

Handwritten text in red ink on a light blue background. The text is written in a cursive style and reads: "Handwritten text in red ink on a light blue background." The text is centered horizontally and occupies the middle portion of the image. There are faint, light green ghostly outlines of the same text visible in the background, suggesting a watermark or a reflection effect.

- **Receptors provide information about both external and internal environments.**
- **The receptors of the human are located in EYES, EARS, NOSE, TONGUE and SKIN.**
- **These organs are called Sense Organs.**

THE EYE

- **It provides more than 80% of the information received about the external environment.**

STRUCTURE OF EYE

- Eyes contain 3 main parts;
- Schlerenchyma
- Choroid
- Retina

Schlerenchyma

- It is supportive structure of eye that protects inner structures of the eye.
- In the front, it bulges and becomes the transparent cornea.
- Light enters the eye through cornea.

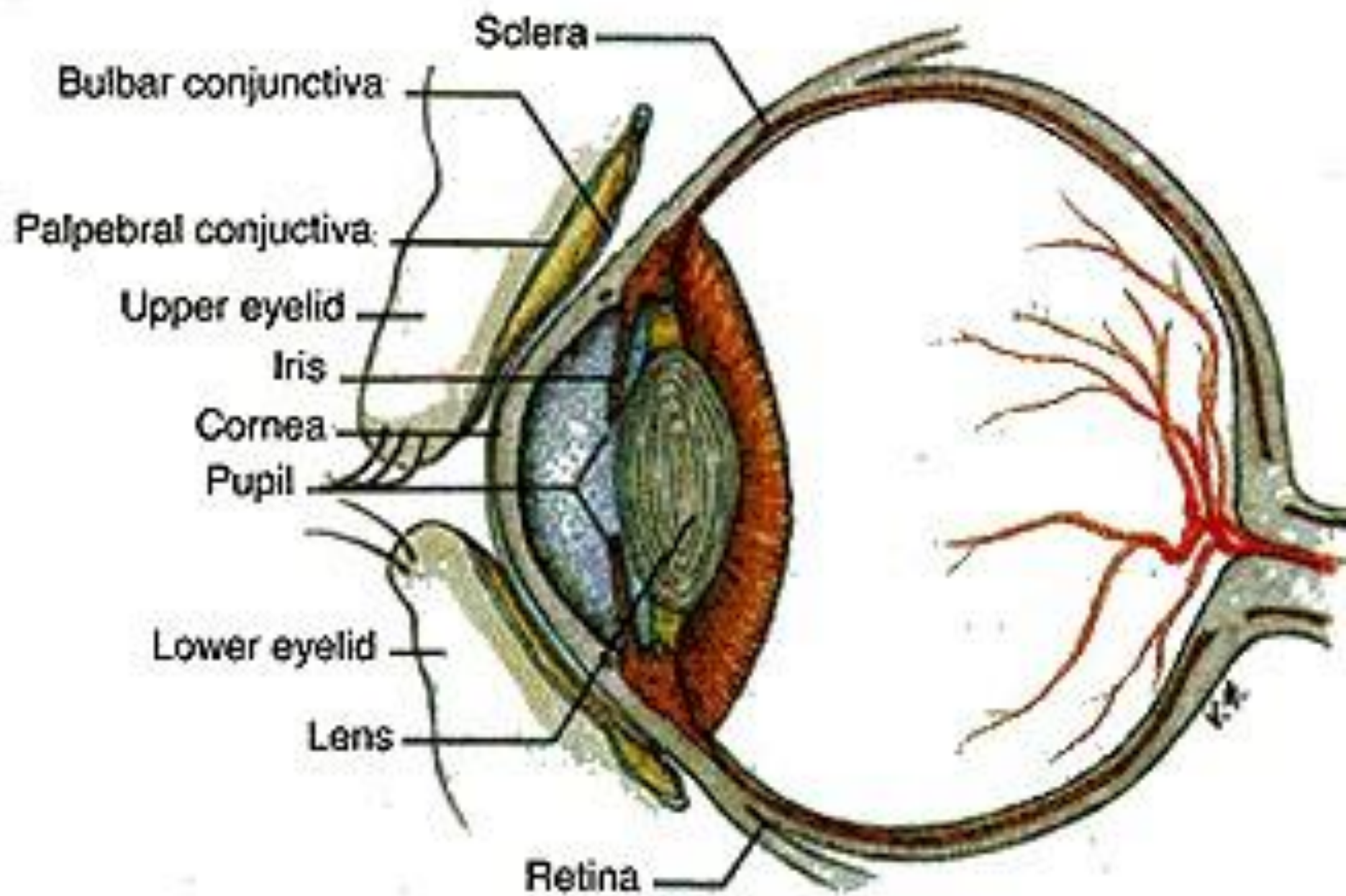
CHOROID

- **Just inside the sclera is the choroid.**
- **This layer contains many blood vessels. At the front the eye the choroid layer forms the iris.**
- **It is colored part of eye. In the centre of the iris is an opening called PUPIL.**

- **The diameter of iris is related to the amount of light.**
- **It narrows pupil under intense light but widens in dark conditions.**
- **The size of pupil is controlled automatically by central nervous system.**

THE RETINA

- **Behind the iris is the lens. It focuses the light on the retina (photoreceptor).**
- **Innermost layer of the eye, the retina contains the light receptors.**
- **At the rear of the eye, the retina is attached to the optic nerve which carries impulses from the light sensitive cells to the brain.**



