

Srovnávací morfologie živočichů

Smyslové orgány

Smyslové orgány

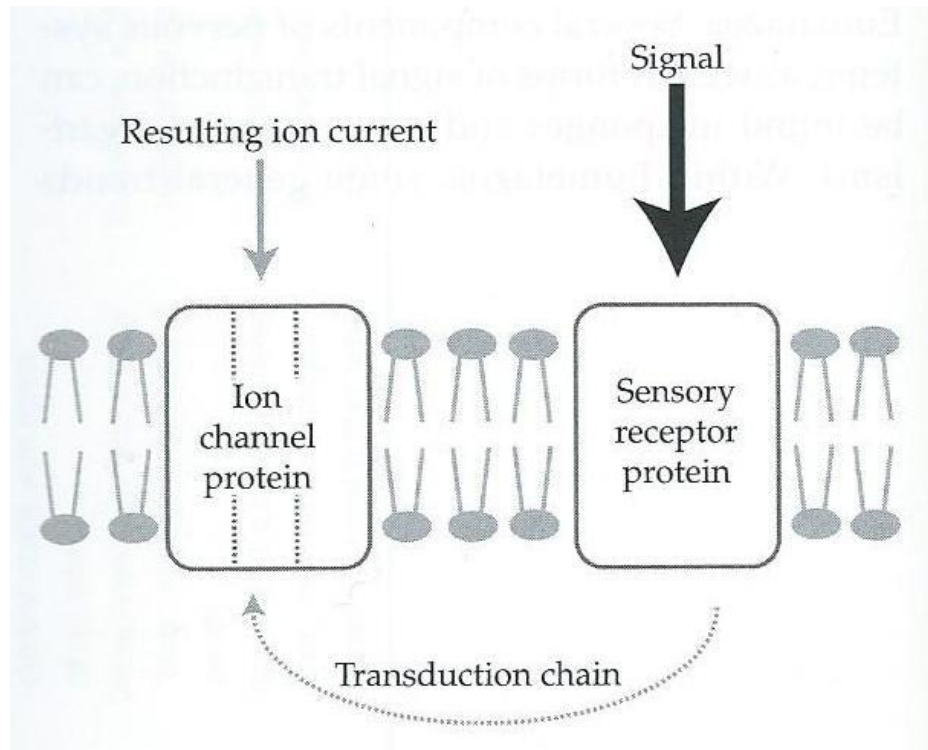
Podnět - **receptor (smyslová buňka)** - nervový vzruch - efektor (sval, žláza)

Typy receptorů:

- | | | |
|--|--|--|
| a) podle energie podnětu | b) podle lokace podnětu | c) podle koncentrace smyslových buněk |
| <ul style="list-style-type: none">• Mechanoreceptory• Chemoreceptory• Fotoreceptory• Termoreceptory• Elektromyokymy• Magnetoreceptory | <ul style="list-style-type: none">• Exteroreceptory• Enteroreceptory• Proprioreceptory | <ul style="list-style-type: none">• Všeobecné smysly• Speciální smysly• (koncentrace na hlavě) |
| | d) podle typu smyslových buněk | |
| | <ul style="list-style-type: none">• Primární (z neuronu, s neuritem)• Sekundární (bez neuritu) | |

Smyslové orgány

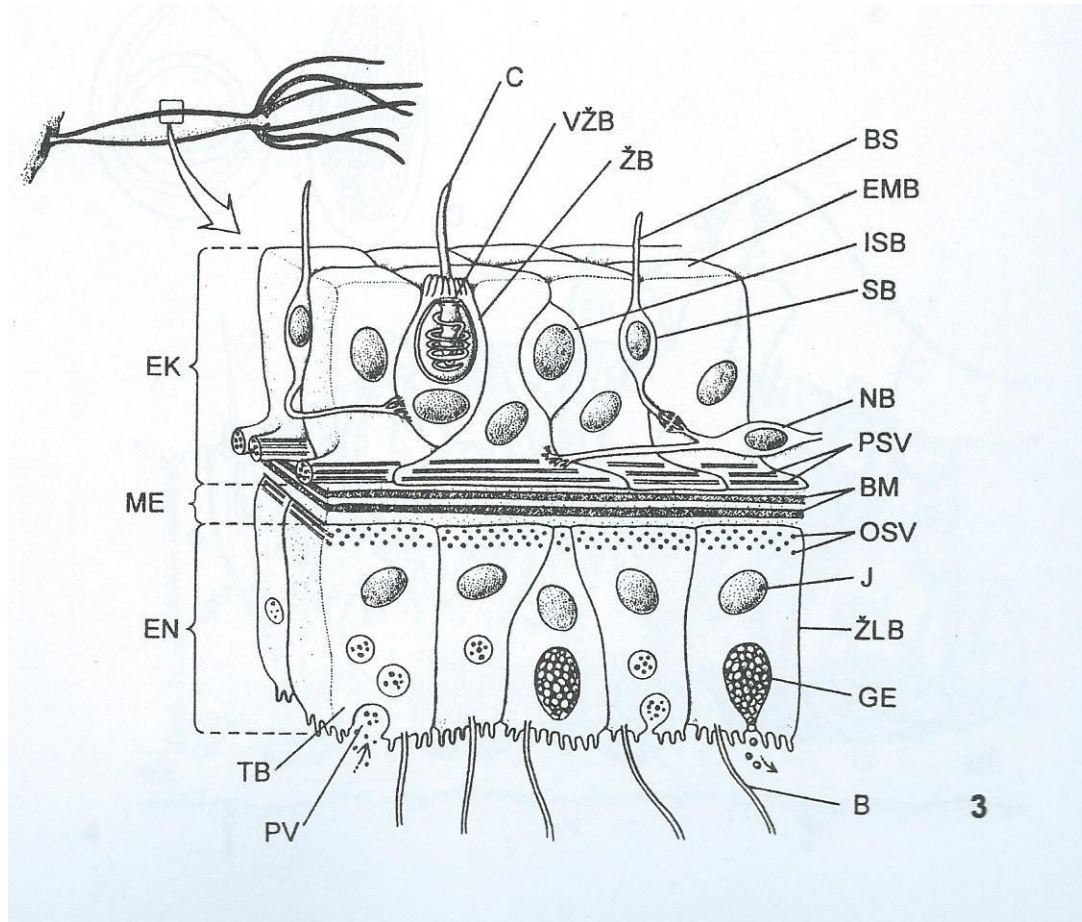
Princip translace signálů v nervový vzruch



Příjem podnětu (signálu) - transdukce - iontové kanály (depolarizace biomembrány) - nervový vzruch

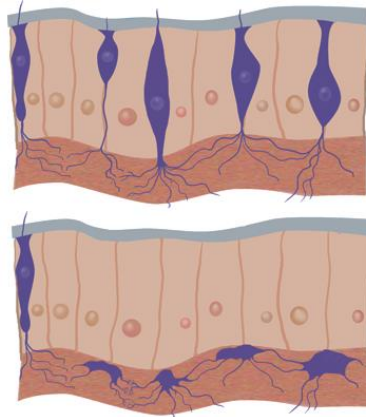
Smyslové buňky a smyslové orgány

Smyslové buňky v epidermis polypoců



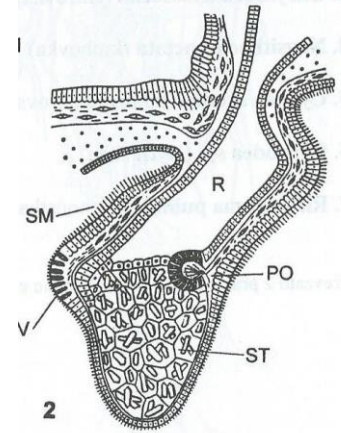
Smyslové buňky a smyslové orgány

Smyslové buňky v epitelu kroužkovců

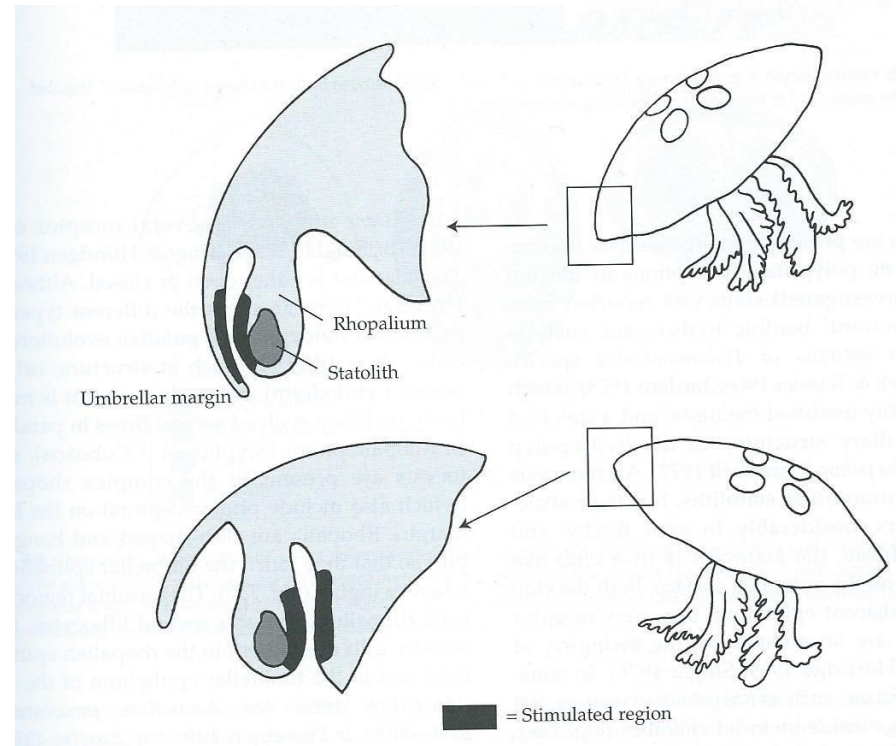
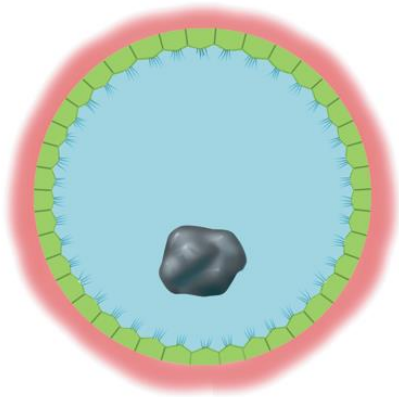


Taktilní receptory (žížala)

Smyslové orgány medúzovců (rhopalia)



Statocysty (georeceptory) se statolity

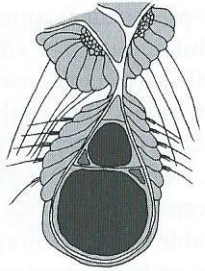


Taktilní receptory členovců - na speciálních přívěscích (tykadla)

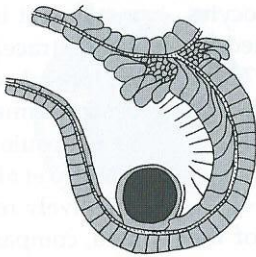
Smyslové buňky a smyslové orgány

Statocysty

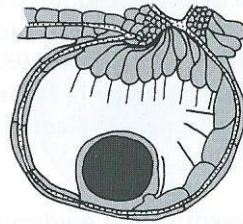
Hydrozoa:
Narcomedusae, *Aegina*



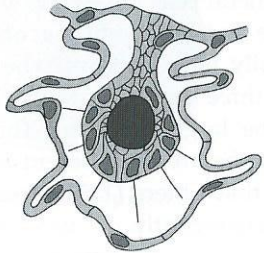
Hydrozoa:
Leptomedusae



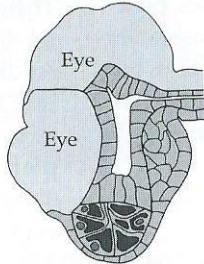
Hydrozoa:
Leptomedusae



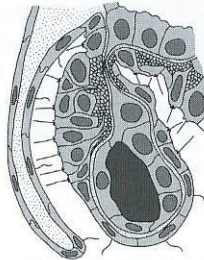
Hydrozoa:
Trachymedusae



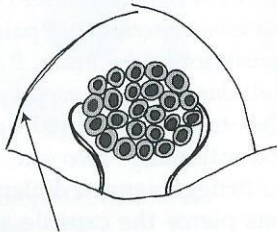
Cubozoa
Tripedalia



Scyphozoa
Nausithoe

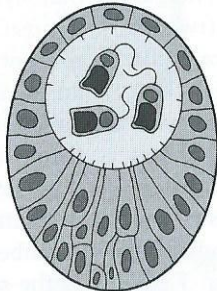


Ctenophora

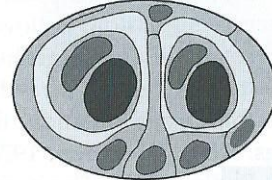


Ciliary 'dome'

