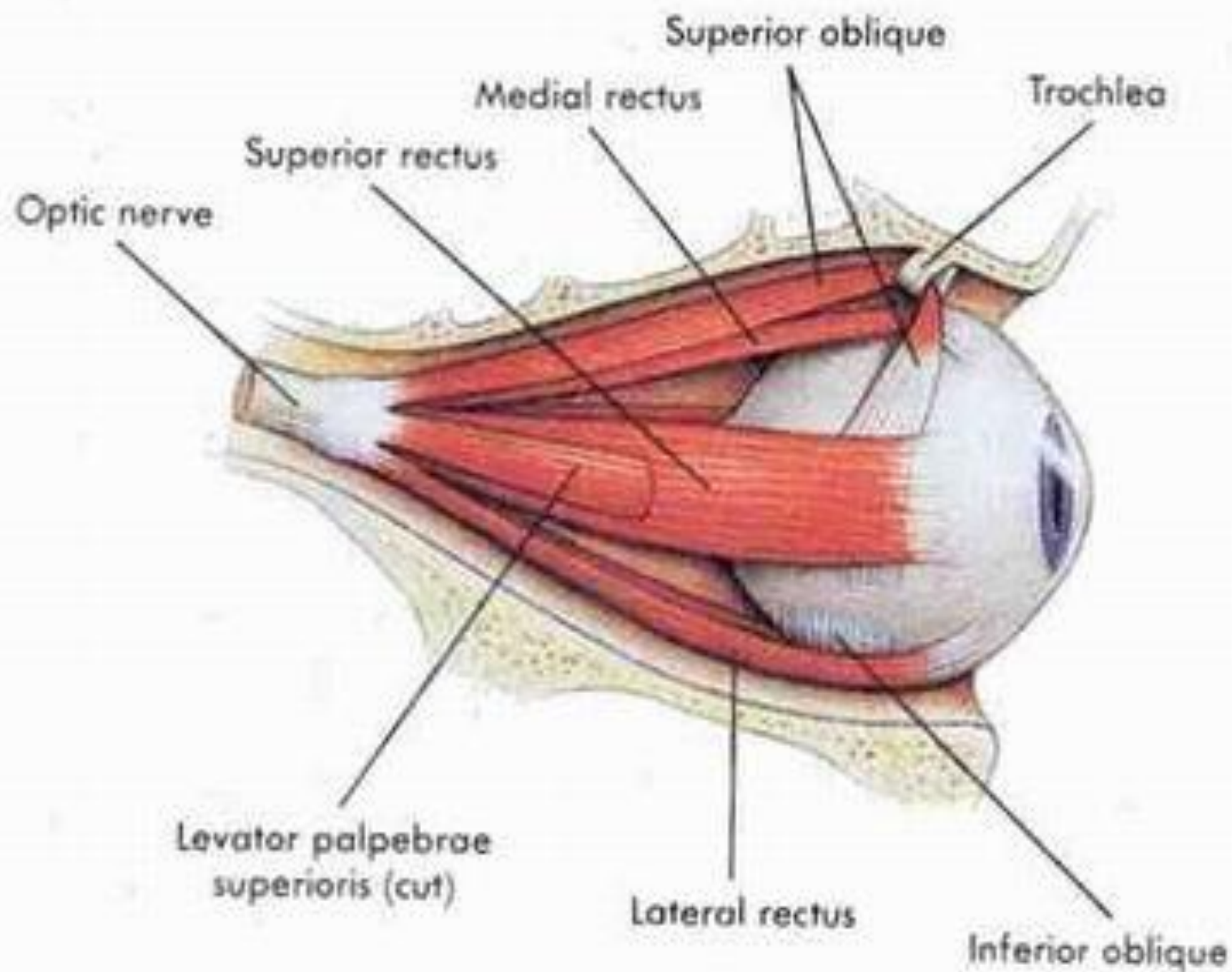
## (B) Oblique Muscles:

1. Superior O.	Trochlaer n.(4)	Depression
2. Inferior O.	Oculomotor n.	Elevation

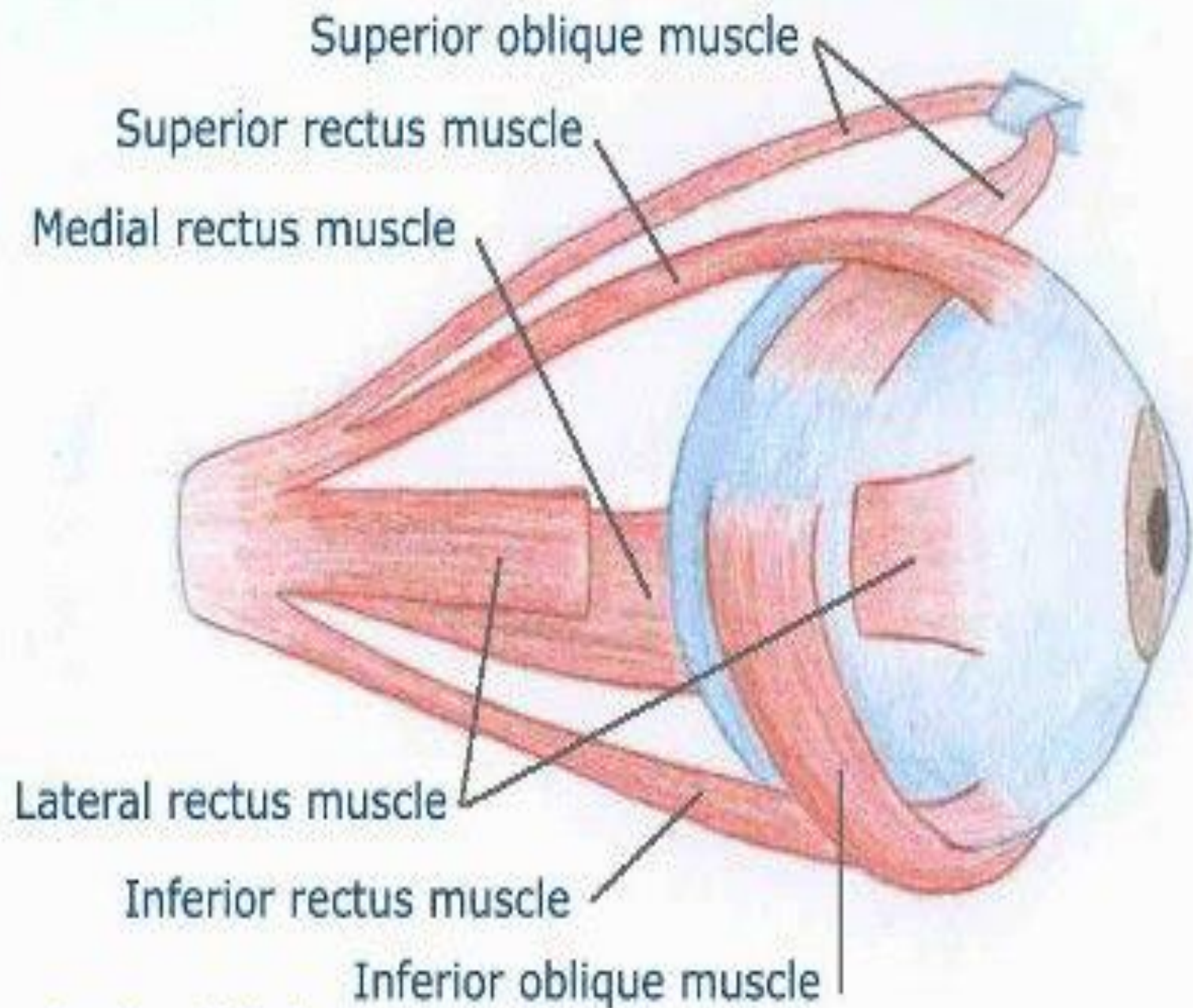
## (C) Lid Muscles:

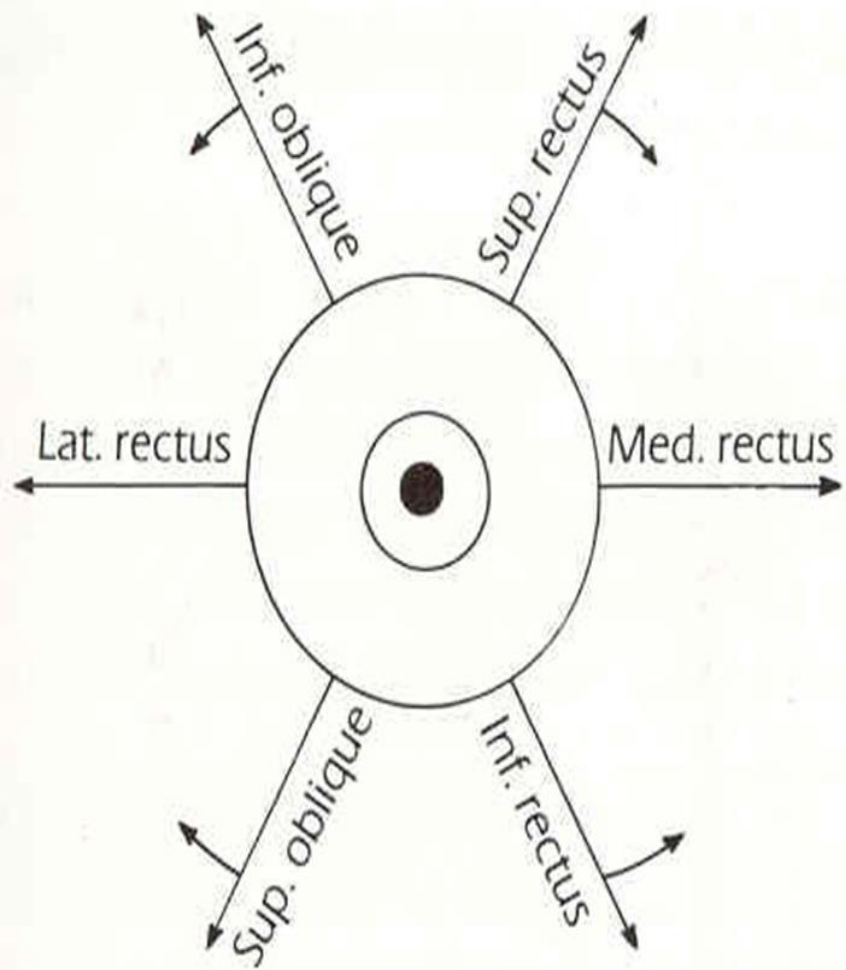
1. Levator P.S.	Oculomotor n.	Lid elevation
2. Muller muscle	sympathetic n.	Partial lid elevation



