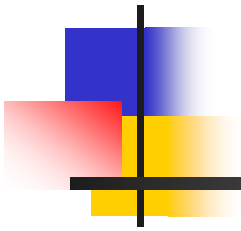
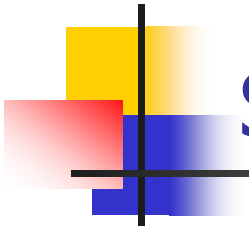


Sensation and Perception



Sensation

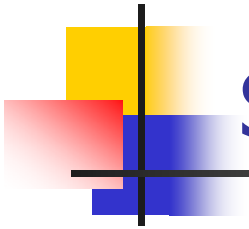
- The detection of physical energy in environment that is encoded into neural signals
- Transduction (sound, light, heat…)
  - Physical stimuli generates messages to brain
  - **Data-driven/"bottom-up process"**

Perception

- The interpretation of sensory data to assign meaning
- **Conceptually-driven (subjective) "top-down process"**

Loch Ness Monster

or tree branch?



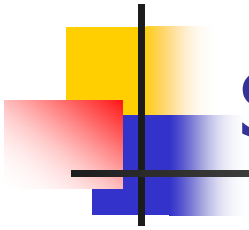
Sensation

- **Parallel processing**

  - Different aspects of object (e.g., color, movement) processed by different regions of brain

  - **"Feature detector" cortical neurons**

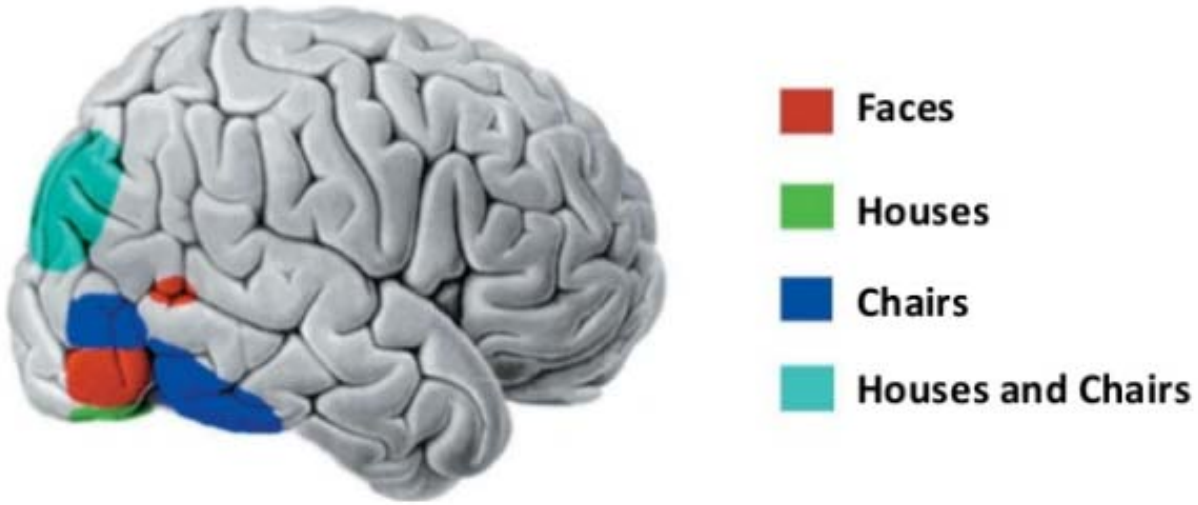
  - Brain damage can create inability to perceive aspects of some visual stimuli



