Histologia ocular básica para oftalmologistas

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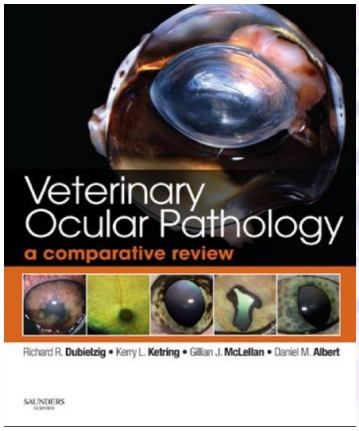
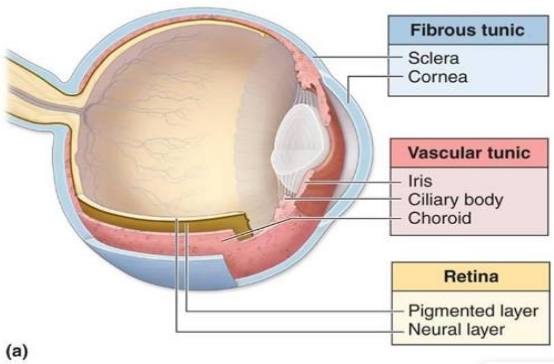
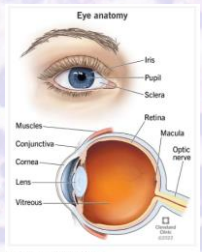




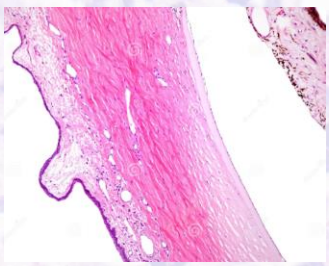
- Divisão por camadas
  - Túnica fibrosa (externa) ou camada córneo-escleral
  - Túnica vascular (média) ou úvea
  - Túnica interna ou retina

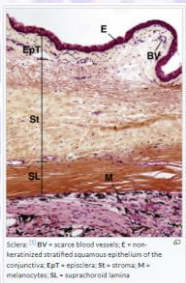
- Esclera ou "branco do olho"
  - Tecido conjuntivo denso
  - Epitélio estratificado não pavimentoso
  - *Limbus*



https://my.clevelandclinic.org/health/body/21823-eyes

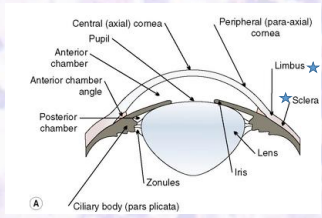
- Esclera ou "branco do olho"
  - Epitélio conjuntival: estratificado pavimentoso não queratinizado
  - Colágeno tipo I – não paralelos
  - Episclera, estroma e lâmina supracoroidal


https://www.dreamstime.com/eye-conjunctiva-sclera-light-micrograph-showing-left-to-right-mucosa-layer-composed-non-keratinized-stratified-imag620382497

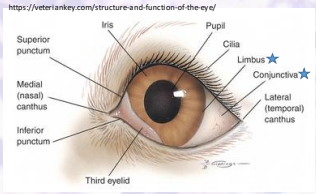


Sclera: BV = scarce blood vessels; E = non-keratinized stratified squamous epithelium of the conjunctiva; EpT = episclera; St = stroma; M = melanocytes; SL = suprachoroid lamina
https://eyewiki.aao.org/Basic_Histology_of_the_Eye_and_Accessory_Structures

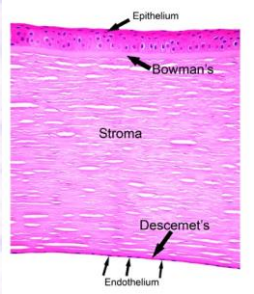
- *Limbus*



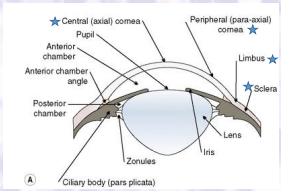
https://veteriankey.com/structure-and-function-of-the-eye/



- Córnea
  - Colágeno tipo 1 – paralelos



https://www.nature.com/articles/eye2012282/figures/1



https://veteriankey.com/structure-and-function-of-the-eye/

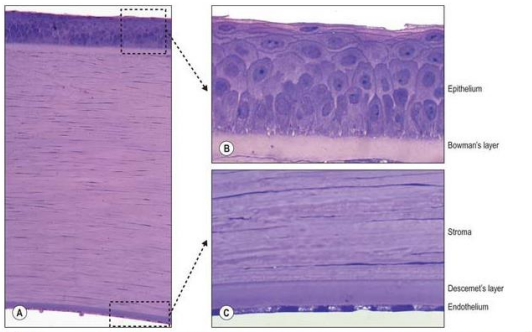


Fig. 40.5 A, Low power light micrograph of the five layers of the cornea. B, High power light micrograph of the corneal epithelium and Bowman's layer. C, High power light micrograph of the corneal endothelium, Descemet's layer and part of the stroma. The darkly staining cells in the stroma are keratocytes.

https://clinicalgate.com/the-eye-4/

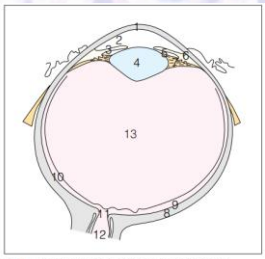
Figure 5-18 Dendritic ulcer caused by herpes in a cat. The ulcer is stained with fluorescein.

Figure 5-24 Corneal scarring in a cat undergoing treatment with trifluridine and oral lysine for herpesvirus infection.

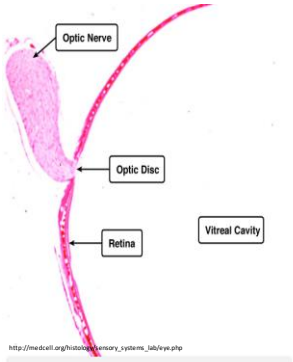
https://veteriankey.com/cornea/

- Câmara anterior
  - Íris, lente e córnea
- Câmara posterior
  - Íris, lente, corpo ciliar e fibrilas suspensoras (da zônula)
- Câmara vítrea

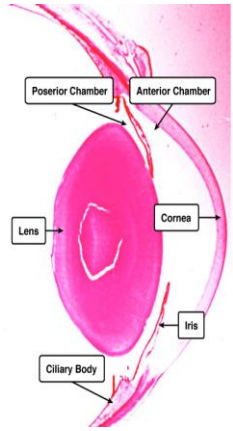
14.10



14.10 Diagram of the eye. (1) Cornea. (2) Anterior chamber. (3) Iris. (4) Lens. (5) Posterior chamber. (6) Ciliary body. (7) Ciliary processes. (8) Sclera. (9) Choroid. (10) Retina. (11) Optic papilla. (12) Optic nerve. (13) Vitreous humour.



