Section 5: The Visual System Cont.

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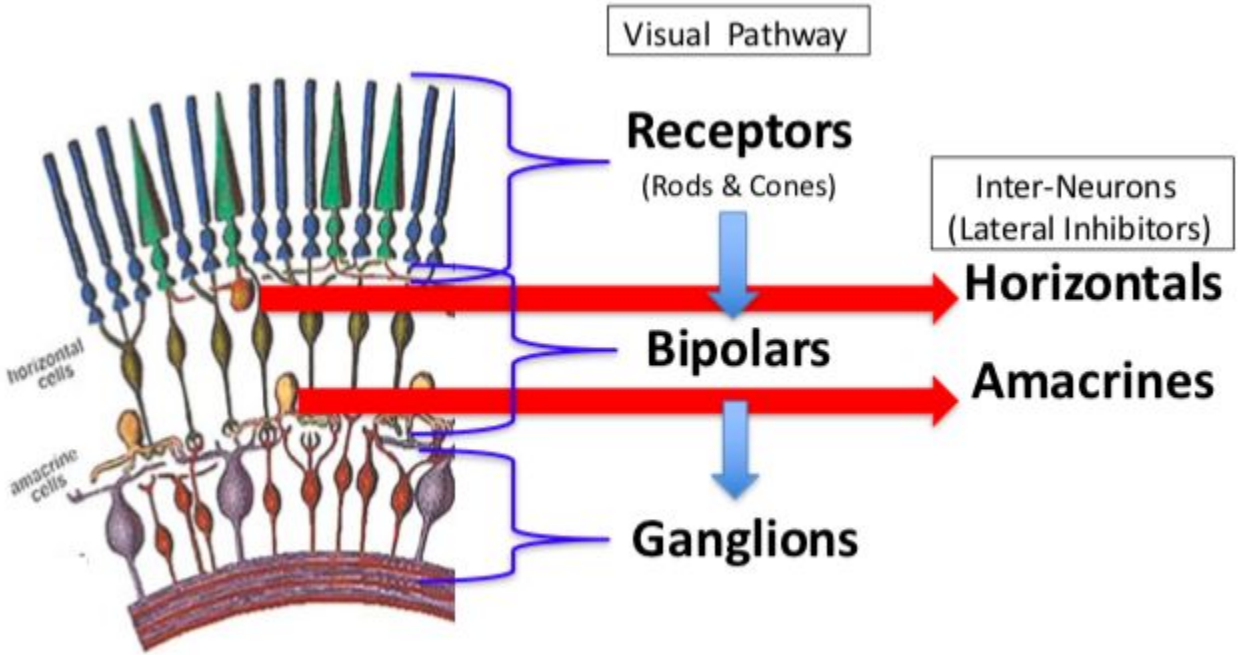
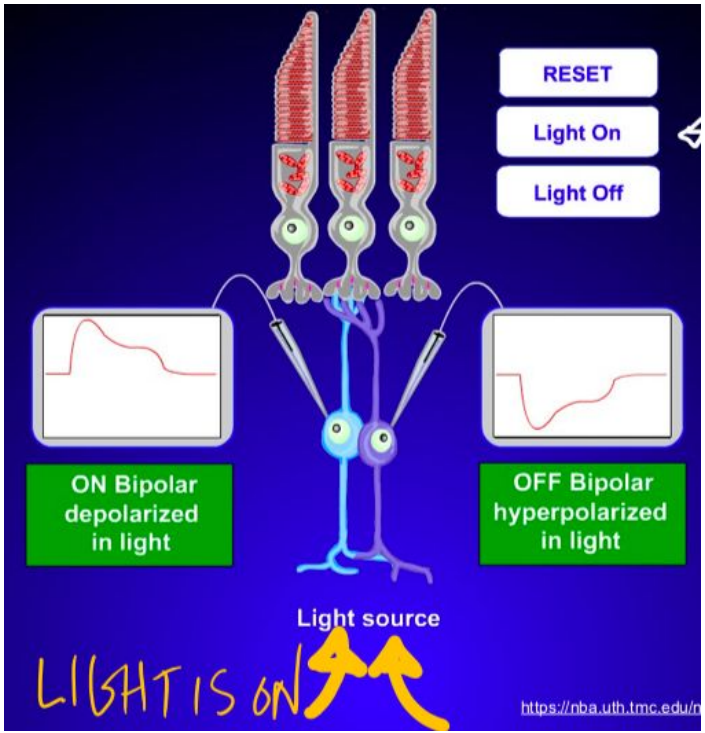
Announcements