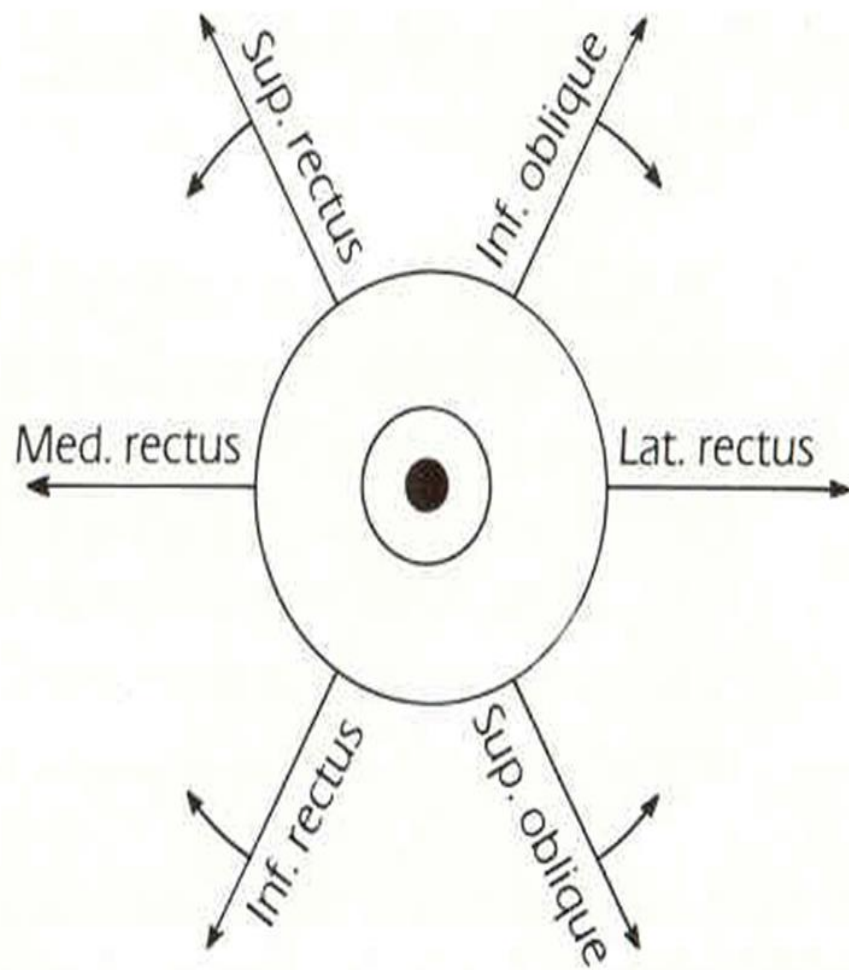








RIGHT EYE



LEFT EYE

# \* OCULAR APPENDAGES:

## \* PARTS :

- |                        |                     |
|------------------------|---------------------|
| a. Eyebrows.           | b. Eyelids.         |
| c. Lacrimal apparatus. | d. Lacrimal glands. |
| e. tears               | f. conjunctiva.     |

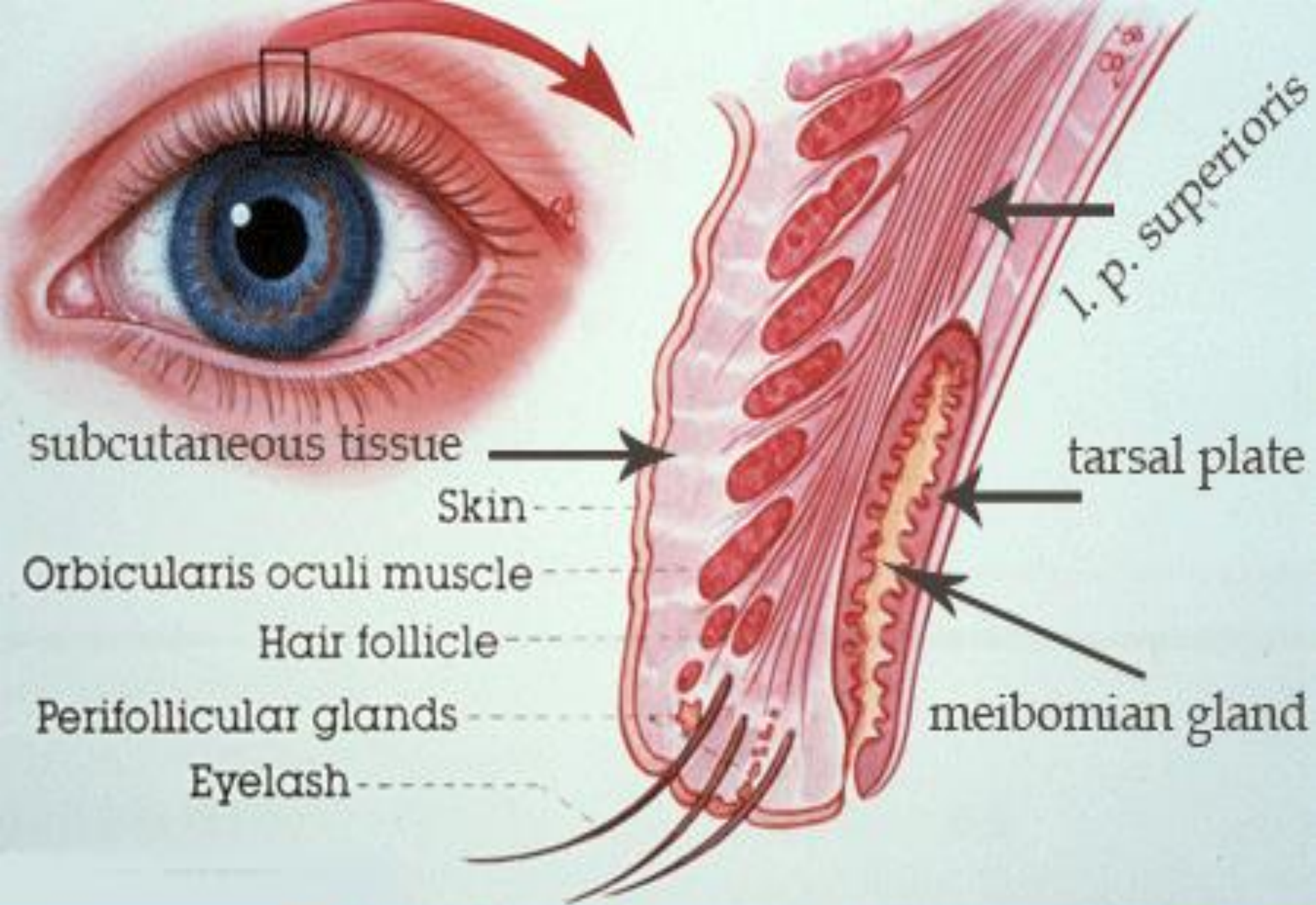
## \* DEFINITIONS:

- Eyebrows--- transverse skin elevation, studded with hair, located between forehead and upper lid.
- Eyelids --- thin , mobile, skin folds covering the eyeballs.
- canthi --- the area at which both lids meet--- medial and lateral.
- puncti --- small openings at medio-posterior aspect of lids.
- palpebral fissure --- the fissure that formed by the two lids.

## \* THE STRUCTURE OF THE EYELIDS : ( HISTOLOGY)

1. skin.
2. subcutaneous tissue.
3. striated muscles--- orbicularis muscle.
4. orbital septum.
5. tarsal plate.
6. palpebral ligaments.
7. palpebral glands.
8. smooth muscles.
9. Levator muscle.
10. conjunctiva (palpebral).





# \* THE CONJUNCTIVA

## \* Def.

- thin , transparent, mucous membrane.
- lines the inner surface of eyelids and anterior part of the sclera.

\* **Parts** : a. palpebral– between skin and conjunctival fornex.

b. conj. Fornex – between palpebral and bulbar conj.

c. bulbar conj. – thin , translucent , covering the sclera.

d. lacrimal caruncle – small, ovoid, pinkish body at lacus lacrimalis.



