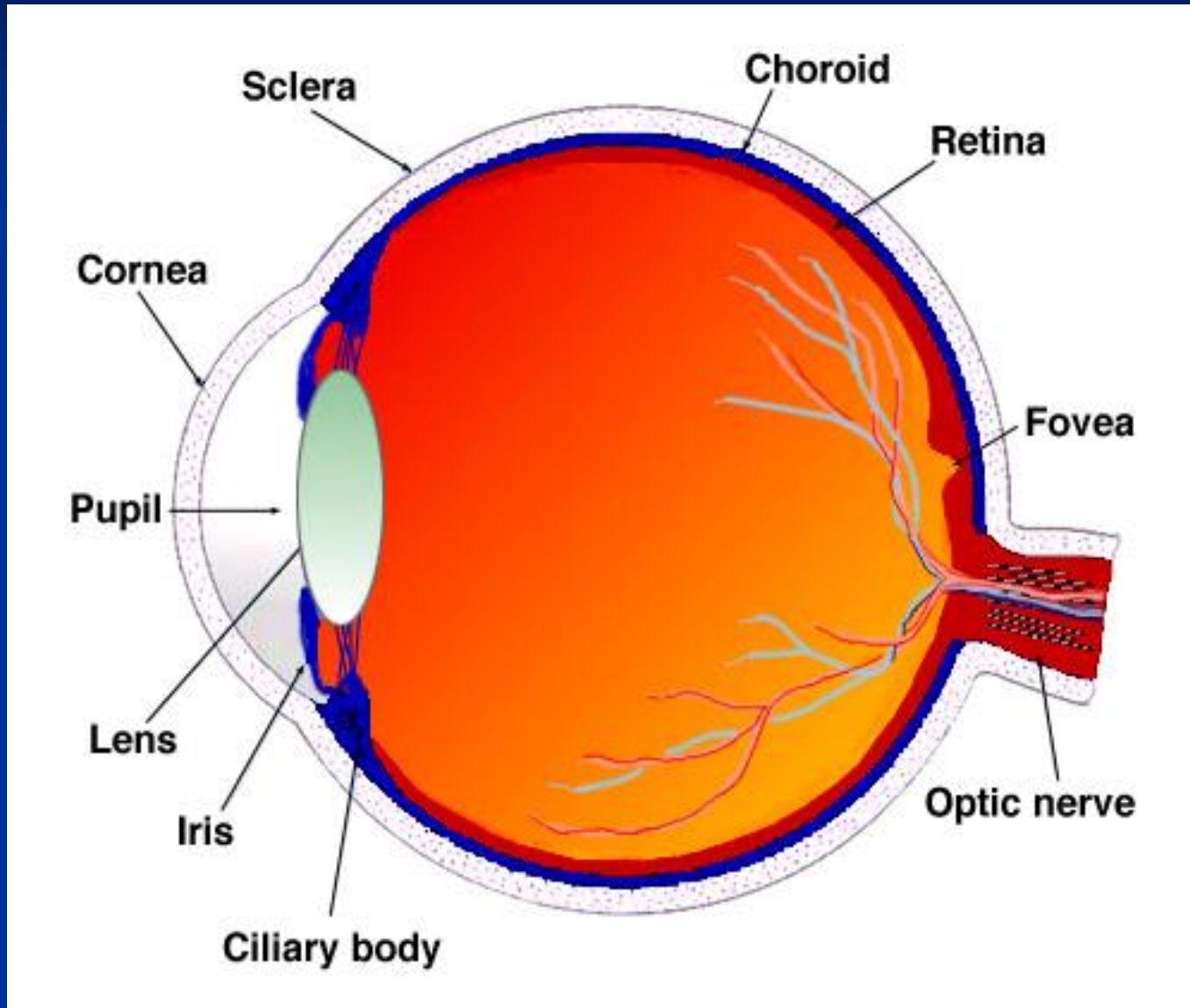


Diseases of the Cornea

CORNEA

- The Anterior part of the globe in front of the colored part of the eye i.e iris, is called the **cornea**.
- Unlike the sclera, which is white, the cornea is transparent, or completely clear, which lets light travel through it.
- The cornea along with crystalline lens helps the eye to focus the light on the retina so that the image can be formed.
- It is a very important part of the eye, but you can hardly see it because it's made of clear tissue.
- Like clear glass, the cornea gives your eye a clear window to view the world through

The human eye



Cornea

- Transparent, avascular tissue
- Forms approximately the anterior 1/6 of the outer coat of the eye and is continuous posteriorly with the sclera
- Curvature is greater than rest of the globe
 - Measures 11-12 mm horizontally and 10-11 mm vertically