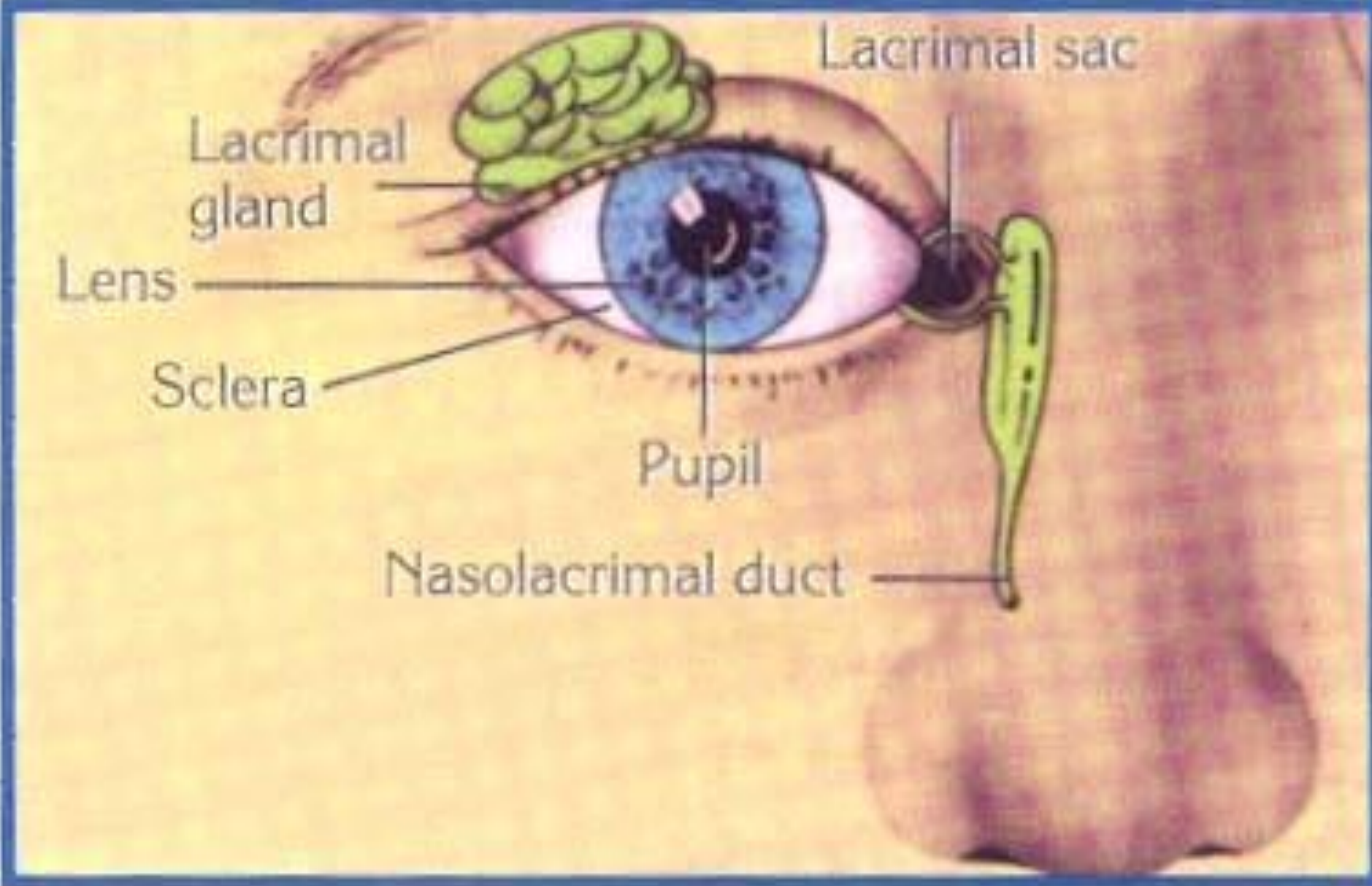


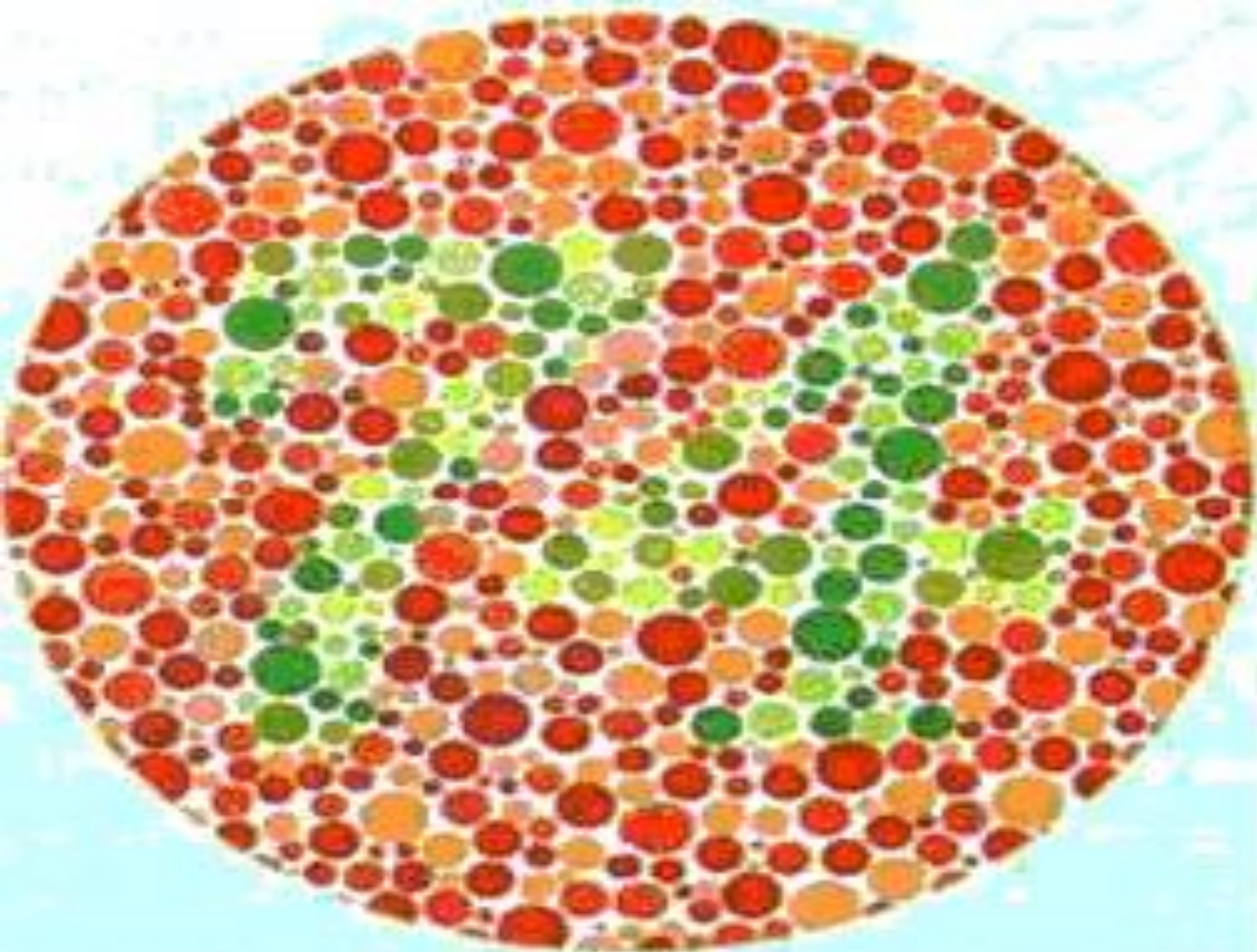
Figure-8.9.: Tear apparatus.

VISION

- **Light entering the eye passes through the cornea, pupil, lens, and forms an image on the retina.**
- **Retina contains light sensitive cells which they are called cones and rods.**

- **Cones are sensitive to color.**
- **Rods are sensitive to dim light but not to color.**
- **The retina contains 125 million rods and 6,5 million cones.**

