

VISION

“And that very hour He cured many of infirmities, afflictions, and evil spirits; and to many blind He gave sight.” Luke 7:21

External and internal structures

- sensory organs that communicate visual information about the environment
- socket/orbit provides surrounding protection of heavy bone; eyelid blinks to keep foreign objects from entering eye and cleans eyeball surface moist
- extrinsic muscles: six muscles which move the eye; work together as three matched pairs (R/L, up/down, tilts R/L)
- eyeball:
 - sclera: tough outer layer provides protection and supporting frame
 - cornea: transparent portion at front of eyeball through which light enters
 - choroid: layer of connective tissue rich in blood vessels provides most of eye's nourishment
 - ciliary body: involuntary muscles adjust lens
 - iris: colored portion of eye
 - pupil: opening through which light enters (responds to light entering eye)

How we see light and images

- retina: innermost layer
 - rear layer - pigmented cells
 - middle layer - light sensitive cells (rods and cones)
 - inner layer - nerve cells
- aqueous humor: fluid between cornea-iris-lens; keeps eyeball's shape and provides nutrients
- lens: focuses rays of light; connected to ciliary body; light refracted by lens to form image on retina at back of eye; accommodation: contraction of ciliary muscles bends lens to increase curvature (near objects) or relax to flatten lens (distant objects)
- vitreous humor: lens-rear of eye; keeps retina pressed against choroid layer
image/light → rods/cones → neurons process motion/color/contrast → optic nerve → meet at optic chiasm (each side of brain receives impulses from both eyes) → optic tracts → stimulation of motor neurons for eyes → occipital lobe → visual cortex
- rods: rhodopsin derived from vitamin A; when rhodopsin struck by photon of light → nerve impulse emitted; rhodopsin extremely sensitive to light so we can see in near darkness but only in shades of gray
- cones: responsible for ability to see color; three types react most strongly to (red, blue, yellow) wavelengths; light of intermediate frequency stimulates more than one type of cone cell and combination relayed to brain

Specifics of vision

- persistence of vision: 1/10 sec delay between time that light strikes retina and brain receives signal; image remains for 1/10 sec (flashlight trail, motion picture)
- myopia: nearsightedness; lens is too thick and convex or eyeball elongated; rays of light focus in front of retina; corrected by concave lens causing light rays to diverge
- hyperopia: farsightedness; eye too short or lens too flat; objects brought to focus at point behind retina; corrected by convex lens
- astigmatism
- presbyopia
- colorblindness results from damage to cones or area of brain where color interpreted

night blindness results from lack of rhodopsin
glaucoma: pressure of fluid inside eye abnormally higher

