

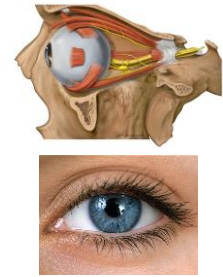
## Visual system

MUDr. Marek Joukal, Ph.D.

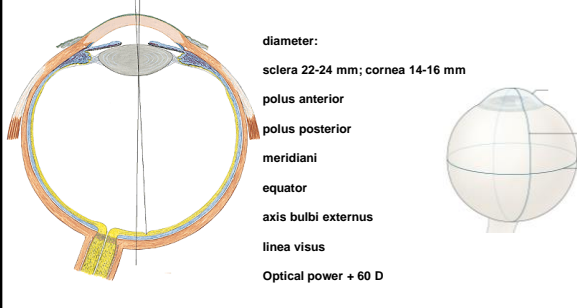
Department of Anatomy

### Visual system

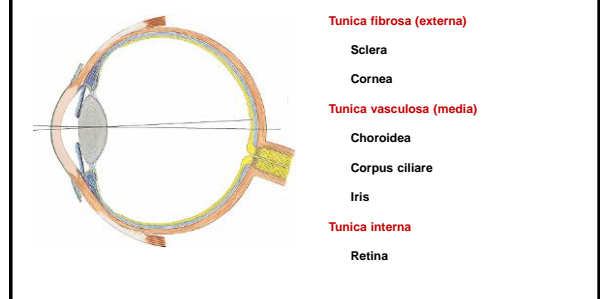
- Bulbus oculi
- Orbita
- Corpus adiposum orbitae
- Organa oculi accessoria
- Musculi bulbi et orbitae
- Ey lids (palpebrae)
- Lacrimal apparatus (apparatus lacrimarius)



