

# Science of Psychology

PSY W1001 Section 2  
MW 8:40-9:55 Fall 2012



Wednesday, September 19  
Sensation and  
Perception

# Announcements

- Mark your calendars
  - Psychology Department Colloquium
    - Today— Malcolm Gladwell
      - Check the Psychology Department website for information about upcoming talks, locations and times.
- Short answer quiz opens today
  - This is a required part of Exam #1

# Sensation and Perception



# Sensation and Perception

- Sensation
  - How do we experience our world?
- Sensation versus Perception
- How many senses are there?
- Sensitivity to CHANGE, not to steady input

# Can You paint with all the colors of the wind?

- Sensory Receptor Organs
  - Translation of physical energy into electrical signals to brain
- Specific receptors for specific forms of energy
  - Also act as filters for non-detectable energy
  - Receptors are determinant of range of energies that can be detected.
- Synesthesia

# The Human Eye - Anatomy

- Blind spot

- Hold the strip of paper so that the + is to your right and the dot is directly in front of you.
- Cover your right eye and look at the + with your left eye.
- Move the strip closer and further from your face (slowly).
- Does the dot disappear? Why?

# Color: Sensation vs. Perception

- Does your experience match your sensory representation?
  - Mapping color vision in the retina

# Common Sense(s)

- Intensity Discrimination
  - Shouts and whispers
- Reliable responses
  - Same energy = same response
    - (This is the nerve response, not the cognitive response...)
- Rapid responding
  - Speed of processing
- Mechanism for attention
  - Sensory adaptation
    - Can be neural or non-neural
    - Rapidly versus slowly adapting receptors



# Psychophysics

- How to measure perception
  - Difference thresholds
  - JND/PSE
- Weber's law

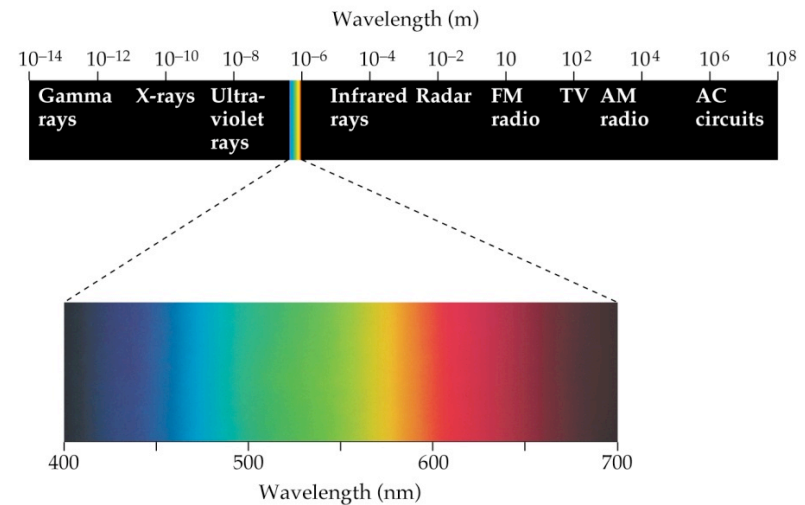
$$k = \Delta S / S$$

# Attention to the Signal

- Selection of competing sensory systems
  - What did you say – I was looking at that really cool car
  - Cocktail Party Phenomenon
- Can attention improve perception?
  - [Demonstration](#)