- **A severe deficiency of vitamin A leads to a condition called night blindness.**
- **In this condition amount of retinal rods and cones is decreased.**



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.

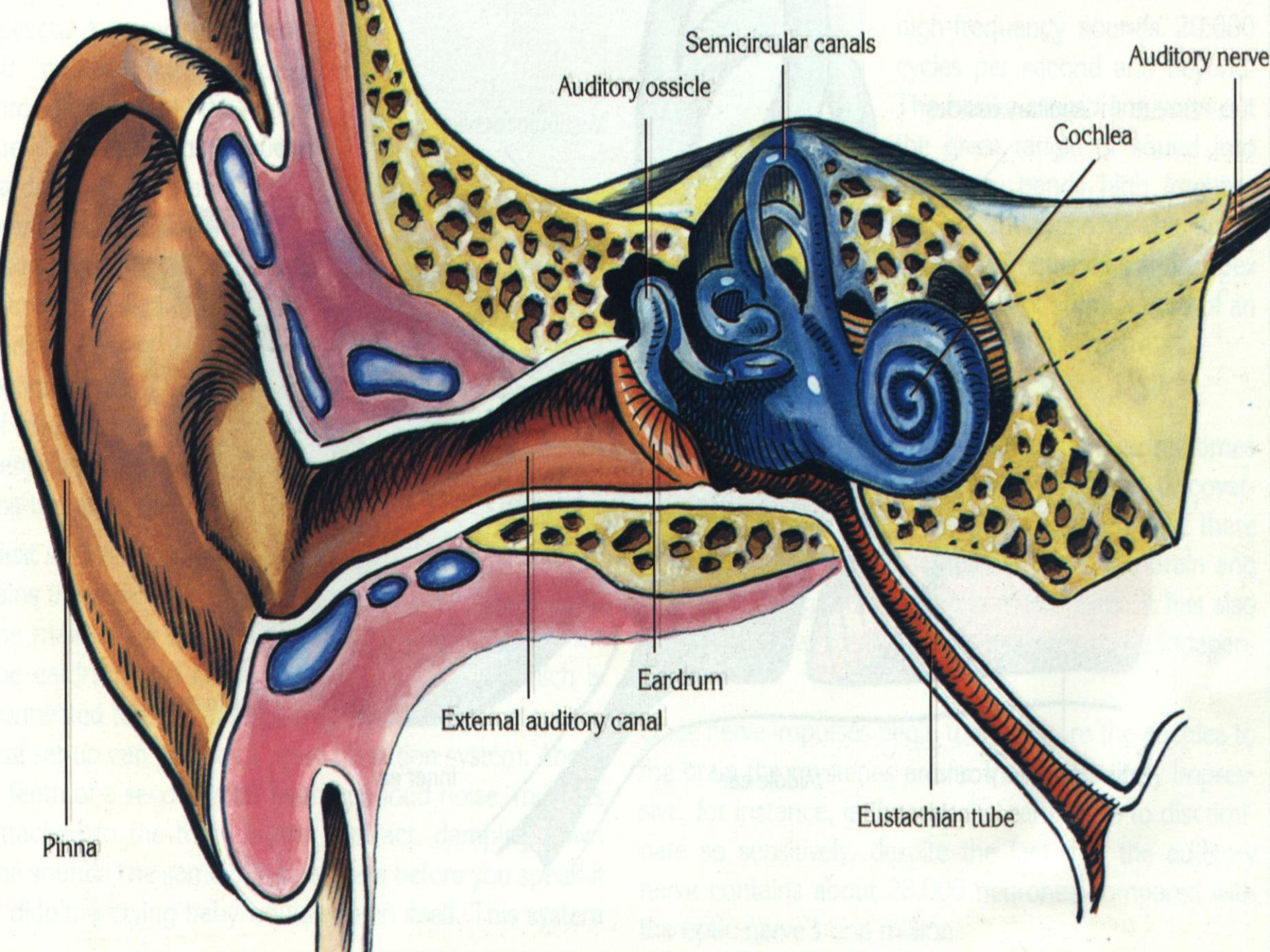
- **At rest, the light rays focus behind instead of on the retina.**
- **This type of eye defect is termed hypermetropia.**
- **This condition can be corrected by convex lenses.**

