

# Introduction to Ophthalmology

## Anatomy of the Eye

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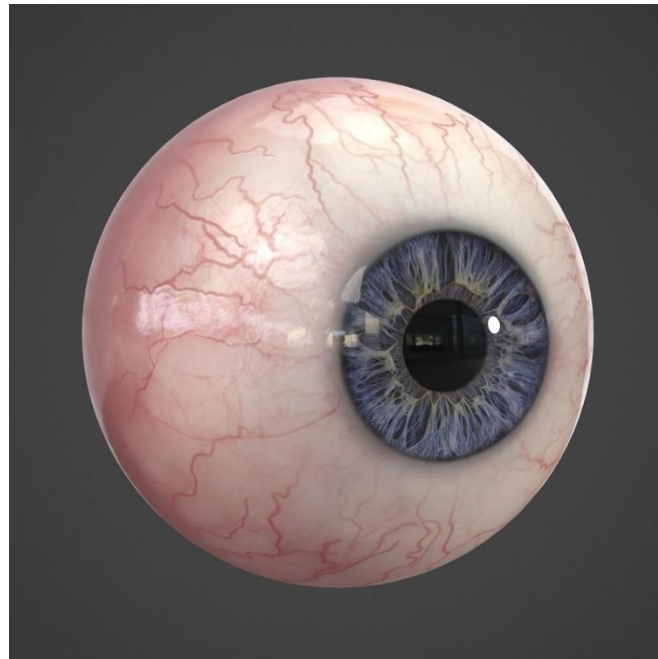
The University of Jordan

# Anatomy the Eye



# Anatomy the Eye

- The eye is a spherical structure that lies within the orbital cavity
- Also known as the **Eyeball** or **Globe**



# Orbit

Bacterial infections can spread from the paranasal sinuses to the orbit leading to orbital cellulitis

Roof fracture → risk of CSF leakage

Frontal bone  
(orbital surface)

Sphenoid bone

Zygomatic bone  
(orbital surface)

The lateral wall is the thickest wall



K. Holoski

Most common site of fracture → the floor  
→ affects the infraorbital nerve leading to  
hypoesthesia of the cheek & upper gum

Ethmoid bone  
(orbital plate)

Lacrimal bone

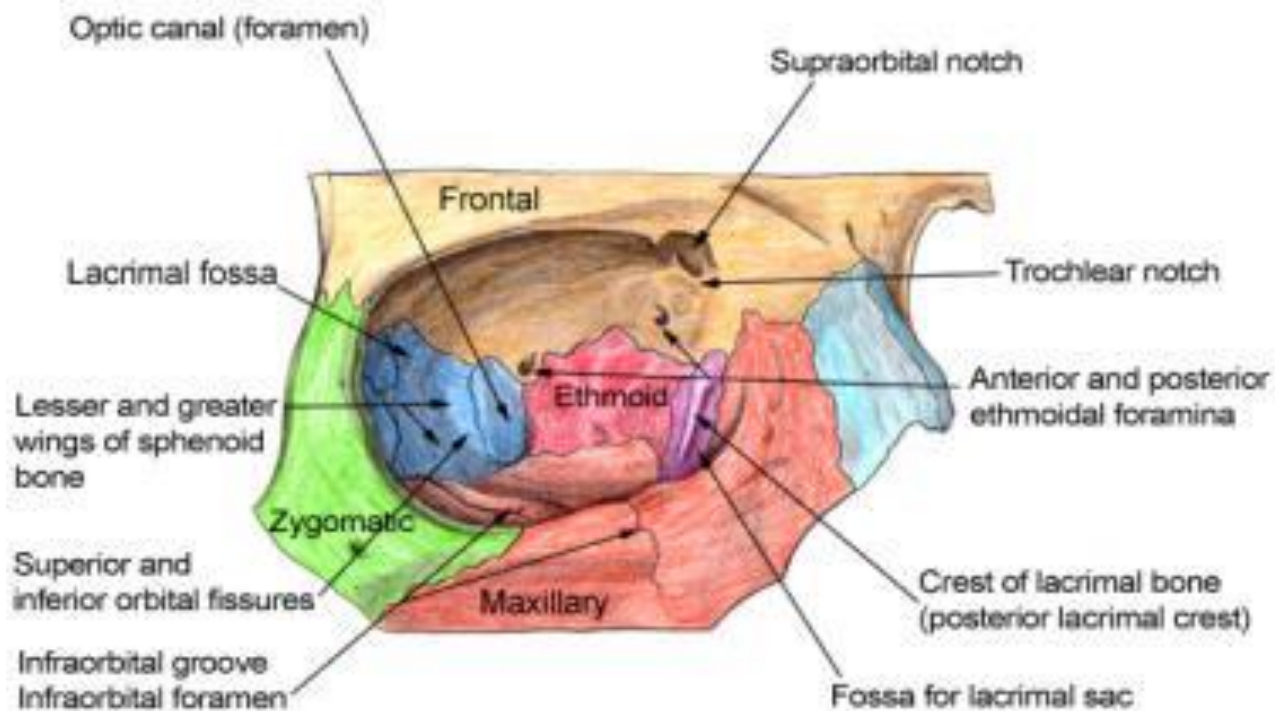
Nose

Palatine bone  
(orbital surface)

Maxilla  
(orbital surface)

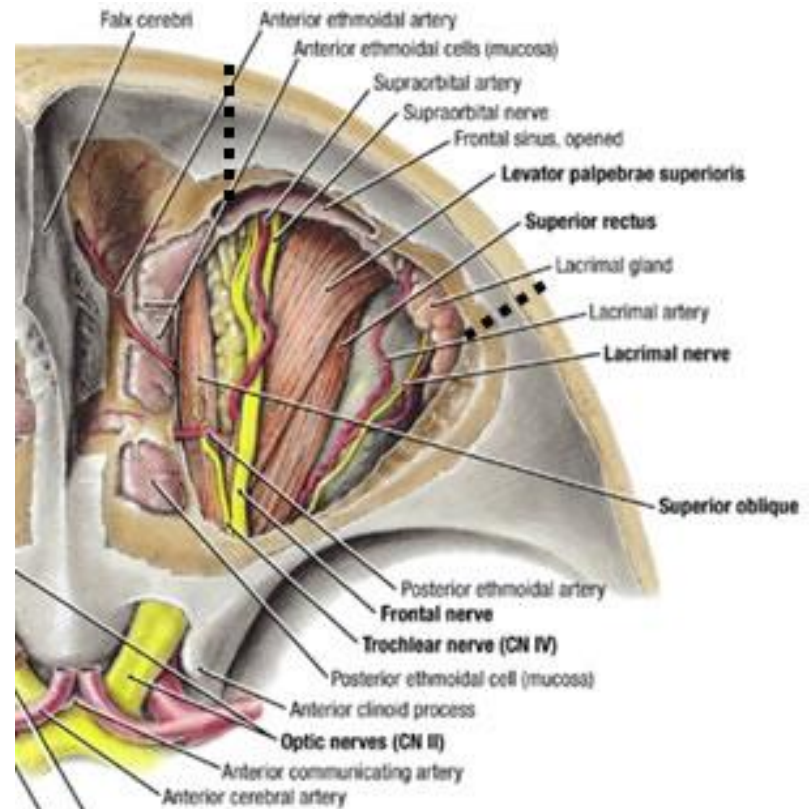
The thinnest wall is the medial wall

# Orbit



# Orbital Structures

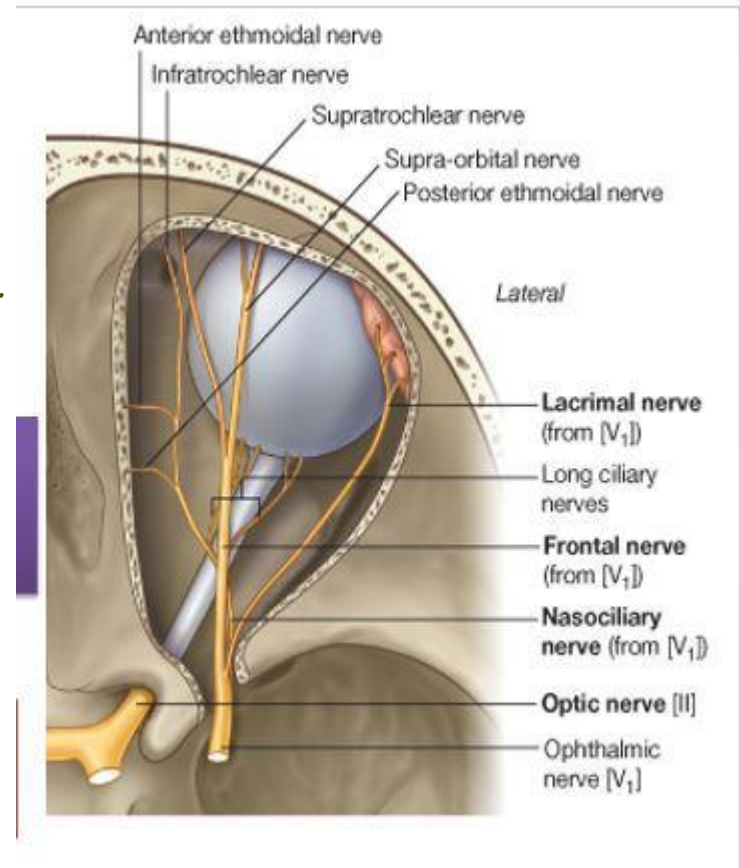
- Eyeball
- Nerves
- Muscles
- Blood Vessels
- Lacrimal Gland
- Fat





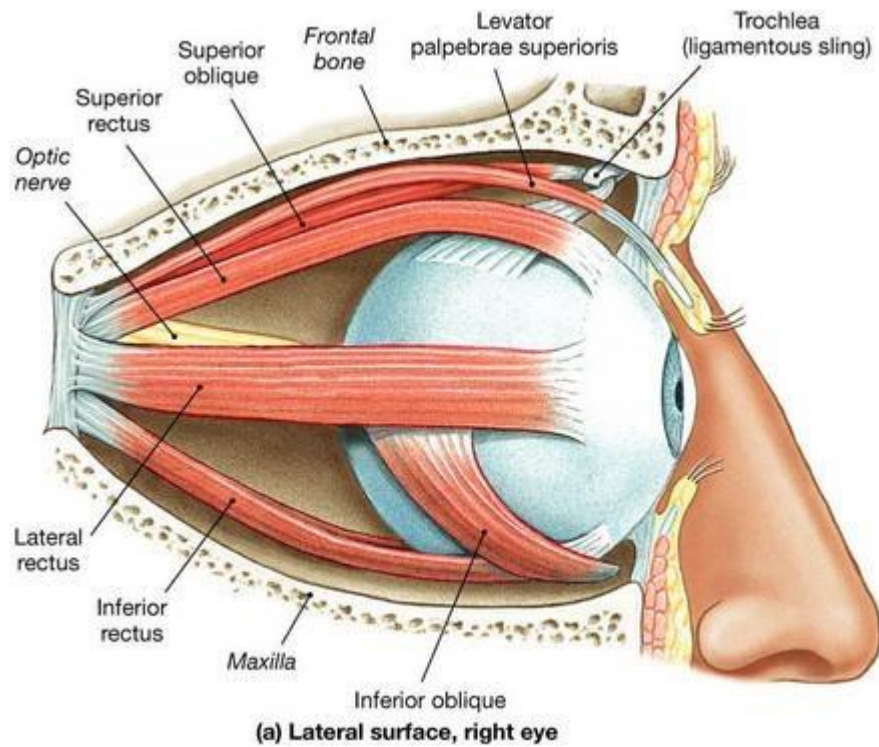
# Orbital Structures- Cranial Nerves

- Optic- CN II *Through the optic canal*
- Oculomotor- CN III *Innervates all extraocular muscles except SO & LR*
- Trochlear- CN IV *Innervates SO*
- Trigeminal- CN V<sup>1</sup> and V<sup>2</sup>
- Abducent- CN VI *Innervates LR*



# Orbital Structures- Muscles

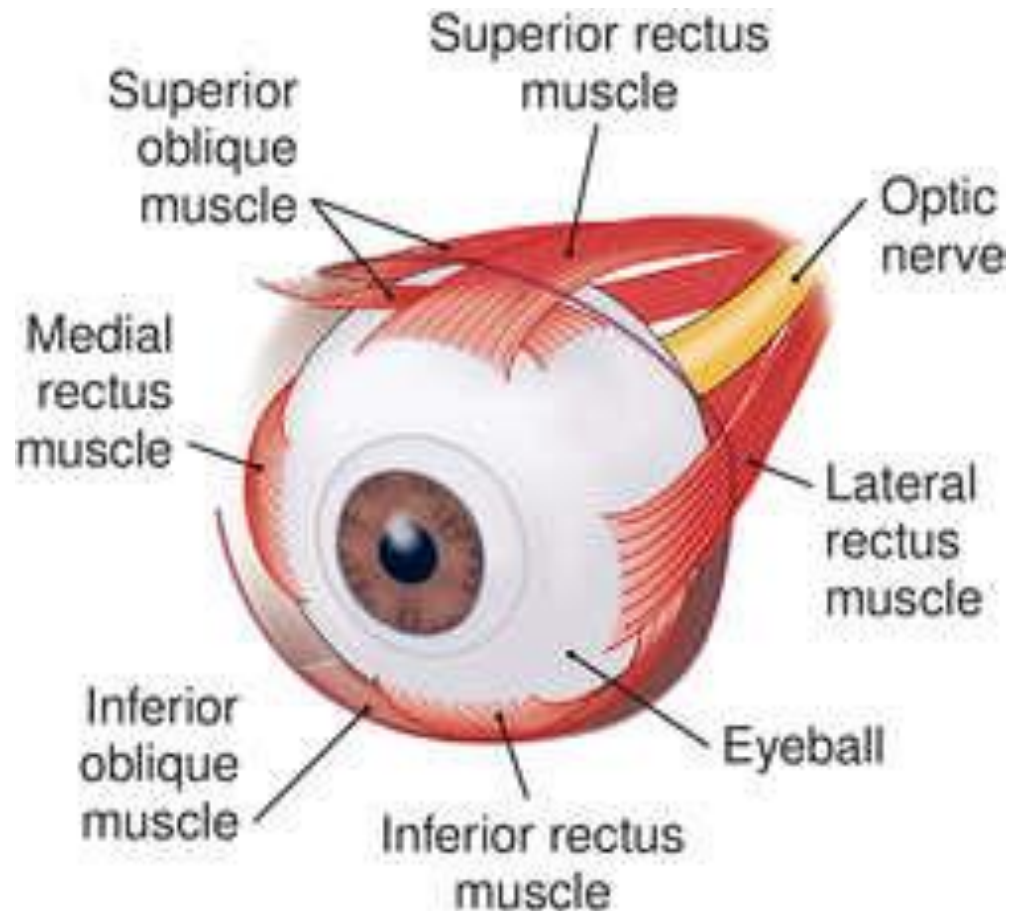
- Extraocular Muscles- EOM
- Levator Palpebrae Superioris



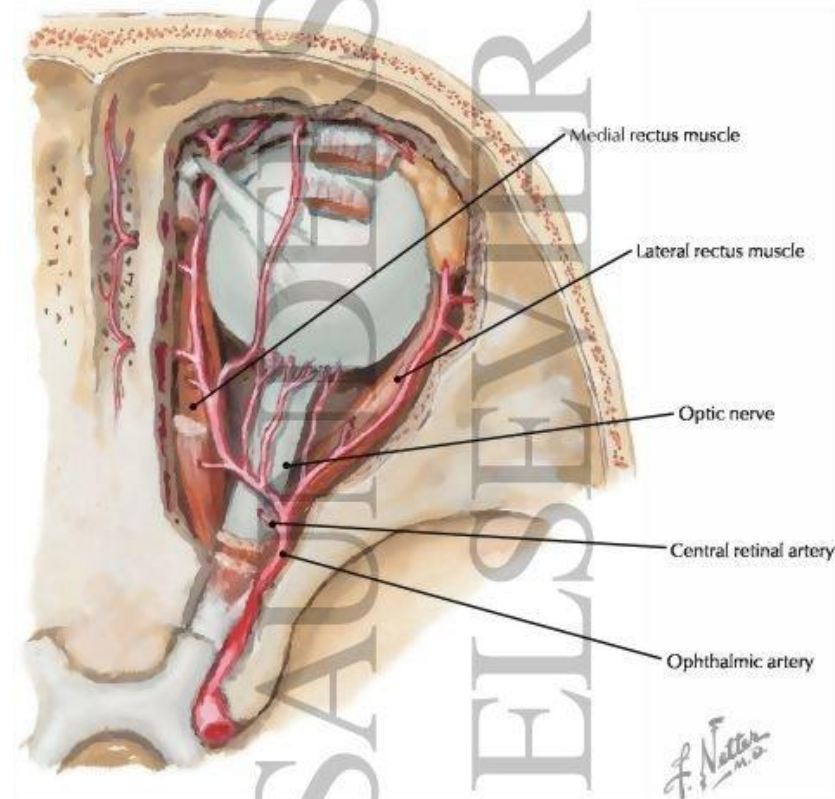


# Orbital Structures- Muscles

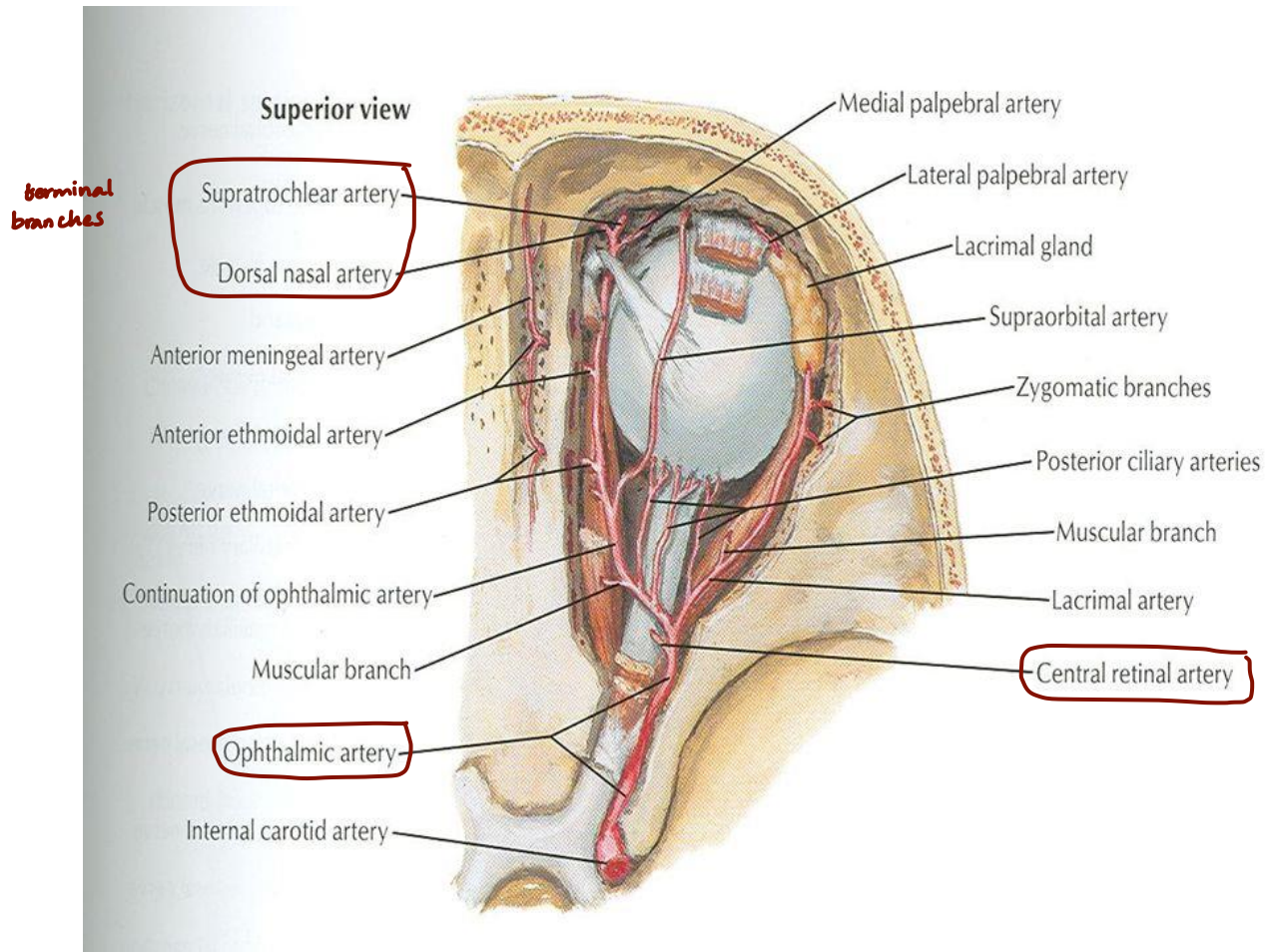
- EOM:
  - Recti : Superior  
Inferior  
Medial  
Lateral
  - Obliques: Superior  
Inferior