# The Visual System

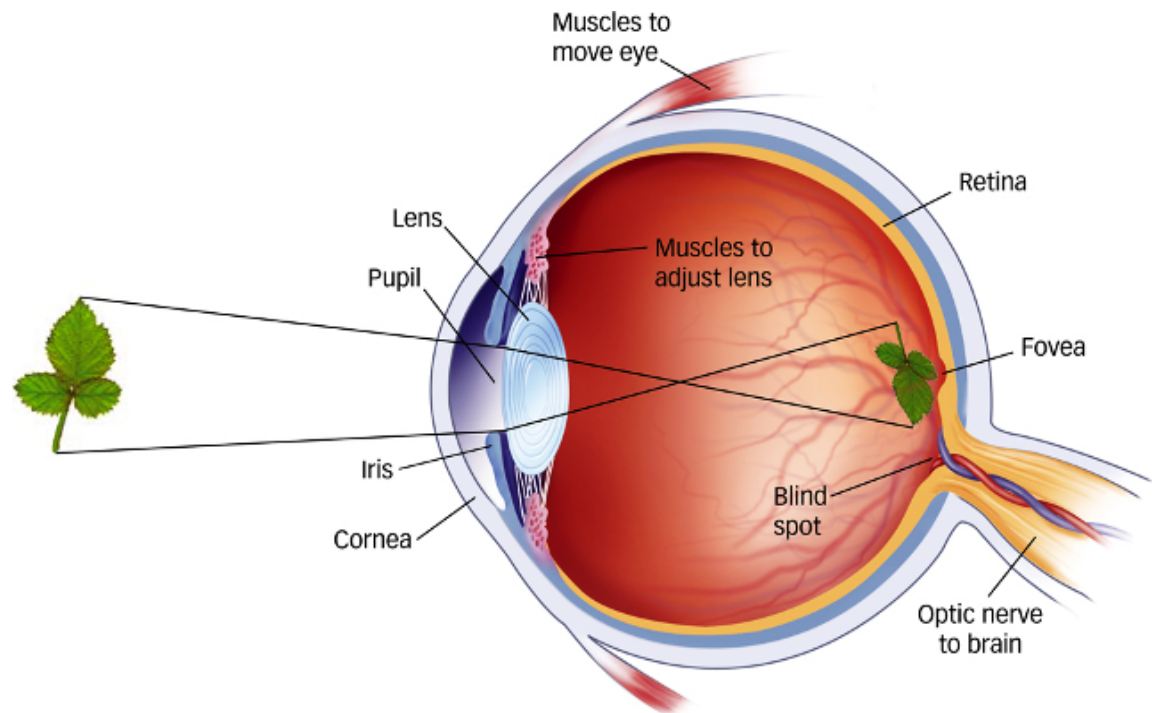
- The Visual Stimulus
- Light Energy
  - Wavelengths
  - Intensities versus Hue



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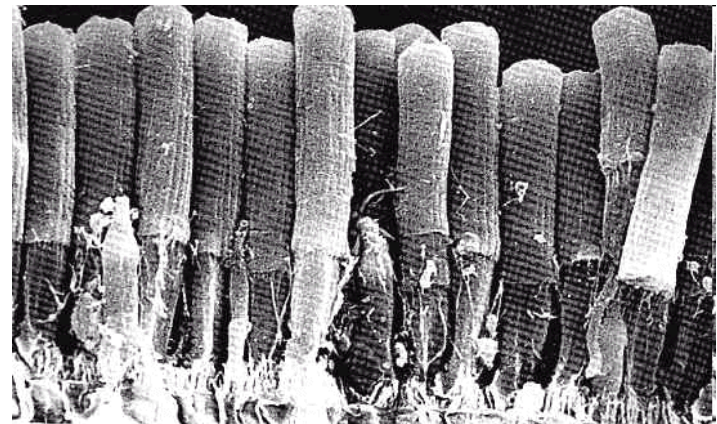
# The Human Eye

- Cornea
- Pupil
- Light adaptation
- Retina
- Accommodation
- Cones
- Rods
- Fovea



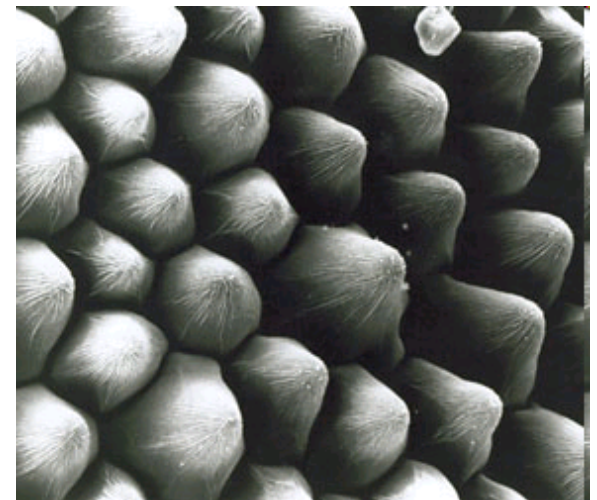
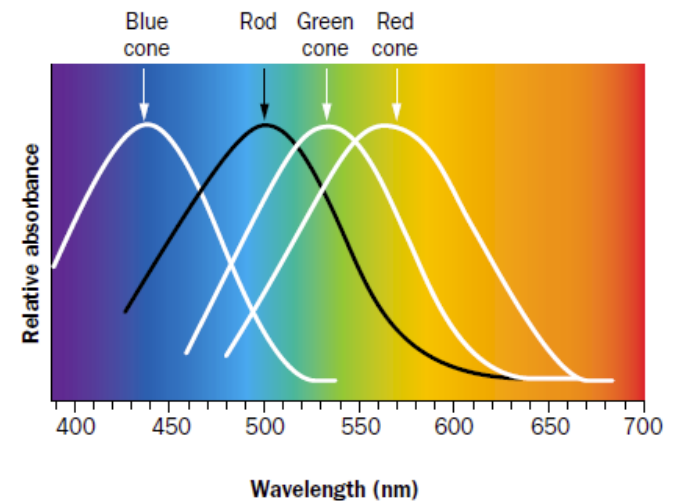
# Rods