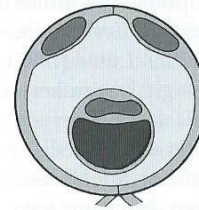
Xenoturbella



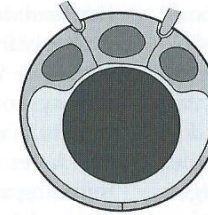
Nemertodermatida



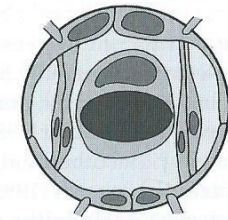
Acoela



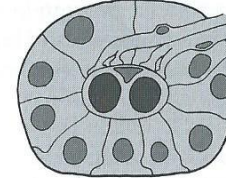
Platyhelminthes:
Catenulida



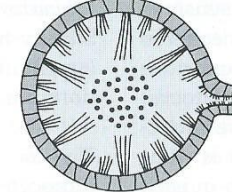
Platyhelminthes:
Proseriata



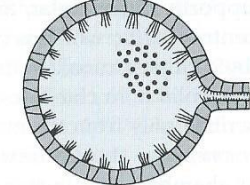
Nemertini:
Ototyphlonemertes



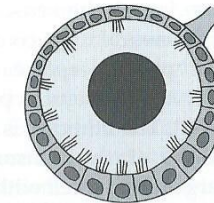
Mollusca, Bivalvia:
Pecten, left statocyst



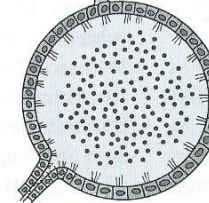
Mollusca, Bivalvia:
Pecten, right statocyst



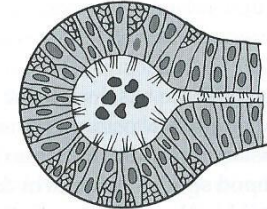
Mollusca, Gastropoda:
Pterotrachea



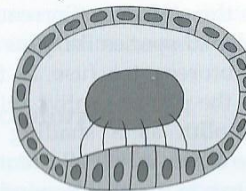
Mollusca, Cephalopoda:
Nautilus



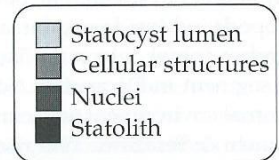
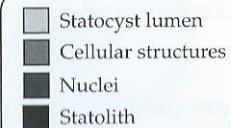
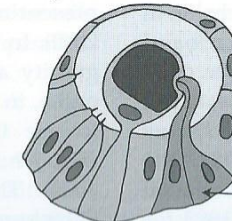
Annelida, Polychaeta:
Arenicola



Euarthropoda, Mysidacea
Neomysis



Tunicata, Ascidia:
Botryllus



Photoreceptor cells

Smyslové buňky a smyslové orgány

Georeceptory obratlovců

Smyslový epitel v blanitém labyrintu vnitřního ucha

Statocysty ve vestibulárním aparátu

Smyslové skvrny ve váčcích - maculae

Utriculus - otolith = utriculith

Sacculus - otolith = sacculith

Lagaena - otolith = lagenit

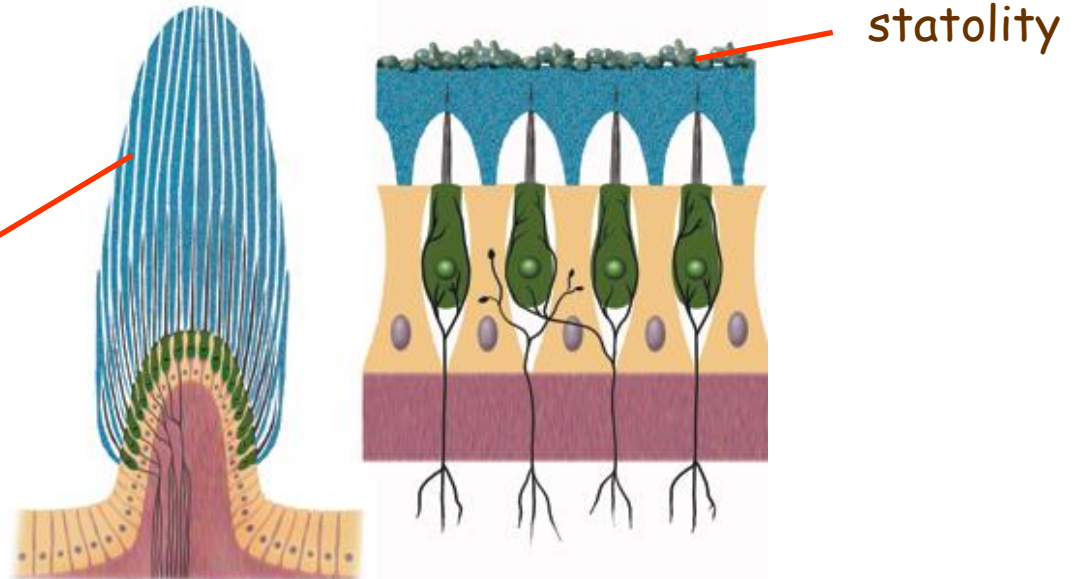
Statolity = otolity, statokonie

Kinetické mechanoreceptory obratlovců

Ampullae polokružných chodeb - obrvený hřeben (crista ampullaris)

Registrace pohybu endolymfy

rosolovitá cupula



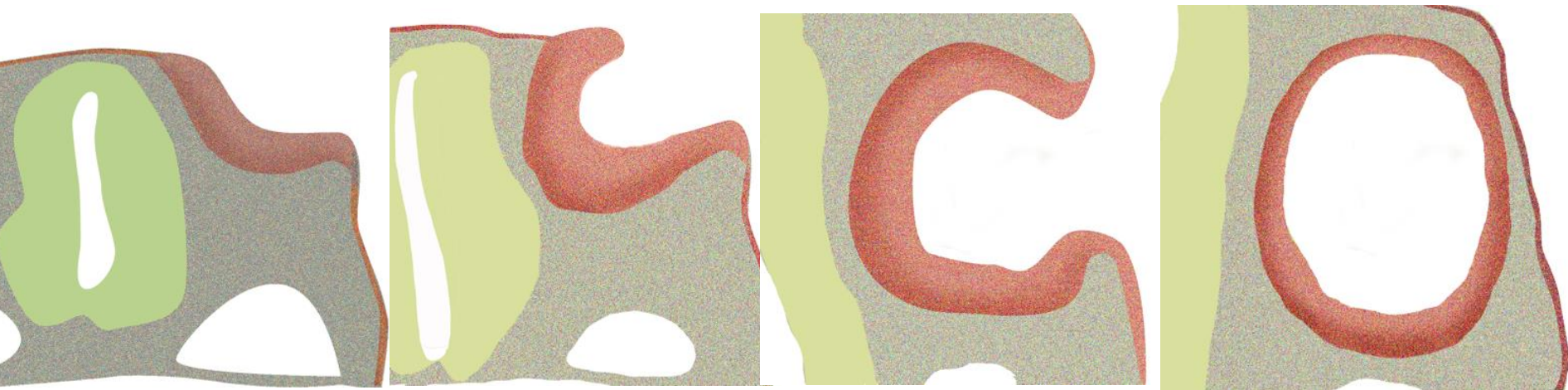
Smyslové orgány obratlovců - vznik

Mechanoreceptory

Z utriculu a sacculu vybíhá **ductus endolymphaticus** až pod lebeční klenbu (pod dura mater), po obou stranách neurální trubice se rozšiřuje v **saccus edolymphatic** se smyslovým epitelem

Ductus a saccus endolymphaticus se smyslovým epitelem - vznik z epidermální plakody

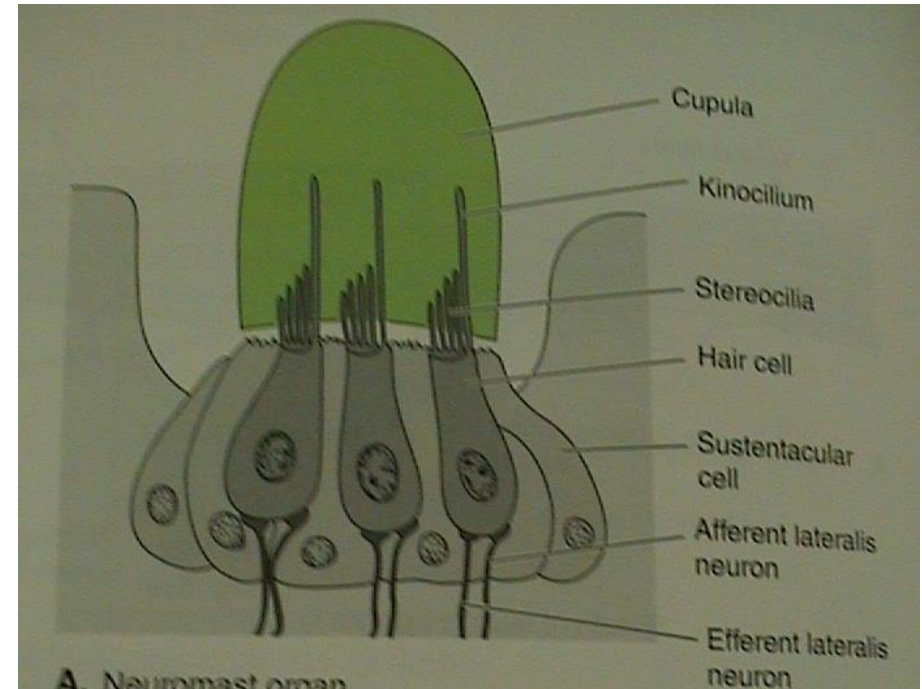
Epidermální plakoda



Smyslové orgány obratlovců

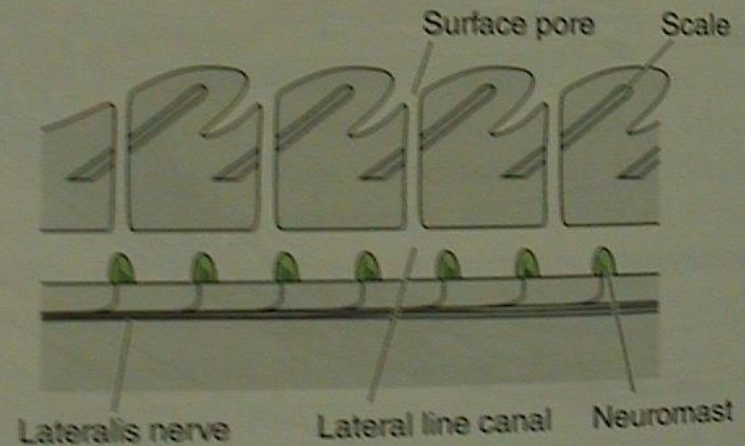
Mechanoreceptory

- proudový orgán - neuromasty



A. Neuromast organ

u ryb na bocích - postranní čára

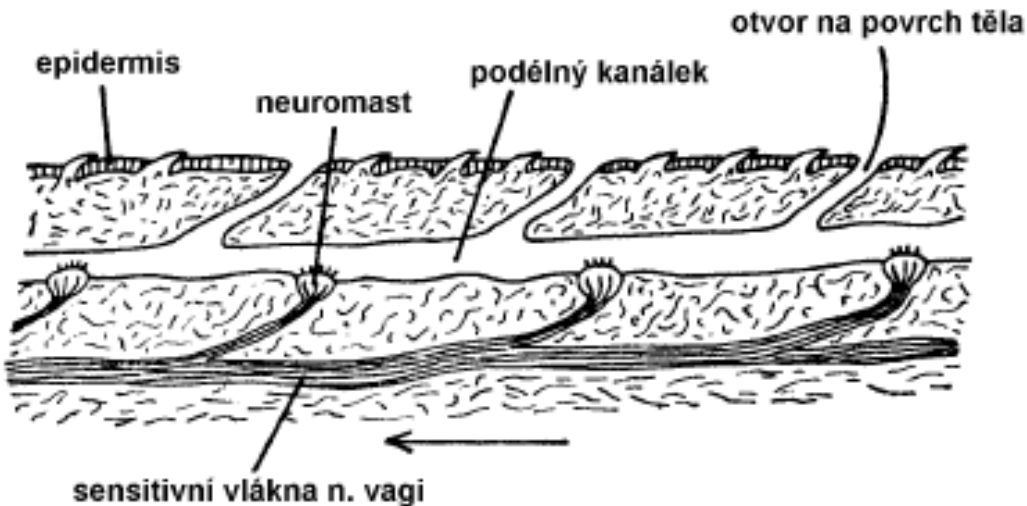
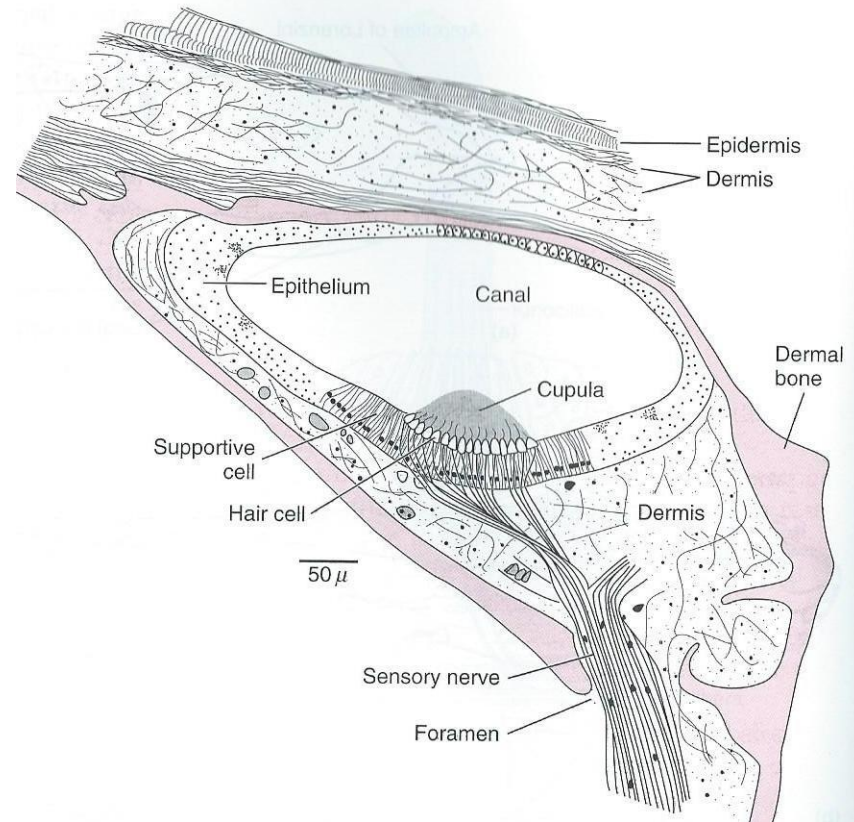
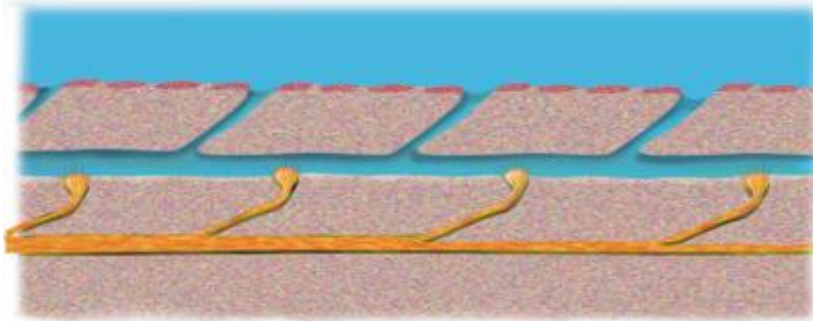


