Peripheral Nervous System

THE EYEBALL

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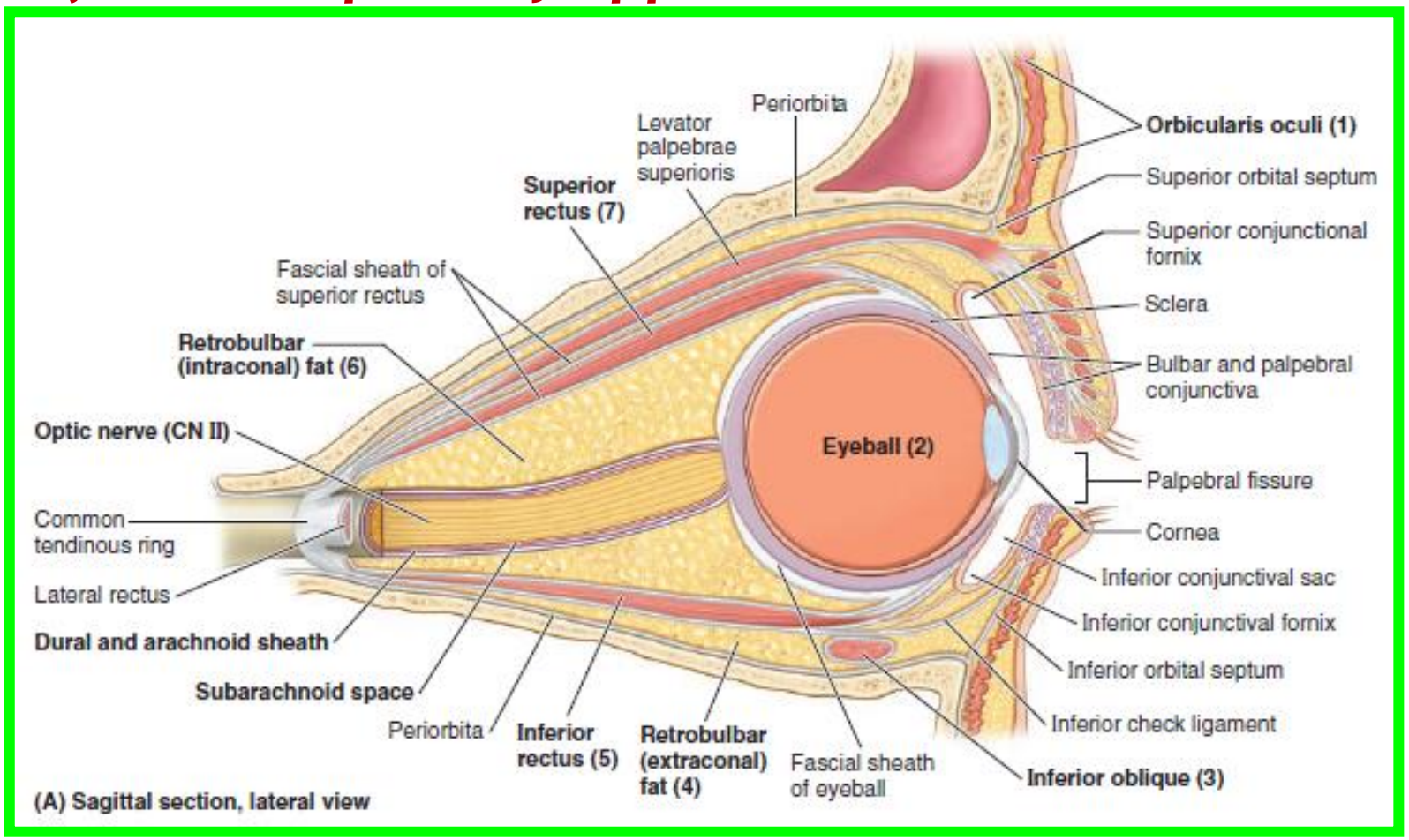
2022-2023

Wednesday 8 March 2023

Eyeball

The eyeball contains the optical apparatus of the visual system. It occupies most of the anterior portion of the orbit, suspended by six extrinsic muscles that control its movements, and a fascial suspensory apparatus

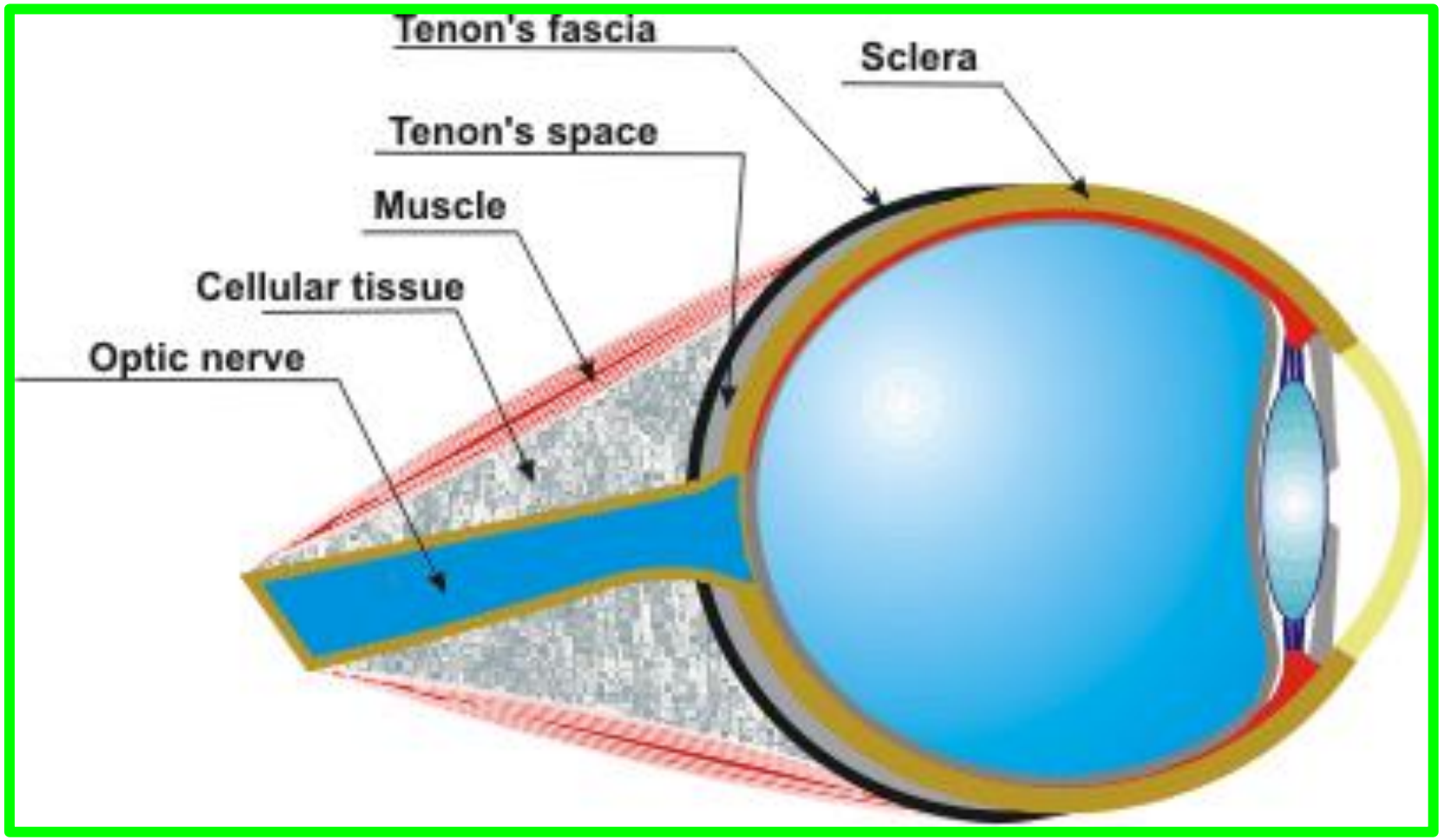
- ***It measures approximately 25 mm in diameter.***
- ***All anatomical structures within the eyeball have a circular or spherical arrangement***



Eyeball

The eyeball proper has three layers; however, there is an additional connective tissue layer that surrounds the eyeball, supporting it within the orbit.

The connective tissue layer is composed posteriorly of the fascial sheath of the eyeball (bulbar fascia or Tenon capsule), which forms the actual socket for the eyeball, and anteriorly of bulbar conjunctiva



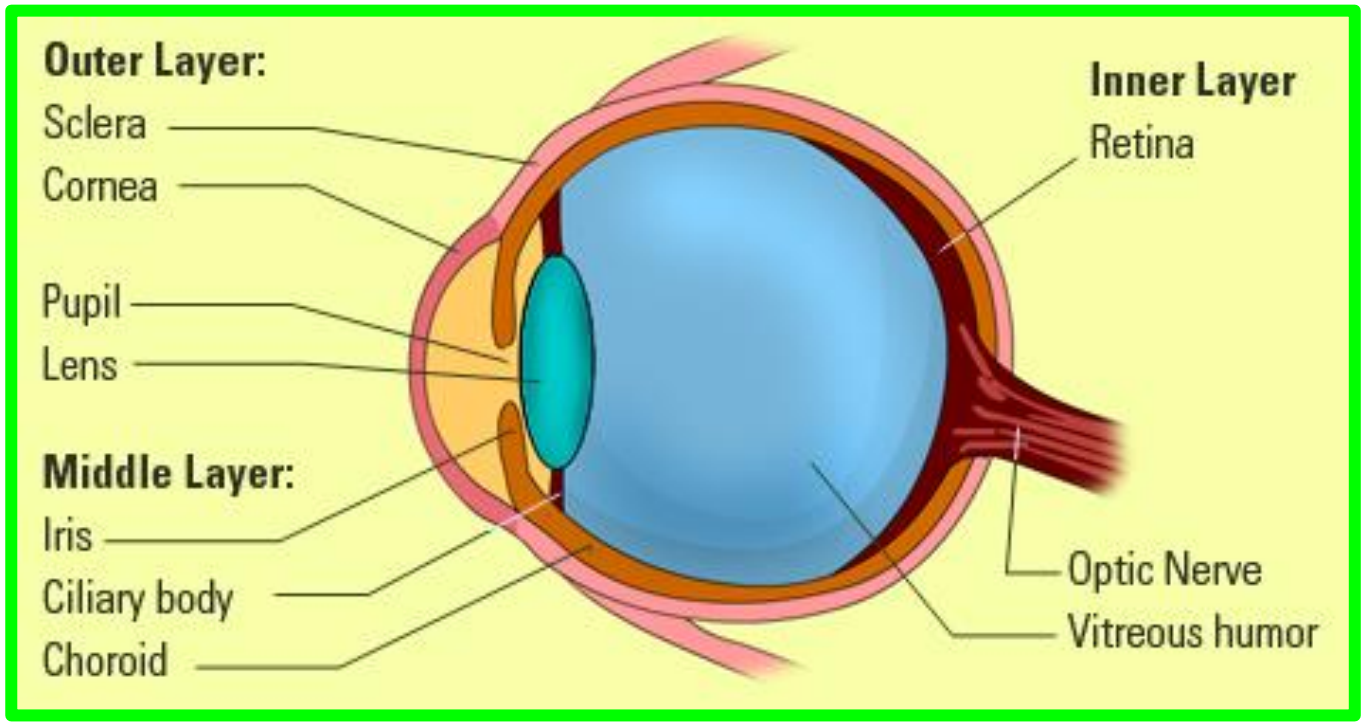
Eyeball

The fascial sheath is the most substantial portion of the suspensory apparatus.

A very loose connective tissue layer, the episcleral space (a potential space), lies between the fascial sheath and the outer layer of the eyeball, facilitating movements of the eyeball within the fascial sheath (Tenon space).

