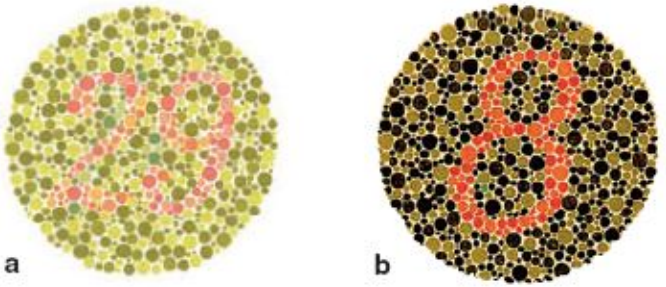
defects of eye

- **While at rest, instead of focusing on the retina, the light rays focus in front of it.**
- **This type of eye defect is called myopia.**
- **This condition can be corrected by concave lenses.**

- **At rest, the light rays focus behind instead of on the retina.**
- **This type of eye defect is termed hypermetropia.**
- **This condition can be corrected by convex lenses.**

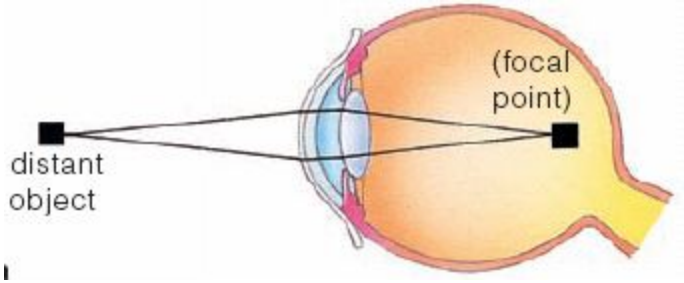
Red-green color blindness is the inability to distinguish red and green colors in dim light (and sometimes bright light) due to a lack of red and green cone cells.



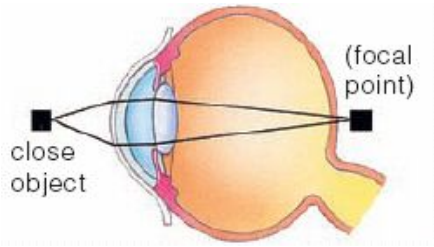
Malformed eye parts cause common focusing problems.

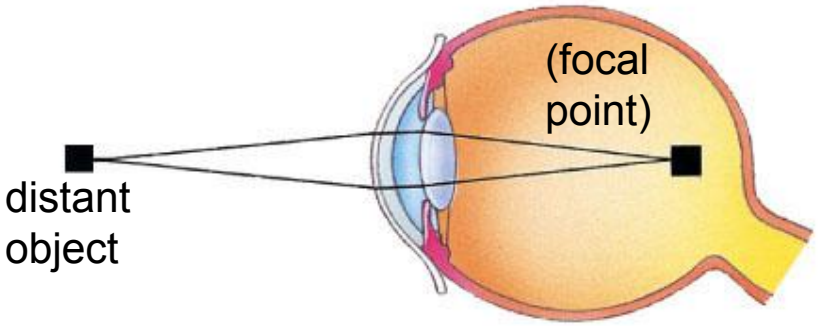
In ***astigmatism***, one or both corneas have uneven curvature and cannot bend light to the same focal point.

– Nearsightedness (***myopia***) results when the image is focused in front of the retina.



– Farsightedness (***hyperopia***) is due to an image focused behind the retina.





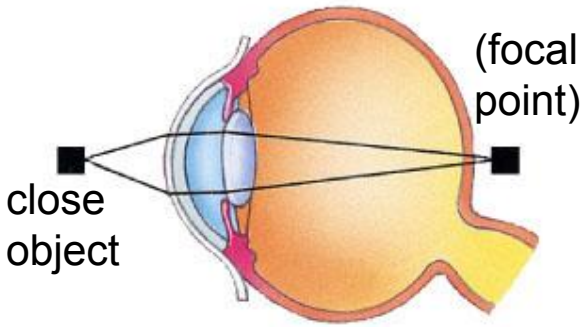


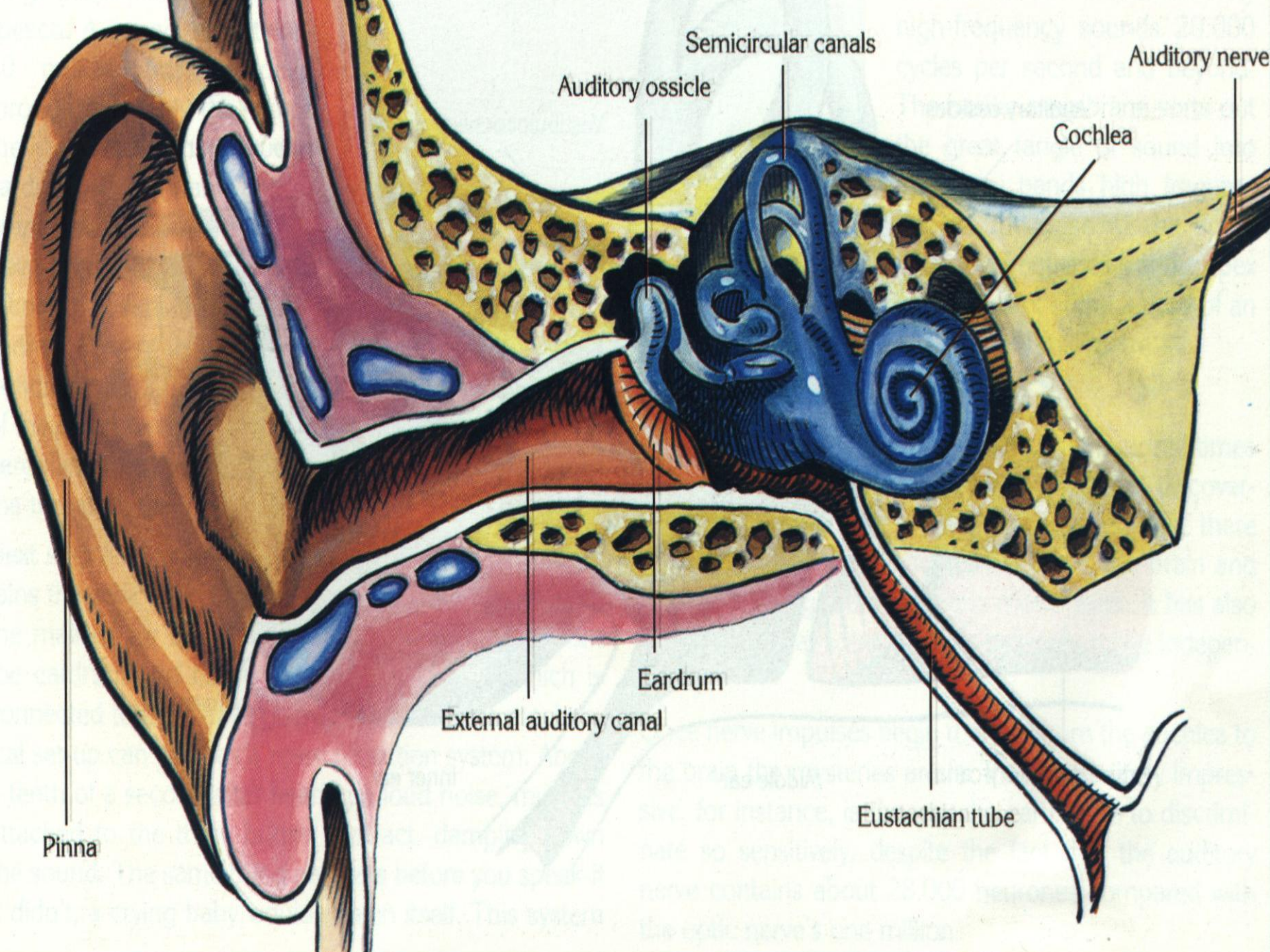
Fig. 14.21 (top), p. 264

THE EARS

- The human ear has 2 sensory functions.
- One of them is hearing.
- Other is maintaning balance or equilibrium.