levator muscle

anterior  
ciliary artery

superior rectus  
muscle

major circle  
of iris

long posterior  
ciliary artery

posterior  
conjunctival artery

peripheral  
palpebral arcade

marginal  
palpebral arcade

marginal

limbal

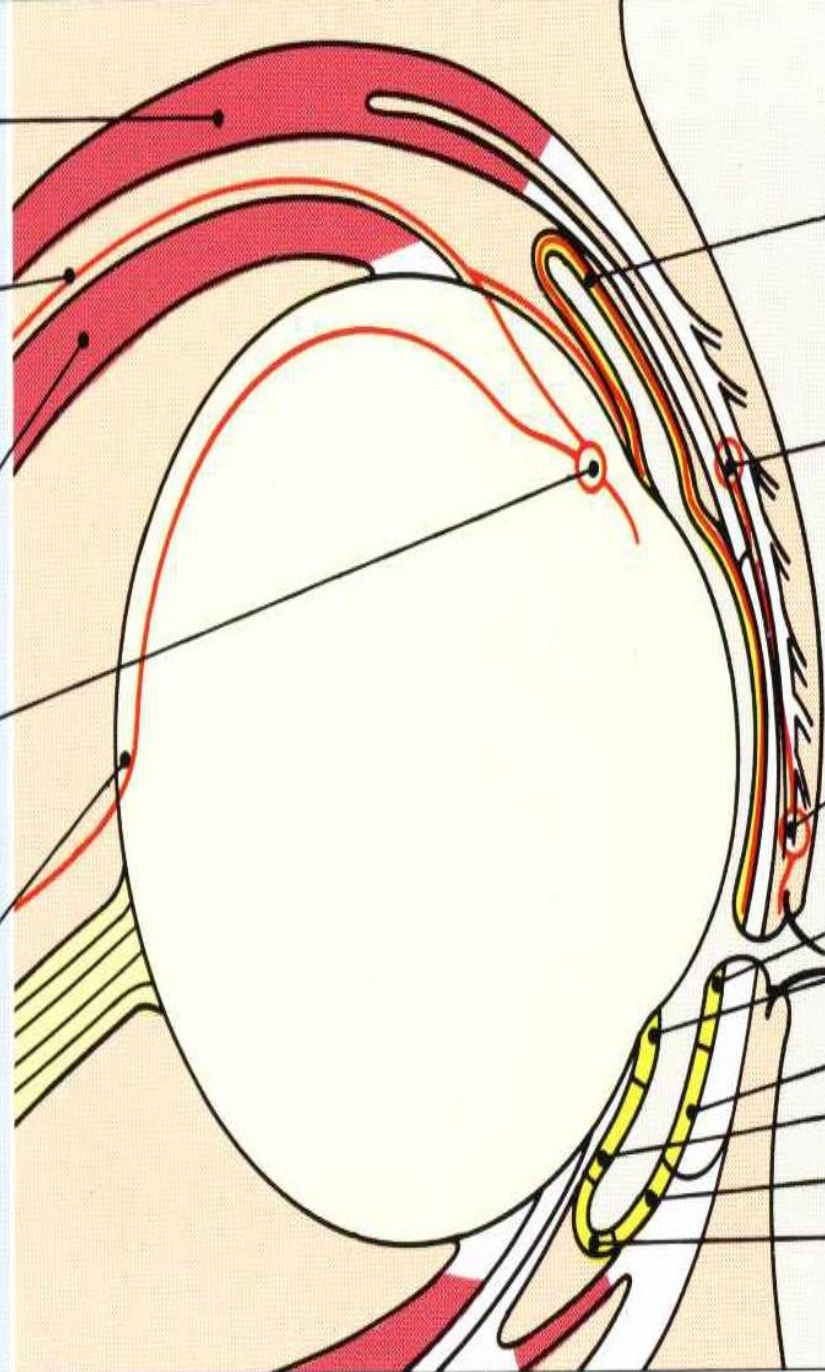
tarsal

bulbar

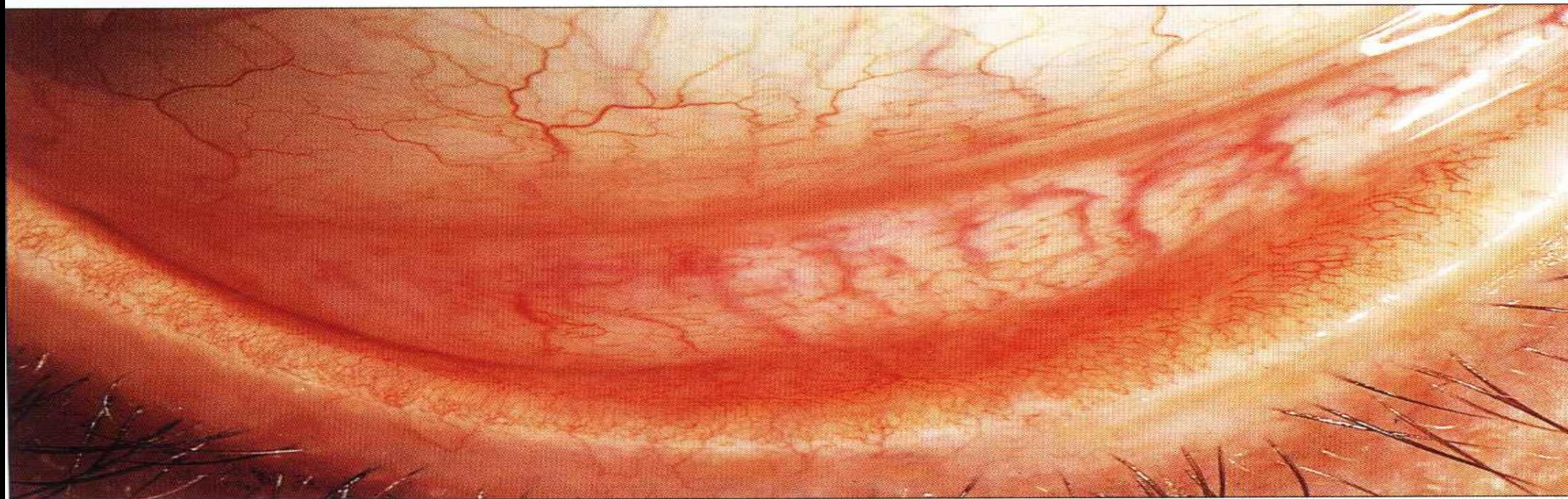
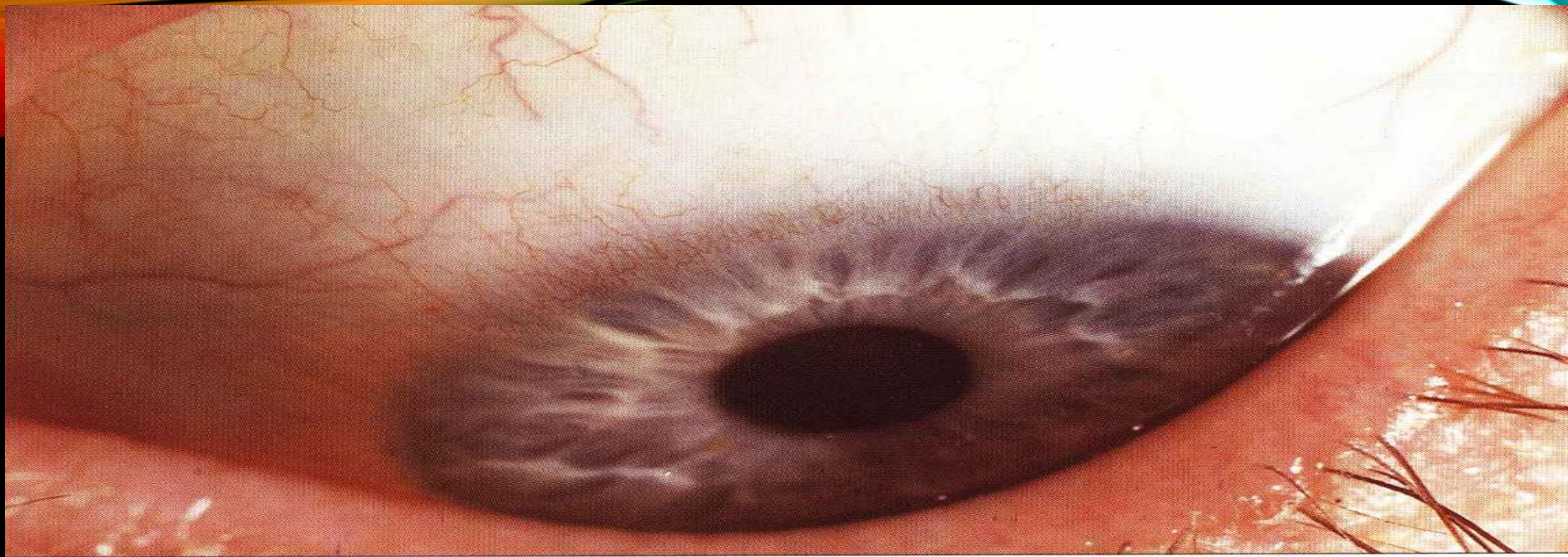
orbital

fornix

zones









# \* THE EYEBALL ( THE GLOBE ):

## \* PARTS :

### (A) Outer Coat [ anterior]:

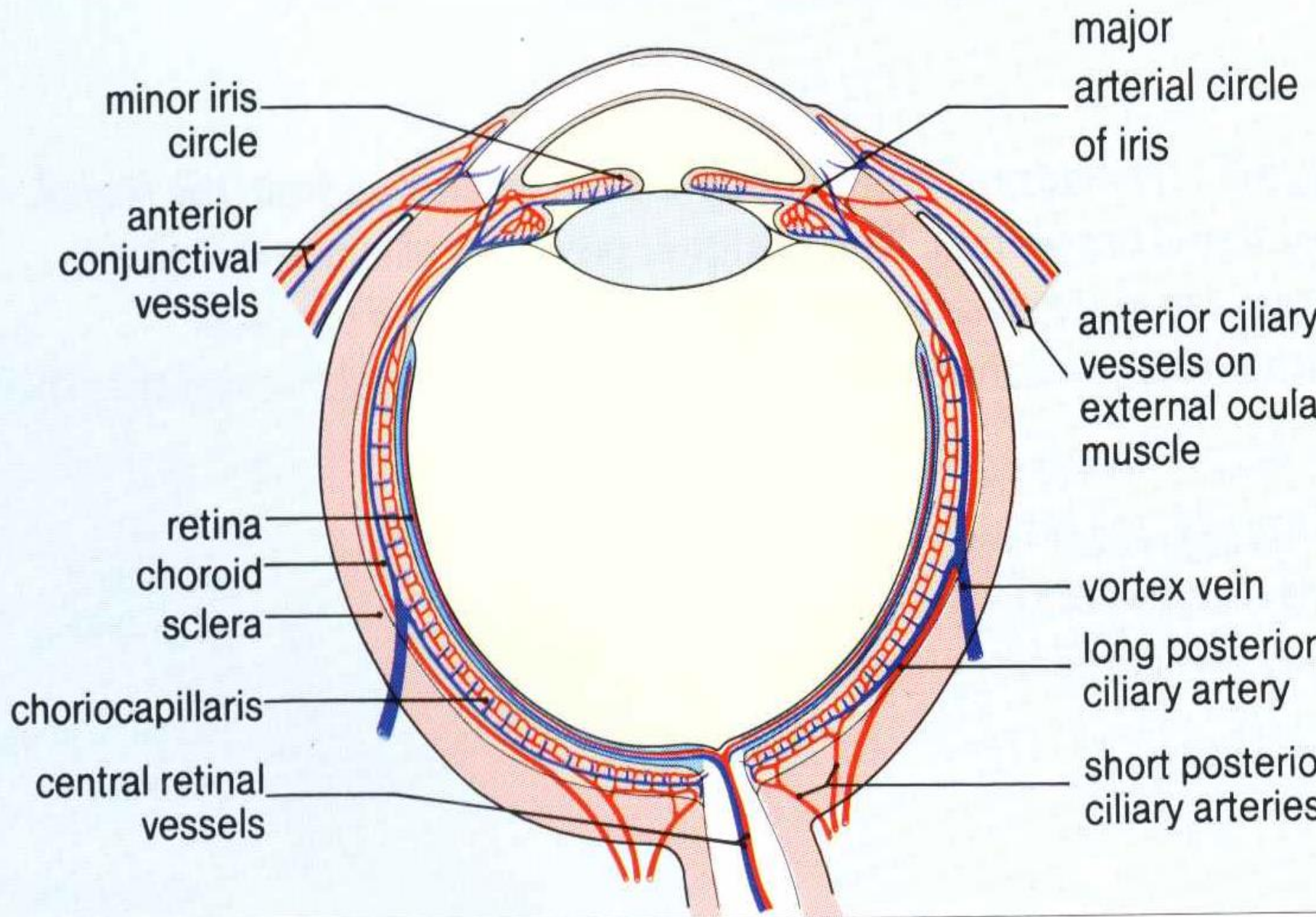
- sclera and episclera.
- cornea.
- anterior chamber and drainage angle.
- lens.