THE EARS

- The human ear has 2 sensory functions.
- One of them is hearing.
- Other is maintaining 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

Pinna

Eardrum

External auditory canal

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 particles.**
- **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 uform a chain across the middle ear linking the eardrum to another membrane, the oval window.**

Semicircular
canals

Vestibulocochlear
nerve

Vestibule

Scala tympani

Cochlear duct

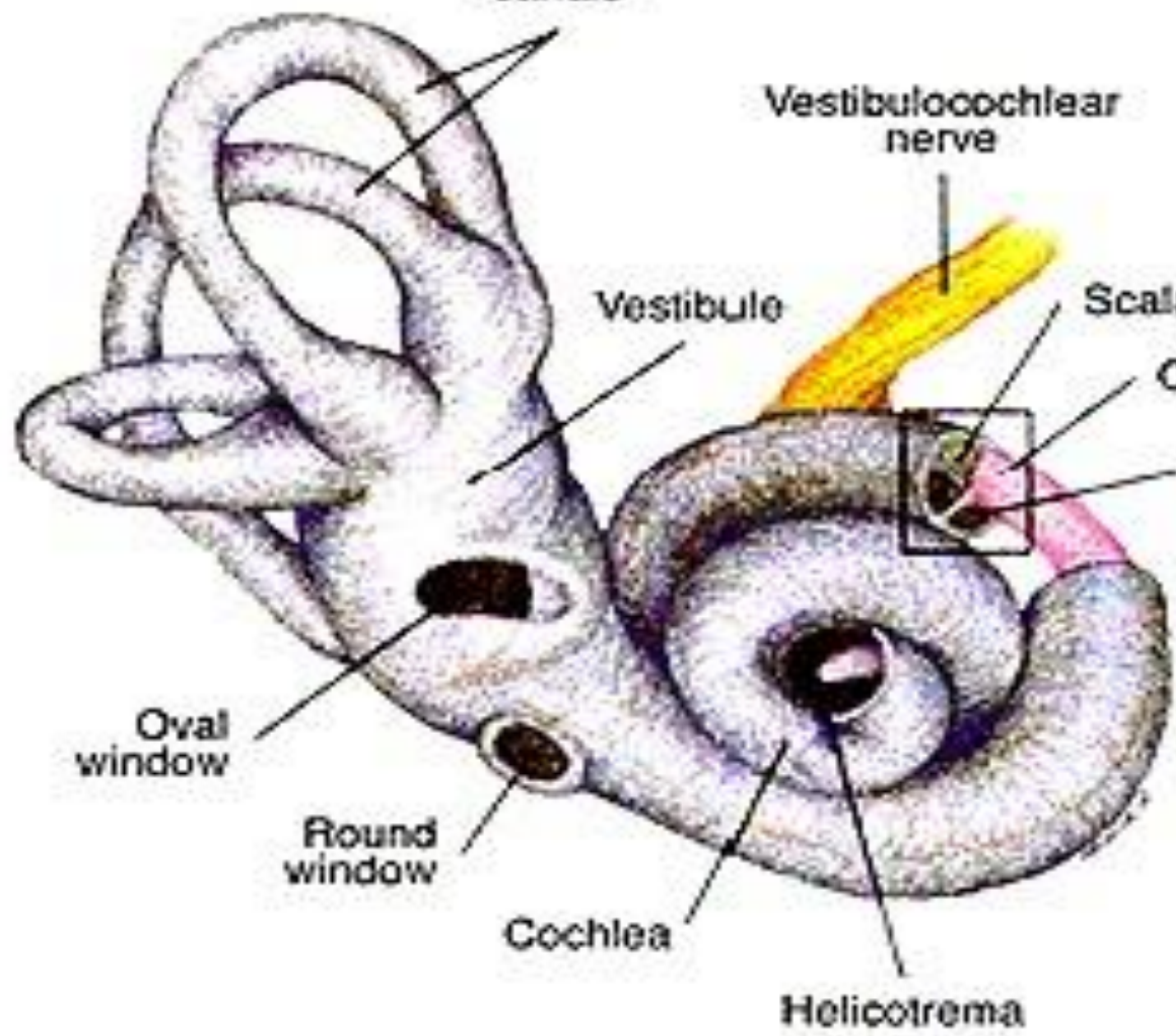
Scala
vestibuli

Oval
window

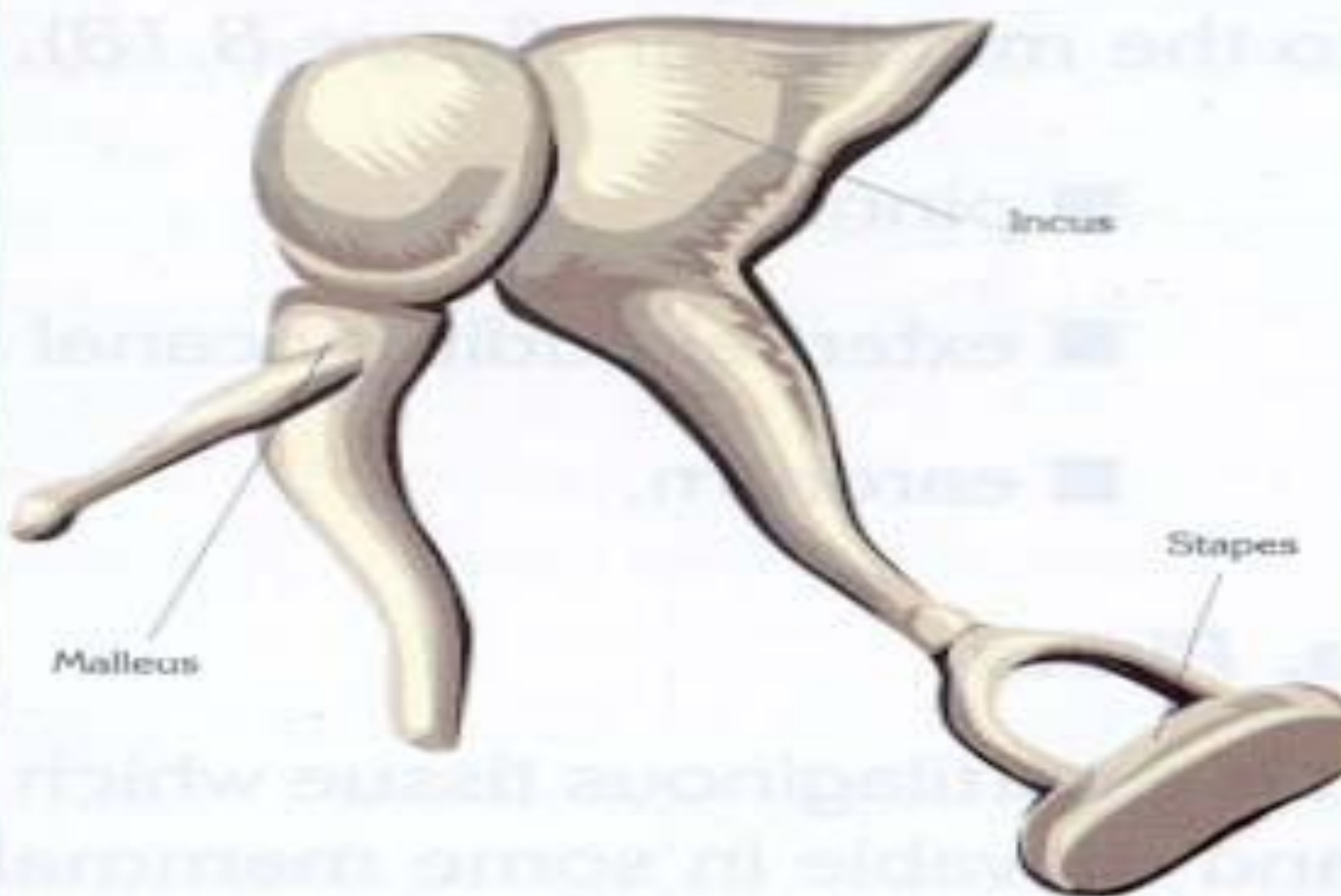
Round
window

Cochlea

Helicotrema



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



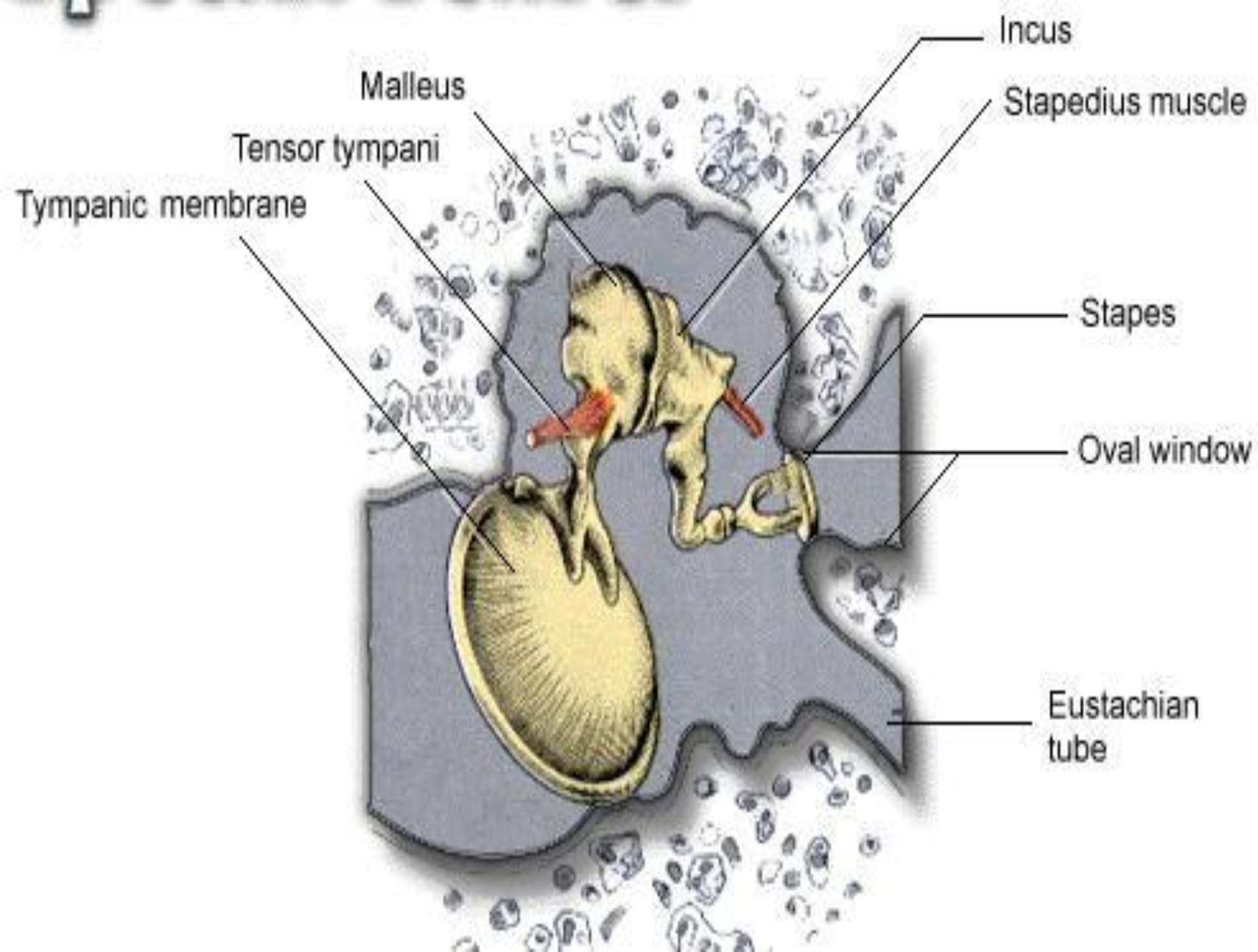
Malleus

Incus

Stapes

EUSTACHIAN TUBE

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



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 projections 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.**