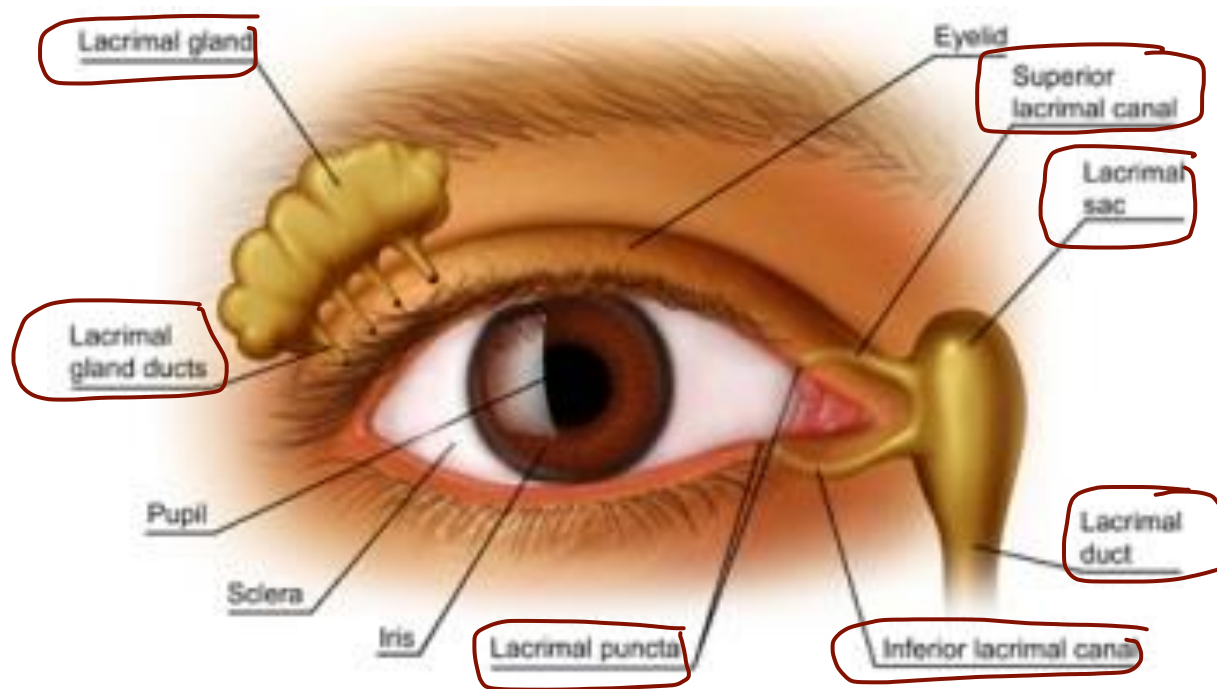
# Orbital Structures-Blood Vessels



# Orbital Structures-Blood Vessels

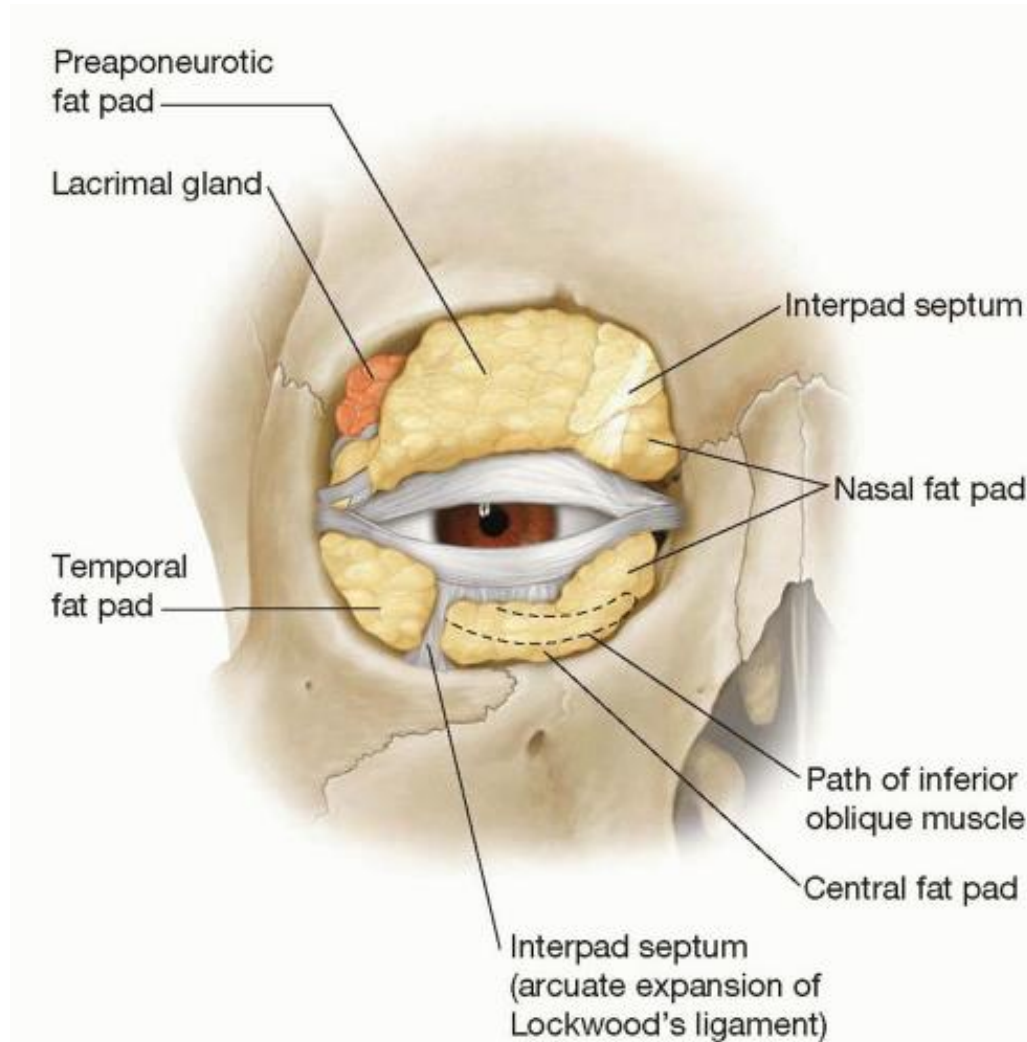


# Orbital Structures- Lacrimal Gland



*(not that important)*

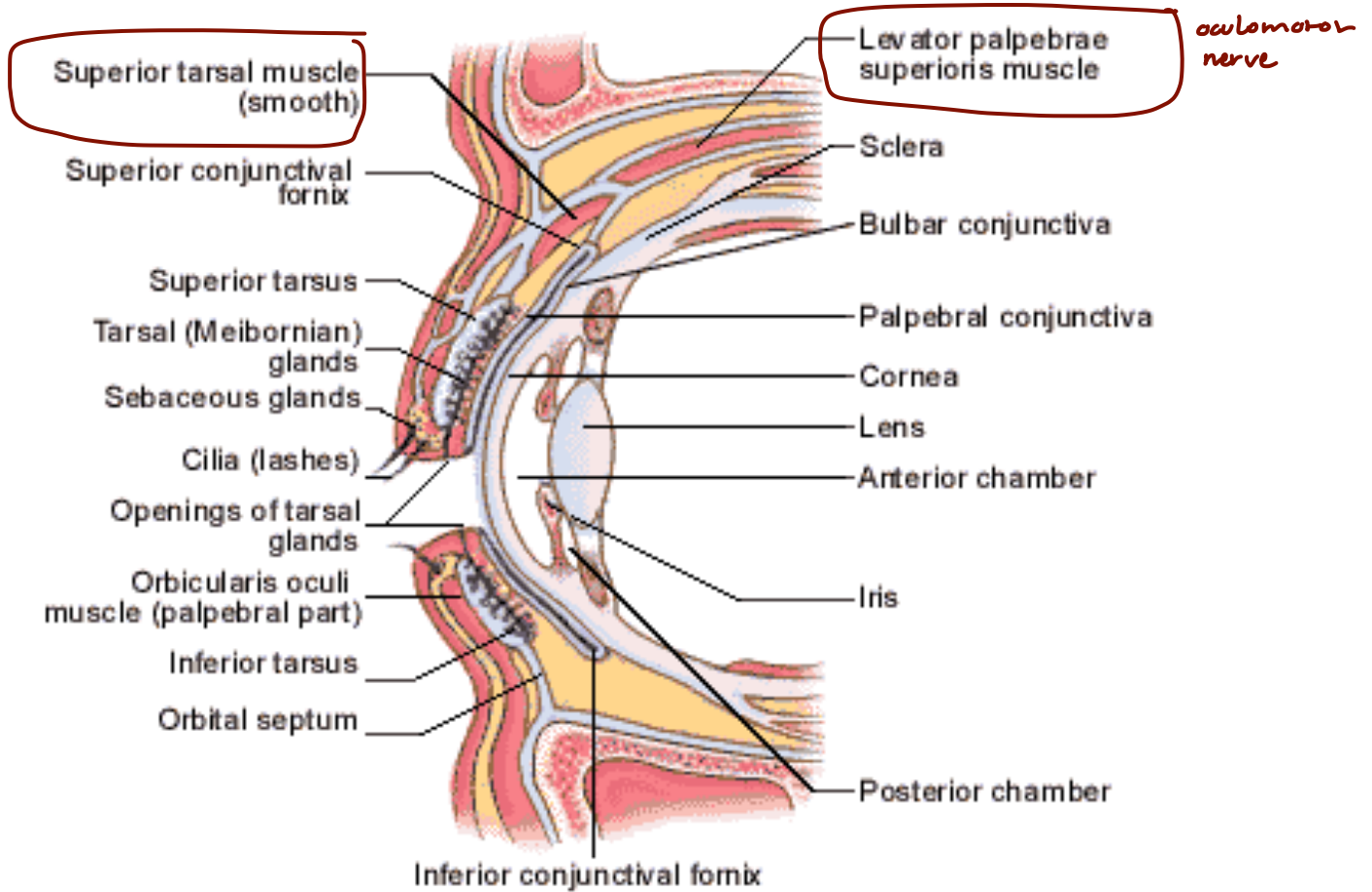
# Orbital Structures- Fat





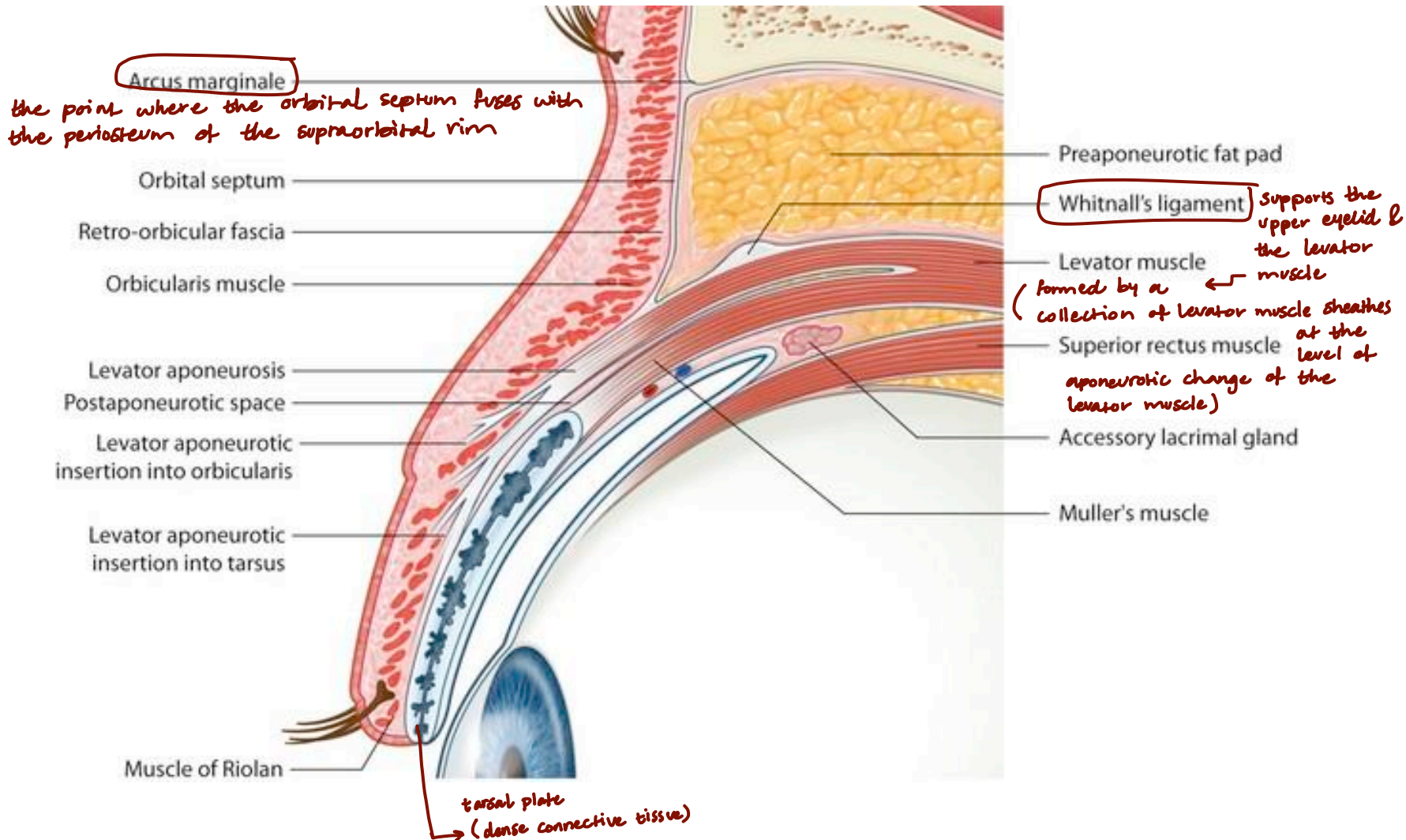
# Eyelid

*receives sympathetic innervation*



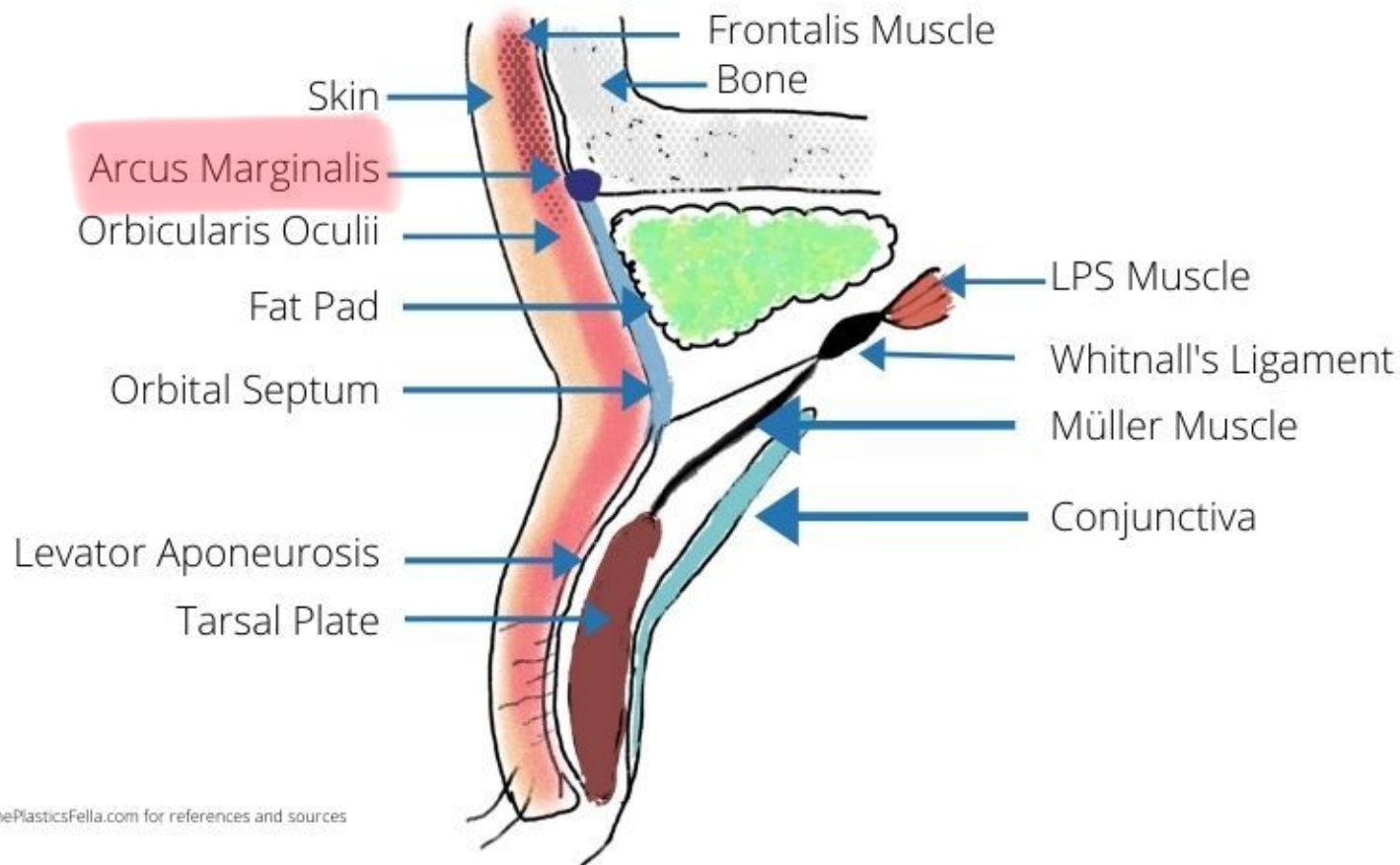


# Eyelid



# UPPER EYELID ANATOMY

THEPLASTICSFELLA.COM



Go to [ThePlasticsFella.com](https://www.ThePlasticsFella.com) for references and sources

Whitnall ligament

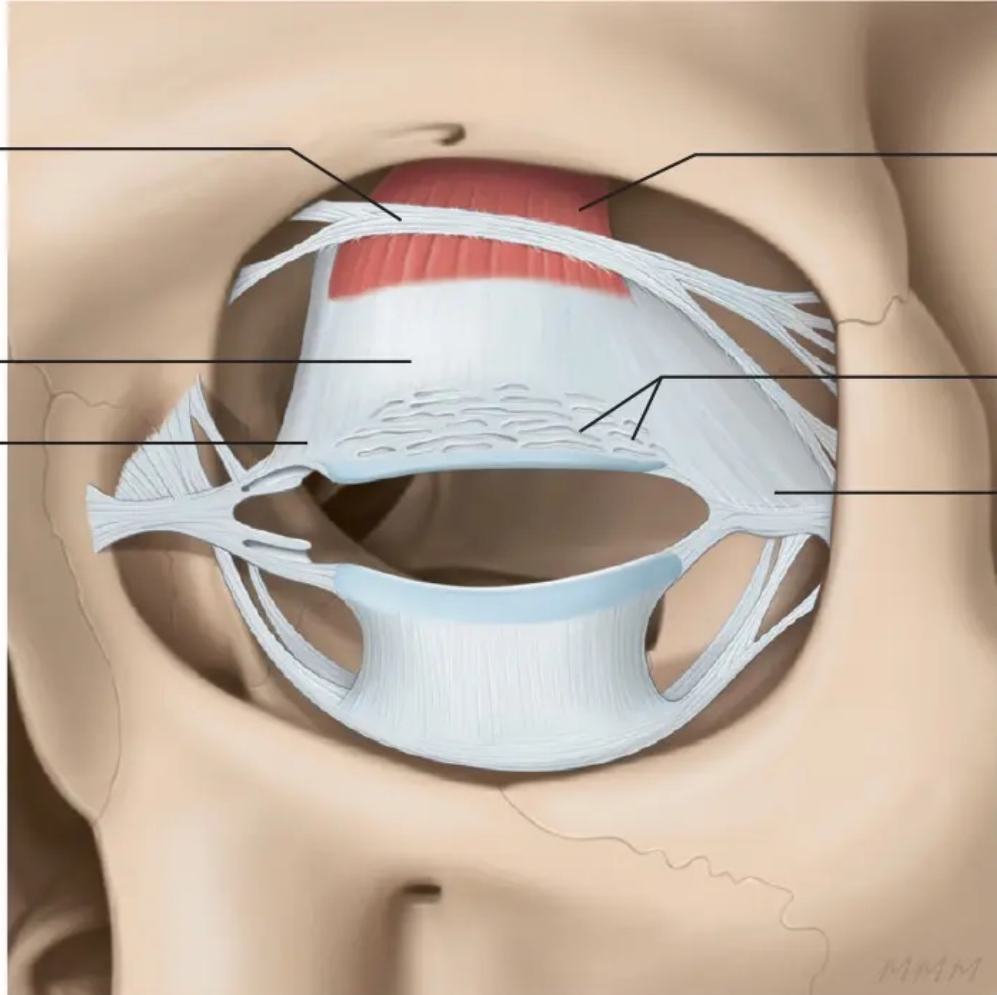
Levator palpebrae superioris m.

