The Autonomic Nervous system

- The autonomic nervous system (ANS) is part of the peripheral nervous system. It operates unconsciously to control involuntary muscles (cardiac and smooth) and glands. It's formed of two divisions: The Sympathetic and Parasympathetic.
- The ANS is formed of Preganglionic and Postganglionic fibers. The preganglionic fibers arise from autonomic centers in the CNS and pass through cranial and spinal nerves to autonomic ganglia outside the CNS. The postganglionic fibers arise from the autonomic ganglia to supply the involuntary muscles and glands.
- The autonomic centers are controlled by the ***Hypothalamus.***

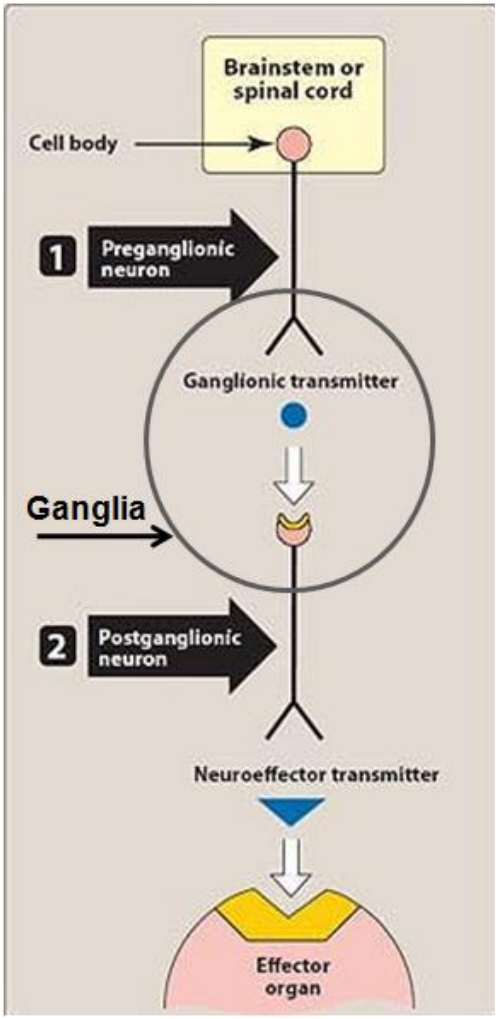


Fig.22: The two-neuron pathway of the ANS.

The Sympathetic (Thoracolumbar) Division

- The gray matter of the ***T1-L2 segments*** of the spinal cord possess a ***lateral horn*** in which are located the cell bodies of the sympathetic preganglionic neurons.
- The myelinated axons of these neurons leave the spinal cord through the anterior root of the spinal nerves.
- They pass through the white ramus to enter the sympathetic trunk.
  - *Sympathetic trunk* is a chain of ganglia located on each side of the vertebral column.

