

# Sensory Organs Skin

seminar from Human Morphology

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M. Chalupová

# Sensory Organs

- ORGAN OF VISION
- ORGAN OF HEARING AND BALANCE
- ORGAN OF SMELL
- ORGAN OF TASTE
- SKIN RECEPTORS

# Organ of Vision – Eye

## 1) FIBROUS TUNIC

- sclera – white of the eye, dense fibrous connective tissue
- cornea – convex anterior portion of the eye, avascular and clear

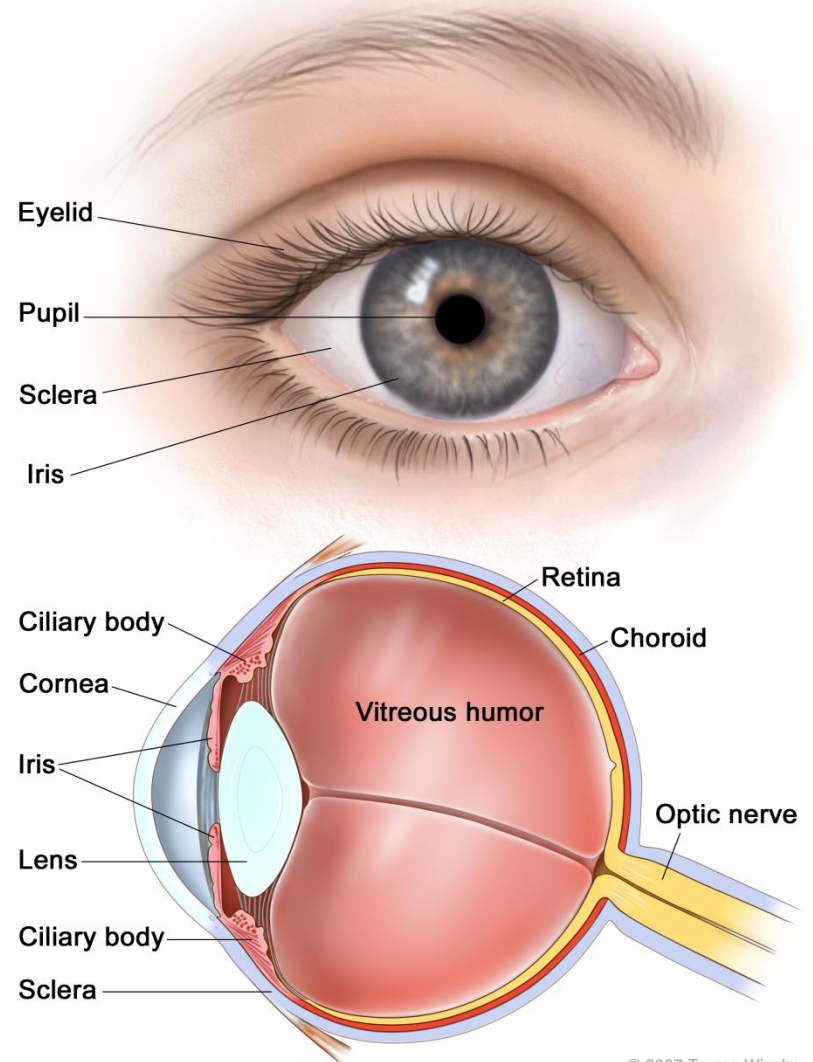
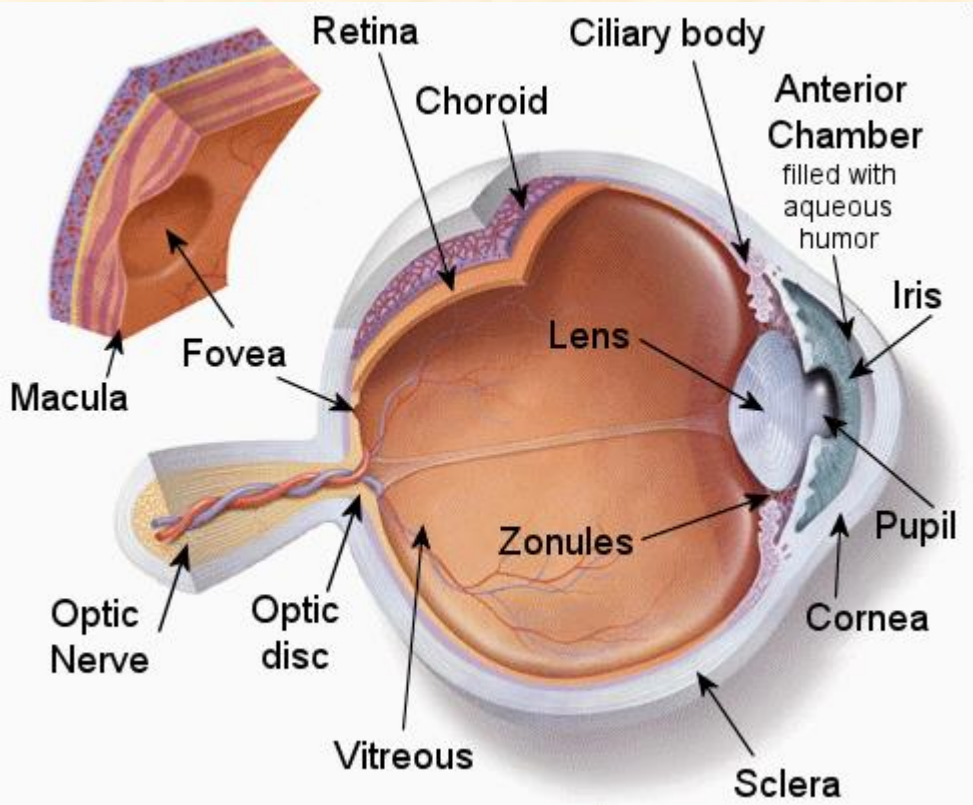
## 2) VASCULAR TUNIC

- choroid – loose fibrous tissue with vessels (nutrition)
- ciliary body contains ciliary muscles which can alter the shape of the lens
- iris – pigmented cells with intrinsic muscles that regulate the opening, the pupil
  - sphincter pupillae muscle (innervation by parasympathicus)
  - dilatator pupillae muscle (innervation by cervical sympathicus)

## 3) NEURAL TUNIC

- retina – composed of rods (do not discriminate colour, night vision) and cones (color vision)
  - fovea: the most sensitive to light and responsible for sharp vision
  - „blind spot“, optic disc: it lacks photoreceptors

