

Crown 85 Winter 2016

Visual Perception: A Window to Brain and Behavior

Lecture 4- Light, the Eye, and Visual Transduction

Reading: [Joy of Perception Master Eye Diagram](#)
[Eye Brain and Vision](#)
[Web Vision](#)

Looking: [Structure and Working of Human Eye](#)
[Anatomy of the Eye \(Sinauer\) mp4](#)
[Phototransduction \(Sunauer\) mp4](#)
[Several Werblin Videos on Retinal Function mp4](#)

OVERVIEW: In all sensory systems, stimuli originating in the "outside world" convey information about the environment to the organism. Common to the study of all sensory processes is the need to know (a) *how information (e.g., pitch, color, odor, etc.) is coded in the physical properties of the stimulus*, (b) *how the organism captures the physical stimulus (e.g., via the eye, the ear, the nose)*, and (c) *how the organism converts the physical information into electrical signals (sensory transduction) which lead to perception*. The objectives of this lecture are to understand how the physical properties of light are related to the information used in vision, how the various structural parts of the eye convey this information to the retina, and how chemicals in the receptor cells convert light to electrical responses.

1. What kinds of information about objects in the environment are conveyed by light and coded by the visual system? What types of information present in light are lost in visual processing (examples of such "lost" information will be discussed in later lectures)?
2. Understand the properties of light and how they are related to brightness and color perception.
 - a. Wavelength
 - b. Intensity
 - c. Luminance
3. Patterns of light coming from an object must be focused to form an image. Know the following terms related to image formation:
 - a. refraction
 - b. accommodation
 - c. diopter
 - d. pupillary reflex
 - e. depth of focus

4. Be able to *identify* and discuss the *function* of the various parts of the eye

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|---------------------------------|----------------|
| a. cornea | h. retina |
| b. iris-pupil | i. choroid |
| c. aqueous humor | j. sclera |
| d. lens | k. fovea |
| e. ciliary muscle | l. macula |
| f. zonula (suspensory ligament) | m. blind spot |
| g. vitreous humor | n. optic nerve |

5. What are the following optical and organic visual disorders:

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|------------------|--------------------|---|
| a. emmetropia | g. strabismus | m. amblyopia |
| b. myopia | h. conjunctivitis | n. diabetic retinopathy |
| c. hyperopia | i. cataract | o. AMD (age related macular degeneration) |
| d. astigmatism | j. glaucoma | p. Retinitis pigmentosa |
| e. presbyopia | k. detached retina | |
| f. Lasik surgery | l. keratoconus | |

6. Describe the process of visual transduction, being sure to understand:

- a. 11-cis and all-trans retinal
- b. rhodopsin
- c. vitamin A and regeneration