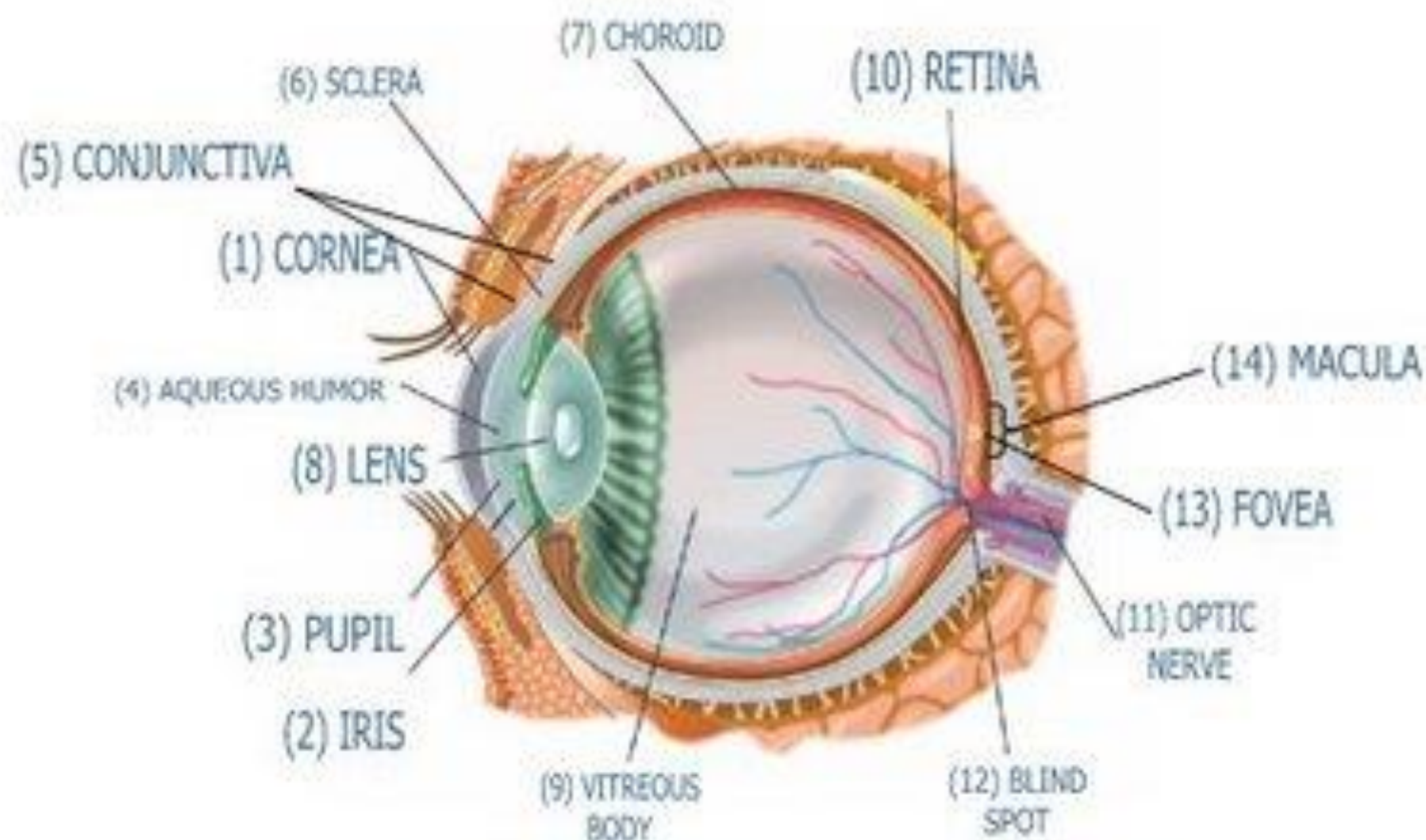
### (B) Intermediate Coat [ middle]: uveal tract

- iris.
- ciliary body.
- the choroid.
- pupils.

### (C) Inner Coat [ posterior]:

- retina.
- vitreous.





From the external layers to the internal ones

# \*THE SCLERA & EPISCLERA:

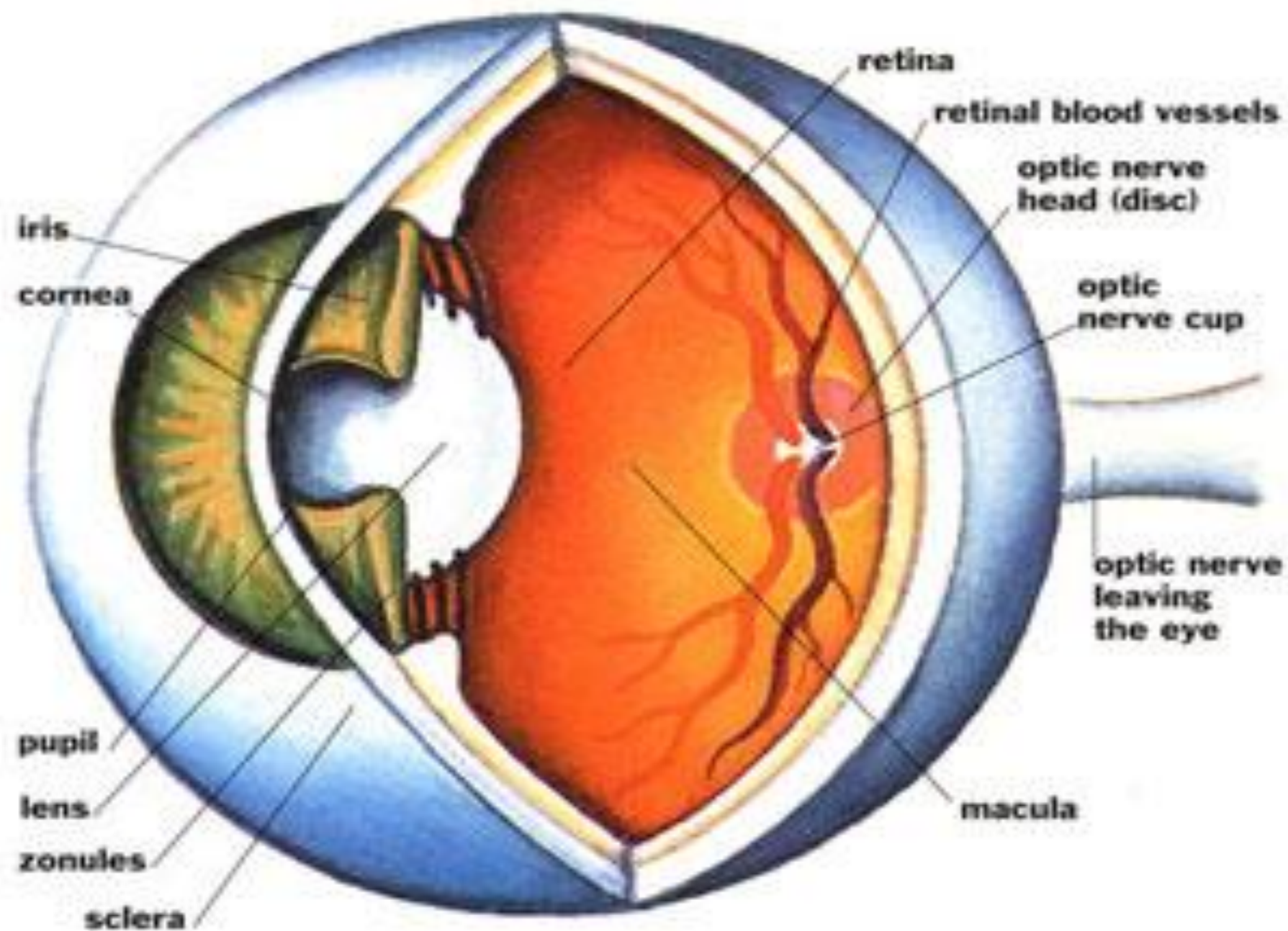
\***Def.** : - dense , fibrous, opaque , collagenous posterior 5/6<sup>th</sup> of the eyeball outer coat.

- divided into episclera , scleral stroma and lamina fusca.

\* **Functions:**

1. mechanical protection.
2. maintain I.O.P.
3. prevent globe deformity.







## \* THE CORNEA:

\* **Def.** : - transparent , a vascular, anterior 1/6<sup>th</sup> of the eyeball outer coat.

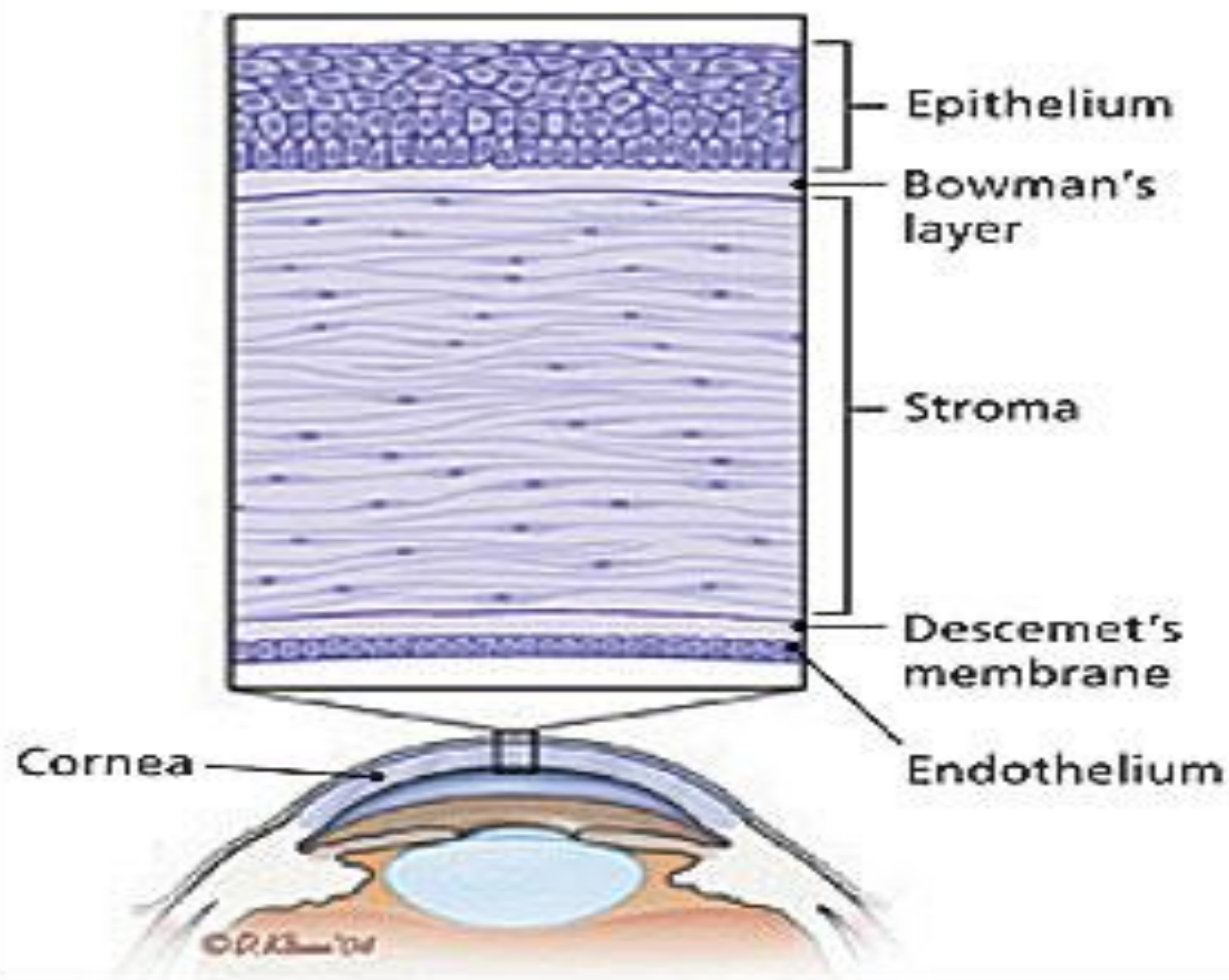
- represent the most refractive power.(75%).