B. Neuromasts in lateral line canal

Smyslové orgány obratlovců

Mechanoreceptory

Neuromasty proudového orgánu ryb



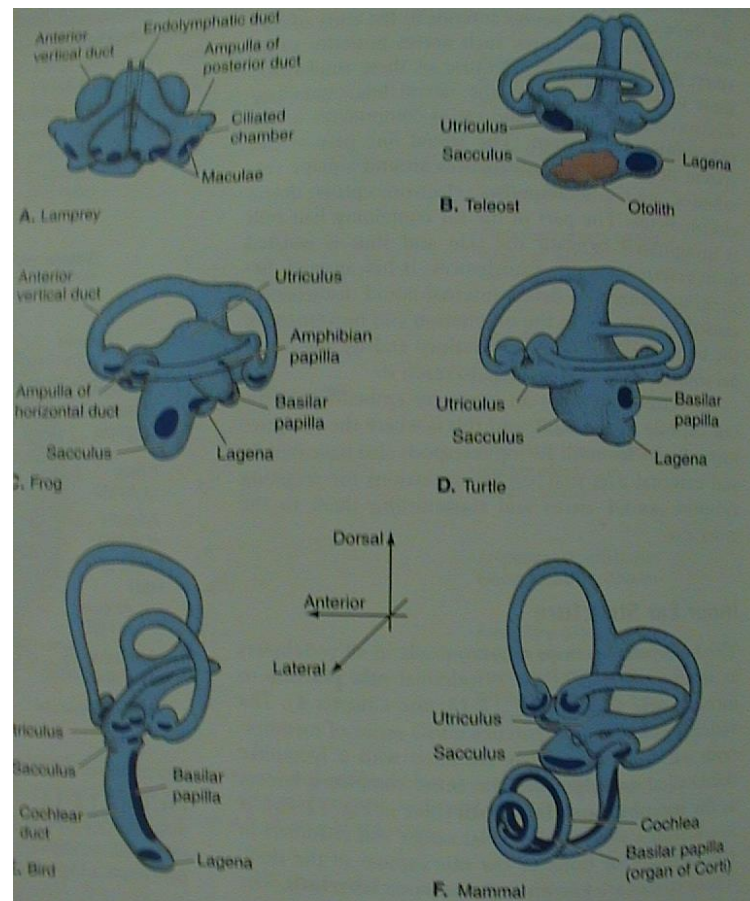
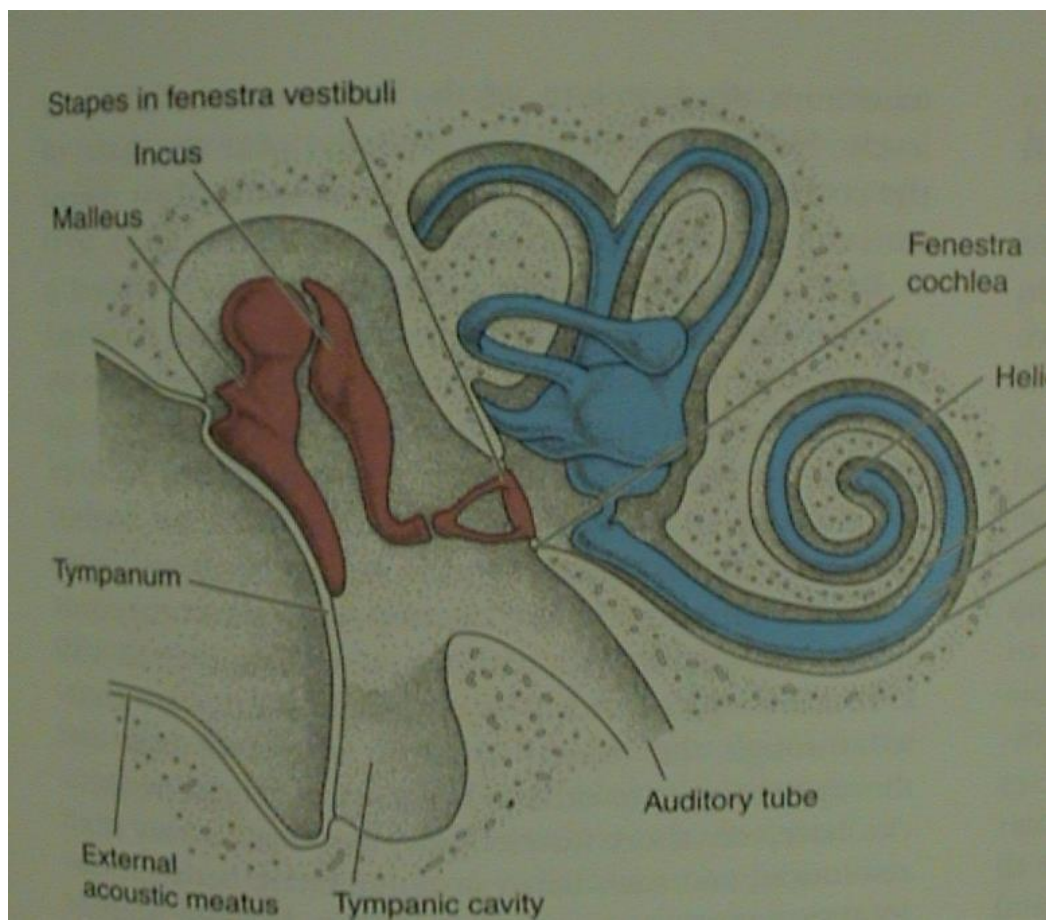
Smyslové orgány obratlovců - ucho

• sluchově rovnovážný orgán - ucho

A. vnitřní ucho - kostěný (perilymfa) a blanitý labyrint (endolymfa); vestibulární aparát (U, S, DS) + sluch (lagena - cochlea)

B. střední ucho - středoušní dutina, tympanum, sluchové kůstky (1-columella, 3 - malleus, incus, stapes), oválné a kruhové okénko, Eustachova trubice

C. vnější ucho - zevní zvukovod, boltec



Smyslové orgány obratlovců - vnitřní ucho

A. vnitřní ucho

utricleus (U)

sacculus (S)

lagena (L) - cochlea

ducti semicirculares (2, 3),
ampullae

Statické receptory:

maculae U, S, L

statokonie - drobné,
statolity (3 otolity) - velké

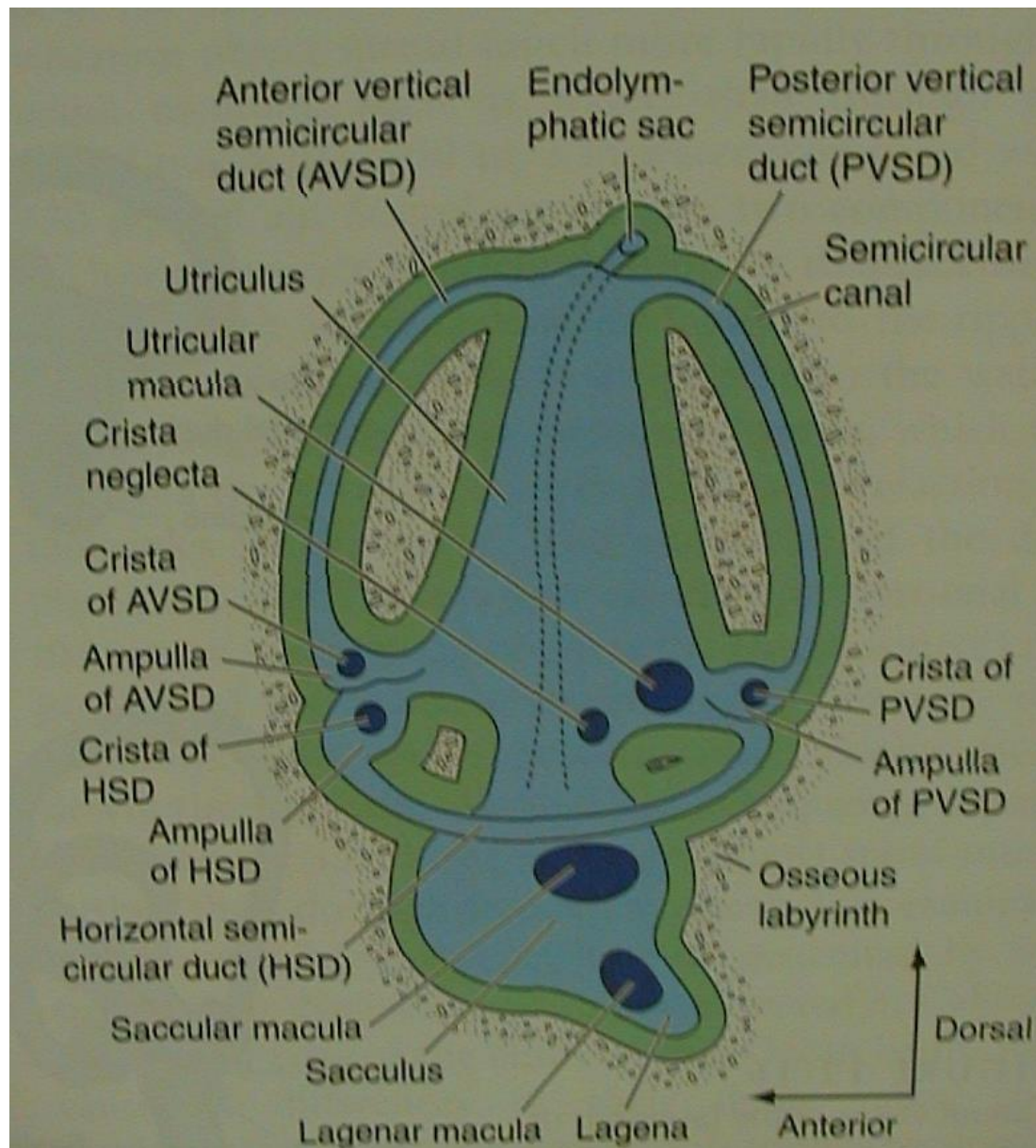
Kinetické receptory:

cristae d. semicircularii

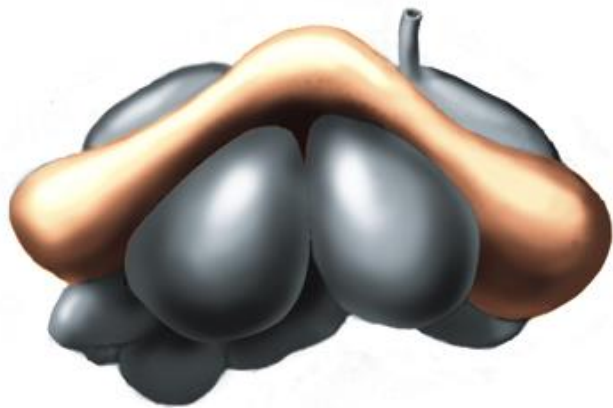
Akustické receptory:

maculae L - papilla basilaris
(+ macula amphibiorum) -

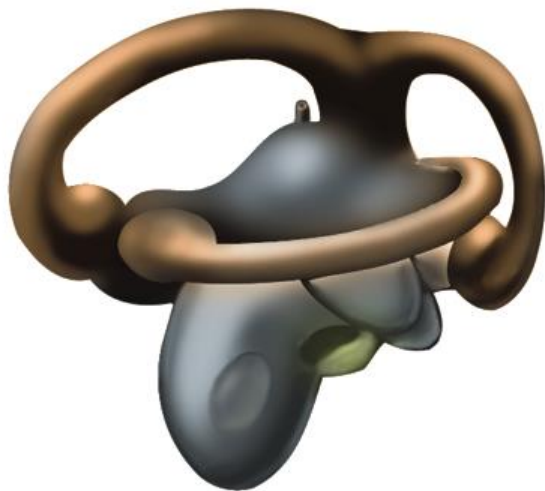
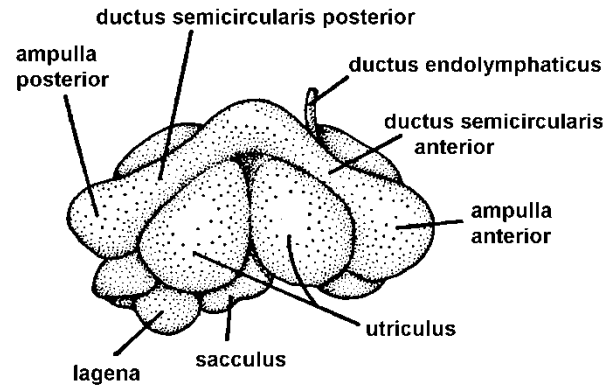
Cortiho orgán