Internal features of the spinal cord

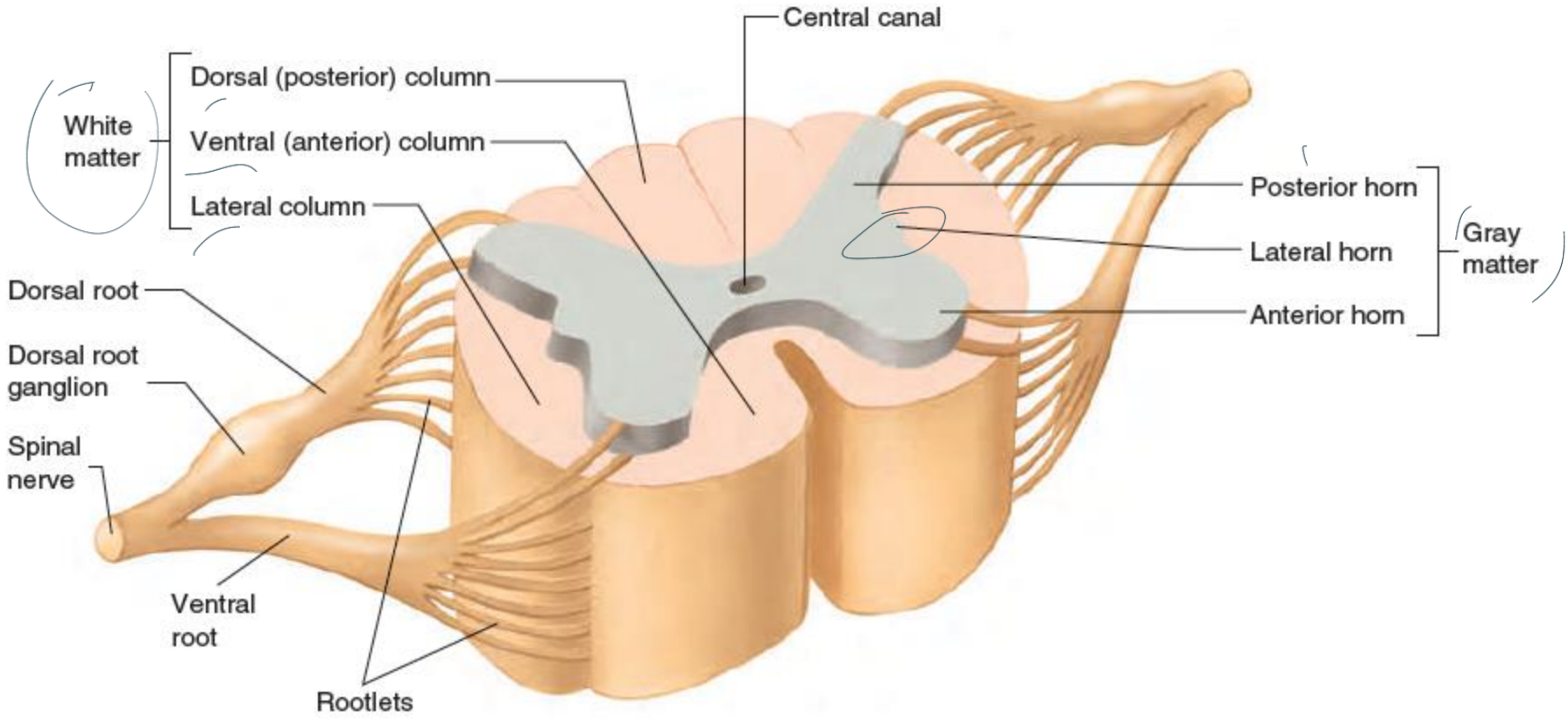


Fig.20*: Cross section through the spinal cord showing important internal features.

- In the sympathetic trunk, the preganglionic neuron may either:
  1. *Synapse* with the postganglionic neurons in the ganglia at the *same level* on the same side. In this case, the unmyelinated postganglionic fibers exit the trunk through the gray ramus to re-enter the spinal nerves where they pass to supply the smooth muscles of blood vessels, sweat glands, and the arrector pili muscles of the skin.
  2. Pass up/down in the sympathetic trunk to *synapse* with postganglionic neurons at a *different level* to supply skin.

  → Some postganglionic fibers will supply various organs in the head, chest, abdomen and pelvis.
  3. *Leave* the trunk *without synapsing*. Here preganglionic fibers will form the Splanchnic nerves and they will eventually synapse with postganglionic neurons in the preaortic ganglia (celiac, superior mesenteric, inferior mesenteric and renal). The postganglinic fibers will then pass to supply the viscera.

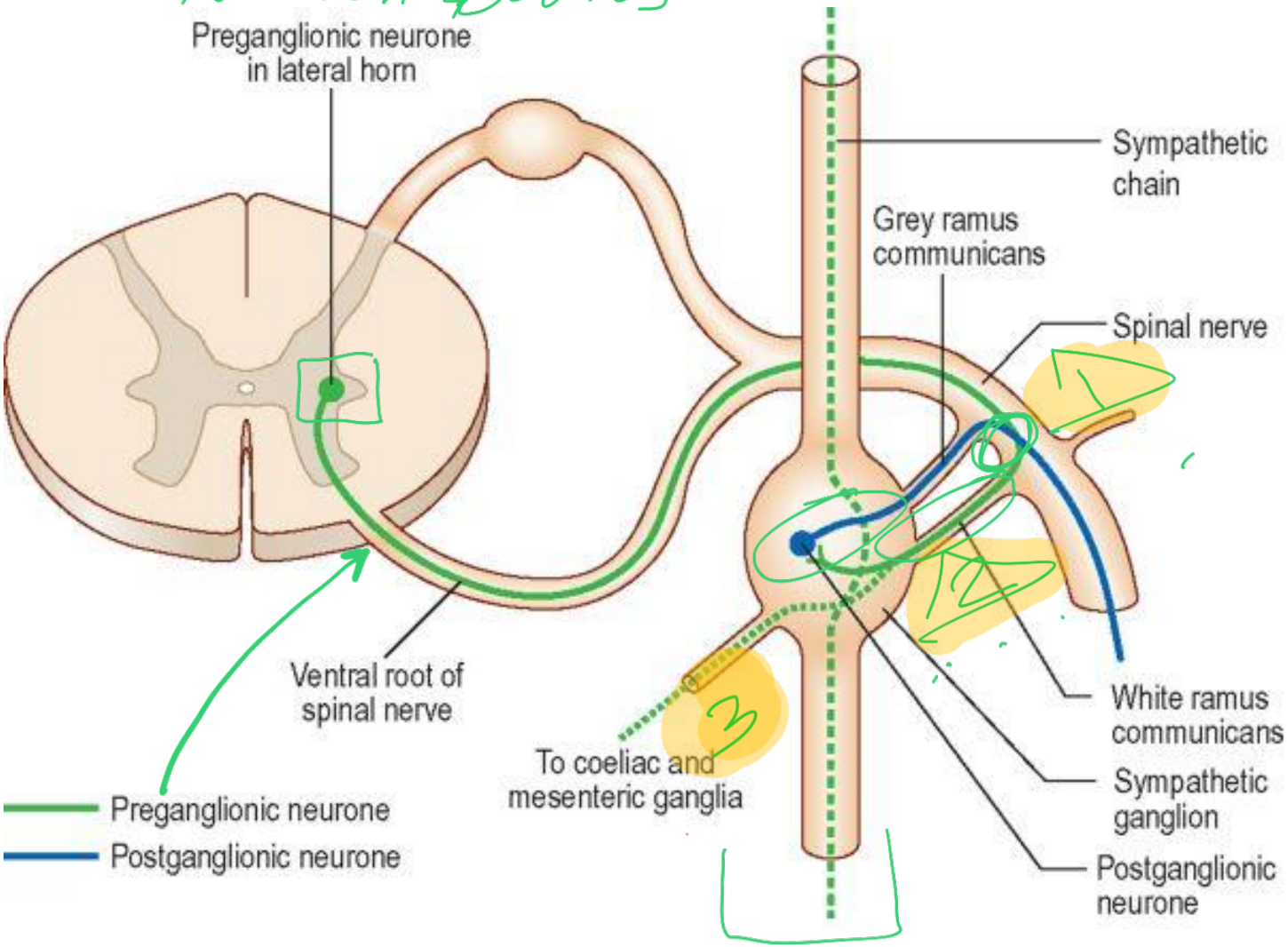


Fig.23: The pathway of the sympathetic neurons.