# Eye



# Auxiliary Structures to the Eye

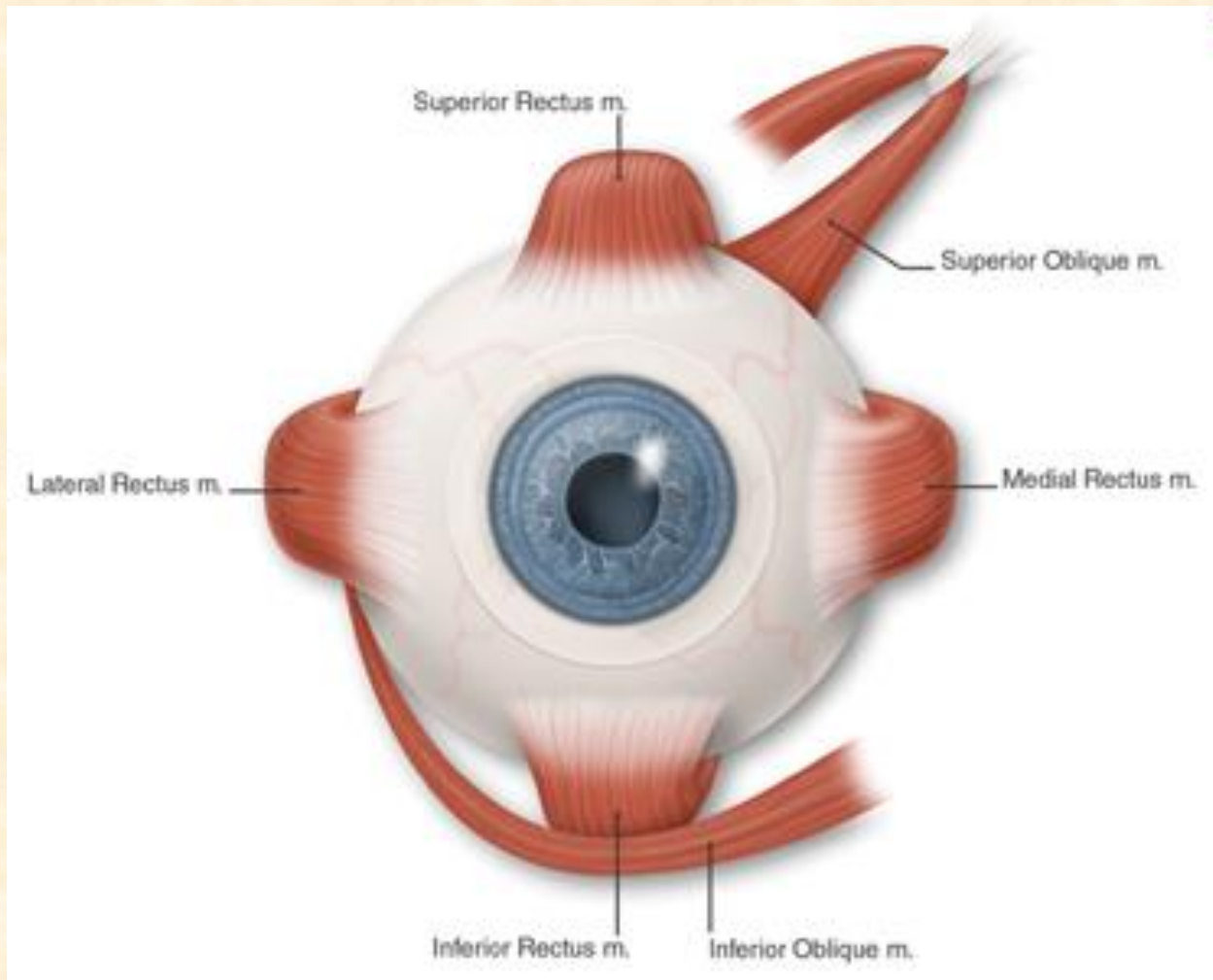
**1) EXTRAOCULAR EYE MUSCLES**

**2) EYELIDS**

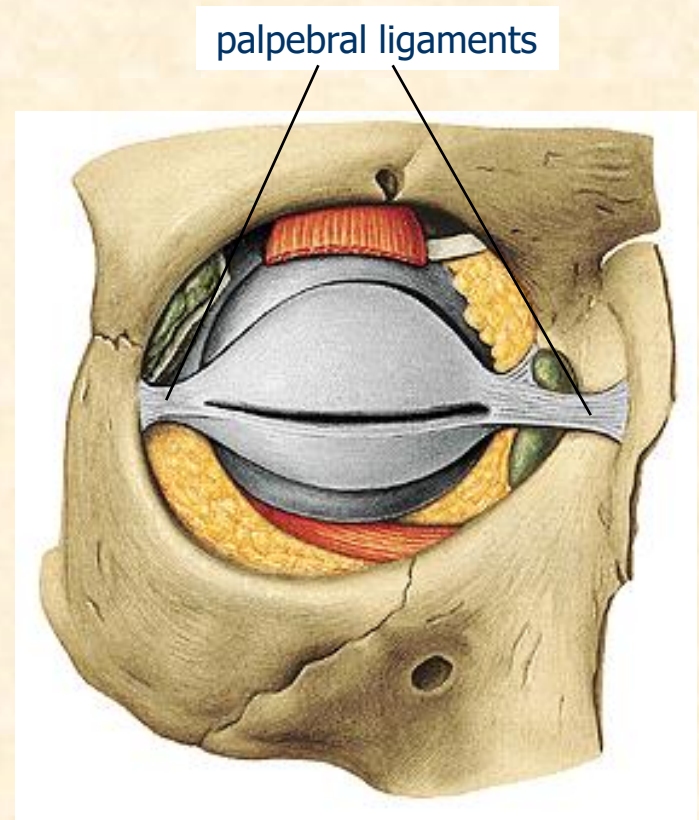
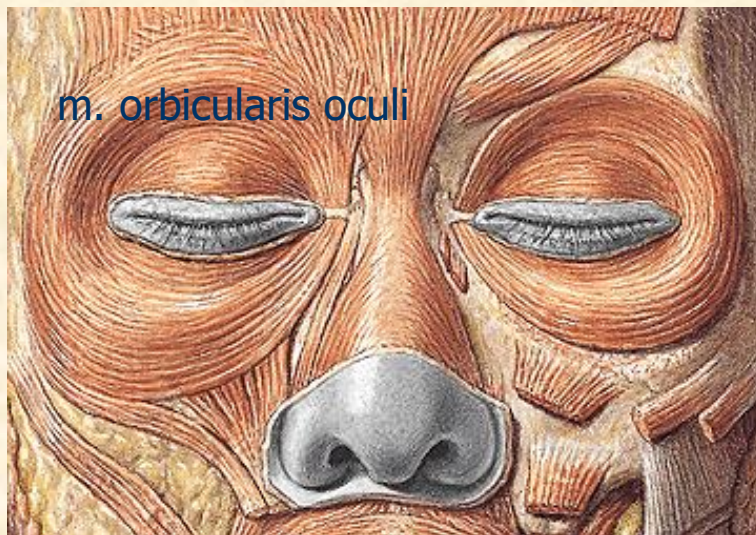
**3) CONJUNCTIVA**

**4) LACRIMAL APPARATUS**

# Muscles of the Eye

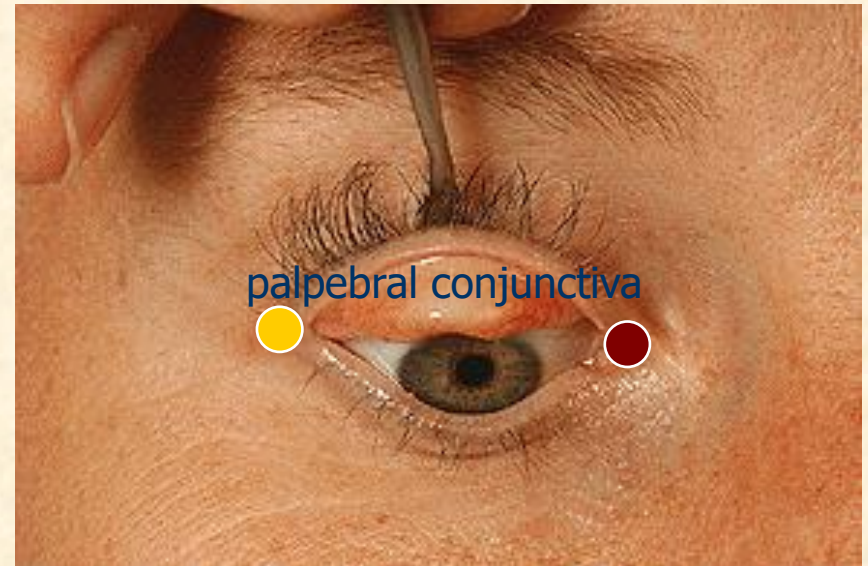
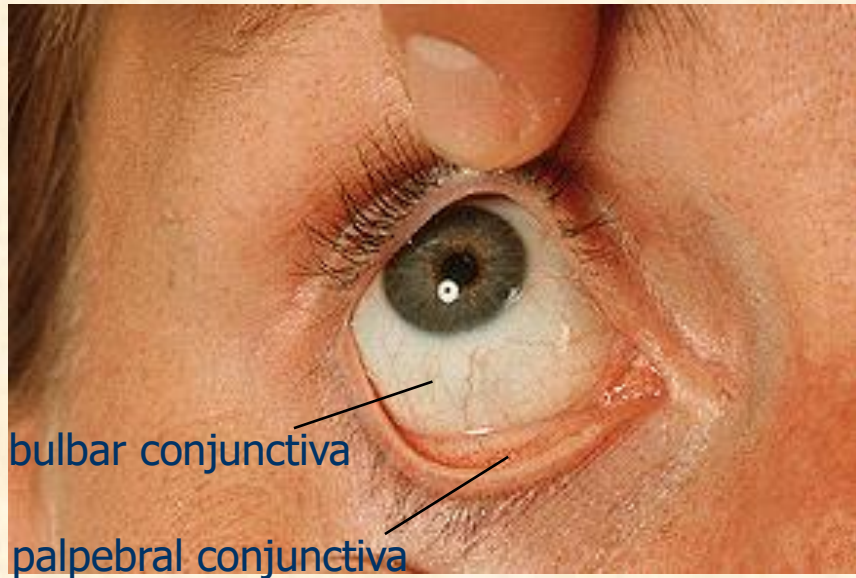