Structure of ears

- Ears contains 3 main parts;
  - –Outer ear,
  - –The middle ear
  - –Inner ear


Semicircular canals
Auditory nerve
Auditory ossicle
Cochlea
Eardrum
External auditory canal
Pinna
Eustachian tube

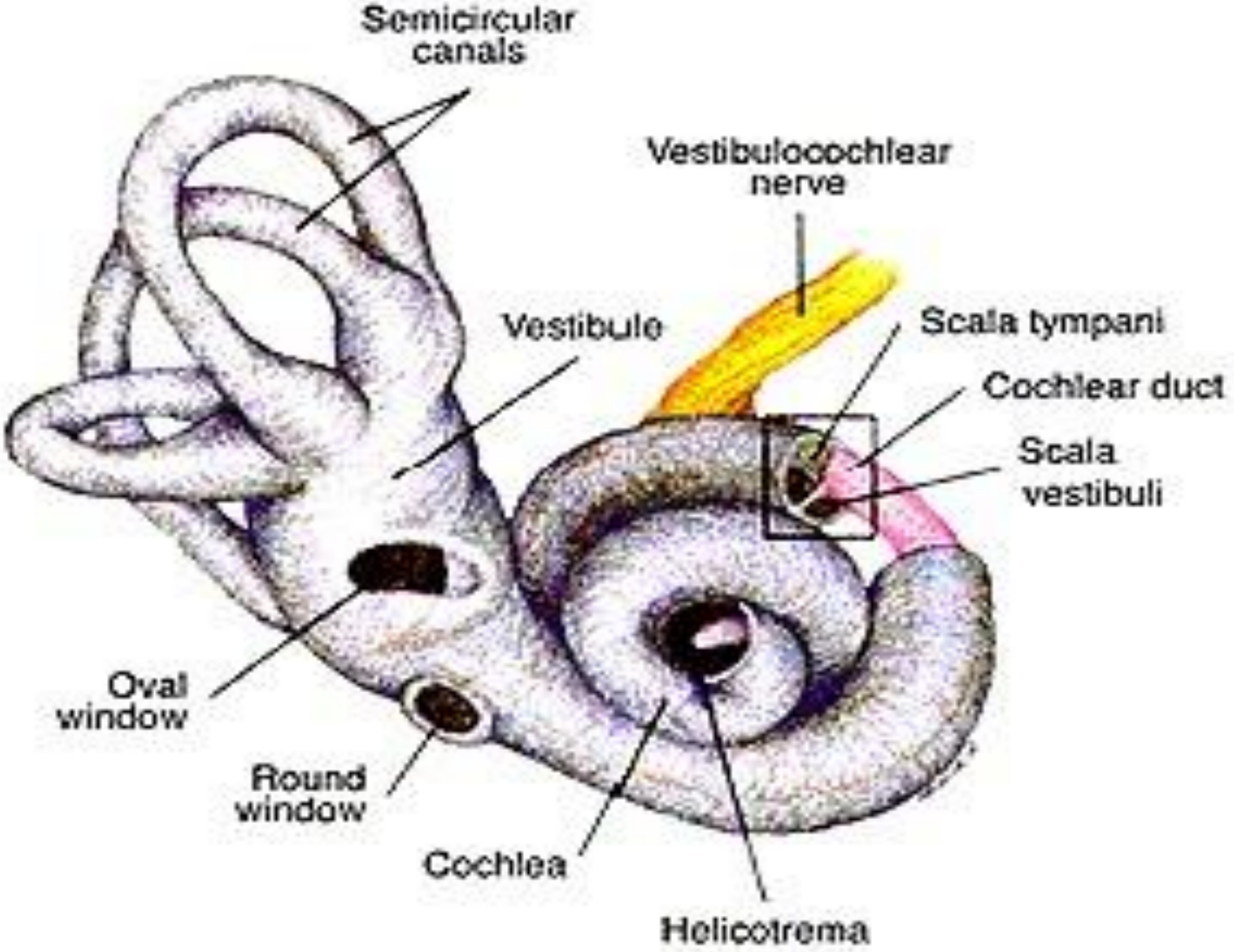
OUTER EAR

- Outer ear is composed of 3 parts.
- These are pinna, auditory canal and eardrum.
- Pinna is a cartilaginous tissue which collects sound waves and determines the source of voices.

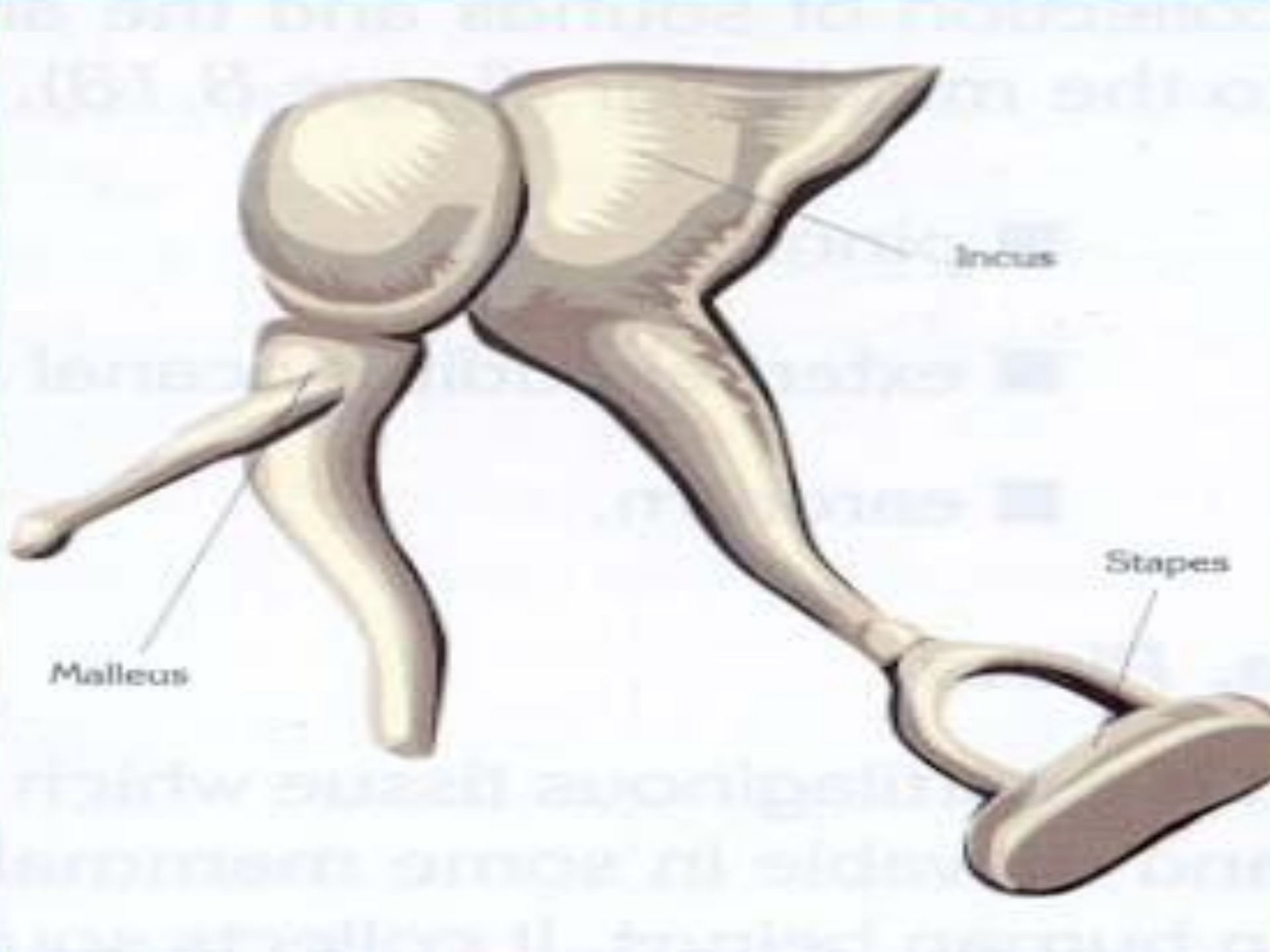
- Auditory canal is a canal which is found between pinna and eardrum.
- It has hairs and produces wax-like substance to filter solid partcicles.
- The eardrum separates outer ear from the middle ear.
- It is thin half transparent.

MIDDLE EAR

- It contains three small bones which are called the hammer, anvil and stirrup.
- These bones form a chain across the middle ear linking the eardrum to another membrane, the oval window.