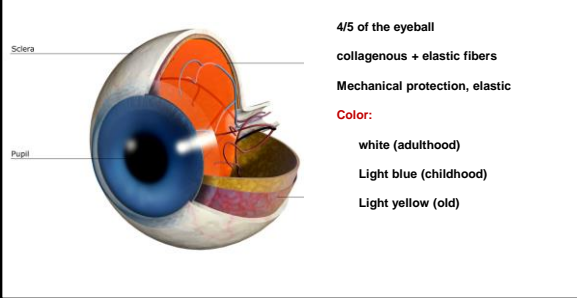
### BULBUS OCULI



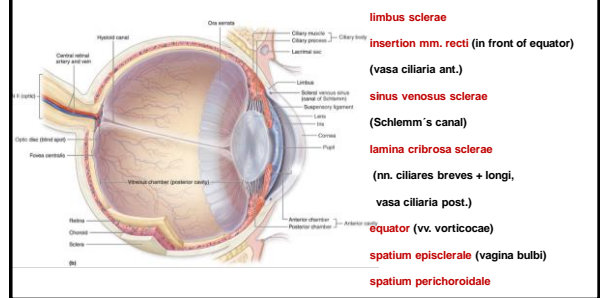
### Morphology of the eyeball



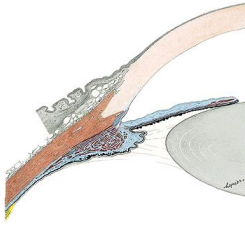
### TUNICA FIBROSA - SCLERA



### TUNICA FIBROSA - SCLERA

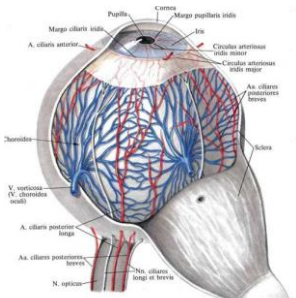


**TUNICA FIBROSA - CORNEA**



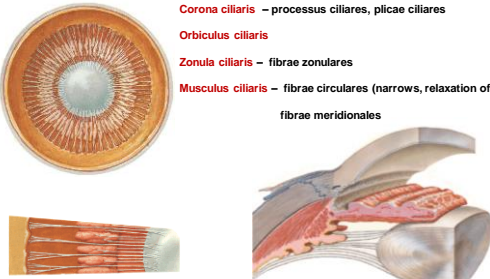
**Limbus corneae** (sulcus sclerae)  
**Facies ant. corneae** (vertex corneae, polus ant.)  
**Facies post. corneae** (anterior chamber of the eye)  
**Morphology:** epithelium ant.  
 substantia propria  
 endothelium corneae  
**Optical power + 40 D**  
**Physiol. astigmatism** (not more than 1/2 D)  
 (vertical curve 11 mm; horizontal curve 12 mm)

**TUNICA VASCULOSA - CHOROIDEA**



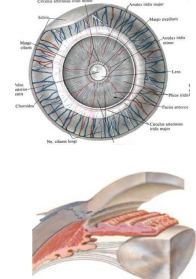
**Fibrous membrane**  
**Pigment cells** (dark chamber)  
 spatium perichorioidale  
**vessels**  
 aa. ciliares ant.  
 aa. ciliares post. breves  
 aa. ciliares post. longi

**TUNICA VASCULOSA – CORPUS CILIARE**

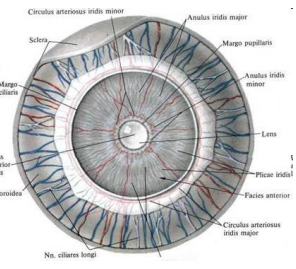


**Corona ciliaris** – processus ciliares, plicae ciliares  
**Orbicularis ciliaris**  
**Zonula ciliaris** – fibrae zonulares  
**Musculus ciliaris** – fibrae circulares (narrows, relaxation of fibrae zon.)  
 fibrae meridionales

**TUNICA VASCULOSA – IRIS**

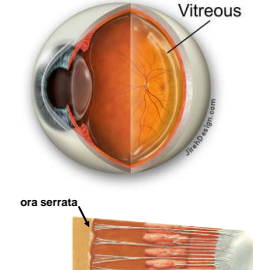


**margo ciliaris**  
**margo pupillaris** (pupilla)  
**facies ant. iridis**  
**facies post. iridis**  
**STROMA IRIDIS**  
 m. sphincter pupillae (miosis, parasympathicus)  
 m. dilatator pupillae (mydriasis, sympathicus)  
 pigment (eye color)