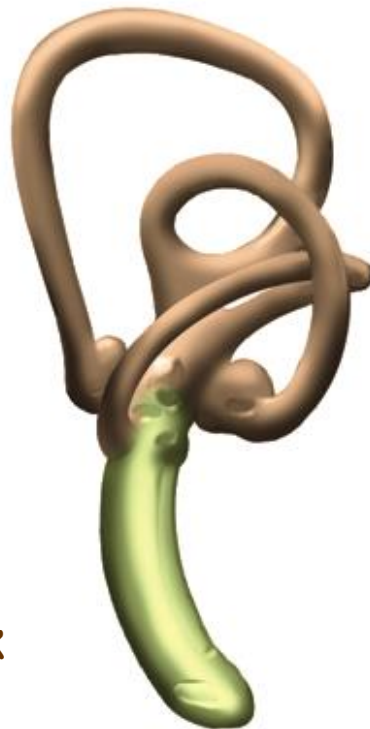
Smyslové orgány obratlovců - vnitřní ucho



mihule



žába



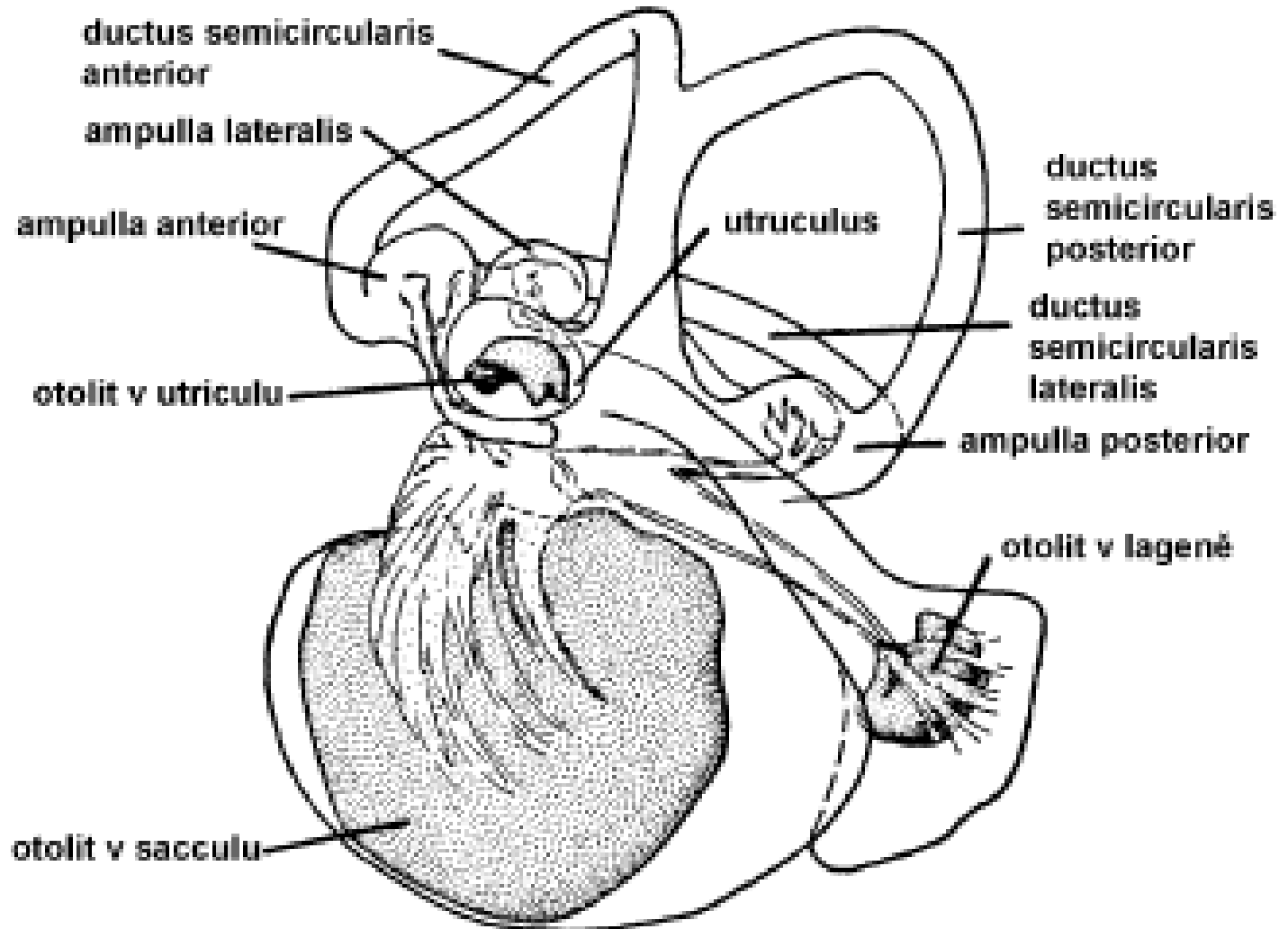
pták



savec

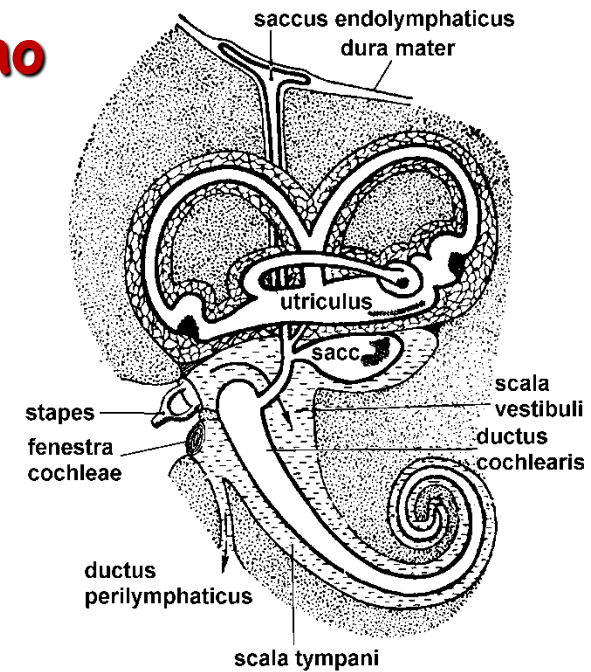
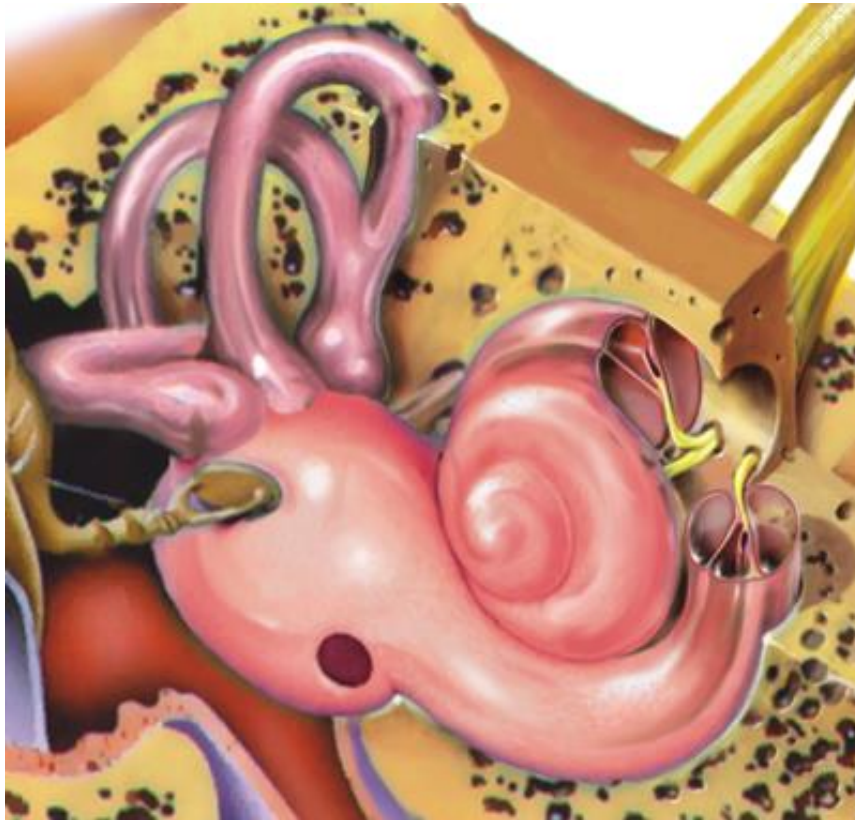
Smyslové orgány obratlovců - vnitřní ucho

Vestibulární aparát kostnaté ryby - 3 otolity (utriculith, sacculith, lagenit)
Vestibulární aparát žraloka - drobné statokonie

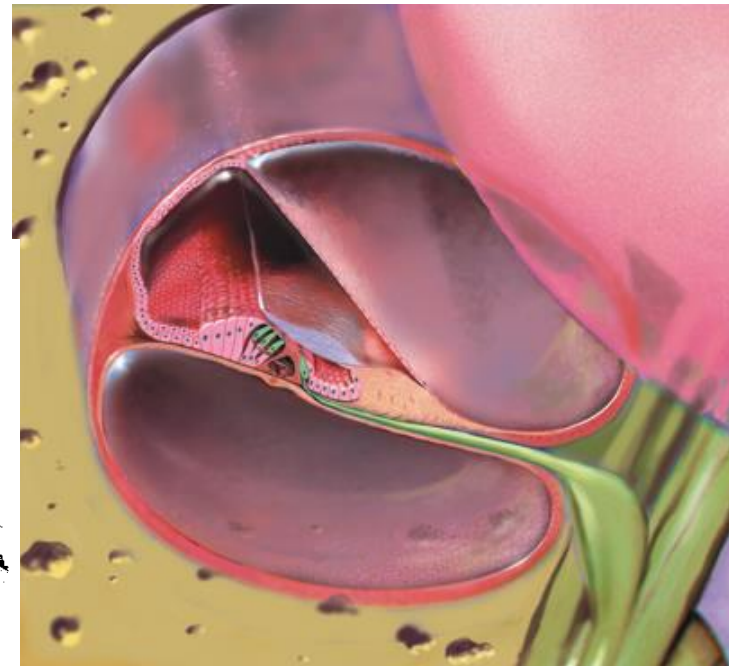
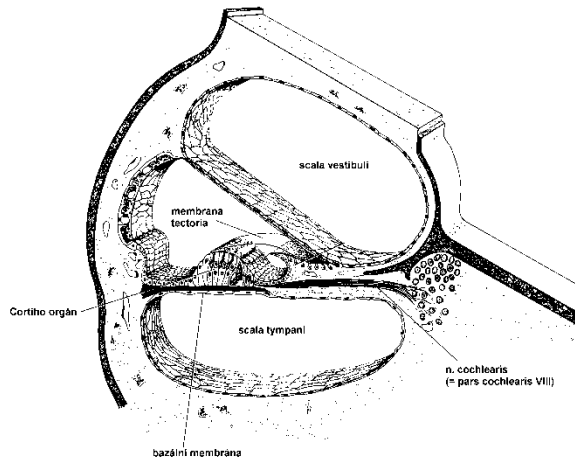


Vnitřní ucho
kaprovité ryby

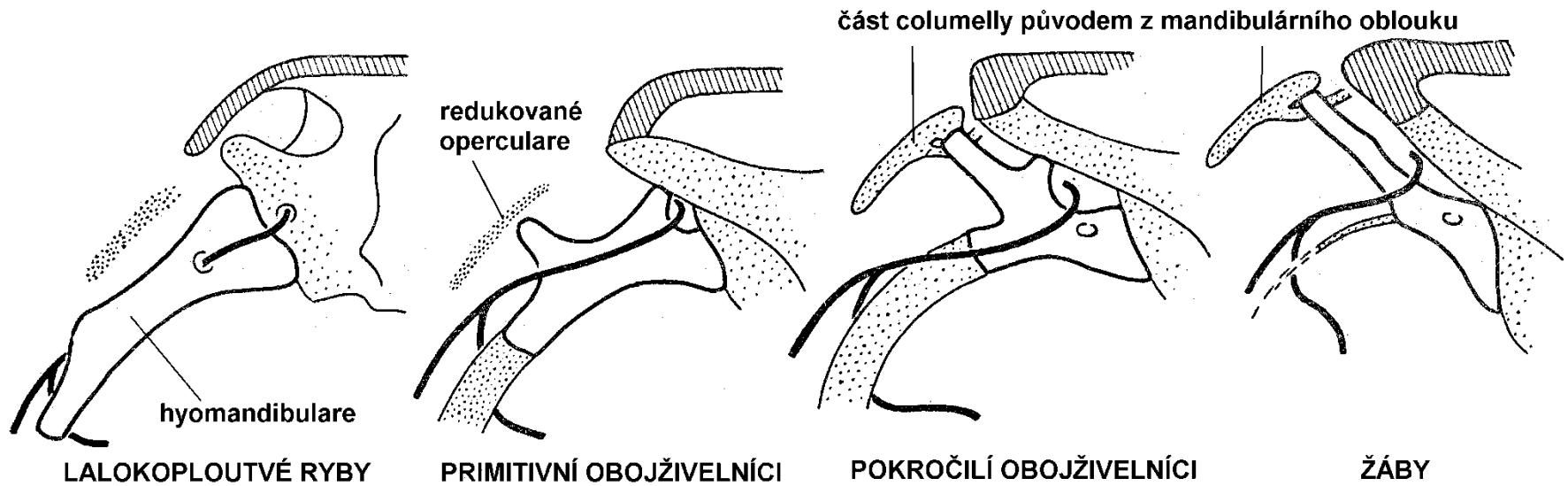
Smyslové orgány obratlovců - vnitřní ucho



