

VIRTUAL HISTOLOGY LABORATORY

EYE AND EAR

I. EYE

Using Figure #1 in your handout, attempt to identify some of the gross structures. Find the anterior curved **cornea**. Between the cornea and **iris** is the **anterior chamber**. The small space between the iris and the **lens** is the **posterior chamber**. The **ciliary processes** appear as a small, serrated structure at the posterior side of the iris where it attaches laterally. The largest cavity of the eye is the **vitreous chamber** that, in life, is occupied by the transparent, gelatinous vitreous humor. The dense outer tunic of the eye is the **sclera**, which is continuous anteriorly with the cornea. Posteriorly, the sclera is continuous with the dura mater. A piece of **optic nerve** may be seen on some slides. Posteriorly, nerve fibers from the retina collect as the **optic nerve**.

Now examine the eye microscopically. Focus your attention on the **cornea**. The most anterior of the five corneal layers is the **epithelium**. It is classified as a **non-keratinized stratified squamous epithelium** about 5 cells thick. Just deep to the epithelium is a thick (7-12 μm) homogenous layer, **Bowman's membrane**. The next layer is the **corneal stroma** that is formed by several lamellae of parallel collagenous fibers that cross at an angle to each other. The major cell types present are **fibroblasts**, although occasional lymphocytes may be seen. The next layer is **Descemet's membrane** that represents the basal lamina of the innermost layer of the **corneal endothelium**. The endothelium (misnamed?) is usually a **simple, cuboidal epithelium**. Note the lack of vascular elements in the cornea.



Move the slide until you reach the lateral portion of the cornea where it is continuous with the sclera. Locate the **limbus** and **iris angle**. The iris side of the limbus contains a trabecular meshwork containing small **spaces of Fontana**. Aqueous humor drains through these spaces to enter the larger **canal of Schlemm**. The canals drain via ophthalmic veins.

Examine the **iris**. The **anterior border** faces the anterior chamber and is lined by a discontinuous layer of pigmented cells and fibroblasts. The stroma comprises the bulk of the iris and contains loose connective tissue, blood vessels, pigment cells, smooth muscle, and autonomic nerves. Find the **sphincter pupillae**. The **dilator pupillae** muscles are not seen in this slide. The **posterior border** of the iris is lined by pigmented cells that are continuous with those of the retina.

Move the slide laterally and find the **ciliary body** to which the iris is attached. Internally, it is composed primarily of smooth muscle. **Ciliary processes** project from the ciliary body into the posterior chamber. Between the smooth muscle of the ciliary body and the internal lining of the ciliary processes is the vascular portion of the ciliary body, which is composed of connective tissue, a few melanocytes, and blood capillaries. The epithelial lining of the ciliary processes is involved in the elaboration of aqueous humor and has two layers:

- a) the most internal (nearest the posterior chamber) is a lamina of unpigmented simple cuboidal cells.
- b) deep to these cells is a layer of pigmented cuboidal cells continuous with the pigmented layer of the retina.

Now examine the **lens**. Because of its dense properties, it is extremely difficult to section this structure for histological investigation. Therefore, the lens may be somewhat artefactually disrupted. The entire surface is bounded by a **hyaline capsule**. A single layer of cuboidal cells, the **lens epithelium**, is located deep to the capsule on the anterior surface only. The bulk of the lens is comprised of **lens fibers**, which are highly differentiated cells. They contained some of the most densely packed protein in the body. The lens is held in place by **zonule fibers** which project from the lens capsule and insert into the ciliary processes.

The general morphology of the eye can be divided into 3 major tunics: **tunica fibrosa**, **tunica vasculosa** (uvea) and **tunica nervosa**.

The **tunica fibrosa** includes the cornea and the sclera. The sclera consists mainly of a thick layer of densely interwoven collagenous fibers.

The **tunica vasculosa** is composed of the iris, ciliary body and processes, and the posterior extension of the ciliary body, the **choroid**.

The **tunica nervosa** or **retina** has two major components: the **pigmented layer** and the **neuronal or sensory portion** (**optical portion**). Identify the layers of the retina using your atlas as a guide:

- 1) **Pigmented epithelium**
- 2) **Layer of rod and cones**
- 3) **External limiting membrane**
- 4) **Outer nuclear layer (nuclei) of rod and cones)**
- 5) **Outer plexiform layer**
- 6) **Inner nuclear layer**
- 7) **Inner plexiform layer**
- 8) **Layer of ganglion cells**
- 9) **Nerve fiber layer (axons of ganglion cells)**
- 10) **Internal limiting membrane (foot-processes of Muller cells)**