The Parasympathetic Division

- Also called Craniosacral division.
- Preganglionic neurons pass through:
  - The cranial nerves III, VII, IX and X
  - Sacral spinal nerves S2-S4 (form the Pelvic Splanchnic nerves)
- A preganglionic neuron usually synapses with 4-5 postganglionic neurons all of which supply a single visceral effector. So the effect is limited.

General and Special Sensations

"عليك بَذل الجُهد وليس عليك تحقُّق النتيجة .. عليك الإتقان والإحسان فيما بين يديك وليس عليك إدراك الغاية .. عليك أن تُعطِي أفضل ما لديك في نطاقك المُتَاح وليس عليك بما يتخطّى حدودك. ولكُلّ إخلاص ثمرة طيّبة ولذيذة بنكهة الرِضا تجدها في نفسك أوّلاً قبل كل شيء."🌻

General and Special Senses

General Senses

- Include:
  - Somatic sensations (tactile, thermal, pain, and proprioceptive – sense of position) from body and joints
  - Visceral sensations from the organs.
- Scattered throughout the body.
- Simple structures.

Special Senses

- Include
  - Smell
  - Taste
  - Vision
  - Hearing and equilibrium.
- Concentrated in specific locations in the head.
- Anatomically distinct structures.
- Complex neural pathway.

[تم وضع المصطلحات باللغة العربية(للتوضيح)وهي نفسها تم أخذها بالثانوية]

The General Sensory Structures

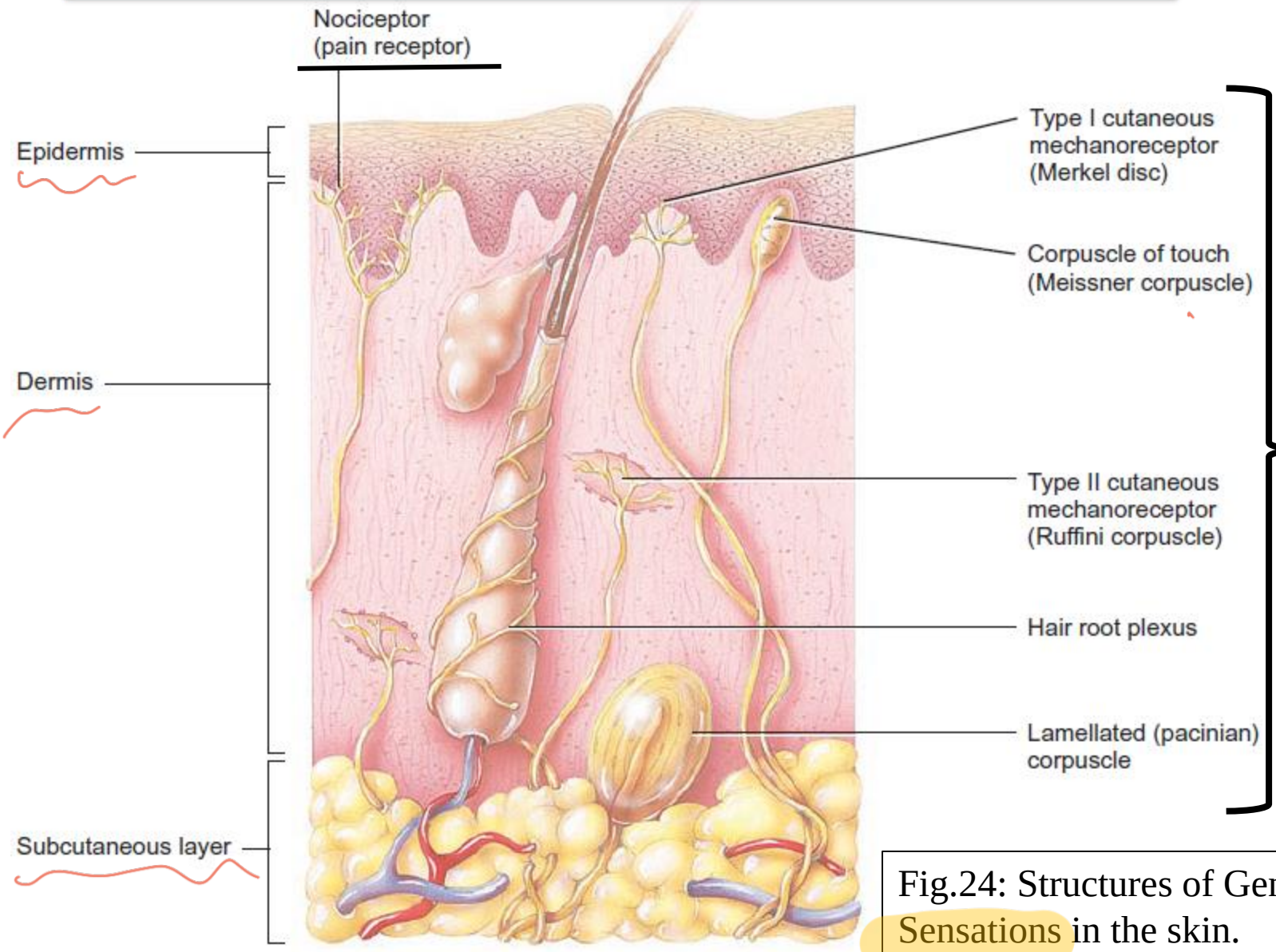


Fig.24: Structures of General Sensations in the skin.