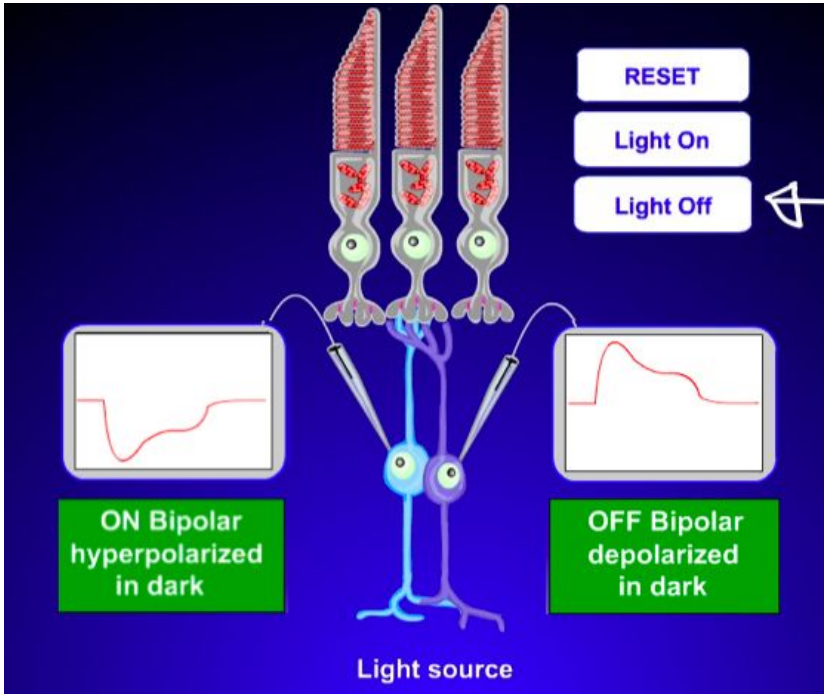
- Midterm grades are posted!
  - If you want to see your test, you have to visit the TAs during office hours
- Homework 2 will be passed out next week

5 Layers in the Retina



Types of Bipolar Cells





Types of Bipolar Cells

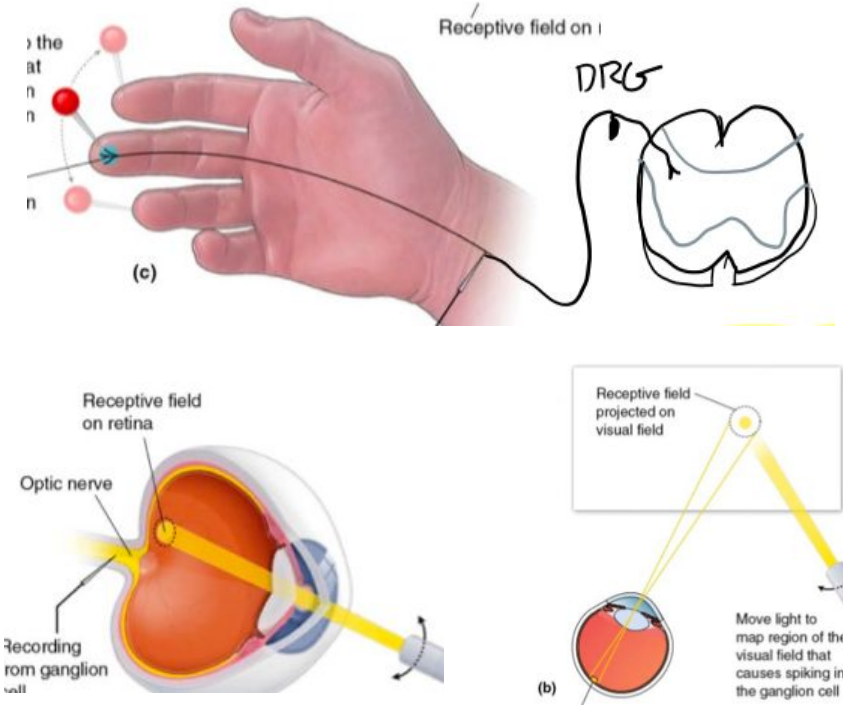
- ON Bipolar
  - In the light: depolarization
  - In the dark: hyperpolarization
- OFF Bipolar
  - In the light: hyperpolarization
  - In the dark: depolarization