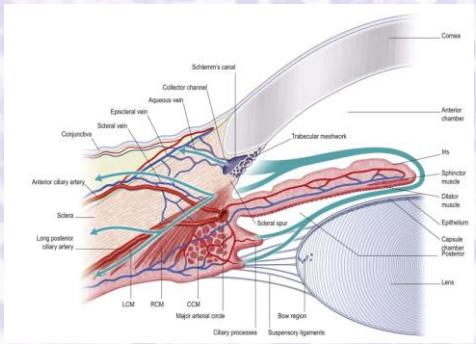
http://medcell.org/histology/sensory_systems_lab/eye.php



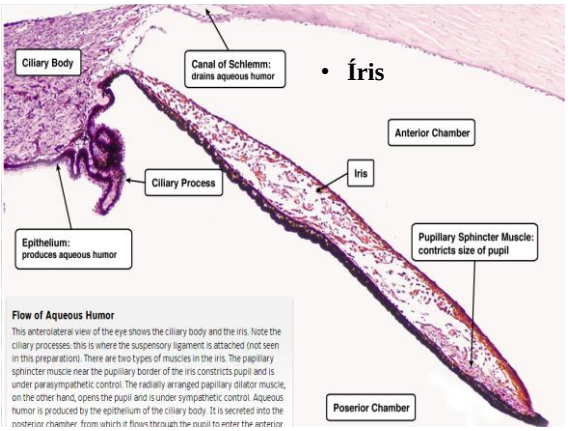
Eye

This is a low power cross section of the eye. At the posterior end, one can easily identify the optic nerve originating from the optic disc. Note the three main chambers of the eye: anterior chamber, posterior chamber, and vitreal cavity.

- Rota do humor aquoso



https://entokey.com/production-and-flow-of-aqueous-humor/



- Íris
  - Borda anterior
  - Estroma
  - Epitélio posterior

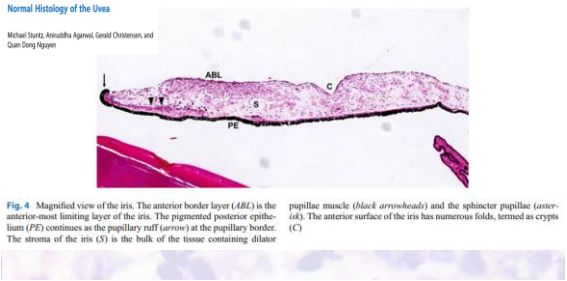
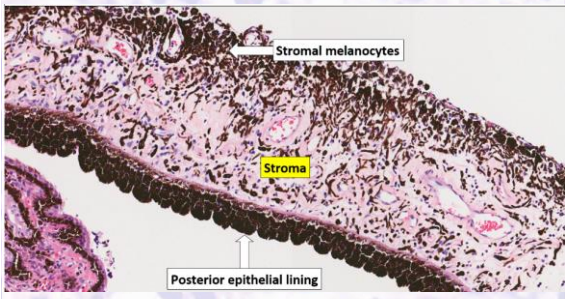
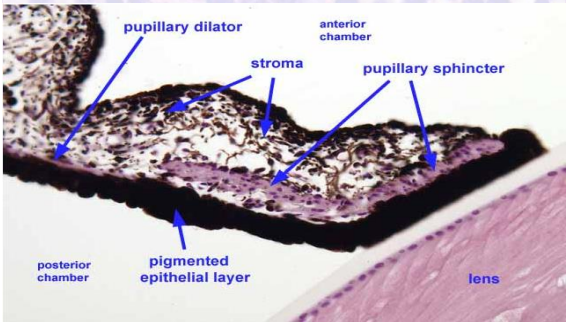


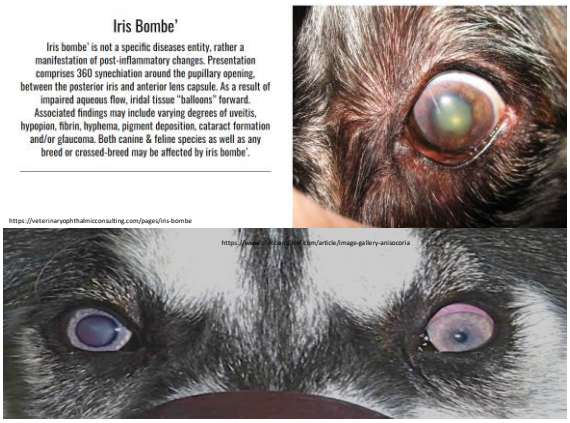
Fig. 4 Magnified view of the iris. The anterior border layer (*ABL*) is the anterior-most limiting layer of the iris. The pigmented posterior epithelium (*PE*) continues as the pupillary ruff (*arrow*) at the pupillary border. The stroma of the iris (*S*) is the bulk of the tissue containing dilator pupillae muscle (*black arrowheads*) and the sphincter pupillae (*asterisk*). The anterior surface of the iris has numerous folds, termed as crypts (*C*)

- Íris
  - Borda anterior
  - Estroma
  - Epitélio posterior (2 camadas)

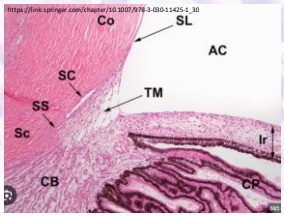


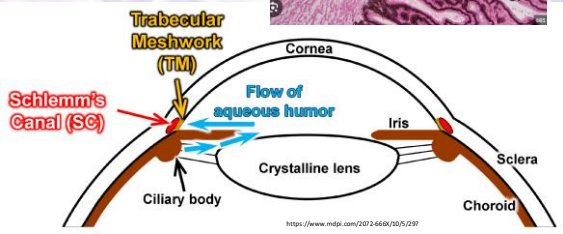
- Íris
  - Músculo esfíncter pupilar
  - Músculo dilatador pupilar