Special Senses – Olfaction = Smell

- The olfactory epithelium is located in the roof of the nasal cavity.

- The olfactory epithelium is formed of:

1. ***Olfactory receptors*** - bipolar neurons with cilia called olfactory hairs.
2. ***Supporting cells*** - provide support and nourishment.
3. ***Basal cells*** - replace olfactory receptors.

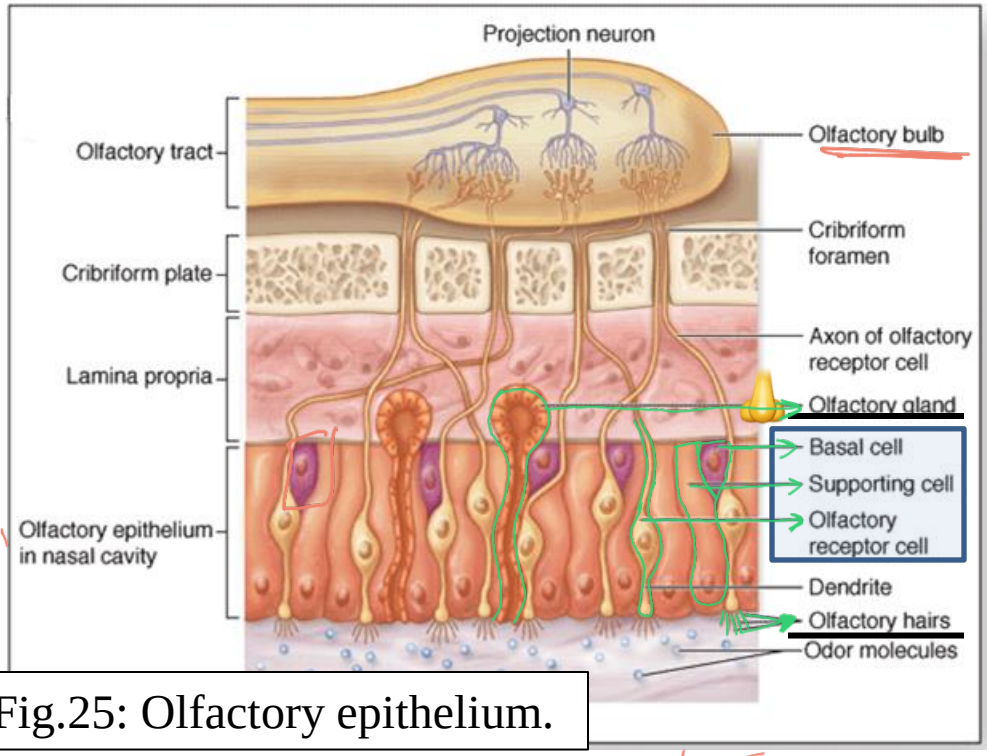


Fig.25: Olfactory epithelium.

- Olfactory glands produce a secretion that helps in moistening the surface of the epithelium

Special Senses – Gustation = Taste

- Gustation is performed by specialized structures called ***Taste Buds*** that are mainly present in the papillae of the tongue.
- Taste buds are oval structures formed of:

1. ***Gustatory cells***- Each one has a gustatory hair (a long microvillus) that projects through an opening in the bud called the taste pore.

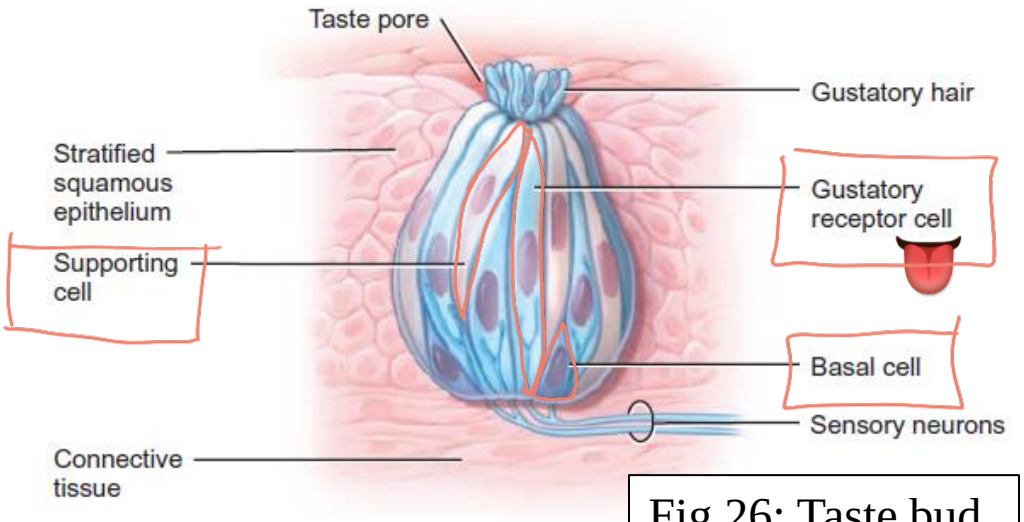


Fig.26: Taste bud.

2. ***Supporting cells***- provide support and nourishment.
3. ***Basal cells***- replace the other cells.