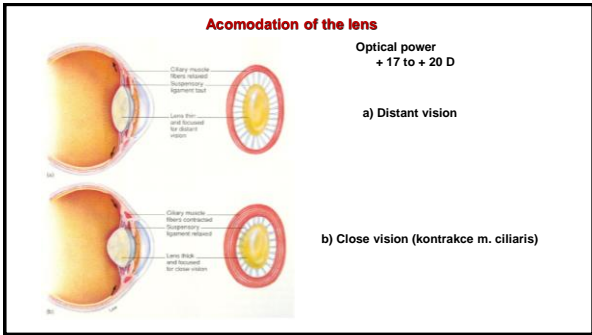
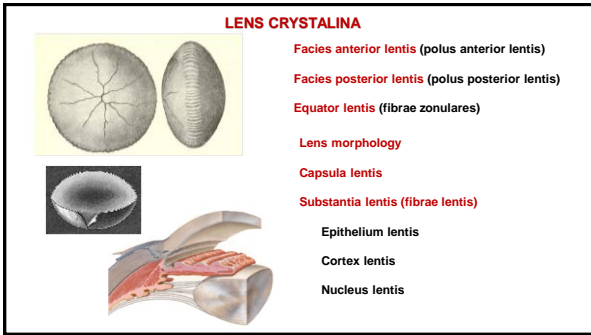
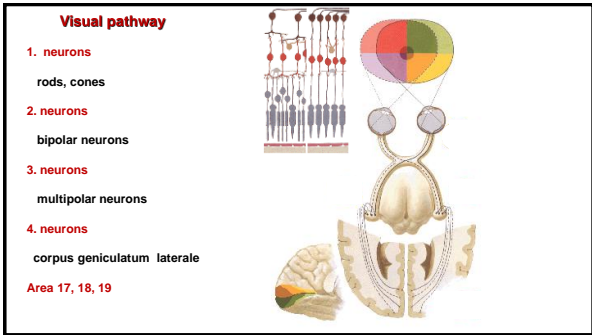
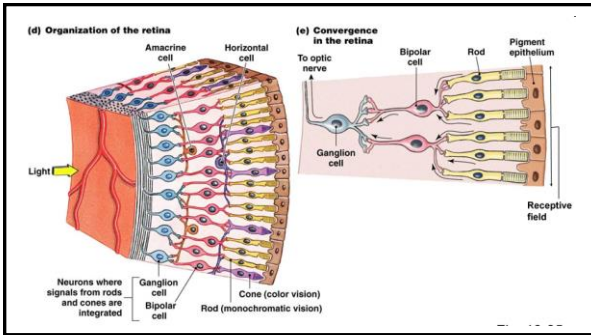
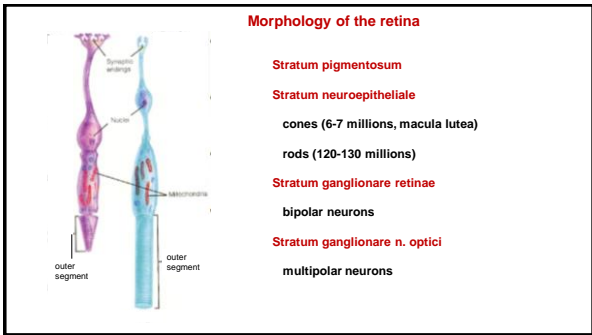
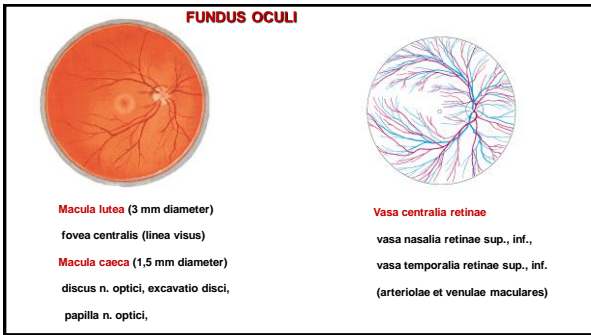


**Arterial rings around iris**  
 aa. ciliares ant.  
 aa. ciliares post. breves  
 aa. ciliares post. longi  
**circulus arteriosus iridis major**  
 (around margo ciliaris)  
**circulus arteriosus iridis minor**  
 (around margo pupillaris)

**TUNICA INTERNA – RETINA**



**Vitreous**  
**Pars caeca retinae**  
 pars ciliaris retinae  
 pars iridica retinae  
**Ora serrata**  
**Pars optica**  
 fotoreceptors (cones, rods)

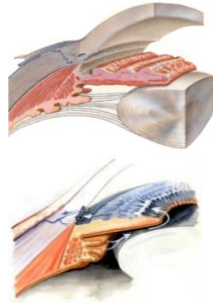


### CORPUS VITREUM



- Camera vitrea bulbi
- Membrana vitrea
- Stroma vitreum
- Humor vitreus
- Fossa hyaloidea
- Canalis hyaloideus (a. hyaloidea)

### CAMERAE BULBI

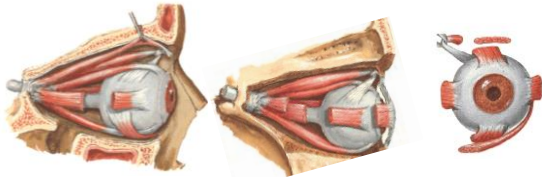


- Camera bulbi anterior
- Camera bulbi posterior
- Camera vitrea
- Humor aquosus
- Angulus iridocornealis
- Lig. pectinatum anguli iridocornealis
- Spatia iridocornealia
- Sinus venosus sclerae
- Venulae aquosae