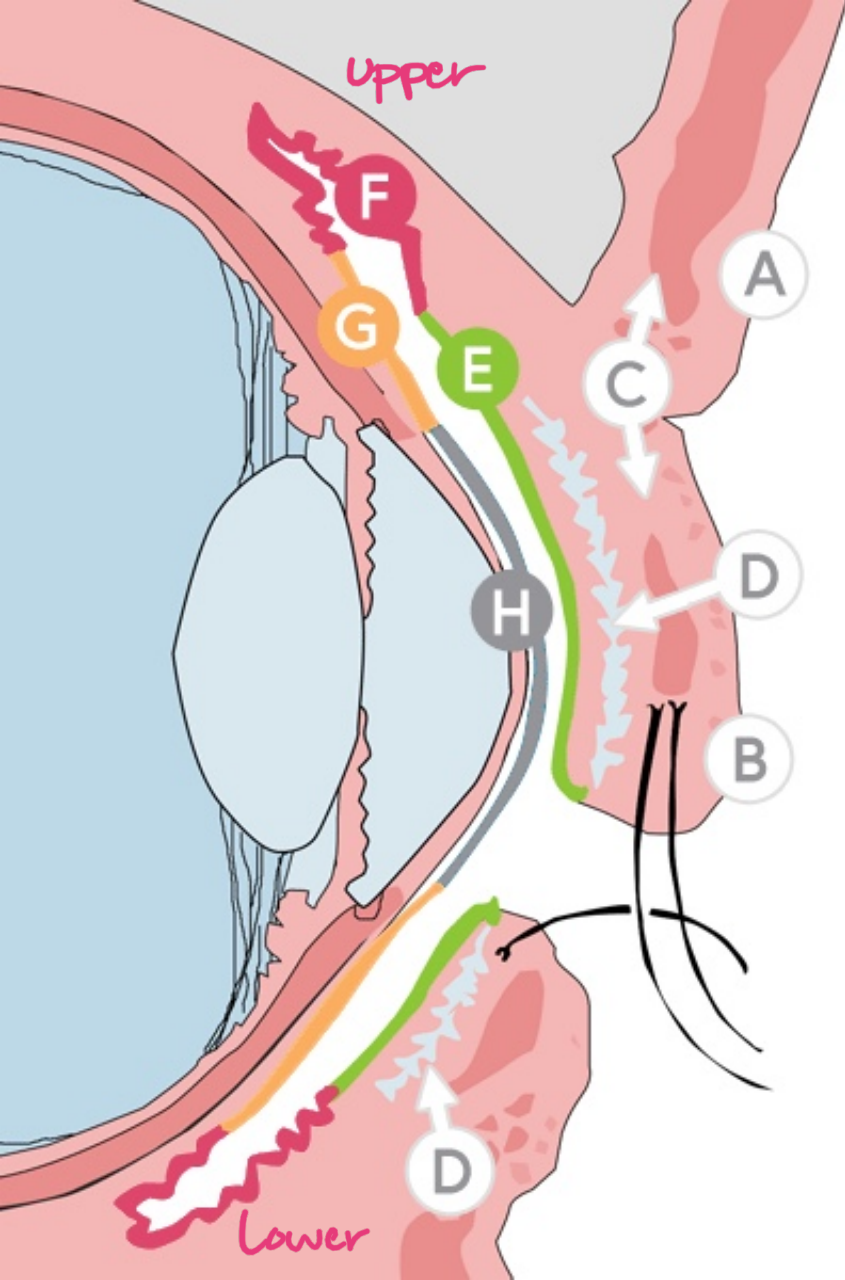
Levator aponeurosis

Fascial slips to orbicularis m.

Medial horn

Lateral horn

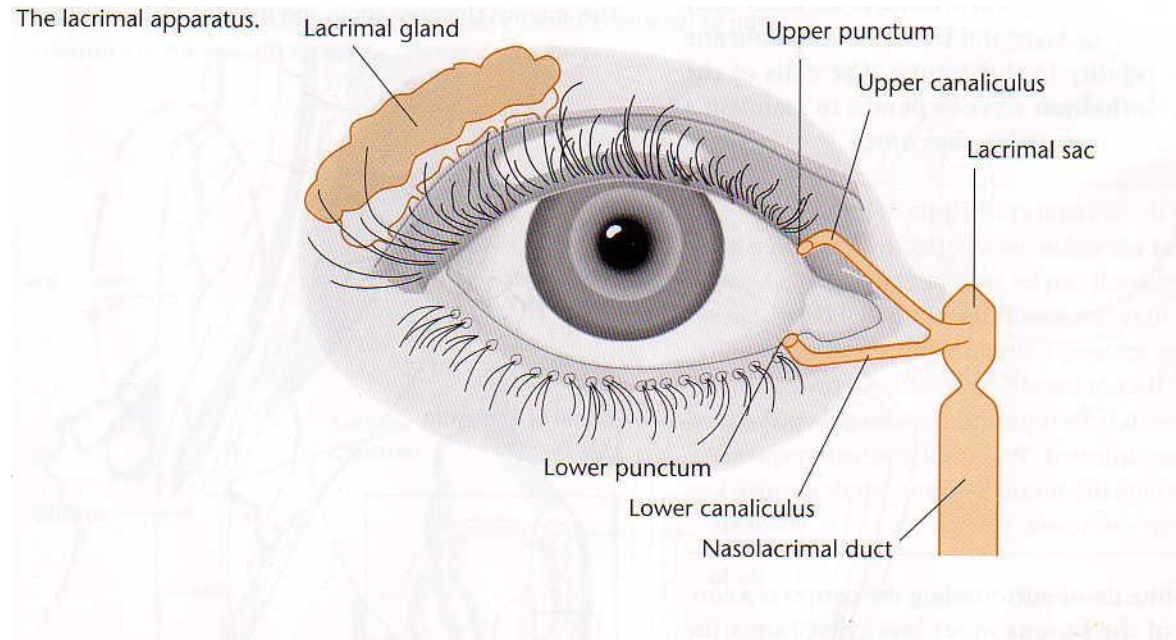




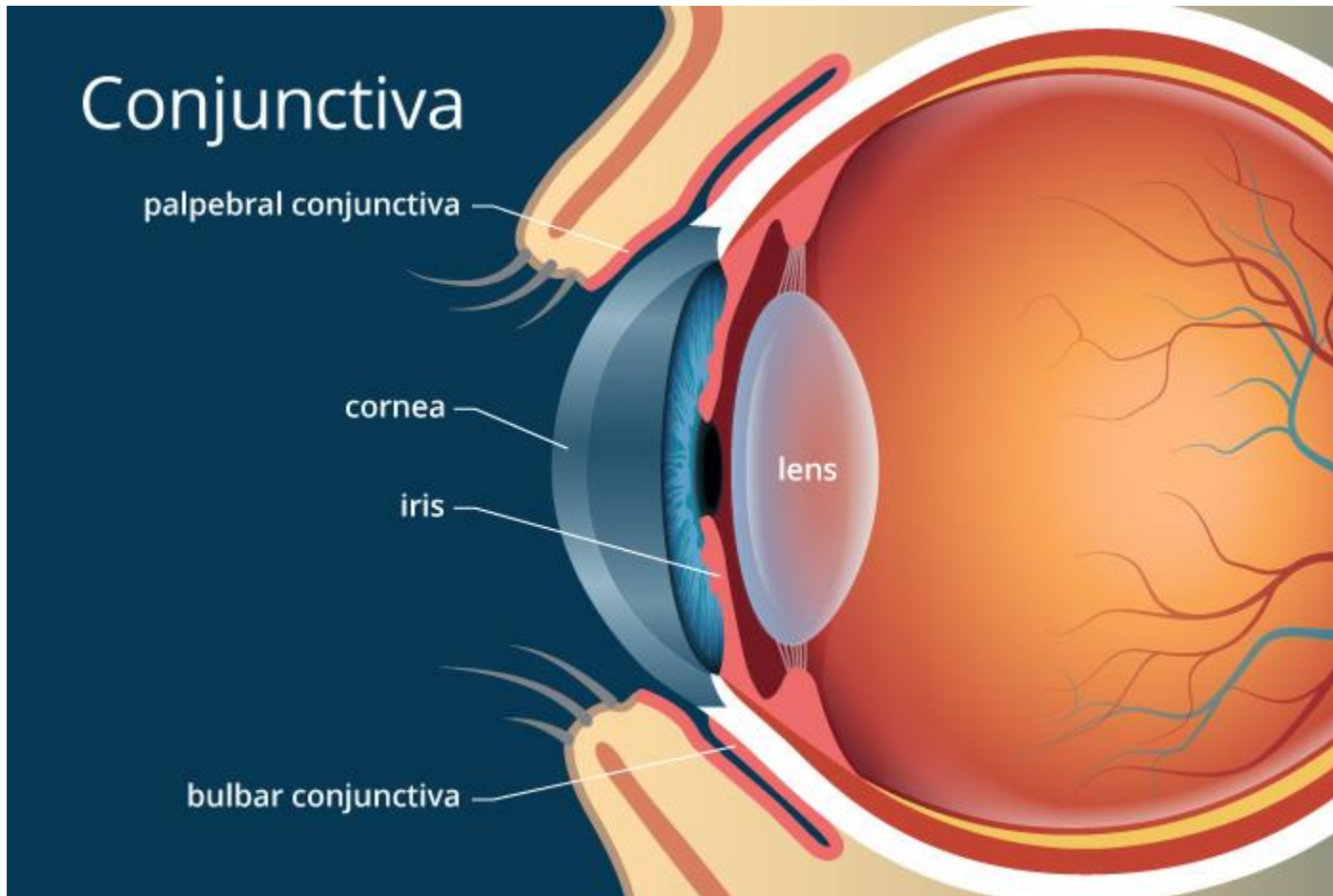
- (A) Skin
- (B) Lid margin
- (C) Orbicularis oculi
- (D) Tarsal plate
- (E) Palpebral conjunctiva
- (F) Conjunctival fornix
- (G) Bulbar conjunctiva
- (H) Surface of cornea