Scala
vestibuli
tympani
Membrana
basilaris
Reisneri
tectorum

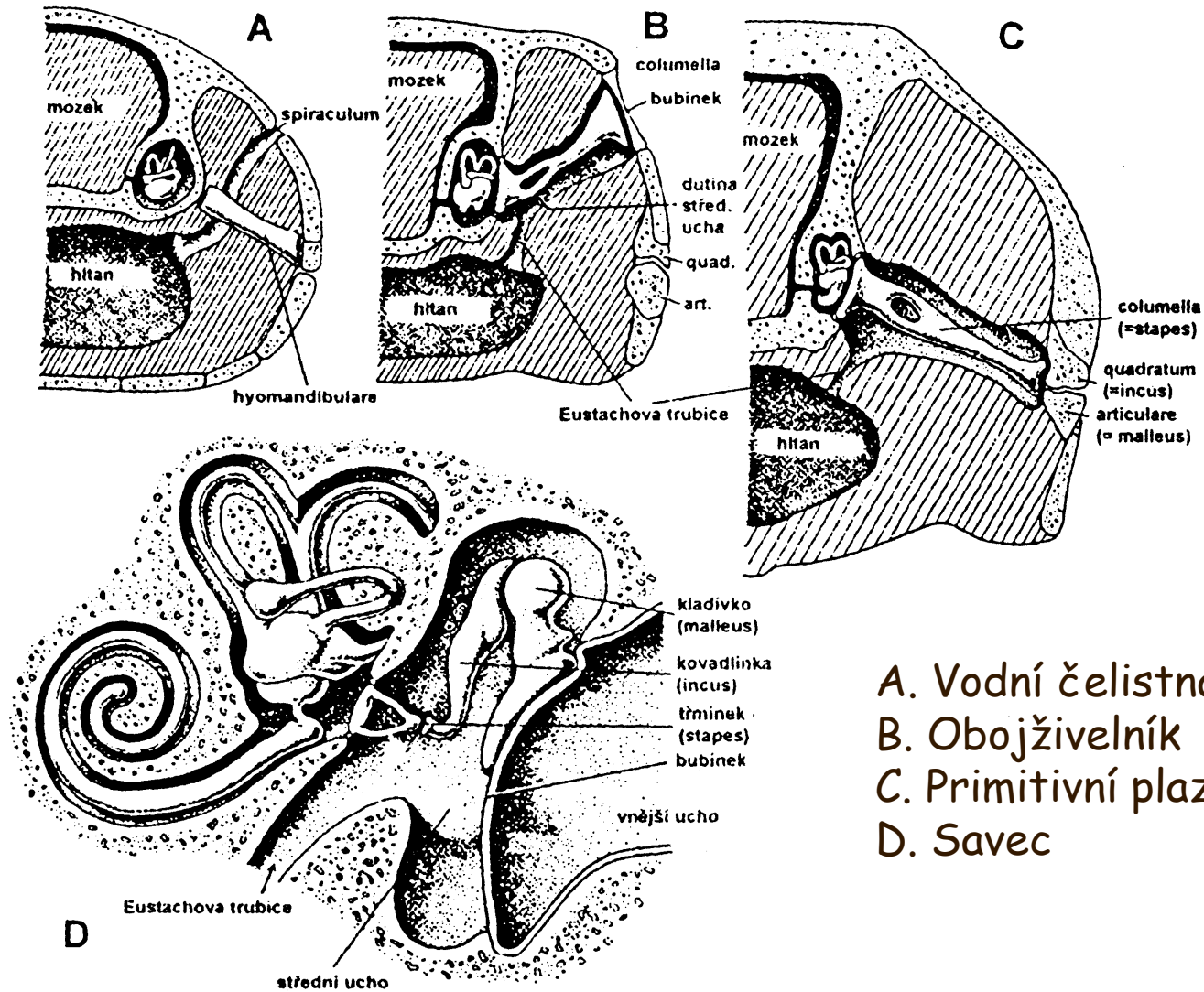


Smyslové orgány obratlovců - střední cho



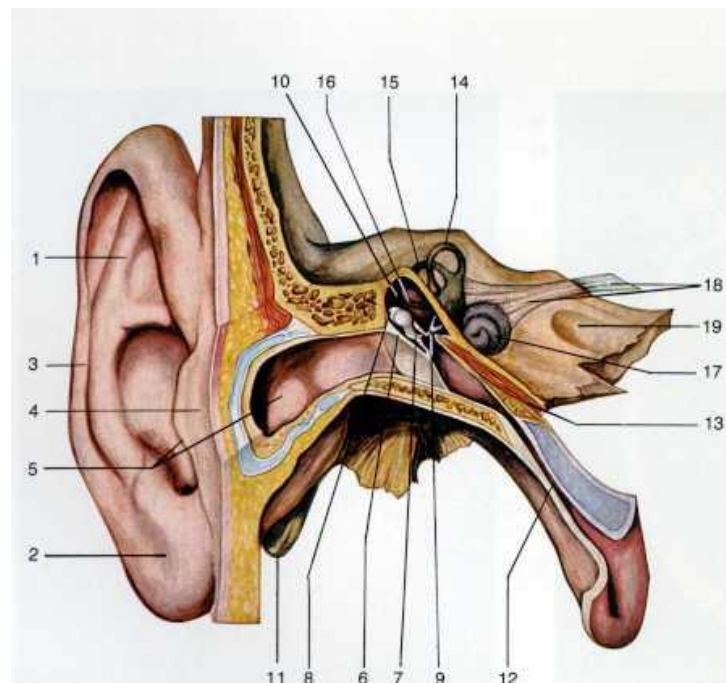
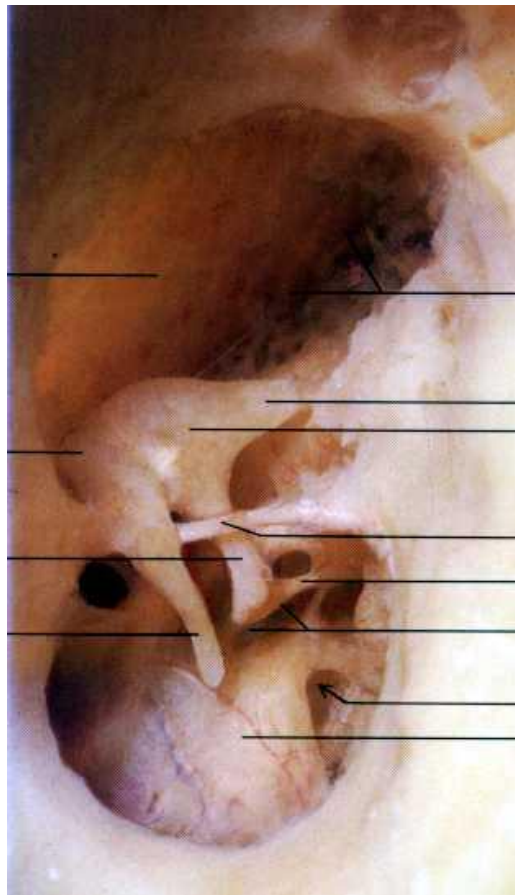
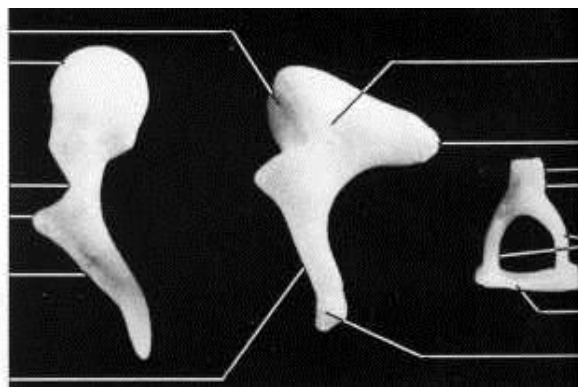
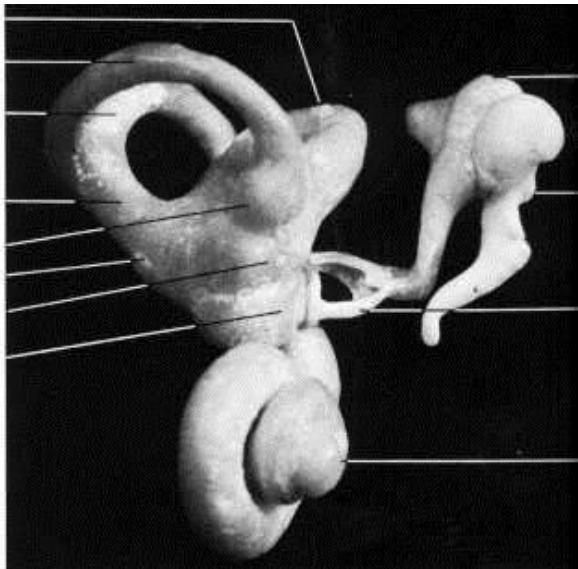
Collumella - původ: část z hyomandibulare, část z mandibulare

Smyslové orgány obratlovců - střední cho

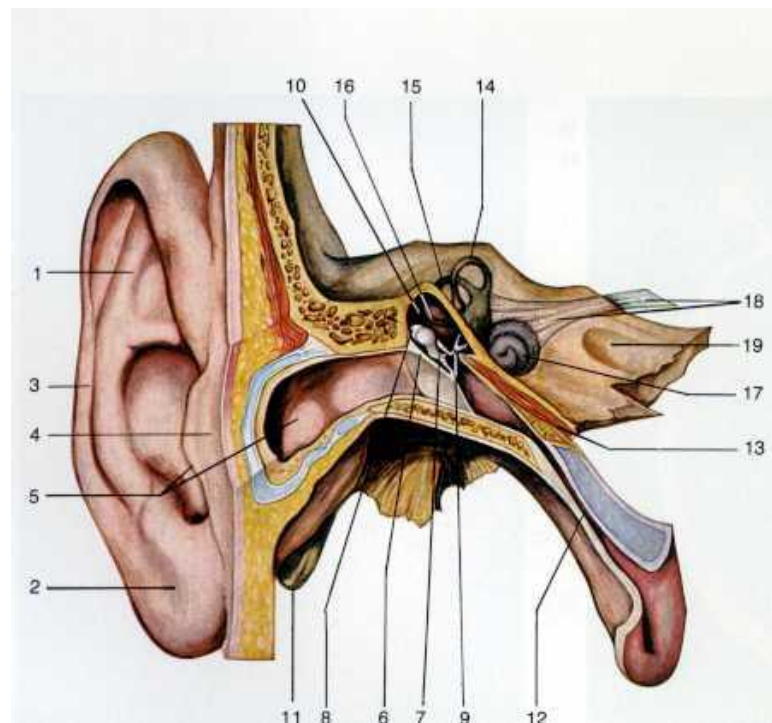


- A. Vodní čelistnatec
- B. Obojživelník
- C. Primitivní plaz
- D. Savec

Smyslové orgány obratlovců - střední ucho člověka



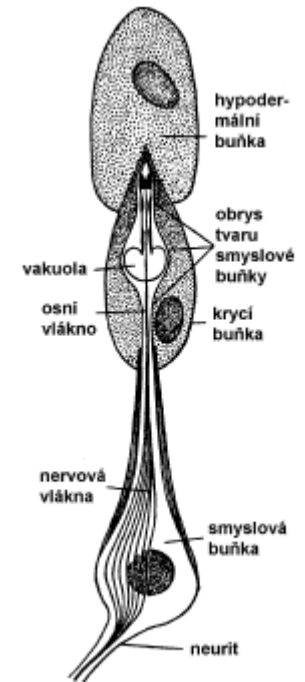
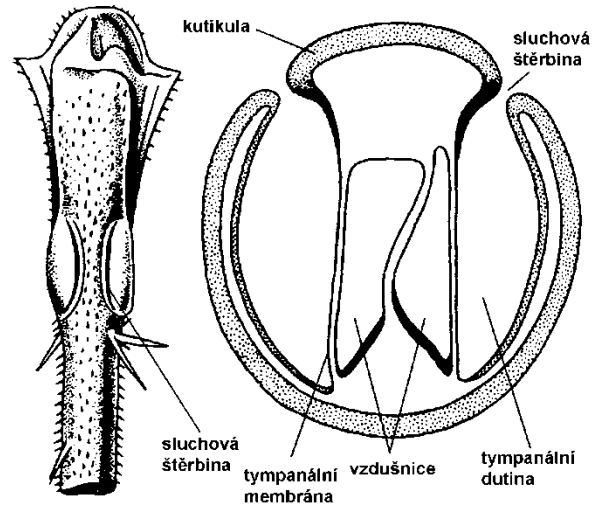
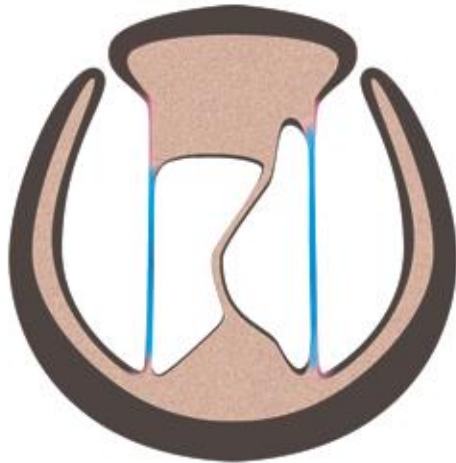
Smyslové orgány obratlovců - střední ucho člověka