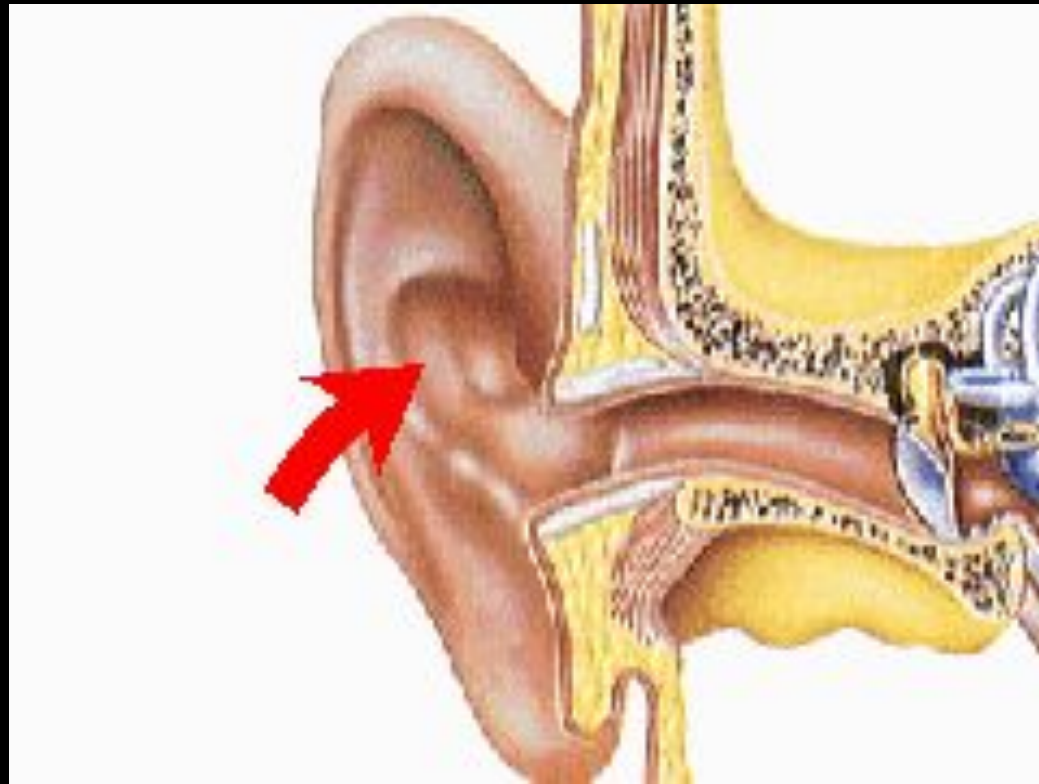
Structure of the ear

- Three regions:
 - Outer ear
 - Middle ear
 - Inner ear



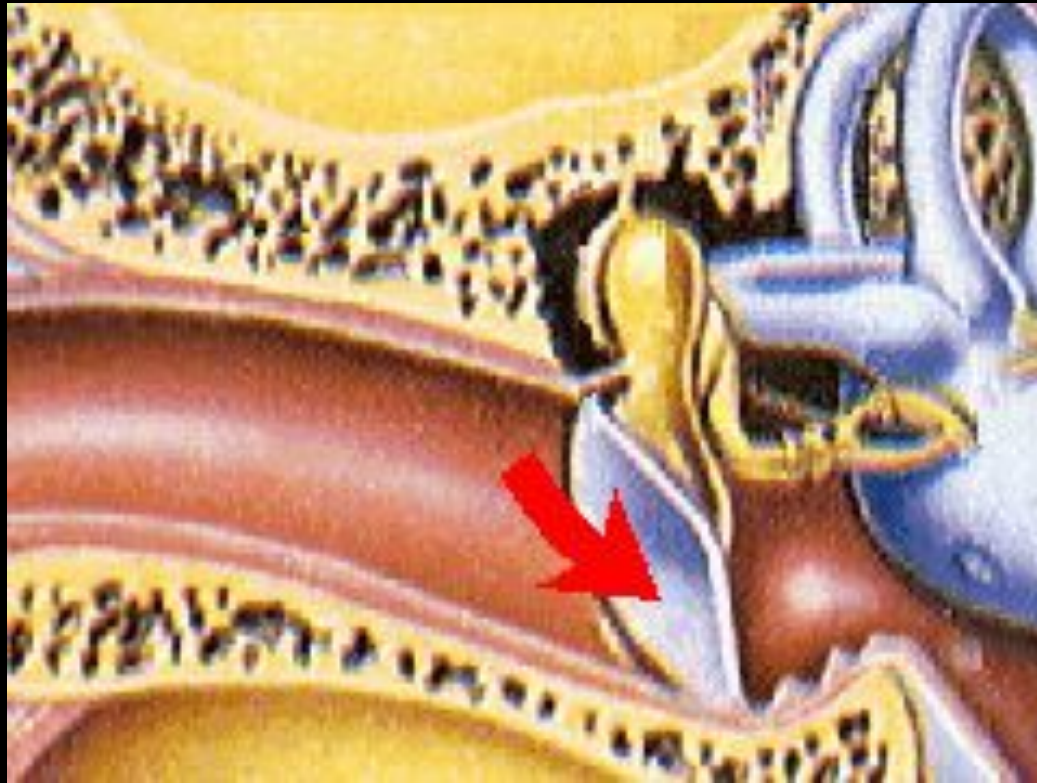
Process of hearing

- Sound waves are collected by the **ear pinna**



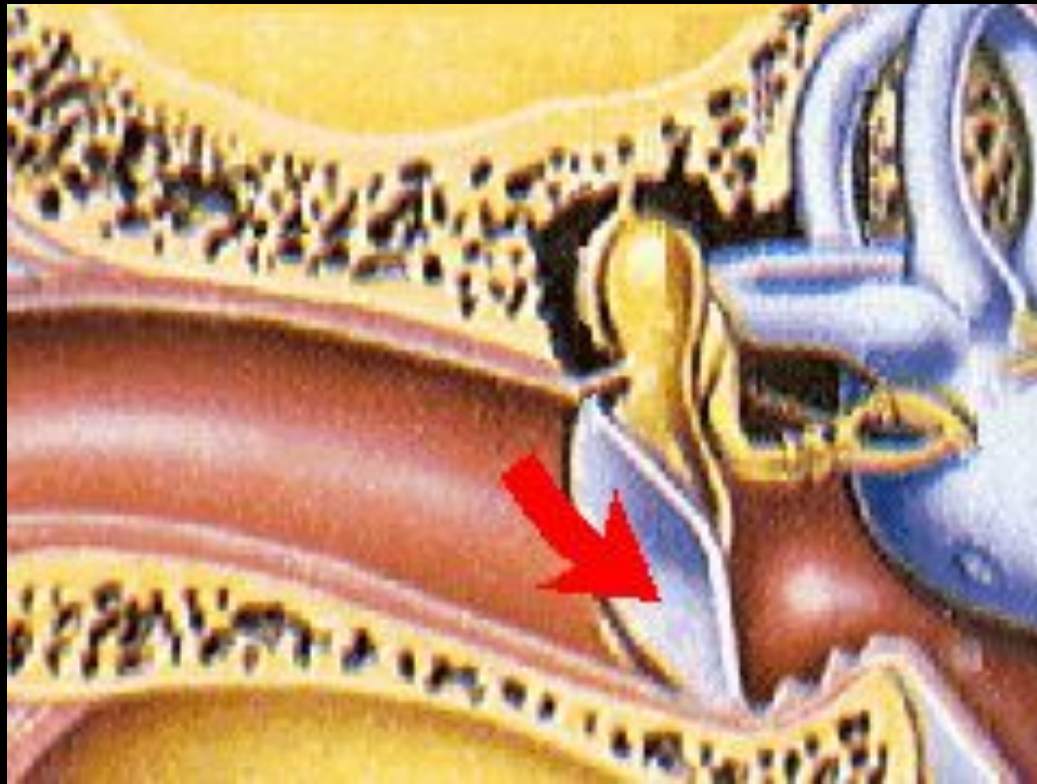
Process of hearing

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



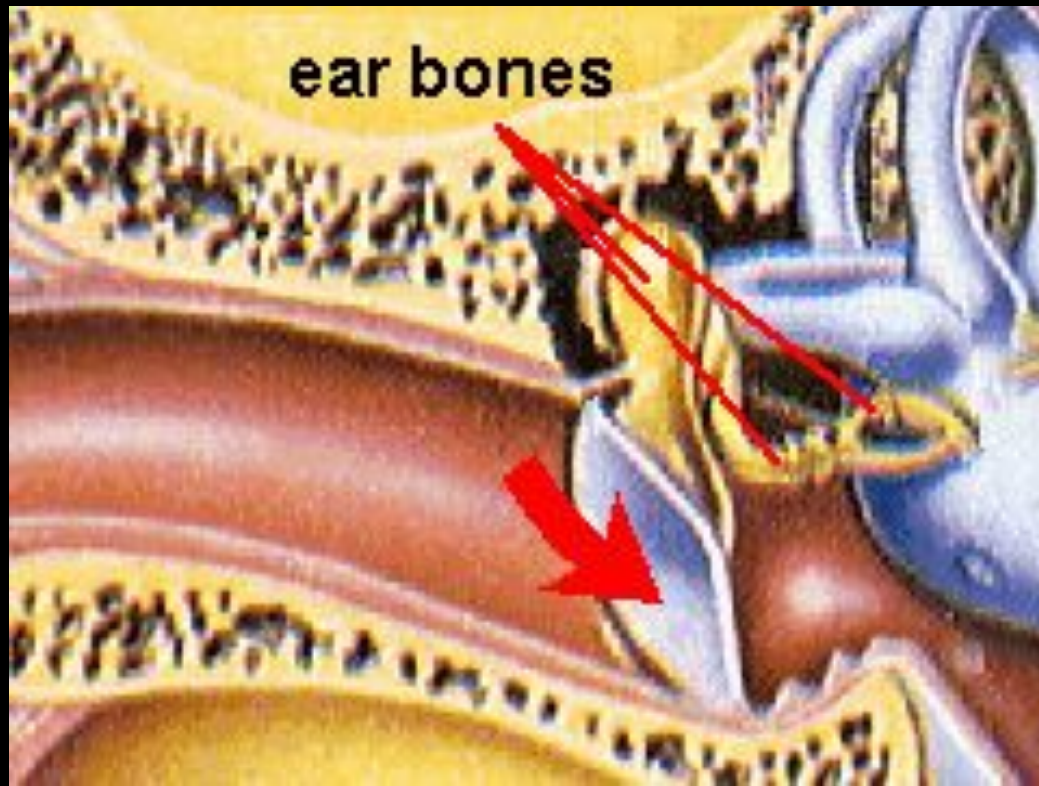
Process of hearing

- Ear drum converts sound waves into
- Sound waves make the ear drum to vibrate mechanical vibrations