NOTE:

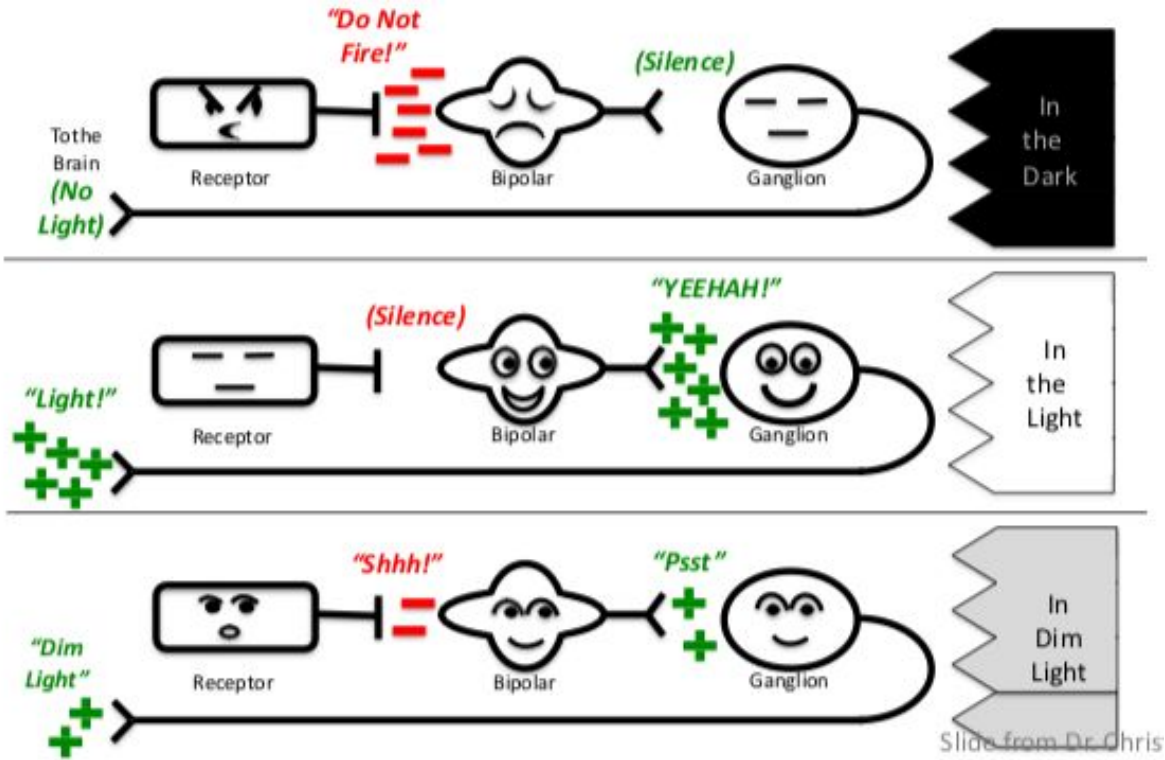
- Depolarization: cell is on
- Hyperpolarization: cell is off

Intro to Receptive Fields

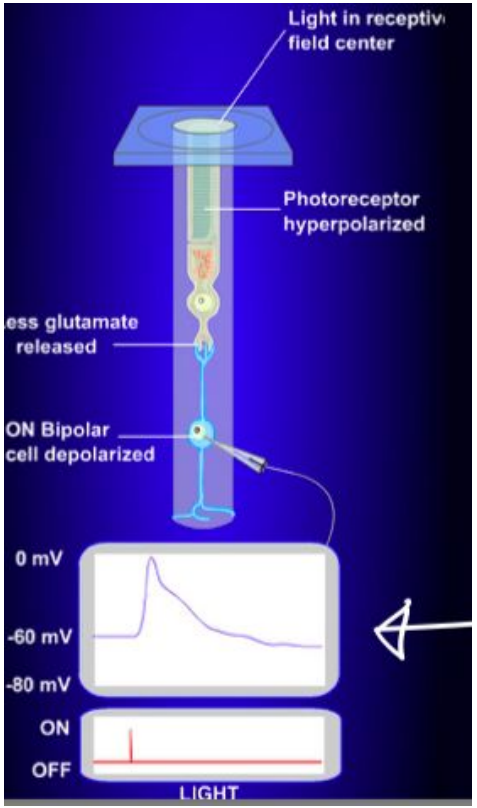
- Definition
  - Region of sensory space where a stimulus will trigger the firing of a neuron
- On the Body
  - Receptive field on the skin -> sensory axon fires to spinal cord -> info conveyed to the brain
- On the Eye
  - Area of the retina where light changes the neuron's firing rate
  - Either projected into the visual field or on the retina