# Lacrimal Apparatus

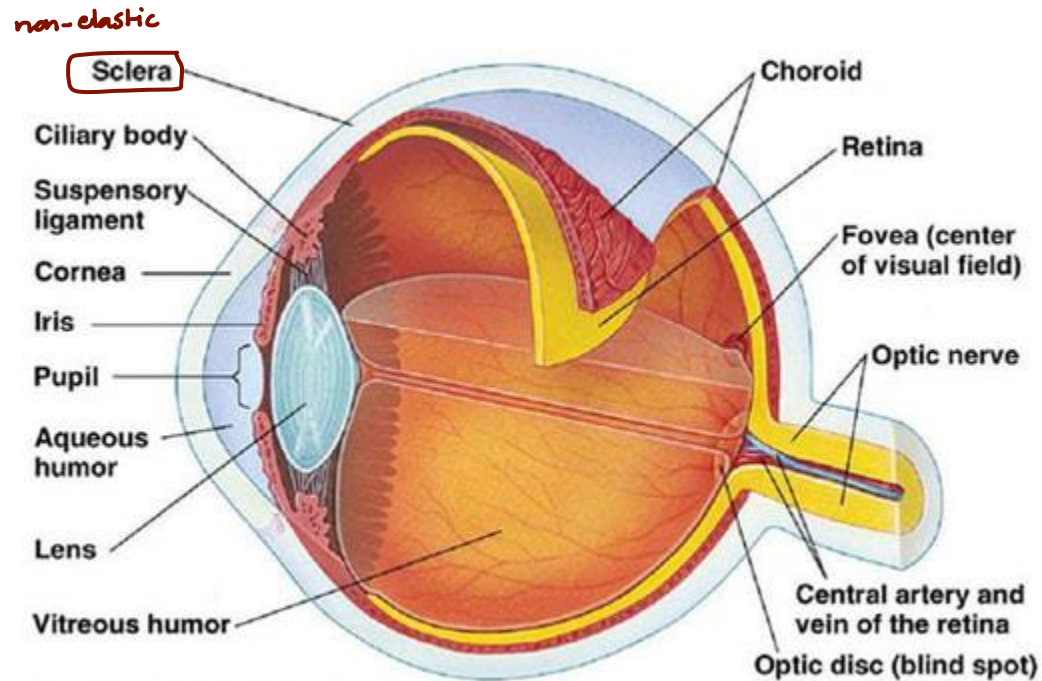


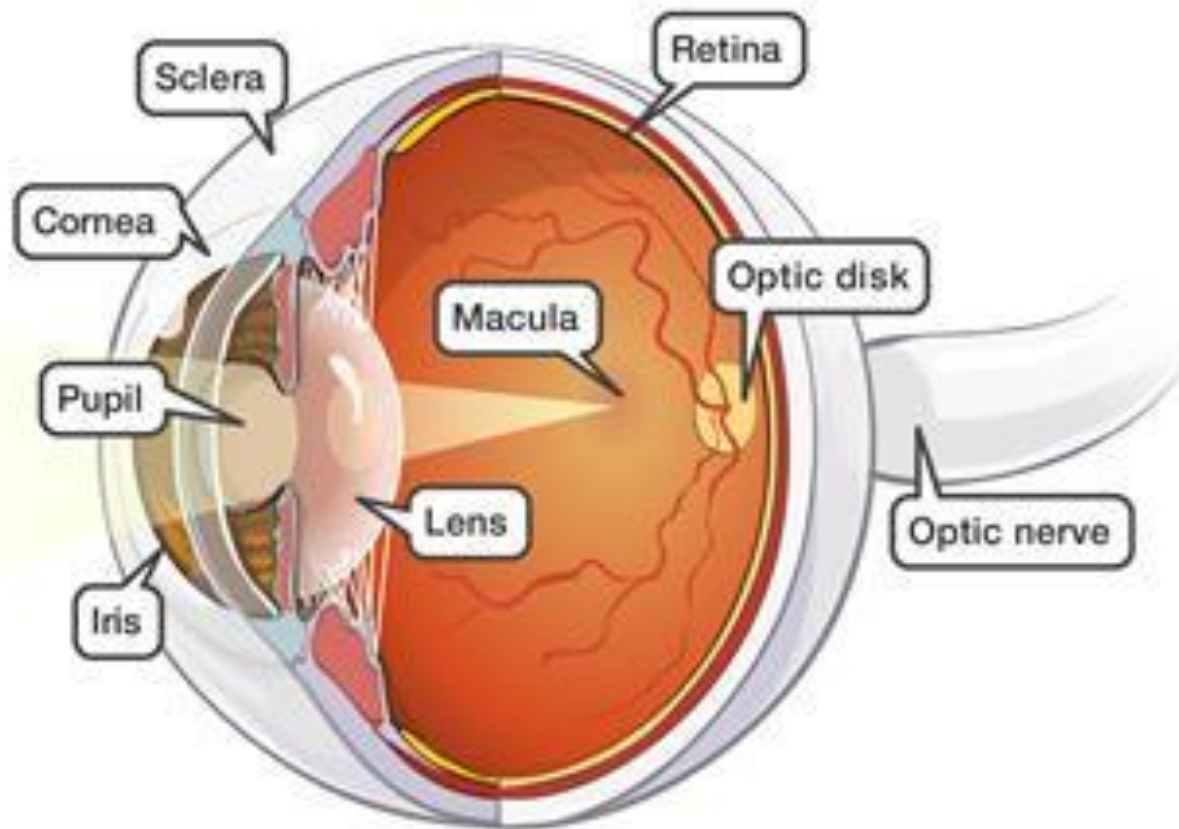
# Conjunctiva



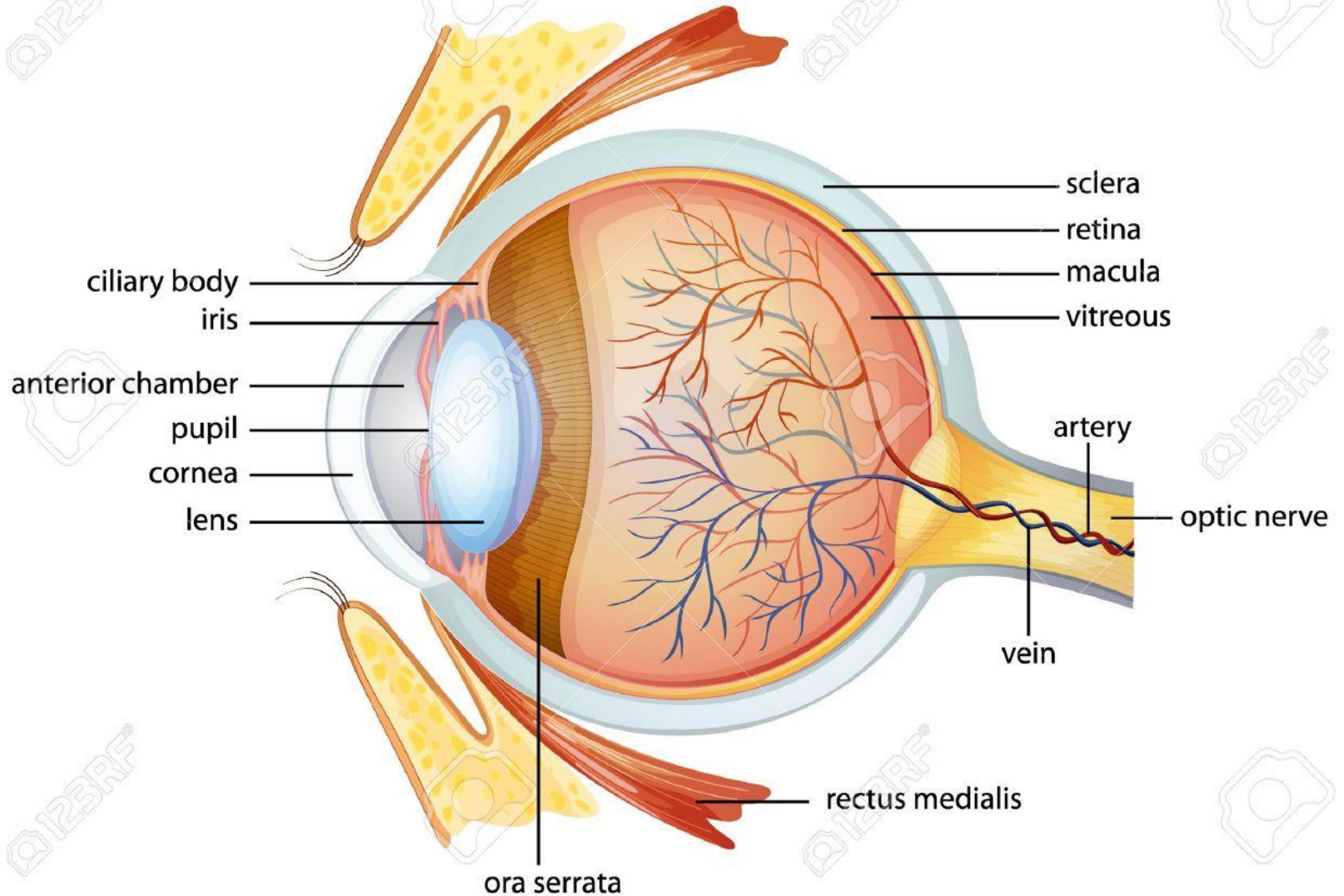


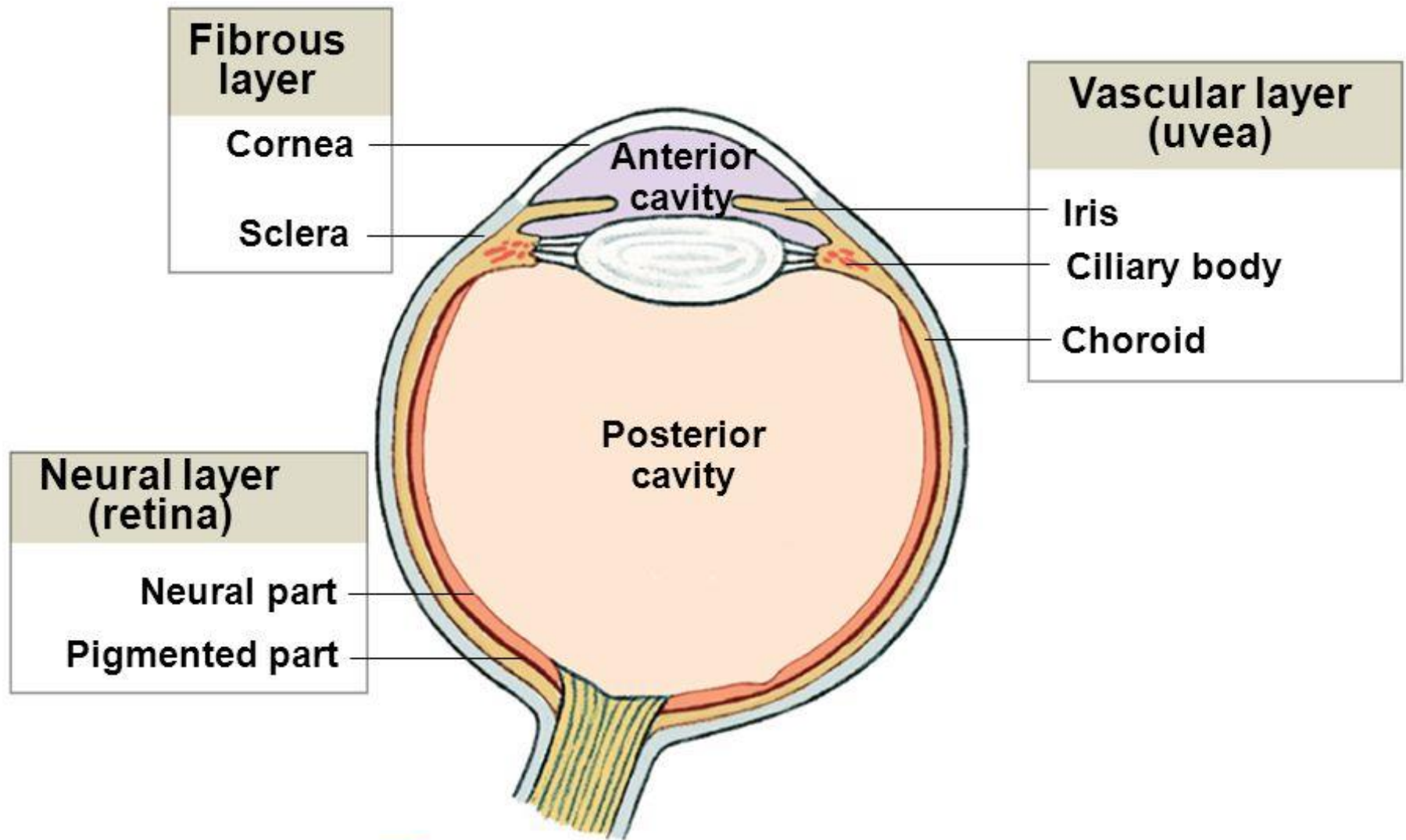
# Anatomy of The Eye





# Anatomy of the Human Eye



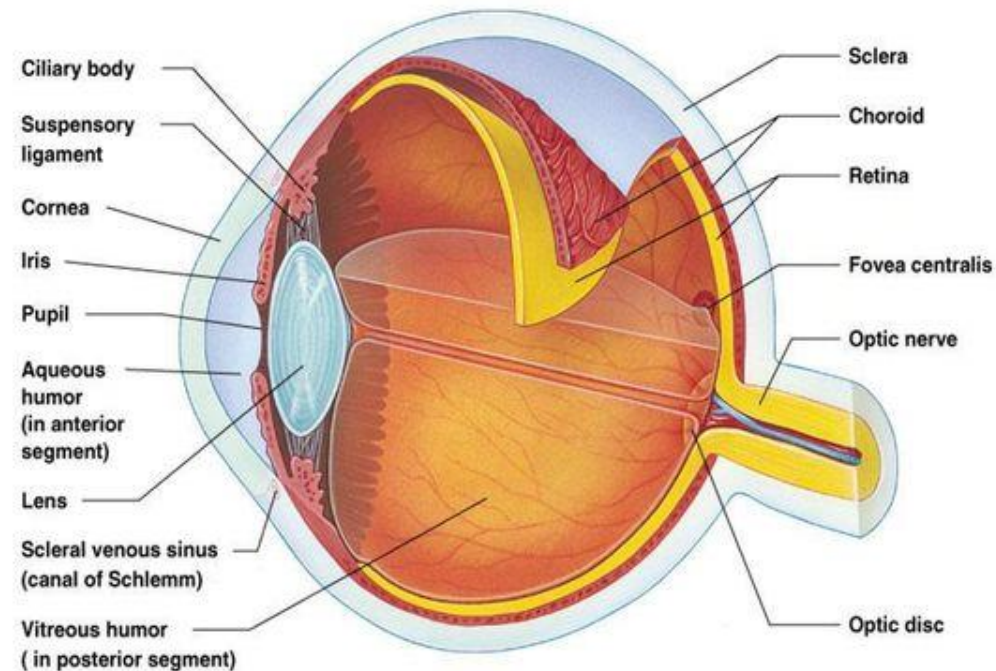


**b** Horizontal section of right eye



# Structure of the Eye

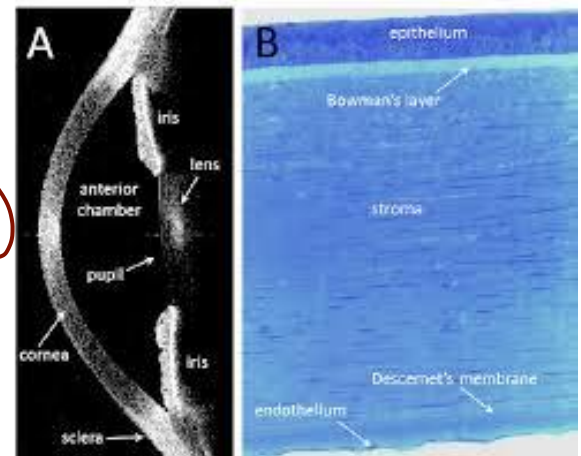
- The wall is composed of three tunics
  - Fibrous tunic (sclera) – outside layer
  - Choroid – middle layer
  - Sensory tunic (retina) – inside layer



(a)

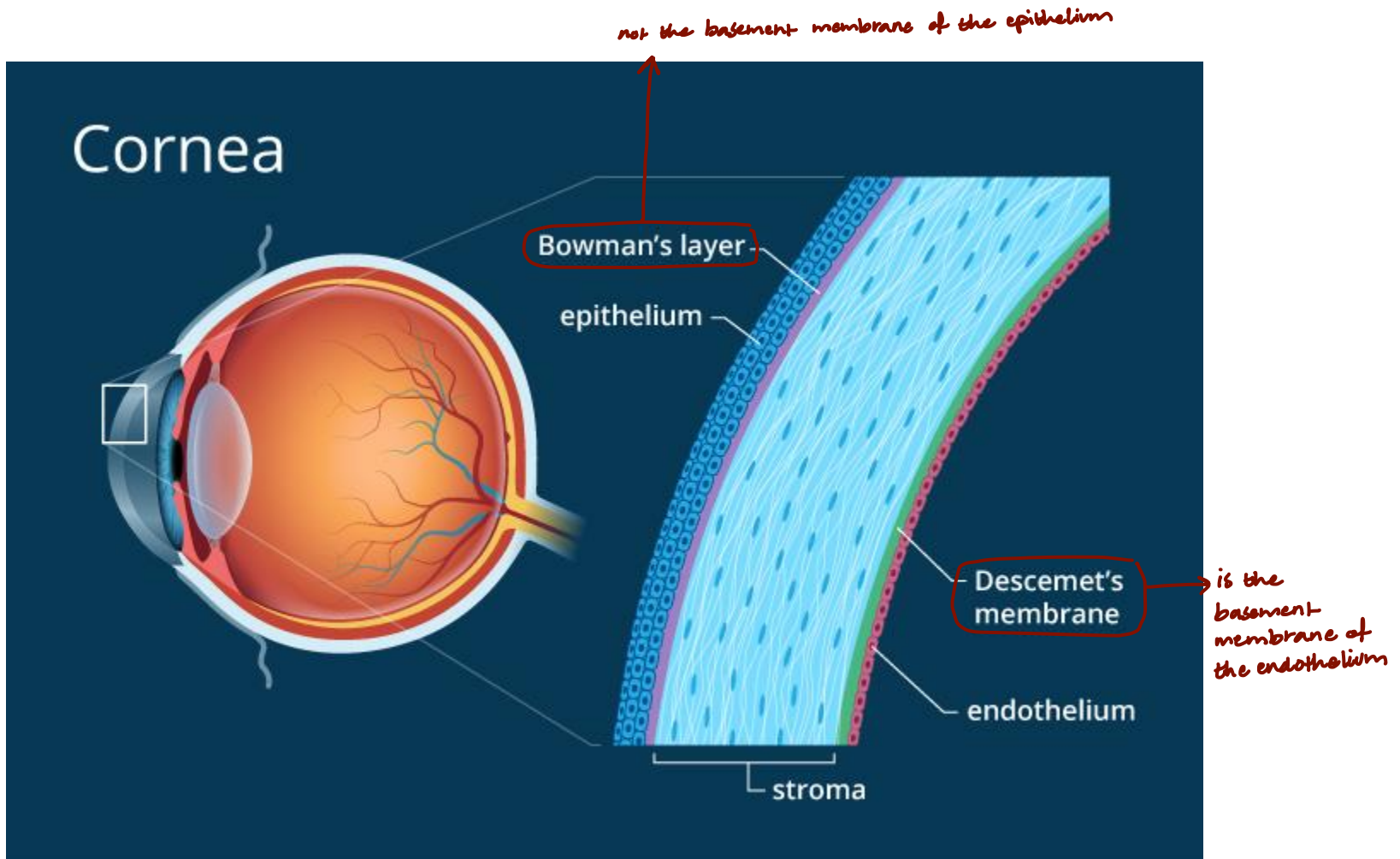
# Cornea

- Transparent dome shaped structure at the front of the eye
- Responsible for 2/3rds of the **refractive power** of the eye  
↓  
*fixed*
- Has an important protective role
- **Avascular** structure
- Mainly made of **collagen type 1**

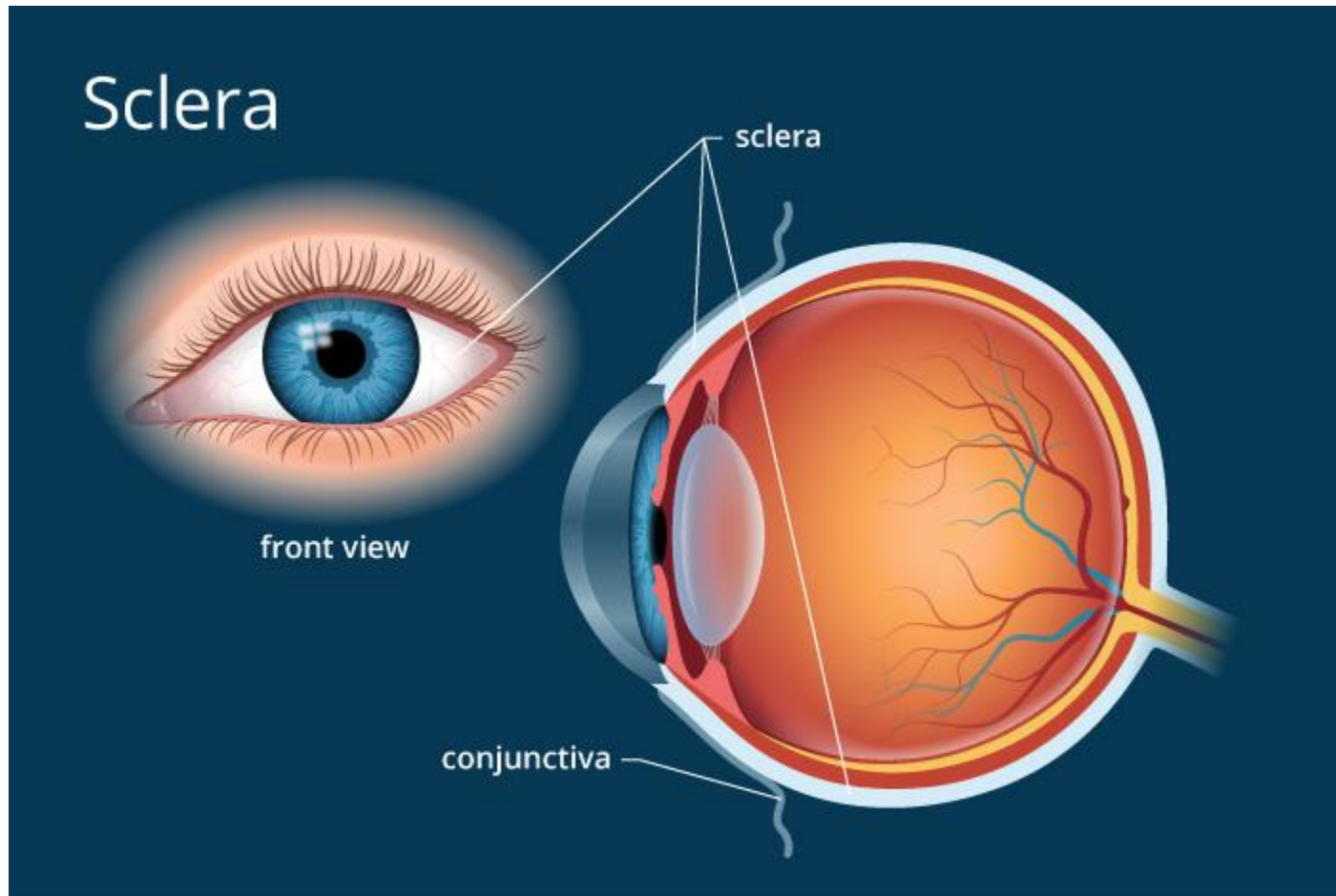




# Cornea



# Sclera

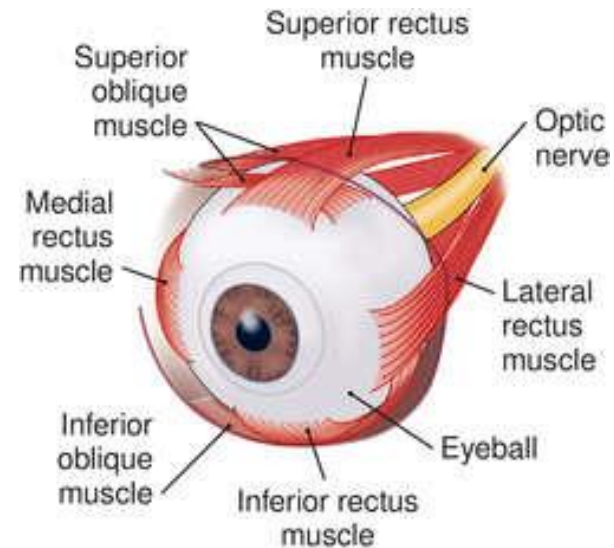


# Sclera

- Also known as the “white” of the eye.
- The sclera is covered by the conjunctiva anteriorly.
- It is **thickest** in the area surrounding the optic nerve.
- The sclera is made up of three divisions:
  - the **episclera**, loose connective tissue, *highly vascularized* ←
  - immediately beneath the conjunctiva; **sclera** *relatively avascular* →
  - proper**, the dense white tissue that gives the area its color; and the **lamina fusca**, *blackish* → the innermost zone made up of elastic fibers.

# Sclera

- It is the opaque, fibrous and protective outer layer of the eye containing mainly collagen
- Gives attachment to extraocular muscle
- Allows the passage of the optic nerve posteriorly

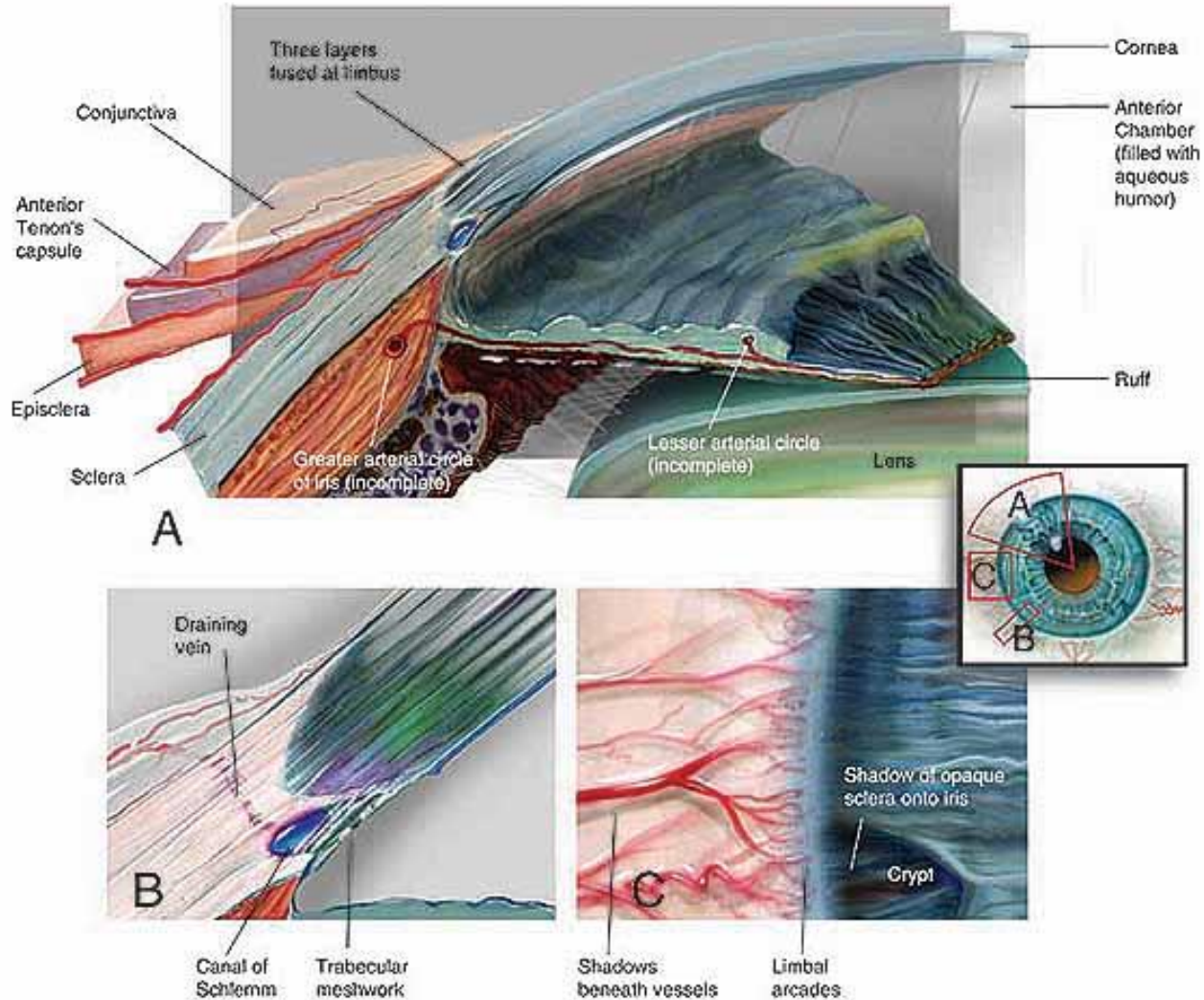


\* In burn cases we fear ischemia of the limbus as the corneal stem cells are responsible for the regeneration of the corneal epithelium.

\* Contains corneal stem cells.

