



The Eye & Ear: Special Sense Organs

Sensory receptors convey information about the external world to the central nervous system.

The Eye: The Photoreceptor System

The eyes are photosensitive organs that analyze light to provide sight. Each eyeball is protected within the skull's orbits and consists of a tough fibrous globe.

A. The Three Layers (Tunics) of the Eye:

1. Fibrous Tunic (External):

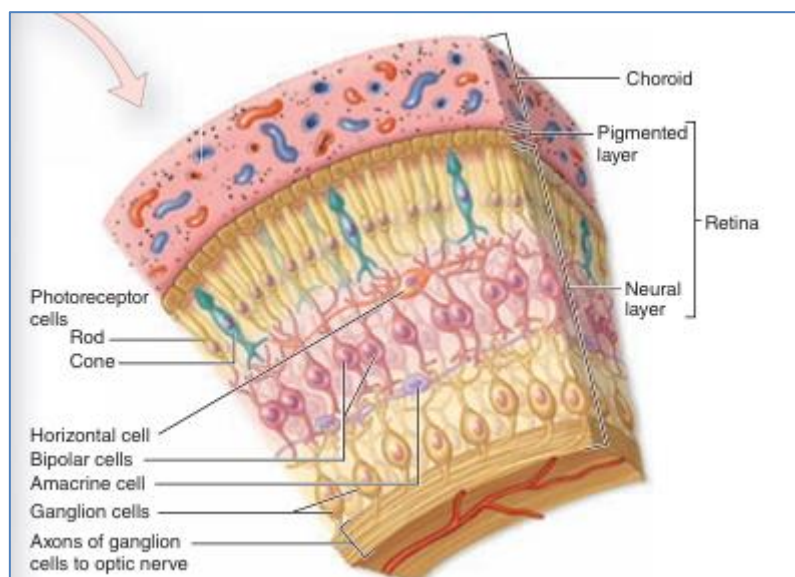
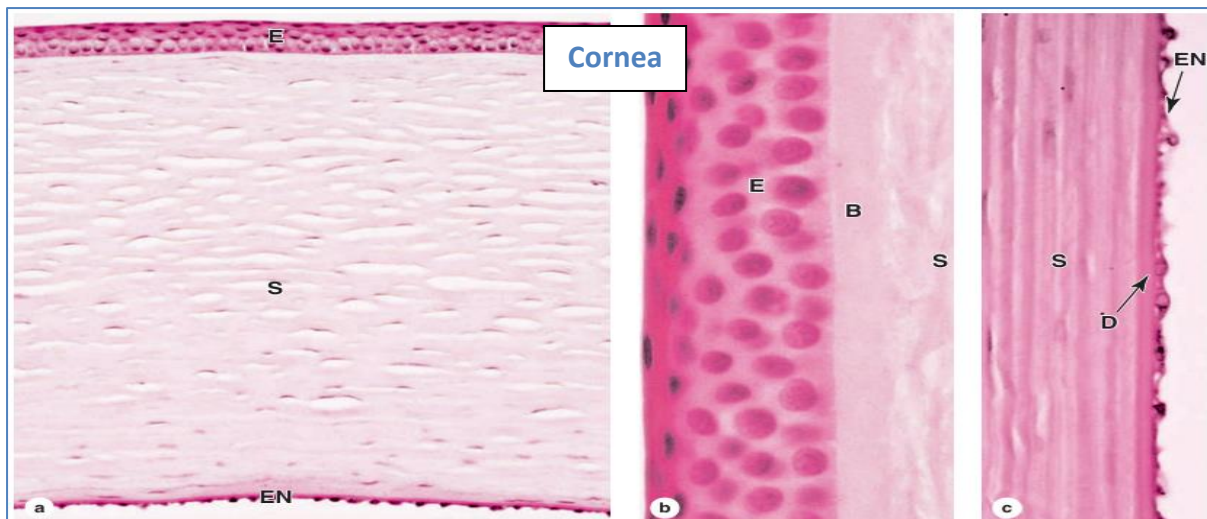
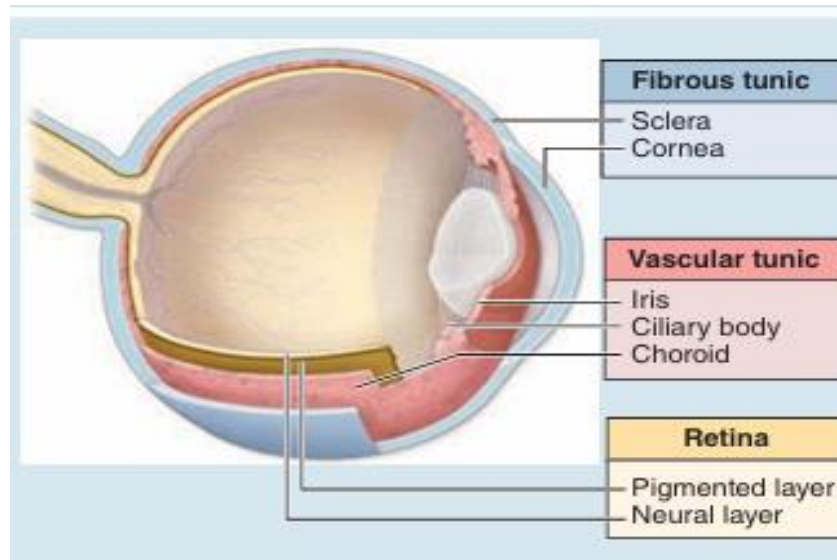
- **Sclera:** The "white" of the eye; provides support and muscle attachment.
- **Cornea:** The transparent front part that reflects incoming light. It has five layers, including a nonkeratinized epithelium with a rich sensory nerve supply.