The three layers of the eyeball are the:

1. *Fibrous layer (outer coat), consisting of the sclera and cornea*
2. *Vascular layer (middle coat), consisting of the choroid, ciliary body, and iris*
3. *Inner layer (inner coat), consisting of the retina, which has both optic and nonvisual parts*



Eyeball

1. FIBROUS LAYER OF EYEBALL

The fibrous layer of the eyeball is the external fibrous skeleton of the eyeball, providing shape and resistance. The sclera is the tough opaque part of the fibrous layer (coat) of the eyeball, covering the posterior five sixths of the eyeball and providing attachment for both the extrinsic (extra-ocular) and the intrinsic muscles of the eye

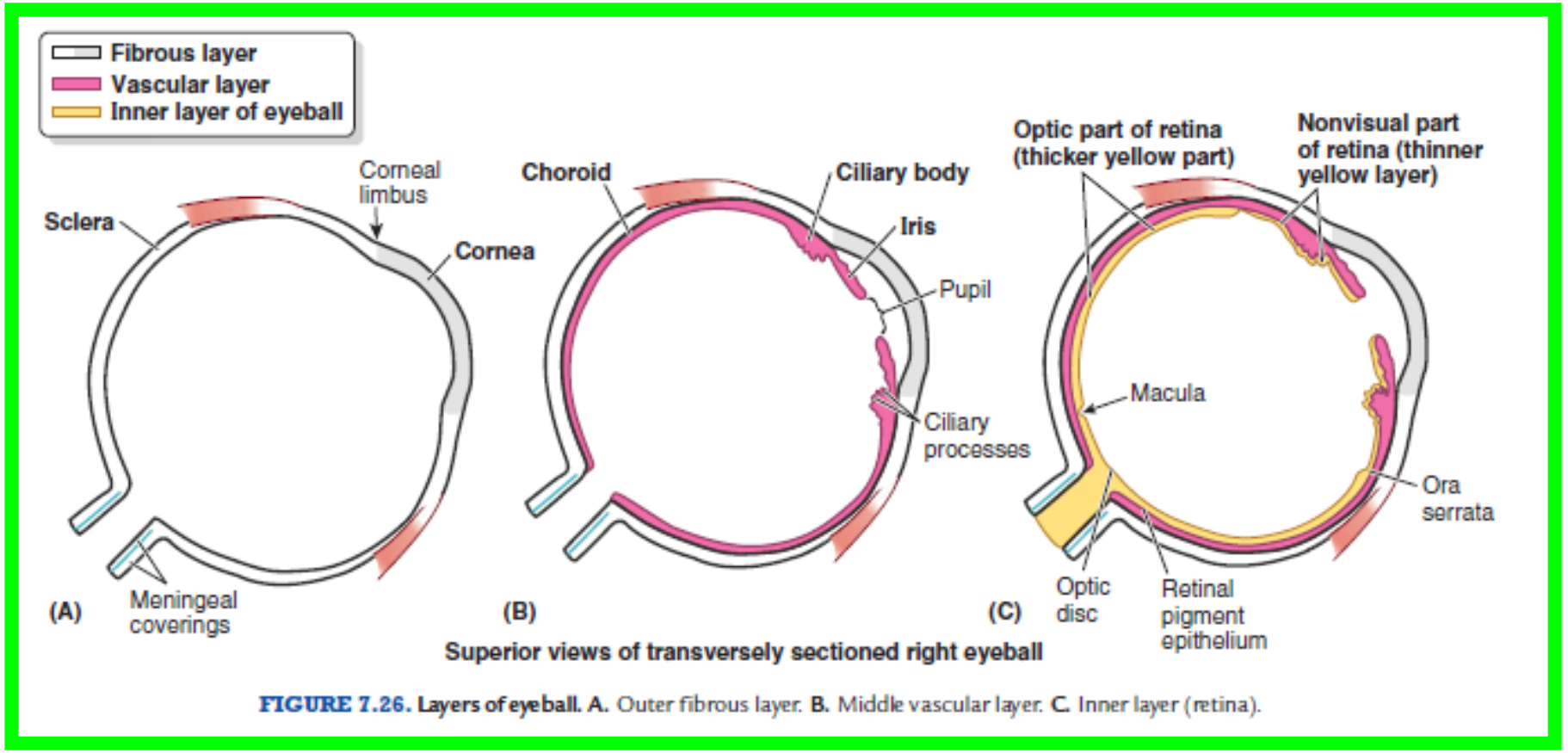


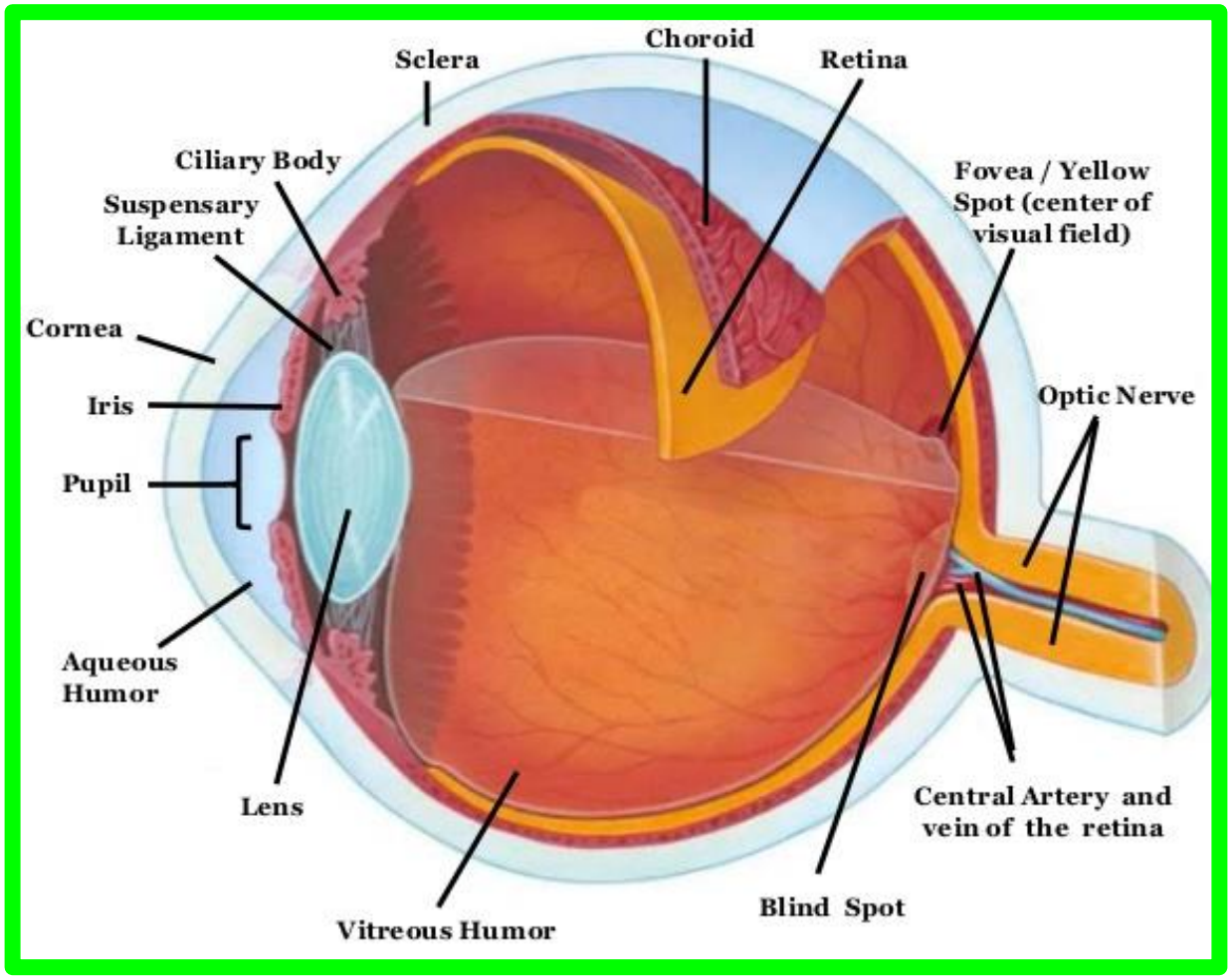
FIGURE 7.26. Layers of eyeball. A. Outer fibrous layer. **B.** Middle vascular layer. **C.** Inner layer (retina).

1. FIBROUS LAYER OF EYEBALL

The anterior part of the sclera is visible through the transparent bulbar conjunctiva as "the white of the eye" .

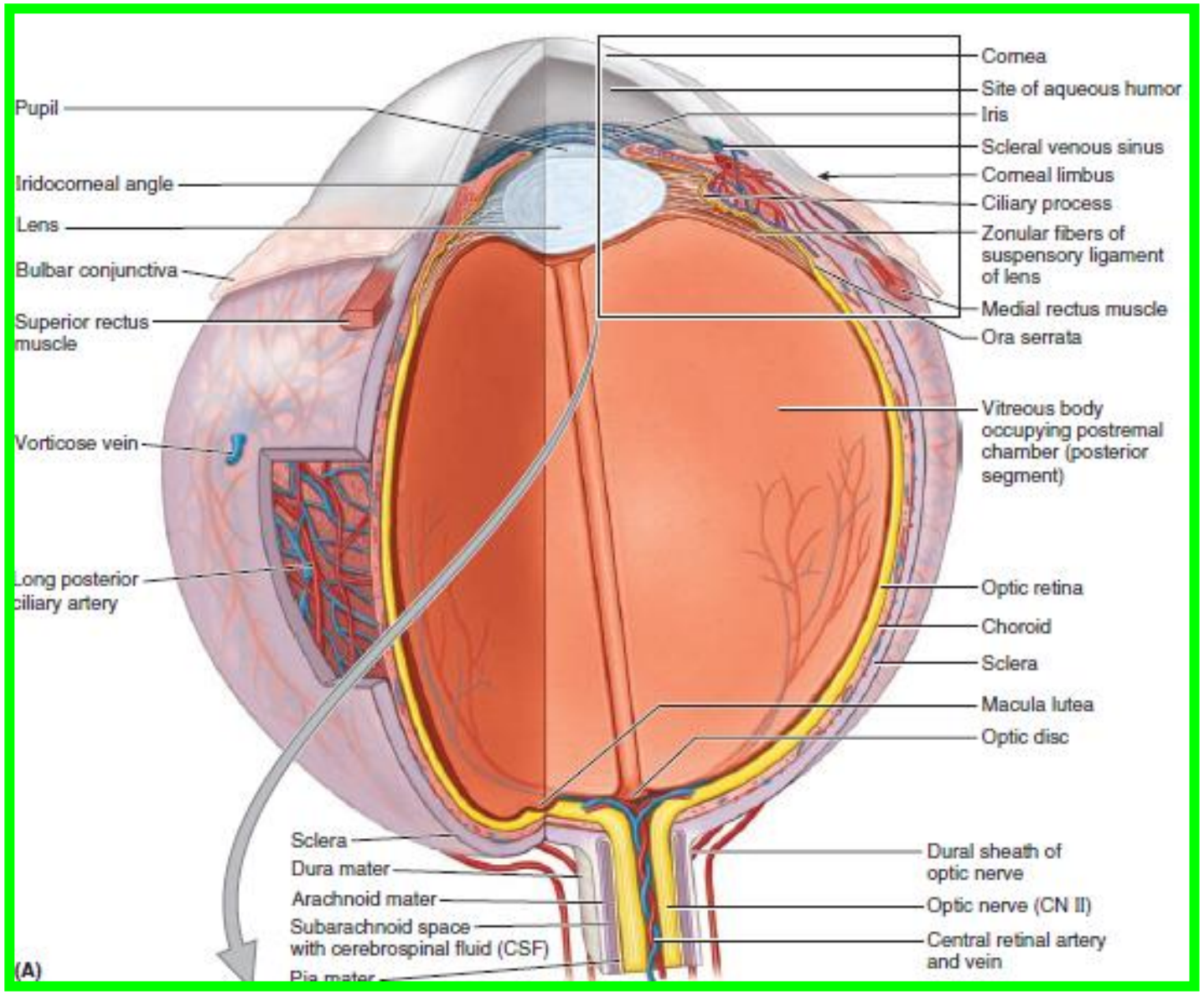
The cornea is the transparent part of the fibrous layer covering the anterior one sixth of the eyeball.

The convexity of the cornea is greater than that of the sclera and so it appears to protrude from the eyeball when viewed laterally.



1. FIBROUS LAYER OF EYEBALL

Whereas the sclera is relatively avascular, the cornea is completely avascular, receiving its nourishment from capillary beds around its periphery and fluids on its external and internal surfaces, the lacrimal fluid and aqueous humor, respectively .