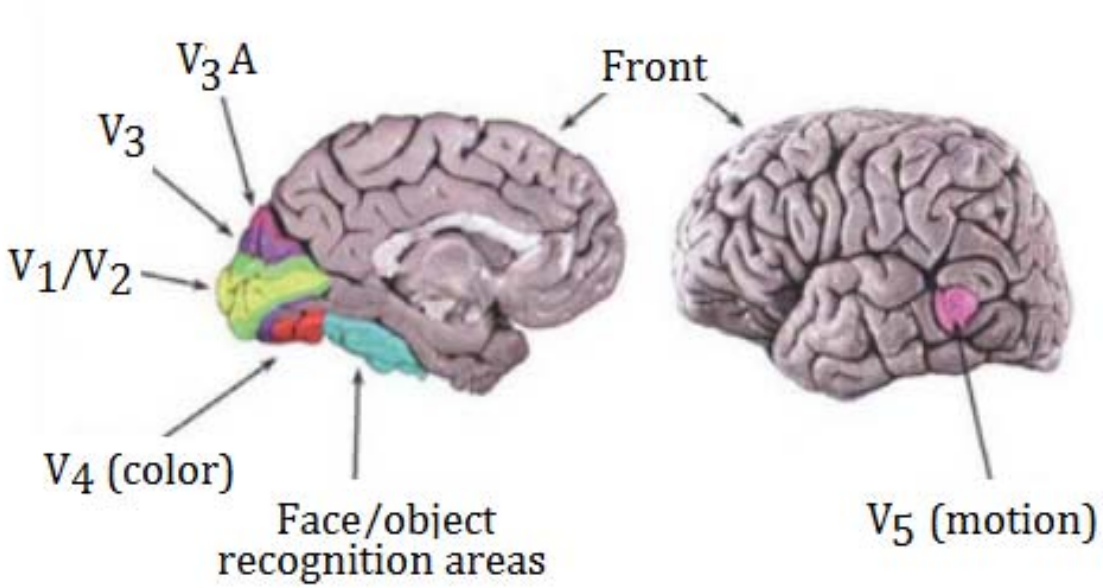
Sensation

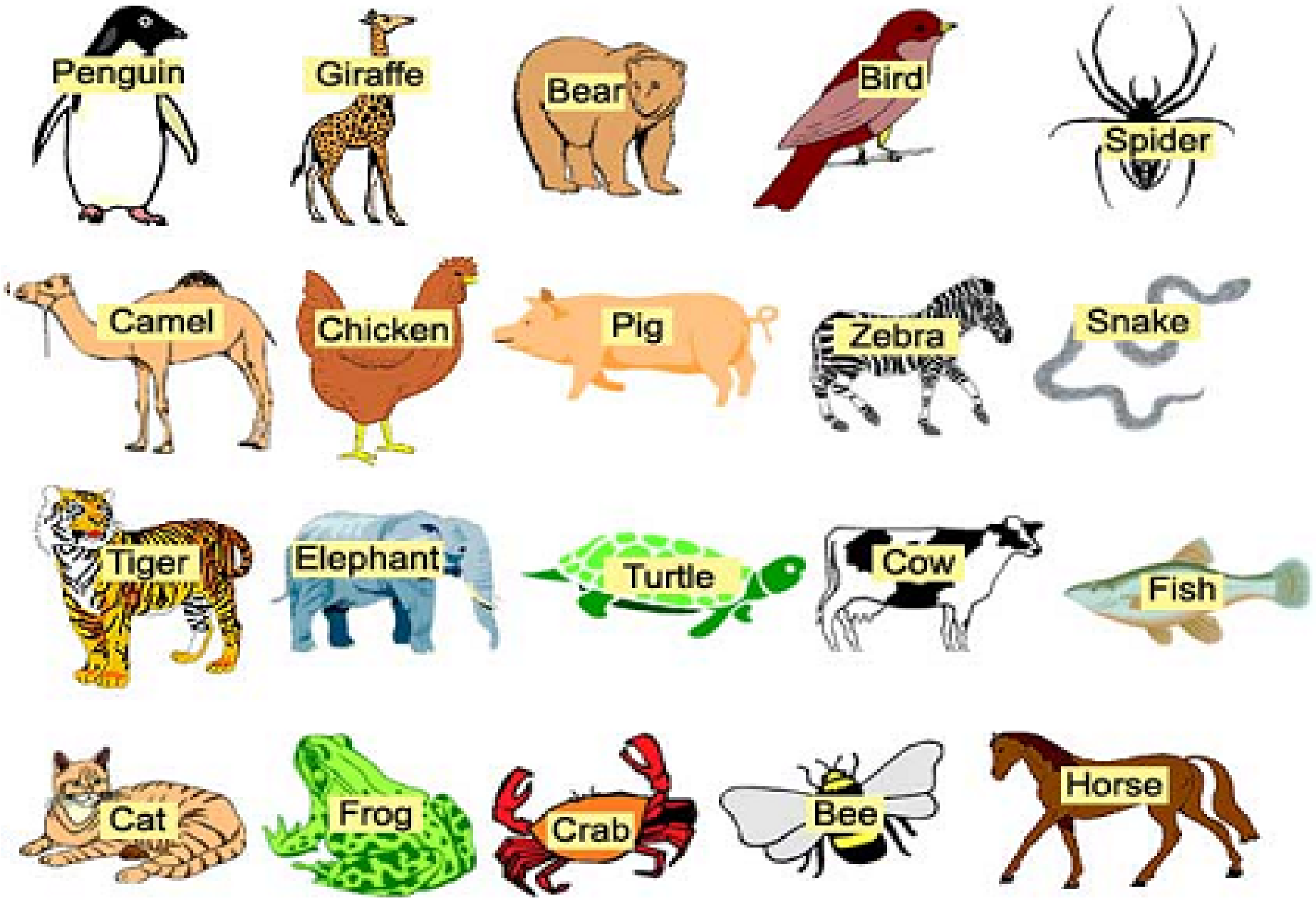
- **“Feature detector” cortical neurons**
  - Some cells in visual cortex respond to lines in specific orientations (e.g., horizontal)
  - Other cells respond to other shapes (spirals, faces, angles)