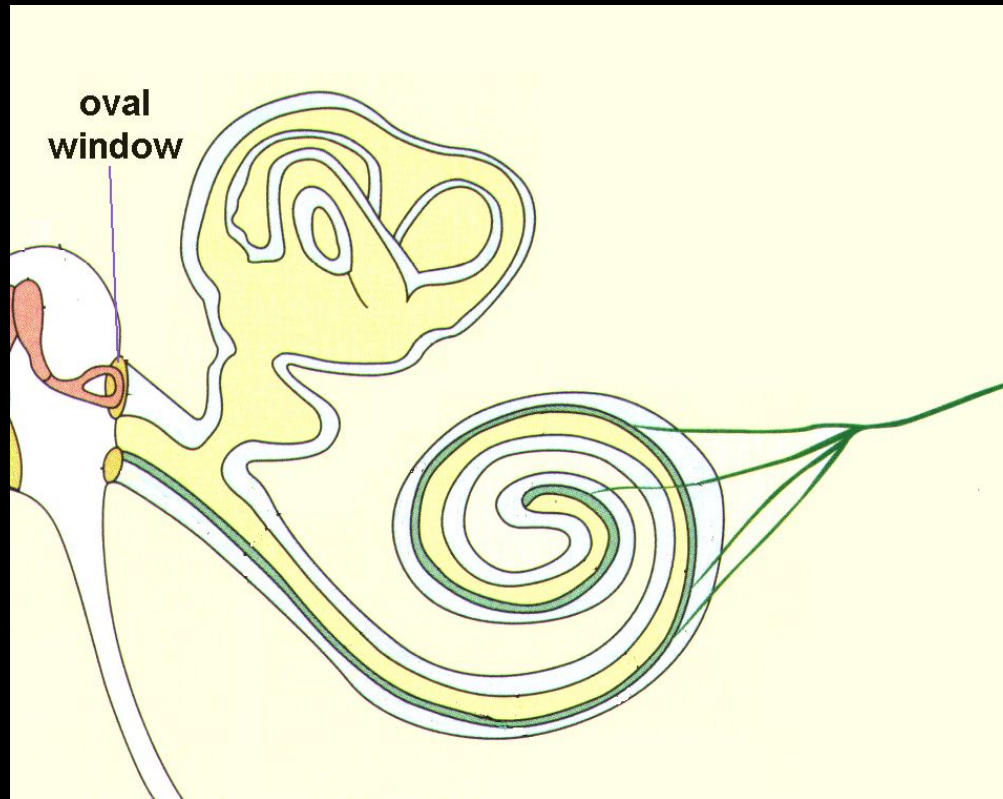
Process of hearing

- Ear bones transmit vibrations and amplify vibrations



Process of hearing

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



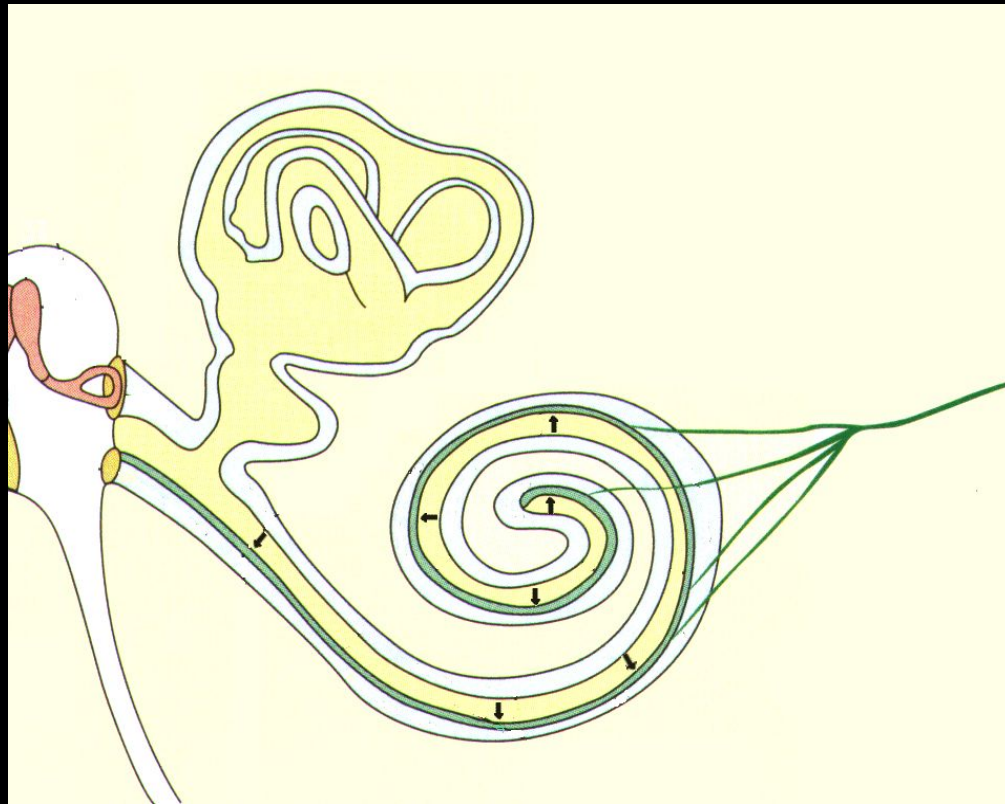
Process of hearing

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



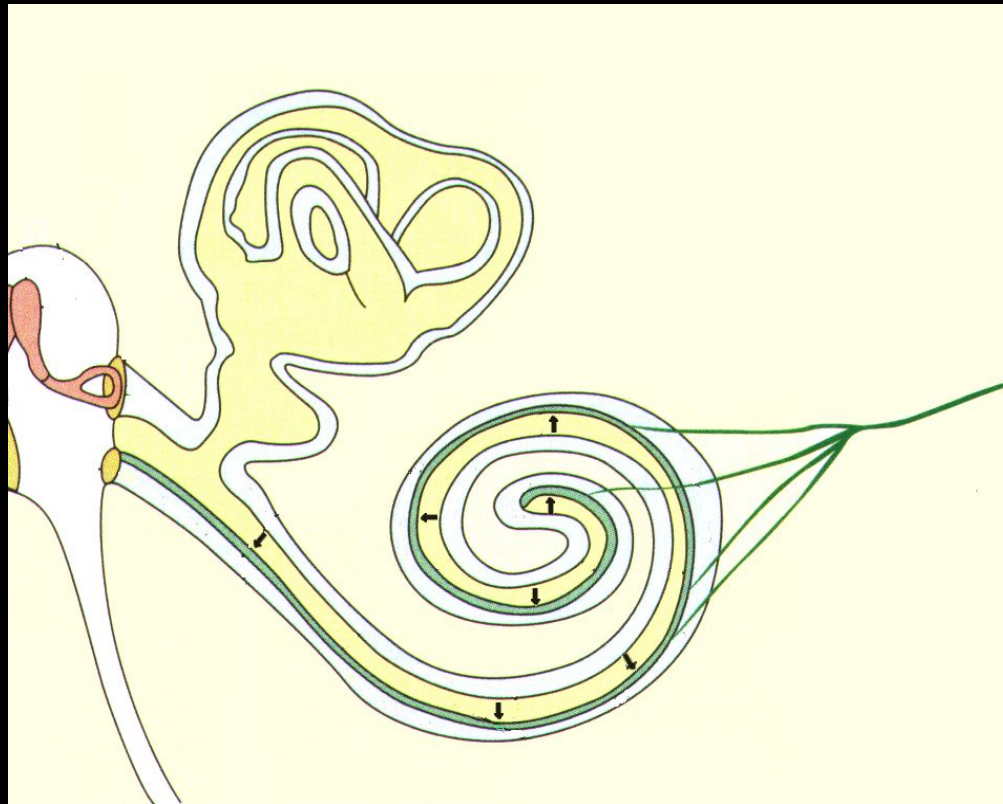
Process of hearing

- Perilymph transmits vibrations to the **endolymph** in the **middle canal**



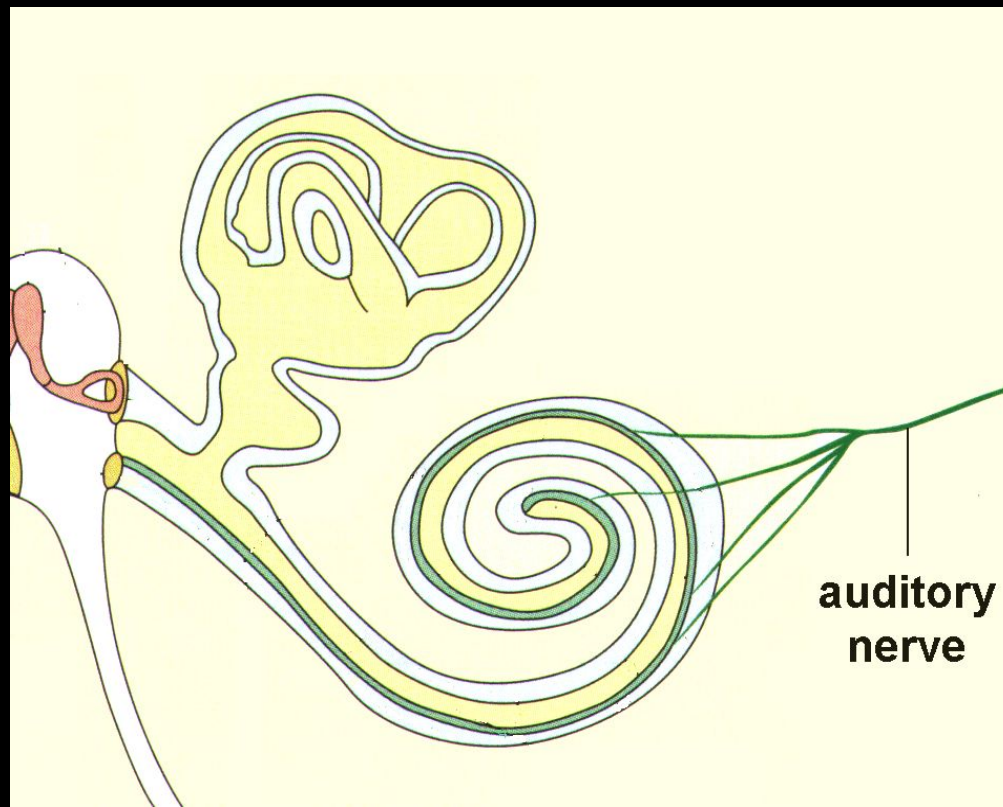
Process of hearing

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



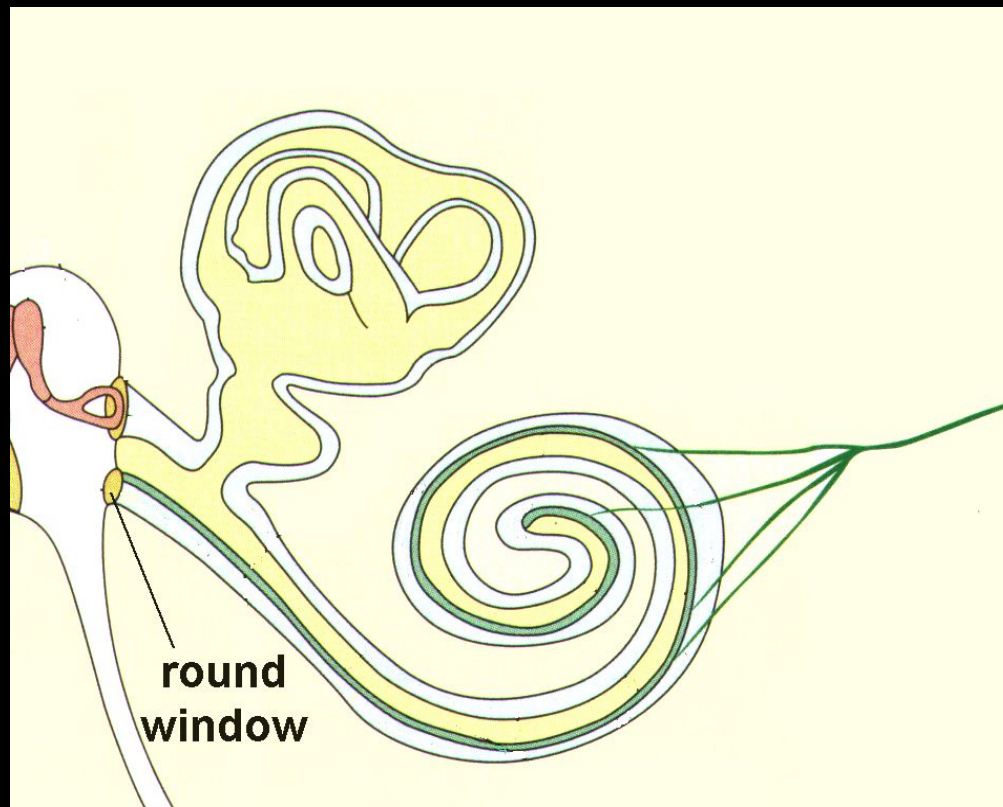
Process of hearing

- 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.**