- maintain IOP.

\* **Histology** : ( 5 Layers );

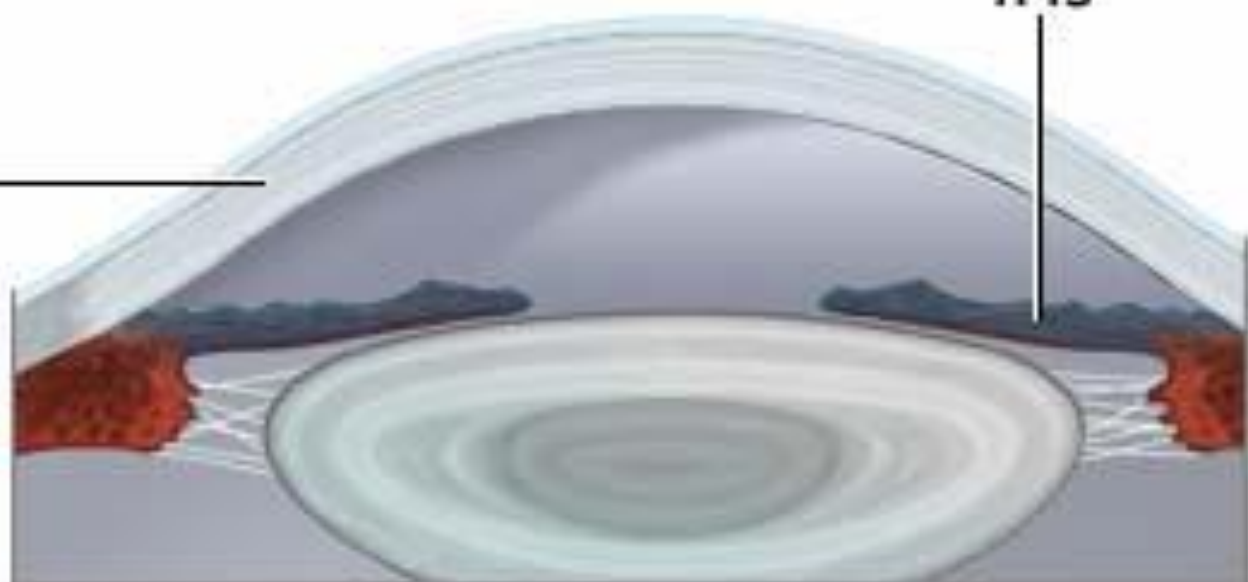
1. Epithelium.
2. Bowman's layer.
3. The stroma.
4. Descement membrane.
5. Endothelium.



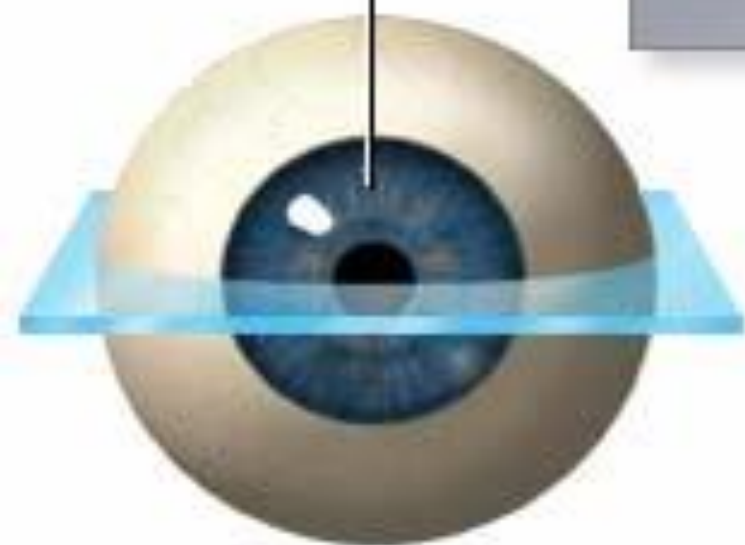


Cornea

Iris



Cut-section view

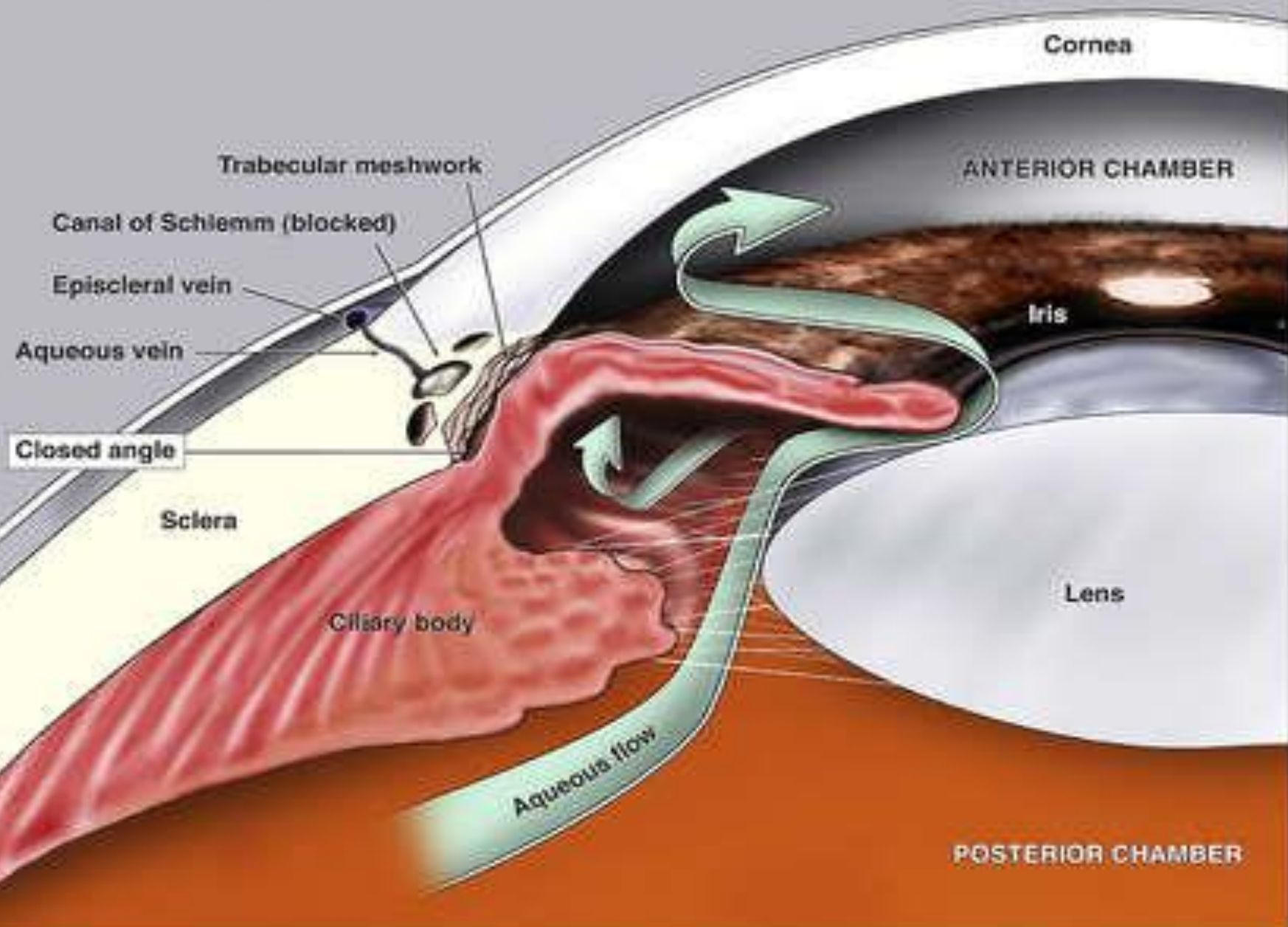


## \*ANTERIOR CHAMBER & DRAINAGE ANGLE:

- \* **Def.** - the chamber which is bounded anteriorly by the cornea and posteriorly by the iris, lens and anterior surface of ciliary body.
- **LIMBUS**--- the transitional zone between the cornea and sclera.
- **Drainage Angle** --- the angle which drains the aqueous.
- Anterior chamber contains Aqueous which is secreted posteriorly and moves to AC. through the pupil.



# Closed Angle



# \* THE UVEAL TRACT :

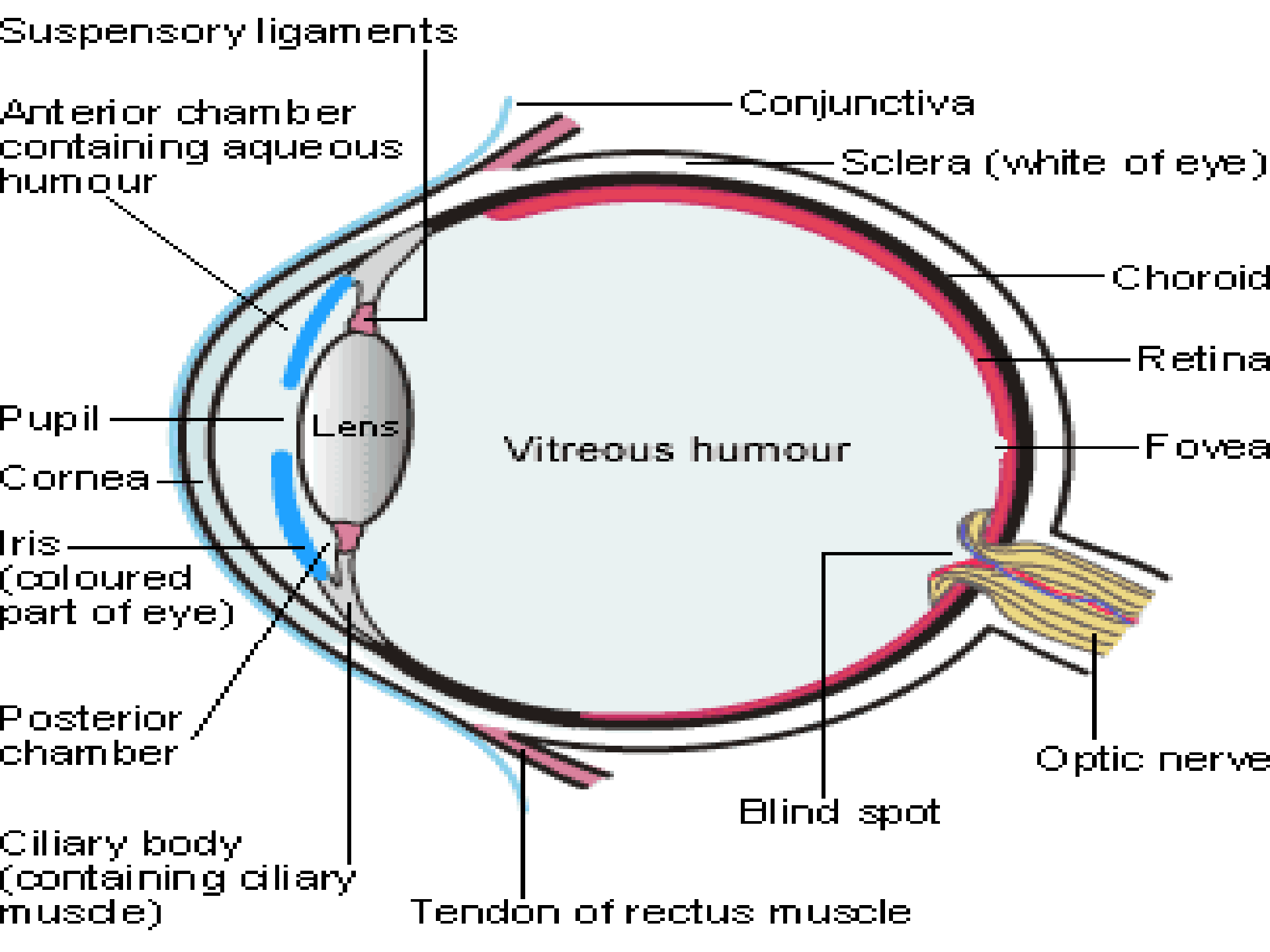
## ( A ) THE IRIS :