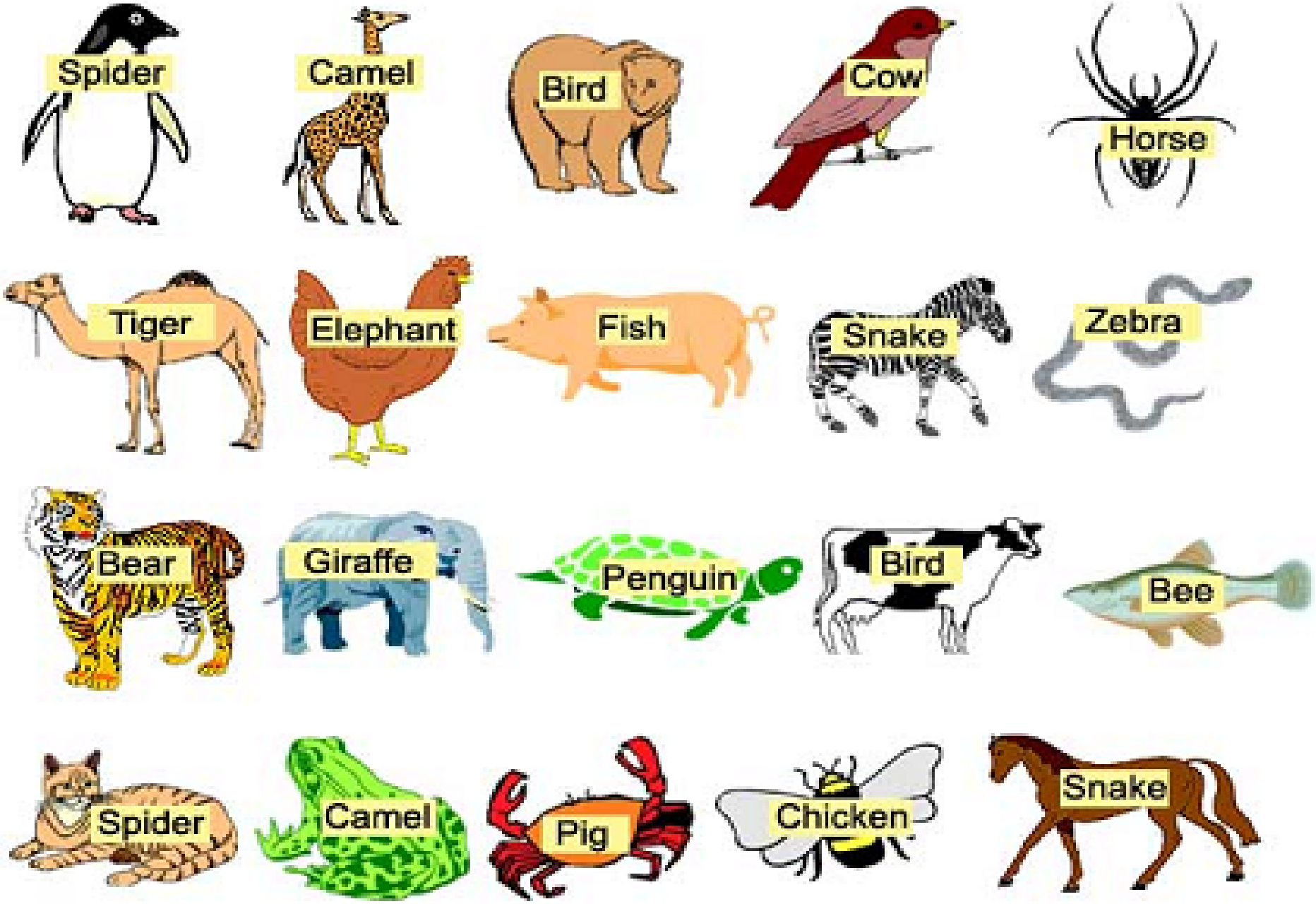
Occipital lobe



Occipital lobe

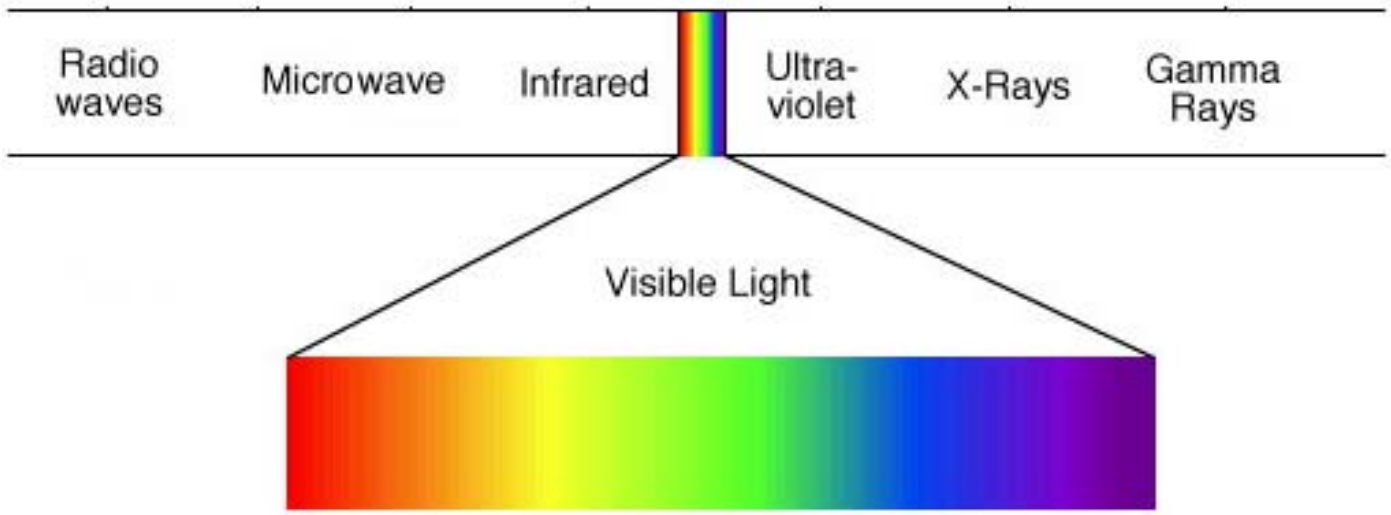


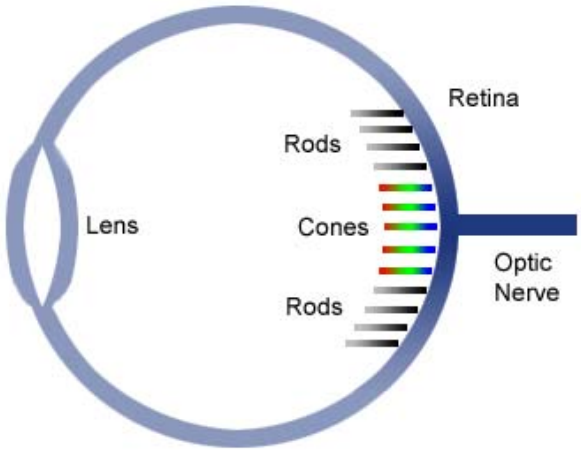

Penguin
Giraffe
Bear
Bird
Spider
Camel
Chicken
Pig
Zebra
Snake
Tiger
Elephant
Turtle
Cow
Fish
Cat
Frog
Crab
Bee
Horse