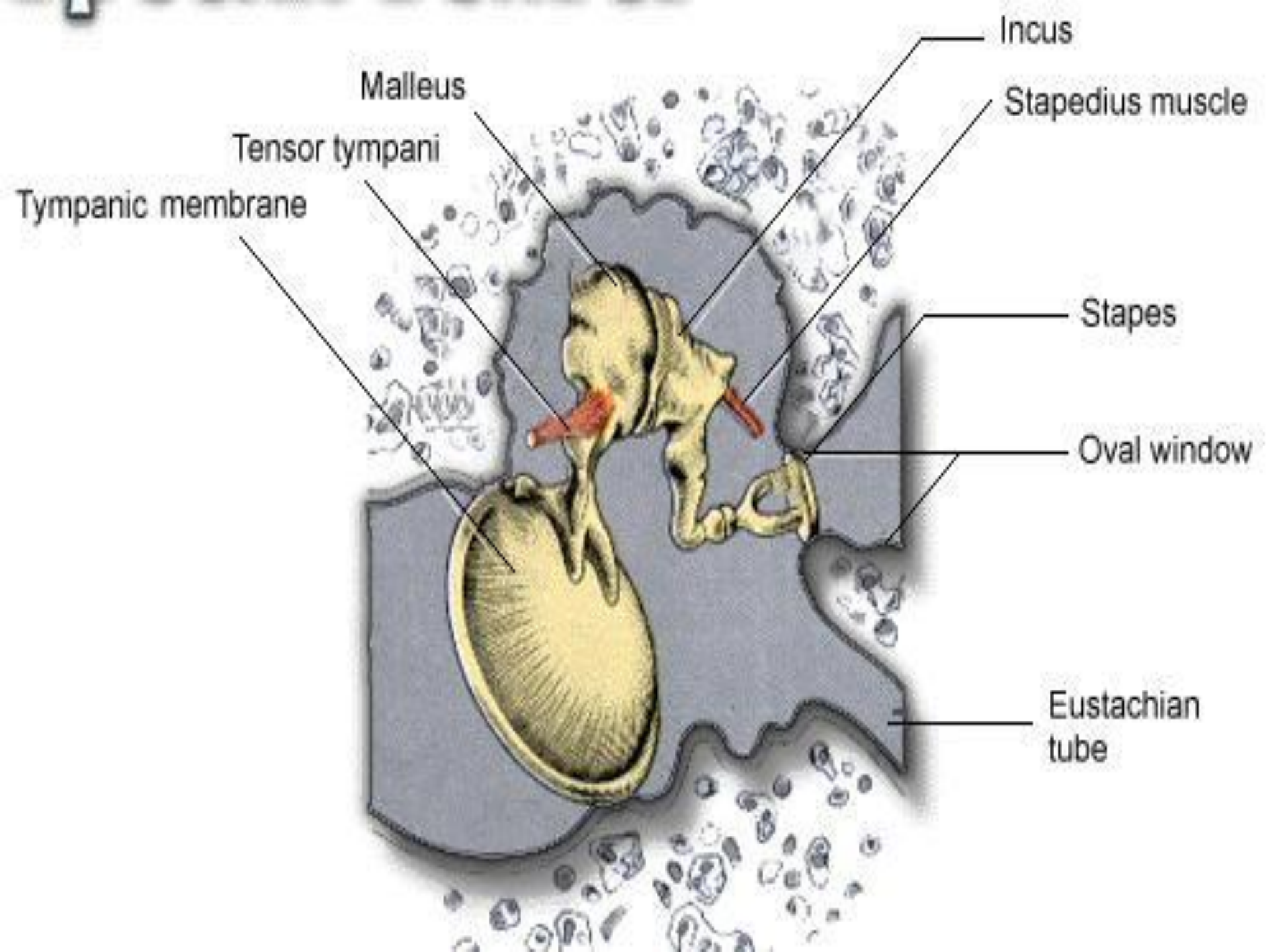

Semicircular canals
Vestibulocochlear nerve
Vestibule
Scala tympani
Cochlear duct
Scala vestibuli
Oval window
Round window
Cochlea
Helicotrema

- **The hammer attached to the eardrum, the anvil connects the hammer to the stirrup.**
- **Stirrup is connected to the oval window.**


Incus
Stapes
Malleus

EUSTACHIAN TUBE

- It is located between pharynx and the middle ear.
- It equalizes in the middle ear and atmosphere.


Incus
Malleus
Stapedius muscle
Tensor tympani
Tympanic membrane
Stapes
Oval window
Eustachian tube

THE INNER EAR

- It consists of the cochlea and semicircular canals.
- Cochlea is organ of hearing which consists of coiled, liquid-filled tubes.

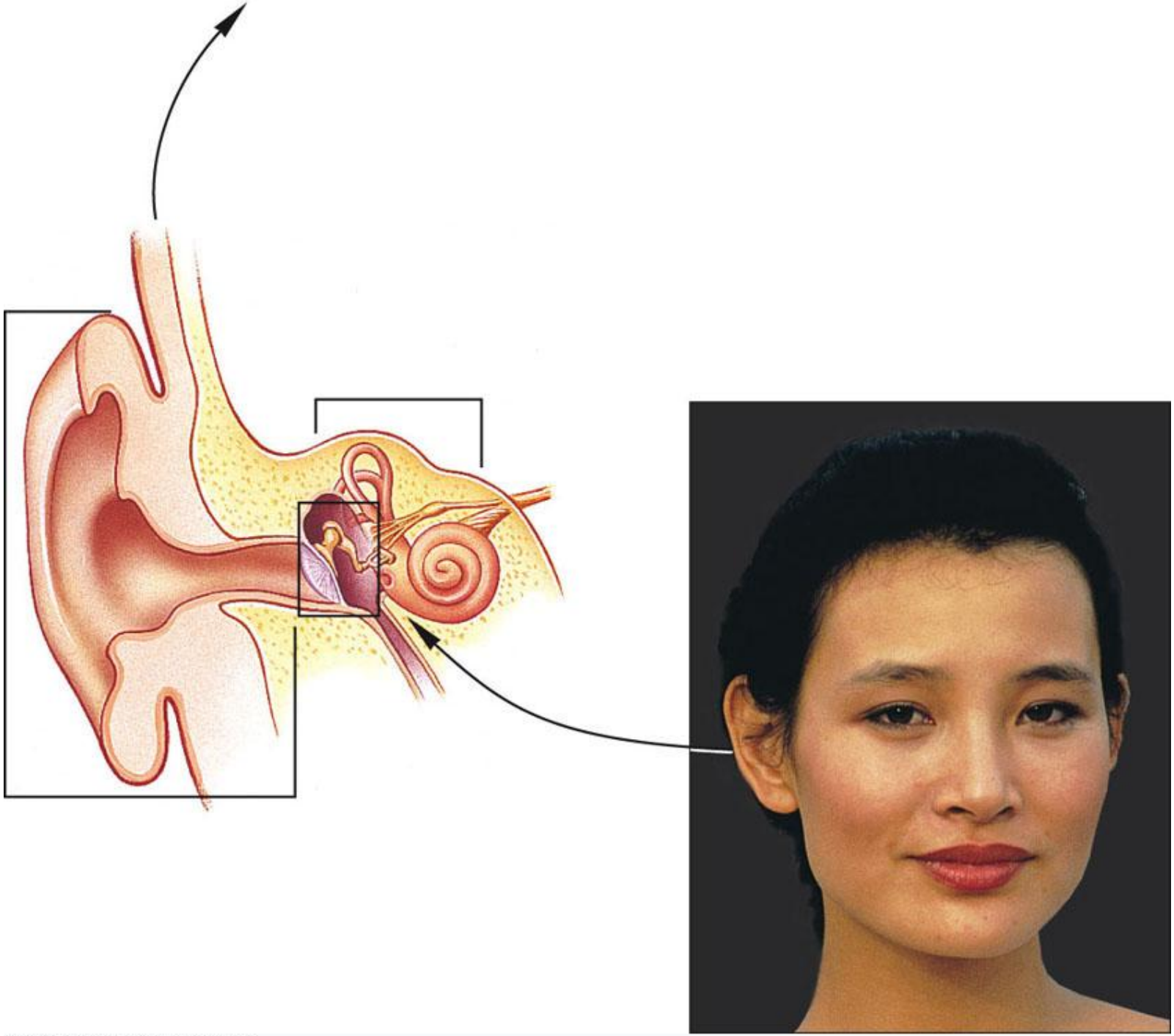
- They are separated from another by membranes.
- Lining of the membranes are specialized hair cells that are sensitive to vibration.

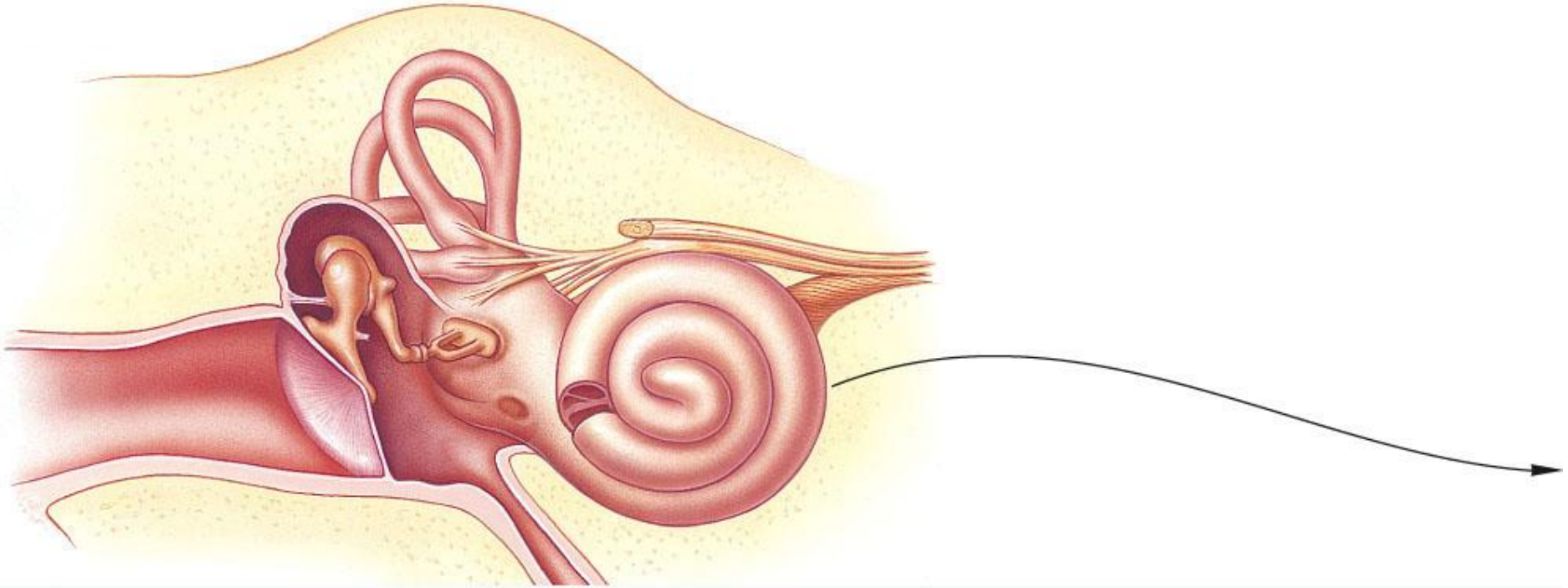
- Semicircular canals enable the body to maintain balance.
- These canals contain fluid and hairlike projenctions that detect changes in body position.