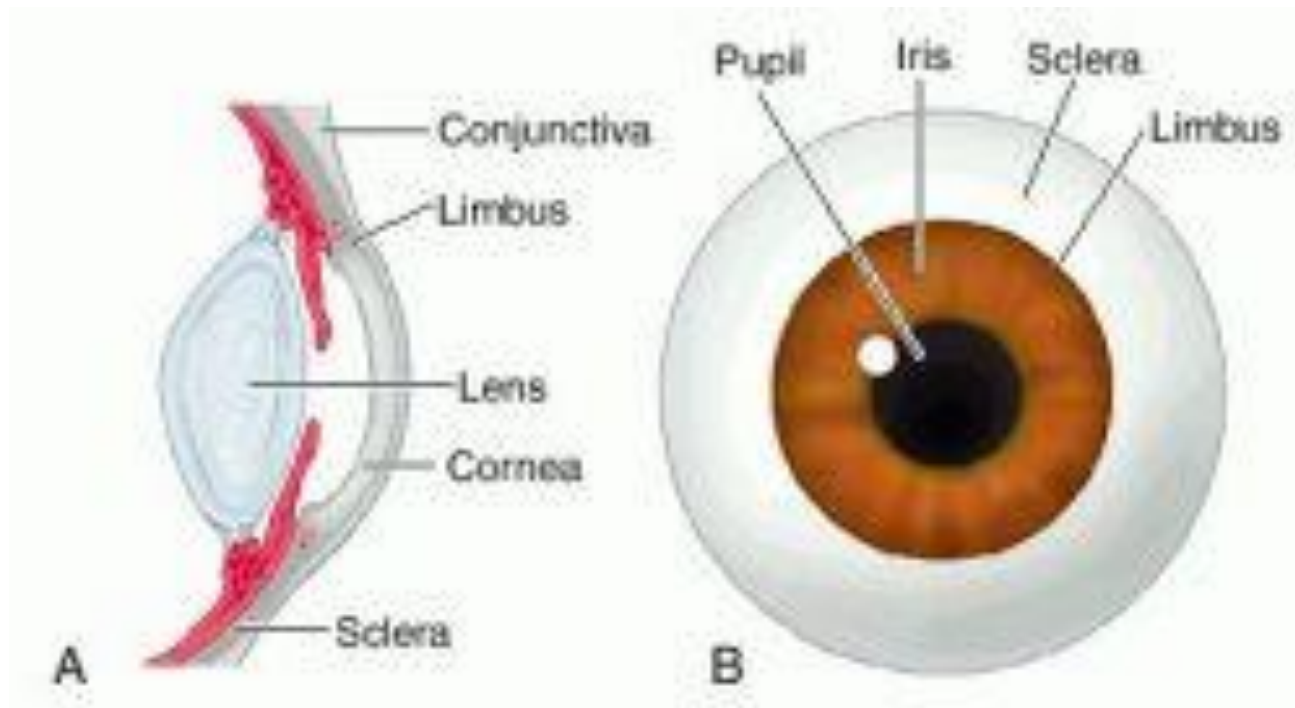
# Limbus

## The Limbus



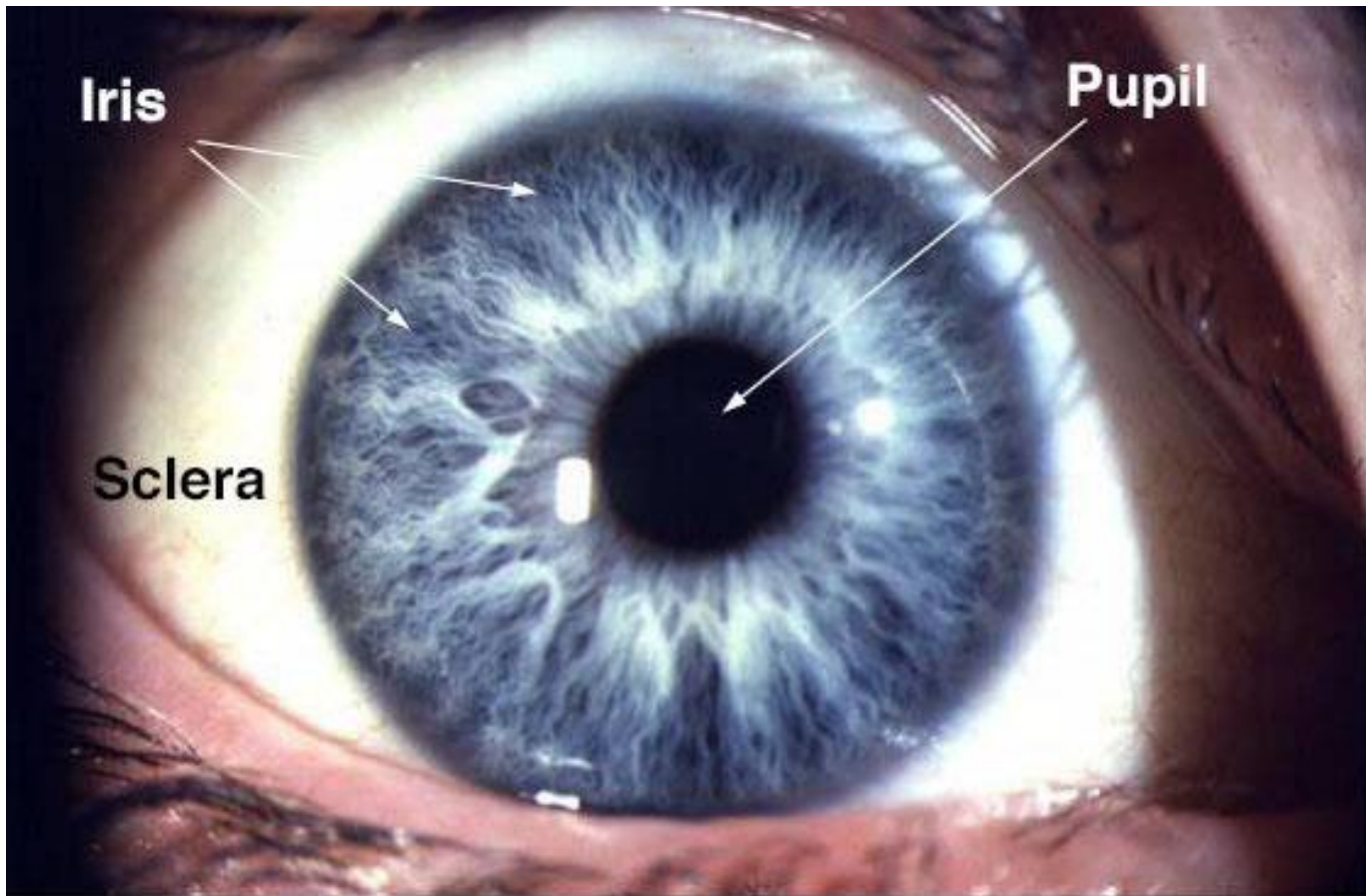
# Limbus-Corneoscleral Junction

- Common site for surgical incisions
- Contains stem cells





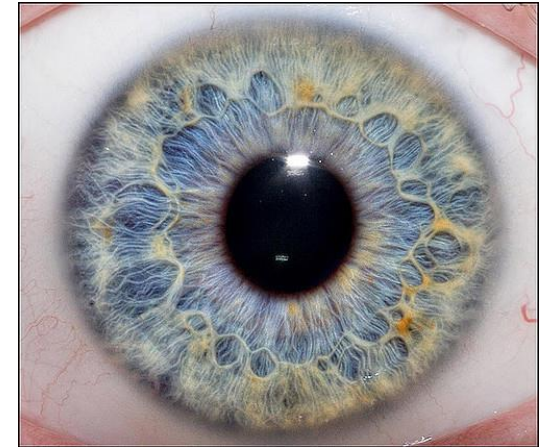
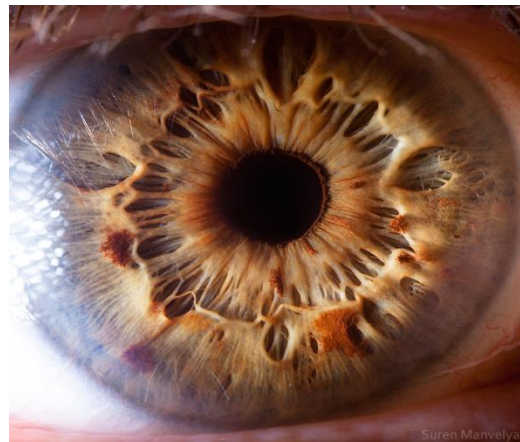
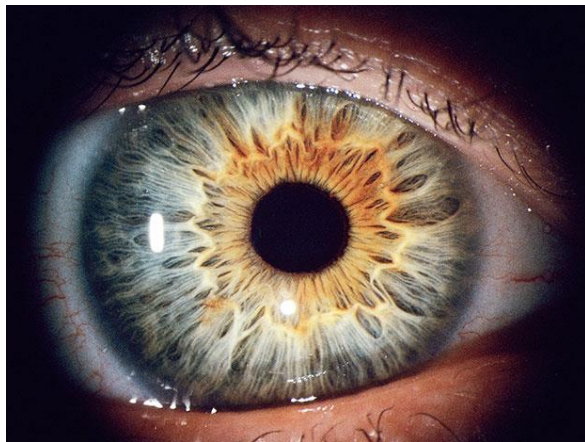
# Iris



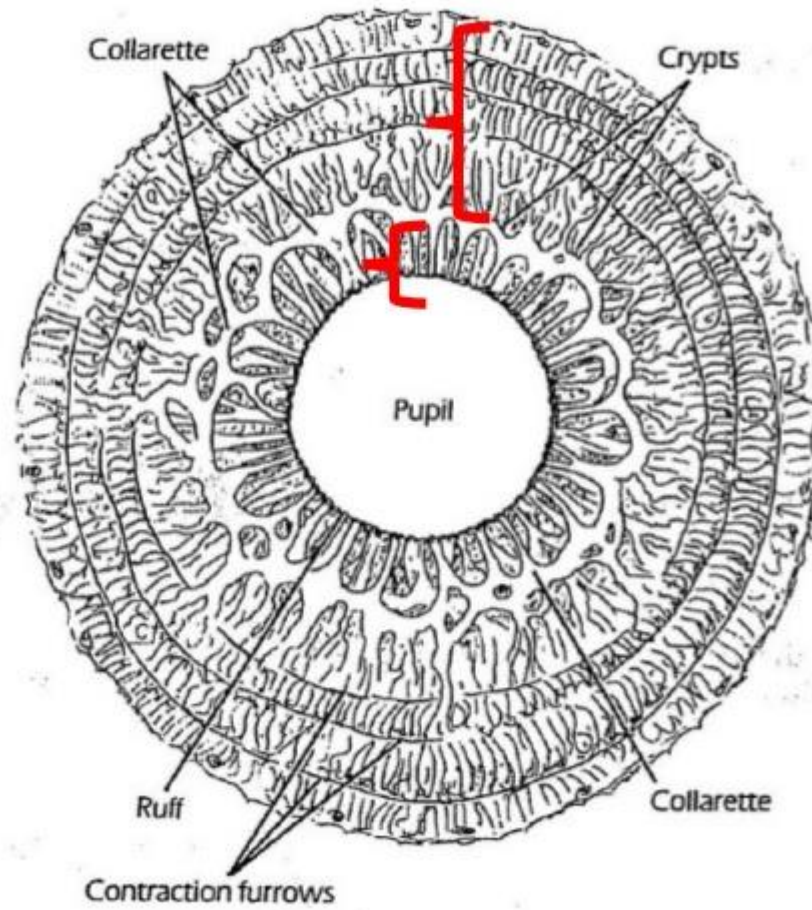
*Fig. 1. View of the human eye*

# Iris

- Contains melanin pigment with variable density resulting in different colors



# Iris



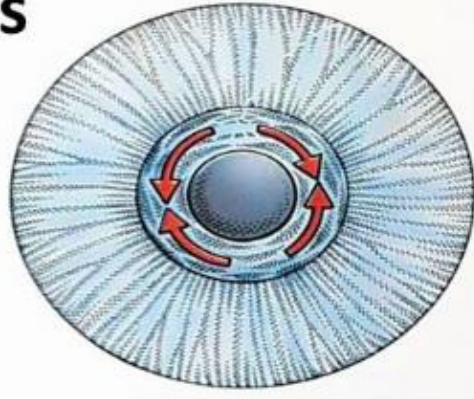


# Iris

## Pupillary Muscles

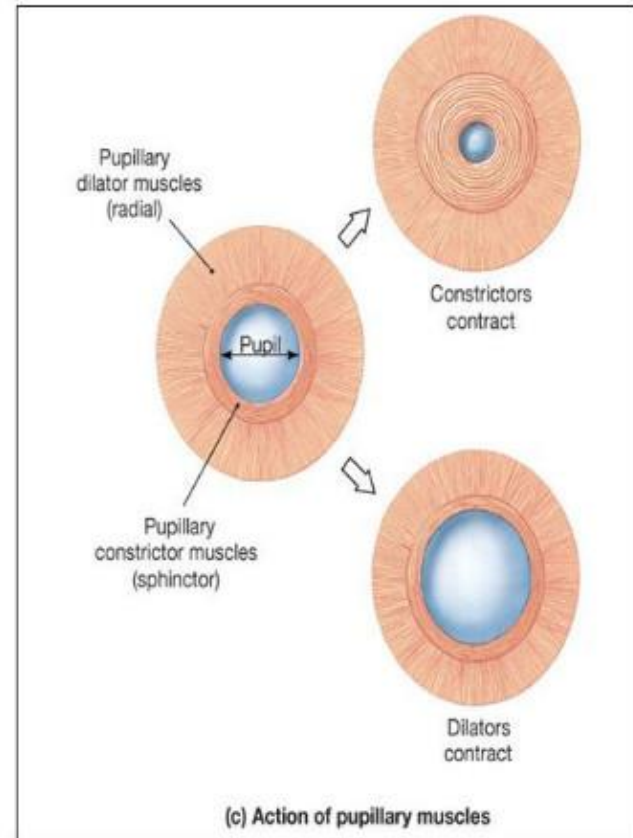
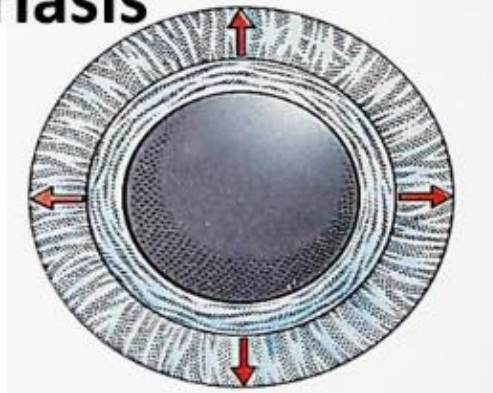
### Miosis

*Parasympathetic*  
*Rich in M<sub>3</sub> receptors*  
*[short ciliary nerves*  
*(oculomotor)]*



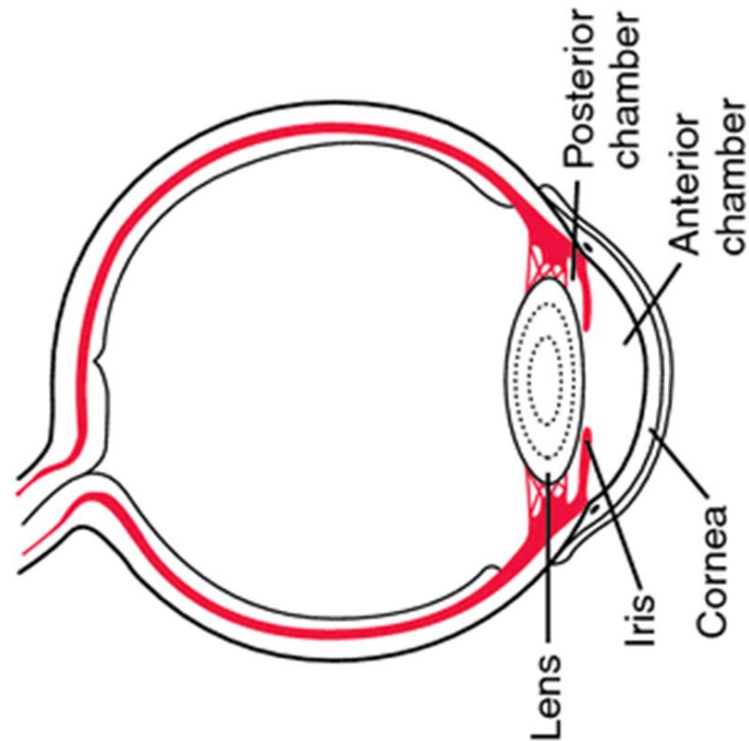
### Mydriasis

*Sympathetic*  
*Rich in  $\alpha_1$ -receptors*  
*[long ciliary nerves]*



# Anterior Chamber

- It is the space bound anteriorly by the back surface of the cornea and posteriorly by the iris and lens
- It is filled by aqueous humor  
*Secreted from the ciliary body*



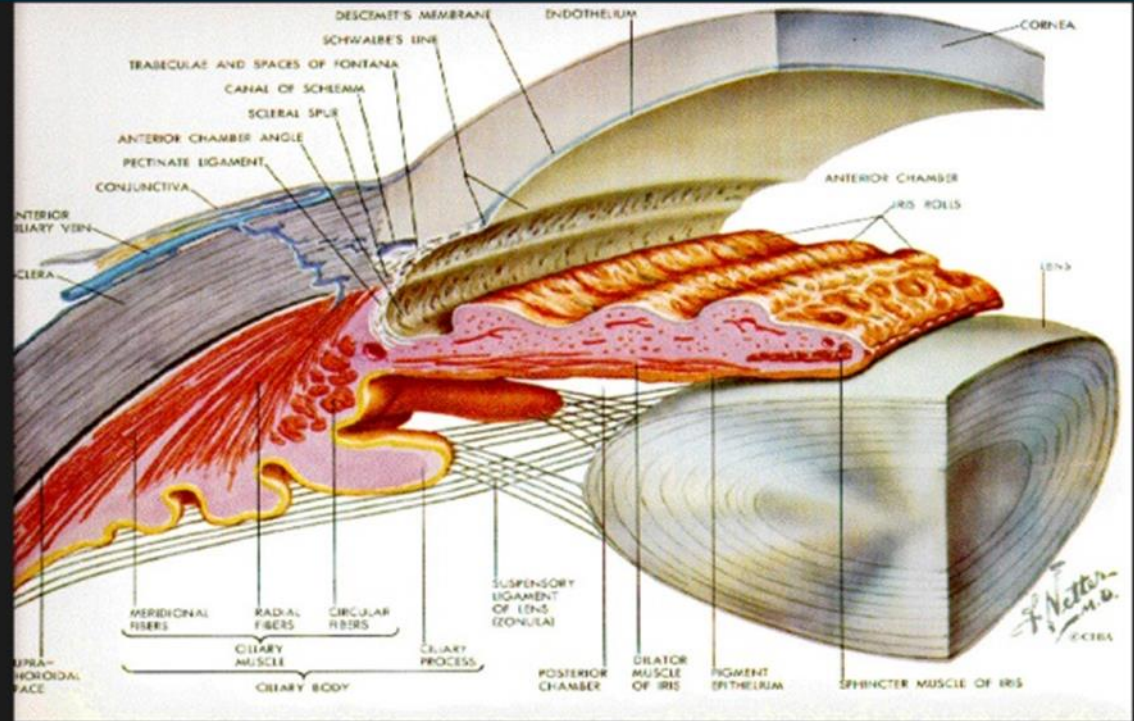


# Irido-corneal Angle

*Drained through the trabecular meshwork & Schlemm's canal.*

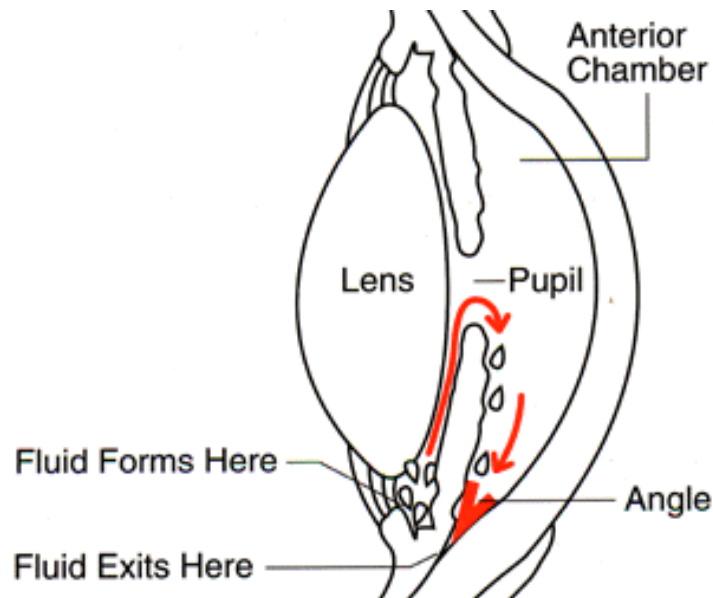
## Eye Anatomy

### The Angle



# Irido-corneal Angle

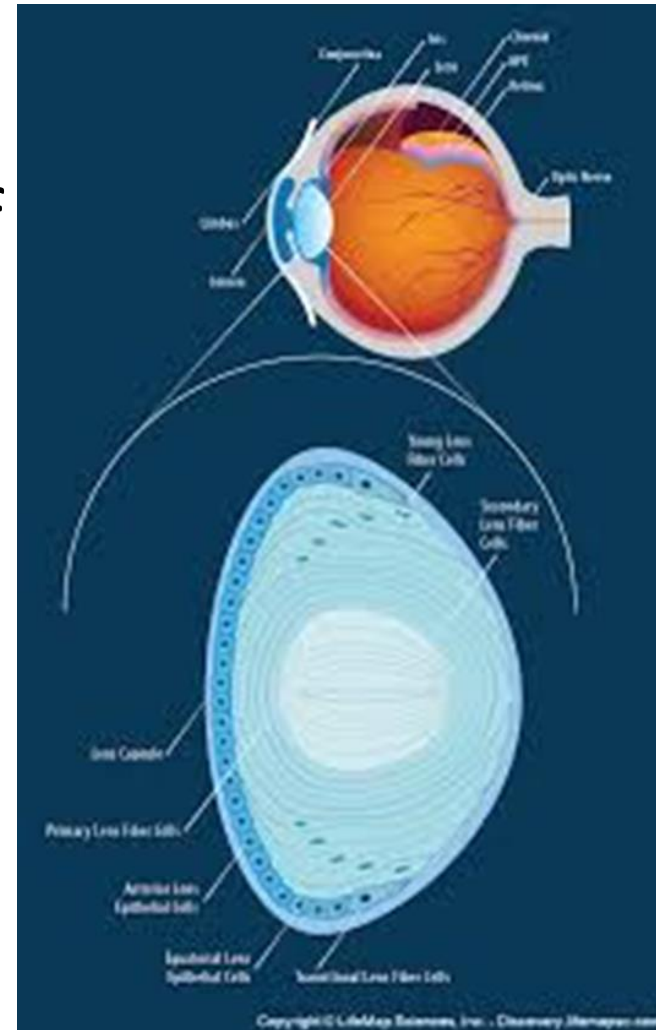
- The area where the iris and the cornea meet
- Contains the trabecular meshwork and Schlem's canal. They constitute the aqueous drainage system