- Scotopic system - dim light
  - Several rods to 1 ganglion cell
- “*All cats are black at night*”

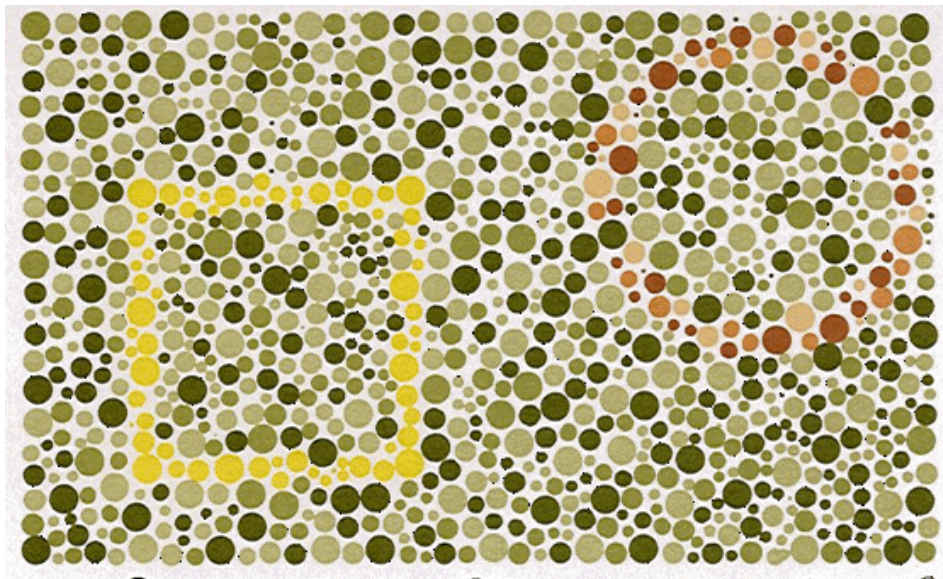


# Cones

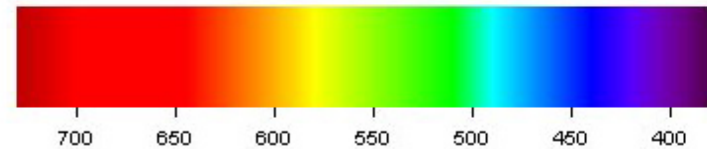
- Photopic system - color vision, visual acuity
  - Smaller ratio of cones to ganglion cells
- Color vision
  - Short
    - Peak response to 420 wavelength (blue)
  - Medium
    - Peak response to 530 (green)
  - Long
    - Peak response to 560 (yellow)