Smyslové orgány bezobratlých

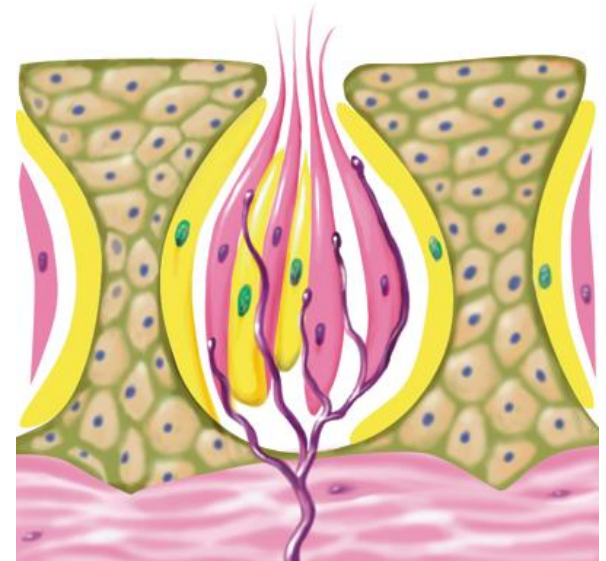
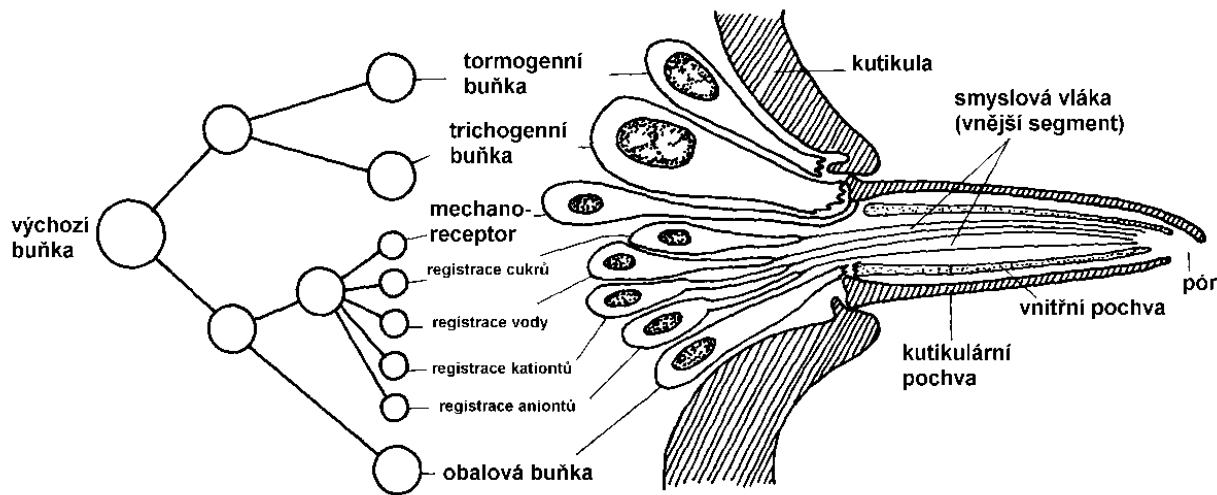
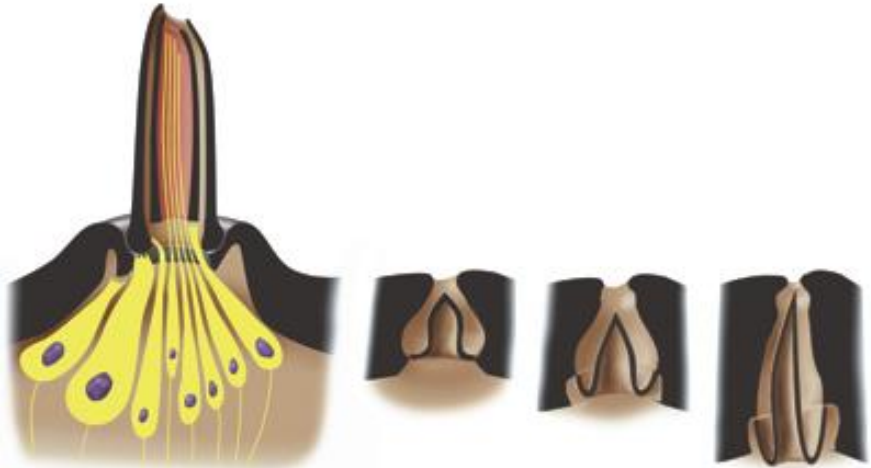
Phonoreceptory hmyzu

Typanální orgán kobyčky, scolopophory



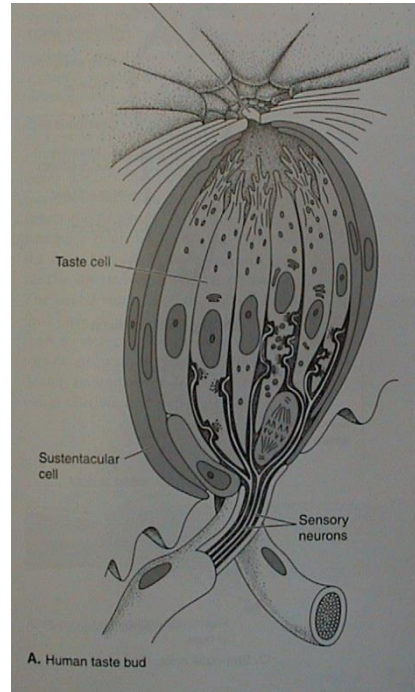
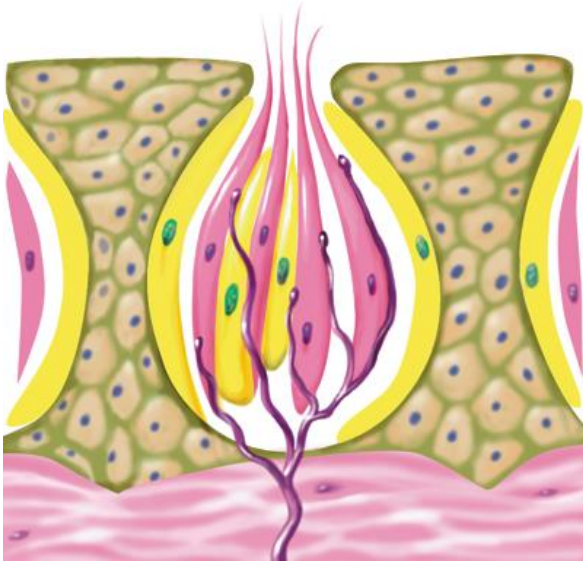
Smyslové orgány bezobratlých

Sensily hmyzu - chemoreceptory (chuťové receptory) - recepce feromonů

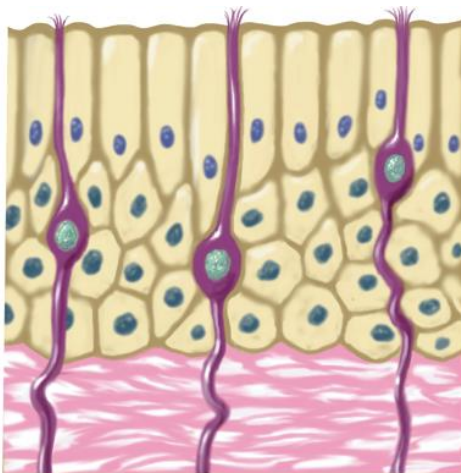


Chemoreceptory obratlovců

Čich a chuť

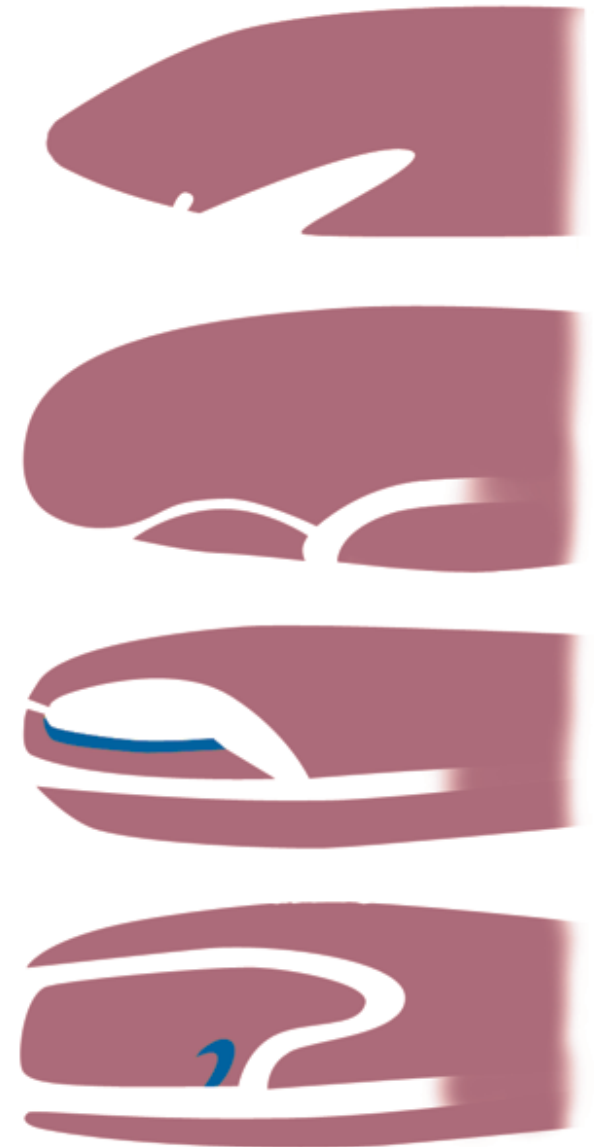


chuťové pupeny a zanořením chuťové pohárky



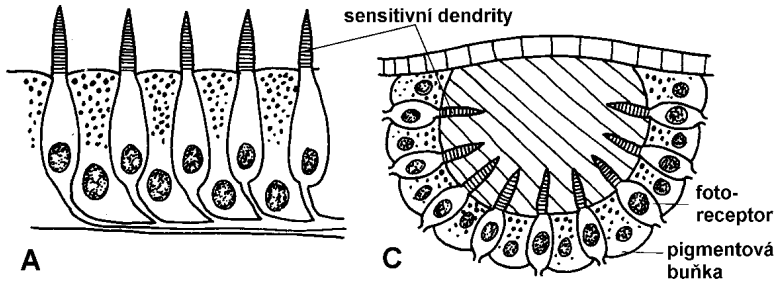
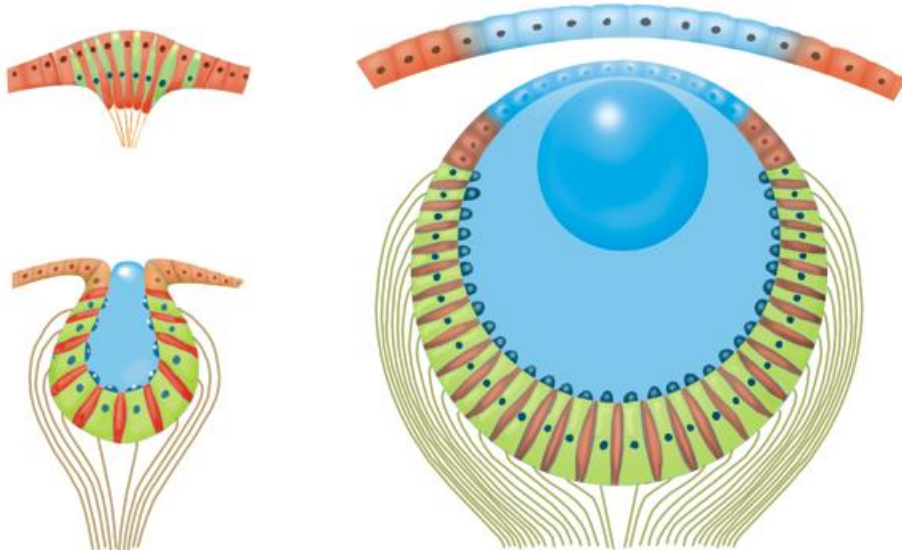
čichový epitel