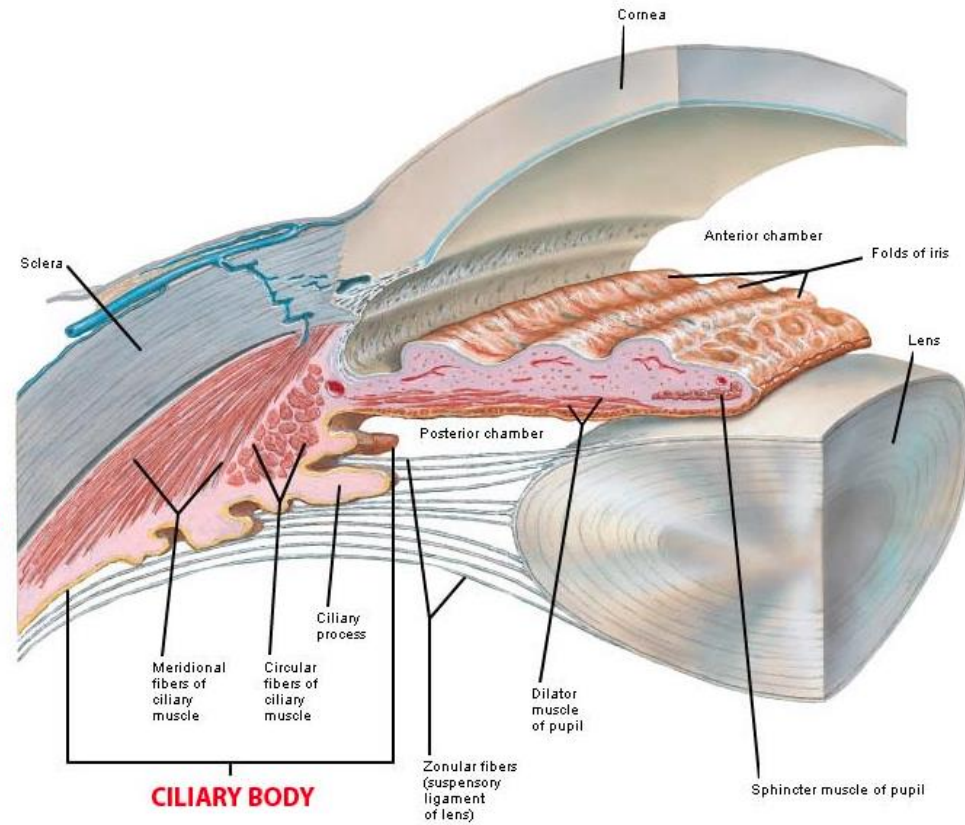
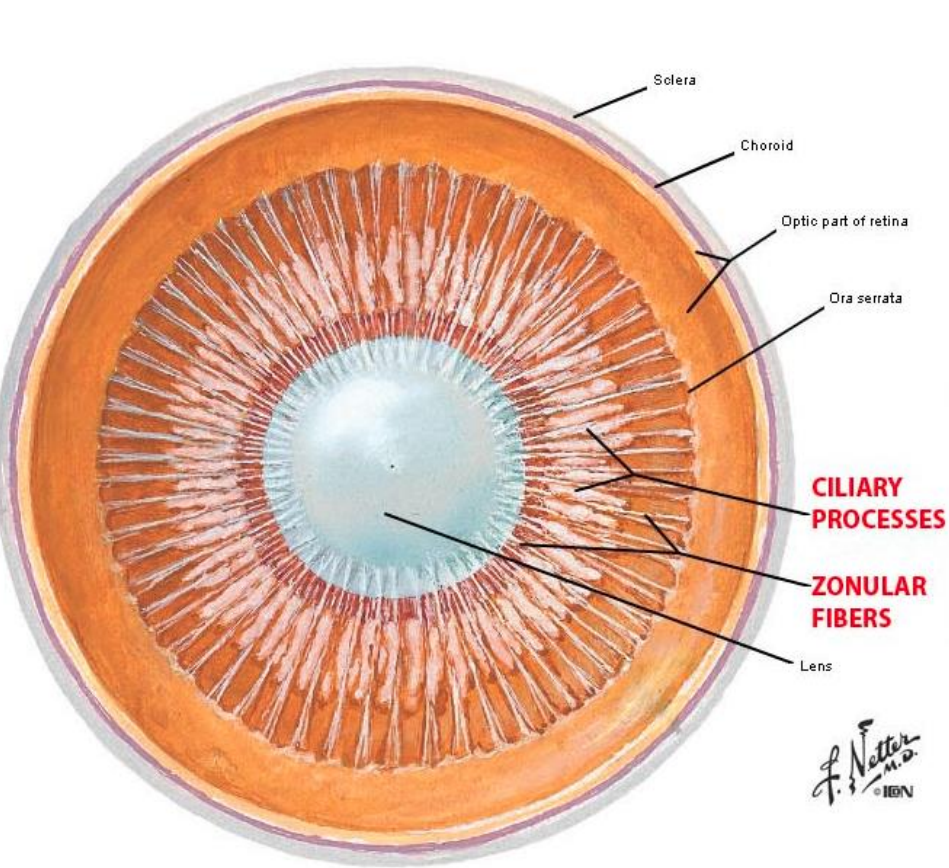
# Crystalline Lens

→ capsule of collagen  
type 4  
→ Avascular

- Responsible for the remaining 1/3 rd of the refractive power of the eye
- Fixed in place by zonules (suspensory ligaments) of the ciliary body



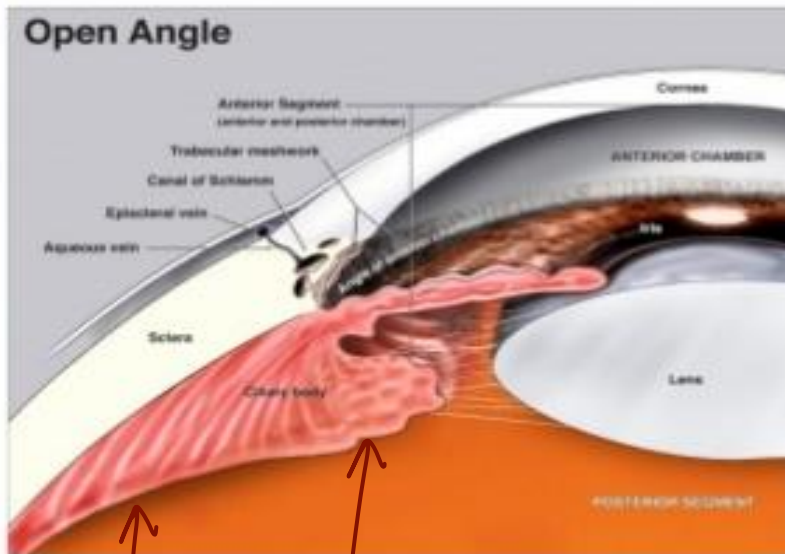
# Ciliary Body





# Ciliary Body

## Ciliary body



*Pars  
Plana*

*Pars  
Plicata*

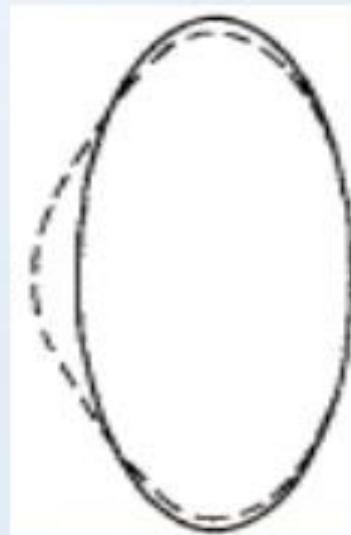
- Connects the iris and the choroid
- 2 parts:
  - Pars plicata (ciliary processes)
  - Pars plana
- Ciliary body has 3 layers:
  - Ciliary epithelium
  - Ciliary stroma
  - Ciliary muscle
- Functions:
  - Aqueous humor production
  - Suspension of lens, accommodation



# Accommodation

## Definition

*Accommodation* is the mechanism by which the eye changes refractive power by altering the shape of lens in order to focus objects at variable distances