2. Vascular Tunic or Uvea (Middle):

- **Choroid:** Highly vascularized to nourish the retina; contains pigment to absorb extra light.
- **Ciliary Body:** Contains smooth muscle that changes lens shape and an epithelium that secretes aqueous humor.
- **Iris:** The colored part of the eye; it uses muscles to control the size of the pupil, regulating how much light enters.

3. Retina (Inner Sensory Layer):

- Communicates with the brain via the **optic nerve**.
- Consists of a pigmented layer and a neural layer.



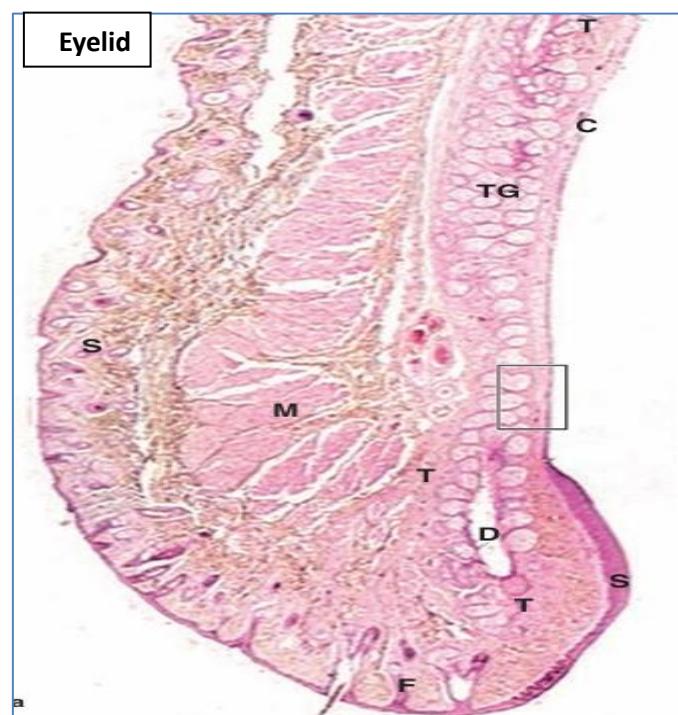


B. Key Internal Structures:

- **Lens:** A transparent, biconvex structure that focuses light. It is held by zonular fibers and becomes less elastic with age.
- **Vitreous Body:** A transparent region behind the lens.
- **Retinal Cells:** The retina contains **rods** (sensitive to low light) and **cones** (detect color and high-intensity light). Signals are integrated by bipolar neurons and sent to the brain by ganglion cells.

C. Accessory Structures:

- **Eyelids:** Protective structures consisting of skin, muscle, and conjunctiva. Protect the eye and contain tarsal glands that produce oils to prevent tear evaporation.
- **Conjunctiva:** A thin mucus membrane lining the eyelids and covering the front of the sclera.
- **Lacrimal Glands:** Produce tears to keep the eye surface moist.





The Ear: The Vestibuloauditory System

The ear is divided into three main parts that handle sound and balance.

A. External Ear:

- The **auricle** receives sound waves and funnels them into the **external acoustic meatus**.
- It ends at the **tympanic membrane** (eardrum) and contains glands that produce earwax (cerumen).

B. Middle Ear:

- This air-filled cavity contains three small bones called **ossicles**: the **malleus, incus, and stapes**.
- These bones amplify sound vibrations and transmit them from the eardrum to the **oval window** of the internal ear.
- The **auditory (Eustachian) tube** connects this space to the nasopharynx.

C. Internal Ear (The Labyrinth): The internal ear is a set of fluid-filled channels (membranous labyrinth) housed inside bone (bony labyrinth). It uses specialized **hair cells** as mechanoreceptors.

1. Maintaining Balance (Vestibular System):

- **Utricle and Saccule:** Contain regions called maculae that use mineralized crystals (**otoliths**) to detect gravity and linear head movements.
- **Semicircular Ducts:** Contain cristae ampullares to detect rotational head movements.

2. Hearing (Auditory System):

- **Cochlea:** A snail-shaped structure containing the cochlear duct.



- **Organ of Corti (Spiral Organ):** Located within the cochlear duct, this is the main organ of hearing. Sound waves cause the **basilar membrane** to vibrate, which bends the hair cells, initiating nerve signals sent to the brain via the acoustic nerve