Special Senses – Vision

- Vision is the function of the eye.
- The eyeball is located in the orbital cavity of the skull.
- Accessory structures of the eye include:
  1. The eyelids
  2. The lacrimal apparatus
  3. The extrinsic muscles of the eye

- The two eyelids (palpebrae) (1)protect eye from light, (2)shade eye during sleep, and (3)spread tear.
- The space between the eyelids that exposes the eyeball is called the ***palpebral fissure***.
- The *levator palpebrae superioris* muscle raises the upper eyelid.

The Lacrimal Apparatus

important for exam.

FLOW OF TEARS

Lacrimal gland

↓

Lacrimal ducts

↓

Superior or inferior lacrimal canal

↓

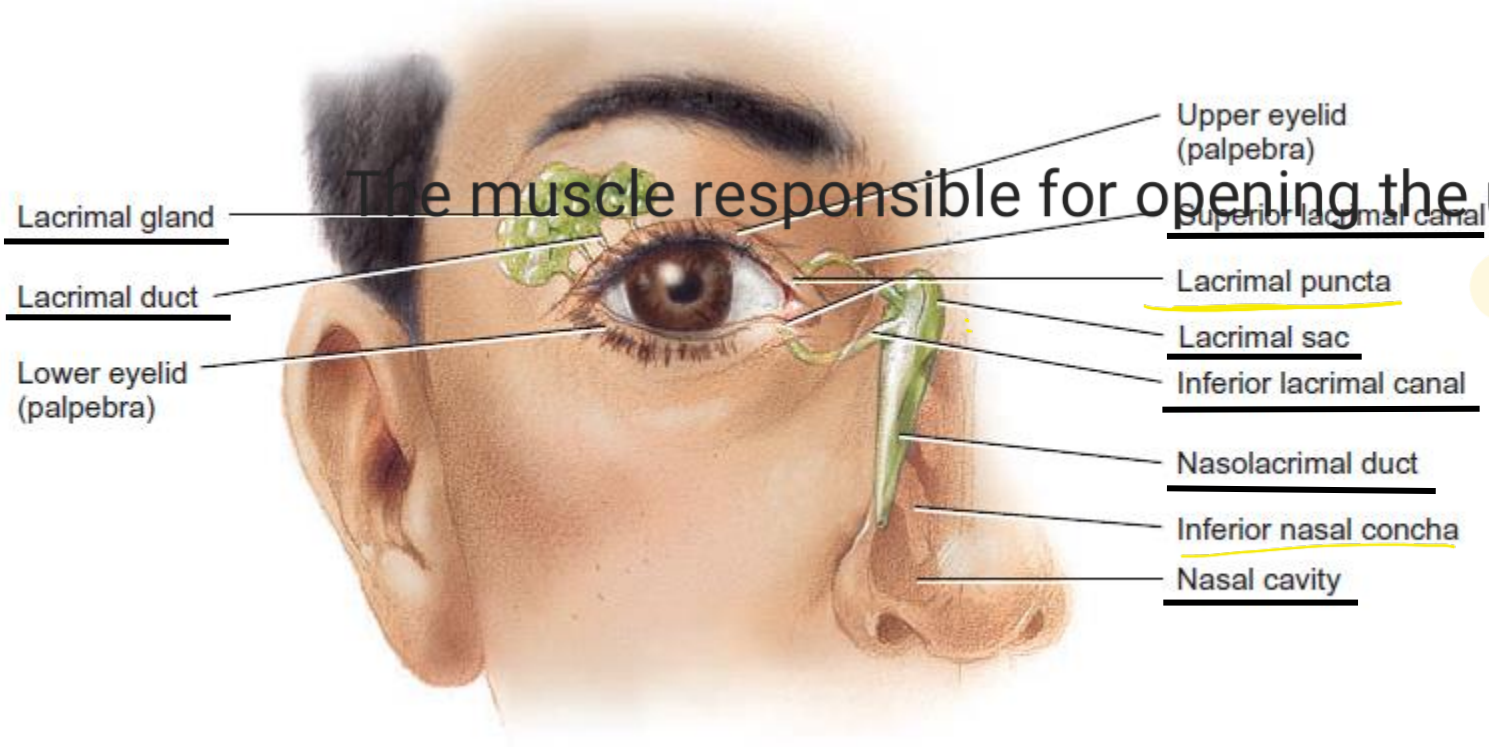
Lacrimal sac

↓

Nasolacrimal duct

↓

Nasal cavity



The muscle responsible for opening the upper eyelid

Fig.27*: Components of the lacrimal apparatus.

Extrinsic Eye Muscles

خارجية (تحيط بالعين).

- Six **extrinsic** eye muscles control movements of each eyeball. They are called extrinsic because they originate outside the eyeball in the bony orbit and insert on the of the sclera. These muscles are supplied by cranial nerve III, IV, and VI.