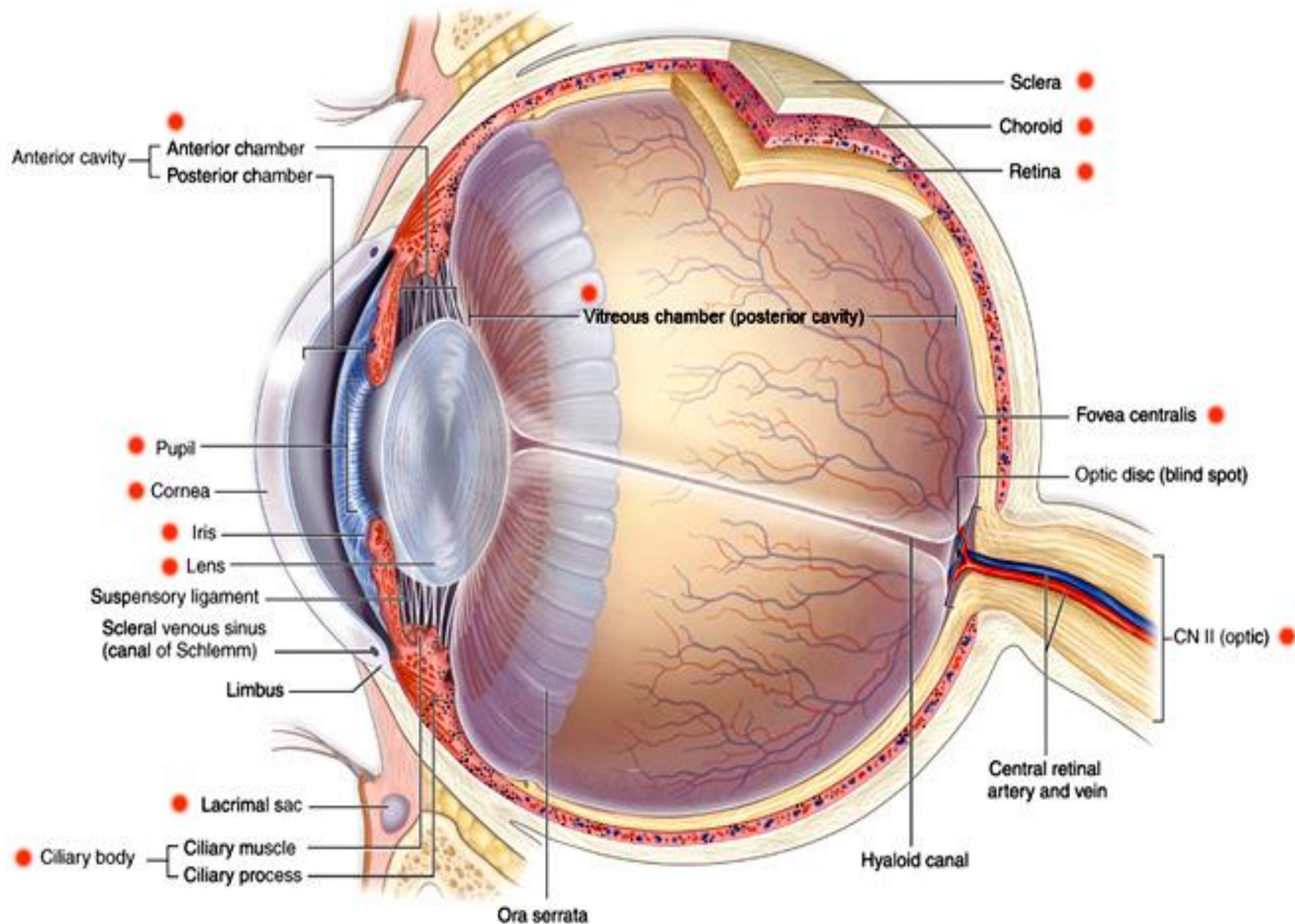
- thin , pigmented anterior part of the uveal tract .
- located between AC. & PC.
- continuous peripherally with ciliary body.

## ( B ) THE PUPIL :

- small , opening within the iris regulates the light entering to the eye.
- normal diameter is 5-8 mm.
- sphincter pupillae constrict the pupil under parasym. control of oculomotor nerve.
- Dilator pupillae dilate the pupil under sympathetic control.









# \* THE CILIARY BODY & CHOROID:

## \* ( THE CILIARY BODY ):

- a ring of tissue about 6mm wide , extends from scleral spur to ora serrata.
- anterior part --- pars plicata.
- posterior part --- pars plana.
- represents the peripheral extension of the iris.

## \* ( THE CHOROID ):

- soft , brown coat, lining the scleral inner surface , and represent the posterior portion of uveal tract.
- extends from optic disc to ora serrata.
- highly vascularised.
- **parts** : 1. stroma. 2. choriocapillaries.
- 3. Bruch's membrane.

### -**Functions**:

- a. retinal nourishment. B. regulate IOP.
- c. retinal heat exchange.

# \* THE LENS :

## \* Def. :

- a transparent , biconvex , a vascular body , with crystalline appearance.
- located between the iris and vitreous.
- lateral part attached to the ciliary body by the zonules.

## \* PARTS :

a - lens capsule.

b - lens nucleolus.

c - lens epithelium.

d – lens cells & fibers.

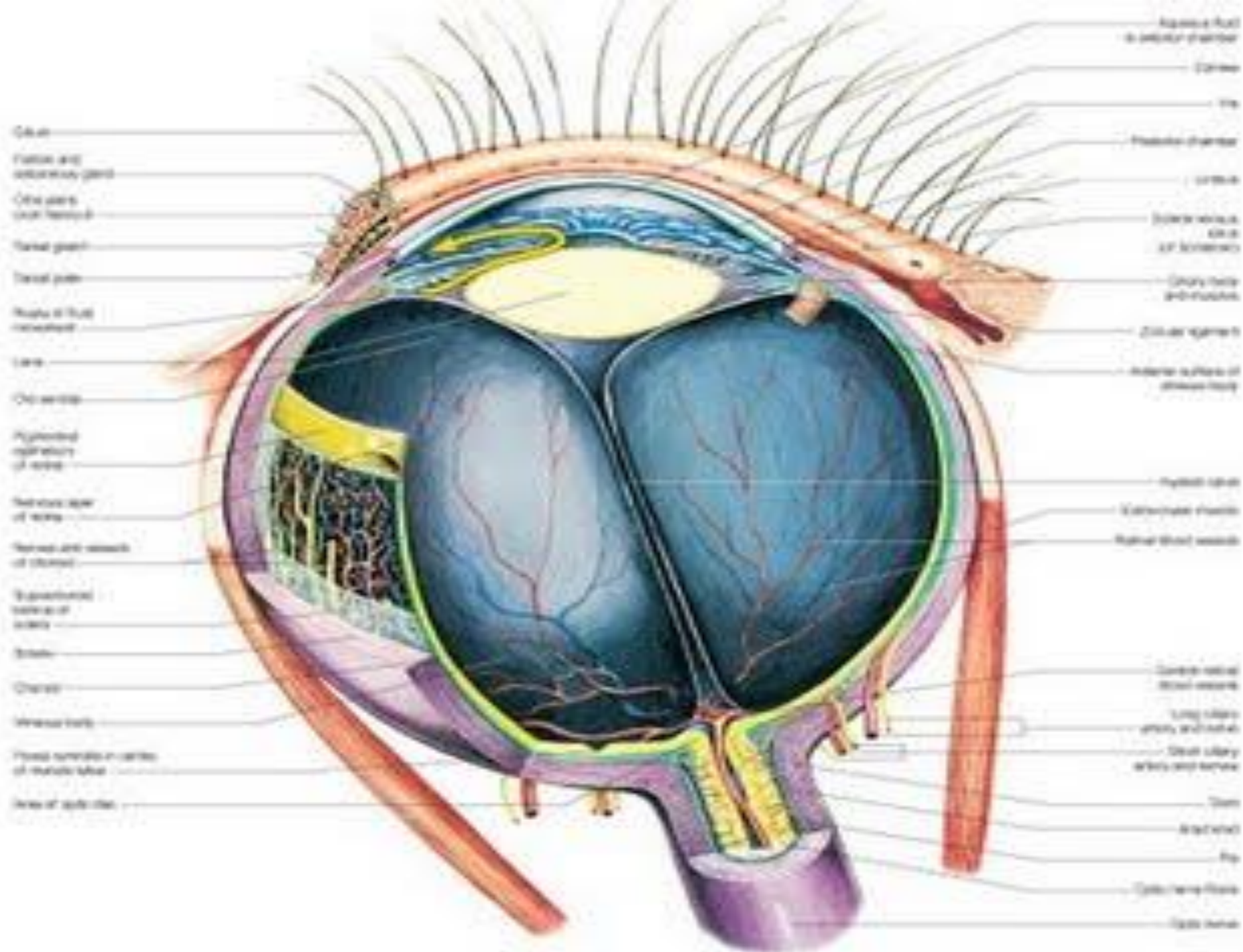
# \* THE POSTERIOR CHAMBER & VITEROUS :

\* DEF. :

- that chamber which is bounded anteriorly by the lens & posteriorly by the retina.
- this chamber filled with gel – like fluid called VITEREOUS.