# Eyelids



# Conjunctiva

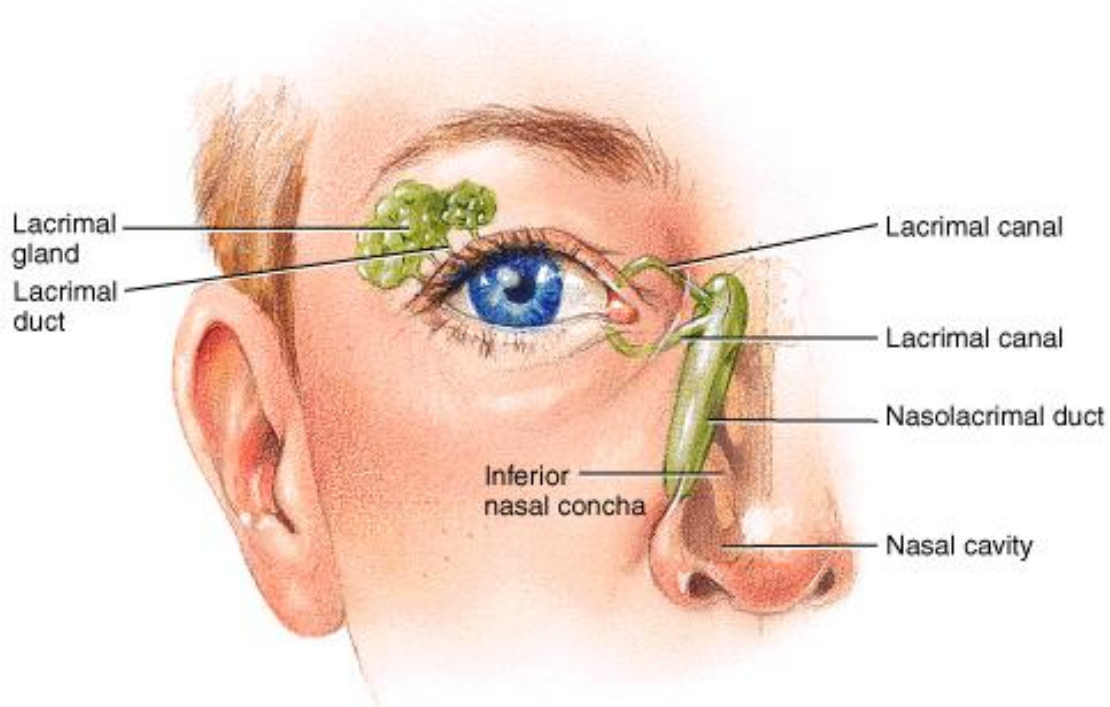
- clear mucous membrane that covers the sclera and lines the inside of the eyelids, helps lubricate the eye
- palpebral and bulbar conjunctiva



- lateral angle of eye
- medial angle of eye

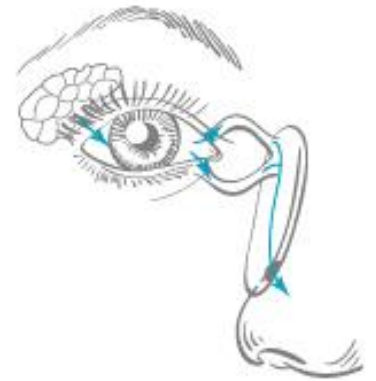


# Lacrimal Gland

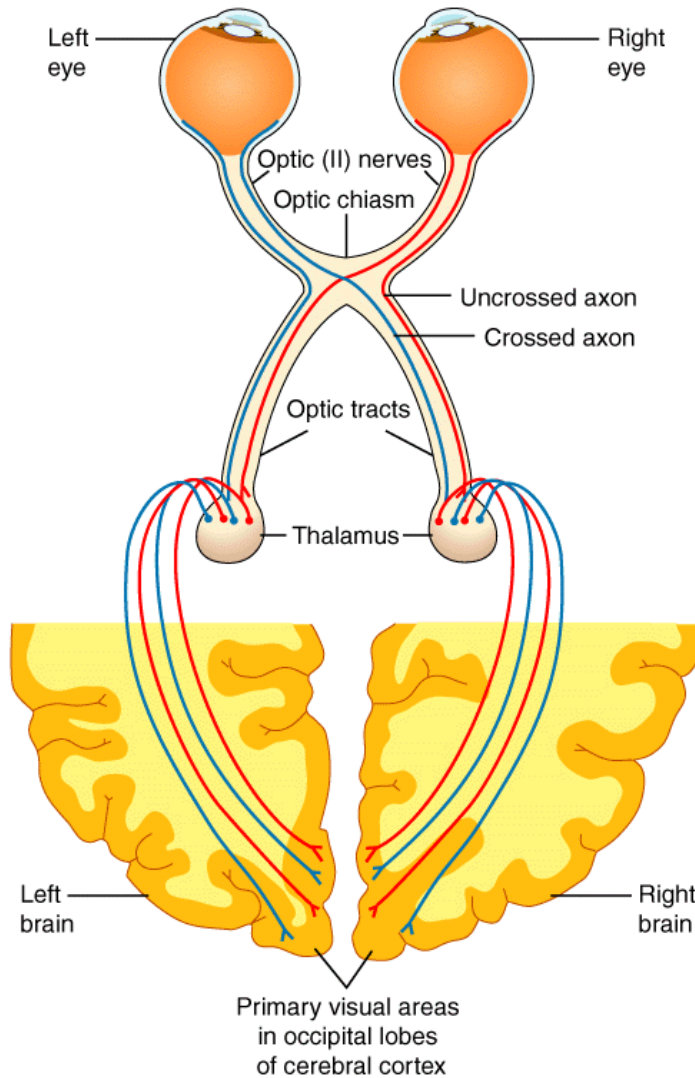


Anterior view of the lacrimal apparatus

## FLOW OF TEARS



# Optic Pathway



# Organ of Hearing and Balance – Ear

## 1) OUTER EAR

- auricle
- external auditory canal
  - cartilaginous – skin with hairs and sebaceous glands producing earwax (cerumen)
  - bony part – inner two thirds of canal
- tympanic membrane (eardrum)
  - thin translucent pearl-grey membrane forming the boundary between the outer and the middle ear