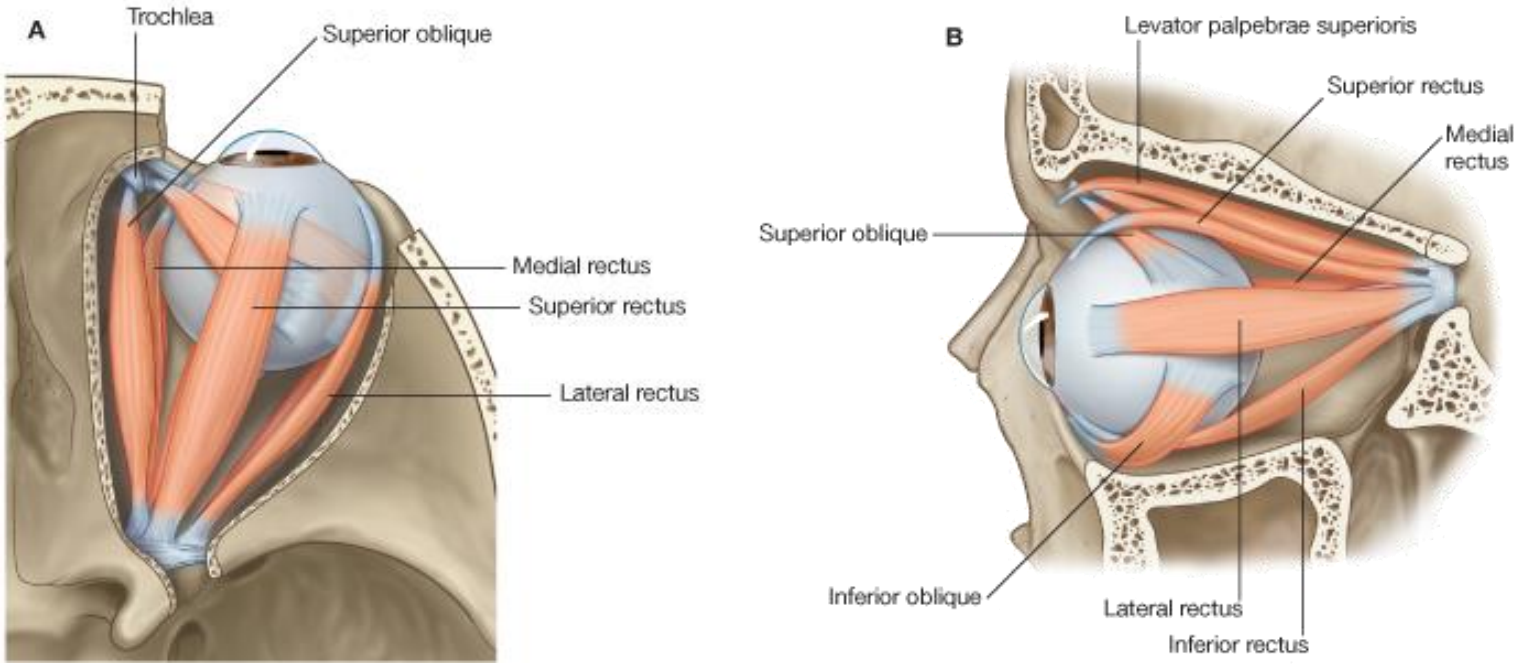


Fig.28: Extrinsic muscles of the eye. (A) superior view. (B) lateral view.