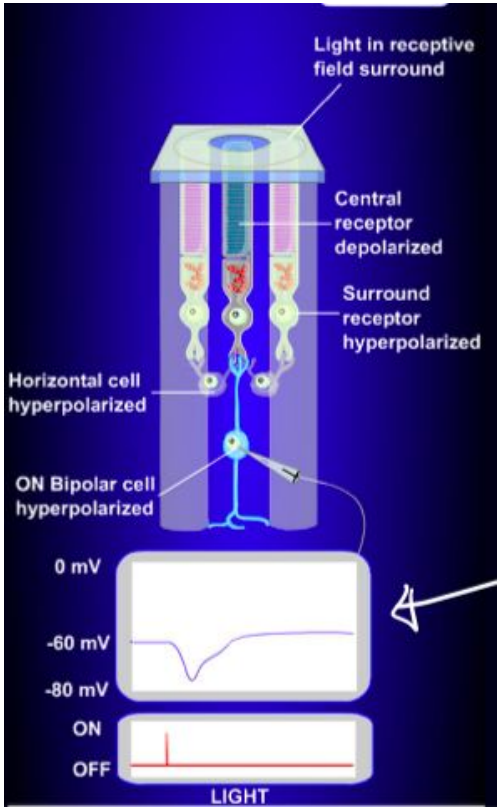


Receptors are Turned Off by Light



Receptive Fields of Bipolar Cells: Direct Pathway



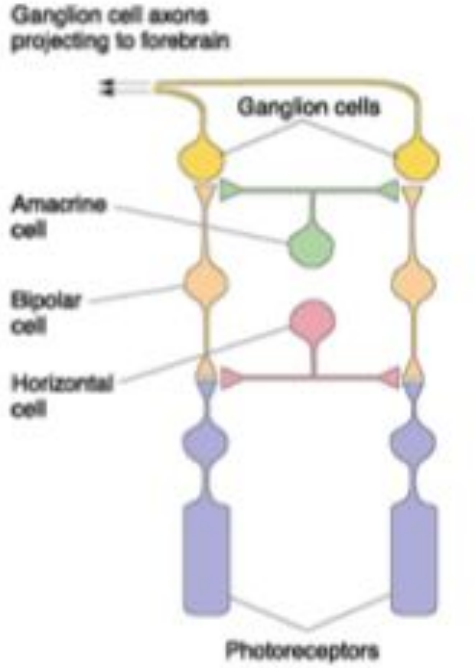


Receptive Fields of Bipolar Cells: Direct Pathway

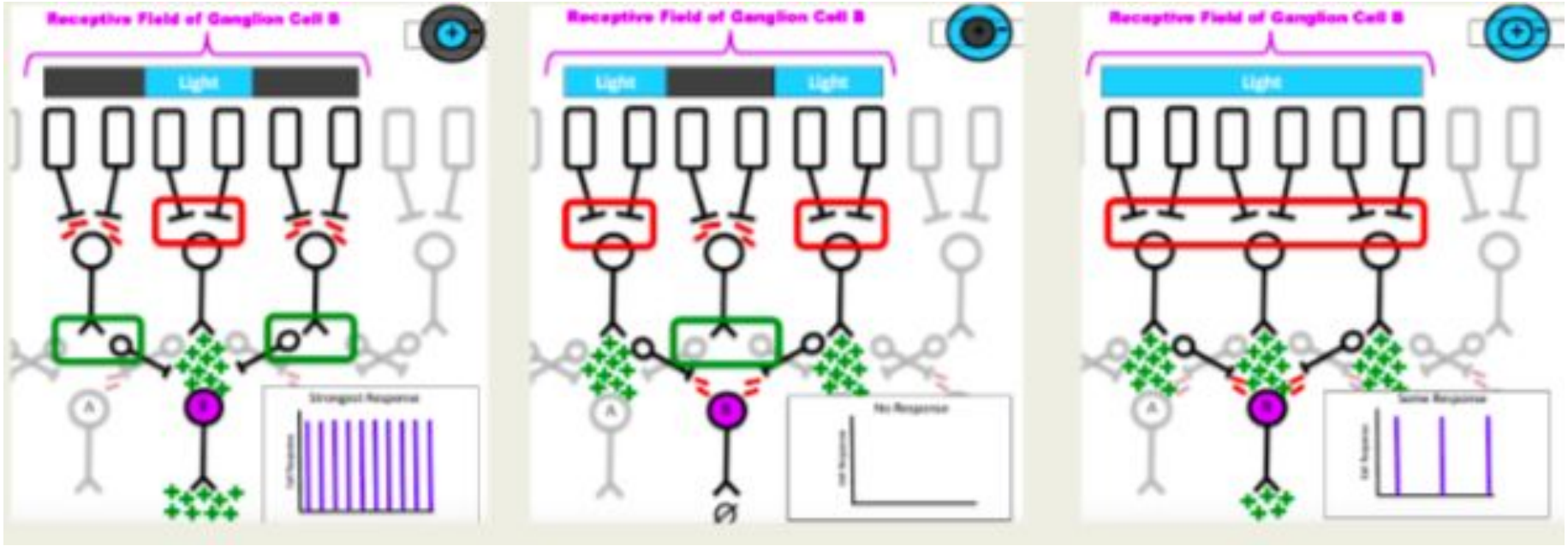
- Light on the Center:
  - Photoreceptor hyperpolarized (off)
  - So ON bipolar cell is depolarized (on)
- Light on the Surround
  - Center receptors is depolarized (on) so ON bipolar cell is hyperpolarized (off)
- Results in Center-Surround Receptive Fields

Inhibitory Lateral Connections

- Horizontal Cells
  - Receive input from photoreceptors
  - Project to other photoreceptors and bipolar cells
- Amacrine Cells