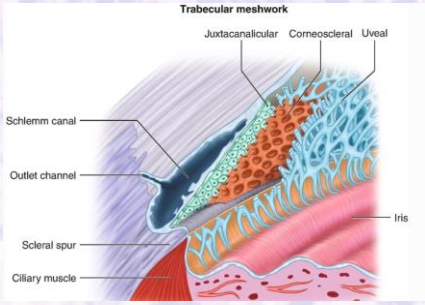


- Íris
  - Ângulo irido-corneal
  - Malha trabecular





- Malha trabecular
  - Malha uveal (interna)
  - Malha corneoescleral
  - Malha justacanalicular



- Canal de Schlemm

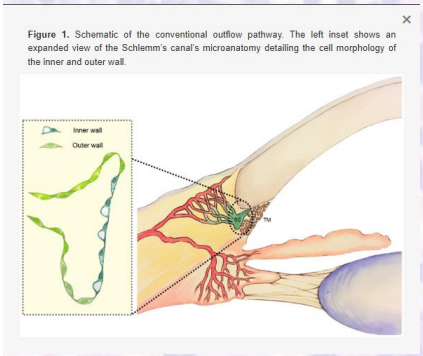
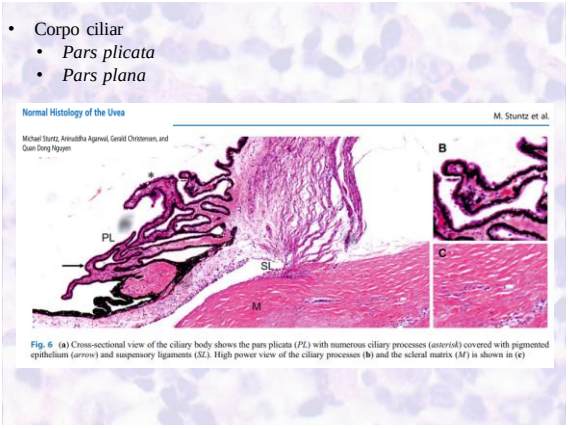
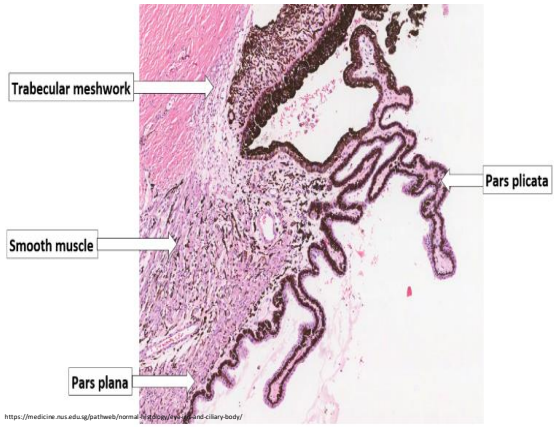


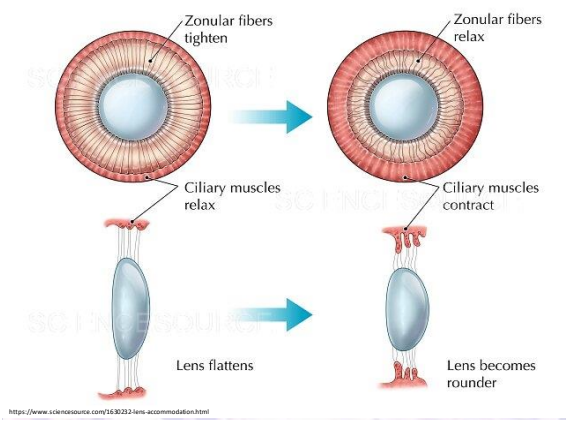
FIGURE 4. Chronic glaucoma. The left eye of a 10-year-old male castrated cocker spaniel with chronic glaucoma. Note the buphthalmos, corneal neovascularization, and central corneal scarring secondary to exposure keratitis.

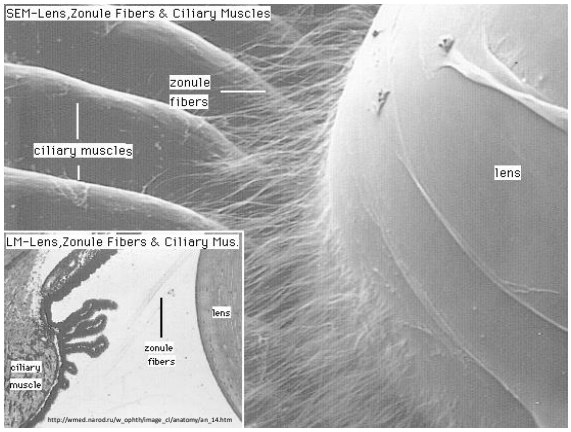
- Corpo ciliar
  - *Pars plicata*
  - *Pars plana*

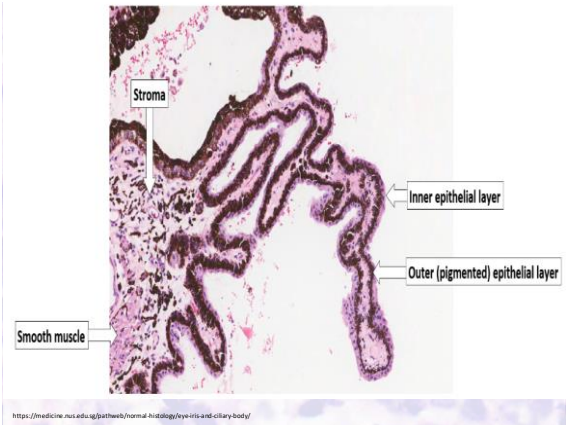
- Corpo ciliar
  - *Pars plicata*
  - *Pars plana*