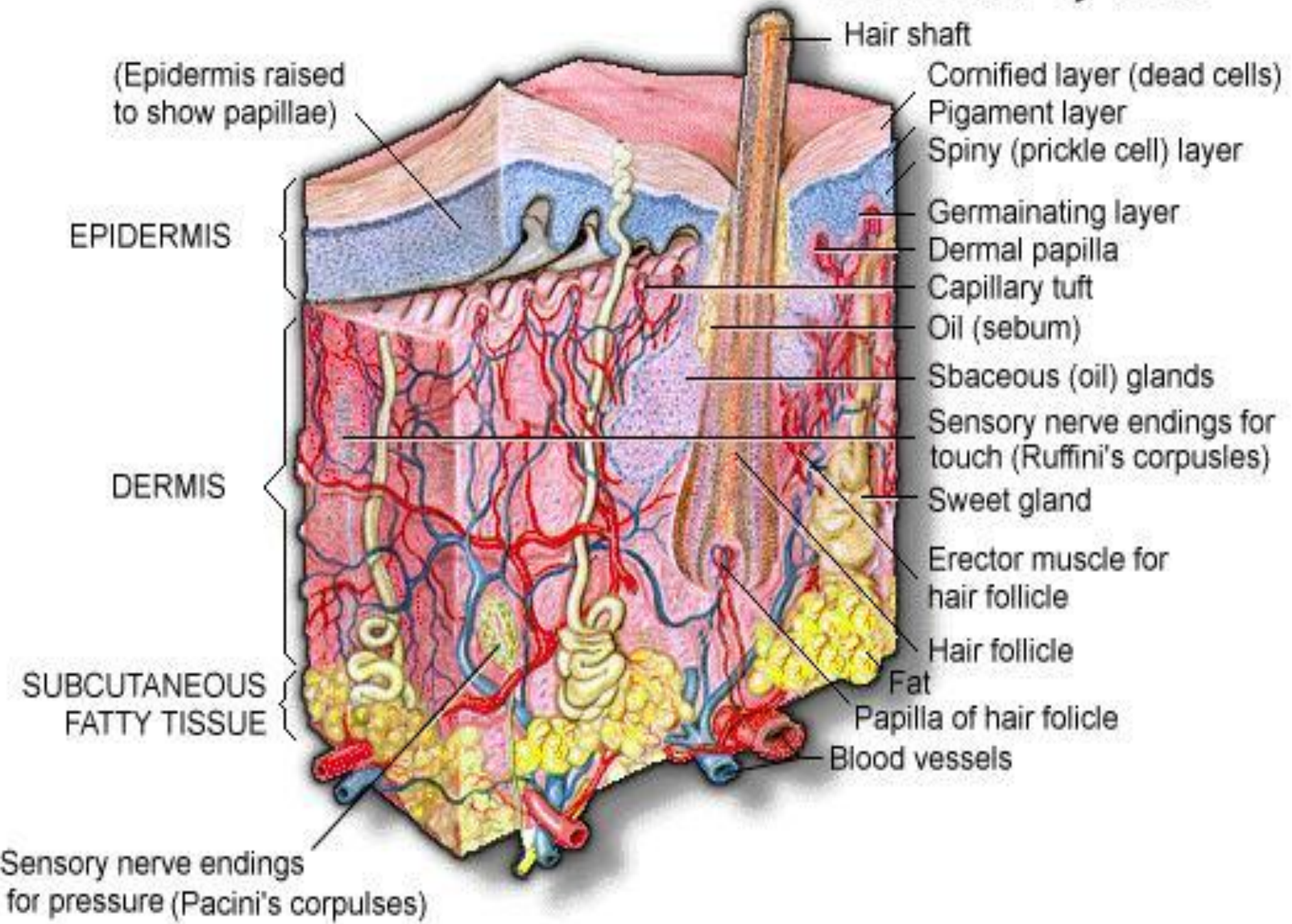
Functions of Skin

- 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 terrestrial organisms.**
- 4. It prevents cell from ultraviolet light.**

- **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, touch receptors and lymph vessels.**

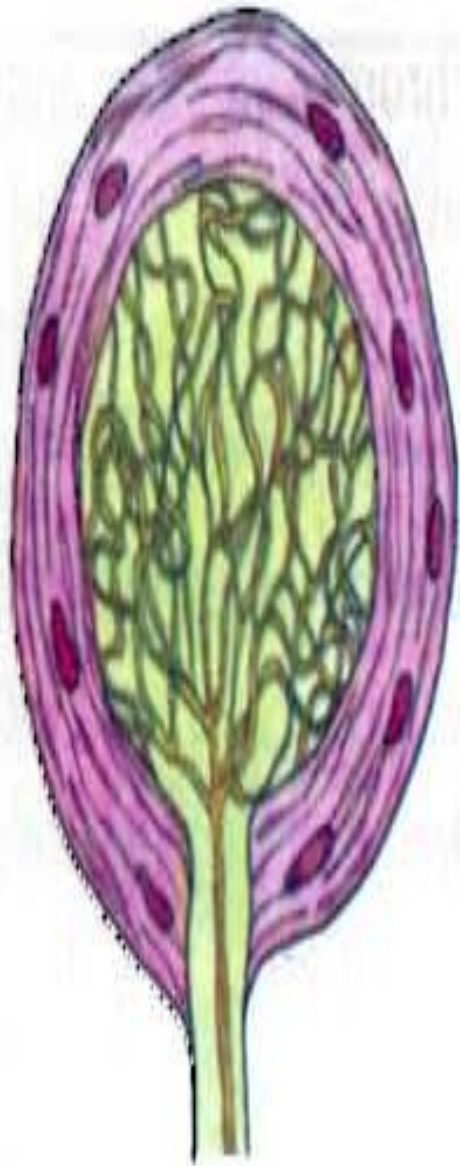
Structure of Skin



RECEPTORS

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

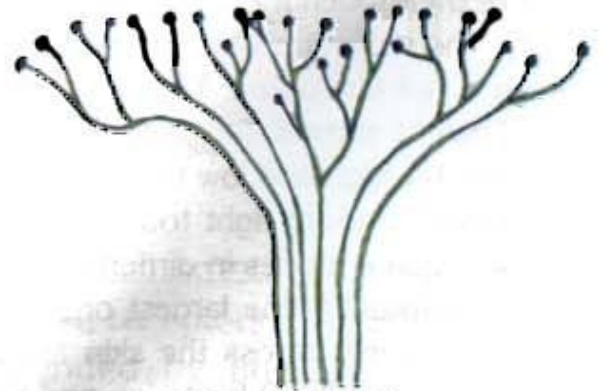
- **Ruffini corpuscles:** They are involved in reception of heat, touch and pressure.
- **Sweat glands:** They are present in all regions of the skin. They open onto the surface of skin by pores.