- the vitreous:

- . Transparent gel, formed by 99% water , some salts, soluble proteins and Hyaluronic acid.
- . Filled posterior 4/5<sup>th</sup> of the globe.



# \* THE RETINA :

## \* DEF. :

- thin , transparent , membrane.
- red color ( purple ).
- continuous anteriorly with the iris and ciliary body, while posteriorly as an optic nerve.

## \* PARTS:

1. optic disc– small, oval structure, 1.5 mm diameter & devoid of cones and rods.
2. macula – yellow oval zone, within central retina.
3. Fovea– central part of the macula.
4. Foveola – central part of the fovea.

## \* Layers :

\*10 layers starting by retinal pigmented epithelium internally.

\* most important layers:  
retinal pigmented epithelium.

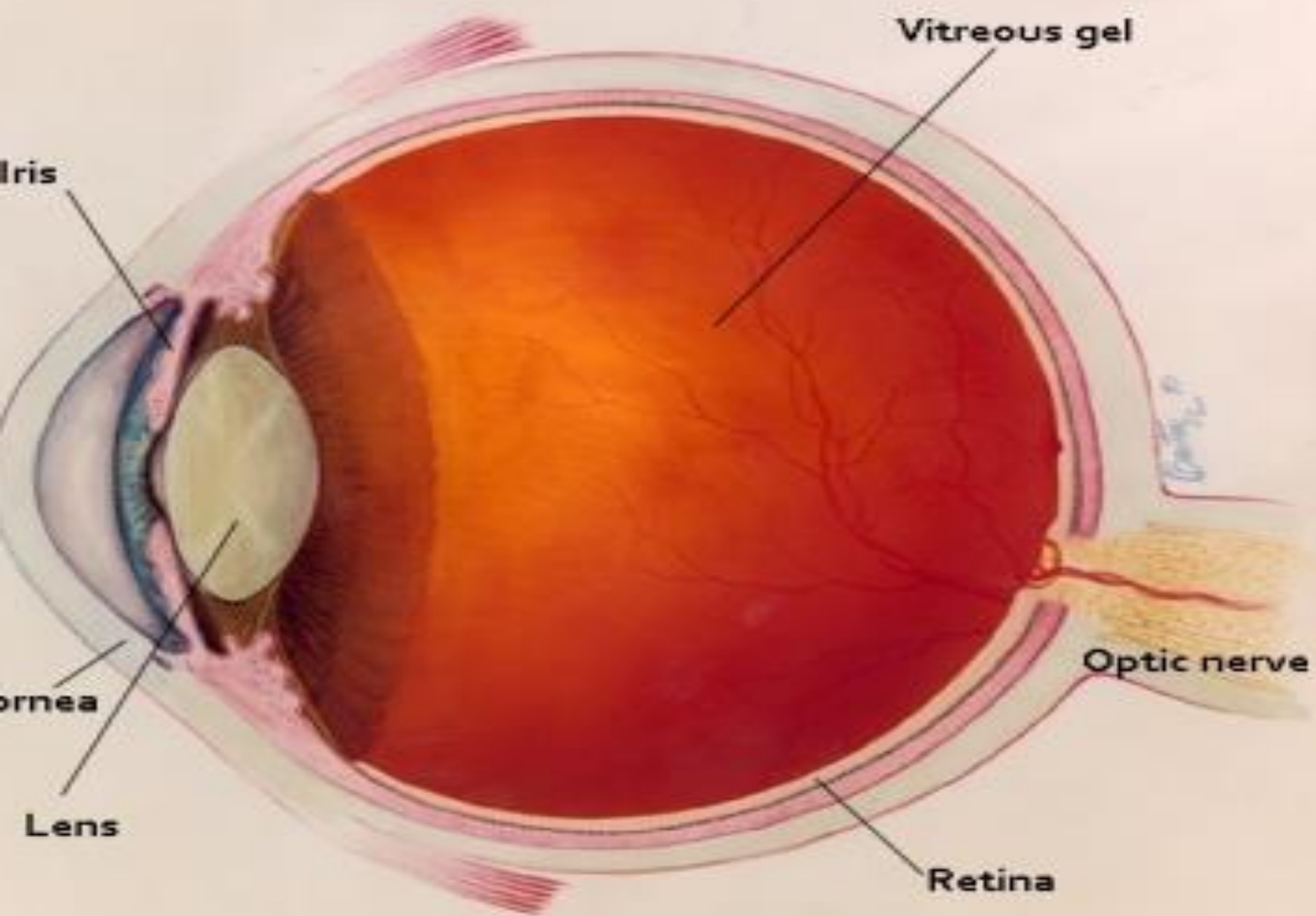
-retinal cells.

-Photoreceptors :

- RODS---- dark vision.

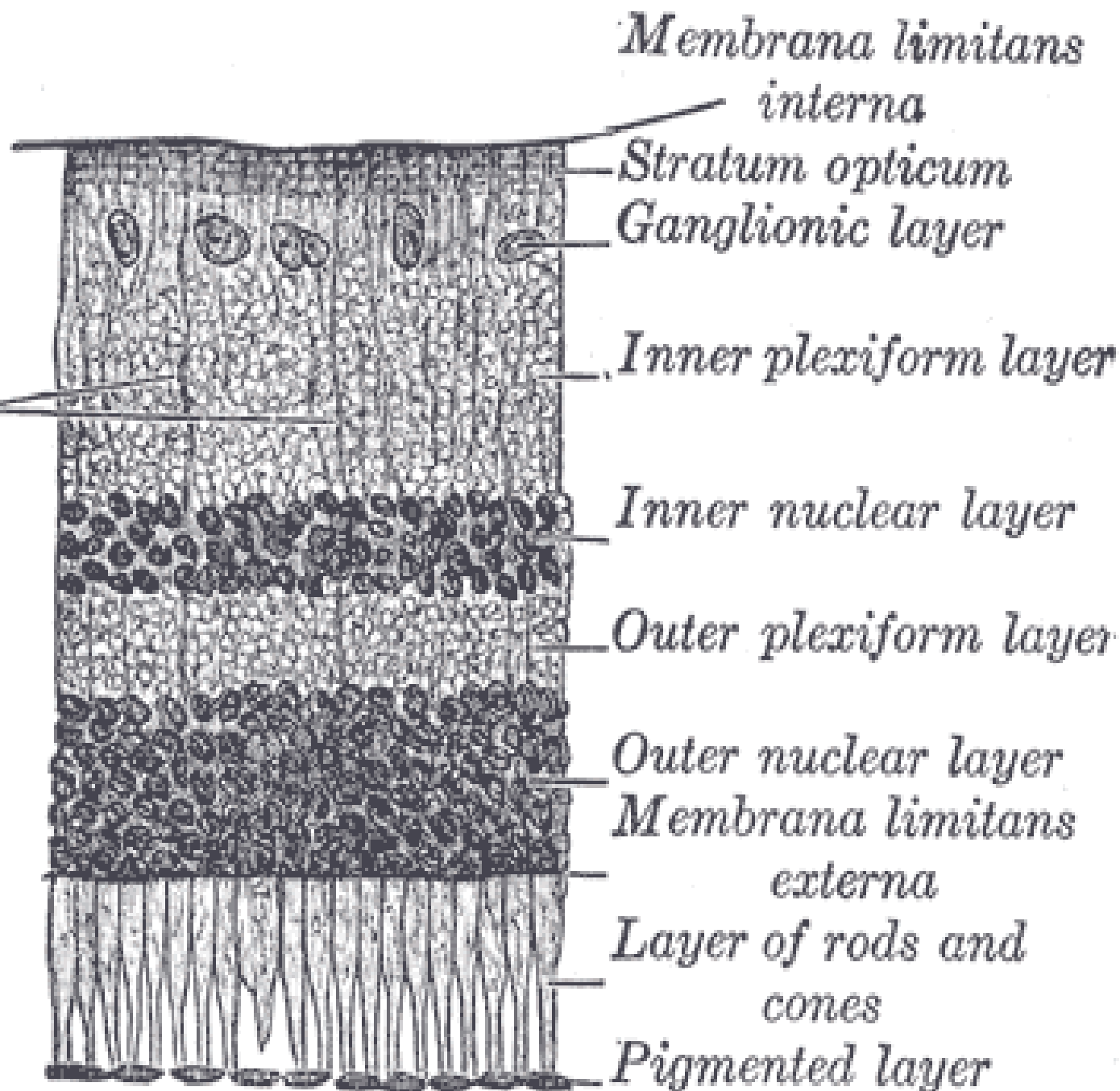
- CONES ----- bright light and colored vision.