Vomeronasální orgán
(Jacobsonův) - vznik



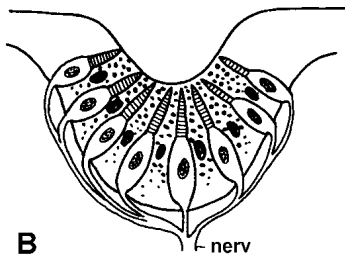
Smyslové orgány - komorové oko

Fotoreceptory

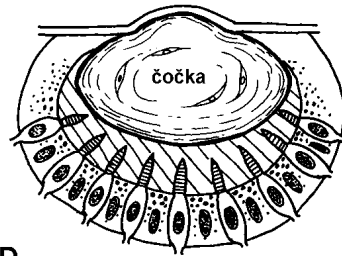


A

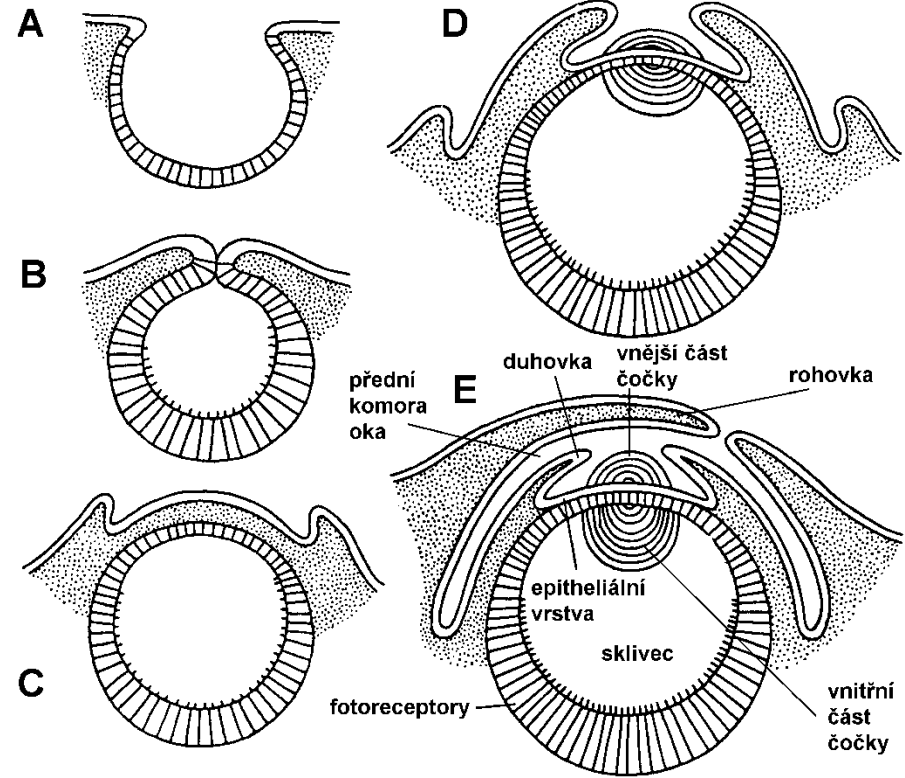
C



B



D



C

A

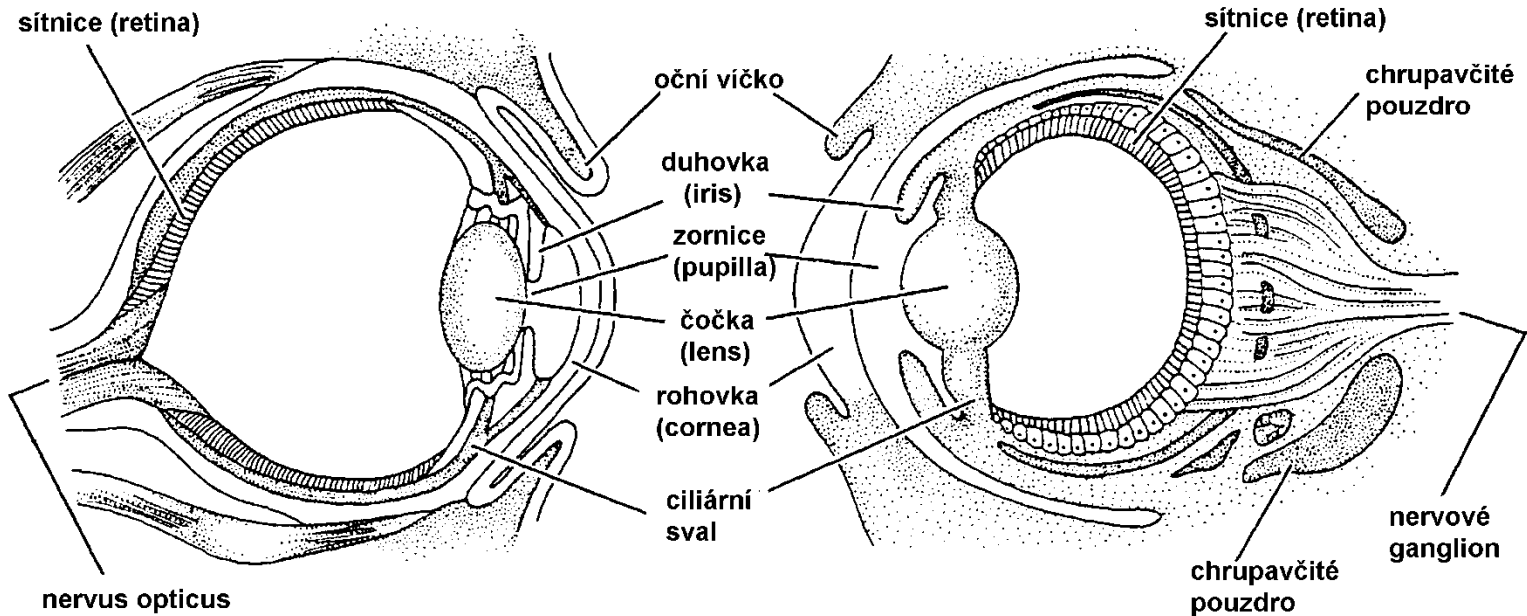
B

D

E

Vznik komorového oka hlavonožce

Smyslové orgány - komorové oko

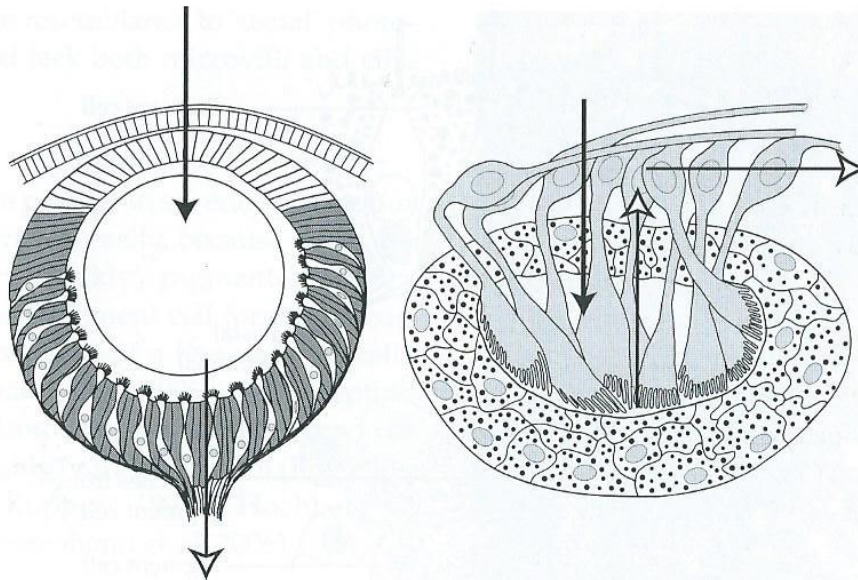


OKO OBRATLOVCE

OKO CHOBOTNICE

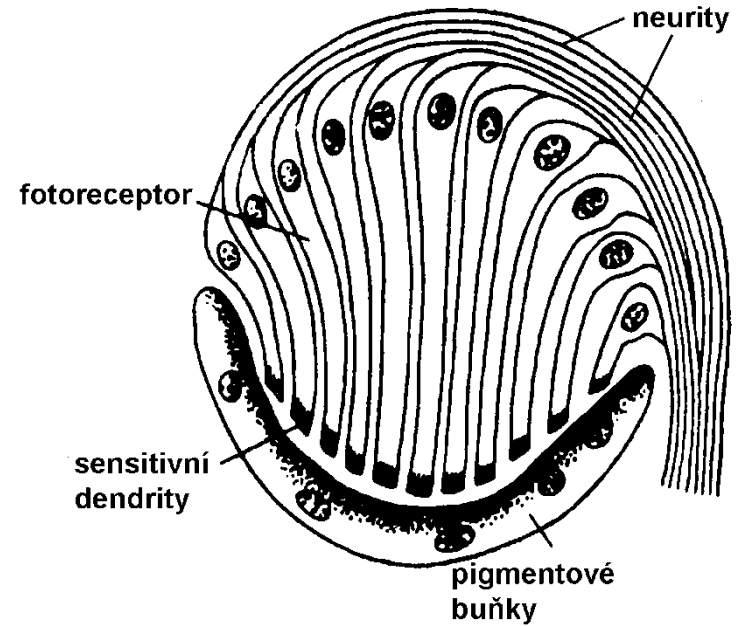
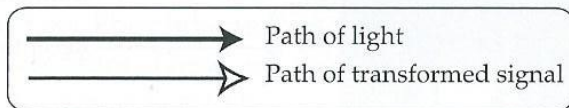
Smyslové orgány - oko

Everzní a inverzní oko



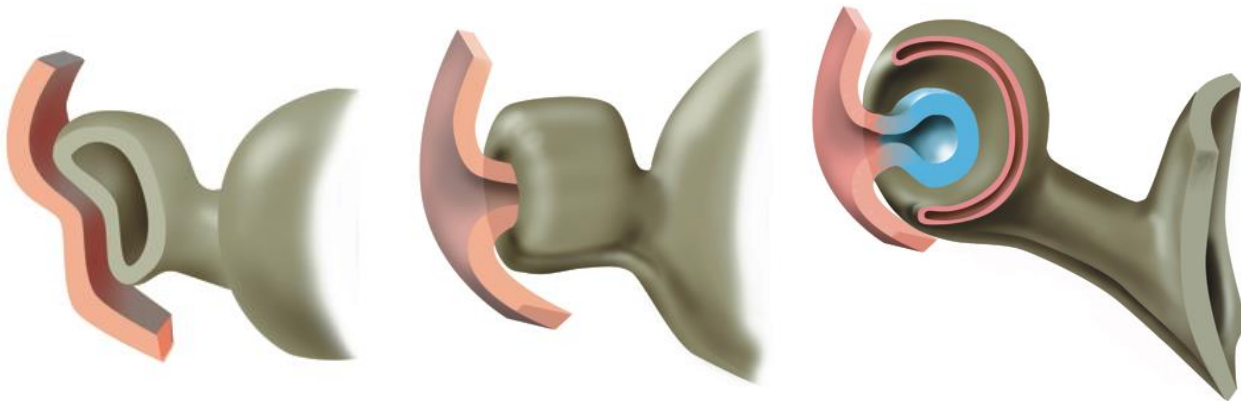
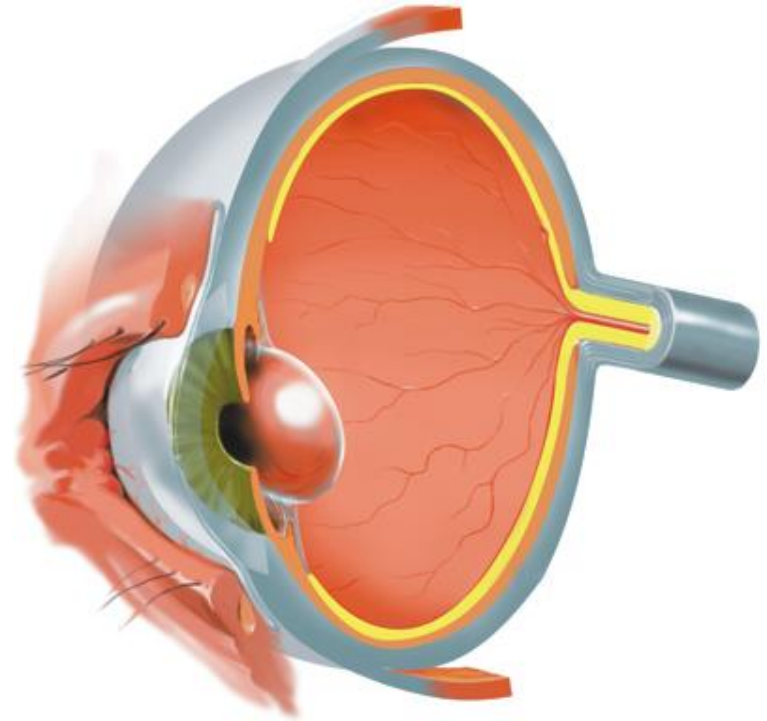
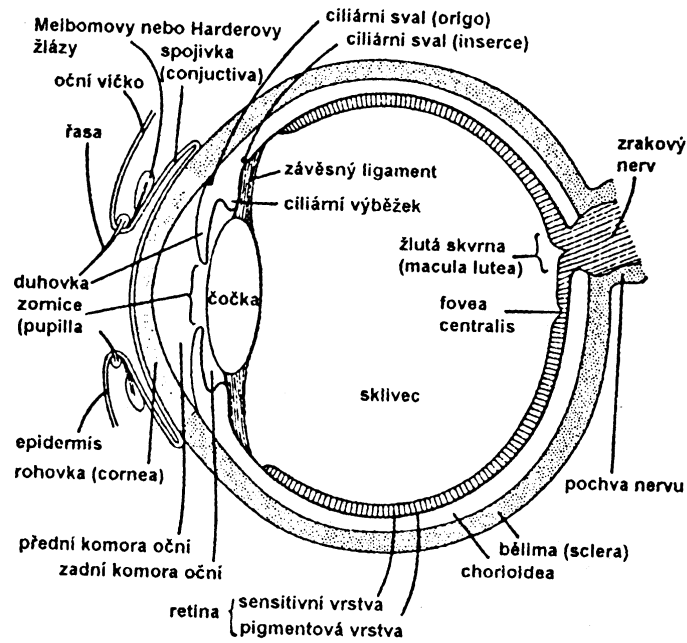
Everse: *Helix* (Gastropoda)