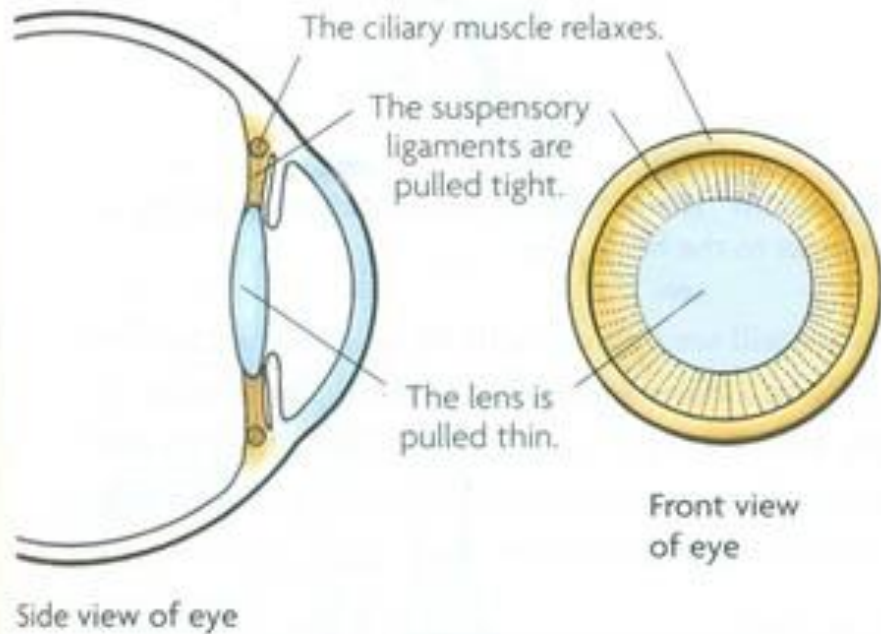


— At rest

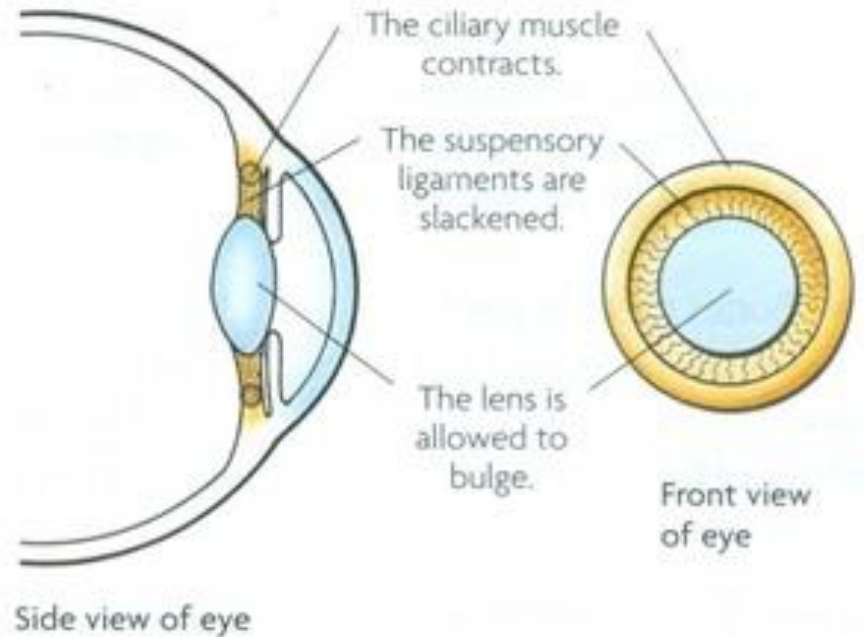
- - - Accommodated

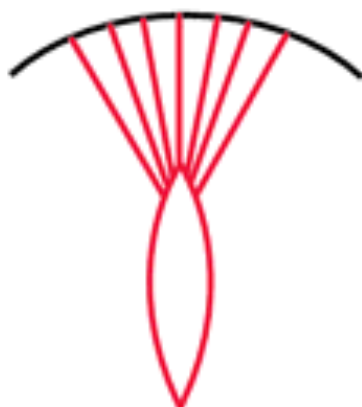
# Accommodation

Distant object

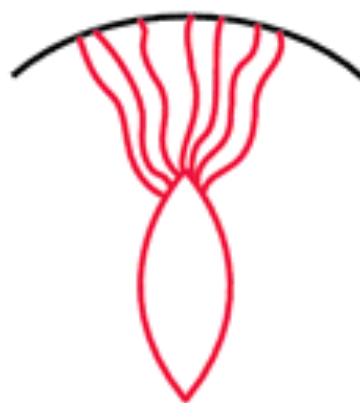


Nearby object

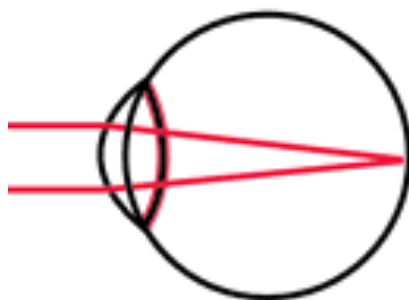




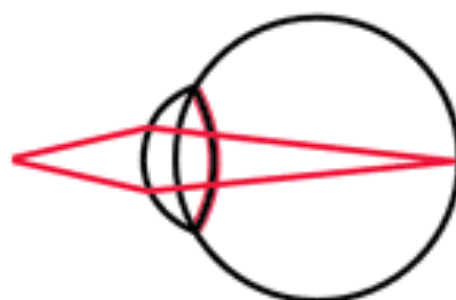
Ligaments tight—lens flattened



Ligaments relaxed—lens more rounded



Rays from a *distant* object are focused on the retina by a flattened lens

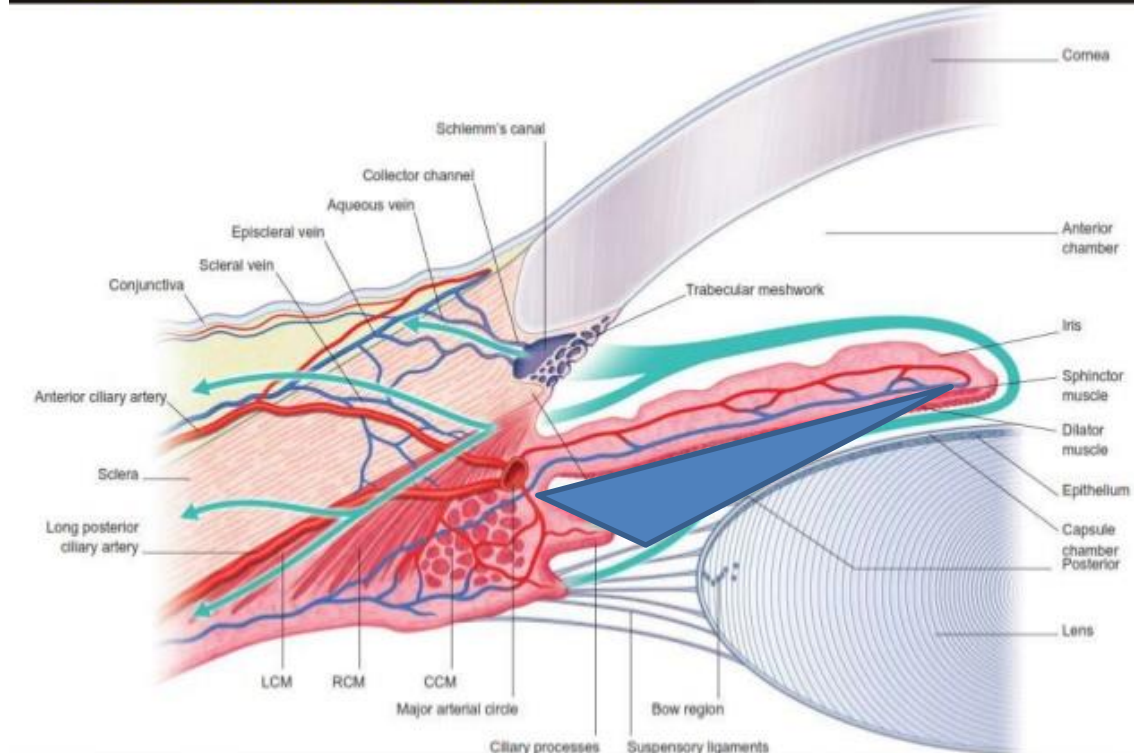


Rays from a *nearby* object are focused on the retina by a more rounded lens

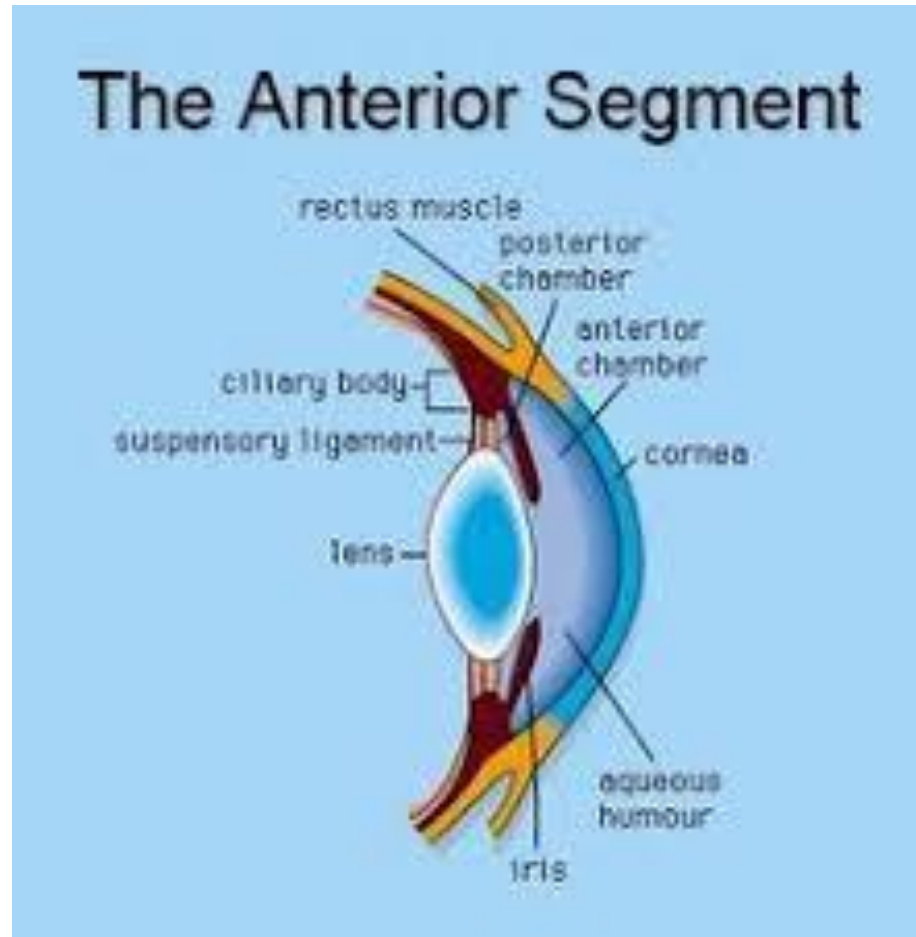
# Posterior Chamber

- The space that lies between ciliary body, iris and lens

## 2.POSTERIOR CHAMBER 0.06ml

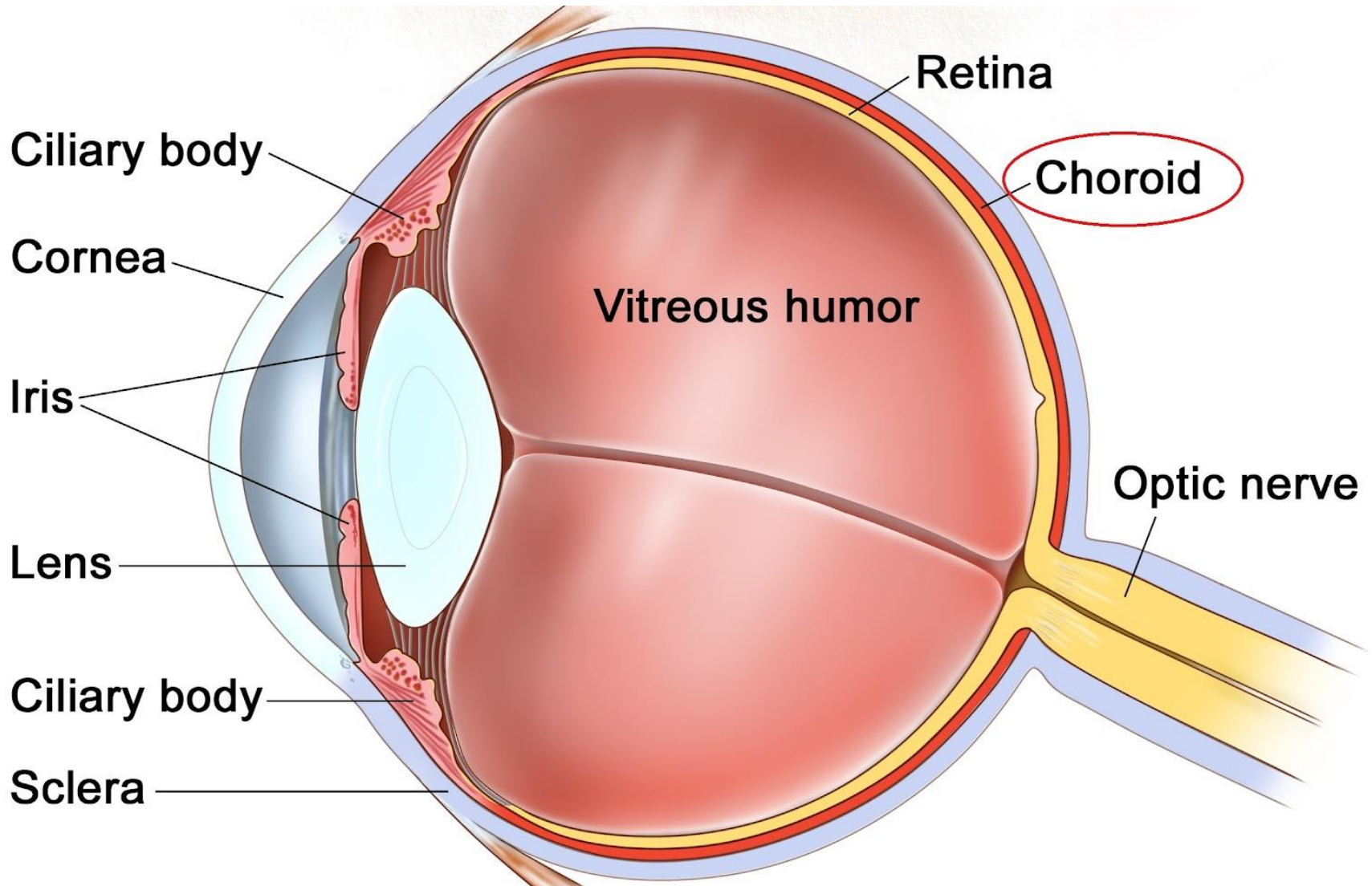


# Anterior Segment





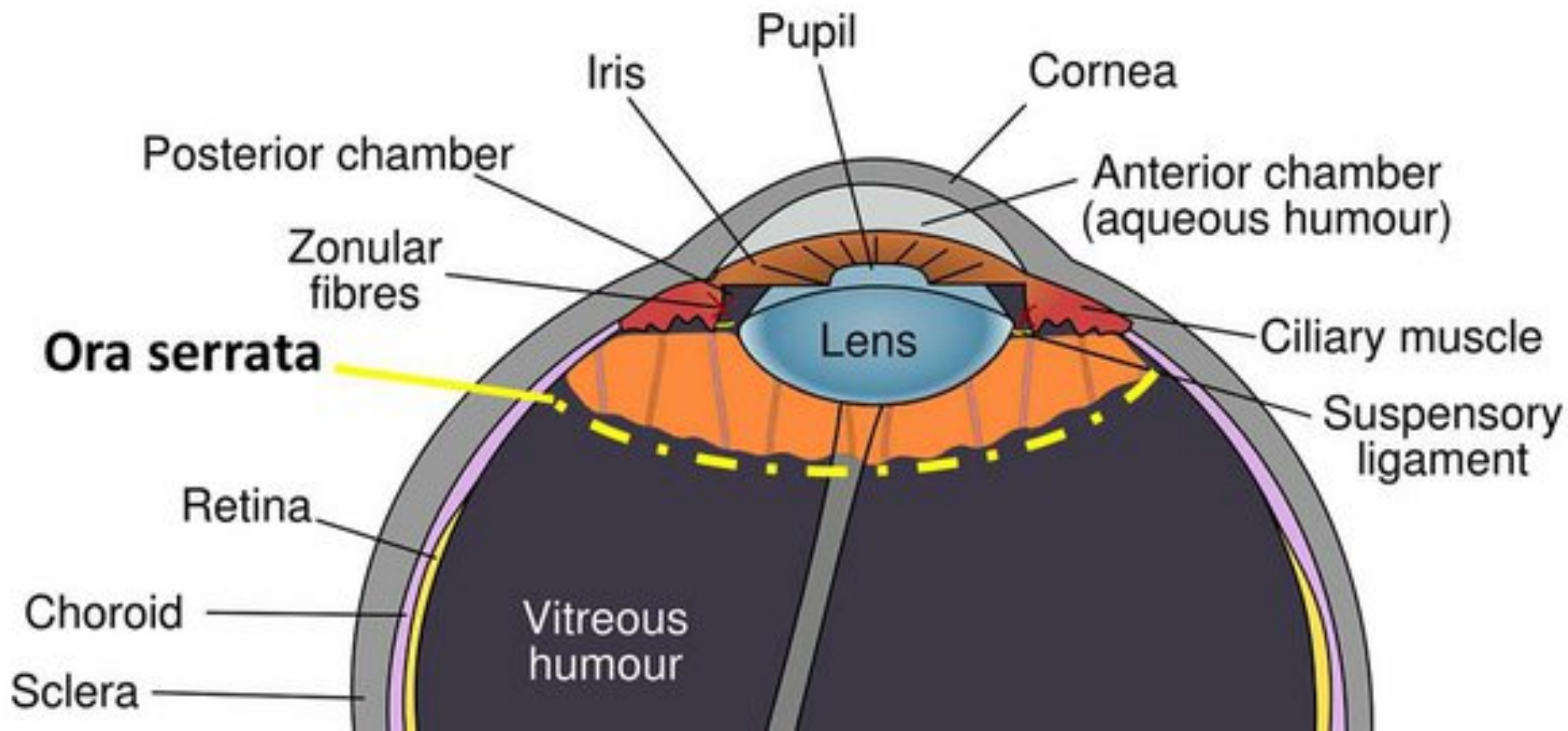
# Choroid



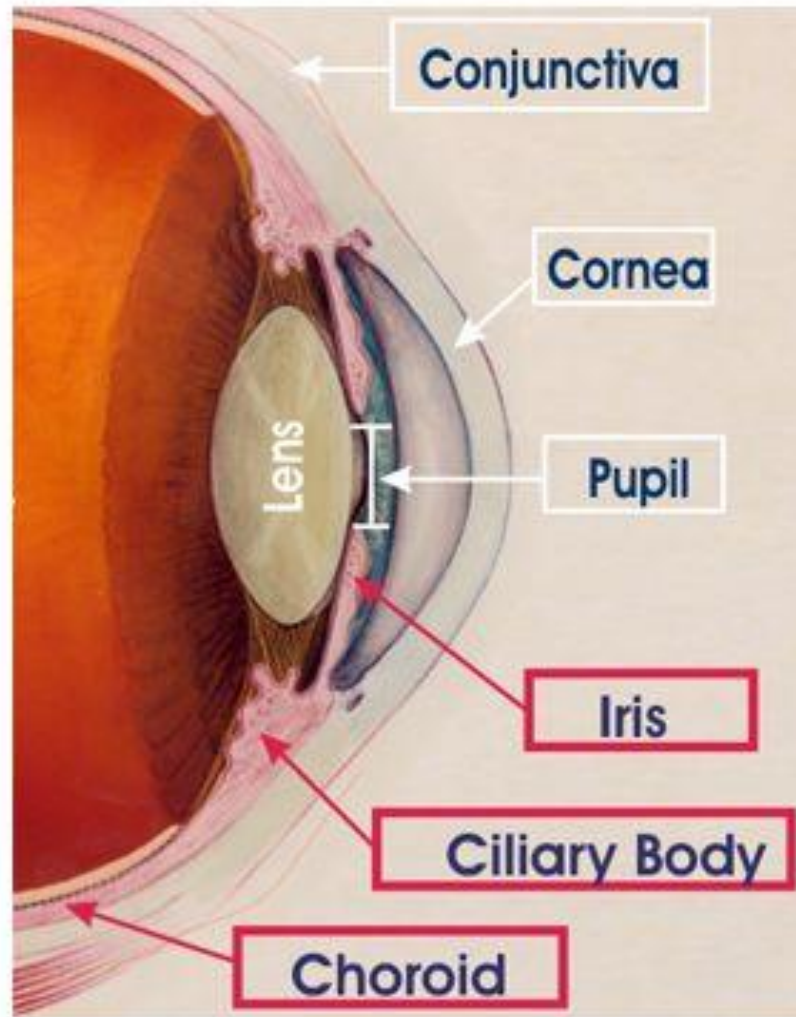
# Choroid

- Thin, highly pigmented, vascular loose connective tissue
- Rich in melanocytes gives characteristic dark color
- Situated between sclera and retina
- Extends from optic nerve to ciliary body (at ora serrata)