Corneal shape

- **Convex forward**, seen from the front it is **Ellipsoidal / elliptical in shape** with horizontal dia slightly more than vertical dia
- **Central zone** of 1-3 mm closely fits a spherical surface
- **Paracentral zone**, 3-4 mm ring, with an outer diameter of 7-8 mm, area of progressive flattening (*prolate*)
- **Peripheral zone**, outer diameter of 11 mm, greatest flattening and asphericity
- **Limbus**, outer diameter that averages 12 mm, the cornea steepens before joining the sclera

Corneal shape

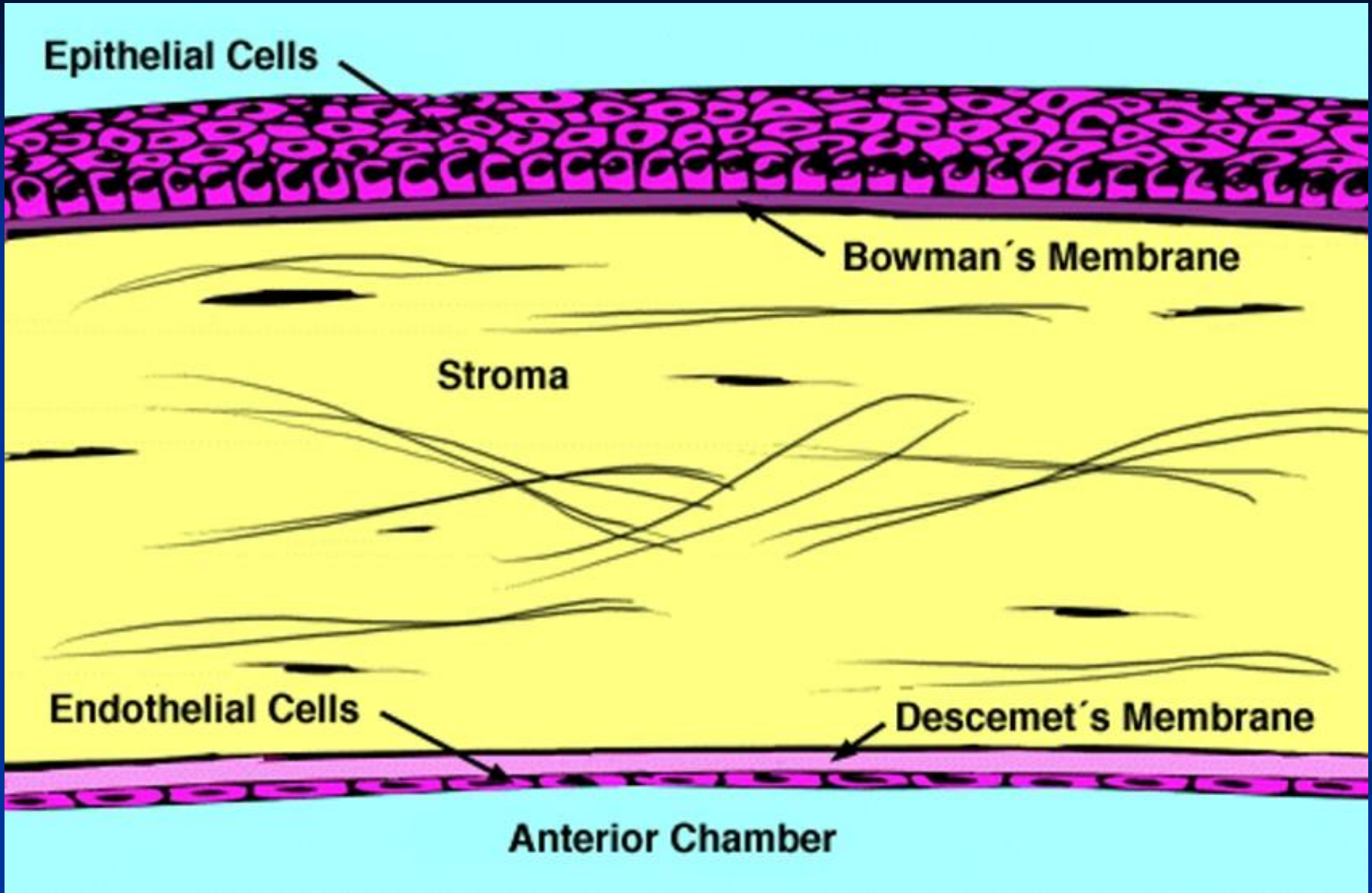
- The **corneal apex** is the point of maximum curvature or height, typically temporal to the center of the pupil
- The **corneal vertex** is the point located at the intersection of the patient's line of sight (visual axis) and the corneal surface. It is represented by the corneal light reflex when the cornea is illuminated coaxially with fixation