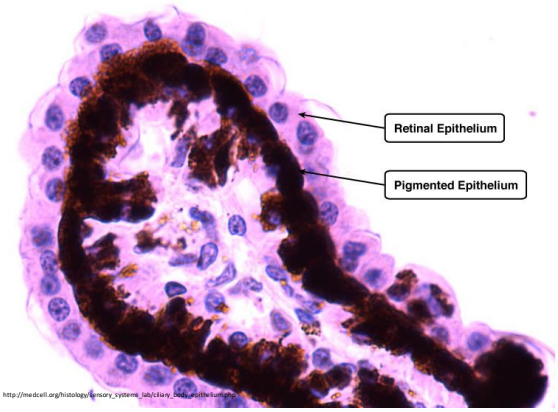




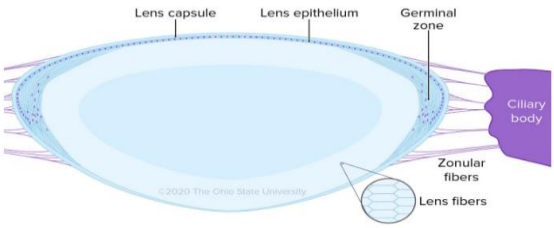


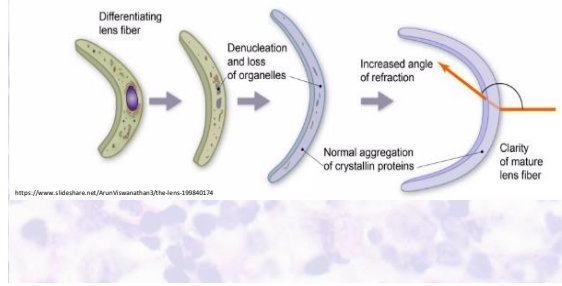






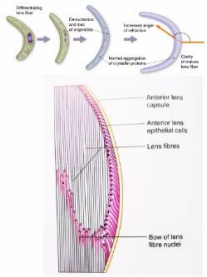
- Lente
  - Avascular
  - Biconvexa
  - Cápsula: é uma MB composta por colágeno tipo IV
  - Epitélio sub-capsular: epitélio cúbico simples (anterior e lateral)
  - Fibras da lente: células epiteliais anucleadas ricas em cristalina





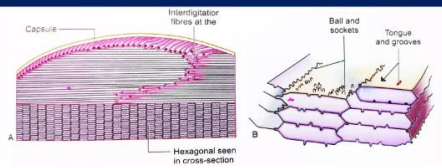
Structure of lens: Lens substance or lens fibers

- These cells divide, elongate and differentiate to produce long, thin, regularly arranged lens fibres that constitute the bulk of the lens
- Successively, the new lens fibres are laid on the older deeper fibres
- The superficial (new) fibres are nucleated with elongation of the cell; the nuclei assume a relatively more anterior position
- As the new fibres are laid down, the anterior shifted nucleus forms a line convex forward at the equator, known as lens or **nuclear bow**



https://www.slideshare.net/ArunViswanathan3/the-lens-199840174

Structure of lens: Lens substance or lens fibers



Structure of lens fibres

- On cross-section, the lens fibres are almost hexagonal in shape and are bound together by the ground substance
- The cytoplasm of the cells of the superficial bow region and the newly formed lens fibres contain a nucleus, mitochondria, Golgi apparatus, rough endoplasmic reticulum, and polysomes

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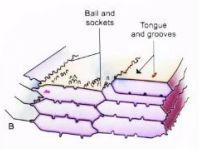
Structure of lens: Lens substance or lens fibers



- The ribosomal content of the newly formed lens fibres is more than the epithelial cells indicating an elevated protein synthesis
- The nuclei of the lens fibres are present temporarily and disappear later on
- Thus the cytoplasm of the older lens fibres is devoid of nuclei, is homogenous and granular with very few organelles
- There are interlocking processes between cells (ball-and-socket and tongue-and groove interdigitations) with zonulae occludentes present
- Both desmosomes and tight junctions are absent from the mature lens fibres, although desmosomes are found between elongating fibres

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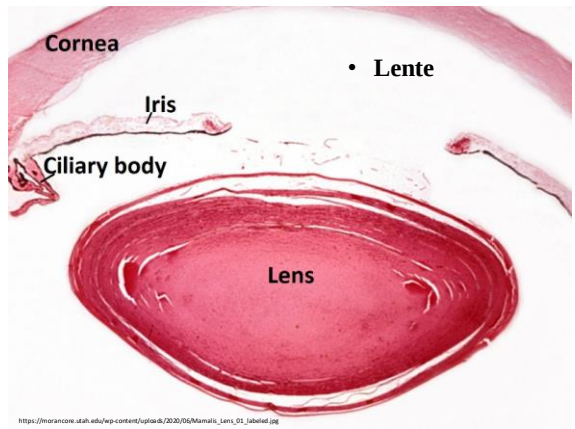
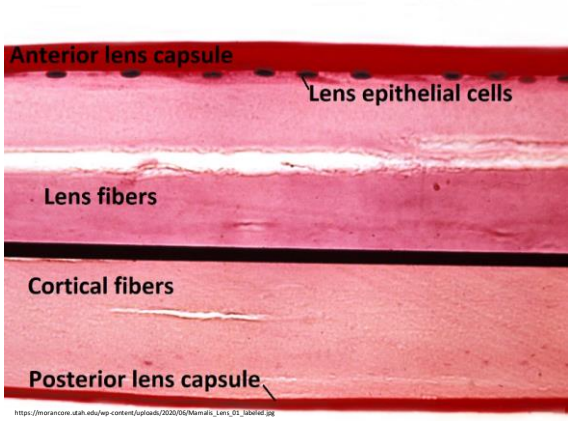
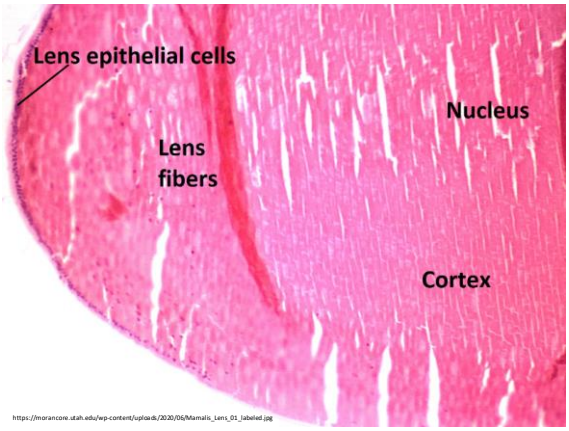
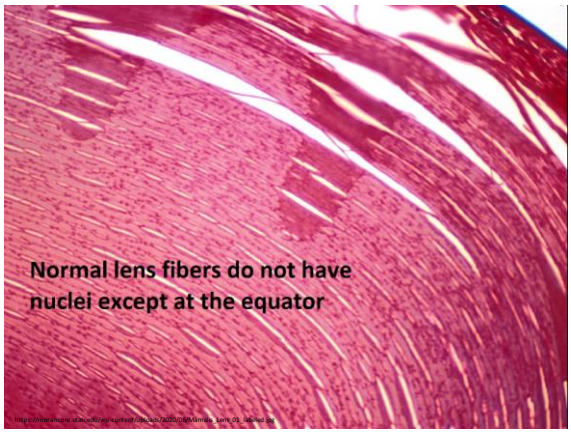
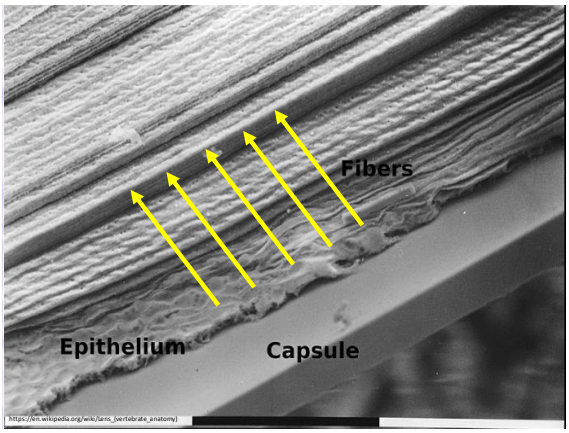