### MUSCULI BULBI

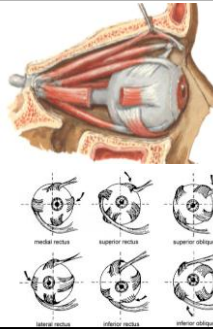
- m. rectus superior, inferior, medialis, lateralis
- m. obliquus superior, inferior
- m. levator palpebrae superioris

- M. rectus superior, inferior, medialis, lateralis**
- O: anulus tendineus communis (Zinni)
- I: to sclera in front of equator on its side
- F: pulls bulbus on its side



### M. obliquus bulbi superior

- O: anulus tendineus comm., tendon around the trochlea
  - I: to sclera in posterior lateral quadrant behind equator
  - F: pulls bulbus lateral and inferior
- M. obliquus inferior**
- O: behind crista lacrimalis post.
  - I: to sclera in posterior lateral quadrant behind equator
  - F: pulls bulbus lateral and superior

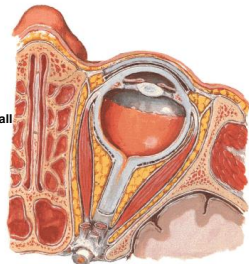


### M. levator palpebrae superioris

- O: anulus tendineus comm.
- I: to tarsus sup + m. orbicularis oculi
- F: elevates eyelid

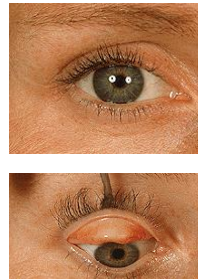
### FASCIAE ORBITALES

- Periorbit – in fissura orbitalis inf. (m. orbitalis)
- Vagina bulbi (Tenonni) – fibrous cover
  - fuses with fasciae of the muscles
- Spatium episclerale – between vagina bulbi and eyeball
- Corpus adiposum orbitae
  - fills the orbit and retrobulbar space

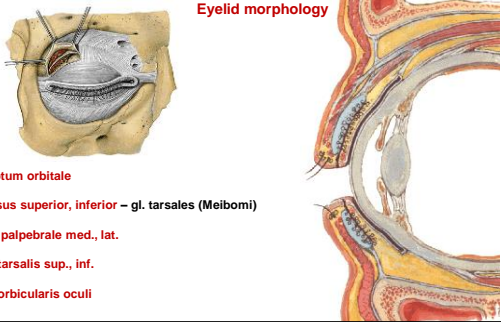


### EYELIDS - PALPEBRAE

- Upper and lower eyelids (palpebra superior, inferior)
- Palpebral fissure (rima palpebrarum)
- Angulus oculi medialis, lateralis
- facies ant., post. palpebrae
- limbus palpebralis ant.
- lashes (cilia) with sebaceous gl. (gl. sebaciae),
- Modified sweat glands (gl. ciliares)
- limbus palpebralis posterior
- rivus lacrimalis
- papilla lacrimalis and punctum lacrimale

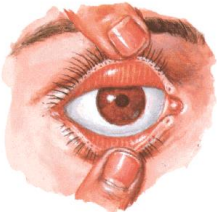


**Eyelid morphology**



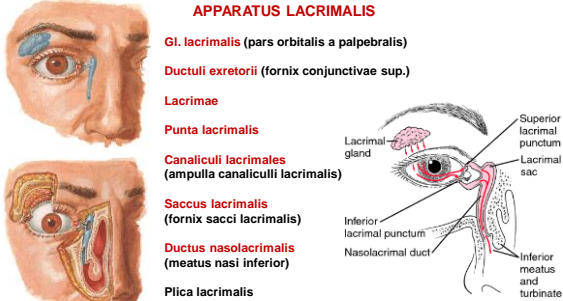
septum orbitale  
 tarsus superior, inferior – gl. tarsales (Meibomi)  
 lig. palpebrale med., lat.  
 m. tarsalis sup., inf.  
 m. orbicularis oculi