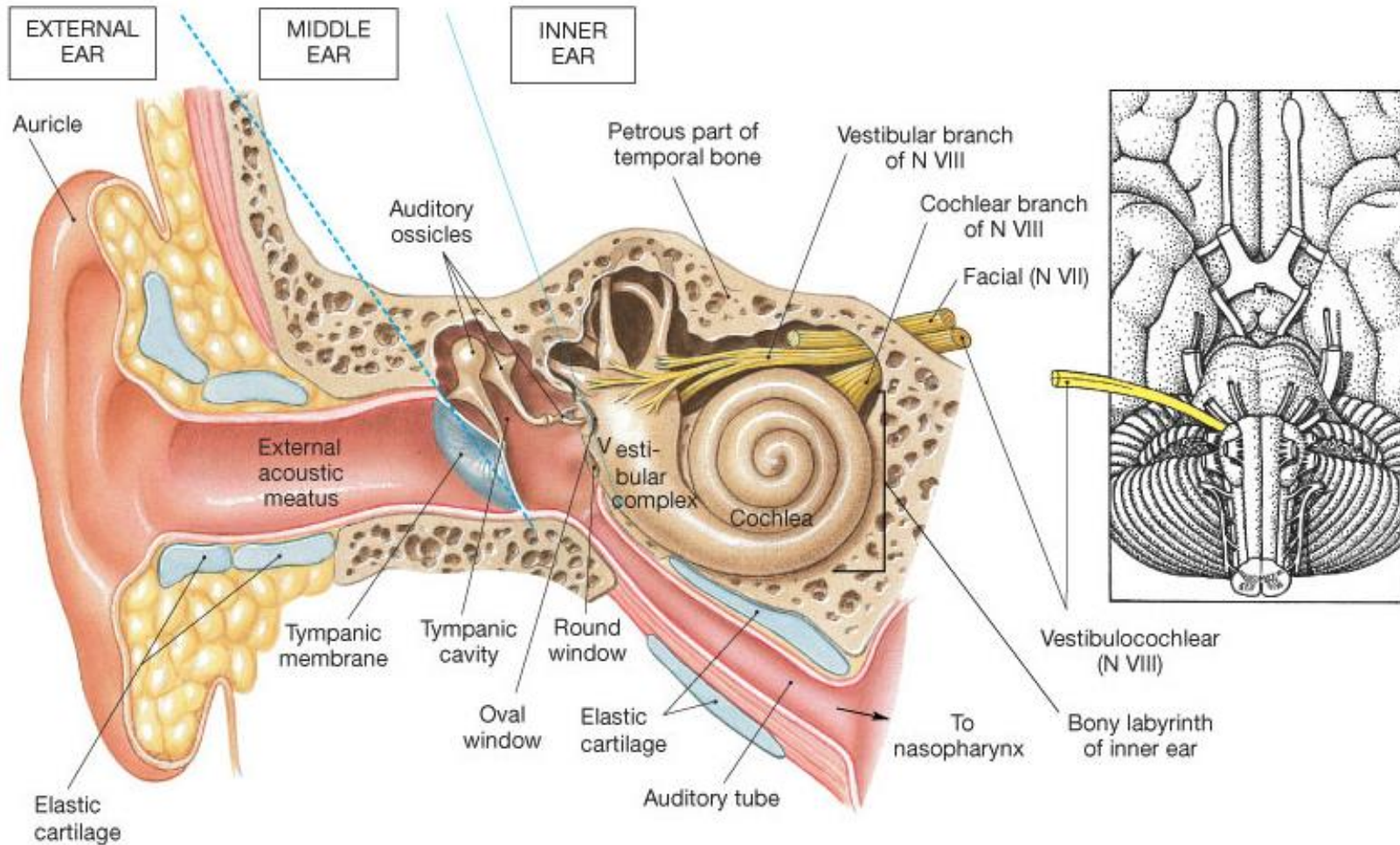
## 2) MIDDLE EAR

- tympanic cavity with auditory ossicles
  - hammer (malleus)
  - incus (anvil)
  - stapes (stirrup)

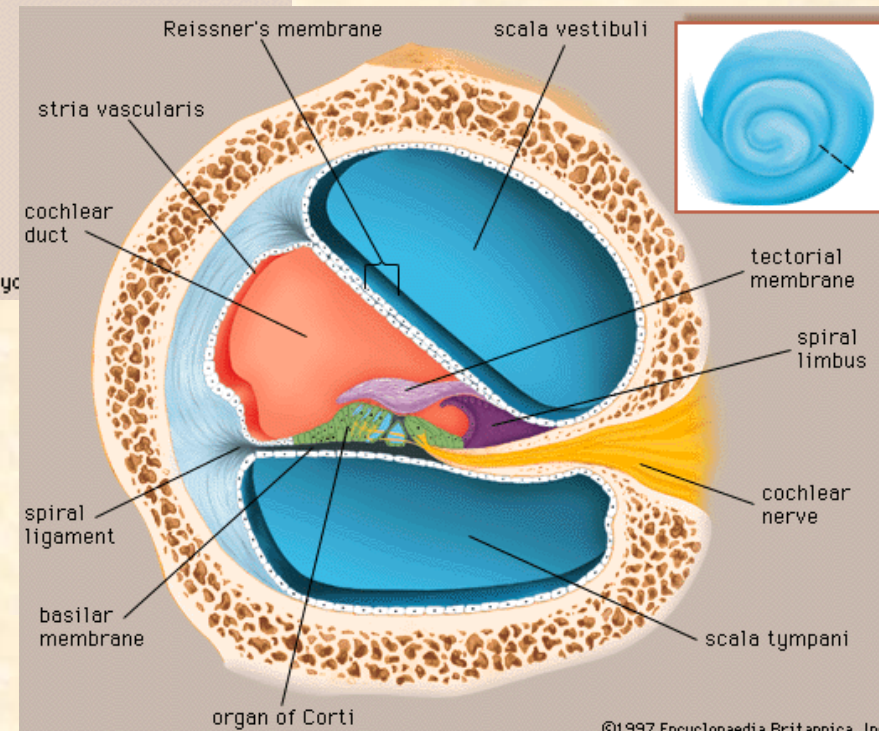
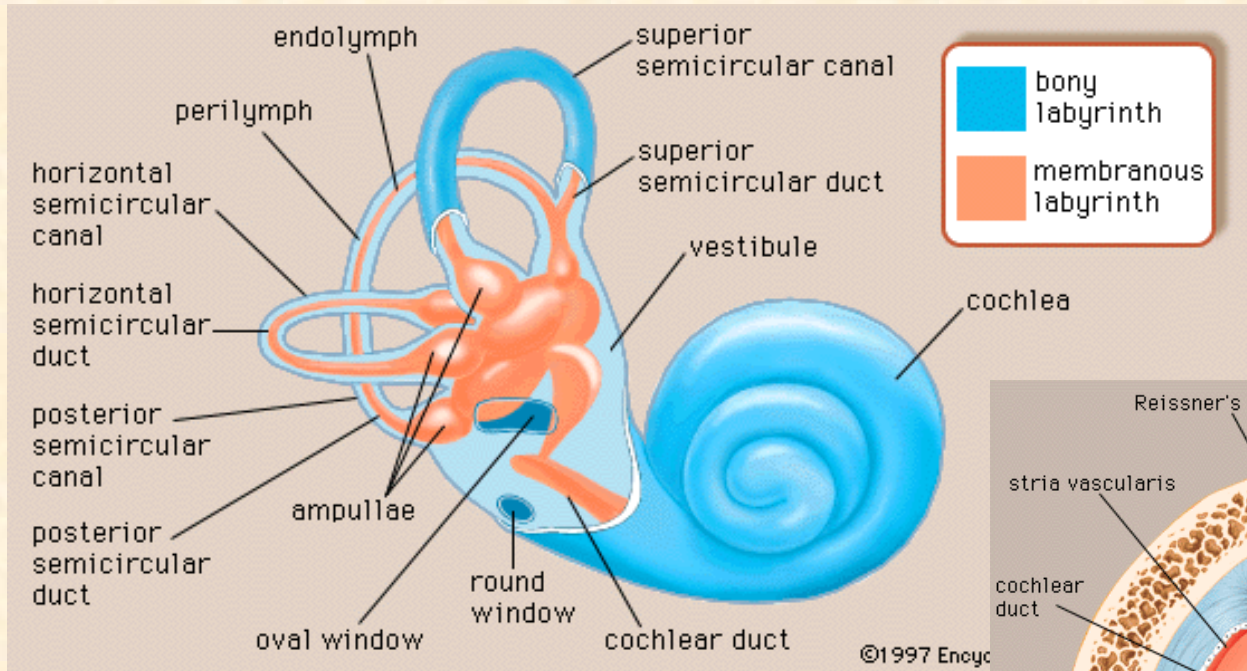
## 3) INNER EAR