50 μ Krouse corpuscle



200 μ m Ruffini corpuscle

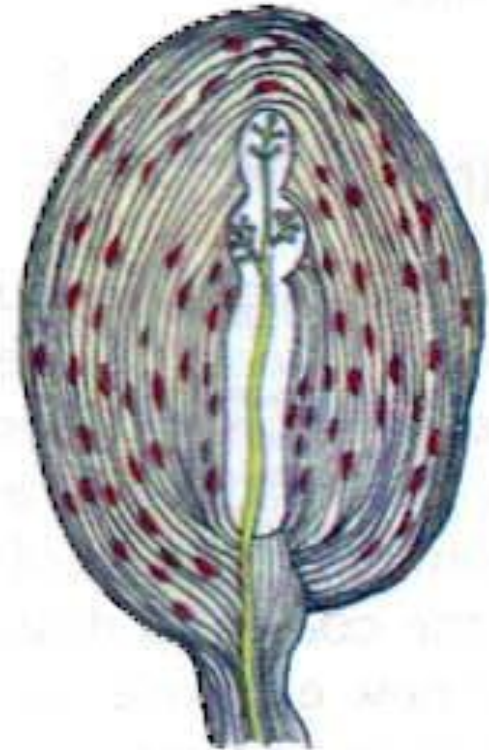


Free nerve endings

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



100 μ m Meissner corpuscle

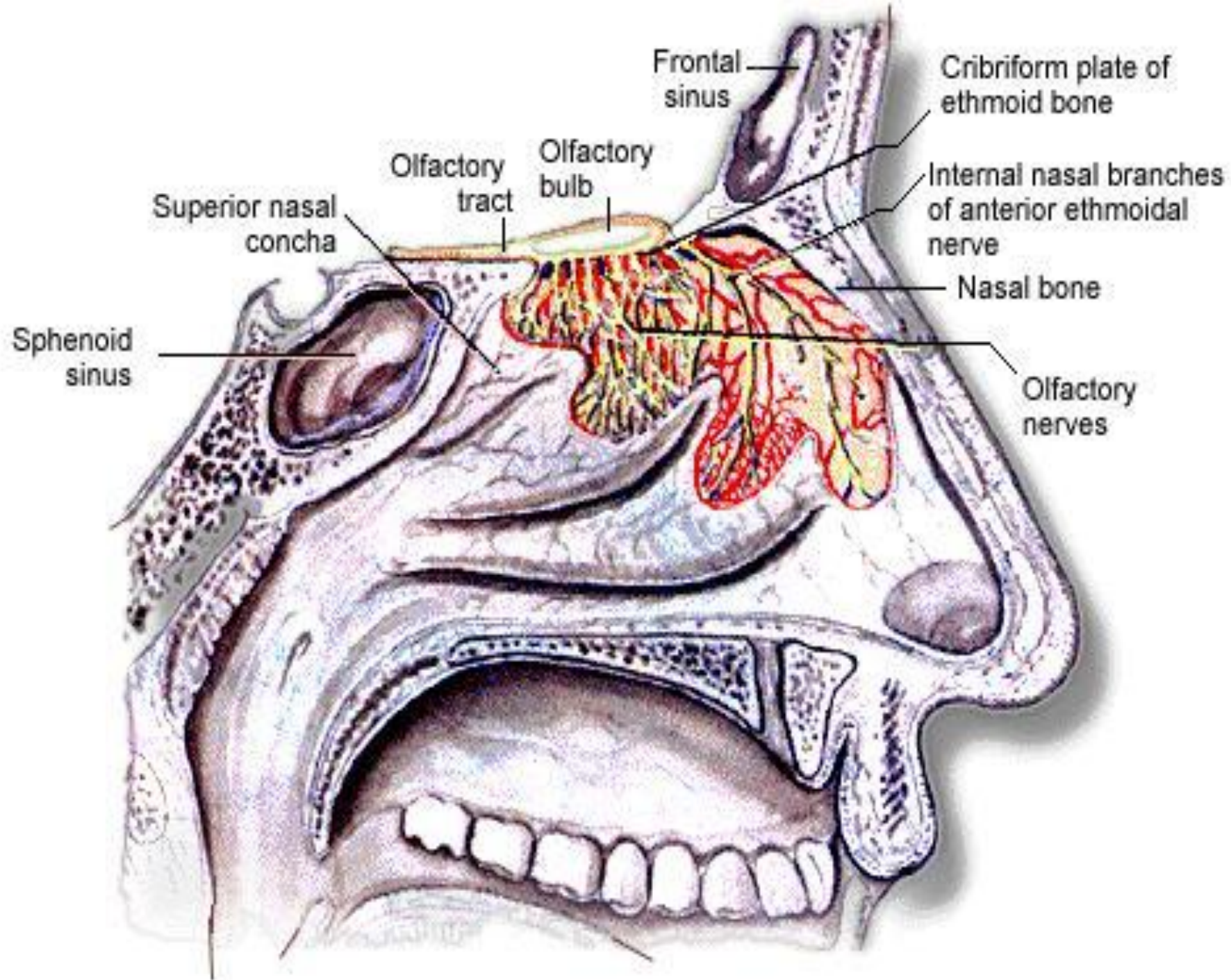


4 mm Paccinian corpuscle

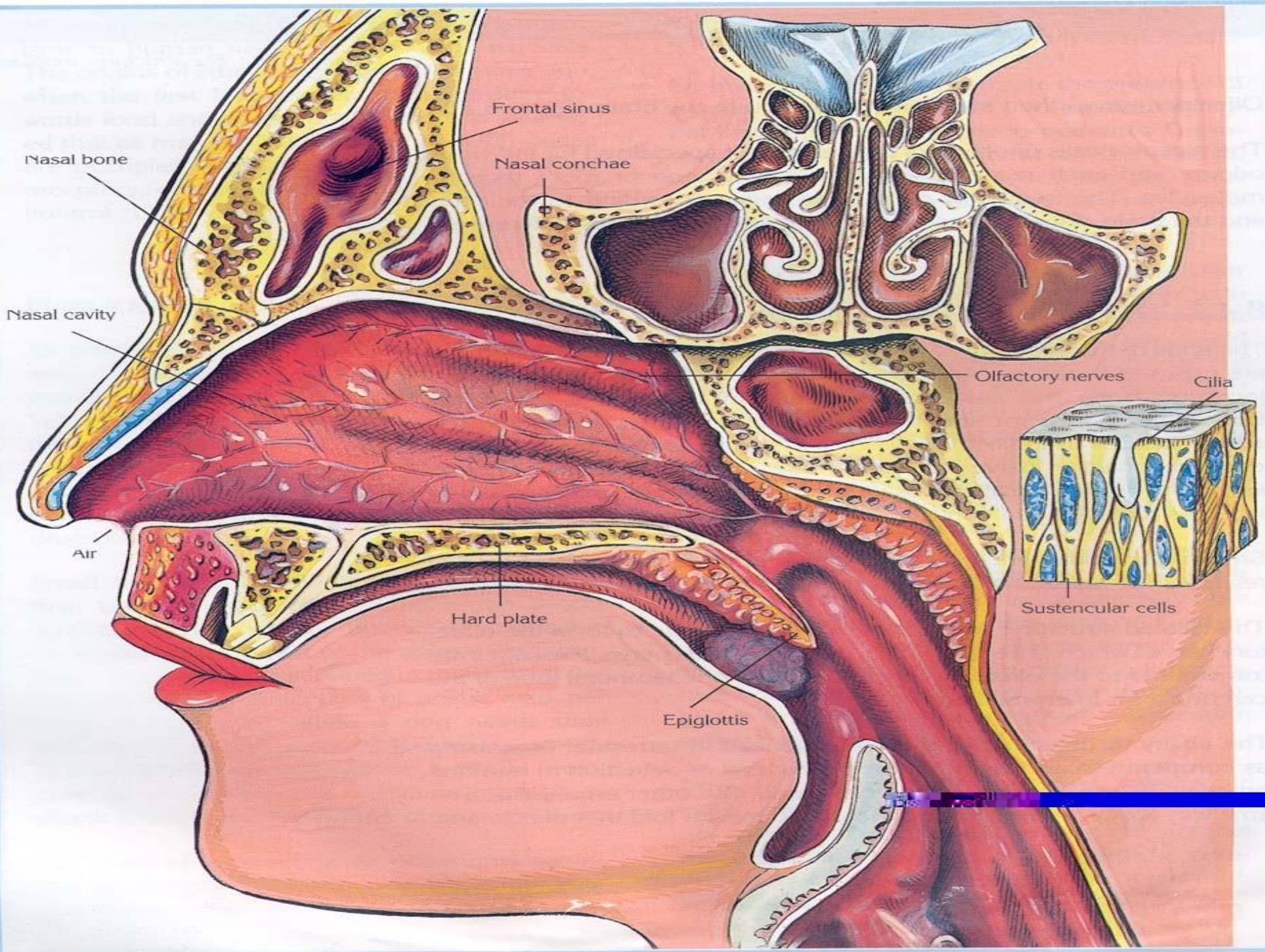
- **They are involved in removal of water, minerals, urea and other substances.**
- **The main function of sweat glands is the regulation of body temperature by evaporation of water.**

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.**



- **Smelling is fundamental 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 elimination of infectious organisms.**



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.**

- **Only substances that are in solution can stimulate the taste buds.**
- **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.**

- **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



