Lecture 17 -- Vision I -- Bailey

Visual Processing by the Retina

A. The Retina Contains the Eye's Receptive Sheet

1. Retinal inversion.
2. Duplicity theory of vision.
   a. there are two types of photoreceptors:
      rods detect dim light;
      cones mediate color vision.
3. Light is absorbed by visual pigments in the outer segments of rods and cones.

B. Phototransduction Results From A Three-Stage Cascade of Biochemical Events in the Photoreceptors

1. Stage 1: Light activates visual pigment molecules in the photoreceptors.
2. Stage 2: Activation of pigment molecules reduces the cytoplasmic concentration of cGMP
3. Stage 3: The reduction in cGMP closes cGMP-gated ion channels and leads to the hyerpolarization of the photoreceptor.

C. The Output of the Retina Is Conveyed by the Ganglion Cells

1. The retina contains five major classes of neurons.
2. The receptive field of the ganglion cell has a center and an antagonistic surround.
3. Ganglion cells process visual information in parallel pathways
4. Ganglion cells are specialized for the detection of contrast and rapid changes in the visual image.
5. Specialized ganglion cells process different aspects of the visual image.

D. Photoreceptor Signals Are Relayed to Ganglion Cells Through a Network of Interneurons

1. Bipolar cells convey cone signals to ganglion cells through direct or indirect pathways.
2. The receptive fields of bipolar cells have a center-surround organization.
3. Different classes of bipolar cells have excitatory connections with corresponding classes of ganglion cells.
4. Chemical synapses in the retina have distinct morphologies.

Relevant reading: chapters 26 and 29 in "Principles"