- membranous labyrinth contained within the bony labyrinth
- vestibule
  - utriculus
  - sacculus
- semicircular canals (anterior, lateral and posterior) – allow a complex analysis of head movements in relation to the body position
- cochlea – hearing part of ear

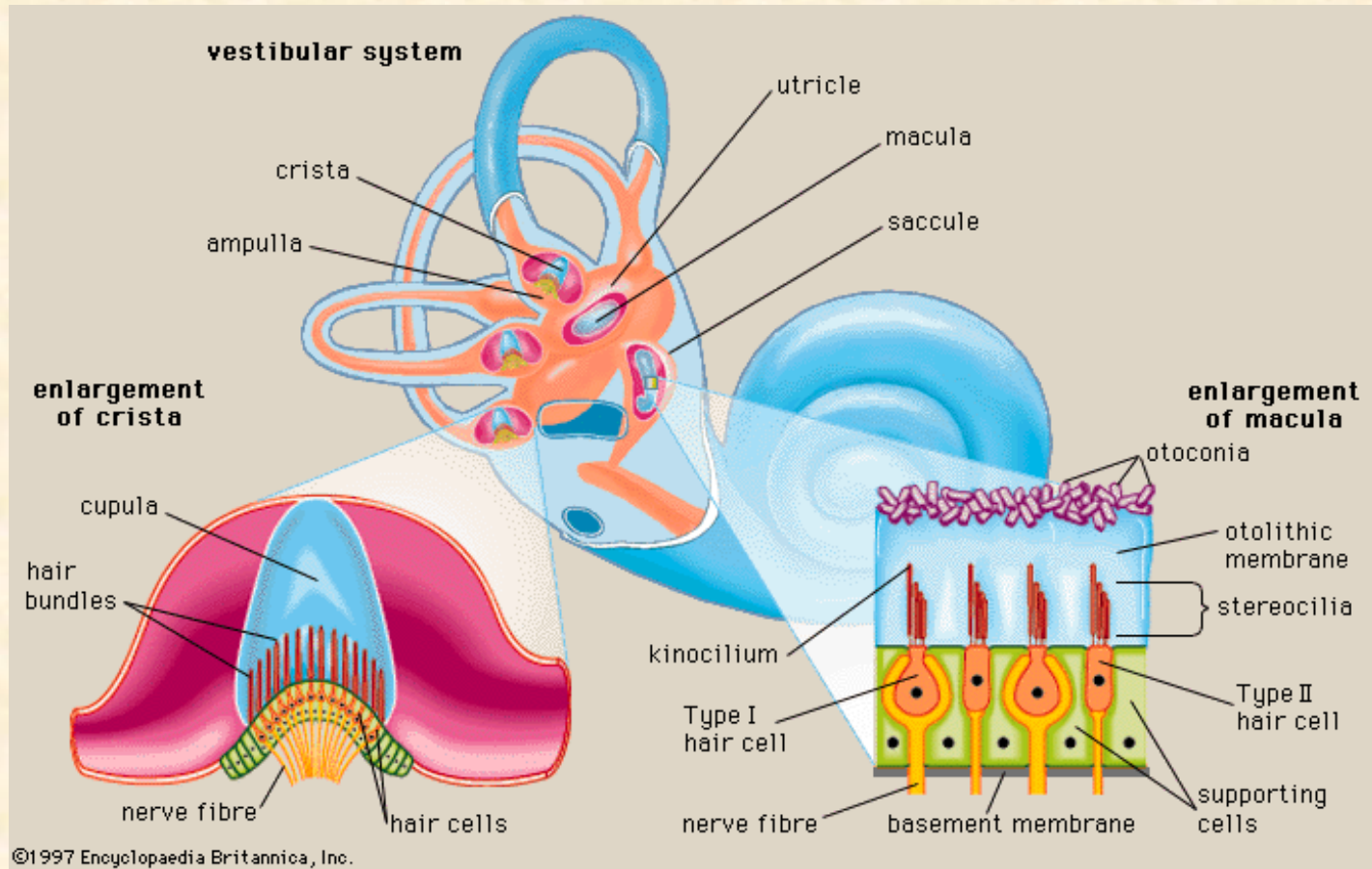
# Ear



# Inner Ear – Labyrinth and Organ of Corti



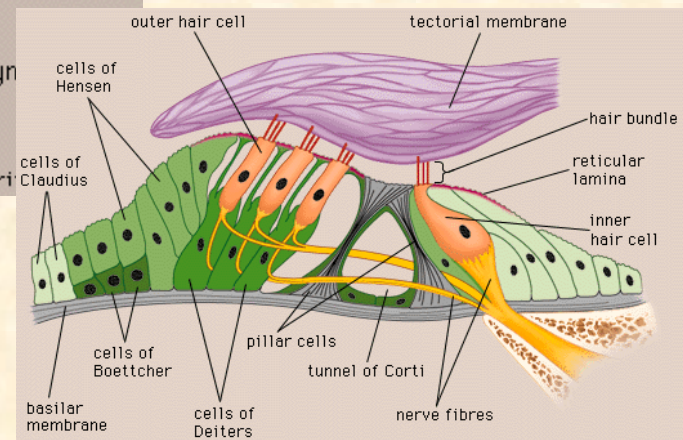
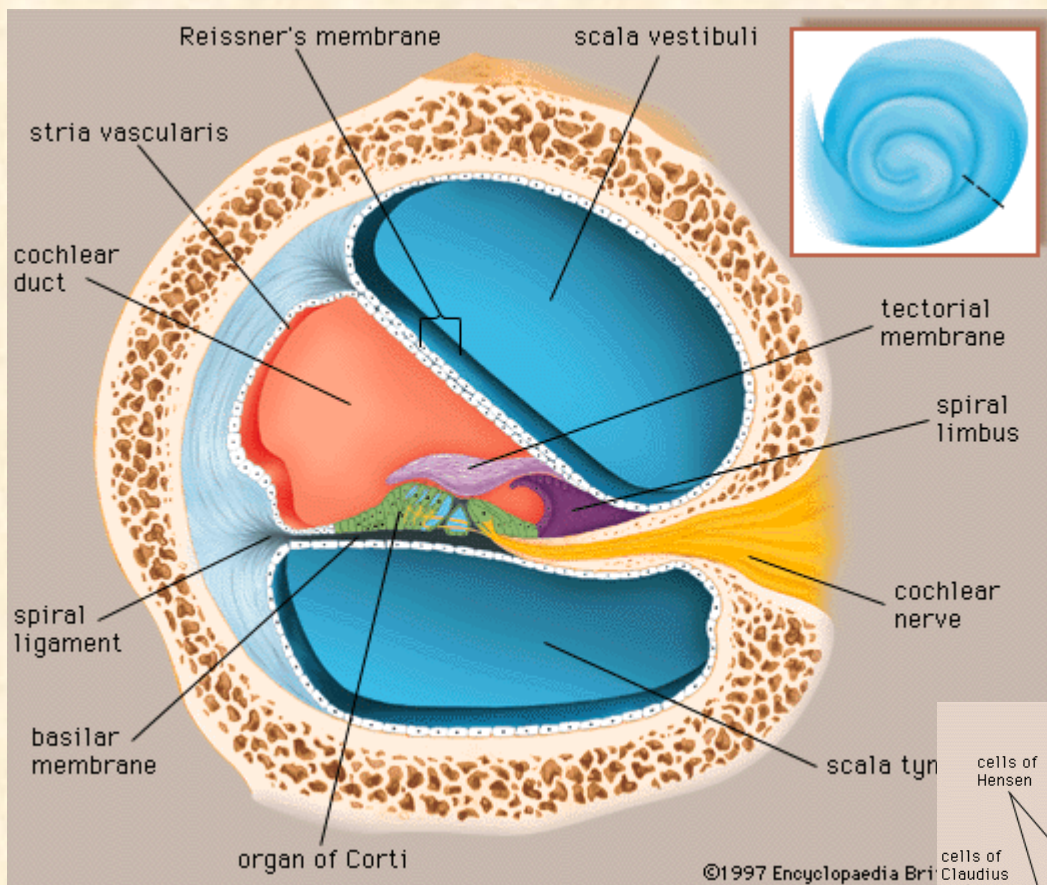
# Organ of Balance