**CONJUNCTIVA**



tunica conjunctiva palpebrarum  
 tunica conjunctiva bulbi  
 fornix conjunctivae sup., inf.,  
 saccus conjunctivae  
 plica semilunaris conjunctivae  
 lacus lacrimalis  
 caruncula lacrimalis  
 papilla lacrimalis  
 punctum lacrimale

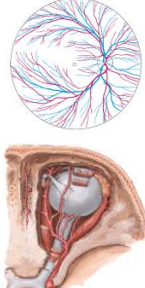
**APPARATUS LACRIMALIS**



Gl. lacrimalis (pars orbitalis a palpebralis)  
 Ductuli excretorii (fornix conjunctivae sup.)  
 Lacrimae  
 Punta lacrimalis  
 Canaliculi lacrimales (ampulla canaliculi lacrimalis)  
 Saccus lacrimalis (fornix sacci lacrimalis)  
 Ductus nasolacrimalis (meatus nasi inferior)  
 Plica lacrimalis

Lacrimal gland  
 Superior lacrimal punctum  
 Lacrimal sac  
 Inferior lacrimal punctum  
 Nasolacrimal duct  
 Inferior meatus and turbinate

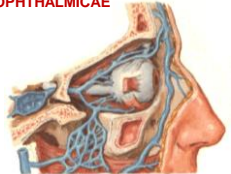
**ARTERIA OPHTHALMICA**



a. centralis retinae (through n. opticus to retina, arteriolae temporales retinae sup. + inf., a. nasales retinae sup. + inf.)  
 a. lacrimalis (aa. palpebrales lat.)  
 rr. musculares (a. ciliares ant. – circulus iridis minor)  
 a. ciliares posteriores breves (choroidea) et longi (circulus art. iridis major)  
 a. supraorbitalis  
 a. ethmoidalis post. et ant. (a. meningea ant.)  
 aa. palpebrales med.  
 a. supratrochlearis  
 a. dorsalis nasi

**VENAE OPHTHALMICAE**

v. ophthalmica sup.  
 v. nasofrontalis  
 vv. palpebrales  
 vv. ethmoidales ant., post.,  
 v. lacrimalis  
 vv. vorticosae (choroidea)  
 vv. ciliares




v. ophthalmica inferior  
 venous plexus on the floor of the orbit  
 (fissura orbitalis inf., plexus pterygoideus)

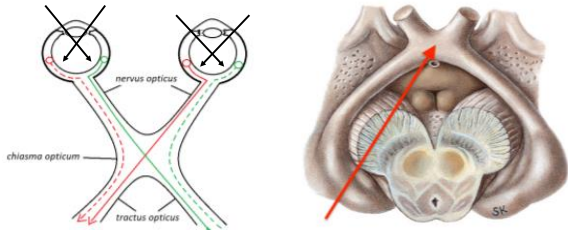
Anastomoses with v. facialis (v. faciei profunda, v. angularis),

**NERVUS OPTICUS**

Axons of multipolar neurons (stratum ganglionare n. optici)  
 leaves in **discus nervi optici** medial from polus post.  
 Travels through canalis nervi optici together with a. ophthalmica



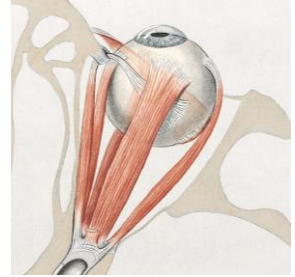
**CHIASMA OPTICUM**



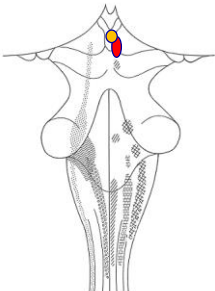
**nervus oculomotorius (III), trochlearis (IV), abducens (VI)**

- nervus oculomotorius (III)**
- nervus trochlearis (IV)**
- nervus abducens (VI)**

innervate:  
 m. levator palpebrae sup.  
 m. rectus bulbi sup., inf., med., lat.  
 m. obliquus bulbi sup., inf.