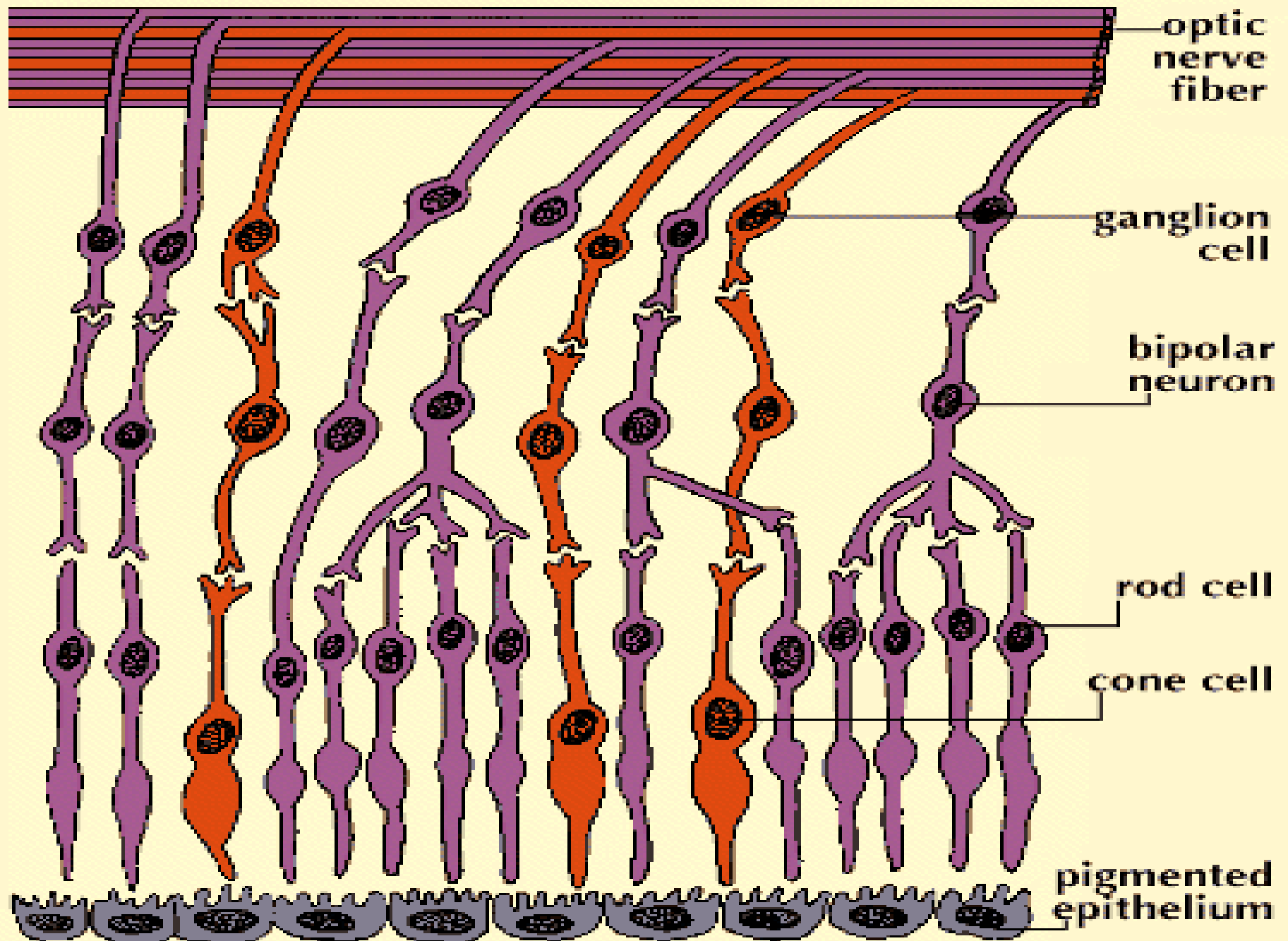


Courtesy of National Eye Institute, National Institutes of Health.

*Fibers of Müller*



# STRUCTURE OF THE RETINA



# \* THE VISUAL PATHWAY:

## \* PARTS :

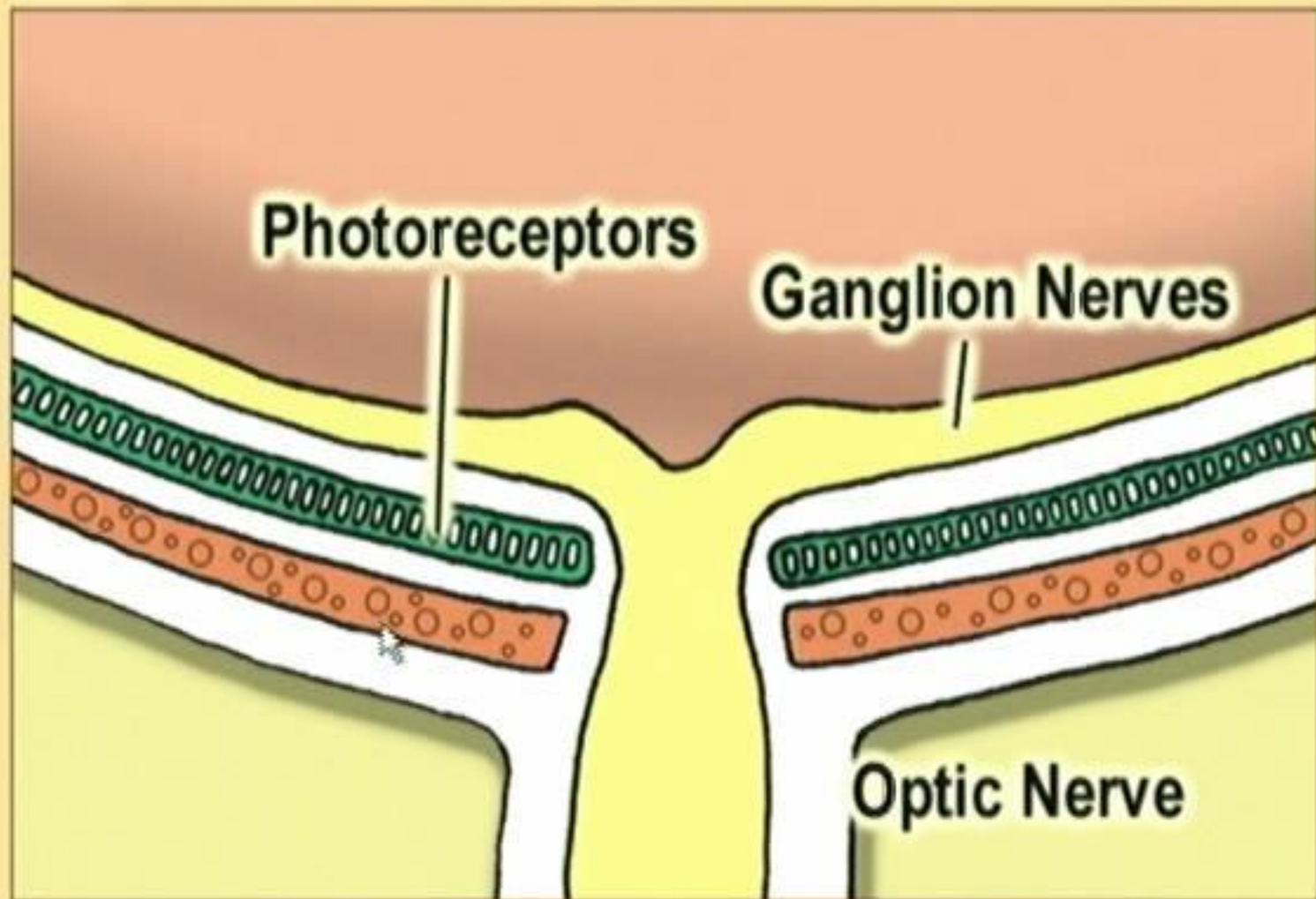
- |                     |                             |
|---------------------|-----------------------------|
| 1. optic nerve.     | 2. optic chiasma.           |
| 3. optic tract .    | 4. lateral geniculate body. |
| 5. optic radiation. | 6. visual cortex.           |

## \* THE OPTIC NERVE :

- a long tract of white matter , 5 cm long , formed by fibers of the ganglionic cells.

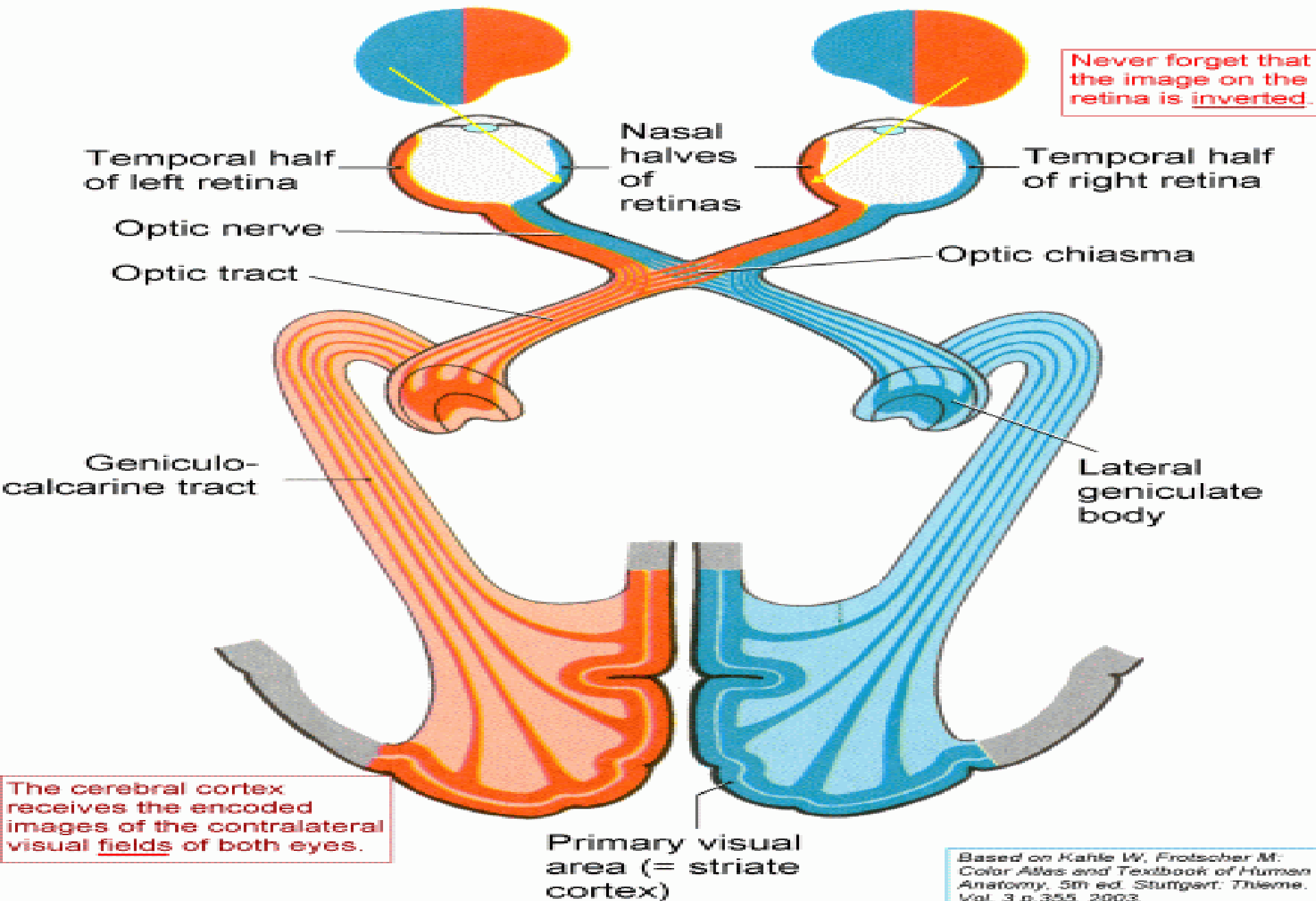


# Retinal Layers



### Visual field of left eye

Visual field of right eye



Based on Kahle W, Fritzsche M:  
Color Atlas and Textbook of Human  
Anatomy, 5th ed. Stuttgart: Thieme.  
Vol. 3 p.355, 2003.

# \* BLOOD & NERVE SUPPLY :

## \* BLOOD SUPPLY :

1. mainly via ophthalmic artery from internal carotid artery.
2. partially via infraorbital artery from external CA.
3. venous drainage through vortex veins to facial vein and to cavernous sinus.

## \* NERVE SUPPLY:

### ( A ) MOTOR NERVES :

- 1- OCULOMOTOR N.— muscular , Levator ,sphincter p.
- 2- TROCHLEAR N. – superior oblique.
- 3- Abducent N. – lateral rectus.

### ( B ) SENSORY NERVES :

- ophthalmic and maxillary divisions of trigeminal nerves.

### ( C ) AUTONOMIC NERVES :

sympathetic and parasympathetic supply for glands ,  
smooth muscles and blood vessels.



**WITH BEST WISHES.....**