**CRISTA AMPULLARIS:** sensory organ of **ROTATION**

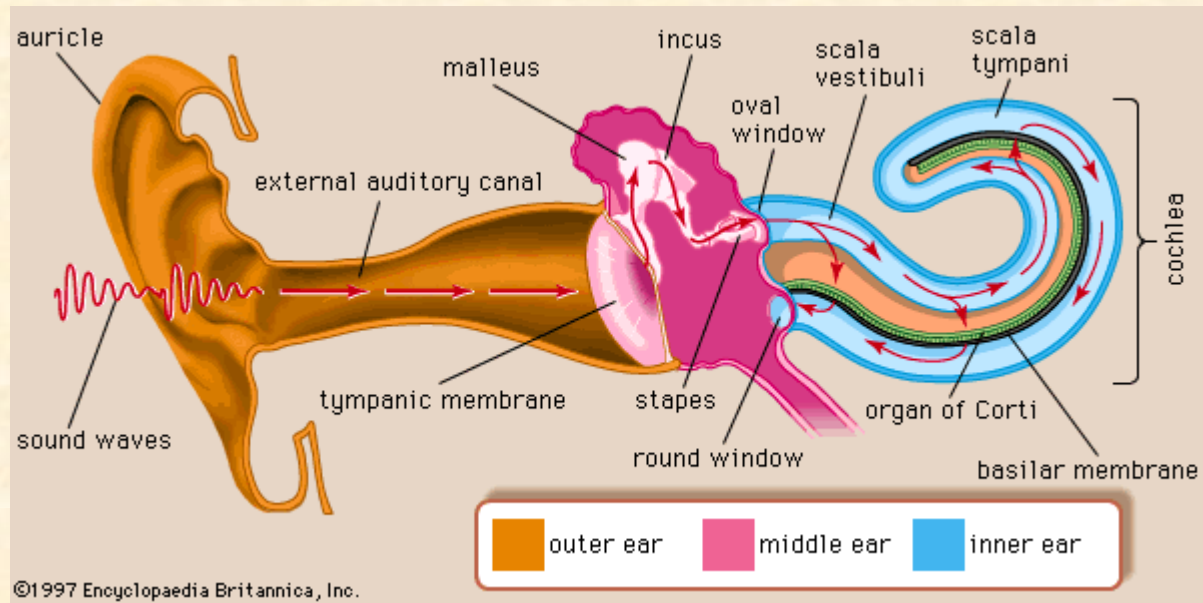
**MACULAE** in utricle and saccule: perception of **CHANGE** of head position towards the body position

# Organ of Corti



# Mechanism of Hearing

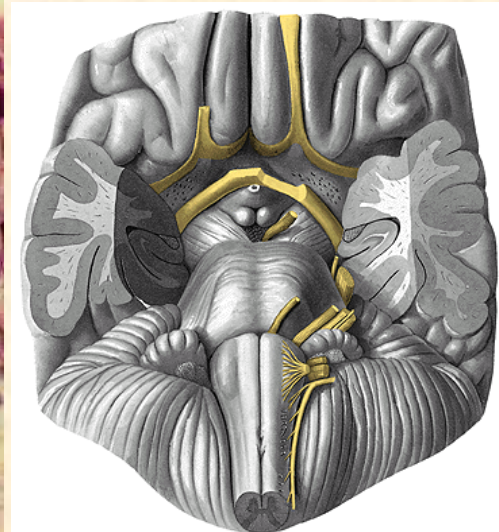
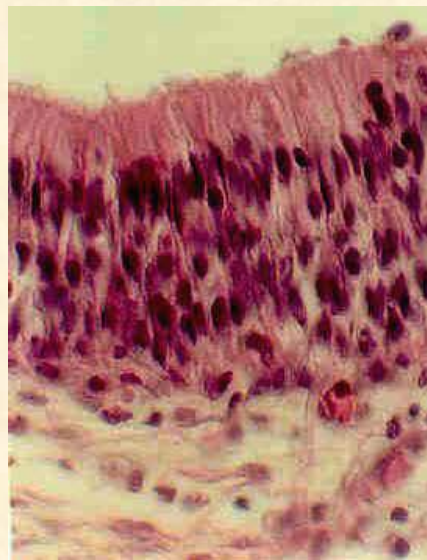
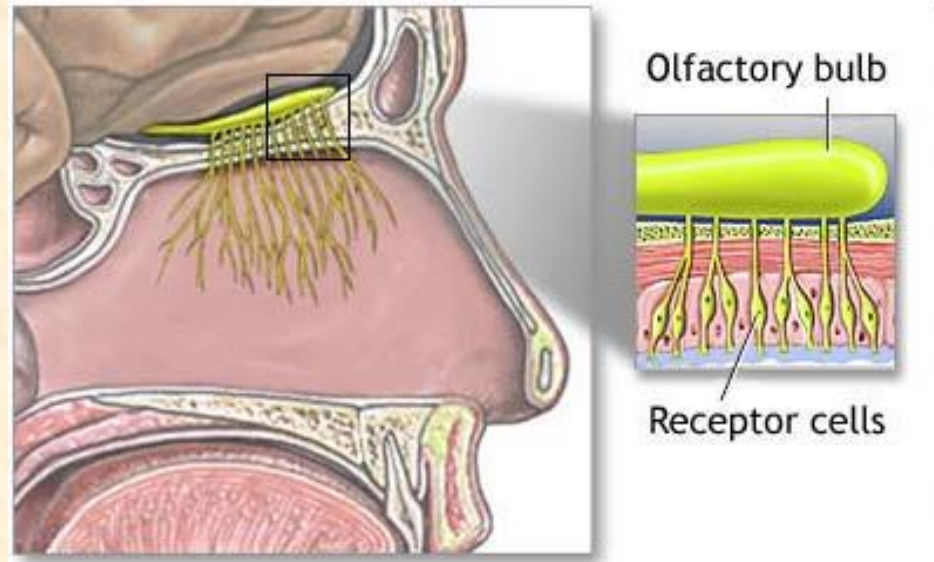
- sound waves enter the outer ear and go through the external auditory canal until they reach the tympanic membrane, causing the membrane and the attached chain of auditory ossicles to vibrate
- the motion of the stapes against the oval window sets up waves in the fluids of the cochlea, causing the basilar membrane to vibrate, this stimulates the sensory cells of the organ of Corti to send nerve impulses to the brain