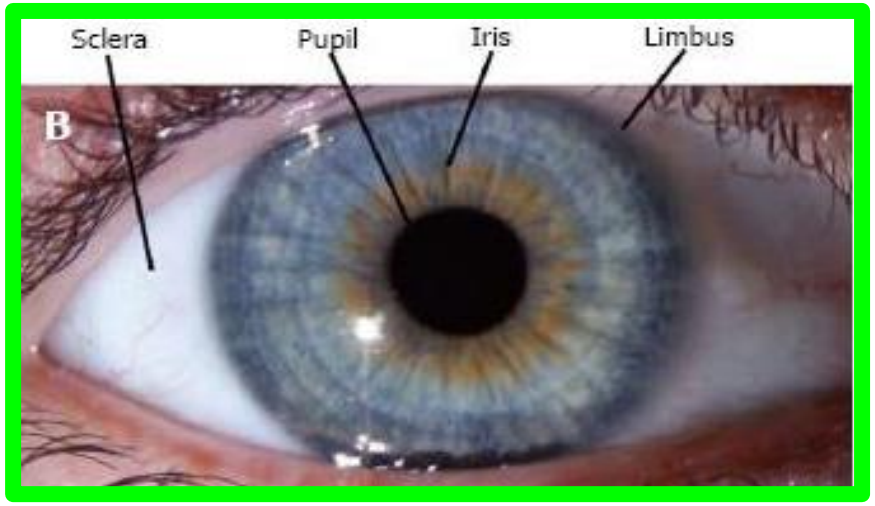


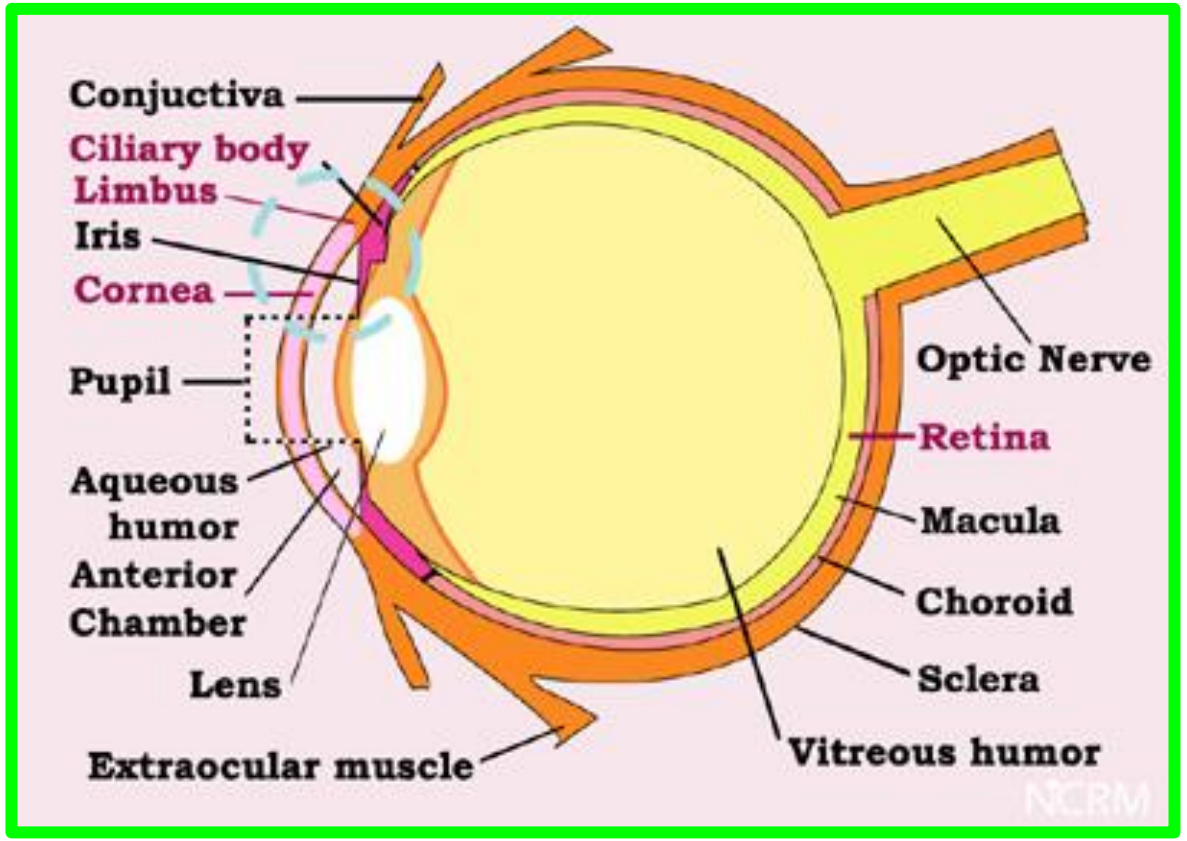
Lacrimal fluid also provides oxygen absorbed from the air

1. FIBROUS LAYER OF EYEBALL

The cornea is highly sensitive to touch; its innervation is provided by the ophthalmic nerve (CN V1). Even very small foreign bodies (e.g., dust particles) elicit blinking, flow of tears, and sometimes severe pain. Drying of the corneal surface may cause ulceration

The limbus of the cornea is the angle formed by the intersecting curvatures of sclera and cornea at the corneoscleral Junction.





The junction is a 1-mm wide, gray, and translucent circle including numerous capillary loops involved in nourishing the avascular cornea.

2. VASCULAR LAYER OF EYEBALL

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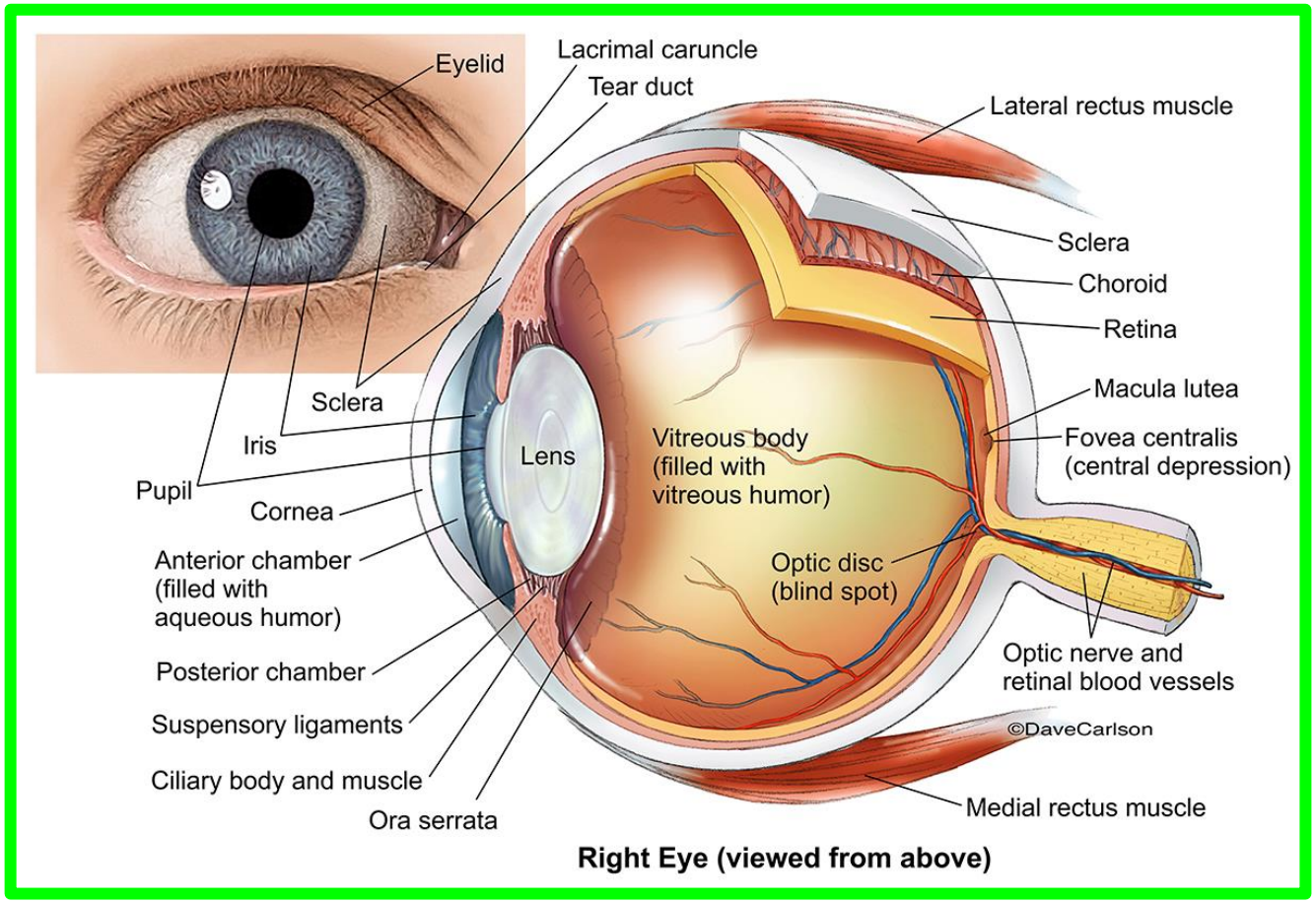
The vascular layer of the eyeball (also called the uvea or uveal tract) consists of the choroid, ciliary body, and iris.

The choroid, a dark reddish-brown layer between the sclera and the retina, forms the largest part of the vascular layer of the eyeball and lines most of the sclera.



Within this pigmented and dense vascular bed, larger vessels are located externally (near the sclera).

2. VASCULAR LAYER OF EYEBALL

The finest vessels *(the capillary lamina of the choroid or* ***choriocapillaris,*** *an extensive capillary bed) are innermost, adjacent to* ***the avascular light-sensitive layer of the retina,*** *which it supplies with oxygen and nutrients. Engorged with blood in life (it has the highest perfusion rate per gram of tissue of all vascular beds of the body),*

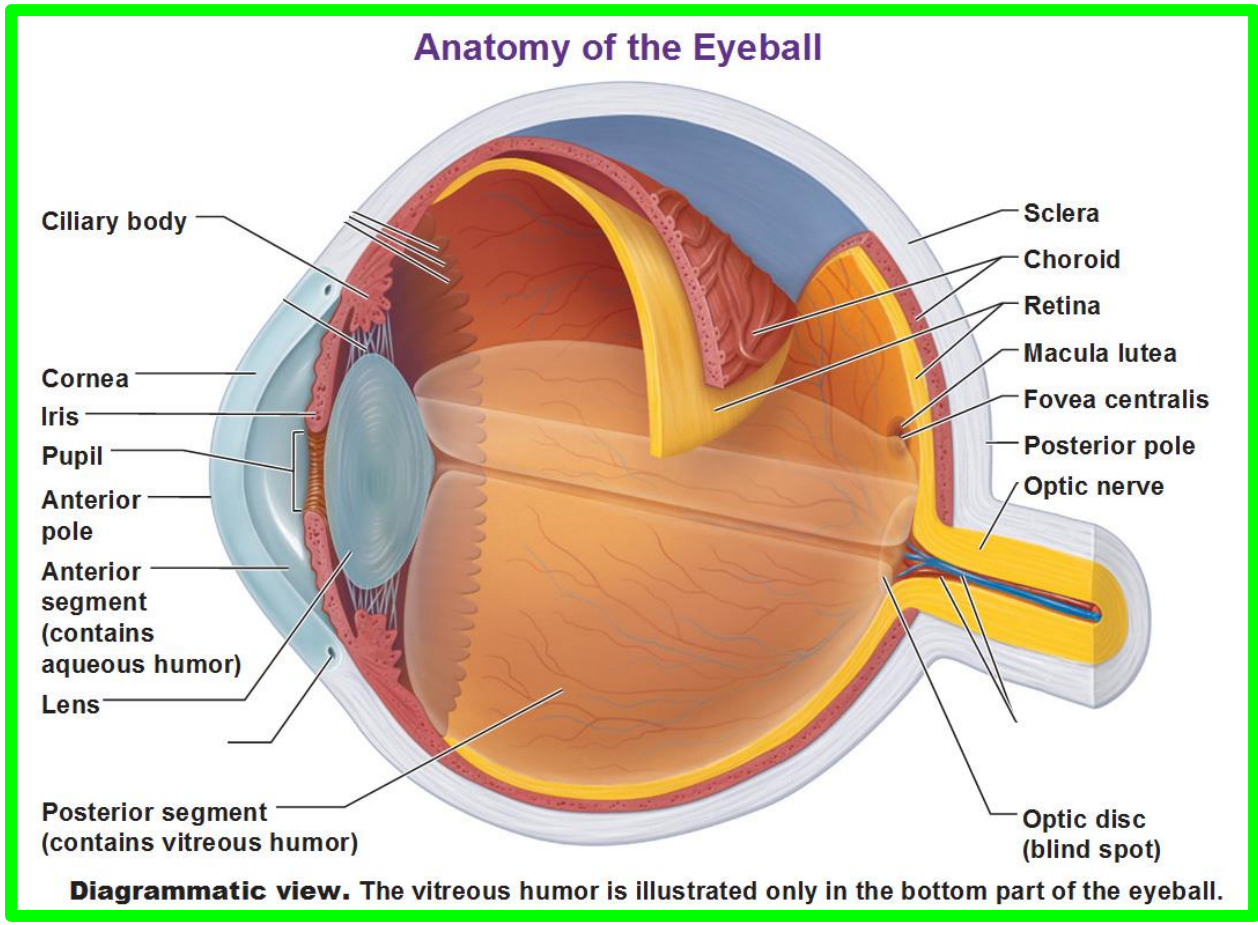
this layer is responsible for the "red eye" reflection that occurs in flash photography

2. VASCULAR LAYER OF EYEBALL

✓*The ciliary body is a ring-like thickening of the layer posterior to the corneoscleral junction that is muscular as well as vascular.*