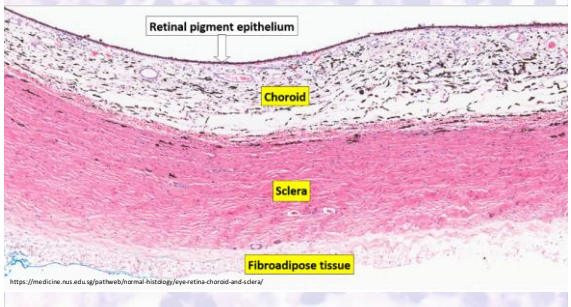


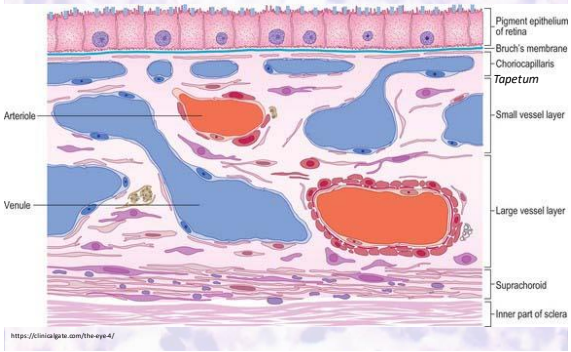






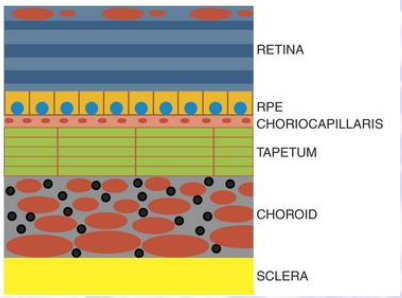
- Coróide
  - *Ora serrata* até nervo óptico
  - Tecido conjuntivo rico em vasos



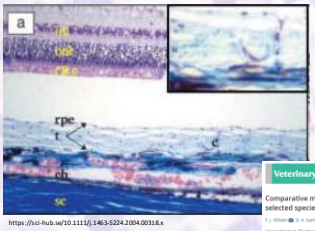


- Membrana de Bruch
  - Sinônimo lâmina vítrea
  - Derivada do coriocapilar e epitélio pigmentado da retina
  - Fibras elásticas
  - Função: participa da passagem de fluidos e solutos dos capilares coroides para a retina

- *Tapetum lucidum*
  - Cores variadas
  - Reflexão da luz



- *Tapetum lucidum*
  - Células tapetais: origem incerta (melanócitos?células do tecido conjuntivo?)
    - Ricas em moléculas refletivas em diferentes comprimentos de onda): guanina, colesterol, riboflavina, lipídeos)



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CASE REPORT

Tapetal dysplasia in a Swedish Vallhund dog

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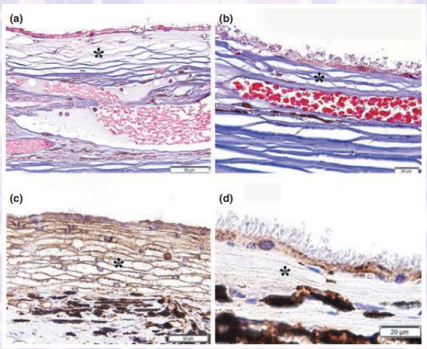
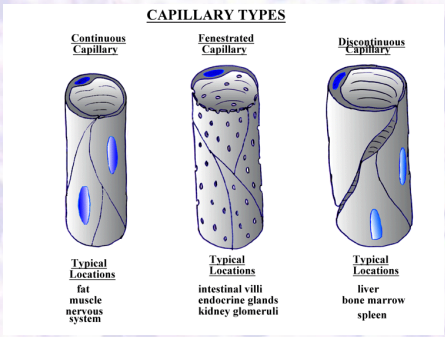


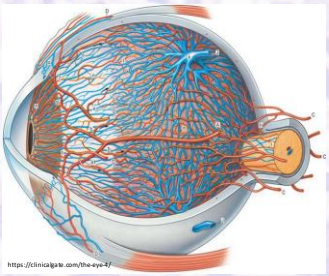
Figure 5. Special staining of choroid and retinal pigment epithelium (RPE). (a) A normal tapetum from a control dog shows minimal positive staining for collagen (asterisk). Masson's trichrome, bar = 50 µm. (b) The affected tapetum shows strong positive staining for collagen (asterisk). Masson's trichrome, bar = 20 µm. (c) Immunohistochemical labeling of a normal tapetum from a control dog is positive for Melan-A (asterisk). Bar = 50 µm. (d) Due to the paucity of tapetal cells in the affected tapetum, it does not express Melan-A by immunohistochemistry (asterisk). Bar = 20 µm.