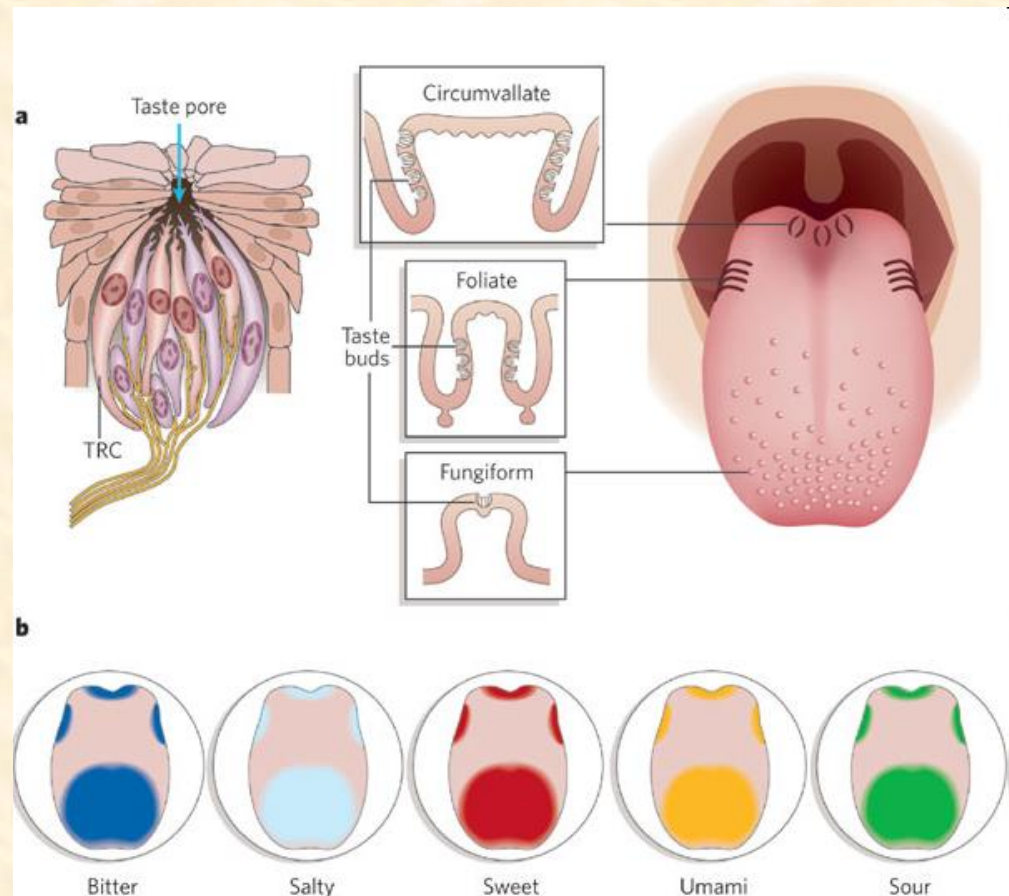
# Organ of Smell/Olfaction

- mucous membrane of nasal cavity
  - olfactory cells
  - supportive cells
- olfactory nerves
- olfactory bulb
- olfactory tract
- rhinencephalon



# Organ of Taste/Gustation

- taste buds in oral cavity
- there is a termination of sensory nerves (facial, glossopharyngeal and vagus nerve)



# Receptors

## EXTERORECEPTORS

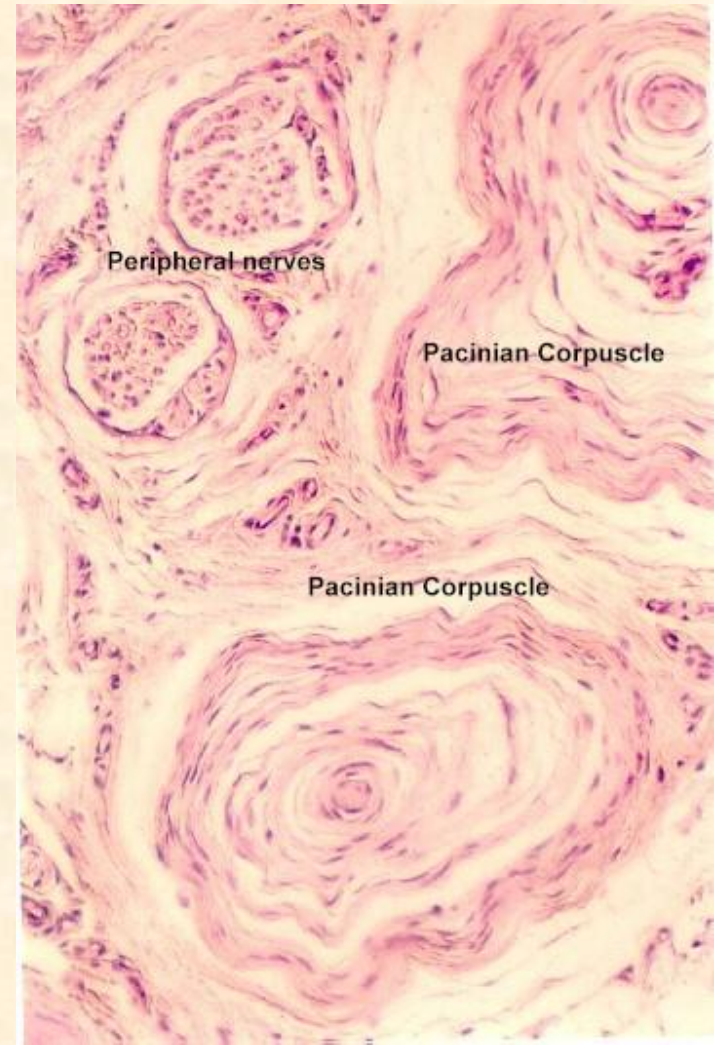
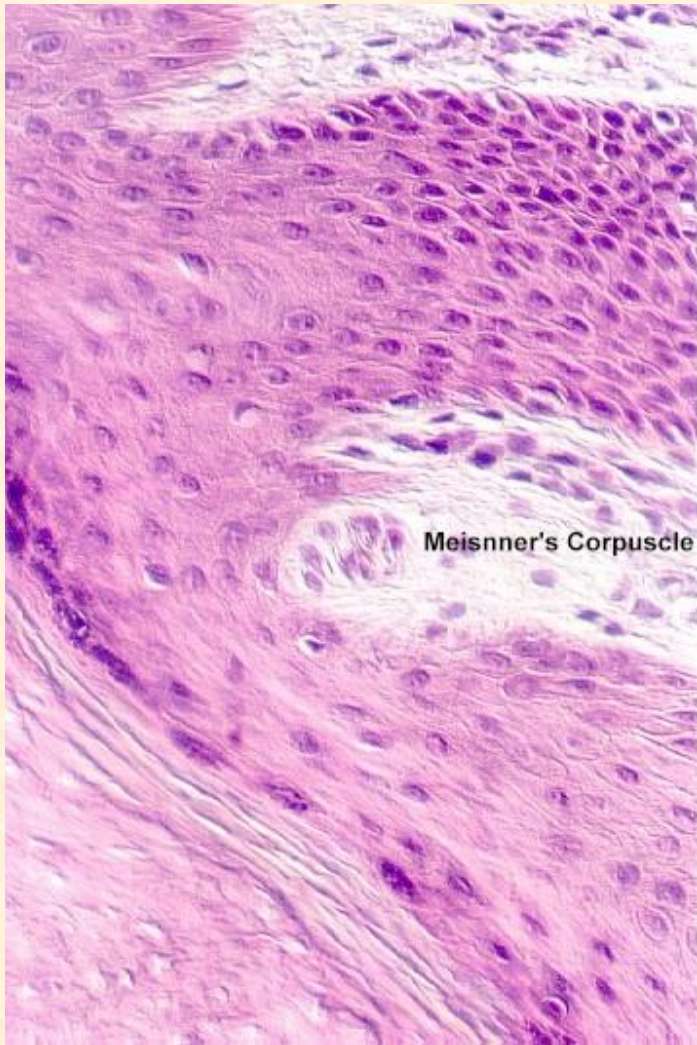
## INTERORECEPTORS

- **proprioceptors**
  - Golgi tendon organ (tension of tendon)
  - muscle spindle (tension of muscles)
- **visceroreceptors** (in internal organs) – pain, pressure

