

Objectives

To understand the physiology of vision and related terminology.

- Visual Acuity
- Refraction
- Accommodation
- Convergence
- Pupillary response
- Adaptation

Visual Acuity

The ability to discern detail.

20/40 means.... A person sees at 20 feet what others see at 40 feet.

Refraction

The bending of light through different media, when it meets a different surface at an oblique angle.

4 refracting media (fluids) encountered

- Cornea
- Aqueous humor (anterior segment)
- Lens*
- Vitreous humor (posterior segment)

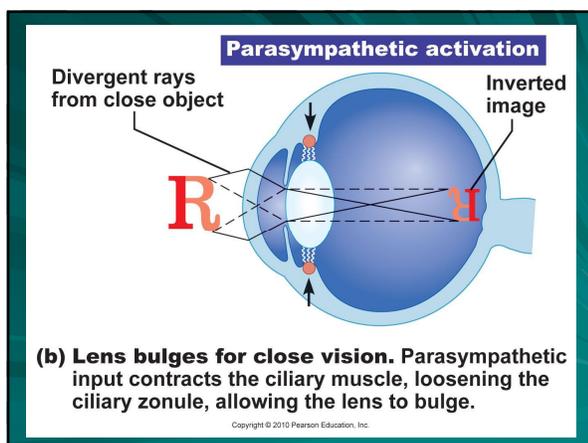
* The thicker (more convex) the lens the more the light is bent and the shorter the focal distance.

Refraction and Lenses

Light passing through a **convex** lens (as in the eye) is bent so that the rays converge at a focal point

Change in lens curvature allows for fine focusing of an image.

The image formed at the focal point is **upside-down and reversed** right to left



Focusing for Close Vision

Accommodation—changing the lens shape by ciliary muscles to **Increase refractory power**.

Mechanism: contraction of the *ciliary muscles* to recoil and bulge the lens. (Parasympathetic)

Near point of vision is determined by the maximum bulge the lens can achieve.

Focus on items close up. → eye strain

Convergence—medial rotation of the eyeballs toward the object being viewed

Presbyopia—loss of accommodation over age 50

Role of the pupil

Constriction—the accommodation pupillary reflex constricts the pupils to prevent the most divergent light rays from entering the eye.

Constriction occurs when we focus on an object at close range. (concentrates light to central part of lens).

Photoreception revisited

Rhodopsin – pigment that combines with proteins called opsins. (forms in rods)
Retinal* + Opsin = Rhodopsin

*Chemically related to Vitamin A.

Converts light energy into electrical signals picked up by the photoreceptors.

Forms and accumulates in the dark .
In light it bleaches out.

Adaptation

Dark adaptation – occurs when eyes are in the dark, [rhodopsin] is high. → Rods

Light adaptation – occurs when eyes are in the light. → Cones

Duplicity Theory – explanation for why we have two types of photoreceptors.

Optical Illusions

<http://www.ritsumei.ac.jp/~akitaoka/index-e.html>