Inverse: *Lineus* (Nemertini)

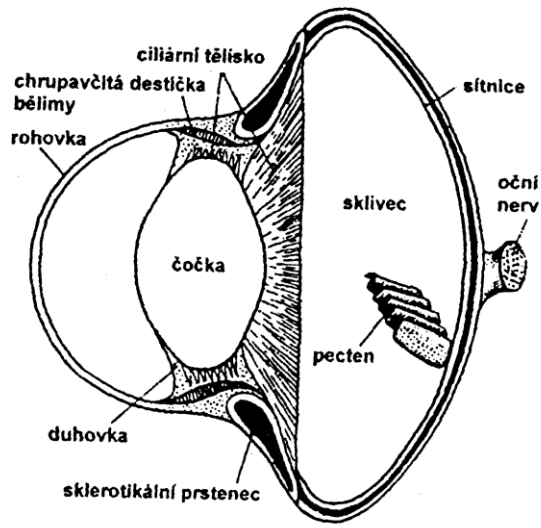


Hlemýžd' (*Helix*) a pásnice (*Lineus*, Nemertini)

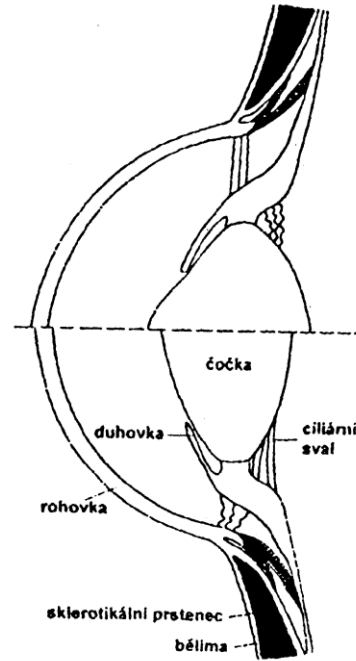
Smyslové orgány - vznik komorového oka



Smyslové orgány - komorové oko



sova

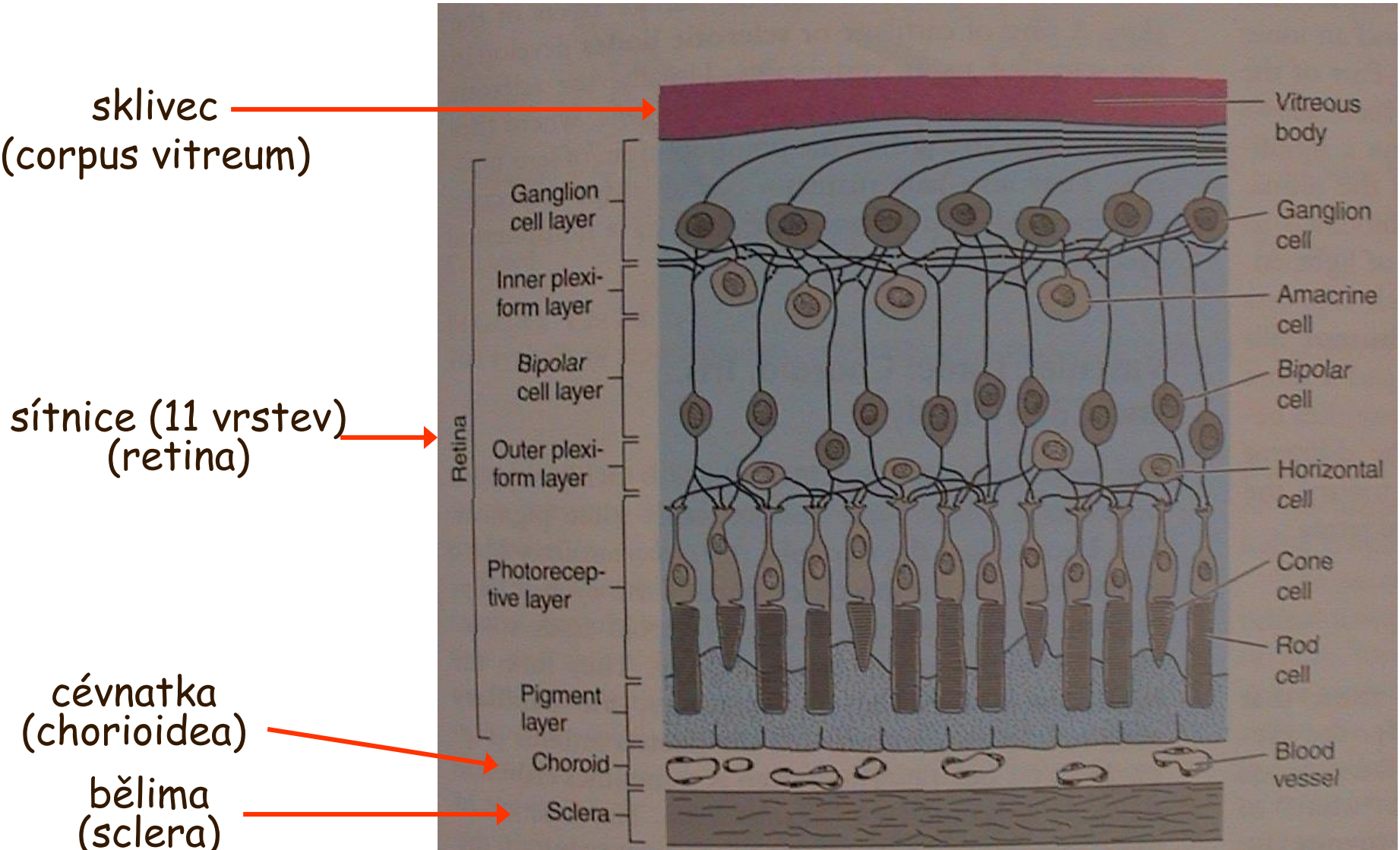


akomodace u ptáků

Smyslové orgány - komorové oko člověka

• zrak - inverzní komorové oko

1. bělima (+ rohovka), 2. cévnatka (+ duhovka, pupilla), 3. sítnice;
přední a zadní komora, čočka (lens), řasnatý val (corpus ciliare)



Smyslové orgány - oko

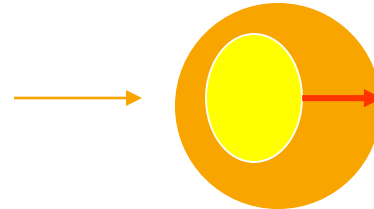
klid

zaostřování - akomodace

na blízko

mihule a kostnaté ryby

na dálku

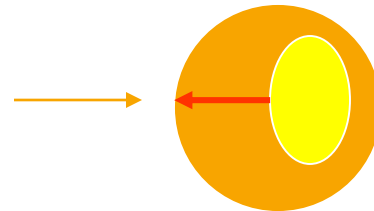


m. retractor lentis

na dálku

paryby, starobylé ryby,
obojživelníci

na blízko



m. protractor lentis

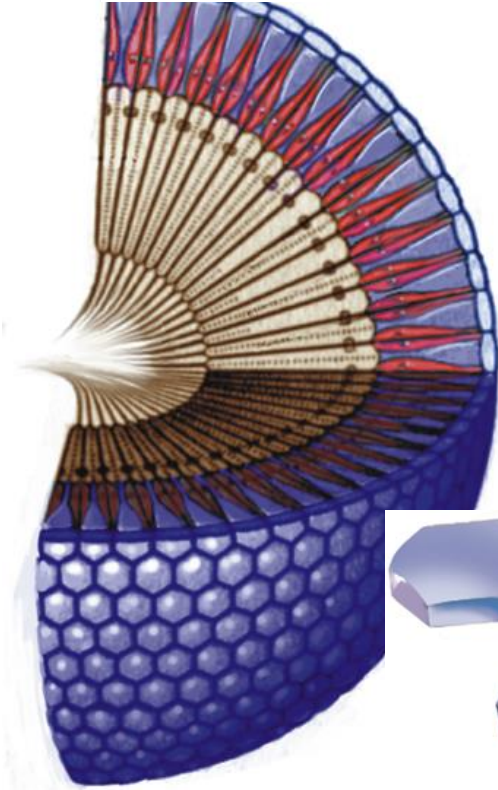
na dálku

Amniota - plazi, ptáci, savci

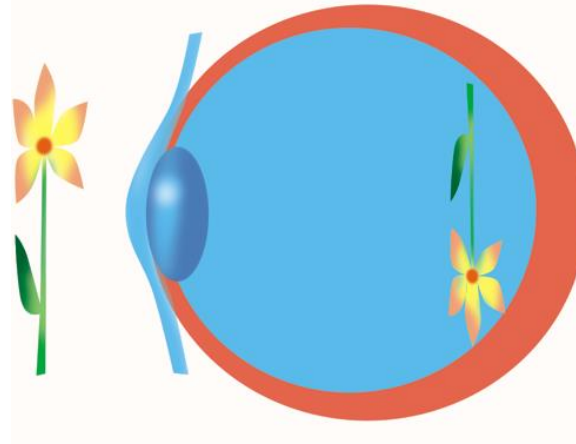
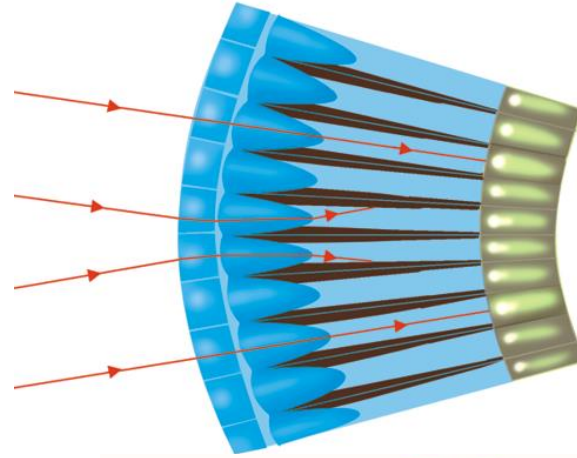
na blízko



Smyslové orgány - složené oko

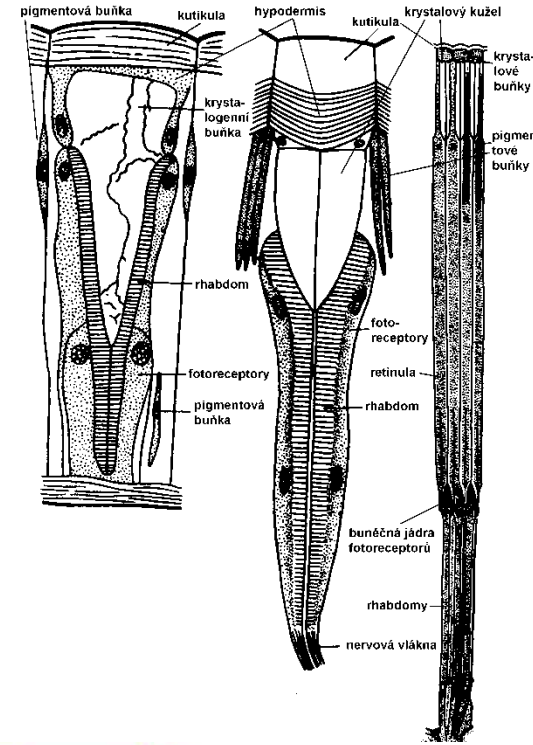
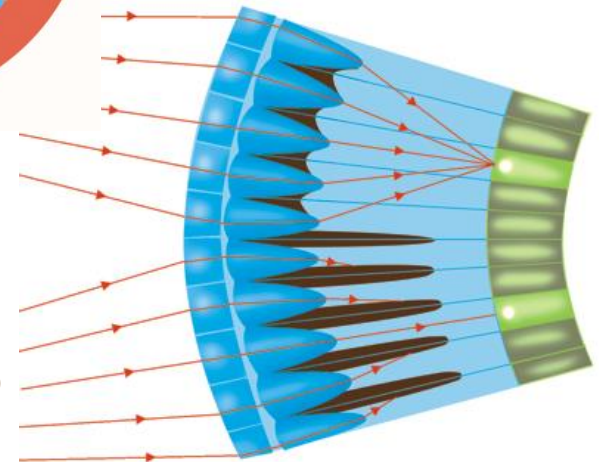


Ommatidium
Složené oko



tma

světlo



Smyslové orgány - kožní receptory

• kožní receptory (exteroreceptory)

Volná nervová zakončení - bolest;
Merkelovy terčky (sek.) - dotek

Tělíska

- Meissnerova - hmat
- Paciniho - tlak
- Herbstova - hmat
- Krauseho - chlad
- Rufiniho - teplo