- Coriocapilar
  - Camada rica em capilares fenestrados

https://www1.udel.edu/biology/Wags/histopage/vascularmodelingpage/circsystempage/capillaries/capillaries.html



- Camadas vasculares
  - Divididas por calibre dos vasos
    - Camada de Haller (grandes vasos)
    - Camada de Slatter (pequenos vasos)

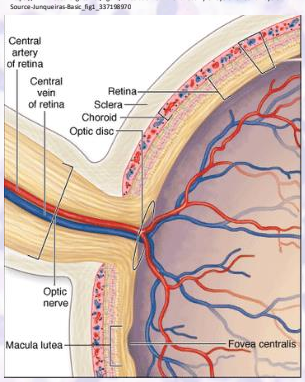


https://clinicalgate.com/the-eye-4/

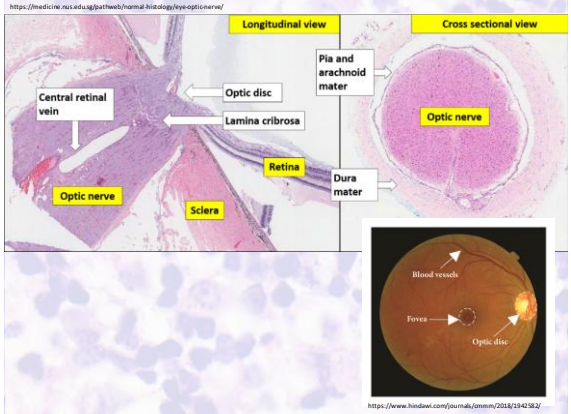
- Lâmina supracoróide (*lamina fusca*)
  - Colágeno, melanócitos
  - Avascular

- Retina

https://www.researchgate.net/figure/Illustration-of-inner-anatomy-of-eye-and-retinal-layers-Source-Junqueiras-Basic_fig1_337198070

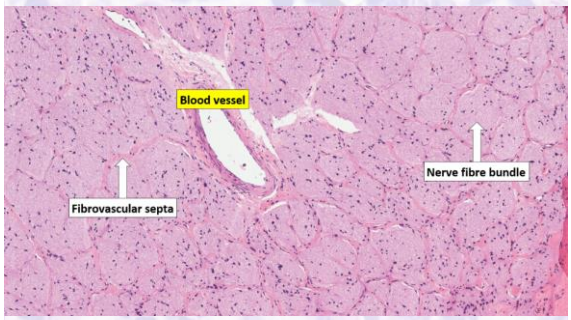


https://medicine.nus.edu.sg/pathweb/normal-histology/eye-optic-nerve/

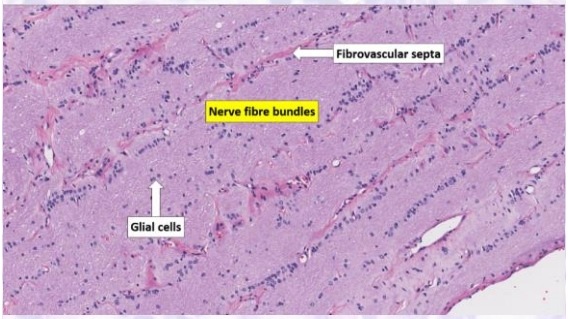


https://www.hindawi.com/journals/ommm/2018/1942582/

https://medicine.nus.edu.sg/pathweb/normal-histology/eye-optic-nerve/



https://medicine.nus.edu.sg/pathweb/normal-histology/eye-optic-nerve/



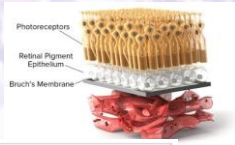
https://histology.oit.duke.edu/NormalBody/EyeEar/EyeEar.html

The retina actually consists of two components: an outermost layer of **retinal pigment epithelium** (RPE), which is composed of single layer of cuboidal melanin-containing cells and the **neural retina** which is a multilayered structure containing photoreceptors as well as neurons and glia. In life, these two components are fused into what we typically call the retina, and it is subdivided into 10 recognizable layers.

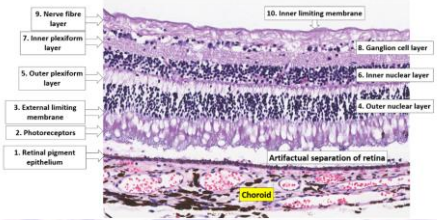
As mentioned above, the outermost layer (closest to the choriocapillaris) is the retinal pigment epithelium which is a single layer of pigmented cells that absorb light, thus preventing stray light from inappropriately reflecting back onto the rods and cones which have their outer segments in close contact with the apices of the pigmented epithelial cells. Tight junctions between the RPE cells also establish a blood-retina barrier to regulate the exchange of materials from the blood to the retina. The next layer is the layer of rod and cone outer segments, which, for the rod cells, are cylindrical whereas for the cone cells these outer segments are conical. Recall that rods are more sensitive to light and thus are the receptors primarily used in periods of low light intensity, but the resulting image is monochromatic. Cones, on the other hand, are sensitive to specific wavelengths of light allowing you to discern colors and more detailed visual information, but they require more intense lighting.

After the rod and cone outer segments is the outer limiting membrane, which is a dense line formed by the junctional complexes between the rod and cone cells and the supportive Muller glia. It separates the outer segments which are rich in photosensitive pigments from the rest of the retina which functions primarily to integrate and process the signals initiated by the rod and cone cells. Next is the outer nuclear layer consisting of the somata and nuclei of rod and cone cells. In general, the rod cell nuclei are typically small and spherical and located at all levels of the layer whereas the cone cell nuclei are larger and more ovoid and usually located just to the inside of the outer limiting membrane. From this layer, the rod and cone cells project their processes into the outer plexiform layer where they synapse with neuronal elements from the inner nuclear layer which is a highly complex layer containing the cell bodies of bipolar cells, horizontal cells, amacrine cells, and Muller glia cells (these cannot be told apart in routine H&E sections, but you should be aware that they are in this layer). The Muller glia, of course, are the primary support cell of the neural retina whereas the other cells of this layer are neurons that perform the initial processing of visual information and then relay that on to the retinal ganglion cells. The relaying of this information takes place in the inner plexiform layer which contains the axons of bipolar and amacrine cells and the dendritic trees of the retinal ganglion cells, the somata and nuclei of which reside in the retinal ganglion cell layer. The cells of this layer are indeed sensory neurons of variable size (correlated with slightly different functional characteristics) that receive input from the amacrine and bipolar cells and send that along to other components of the visual system via axons that travel in the nerve fiber layer containing **non-myelinated axons** and supportive **astroglia**. These axons coalesce at the optic disc and then exit the eye via the optic nerve. The final element of the neural retina is a thin internal limiting membrane consisting of the expanded terminal portions of Muller glia and a basement membrane that delimits the neural retina from the vitreal cavity.