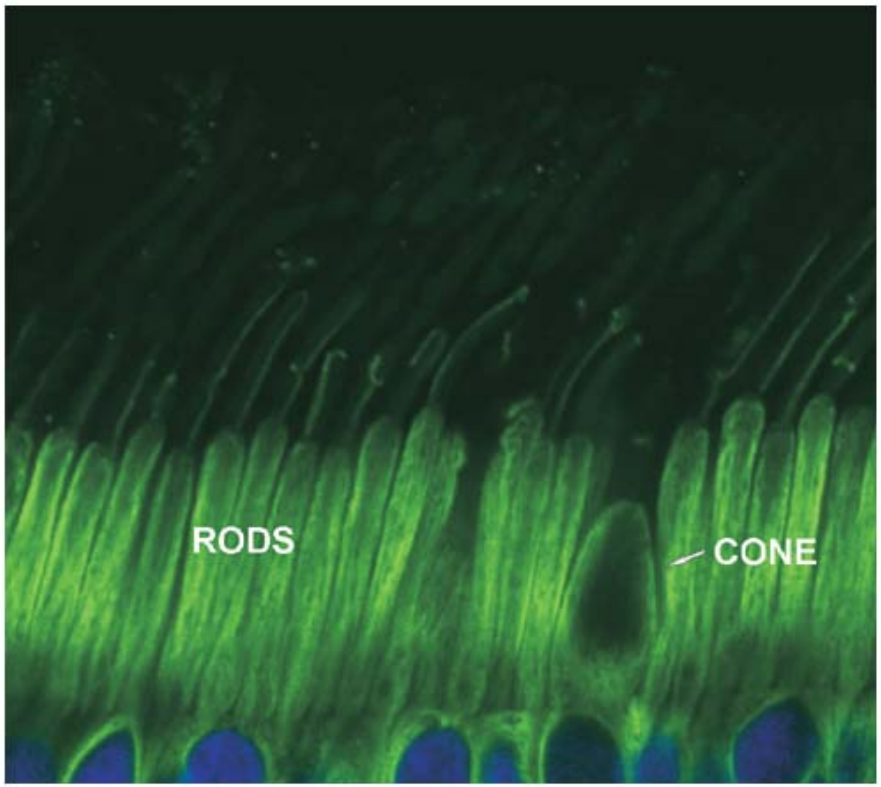

Spider
Camel
Bird
Cow
Horse
Tiger
Elephant
Fish
Snake
Zebra
Bear
Giraffe
Penguin
Bird
Bee
Spider
Camel
Pig
Chicken
Snake

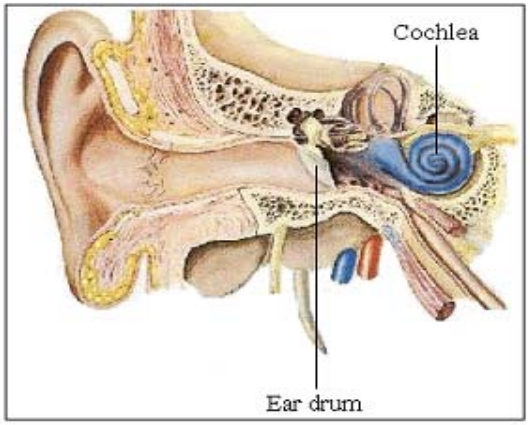
Fundamental Features of the Human Senses

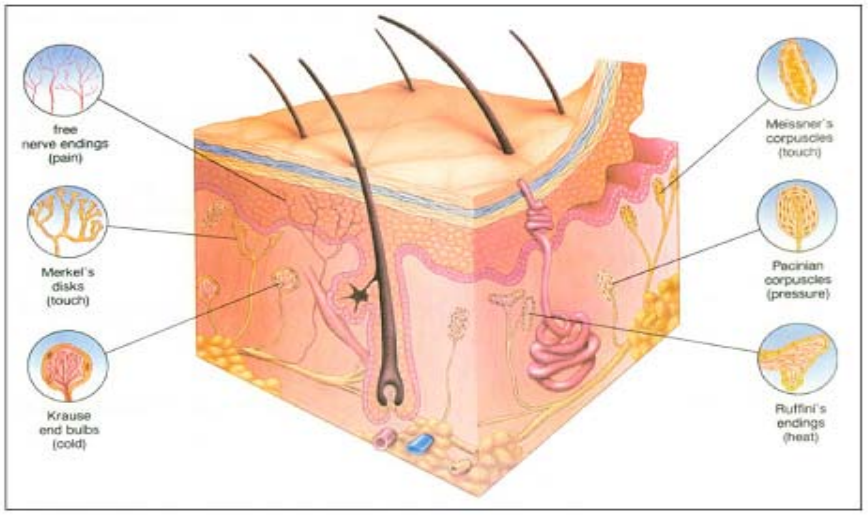
Sense	Stimulus	Sense Organ	Receptor	Sensation
Vision	Light waves	Eye	Rods and cones of retina	Colors, brightness, patterns, motion, textures
Hearing	Sound waves	Ear	Hair cells of the basilar membrane	Pitch, loudness, timbre
Skin senses	External contact	Skin	Nerve endings in skin	Touch, warmth, cold
Smell	Volatile substances	Nose	Hair cells of olfactory epithelium	Odors
Taste	Soluble substances	Tongue	Taste buds of tongue	Flavors
Pain	Many intense or extreme stimuli: temperature, chemicals, mechanical stimuli, etc.	Net of pain fibers all over the body	Specialized pain receptors, overactive or abnormal neurons	Acute pain, chronic pain
Kinesthetic senses	Body position, movement, and balance	Semicircular canals, skeletal muscles, joints, tendons	Hair cells in semicircular canals; neurons connected to skeletal muscles, joints, and tendons	Position of body parts in space