Anatomy of the Eyeball

The Wall of the eyeball

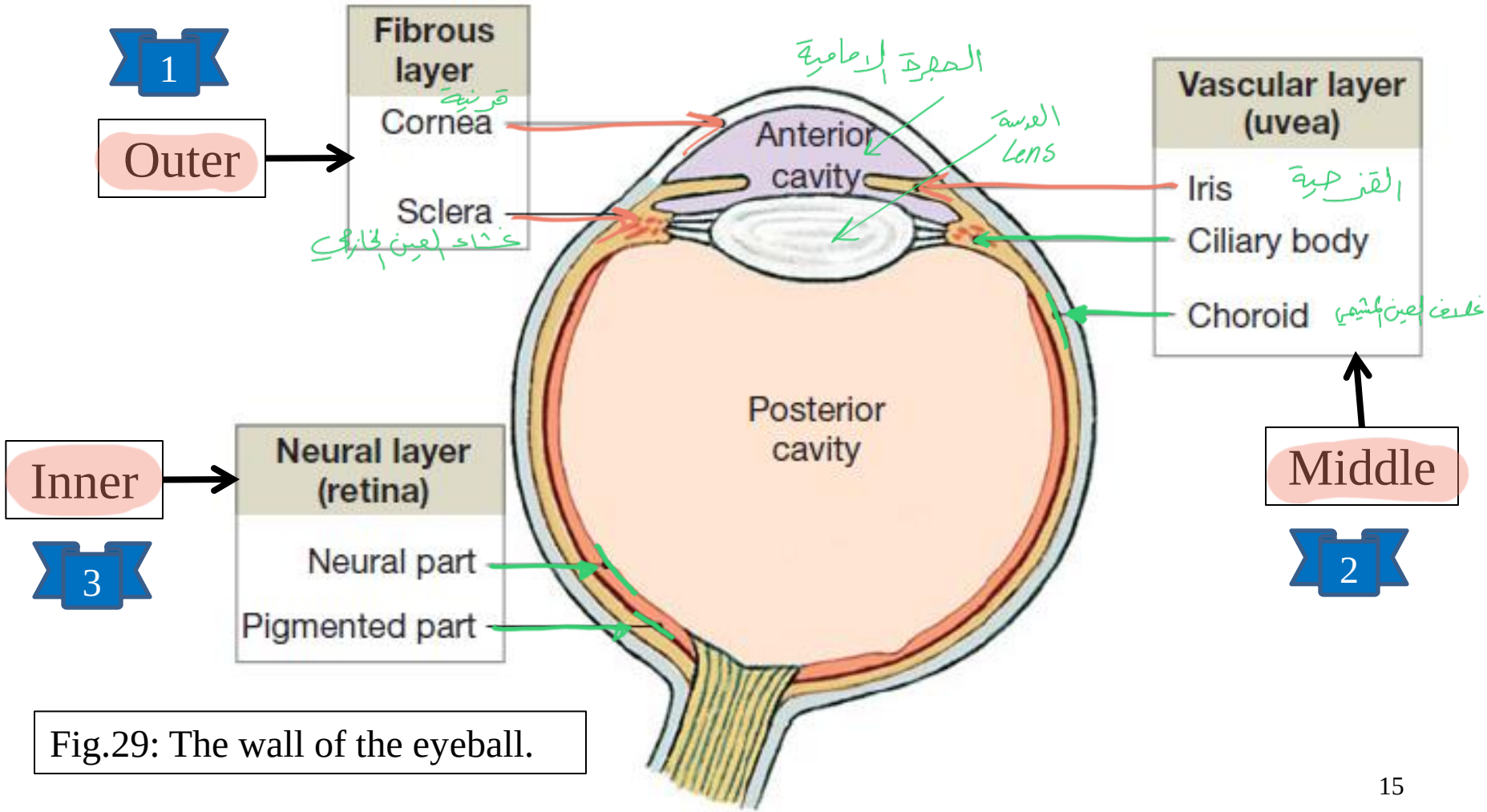
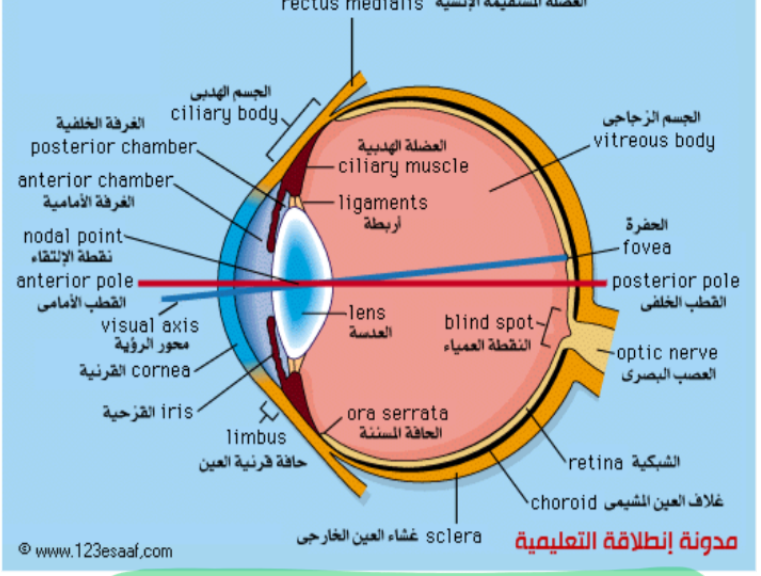


Fig.29: The wall of the eyeball.

1. *Fibrous tunic (layer)*



a) **Sclera** "white" of the eye

- The larger posterior part.
- A strong fibrous layer.
- Functions:
  1. Protect the eye.
  2. Help maintain shape of the eye.
  3. Site of attachment of extrinsic eye muscles.

b) **Cornea** القرنية

- The smaller anterior part. Located in front of the iris. القزحية
- Transparent. شفافة
- Function: it allows light to enter the eye and it's the major refractory structure in the eye.

(توضيح المعاني باللغة العربية)

2. *Vascular tunic*

a) Choroid

- The large posterior part. It's highly vascular layer with numerous melanin-producing melanocytes.
- Functions: (1)supply nutrients to the retina, (2)melanin pigment absorbs any stray lights, thus, making the image sharp.

b) Ciliary body

- The middle part of the vascular tunic.
- Located just posterior to the junction of the cornea and sclera.
- Has numerous protrusions called the ***ciliary processess.*** These produce the aqueous humor. From them extend the ***zonular fibers*** (suspensory ligaments) that are attached to the lens.
- The ***ciliary muscle*** is a smooth muscle within the ciliary body. It's responsible for changing the shape of the lens.