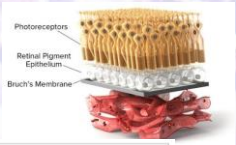
- Epitélio retiniano pigmentado
  - Absorção da luz
  - Barreira (junções aderentes)
    - Imunoprivilégio
    - Transporte de íons e moléculas
    - Barreira hemato-retiniana



Retina (High power):
The retina is organised in 10 well-defined layers (numbered from outermost to innermost). The cellular components include photoreceptors (rods and cones), neurons, and glial cells.
The ganglion cell layer is more than 1 cell thick in the macula (area of highest visual acuity), and is thinner in the rest of the retina.



- Fotorreceptores
  - Cones e bastonetes



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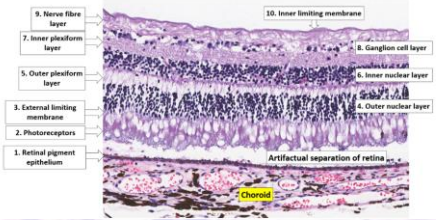

- Fotorreceptores
  - Membrana limitante externa

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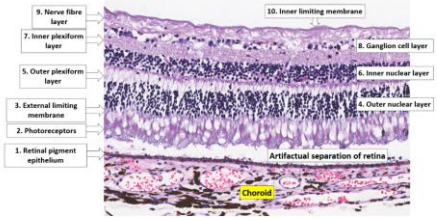

- Fotorreceptores
  - Camada nuclear externa

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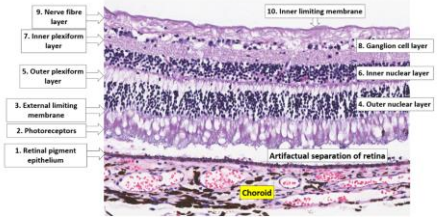
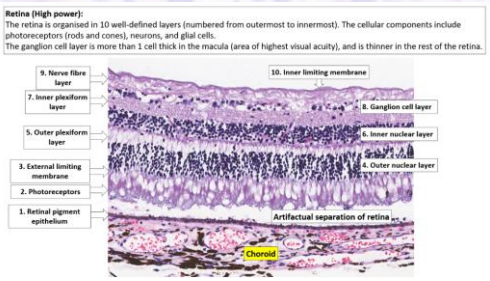
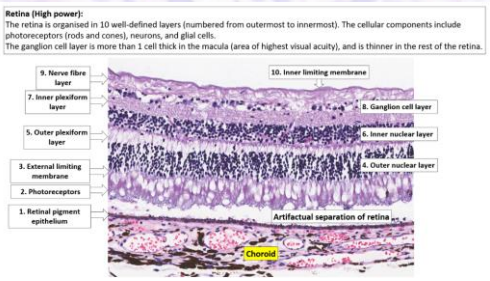


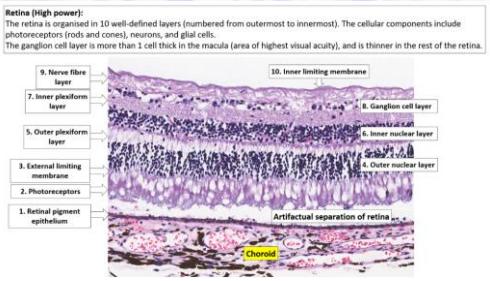
- Fotorreceptores
  - Camada plexiforme externa



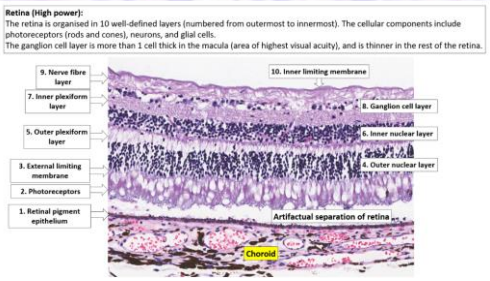
- Fotorreceptores
  - Camada nuclear interna



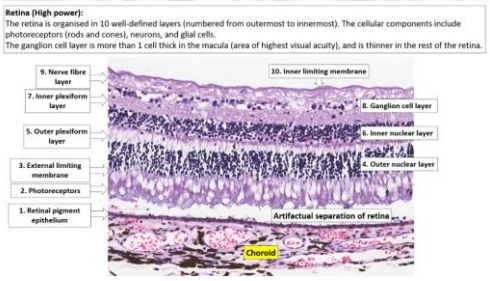
- Fotorreceptores
  - Camada plexiforme interna



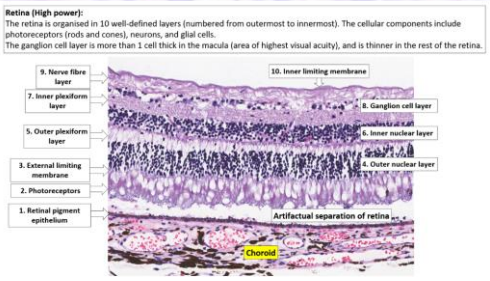
- Fotorreceptores
  - Camada de células ganglionares