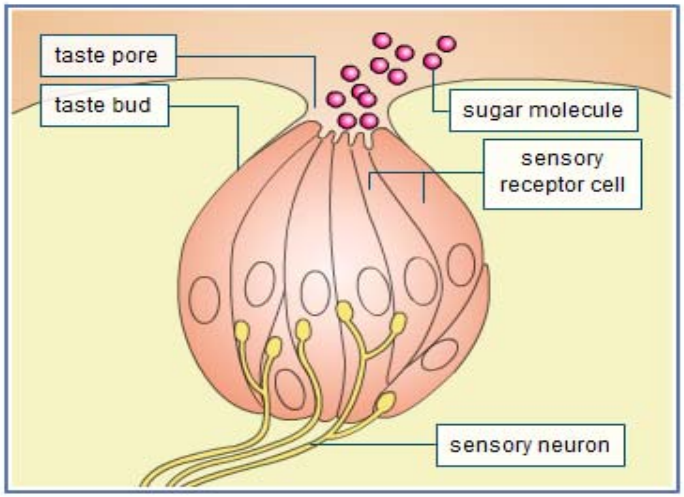

Radio waves
Microwave
Infrared
Ultra-violet
X-Rays
Gamma Rays
Visible Light

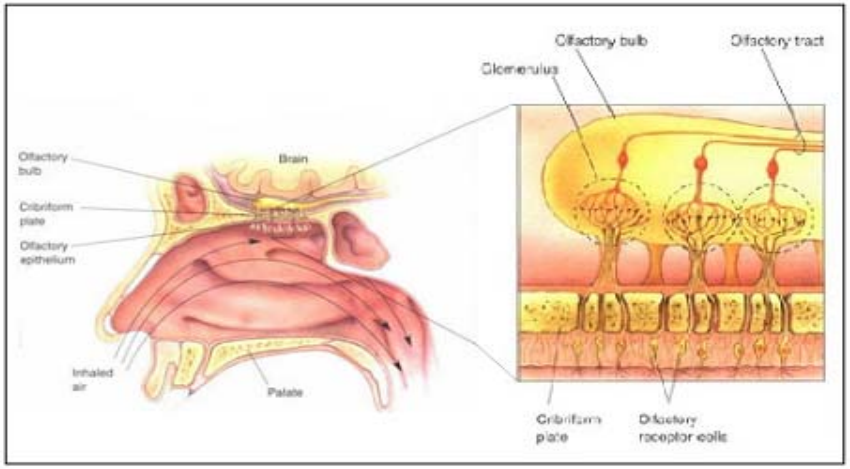

Retina
Rods
Lens
Cones
Optic
Nerve
Rods

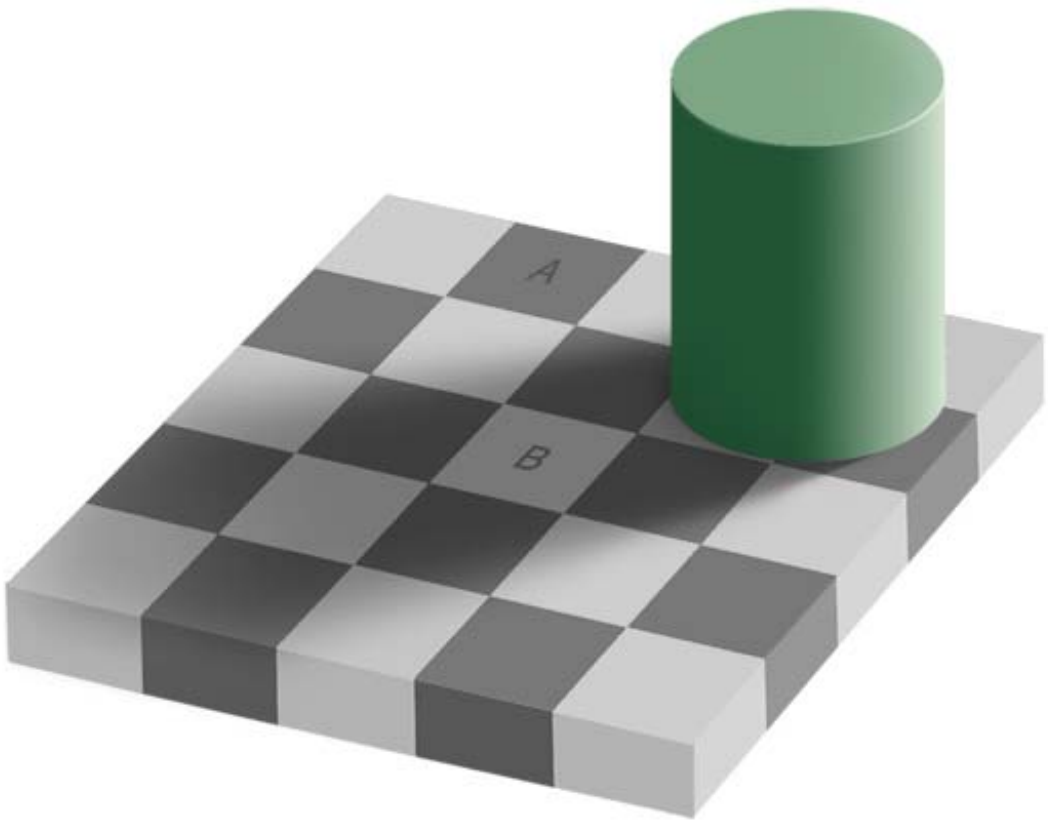