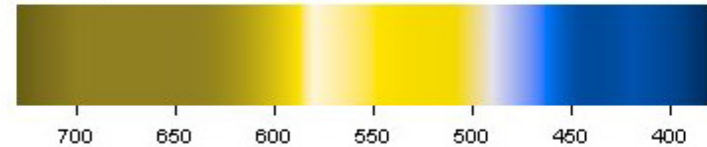
# Color Blindness



Normal

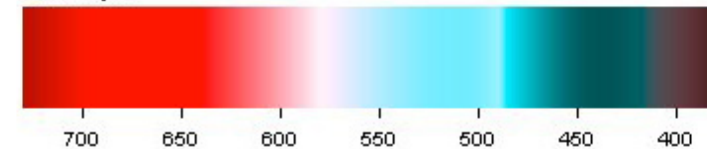


Protanopia

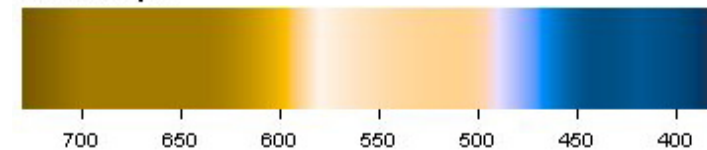


*Protanopia Color Spectrum*

Tritanopia



Deuteranopia



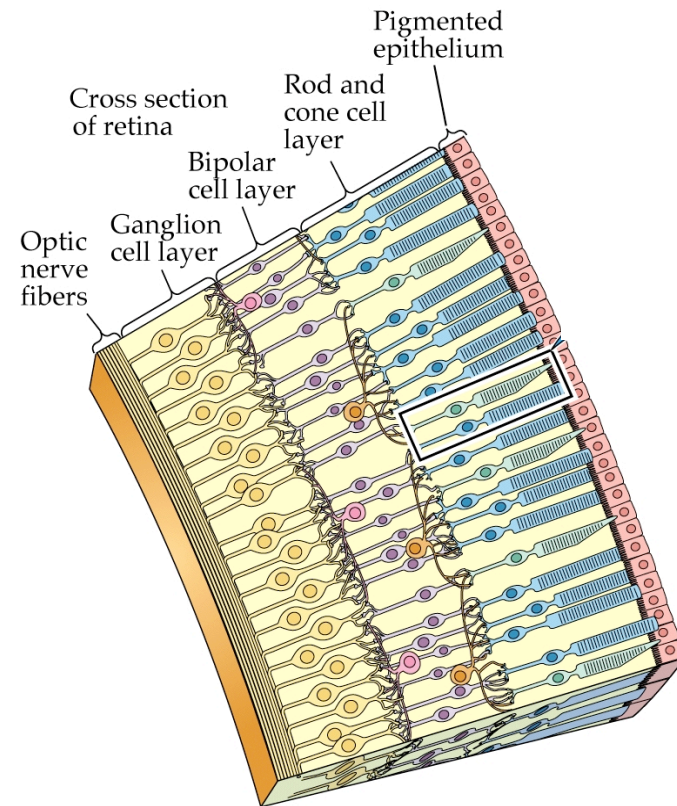
# More at the Retina

- Dealing with intensities of light
  - Pupil contraction
  - Range fractionation
    - Rods - low illumination, cones - higher illumination