**NERVUS OCULOMOTORIUS (III)**



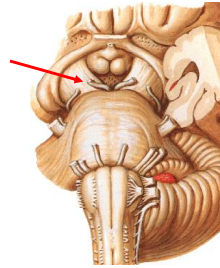
On the level of colliculi sup. mesencephala

**ncl. motorius n. oculomotorii**  
 (somatomotor)

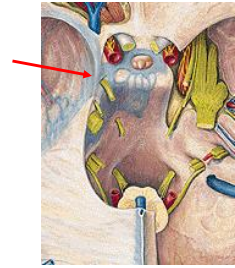
**ncl. parasympaticus (Edinger-Westphal) n. oculomotorii**  
 (visceromotor)

**sulcus n. oculomotorii**

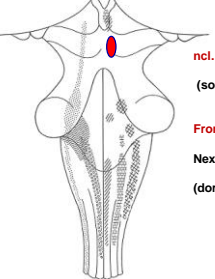
(next to fossa interpeduncularis)



**Sinus cavernosus**



**NERVUS TROCHLEARIS (IV)**

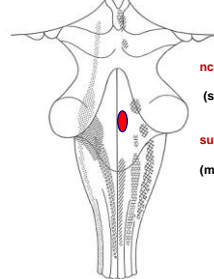


**ncl. motorius n. trochlearis**  
 (somatomotor)

From the brain stem:  
 Next to frenulum veli medullaris sup.  
 (dorsal side of the mesencephalon)

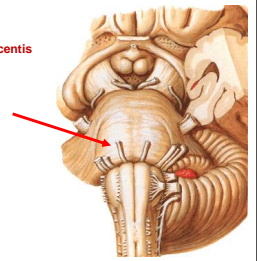


**NERVUS ABDUCENS (VI)**

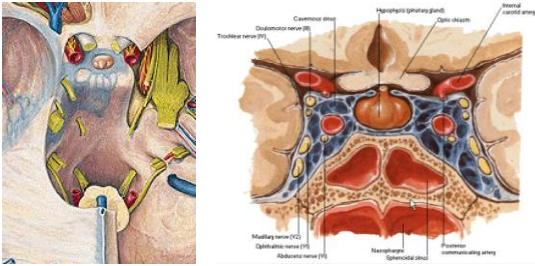


**ncl. motorius n. abducentis**  
 (somatomotor)

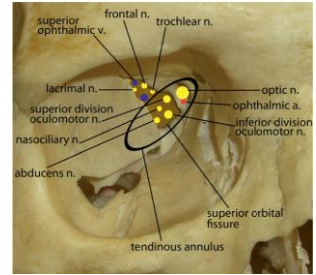
**sulcus bulbopontinus**  
 (medially)



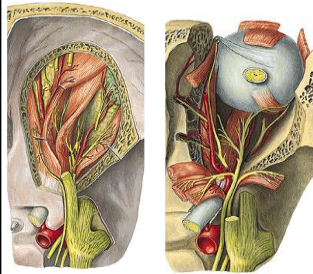
### SINUS CAVERNOSUS



### FISSURA ORBITALIS SUPERIOR



### NERVUS OCULOMOTORIUS



- Ramus superior**
- m. levator palpebrae sup.
  - m. rectus sup.
- Ramus inferior**
- m. rectus medialis
  - m. rectus inf.
  - m. obliquus inf.
- Radix oculomotoria**  
(parasympatic fibers) to gg. ciliare

### NERVUS TROCHLEARIS - m. obliquus bulbi sup.



### NERVUS ABDUCENS - m. rectus lat.



### References

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