RODS
CONE


Cochlea
Ear drum

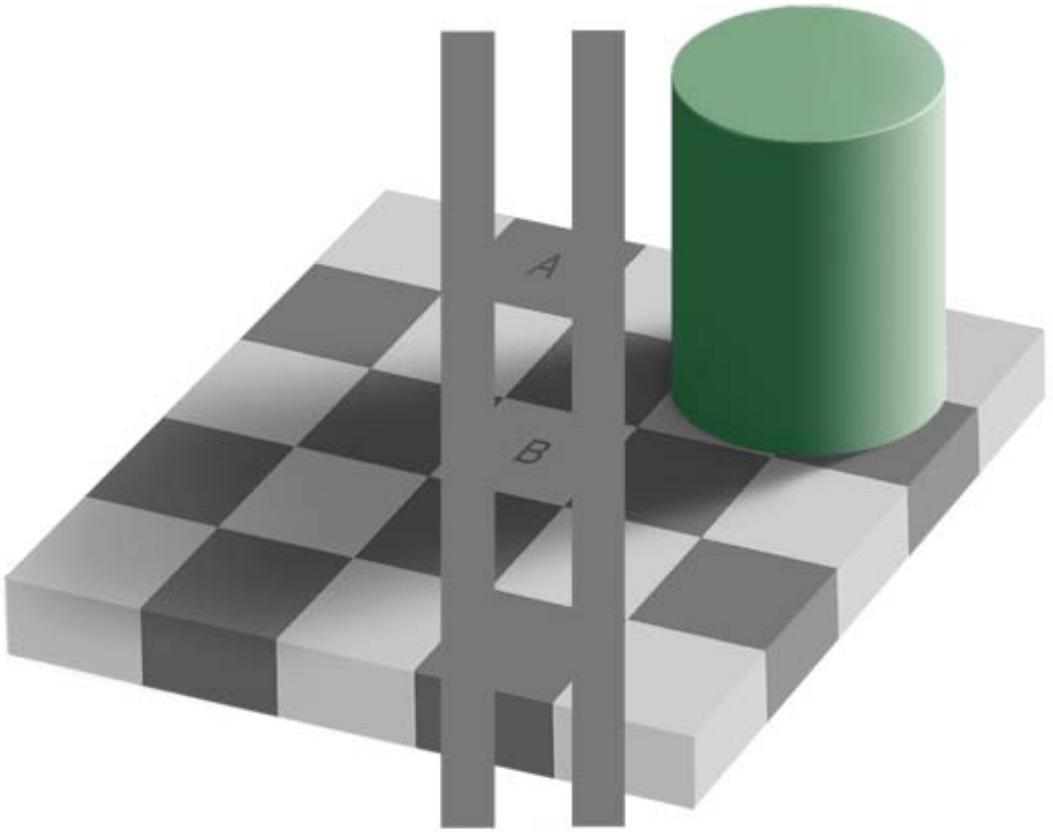

free nerve endings (pain)
Merkel's disks (touch)
Krause end bulbs (cold)
Meissner's corpuscles (touch)
Pacinian corpuscles (pressure)
Ruffini's endings (heat)