*the serrated junction between the retina & the ciliary body*

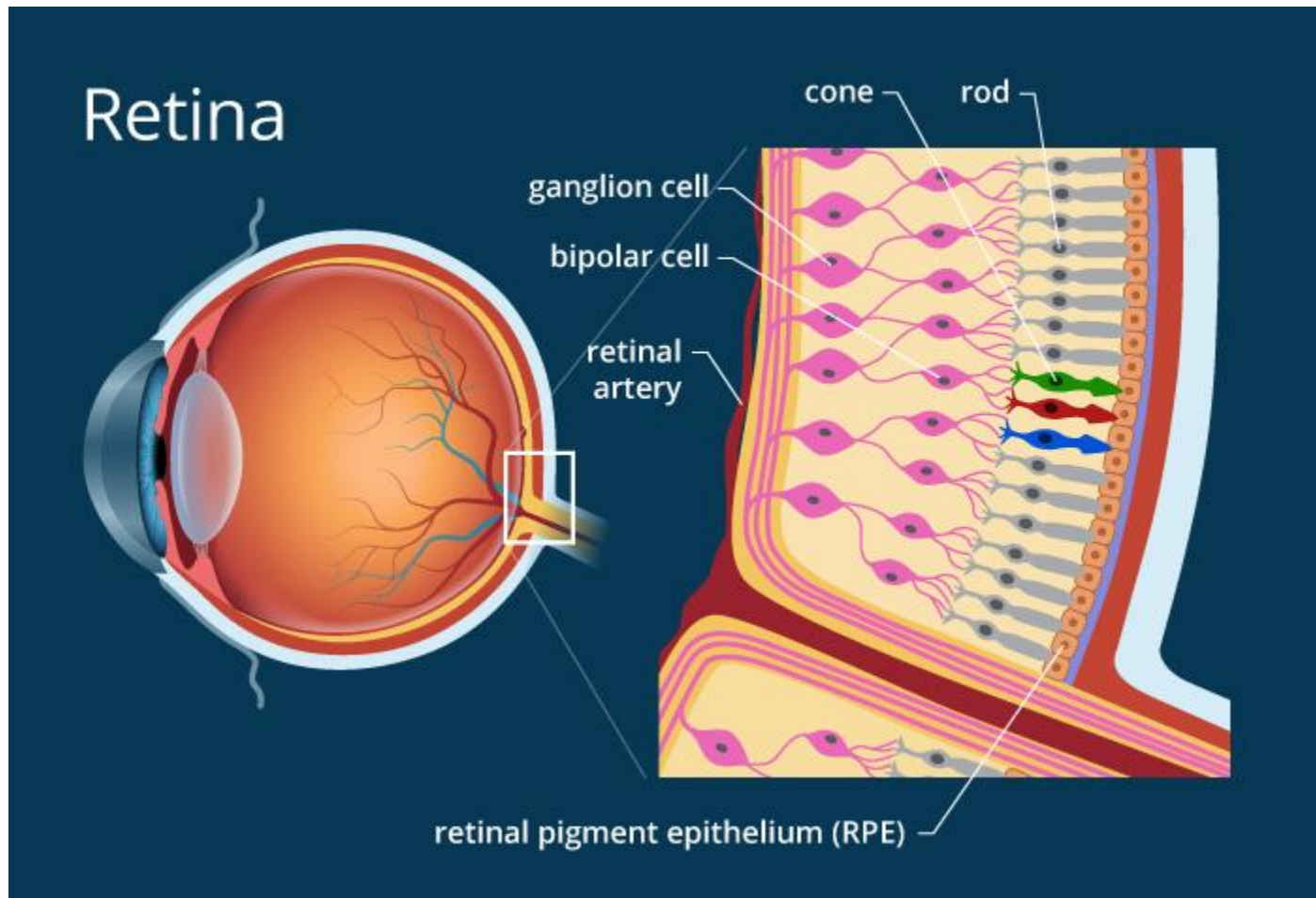


# Uveal Tract

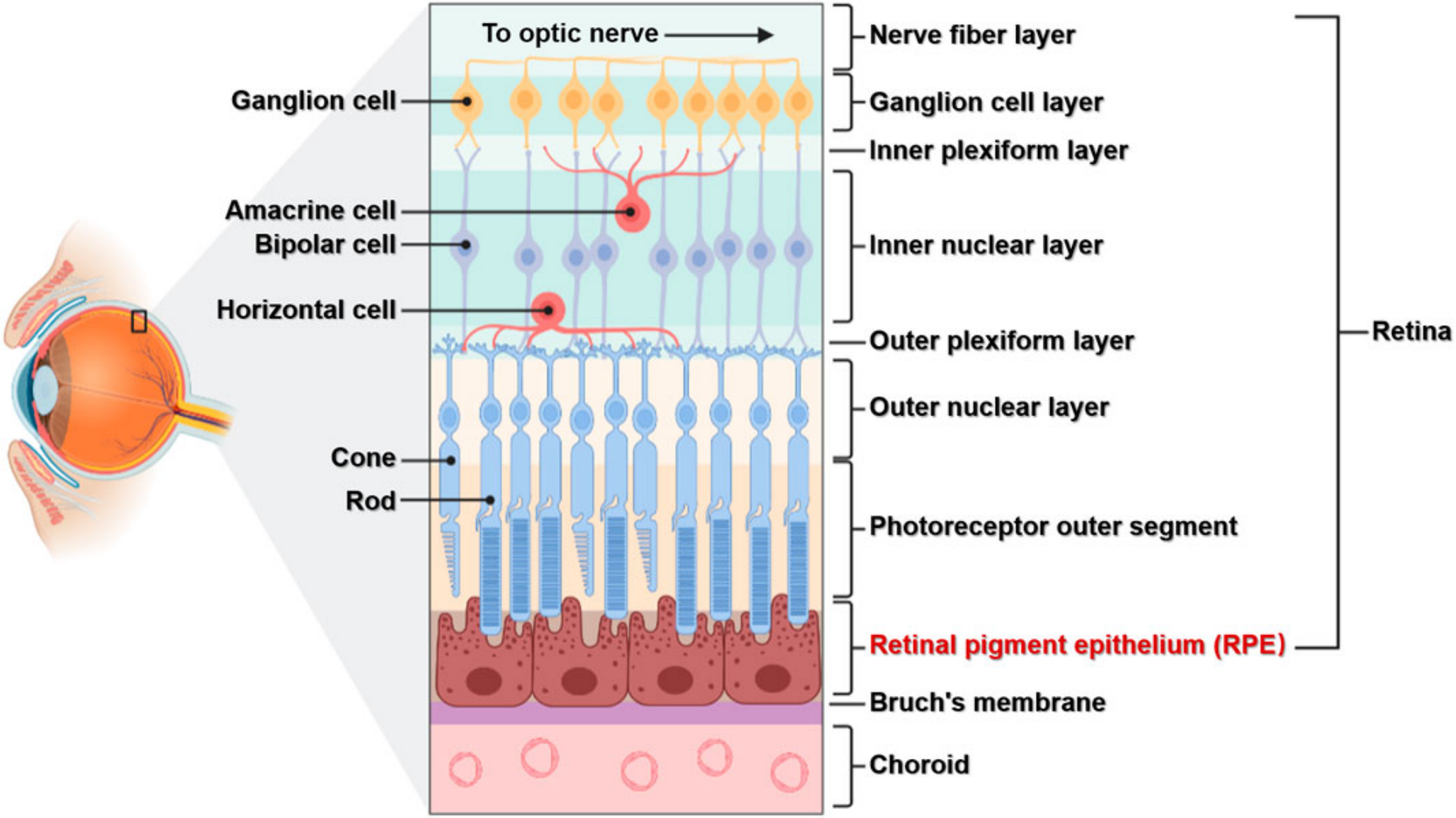


*Optic nerve = axons of the ganglion cells*

# Retina







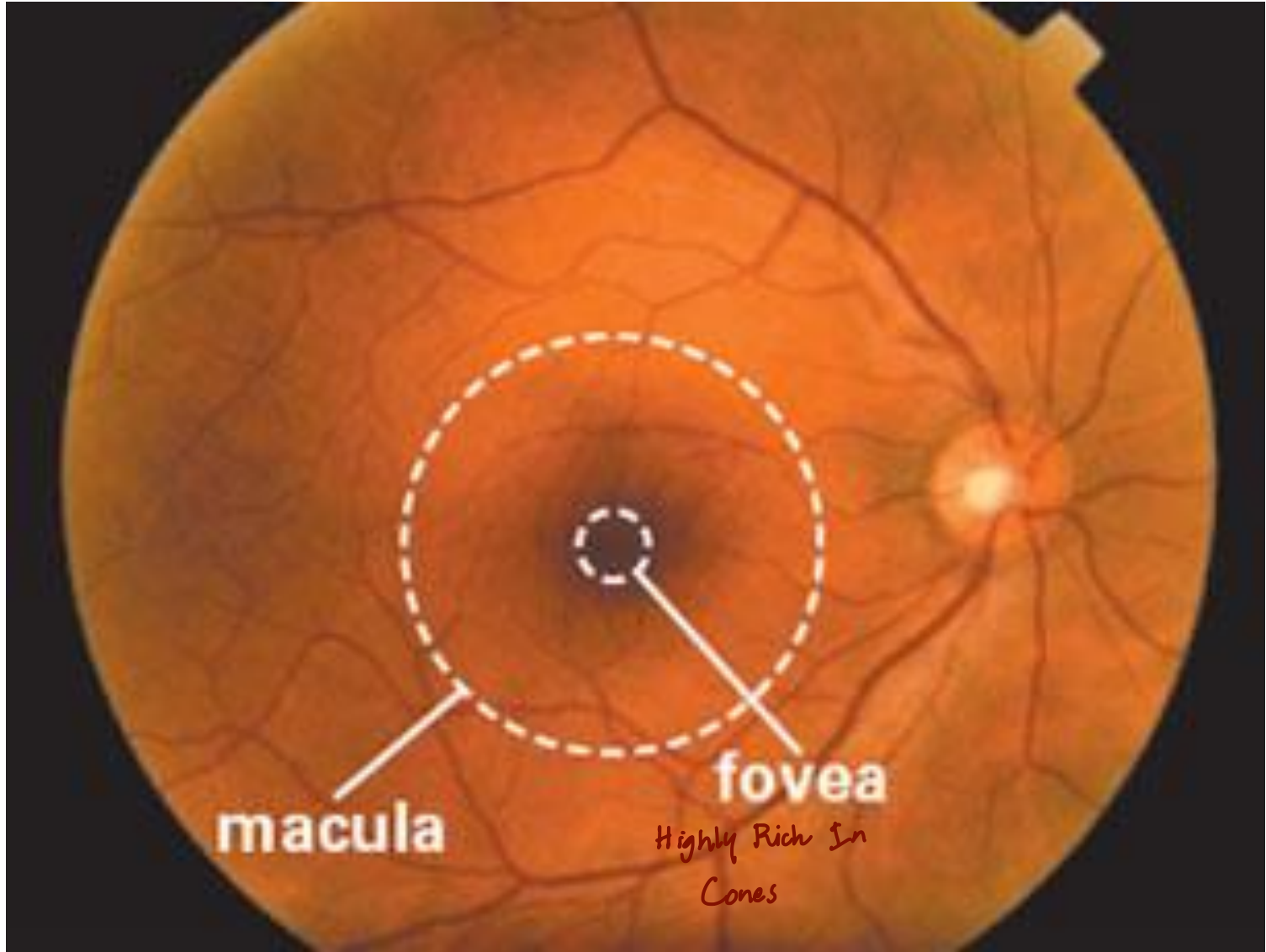
# Retina

- The retina is the light-sensitive tissue that lines the inside of the eye
- Functions in a manner similar to film in a camera
- The optical elements within the eye focus an image onto the retina , initiating a series of chemical and electrical events
- Nerve fibers within the retina send electrical signals to the brain, which then interprets these signals as visual images

# Retina

- The center of the retina provides the greatest resolving power of the eye
- This area, responsible for central vision, is known as the macula
- The center of the macula is called the fovea

# Retina



# Healthy Retina

optic ratio (vertical)

Cup : disc

abnormal :

50-60% <

(as in glaucoma)

Optic Nerve

if on the Rt (Rt eye)

if on the Lt (Lt eye)

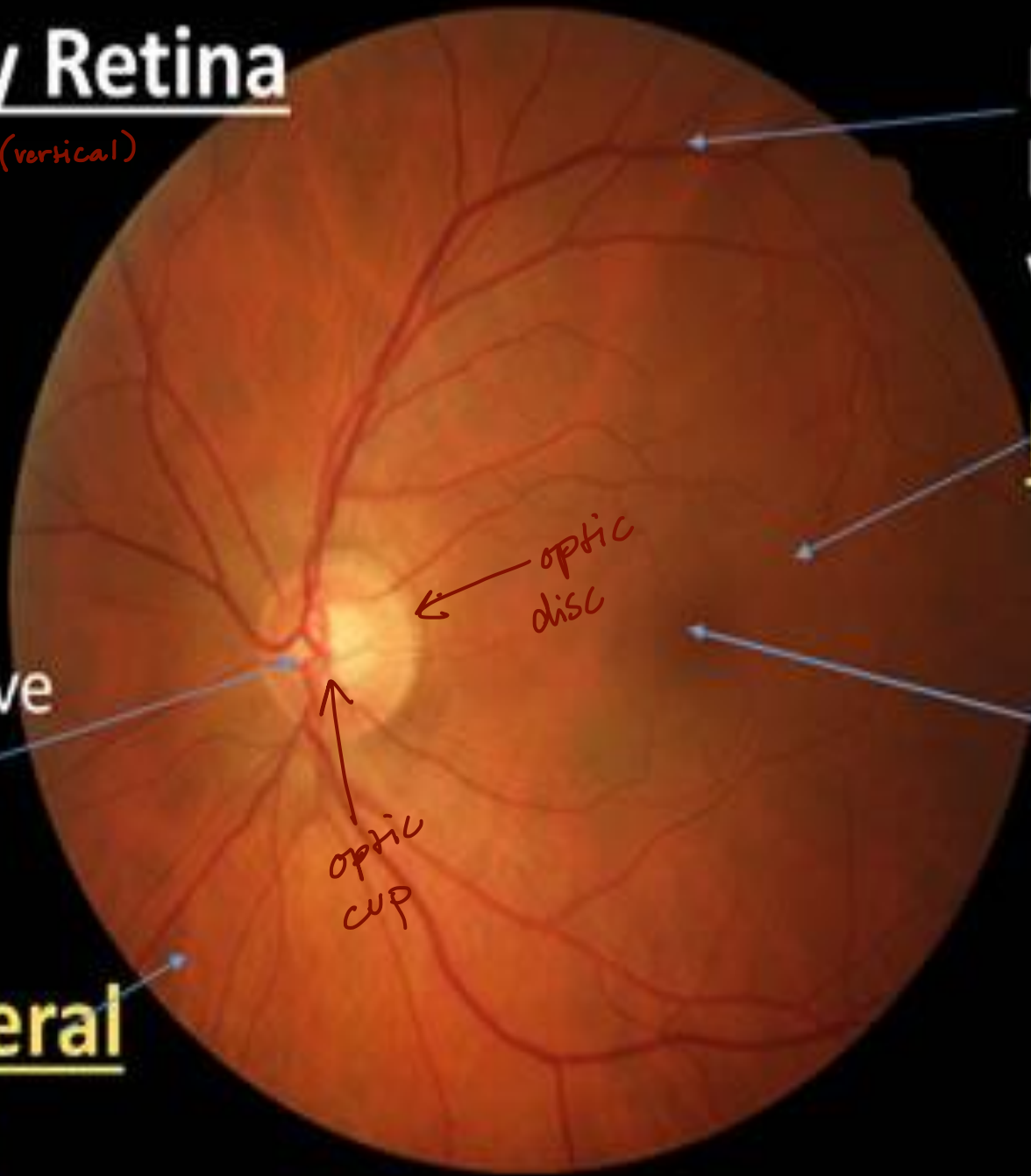
Peripheral

Retina

Retinal blood vessels

Macula

No yellow spots (No drusen)

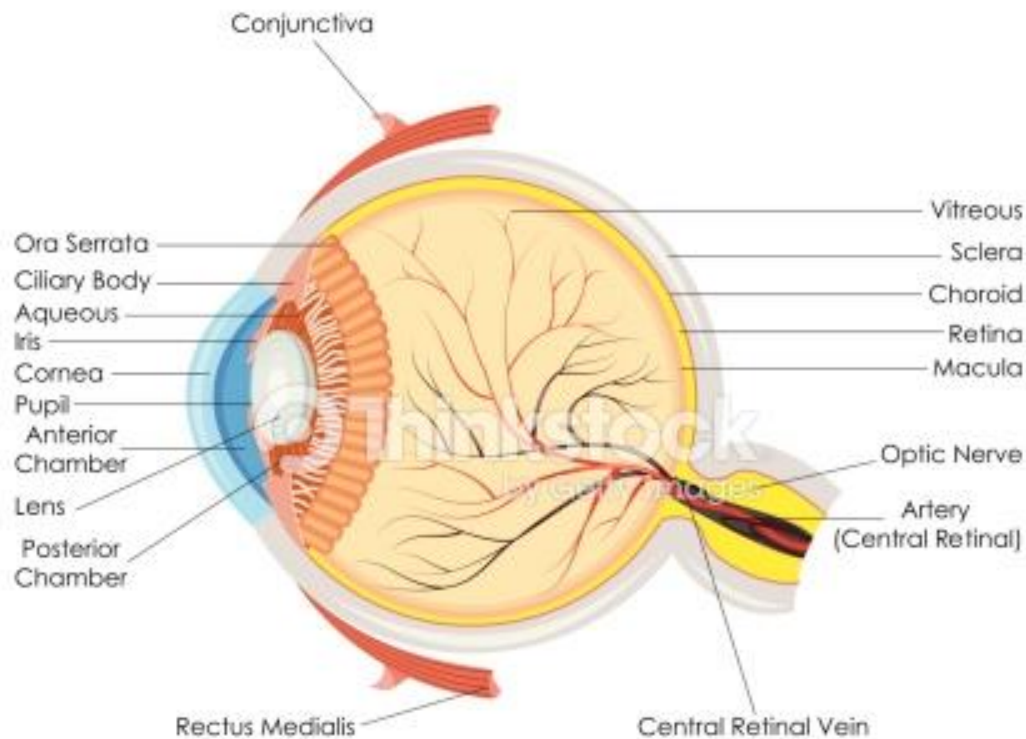


optic disc

optic cup

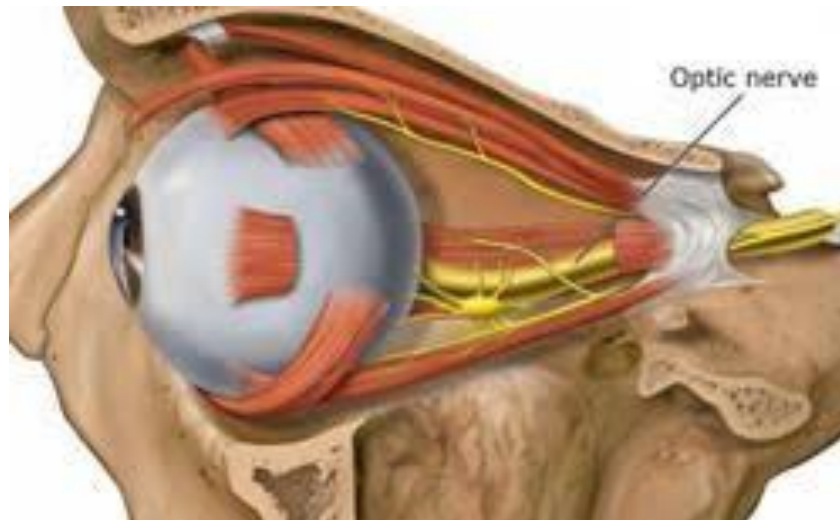


- Peripherally, retina has dentate/teeth like processes called Ora Serrata

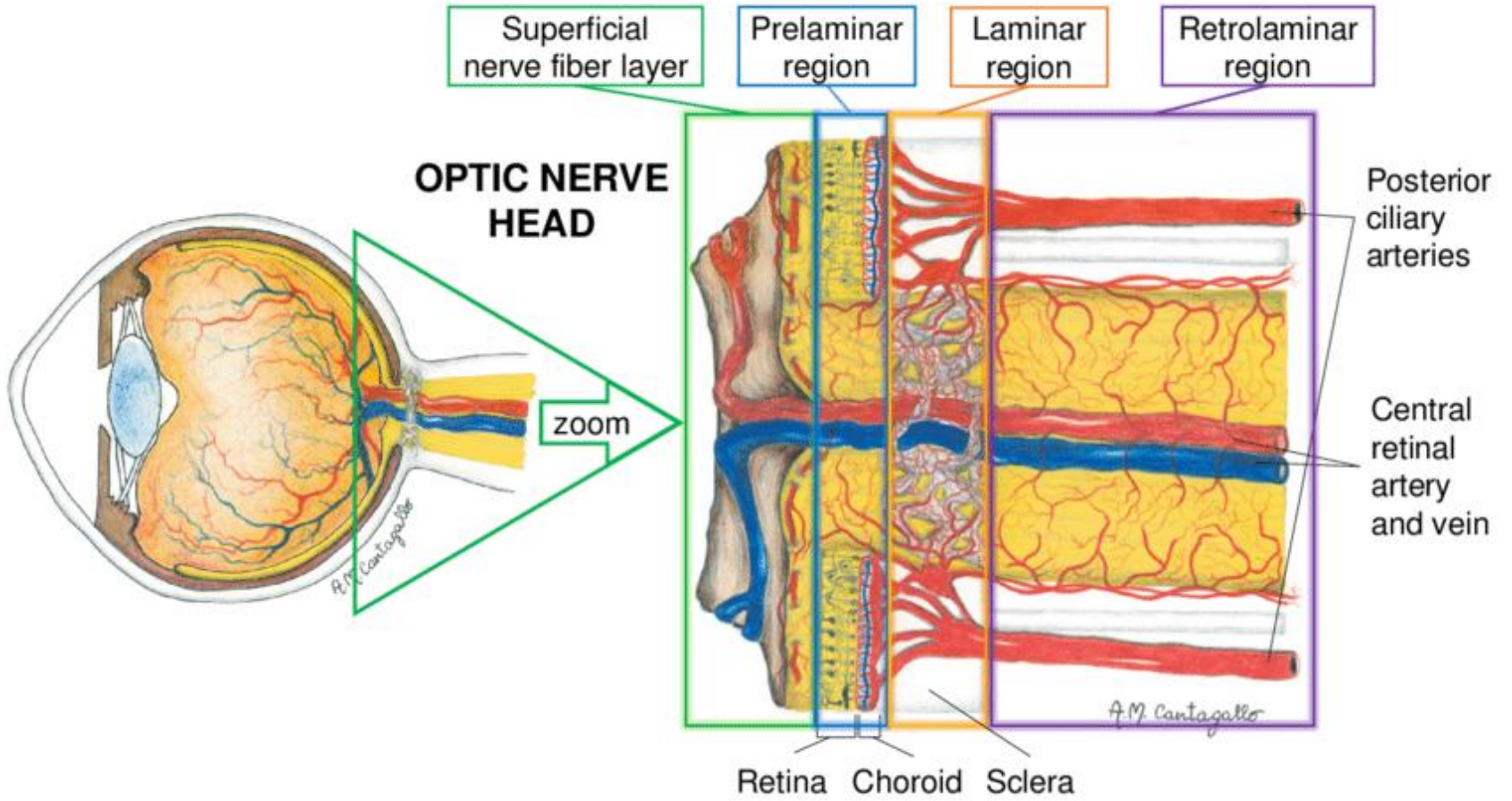


# The Optic Nerve- CN 2

- The optic nerve is formed by the convergence of axons from the retinal ganglion cells.
- These cells in turn receive impulses from the photoreceptors of the eye (the rods and cones).

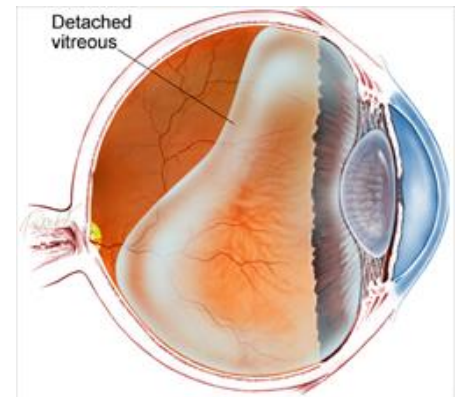


*Lamina cribrosa*



# Vitreous Body

- The vitreous body is the clear gel that fills the space between the lens and the retina.
- Occupies 80% of the volume of the eye
- It is a clear matrix composed of collagen, hyaluronic acid, and water *type II*
- Often referred to as the vitreous humour or simply "the vitreous"

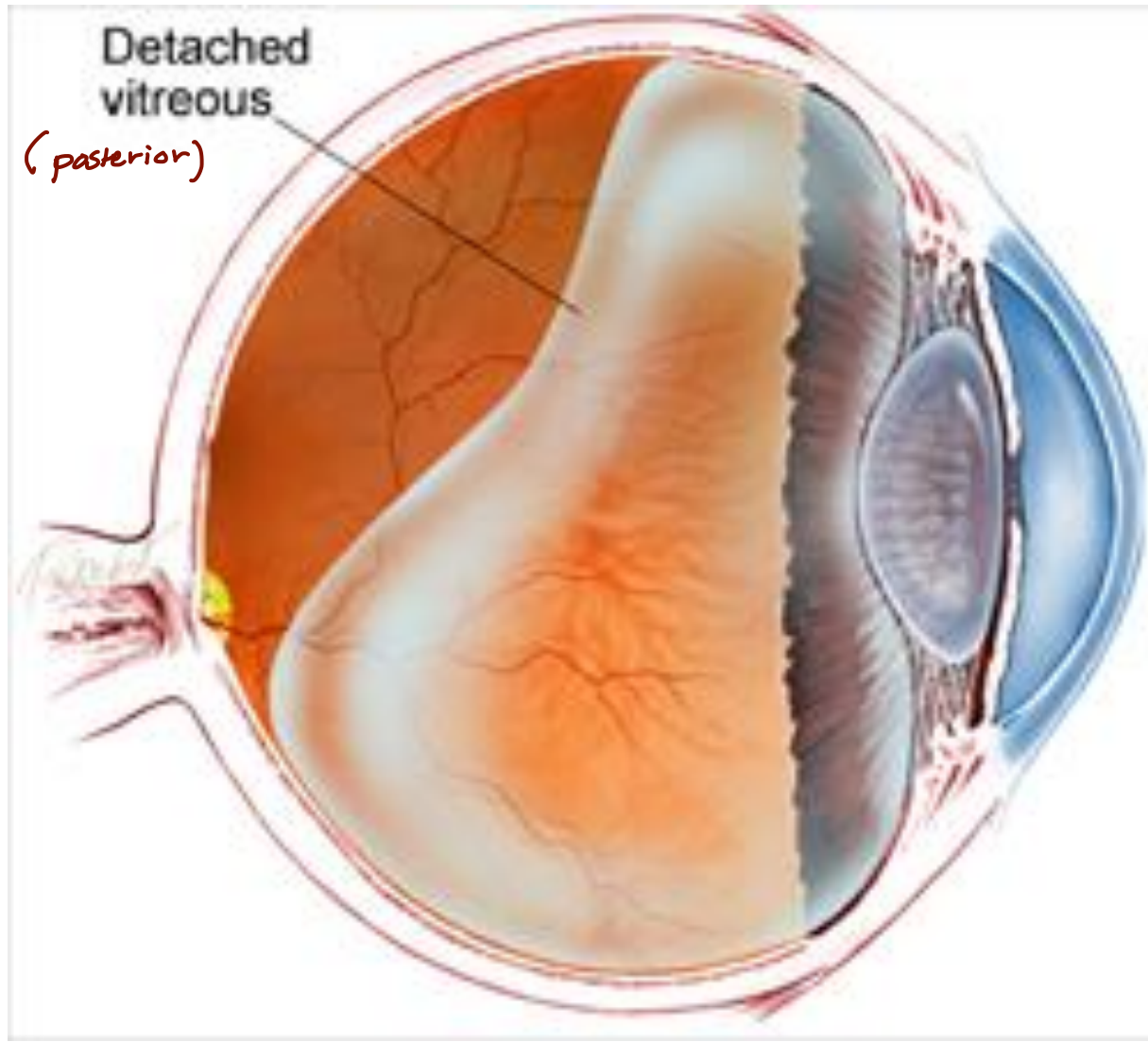


\* Old age (> 80 y.o almost 100%)

\* Might lead to retinal detachment

\* Floaters

↳ if accompanied by: 1. flashes of light / 2. sudden drop of vision /  
3. a black curtain coming down (if superior detachment  
→ curtain inferiorly & vice versa)





The End