✓*It connects the choroid with the circumference of the iris.*

✓*The ciliary body provides attachment for the lens.*



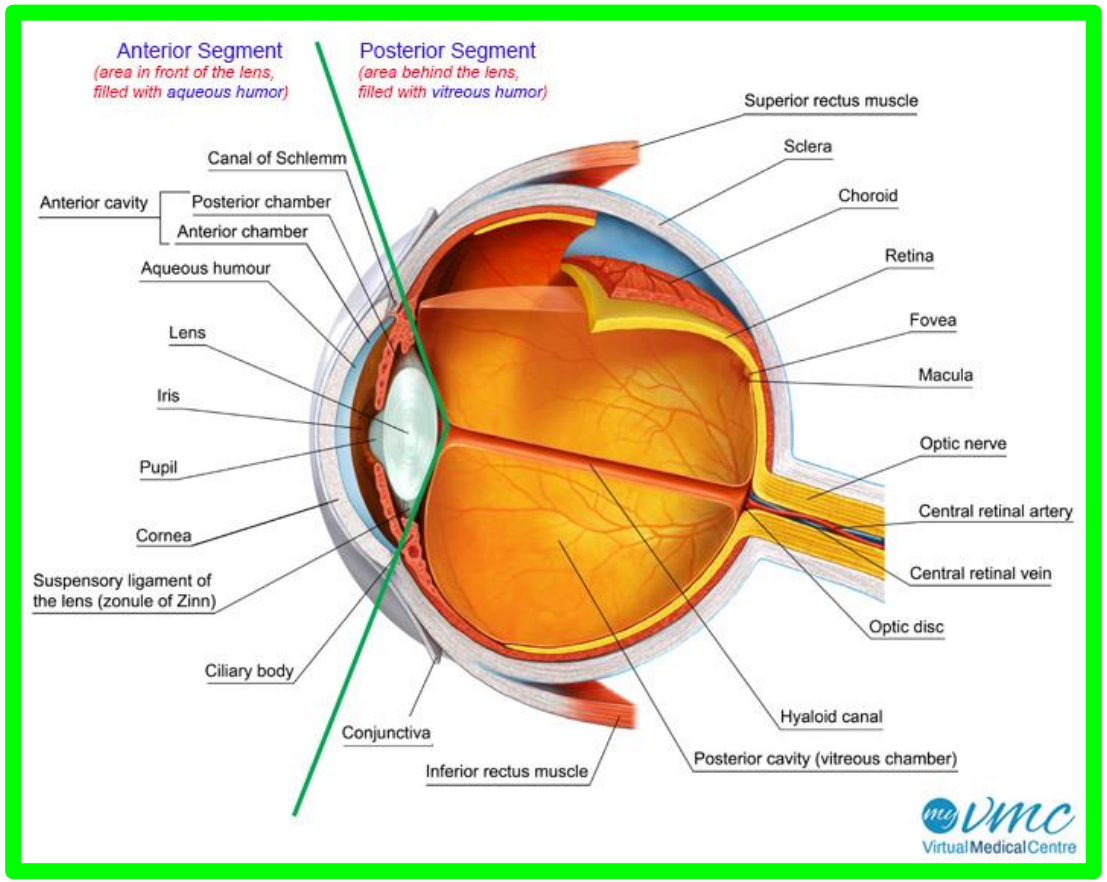
Diagrammatic view. The vitreous humor is illustrated only in the bottom part of the eyeball.

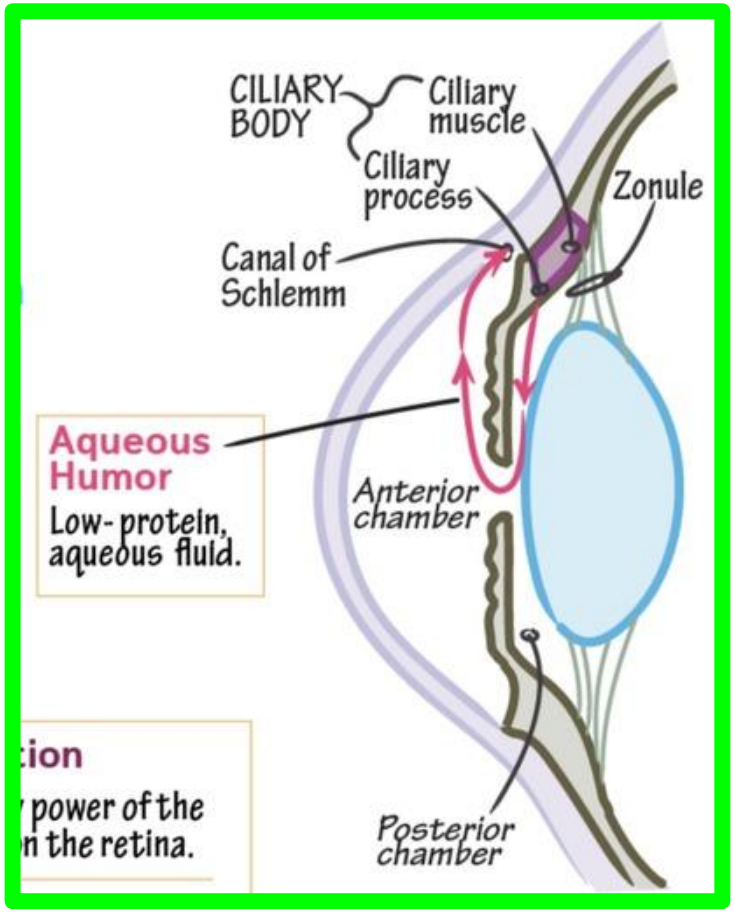
✓*The contraction and relaxation of the circularly arranged smooth muscle of the ciliary body controls thickness, and therefore the focus, of the lens.*

2. VASCULAR LAYER OF EYEBALL

✓Folds on the internal surface of the ciliary body, the ciliary processes, secrete aqueous humor.

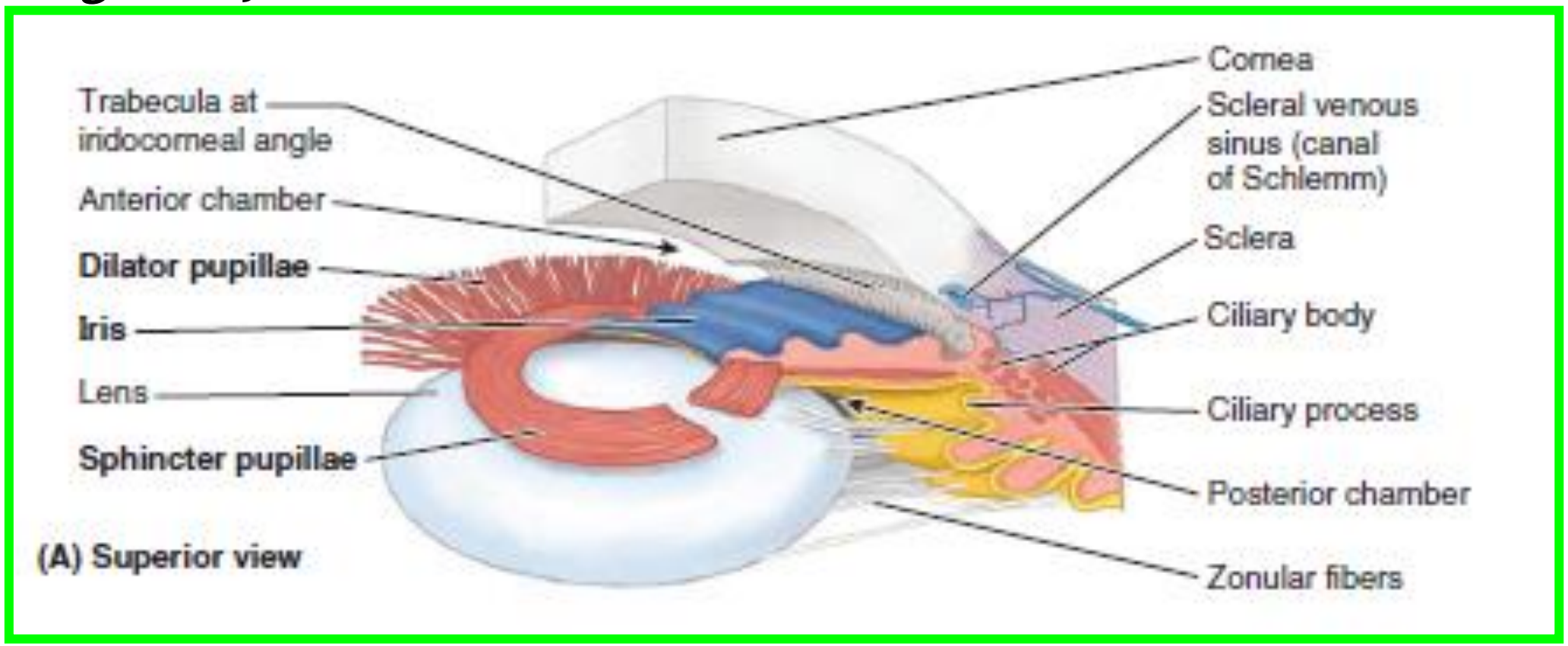
✓Aqueous humor fills the anterior segment of the eyeball, the interior of the eyeball anterior to the lens, suspensory ligament, and ciliary body .





2. VASCULAR LAYER OF EYEBALL

***The iris*, which literally lies on the anterior surface of the lens, is a *thin contractile diaphragm* with a central aperture, *the pupil*, for transmitting light . When awake, the size of the pupil varies continually to regulate the amount of light entering the eye**

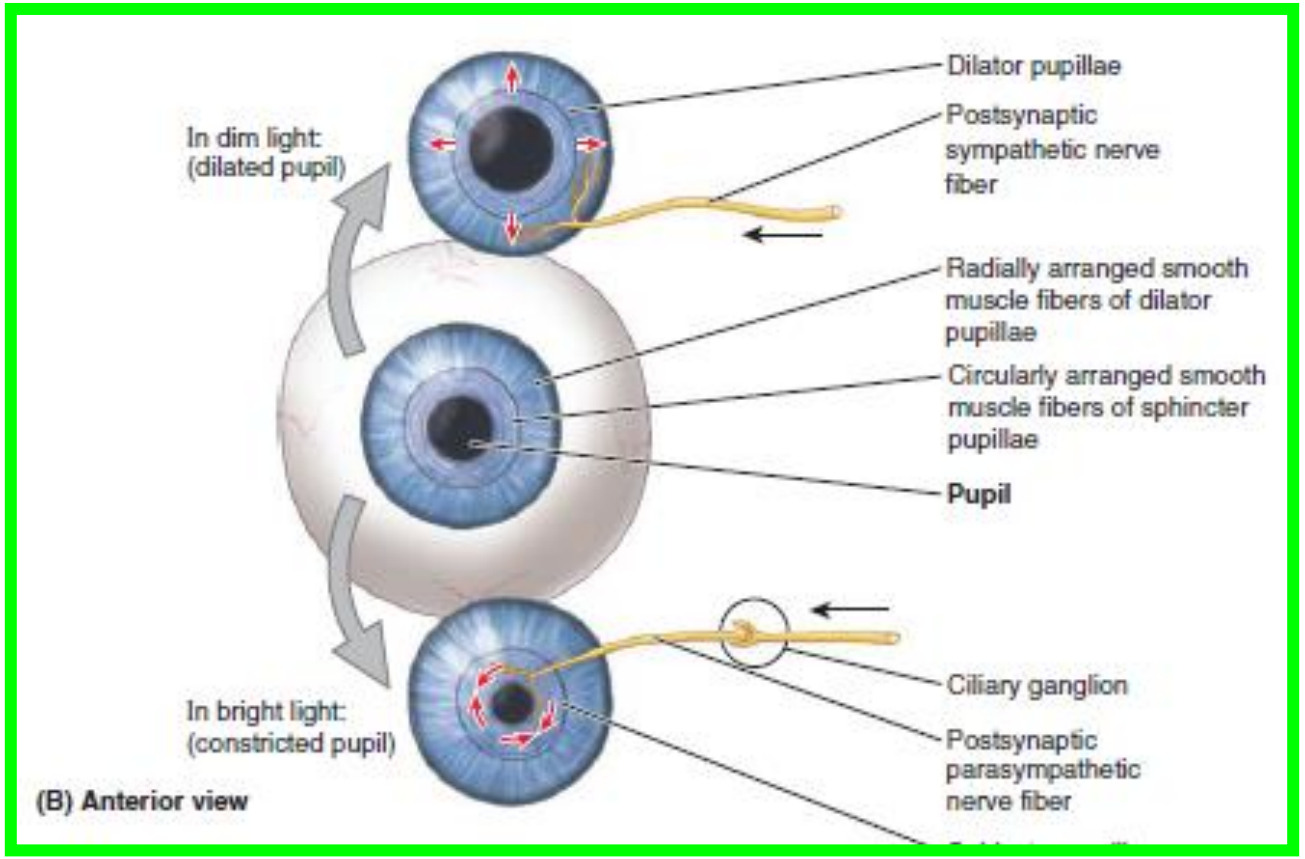


2. VASCULAR LAYER OF EYEBALL

Two involuntary muscles control the size of the pupil:

