

Chapter 15
The Special Senses /Sensory Physiology

I. The Eye and Vision

A. Structures of the Eyeball

1. Fibrous Layer
 - a. Sclera
 - b. Cornea
2. Vascular Layer
 - a. Choroid
 - b. Ciliary body
 - c. Iris
3. Inner Layer (Retina)
 - a. Pigmented Layer of the Retina
 - b. Neural Layer of the Retina
4. Lens

B. Optics and the Eye

1. Overview: Light and Optics
 - a. Wavelength and Color
 - b. Refraction and Lenses
2. Focusing light on the retina
 - a. Focusing for distant vision
 - b. Focusing for close vision

C. Photoreceptors and Phototransduction

1. Functional Anatomy of the Photoreceptors
 - a. outer segments
 - i. visual pigments (photopigments)
 - b. inner segments
2. Comparing Rod and Cone Vision
3. The Chemistry of Visual Pigments
 - a. retinal
 - i. 11-cis retinal
 - ii. all trans retinal
 - b. opsins
4. Phototransduction
 - a. Capturing Light
 - i.
 - ii.
 - iii.
 - b. Light Transduction Reactions
5. Information Processing in the Retina
6. Light and Dark Adaptation
 - a. Light Adaptation
 - b. Dark Adaptation

D. Visual Pathways and Processing

1. The Visual Pathway to the Brain
 - a. Optic nerves

- b. Optic chiasma
- c. Optic tracts

E. Vision Problems

- 1. Myopia
- 2. Hyperopia
- 3. Astigmatism

III. The Chemical Senses: Smell and Taste

1. Chemoreceptors

A. Olfactory Epithelium and the Sense of Smell

- 1. Location and Structure of Olfactory Receptors
- 2. Physiology of smell
 - a. Activation of the Olfactory Sensory Neurons
 - b. Smell Transduction

B. The Olfactory Pathway

- 1. Olfactory bulbs
- 2. Mitral cells
- 3. Glomeruli
- 4. Olfactory tracts

C. Taste Buds and the Sense of Taste

- 1. Location and Structure of Taste Buds
- 2. Basic Taste Sensations
 - a. sweet
 - b. sour
 - c. salty
 - d. bitter
 - e. umami
- 3. Physiology of Taste
 - a. Activation of Taste Receptors
 - b. Taste Transduction
- 4. The Gustatory Pathway

IV. The Ear: Hearing and Balance

A. Structure of the Ear

- 1. External Ear
- 2. Middle Ear
- 3. Internal Ear
 - a. Vestibule
 - b. Semicircular Canals
 - c. Cochlea

B. Physiology of Hearing

- 1. Overview: Properties of Sound
 - a. Frequency
 - b. Amplitude
- 2. Transmission of Sound to the Internal Ear
- 3. Resonance of the Basilar Membrane
- 4. Excitation of Hair Cell in the Spiral Organ

C. Equilibrium and Orientation

1. The Maculae
 - a. Anatomy of the Macula
 - b. Activating Macula Receptors
2. The Cristae Ampullaris
 - a. Anatomy of the Cristae Ampullaris
 - b. Activating Cristae Ampullaris Receptors