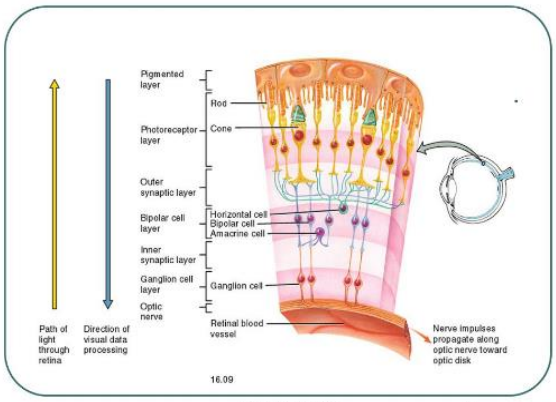


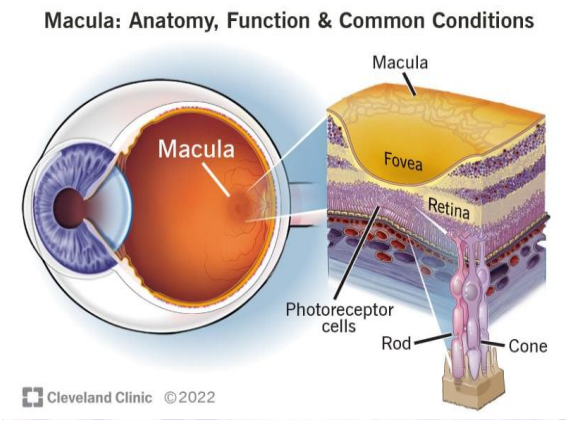
- Fotorreceptores
  - Camada de fibras nervosas



- Fotorreceptores
  - Membrana limitante interna







https://entokey.com/anatomy-of-the-eyelid/

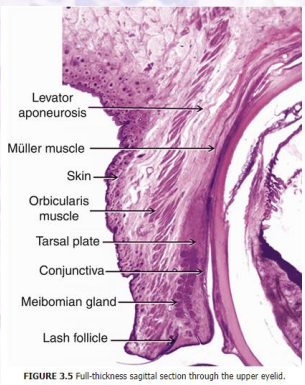
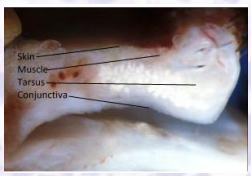


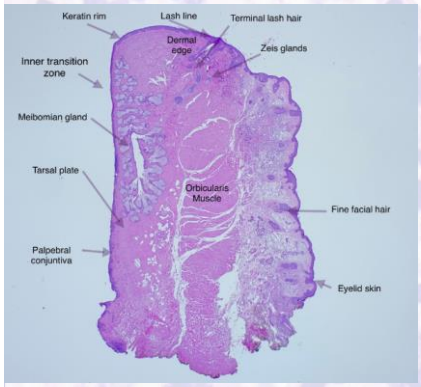
FIGURE 3.5 Full-thickness sagittal section through the upper eyelid.

- Pálpebras



https://morancore.utah.edu/section-04-ophthalmic-pathology/eyelid/

https://twitter.com/ArjunRamaiya1/status/1480948121823813636/photo/1



- Pálpebras

- Glândulas
  - *Zeiss*

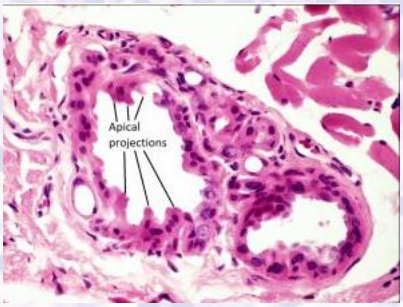
https://morancore.utah.edu/section-04-ophthalmic-pathology/eyelid/

- Glândulas
  - *Meibomius*: camada oleosa do filme lacrimal

https://morancore.utah.edu/section-04-ophthalmic-pathology/eyelid/

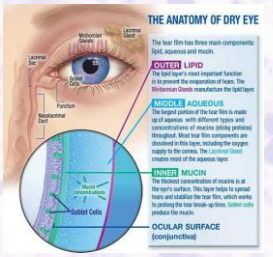
- Glândulas
  - *Moll:* abre no folículo piloso

https://morancore.utah.edu/section-04-ophthalmic-pathology/eyelid/

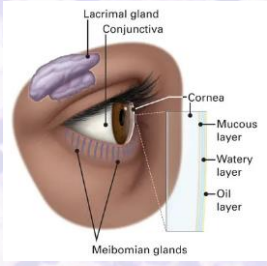


- Outras glândulas acessórias conjuntivais
  - *Krause* (fórnix)
  - *Wolfring* (parte superior da placa tarsal)

- Filme lacrimal
  - Glândula lacrimal principal e acessórias (*Moll, Krause* e *Wolfring*)
  - 3 camadas

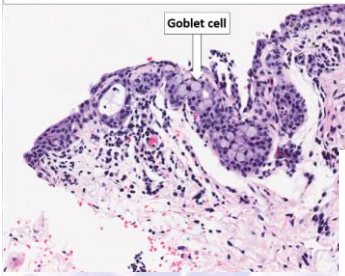


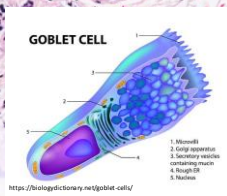
https://primaryeyecare.net/wp-content/uploads/2013/08/anotamy-o-dryeye.jpg



https://www.aao.org/eye-health/anatomy/lacrimal-gland

Conjunctiva (High power):
Goblet cells are commonly seen in the inferior and nasal aspects of the bulbar conjunctiva (conjunctiva covering the globe), as well as the forniceal conjunctiva. These cells contain abundant intracytoplasmic mucin, and function to secrete mucoid material that becomes incorporated into the tear film.

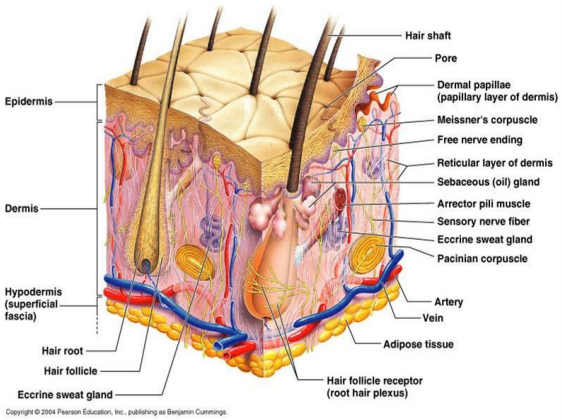




https://biologydictionary.net/goblet-cells/

https://biologydictionary.net/goblet-cells/

PAS



Prática

https://histology.oit.duke.edu/NormalBody/EyeEar/EyeEar.html