# Flow of information

- Retinal cell →
- Bipolar cell →
- Ganglion cell →
- Primary visual cortex



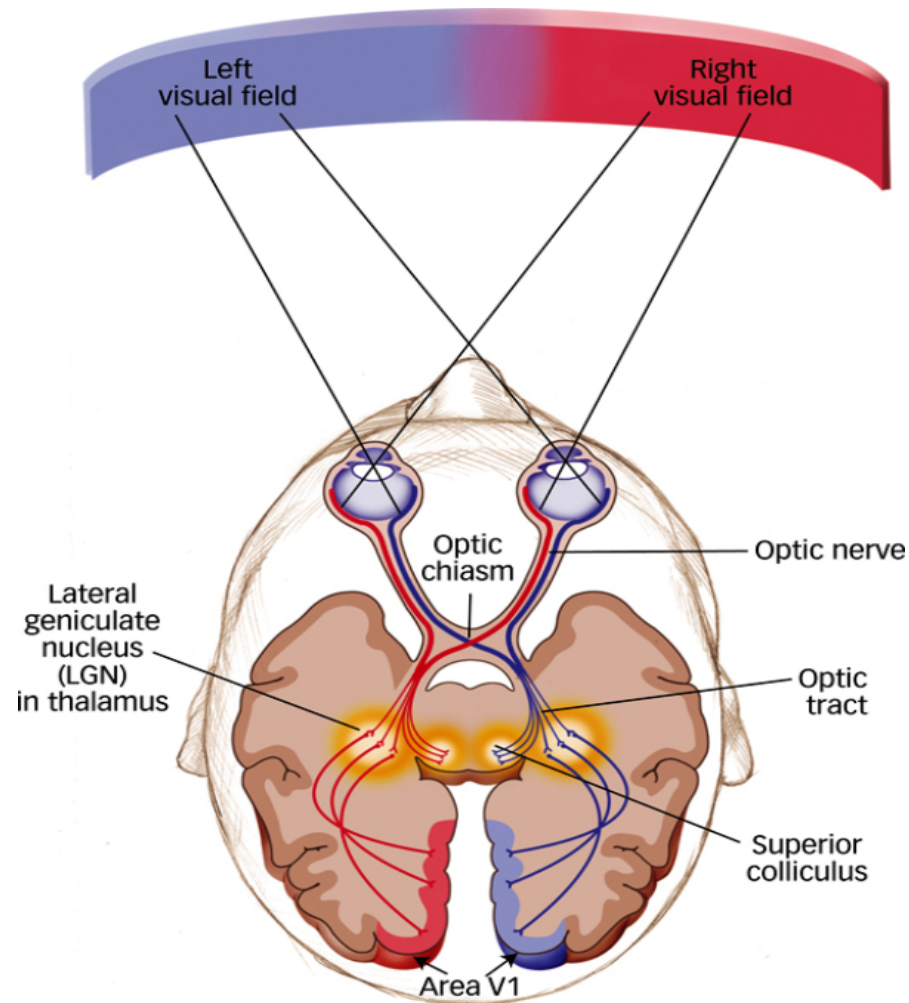
# Lateral Inhibition



# Color: Sensation vs. Perception

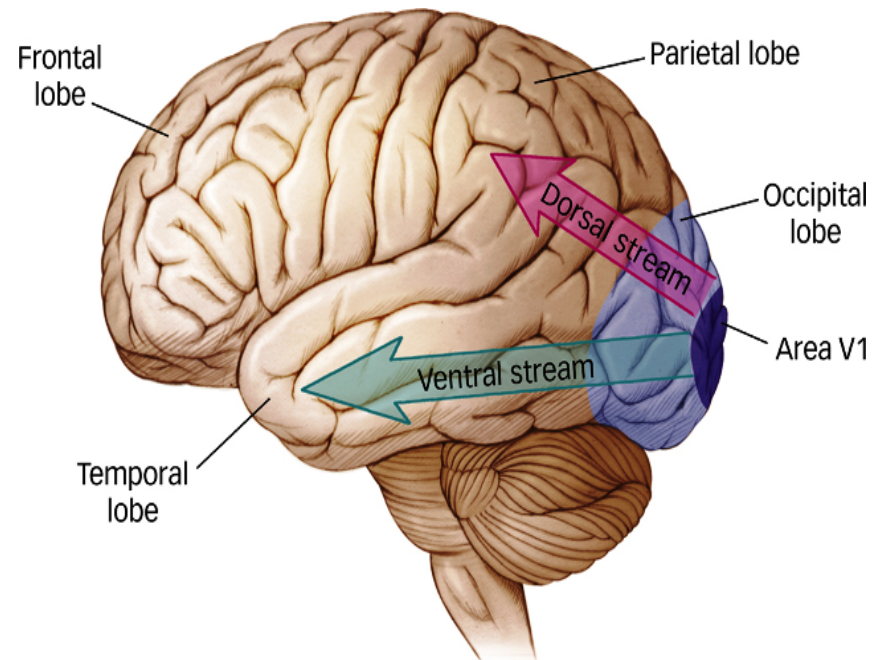
- Does your work representation match your sensory representation?
  - Mapping color vision in the retina

# From Eye Through Brain



# Pathways

- Visual streams
- Ventral (below) stream
  - across occipital lobe into lower levels of temporal lobes (shape and identity)
- Dorsal (above) stream
  - travels up from occipital lobe to parietal lobes (location and motion)

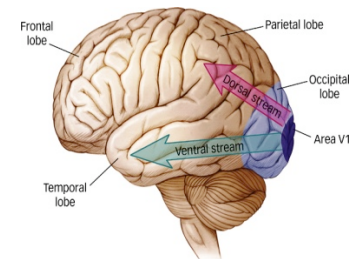


# What do we need to do with all this stuff?

- Making sense of our environment
- What changes?
- What remains the same?
- The effort of perception
  - Taking advantage of the properties of the environment.

# Recognizing Objects by Sight

- Visual-form agnosia
  - The importance of object recognition
    - without it, all information would require effortful processing
- Motion Blindness
- Feature detectors
  - modular view (specialized cells?)
    - Hand cells
  - distributed representation (pattern of activity)
    - Patterns of brain activation



# Study Questions

- Name and define the common properties of sensory systems
- Explain why if you are carrying a heavy load of books you might not feel the addition of a slim volume of poetry, but you would feel the difference if that same slim volume were added to your load if you are only carrying today's edition of the CU Spectator.
- How can attention affect perception?
- Compare and contrast photopic and scotopic systems
- Explain how the signal is starting to be processed at the retina. Use lateral inhibition as an example.
- Explain how the blind spot can differentiate sensation from perception.
- Why don't we see the world as a colorful center surrounded by black and white?
- What is the difference between sensation and perception?
- How are brightness, hue and saturation different?
- Explain how image aftereffects cannot be explained by the trichromatic theory of color perception, but can be explained by the opponent process theory.
- What is a receptive field?
- Describe the difference between an on-center and off-center receptive field.



# More Questions

- What happens when you shine a spot of light on the center of the receptive field? On the edge of the receptive field? Over the entire receptive field?
- A split brain patient fixates on a mark on a computer screen. Images are quickly flashed to the right side of the mark. Will that person be able to name the object? Why or why not (including specifics about the flow of information from the eye to the brain)
- Why is this statement false: Information from the right eye travels to the left side of the brain.
- Diagram the flow of information from the external world through the perception of form. Do the same for the perception of movement.
- What is visual form agnosia? How can agnosias like form agnosia and motion agnosia tell us about how information is processed in the brain?