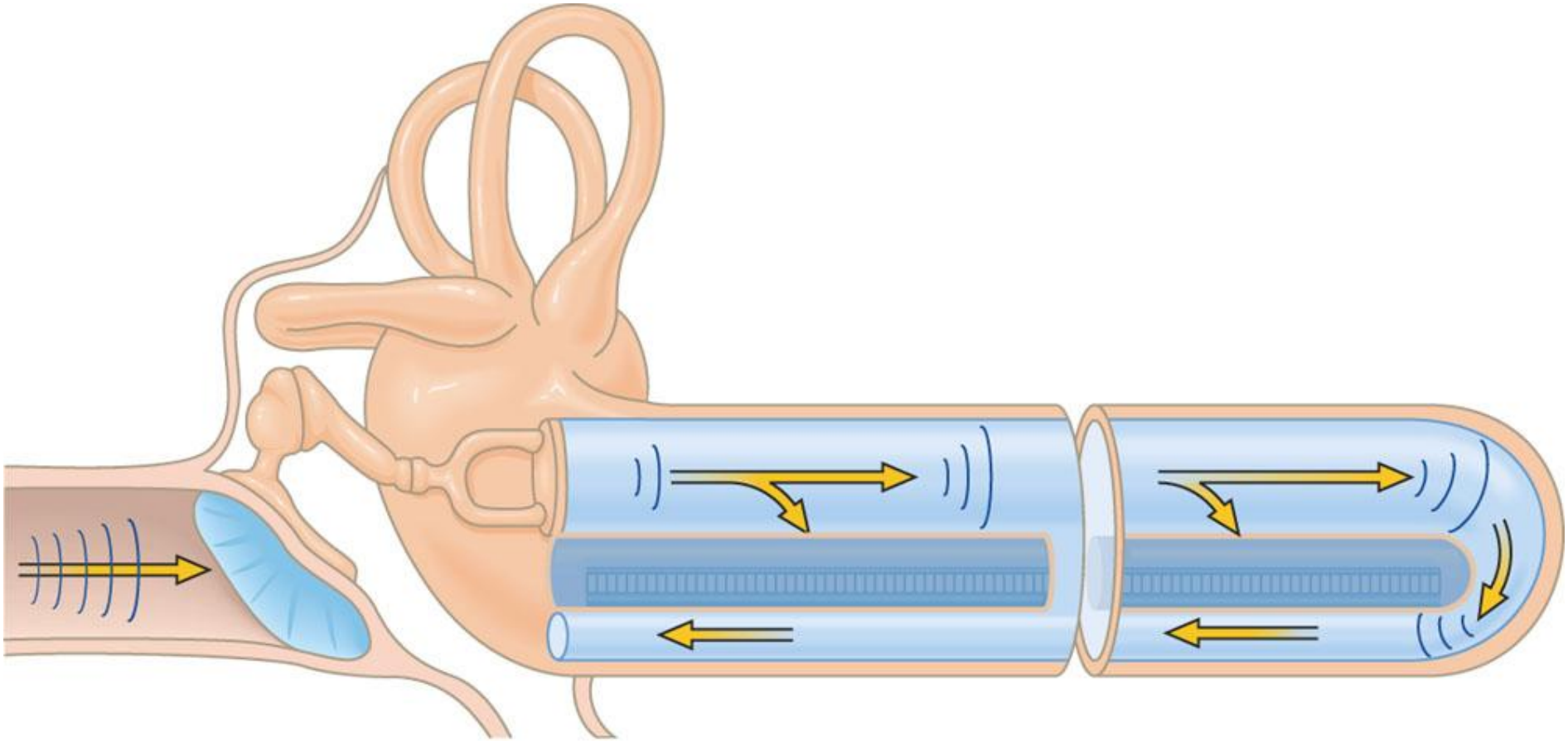
HEARING

- Sound waves collected by outer ear pass down the auditory canal to the eardrum.
- They cause the eardrum to vibrate.
- The vibrations are transmitted across the middle ear by the hammer, onvil and stirrup.

- **Vibration of stirrup cause vibrations in the oval window which in turn cause the fluid within the cochlea.**
- **The initiates in nerve endings around the hair cells.**
- **These impulses are carried to the cerebral cortex, where their meaning is interpreted.**







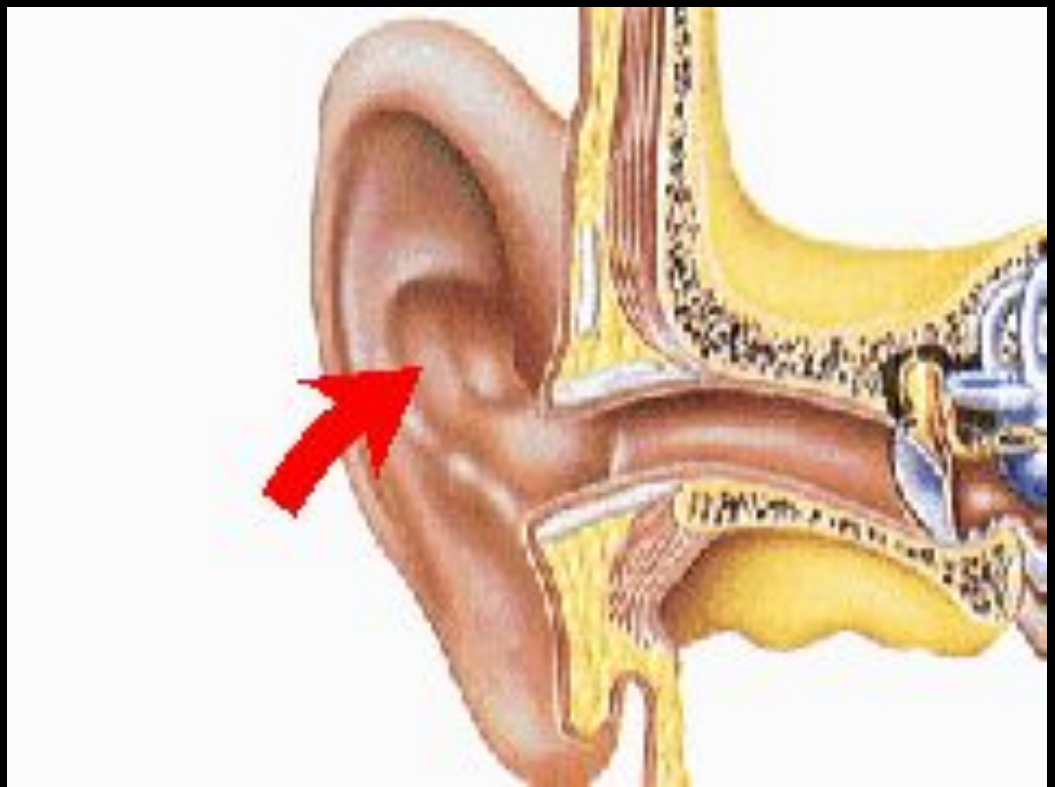
Structure of the ear

- Three regions:

- Outer ear
- Middle ear
- Inner ear

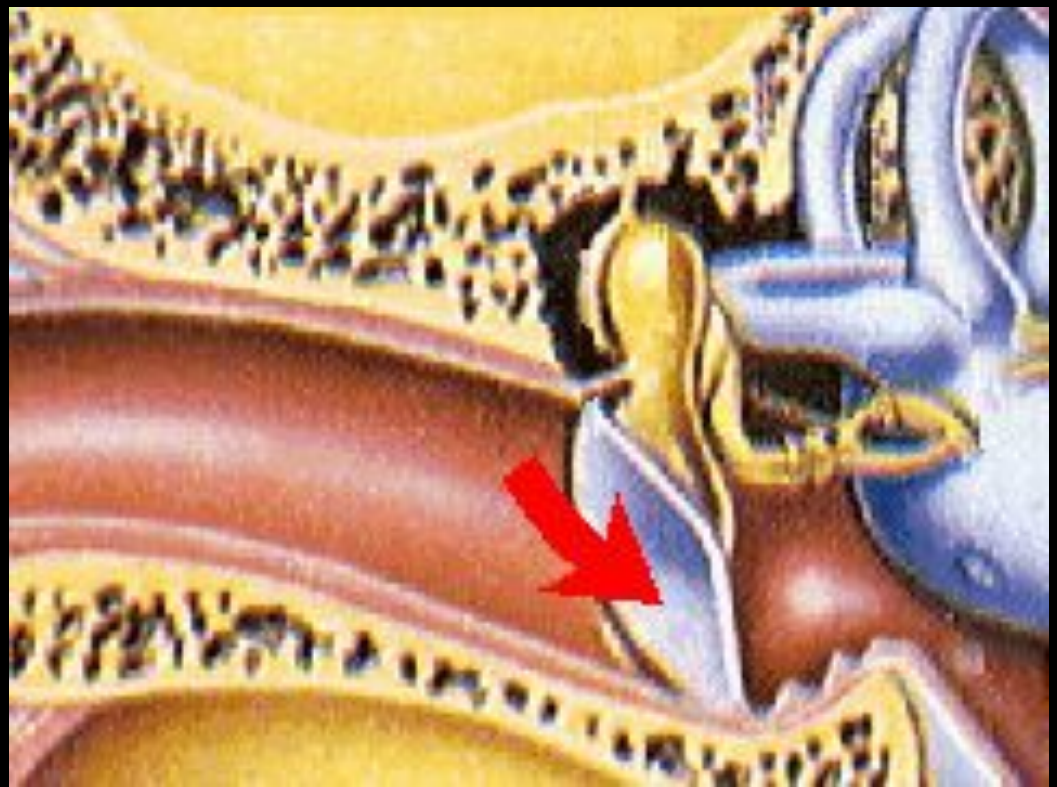
Process of hearing

- Sound waves are collected by the ear pinna



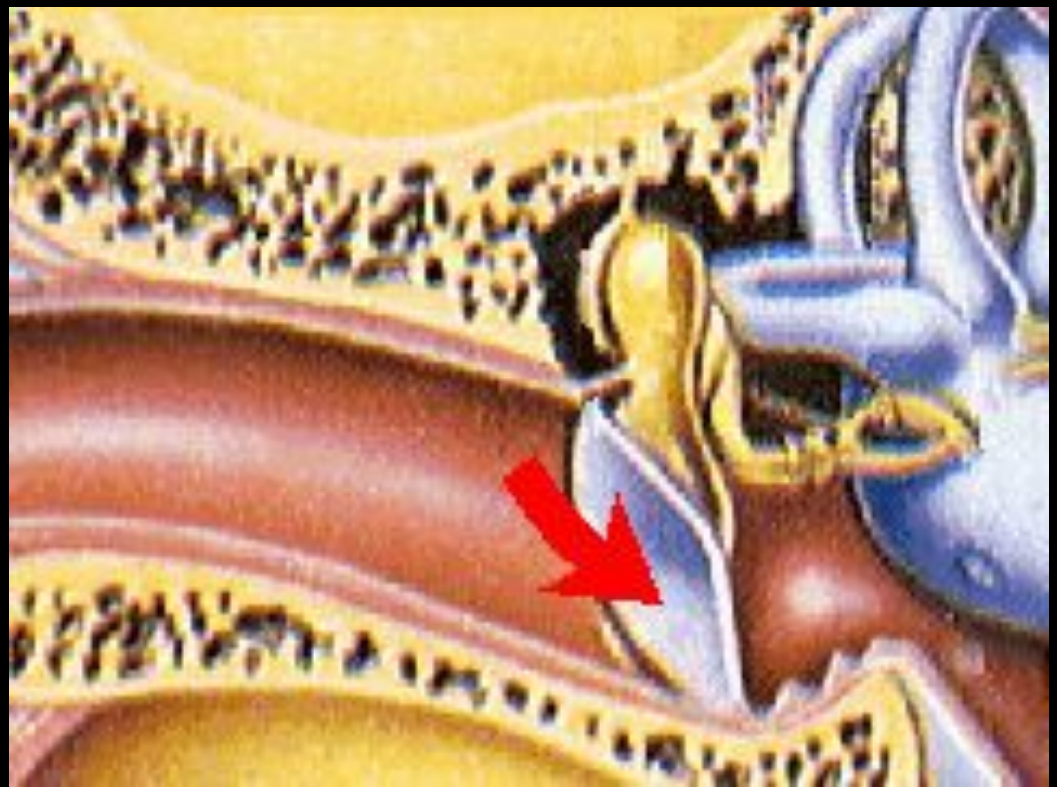
Process of hearing

- Sound waves pass along the external auditory canal to the ear drum



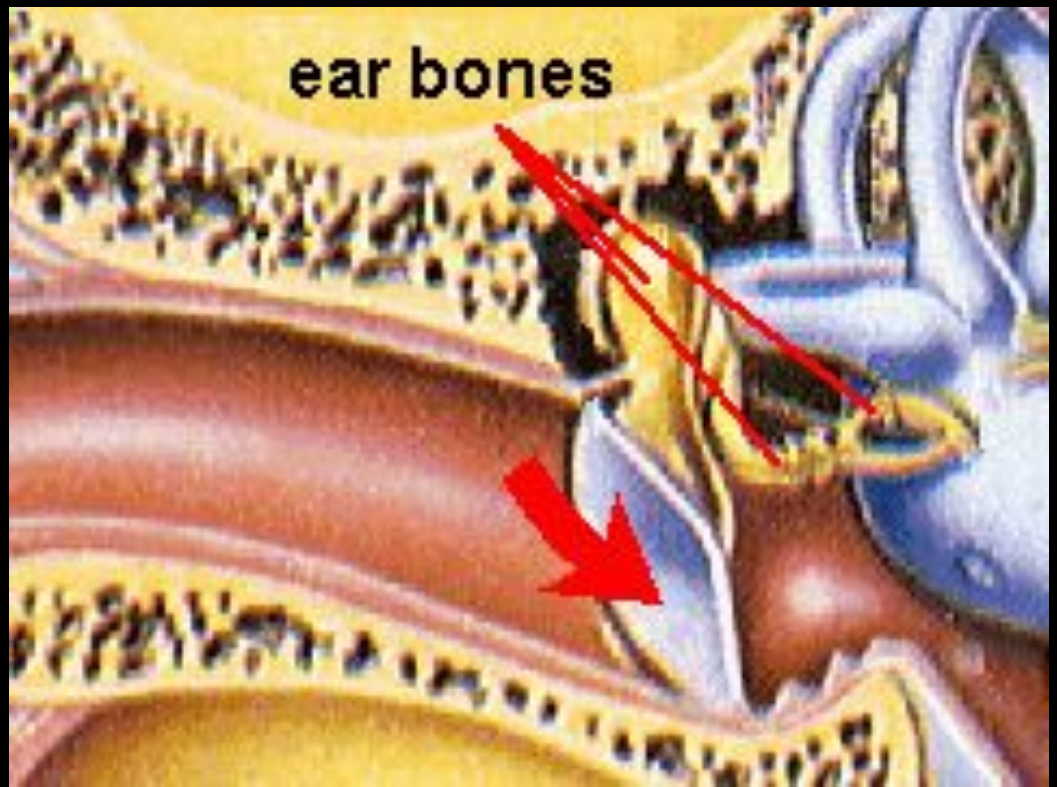
Process of hearing

- Ear drum converts sound waves into mechanical vibrations



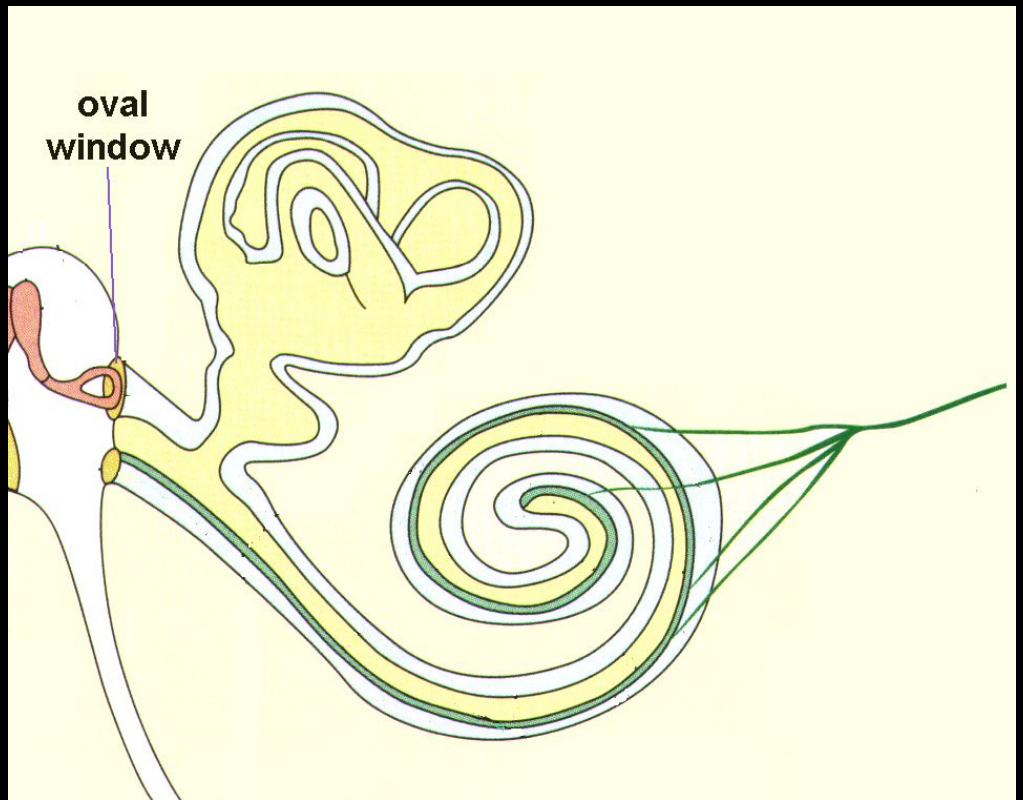
Process of hearing

- Ear drum transmits vibration to the ear bones



Process of hearing

- Ear bones transmit vibration to the **oval windows**



Process of hearing

- Oval window causes the perilymph in the upper canal of the cochlea to vibrate

Process of hearing

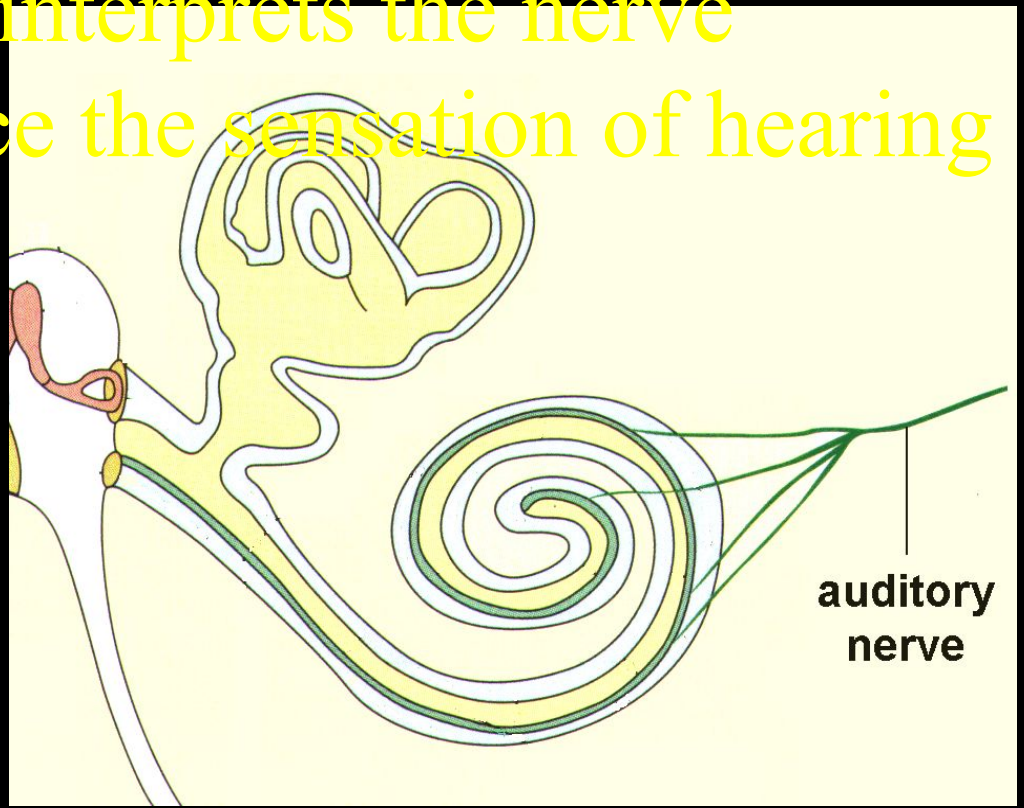
- Perilymph transmits vibrations to the endolymph in the middle canal

Process of hearing

- The sensory hair cells on the bottom membrane of the middle canal are stimulated