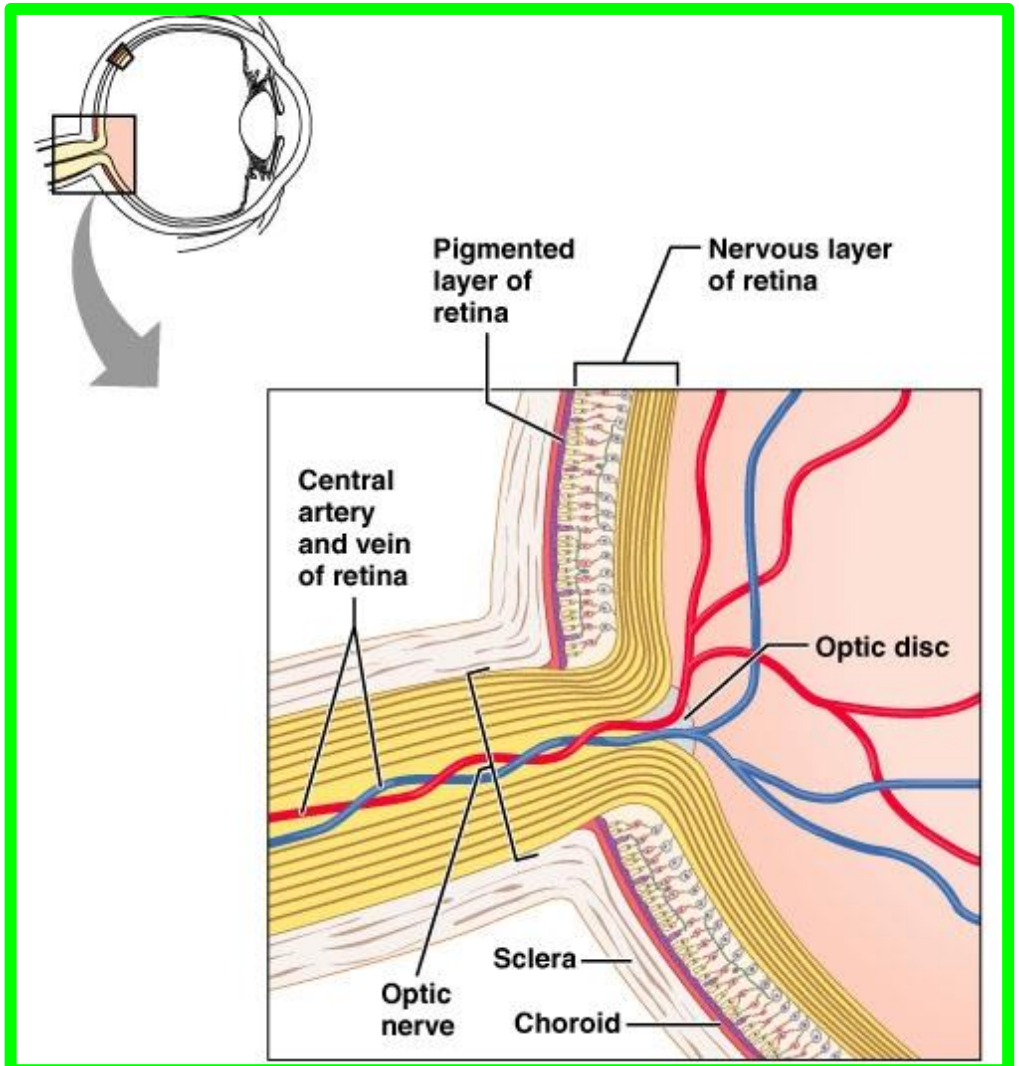
- ***the parasympathetically stimulated, circularly arranged sphincter pupillae decreases its diameter (constrict or contracts the pupil, pupillary miosis)***

- ***and the sympathetically stimulated, radially arranged dilator pupillae increases its diameter (dilates the pupil).***



3. INNER LAYER OF EYEBALL

- ***The inner layer of the eyeball is the retina.***
- ***It consists grossly of two functional parts with distinct locations: the optic and nonvisual parts.***



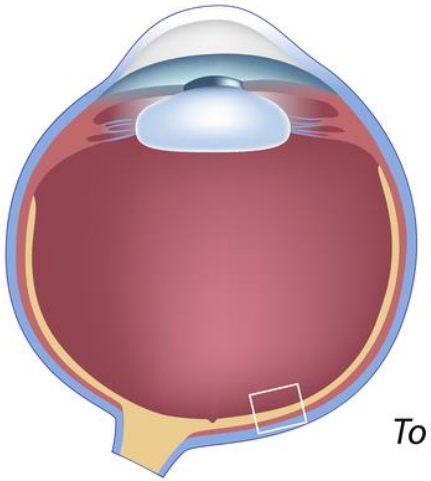
✓ ***A. The optic part of the retina;***
is sensitive to visual light rays and has two layers:

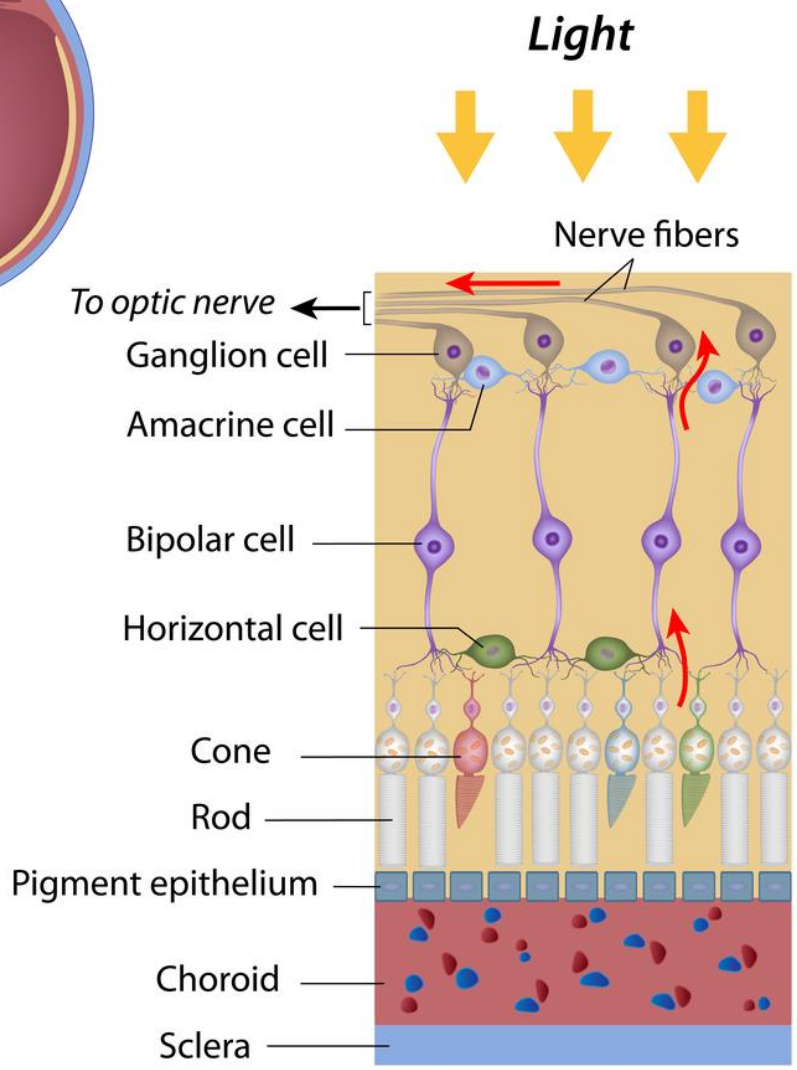
a neural layer and pigmented layer.

3. INNER LAYER OF EYEBALL

***The neural layer* is light receptive.**

***The pigmented layer* consists of a single layer of cells that reinforces the light-absorbing property of the choroid in reducing the scattering of light in the eyeball**

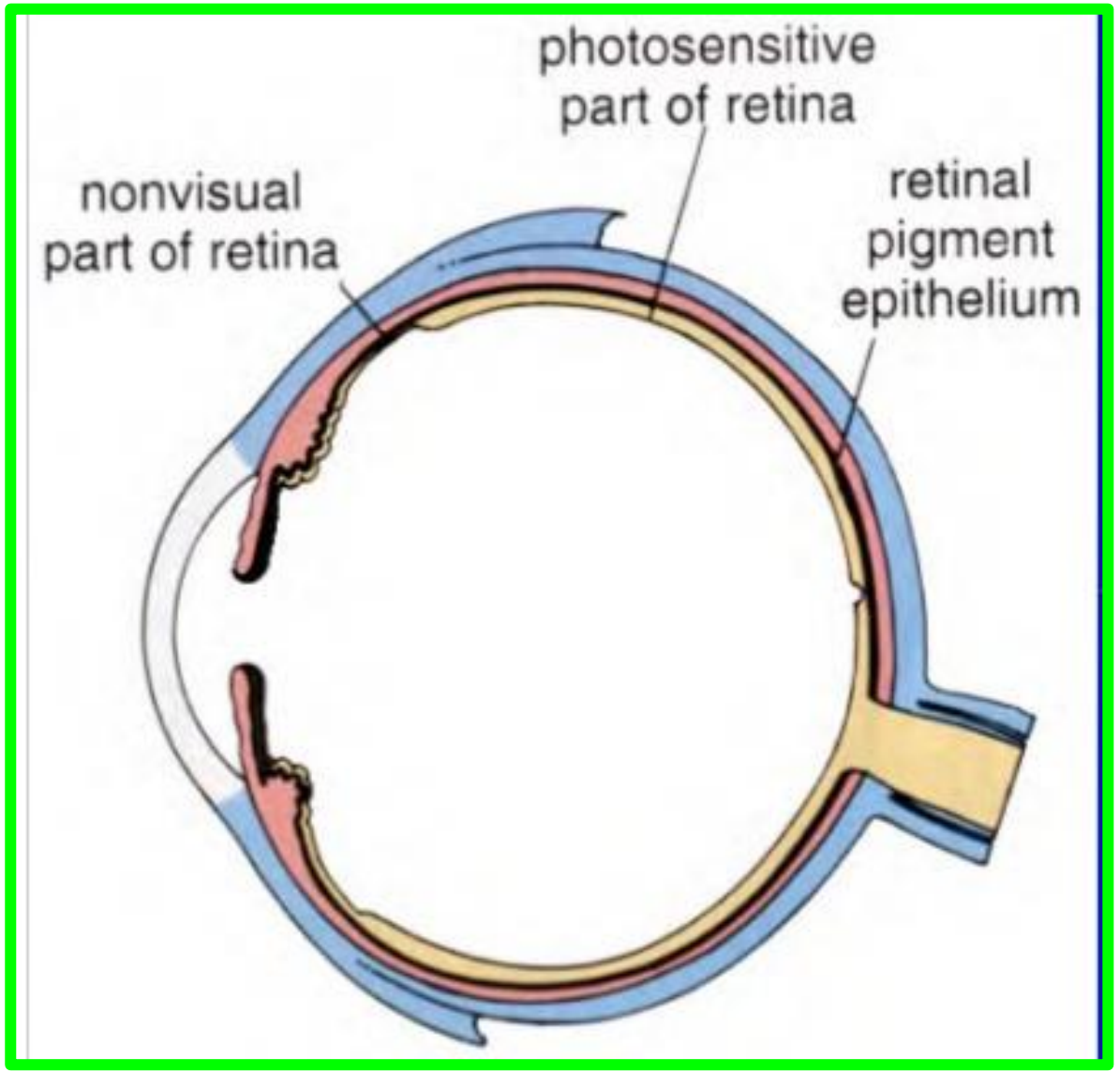




3. INNER LAYER OF EYEBALL

✓ **B. The nonvisual retina** *is an anterior continuation of the pigmented layer and a layer of supporting cells.*