## SKIN RECEPTORS

- **Vater-Pacini corpuscles** – pressure changes and vibration
- **Meissner's corpuscles** – sensitivity to light touch
- **Ruffini corpuscle** – warm
- **Krause corpuscle** – cold
- **free nerve endings** – pain

# Skin Receptors



# Skin

- total area of 1,6 – 2,0 m<sup>2</sup>
- anatomical barrier from pathogens and damage between the internal and external environment
- skin senses (receptors)
- heat regulation (thermoregulation)
- metabolism
- storage and synthesis (fats, water)
- vitamin D
- aesthetics and communication

# Skin

## 1) EPIDERMIS

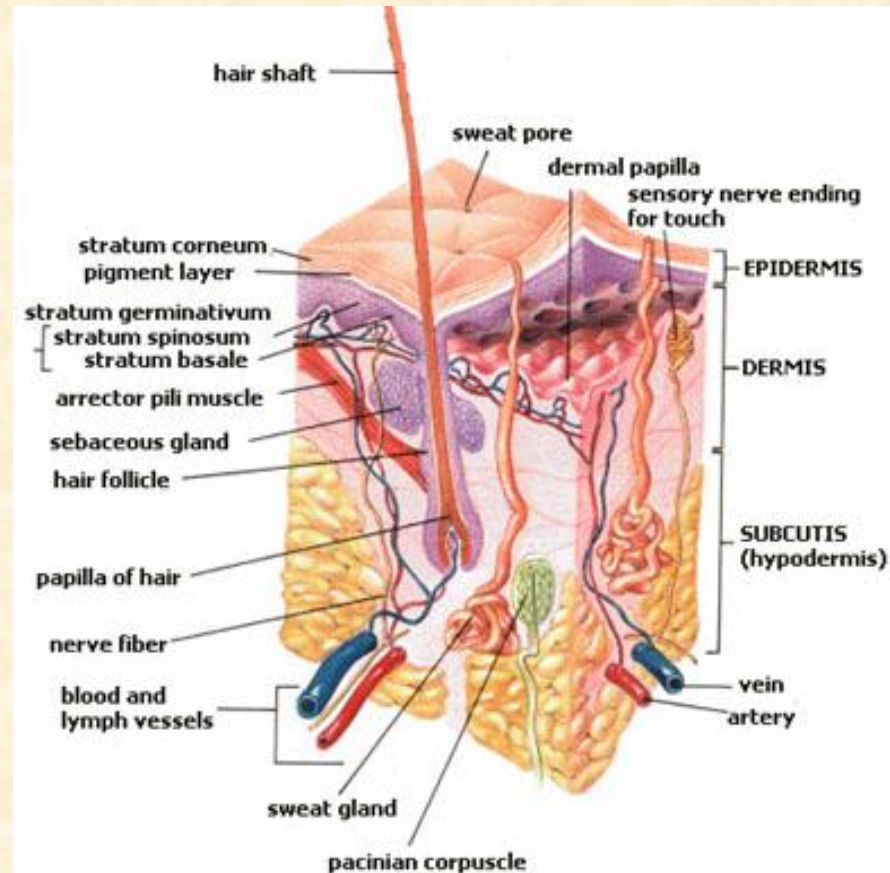
- composed of terminally differentiated stratified squamous epithelium

## 2) DERMIS

- **papillary dermis** – surface layer, skin papillae, elastic fibres
- **reticular dermis** – deep layer, collagen fibres

## 3) HYPODERMIS (subcutaneous adipose layer)

- net of the loose collagen fibrous tissue with adipose cells
- fat storage

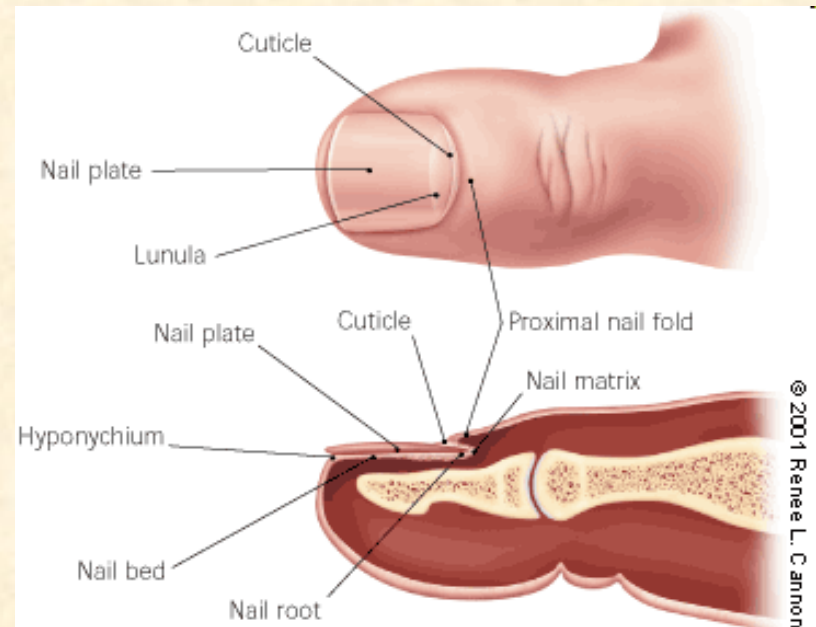
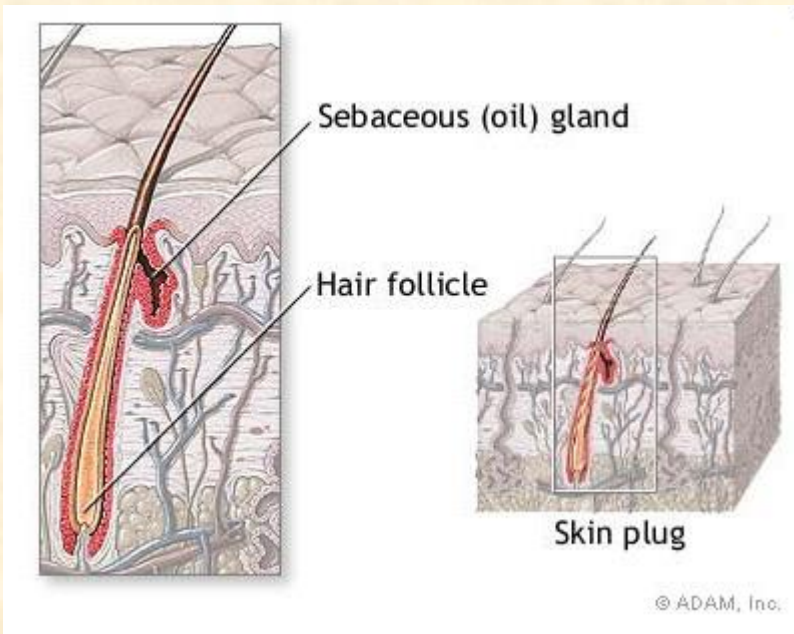


# Skin Appendages

- **SEBACEOUS GLANDS** – secrete an oily/waxy matter called sebum, they are found mostly on the scalp and face, sebum acts to protect and waterproof hair and skin and keeps them from becoming dry, inhibits the growth of the microorganisms
- **SWEAT GLANDS**
  - eccrine – skin on the body, palms and soles have the highest number
  - apocrine – in the axillae, around the nipple and in the groin, may also contain odour substances (pheromones)
- **MAMMARY GLAND** – modified apocrine sweat gland, 15–20 lobules + adipose fibrous tissue

# Skin Appendages

- **HAIR** – cylindrical, keratinized, often pigmented filaments characteristically growing from follicles deep within the dermis
  - primary – lanugo (fine soft hair in newborn child)
  - secondary – hair, hairs of the body, eyelashes, eyebrows
  - tertiary – beard, hairs in groins and armpits, nasal hairs, hairs in the auditory meatus
- **NAIL** – plate made of tough protein (keratin)





# Mammary Gland