- The sensory hair cells send off nerve impulses

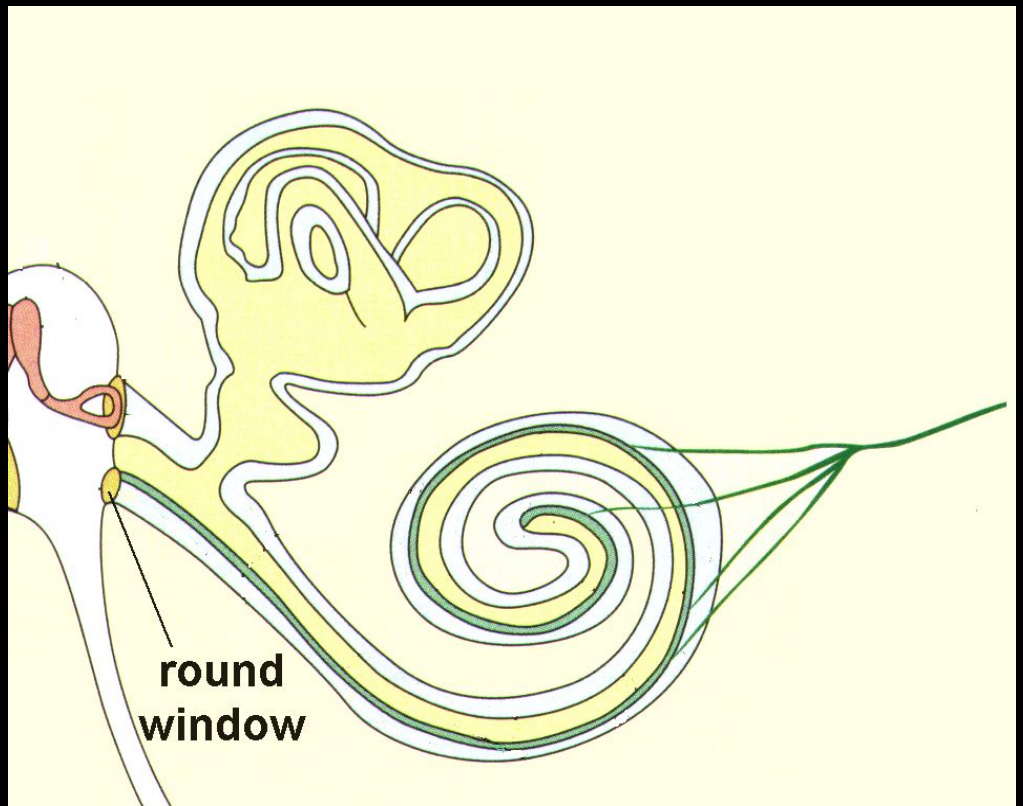
Process of hearing

- **The auditory nerve transmits the impulses to the auditory centre of the cerebral cortex**
- The auditory centre interprets the nerve impulses and produce the sensation of hearing



Process of hearing

- Round window bulges outwards into the middle ear cavity to release pressure



THE SKIN

- **All multicellular organisms have a skin composed of one or more layers.**

Functions of Skin

1. It protects the inner layers of the body from physical and chemical effects.
2. It prevents body from enterance of microbes
3. It prevents water loss in terrestial organisms.
4. It prevents cell from ultraviolet light.

Structure of the skin

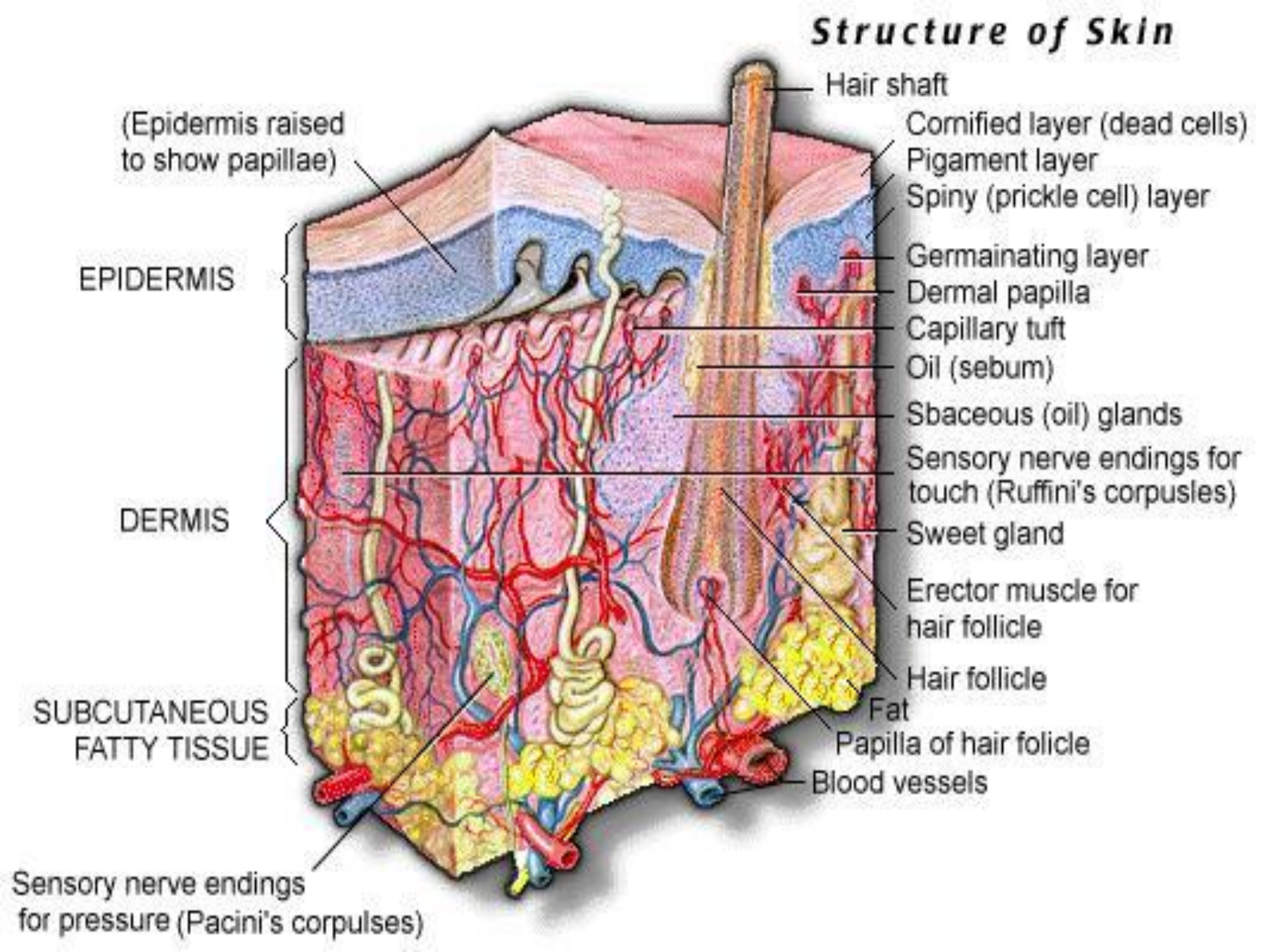
- Epidermis
- Dermis
- Accesory structure of the skin