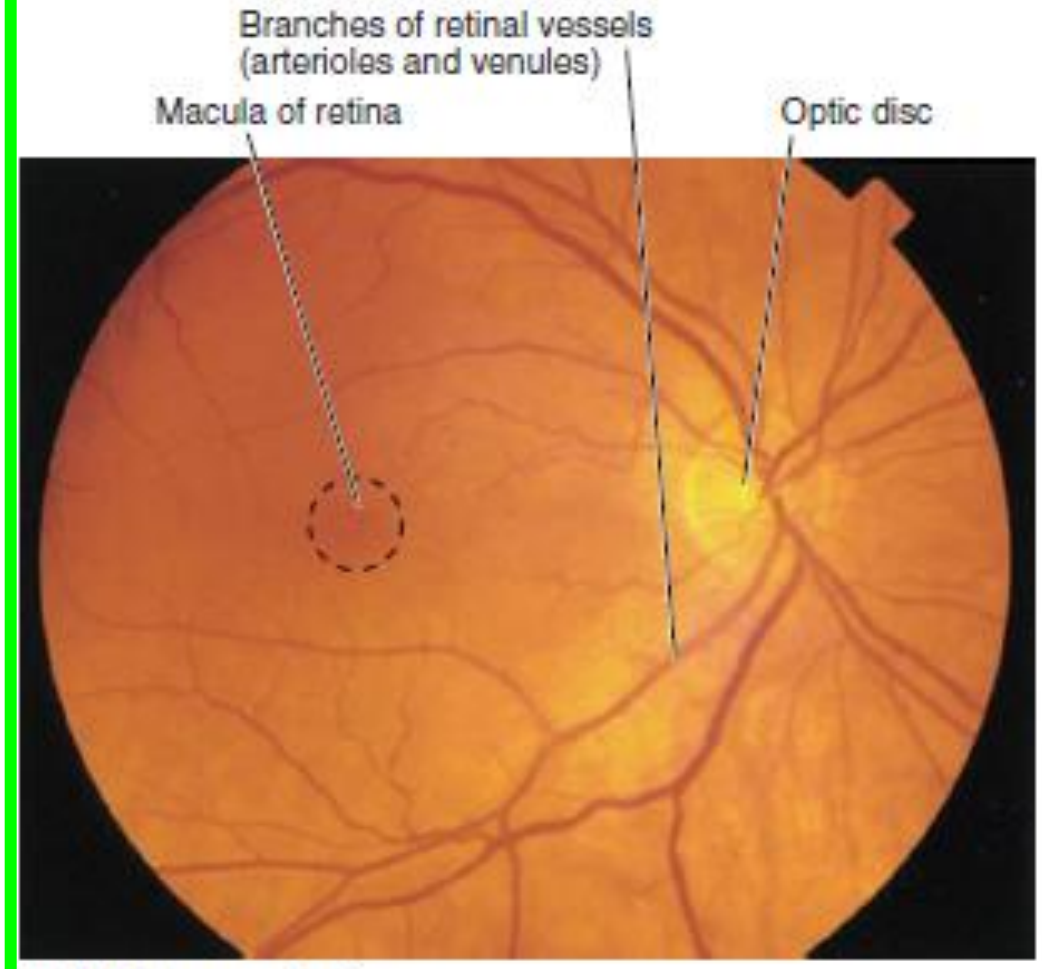
The nonvisual retina *extends over* **the ciliary body** *(ciliary part of the retina) and the posterior surface of* **the iris** *(iridial part of the retina) to the pupillary margin*



3. INNER LAYER OF EYEBALL

Clinically, the internal aspect of the posterior part of the eyeball, where light entering the eyeball is focused, is referred to as the fundus of the eyeball (ocular fundus).

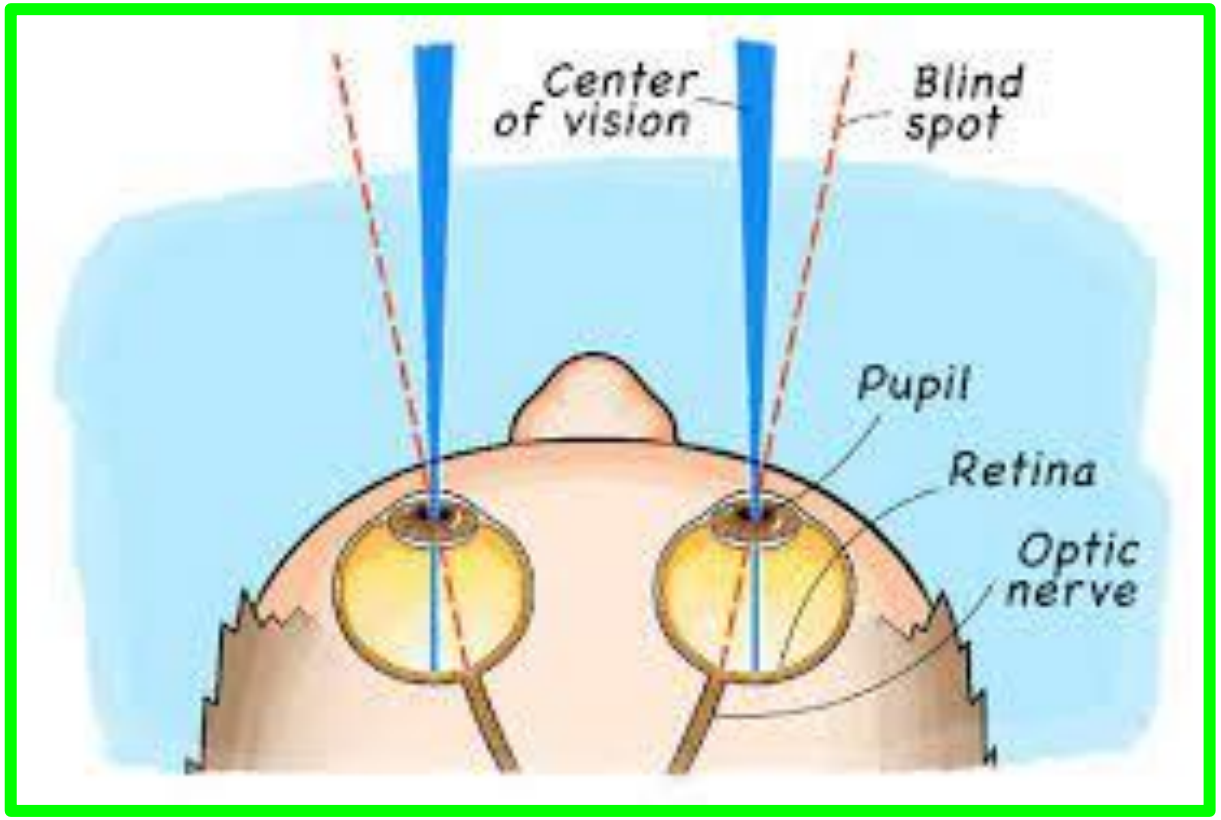
The retina of the fundus includes a distinctive circular area, the optic disc (optic papilla), where the sensory fibers and vessels conveyed by the optic nerve (CN II) enter and radiate to the eyeball.

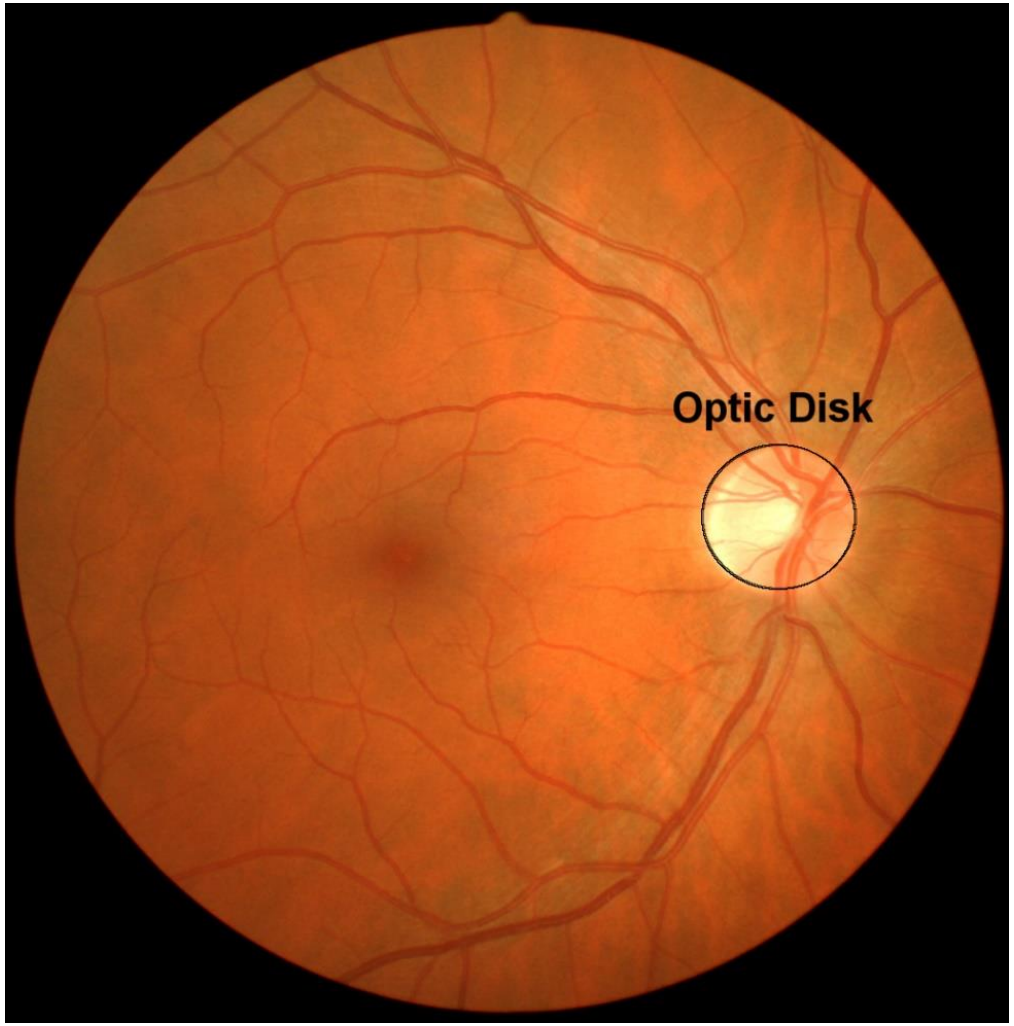


Ophthalmoscopic view

3. INNER LAYER OF EYEBALL

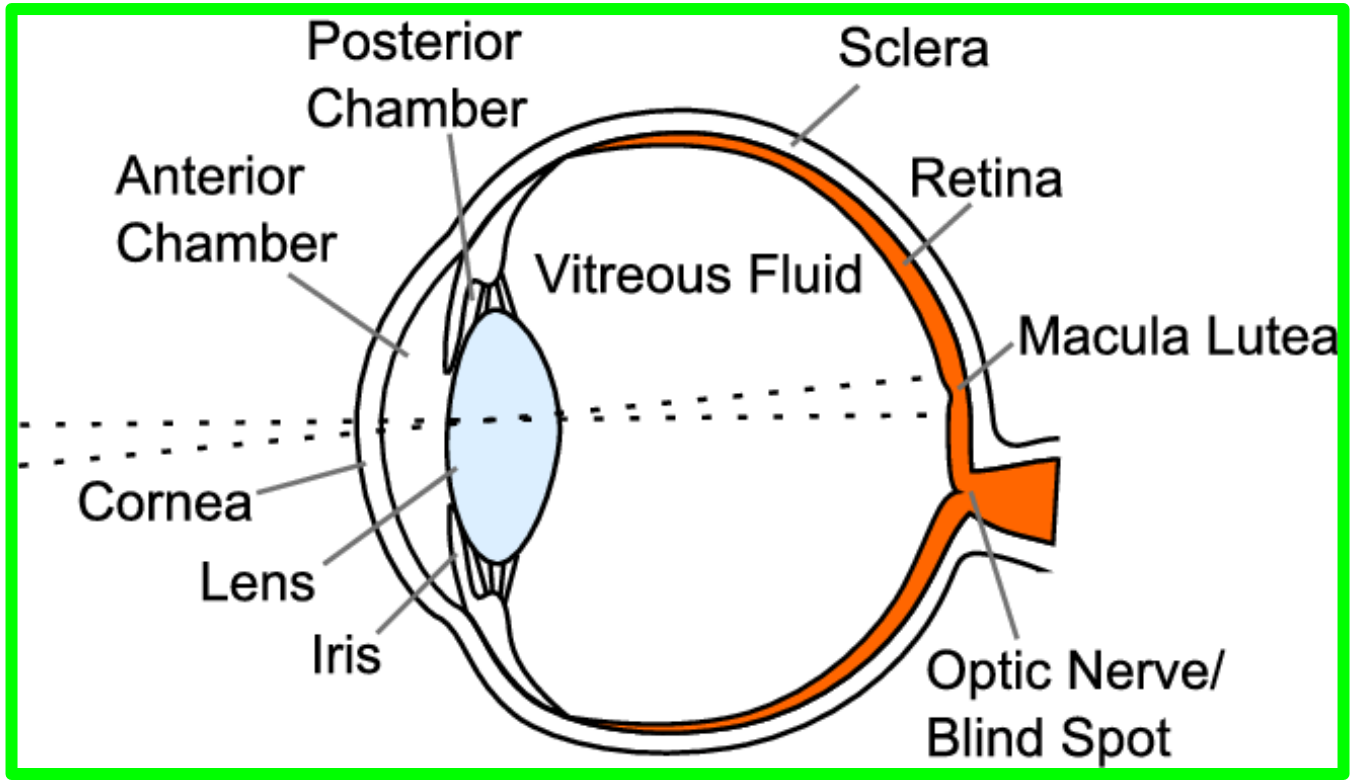
Because it contains no photoreceptors, the optic disc is insensitive to light. Hence, it is commonly called the blind spot.