Cornea

- The corneal shape is maintained by its elastic properties in conjunction with intraocular pressure (10-21 mm Hg), generated by the continuous production and outflow of aqueous humor in the eye
- The average depth of the anterior chamber is 3.5 mm for an adult eye ($s = 0.35$ mm), and volume of around 260 microlitres

Cornea - anatomy

- Has 5 layers comprising
 - Epithelium
 - Bowman's membrane
 - Stroma
 - Descemet's membrane
 - Endothelium



Corneal Epithelium

- The epithelium is the cornea's outermost region, comprising about 10 percent of the tissue's thickness.
 - Stratified squamous epithelial cells, basement membrane
- The epithelium functions primarily to
- (1) Block the passage of foreign material, such as dust, water, and bacteria, into the eye and other layers of the cornea; and
- (2) Provide a smooth surface that absorbs oxygen and cell nutrients from tears, then distributes these nutrients to the rest of the cornea.
- The epithelium is filled with thousands of tiny nerve endings that make the cornea extremely sensitive to pain when rubbed or scratched.

Bowman's Layer

- Lying directly below the basement membrane of the epithelium is a transparent sheet of tissue known as Bowman's layer. It is composed of strong layered protein fibers called collagen. Once injured, Bowman's layer can form a scar as it heals. If these scars are large and centrally located, some vision loss can occur.

Corneal stroma

- Beneath Bowman's layer is the stroma, which comprises about 90 percent of the cornea's thickness.
- It consists primarily of water (78 percent) and collagen (16 percent), and does not contain any blood vessels.
- Collagen gives the cornea its strength, elasticity, and form.
- The collagen's unique shape, arrangement, and spacing are essential in producing the cornea's light-conducting transparency.

Descemet's Membrane

- Under the stroma is Descemet's membrane, a thin but strong sheet of tissue that serves as a protective barrier against infection and injuries.
- Descemet's membrane is composed of collagen fibers (different from those of the stroma) and is made by the endothelial cells that lie below it.
- Descemet's membrane is regenerated readily after injury.

Endothelium

- The endothelium is the extremely thin, innermost layer of the cornea.
- Endothelial cells are essential in keeping the cornea clear. Normally, fluid leaks slowly from inside the eye into the middle corneal layer (stroma). The endothelium's primary task is to pump this excess fluid out of the stroma.
- Without this pumping action, the stroma would swell with water, become hazy, and ultimately opaque. In a healthy eye, a perfect balance is maintained between the fluid moving into the cornea and fluid being pumped out of the cornea.
- Once endothelium cells are destroyed by disease or trauma, they are lost forever.
- If too many endothelial cells are destroyed, corneal edema and blindness ensue, with corneal transplantation the only available therapy.