  - Skin gland
  - Hair follicles
  - Nails
  - Skin pigment

- **EPIDERMIS is outermost layer of skin.**
- **This layer composed of keratinised epithelial cells.**
- **Epidermis contains no blood vessels.**
- **Upper section of epidermis is composed of non-living cells.**
- **The color of skin is conferred by melanin pigment.**

- **DERMIS is rich in blood vessels and nerve ending.**
- **The receptors located in the skin are connected to these nerve ending.**
- **Dermis also contain smooth muscle, sweat glands, hair follicles, toch receptors and lymph vessels.**

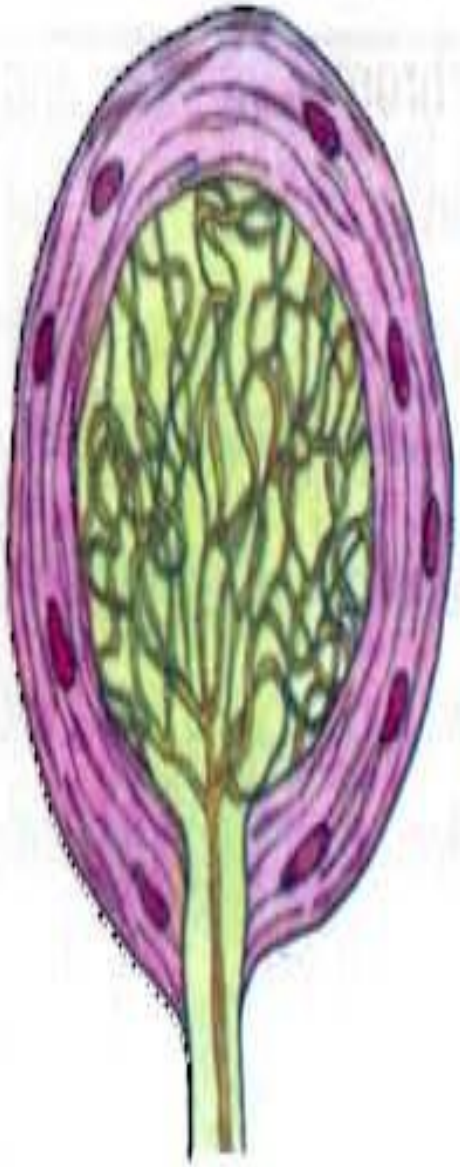
Structure of Skin



RECEPTORS

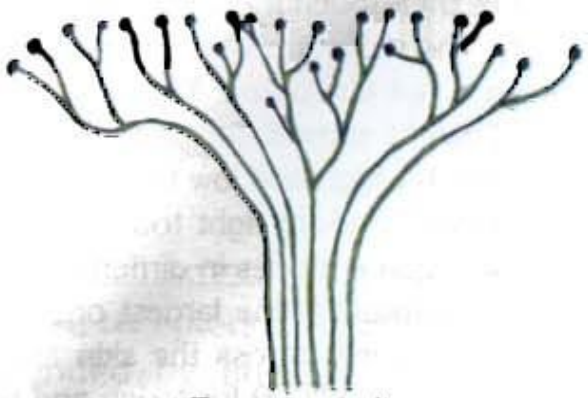
- **Meisner corpuscles:** They are involved in reception of touch of the palm sole and lips.
- **Paccinian corpuscles:** They are involved in recption of mechanical stimuli.
- **Krouse corpuscles:** They are involved in reception of cold and pressure.

- **Ruffini corpuscles:** They are involved in recption of heat, touch and pressure.
- **Sweat glands:** They are present in all regions of the skin. They open onto the surface of skin by pores.



50 μ Krouse corpuscle

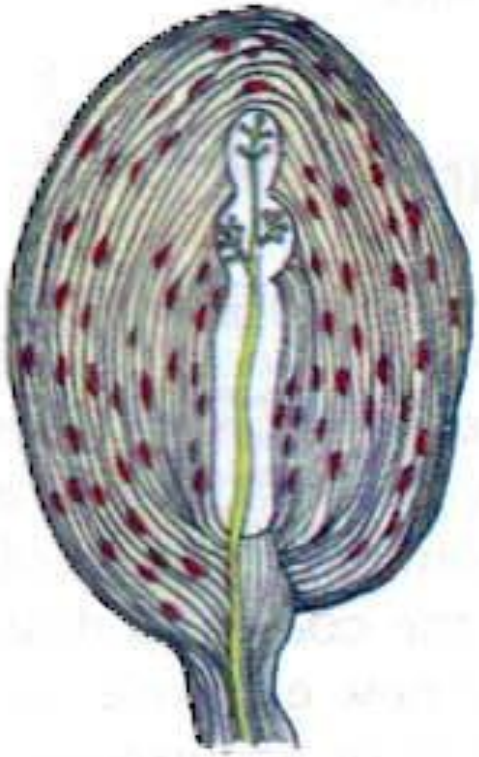
200 μm Ruffini corpuscle



Free nerve endings

Figure-8.28.: Sensory organs of the skin and their size.