3. INNER LAYER OF EYEBALL

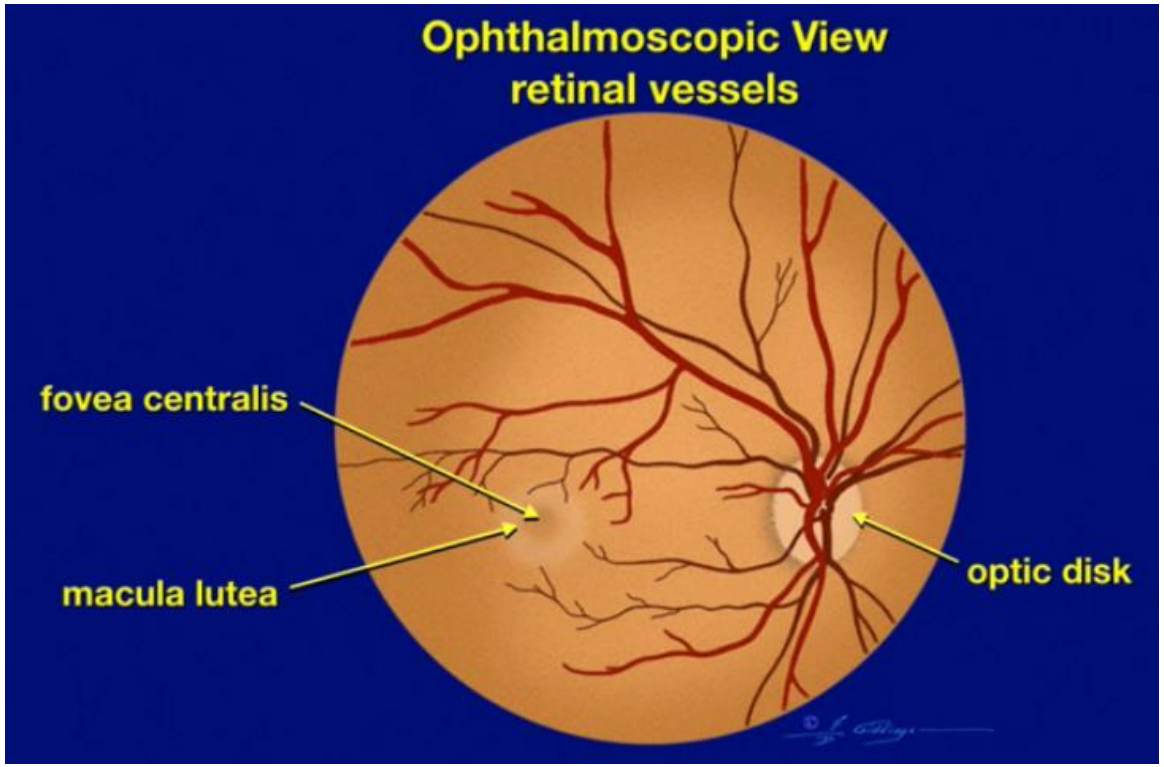
- *Just lateral to the optic disc is the macula of the retina or macula lutea (L. yellow spot). The yellow color of the macula is apparent only when the retina is examined with red-free light.*

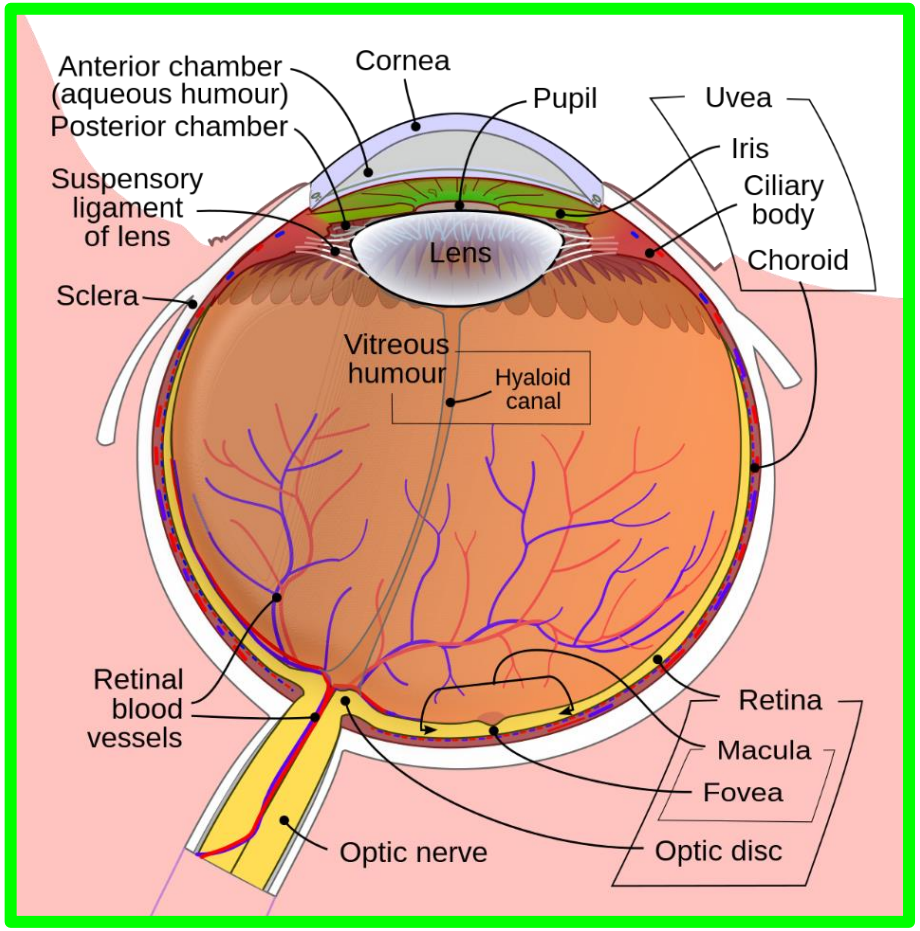


- *The macula lutea is a small oval area of the retina with special photoreceptor cones that is specialized for acuity of vision.*
- *It is not normally observed with an ophthalmoscope*

3. INNER LAYER OF EYEBALL

At the center of the macula lutea is a depression, the fovea centralis (L. central pit), the area of most acute vision.



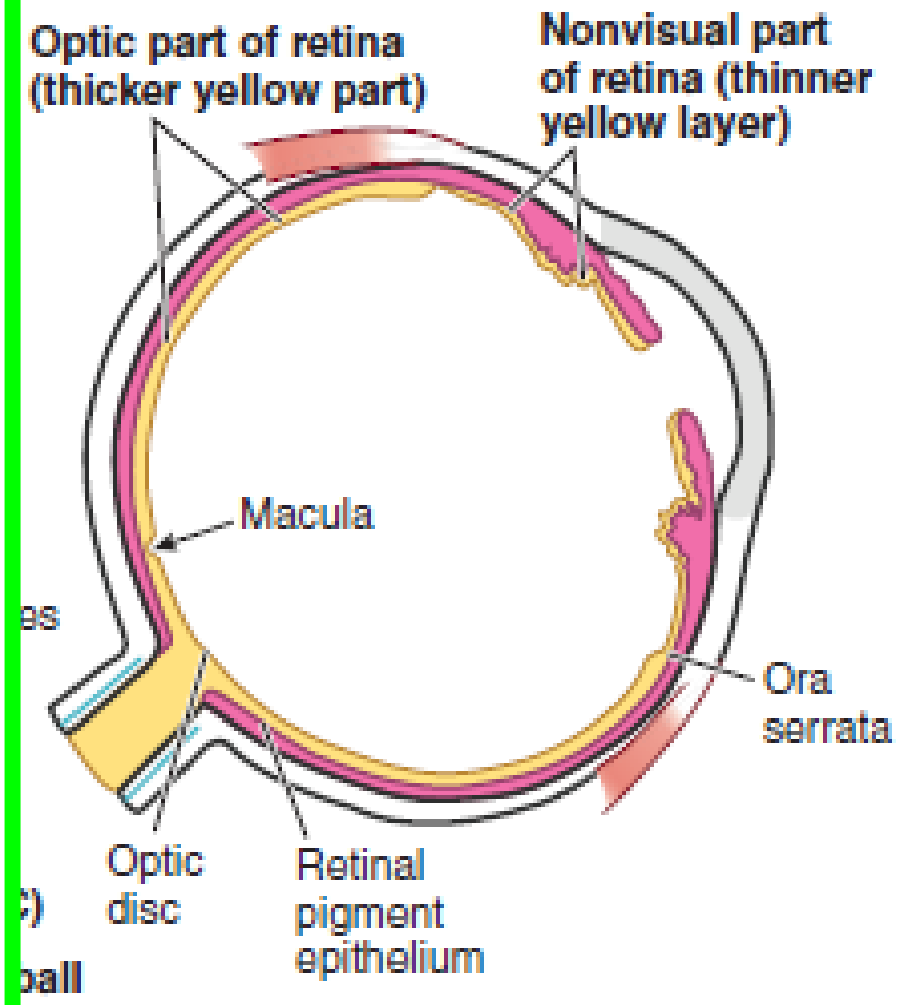


The fovea is approximately 1.5 mm in diameter; its center, the foveola, does not have the capillary network visible elsewhere deep to the retina.

3. INNER LAYER OF EYEBALL

***The optic part of the retina** terminates anteriorly along **the ora serrata** (L. serrated edge), the irregular posterior border of the ciliary body*

Except for the cones and rods of its neural layer, the retina is supplied by the central retinal artery, a branch of the ophthalmic artery.



yer. C. Inner layer (retina).

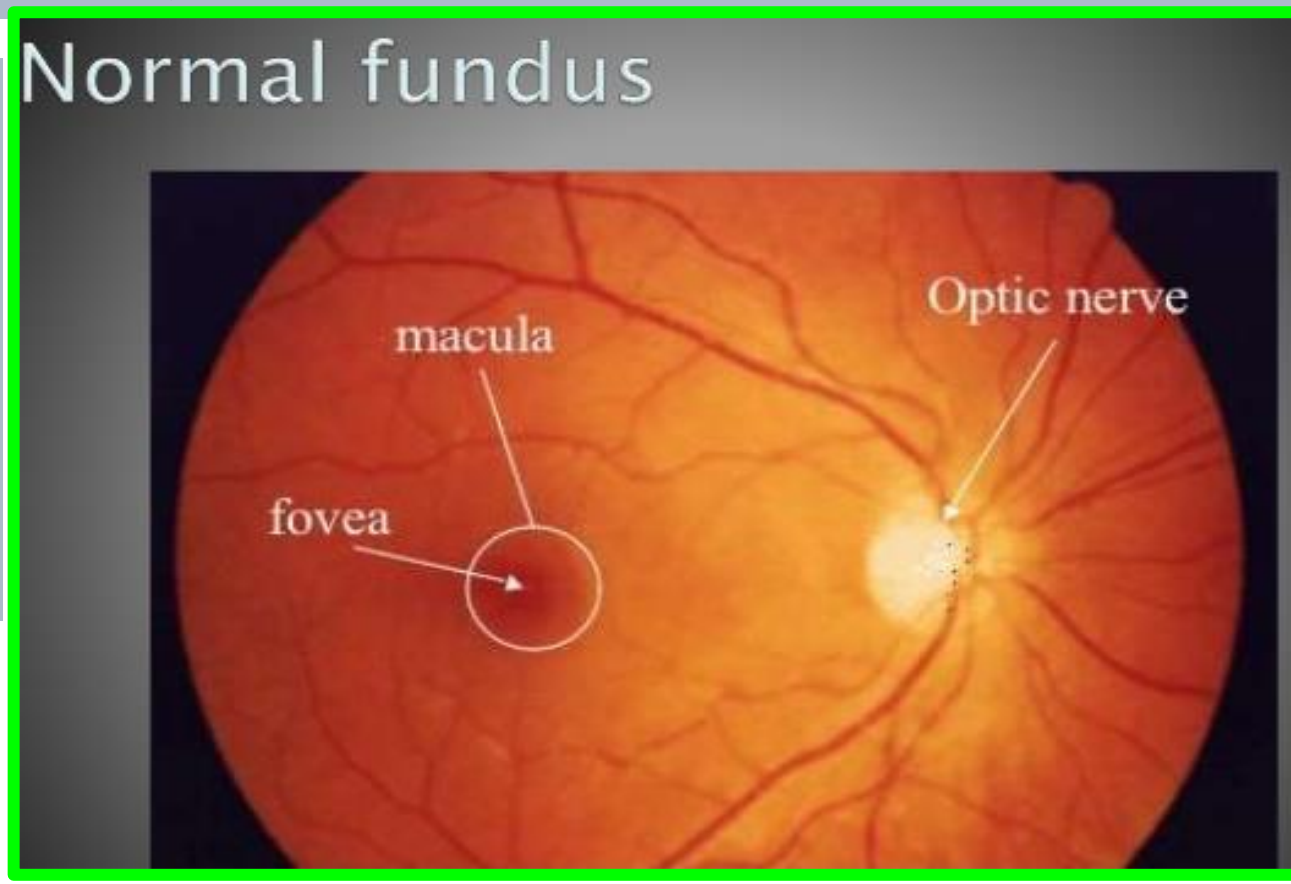
Ophthalmoscopy

Physicians view the fundus (inner surface of the posterior part) of the eye with an ophthalmoscope.