Cornea - physiology

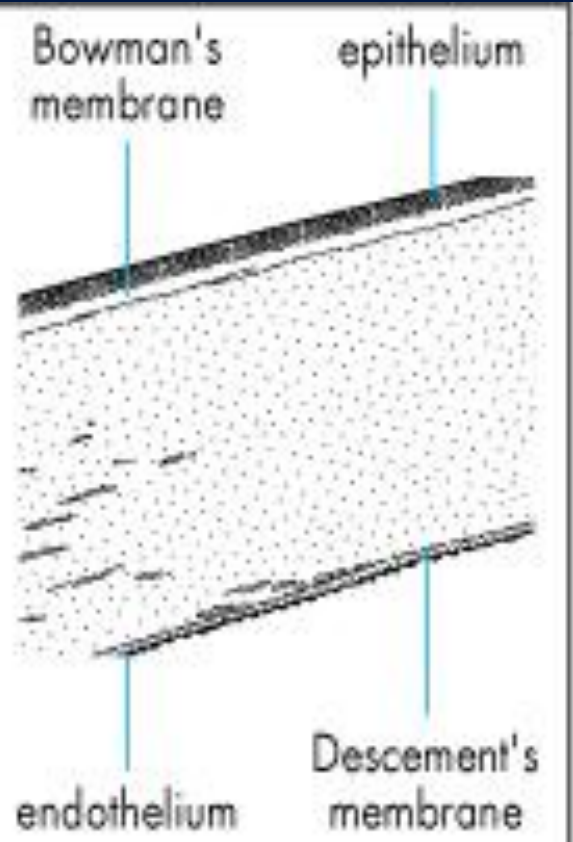
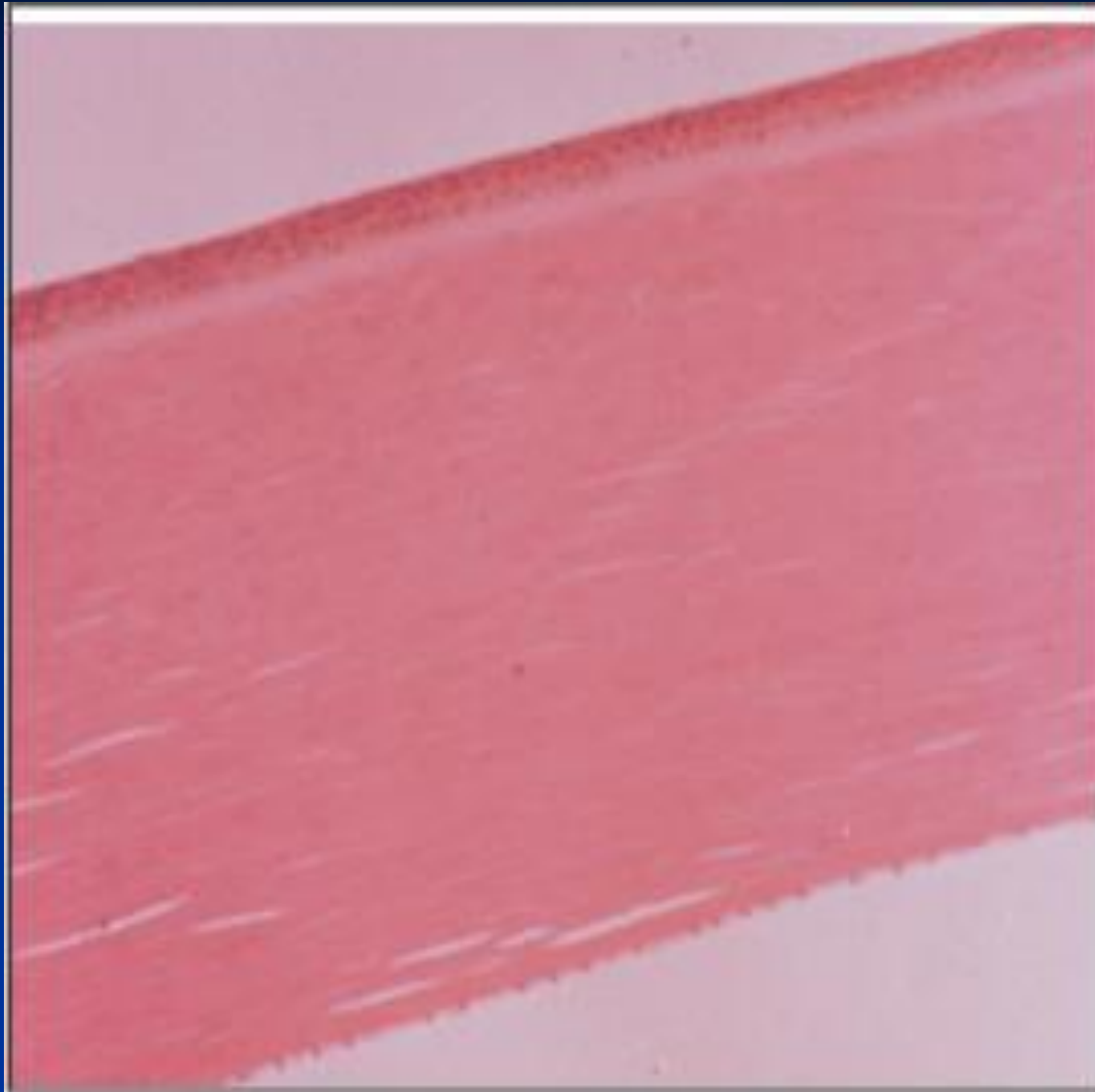
■ Transparency

- Relative dehydration of the stroma is maintained by the impermeable epithelial barrier and active pumping mechanisms of the corneal endothelium
- The regular spacing of individual stromal collagen fibrils
- Avasculature nature of cornea

■ Refraction

- The cornea is the major refractive component of the eye
- Ant.Surface Approx + 49 D
- Post.Surface Approx - 6.0 D
- Overall power approx + 43 D

■ Barrier to infection and trauma



Endothelium cells : specular Microscopy



Structure of the cornea

- **Corneal thickness:**
 - Central: 0.5 to 0.6 mm
 - Paracentral: 0.6 – 0.7
 - Peripheral: 1-1.2mm



Thanks