  - Receive input from bipolar cells
  - Project to ganglion and bipolar cells



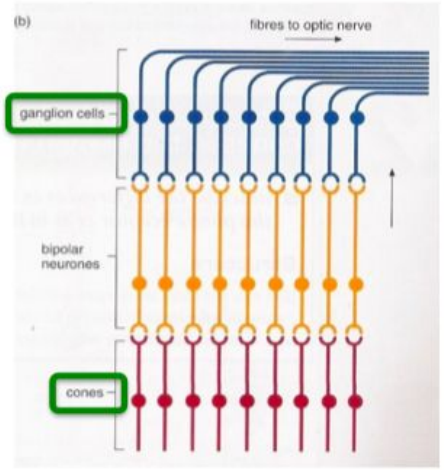
Receptive Fields of Bipolar Cells: Lateral Inhibition



Convergence and Features of Rods & Cones

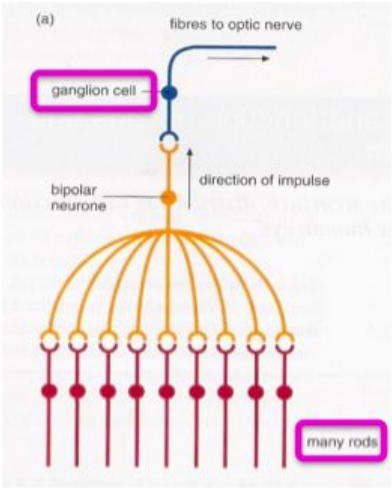
- Cones
  - Low convergence,1:1
  - High acuity
  - Information about details is preserved
- Rods
  - High convergence
  - Many:1
  - High sensitivity to light
  - Details can be lost

Cones show LOW convergence



Cones 1:1 or Few:1
(Cones per Ganglion,
on average across retina, **6:1**)

Rods show HIGH convergence



Rods Many:1
(Rods per Ganglion,
on average across retina, **120:1**)

The Beginnings of the Visual Pathway