The retinal arteries and veins radiate over the fundus from the optic disc. The pale, oval optic disc appears on the medial side, with retinal vessels radiating from its center in the ophthalmoscopic view of the retina

Pulsation of the retinal arteries is usually visible.

Centrally, at the posterior pole of the eyeball, the macula lutea appears darker than the reddish hue of surrounding areas of the retina.



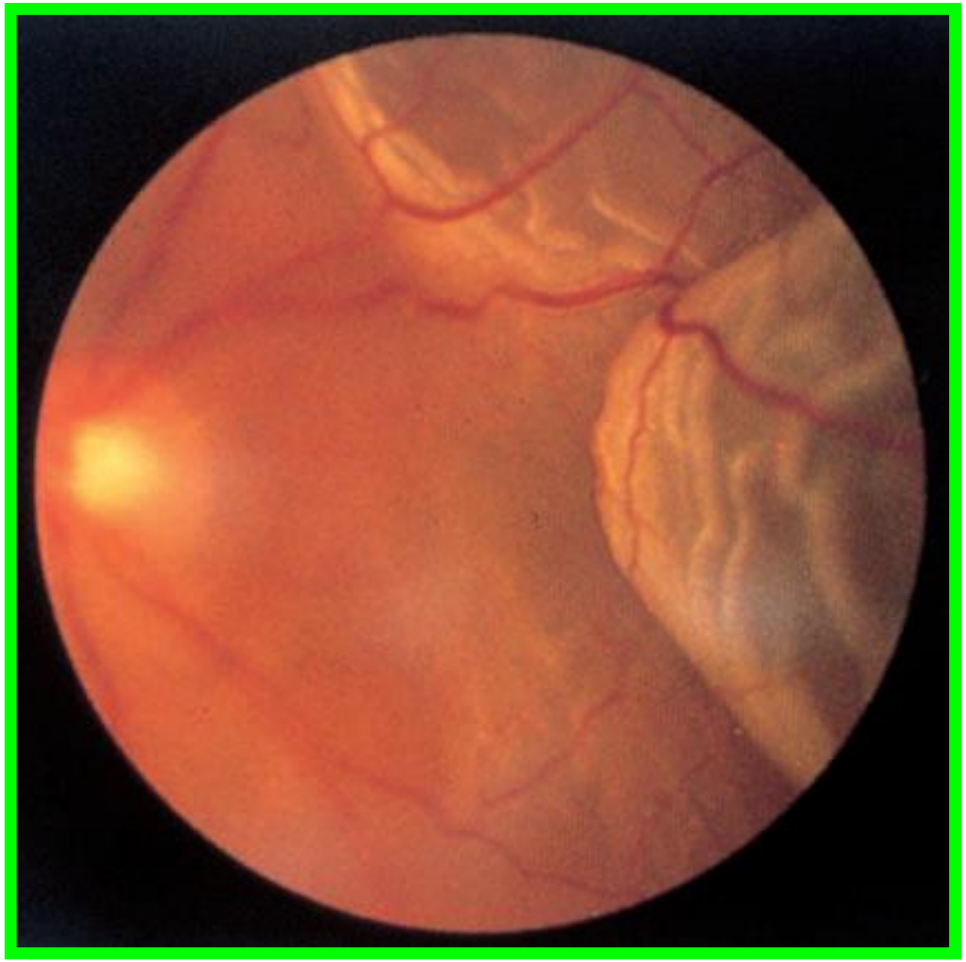
Detachment of Retina

The layers of the developing retina are separated in the embryo by an intraretinal space. During the early fetal period, the embryonic layers fuse, obliterating this space. Although the pigment cell layer becomes firmly fixed to the choroid, its attachment to the neural layer is not firm.

Consequently, detachment of the retina may follow a blow to the eye.

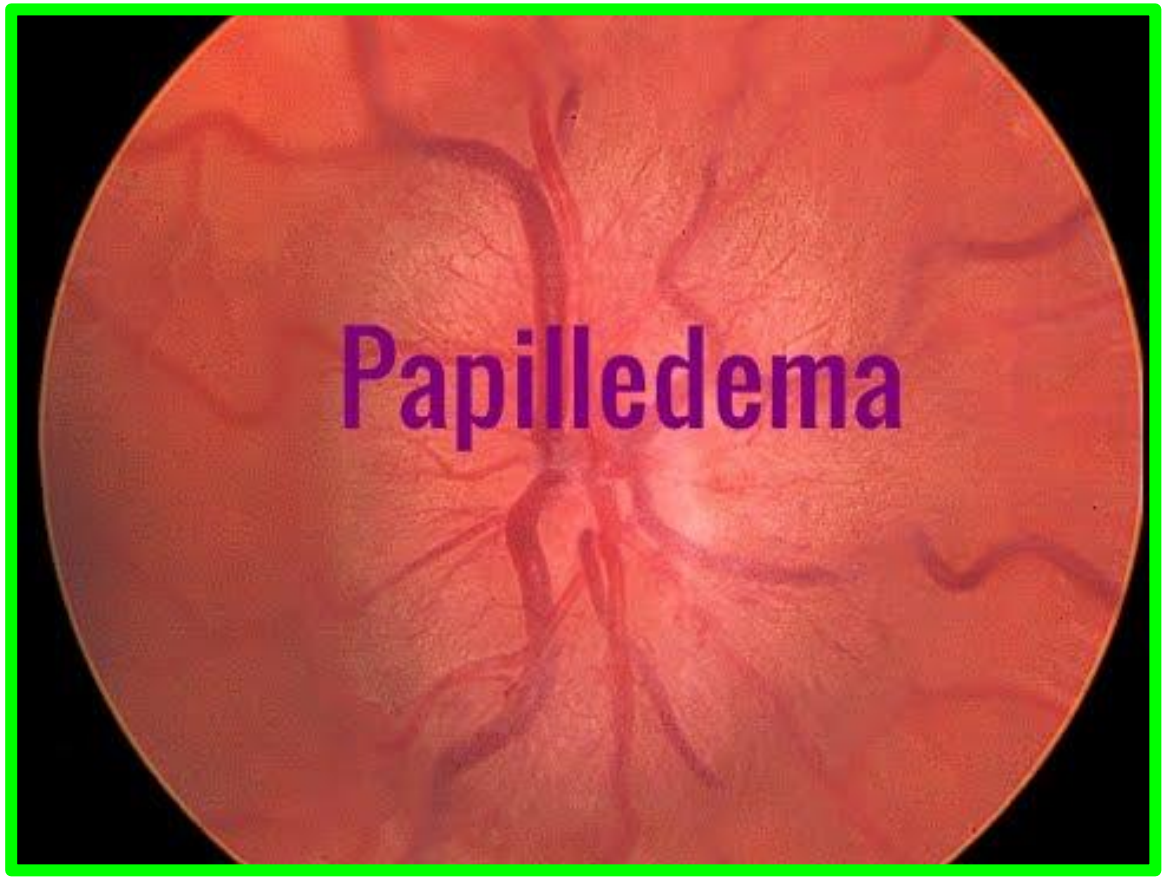
A detached retina usually results from seepage of fluid between the neural and pigmented layers of the retina, perhaps days or even weeks after trauma to the eye.

People with a retinal detachment may complain of flashes of light or specks floating in front of their eye.

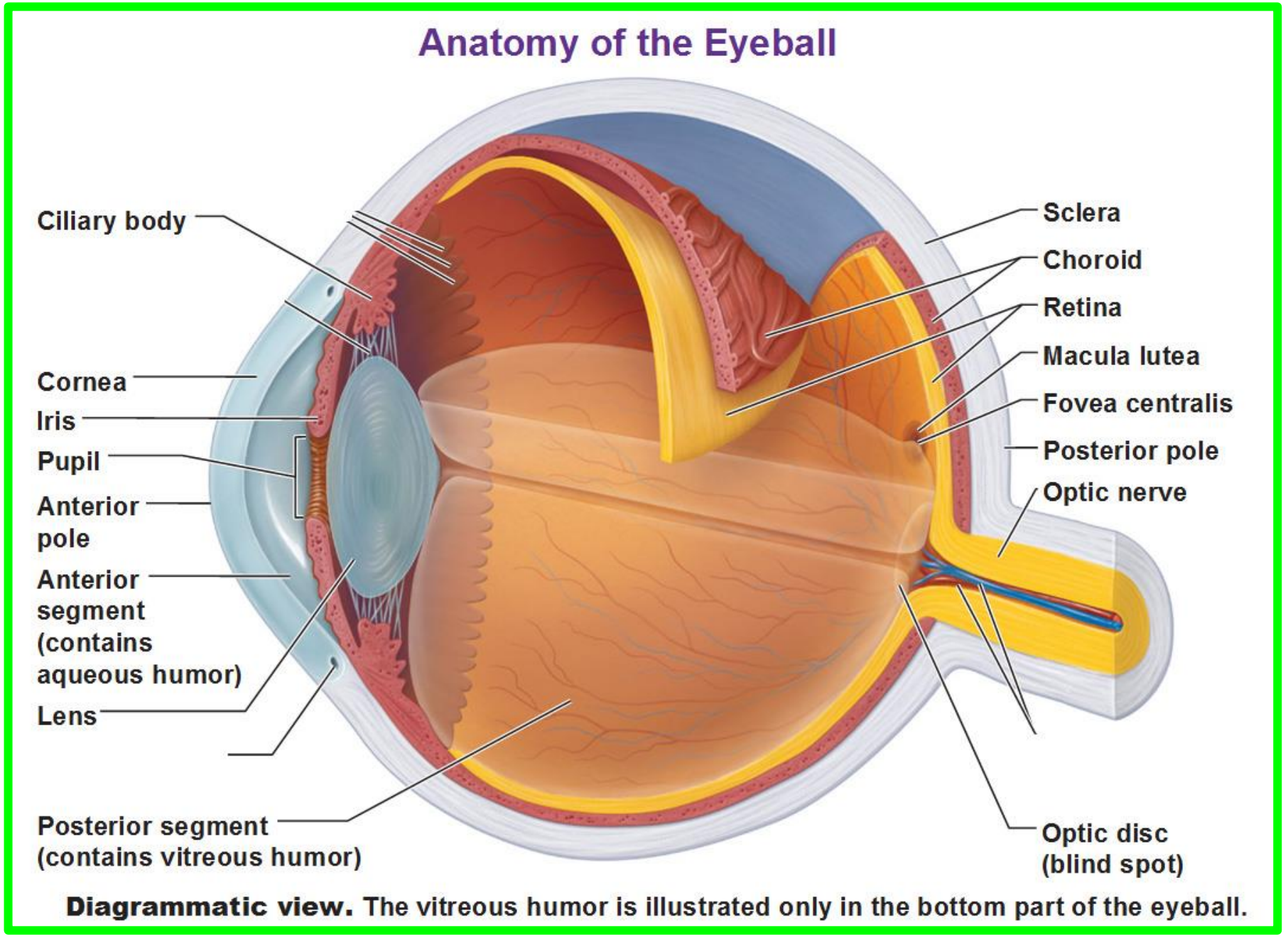


Papilledema

An increase in CSF pressure slows venous return from the retina, causing edema of the retina (fluid accumulation). The edema is viewed during ophthalmoscopy as swelling of the optic disc, a condition called papilledema.



Eyeball


Anatomy of the Eyeball
Ciliary body
Cornea
Iris
Pupil
Anterior pole
Anterior segment (contains aqueous humor)
Lens
Posterior segment (contains vitreous humor)
Sclera
Choroid
Retina
Macula lutea
Fovea centralis
Posterior pole
Optic nerve
Optic disc (blind spot)
Diagrammatic view. The vitreous humor is illustrated only in the bottom part of the eyeball.

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