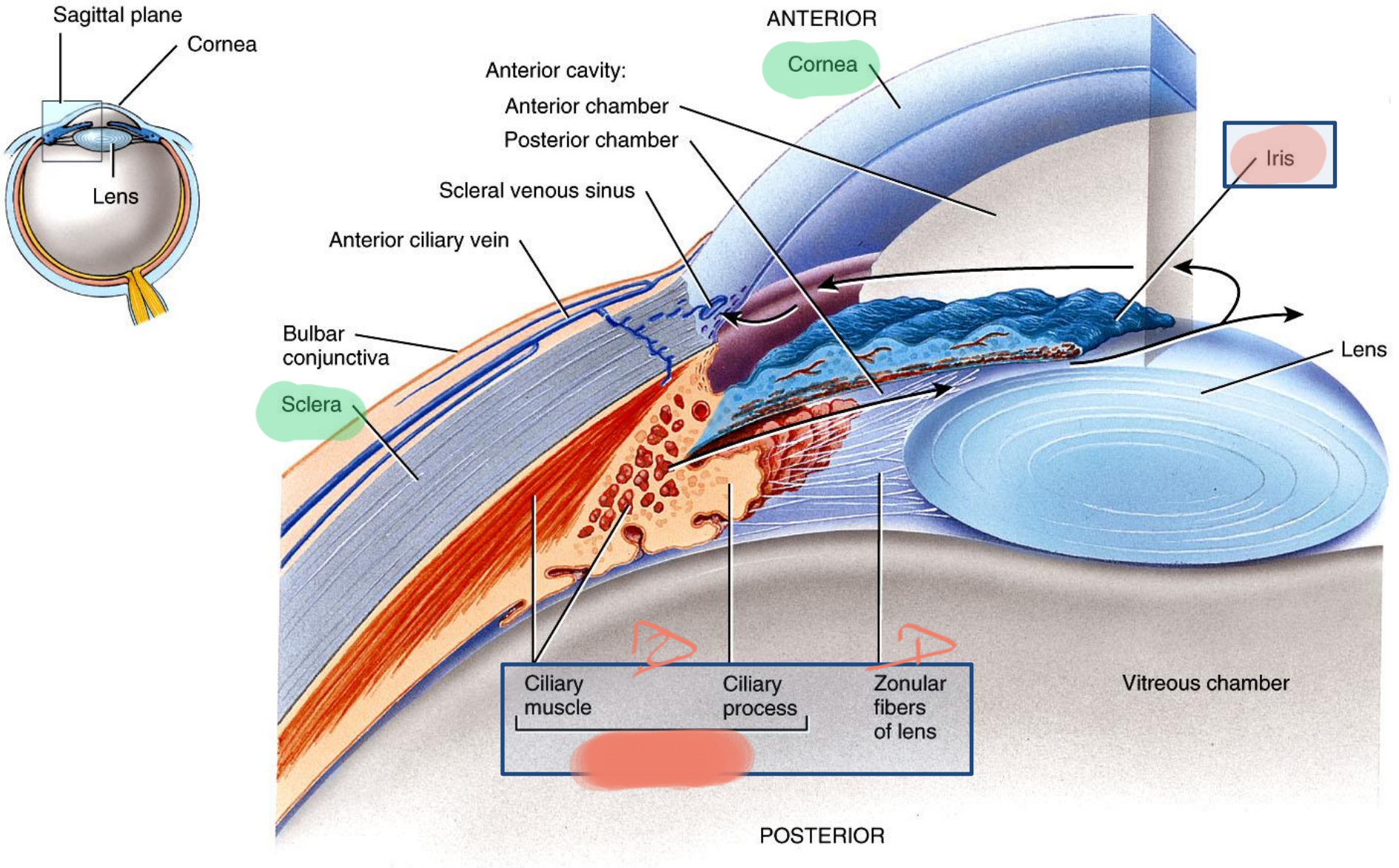


Fig.30: The ciliary body and the iris.

c) The Iris

قزحية العين

- The anterior colored portion of the vascular tunic.
- The opening in the middle of the iris is called the ***pupil.*** Through this pupil light can pass to the lens.

2 types of muscles :-

- The iris contains the circular ***sphincter pupillae muscle*** and the radial ***dilator pupillae muscle***. These muscles change the diameter of the pupil regulating the amount of light passing through it.

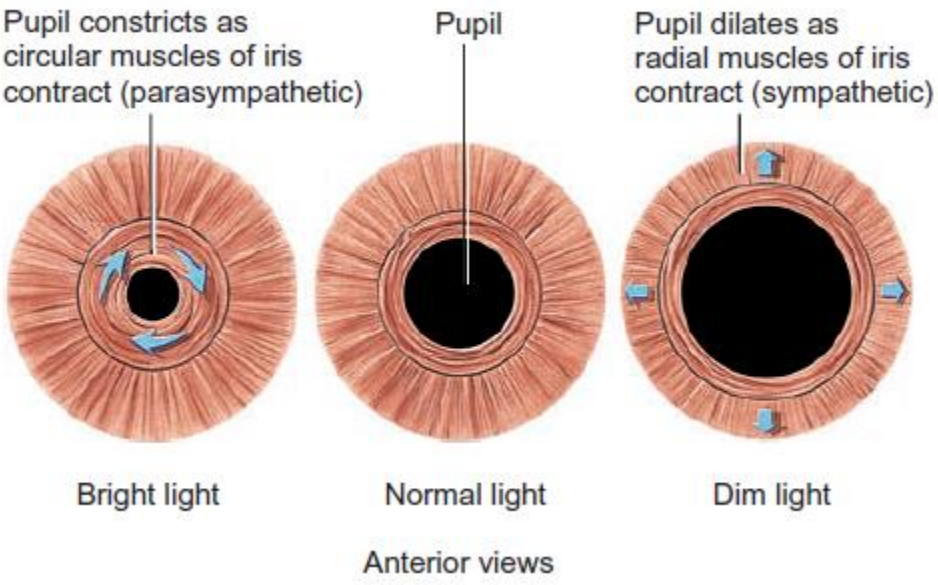


Fig.31*: The muscles of the iris. Note the effect of the two divisions of the ANS on them.

"لا تخشَ أن تفشل في الوصول لمنالك،
ولا أن يسبقك فلانٌ وعِلان في كم الإنجازات التي حققها،
لا تدع شعور الغِبطة يستحوذ علىٰ نظرتك لحياتك،
فتُركّز في سباقك معهم لا في نفسِك.

عليك أن تخشىٰ أن تكون في نفس المكان بعد أن تنقضي سنون،
يتغير الزمن وكلُّ ما فيه إلاك؛
لا زلت في نقطتك بالضبط.

حاول عدَّ نقائصك، وجاهد لتغيرها بكلِّ خير..

سابق نفسك لتتخطاها." ✨

لا تنسونا من دعواتكم 🤍🌹

بالتوفيق جميعًا🦋