100 μm Meissner corpuscle

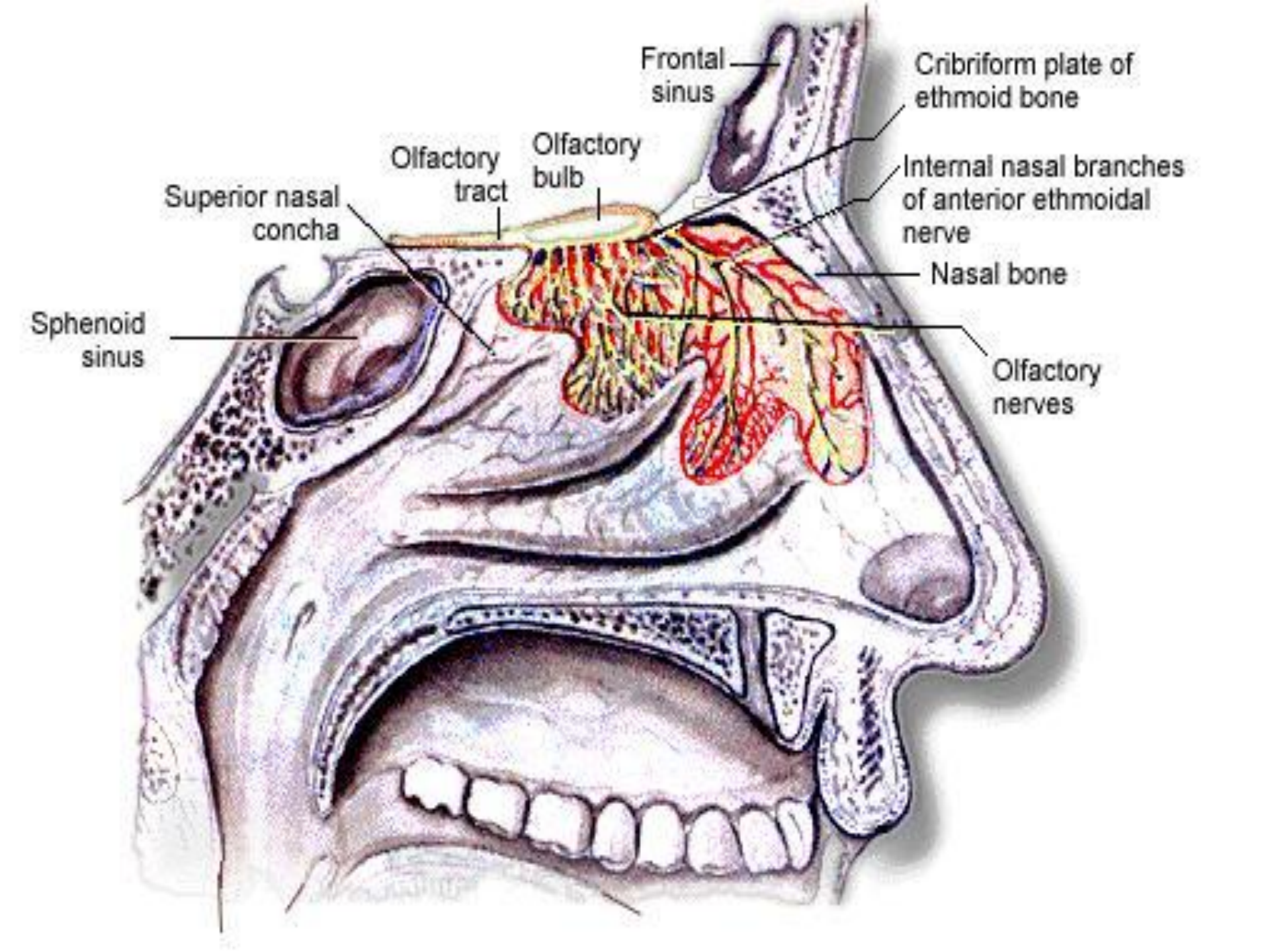


4 mm Paccinian corpuscle

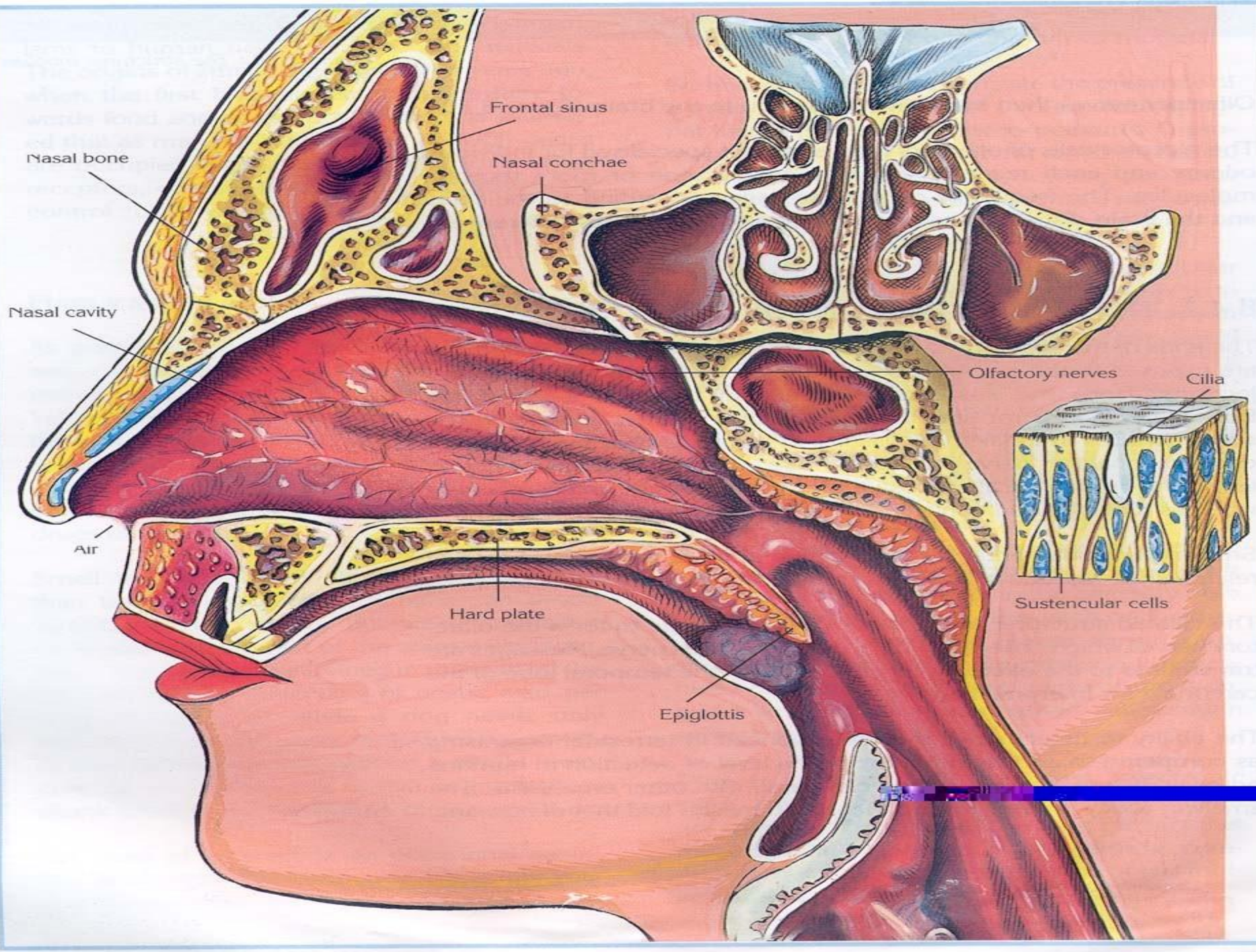
- **They are involved in removal of water, minerals, urea and other substances.**
- **The main function of sweat glands is the regulation of body temperature by evaporation of water.**

THE NOSE

- Nose is the organ of the body involved in both respiration and smell.
- The reception of smell takes place in chemoreceptors located in nasal cavity.


Frontal sinus
Cribriform plate of ethmoid bone
Olfactory tract
Olfactory bulb
Internal nasal branches of anterior ethmoidal nerve
Superior nasal concha
Nasal bone
Sphenoid sinus
Olfactory nerves

- Smelling is fundemantal in the detection of food, maintenance of relationship, reproduction and communication of some animals.
- Nose also provides the control of temperature
- The control of humidity and the elemination of infectious organisms.


Frontal sinus
Nasal bone
Nasal conchae
Nasal cavity
Olfactory nerves
Cilia
Air
Hard plate
Sustencular cells
Epiglottis

THE TASTE

- The surface of the tongue is covered with small projections called papillae.
- There are the taste receptors or taste buds within the papillae.
- Nerve fibers branch among the cells of the taste bud and each cell is in contact with one or more neurons.

- **The taste buds are sensitive to only four basic tastes;**
- **SWEET, SOUR, SALT AND BITTER**
- **Each taste bud is particularly sensitive to one of these tastes.**
- **Taste and smell are chemical senses; they begin at chemoreceptors**

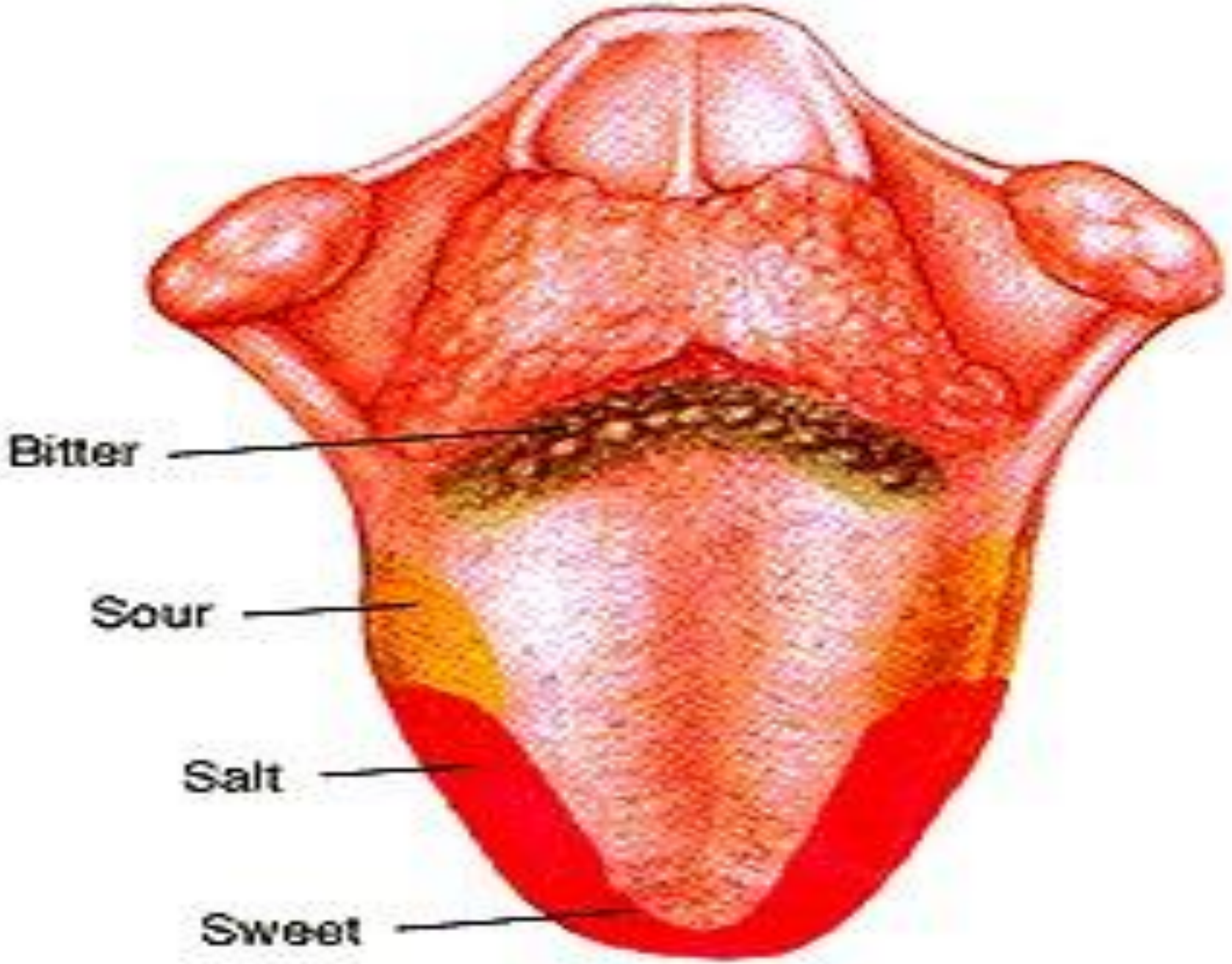
- Tend to be localized on specific areas of the tongue, taste buds for sourness are found along the sides of the tongue
- Taste buds for bitterness at the back of the tongue
- Taste buds for sweetness and saltiness at the back of the tongue

- **Taste buds for sweetness and saltiness on the tip of the tongue.**
- **When taste buds are stimulated, impulses are initiated by the sensory cells of the structure and carried to the brain.**

Tongue - the taste organ

- **Detected by taste buds on the upper surface of the tongue which are stimulated by chemicals dissolved in saliva**
- **Different regions detect different tastes**

- **Flavour of food is given by both the sense of taste and odour of it**


Bitter
Sour
Salt
Sweet