taste pore
taste bud
sugar molecule
sensory receptor cell
sensory neuron

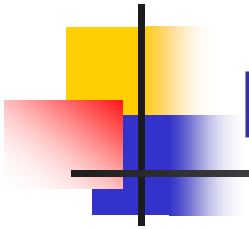

Olfactory bulb
Olfactory tract
Glomerulus
Olfactory bulb
Brain
Cribriform plate
Olfactory epithelium
Inhaled air
Palate
Cribriform plate
Olfactory receptor cells



Are blocks A and B the same color?

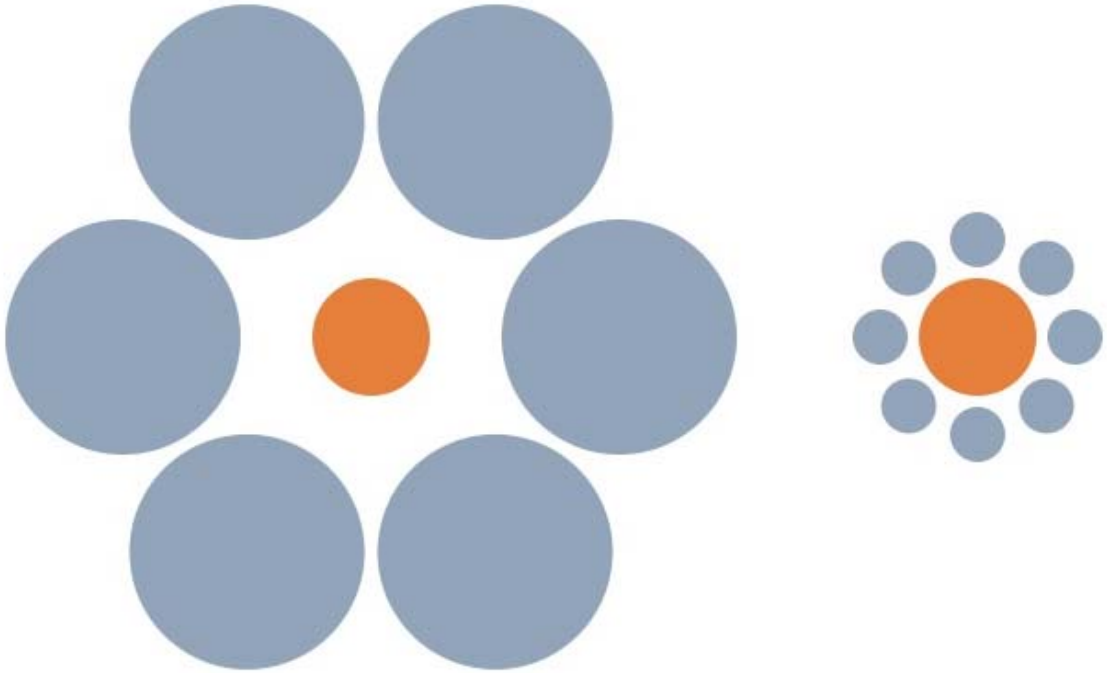


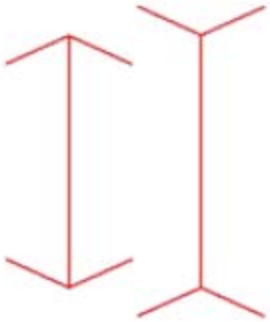
Convinced yet?

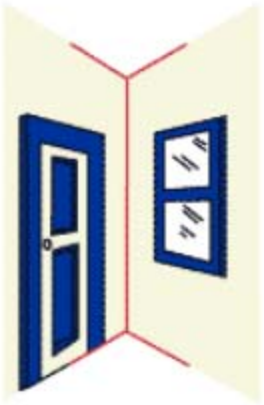


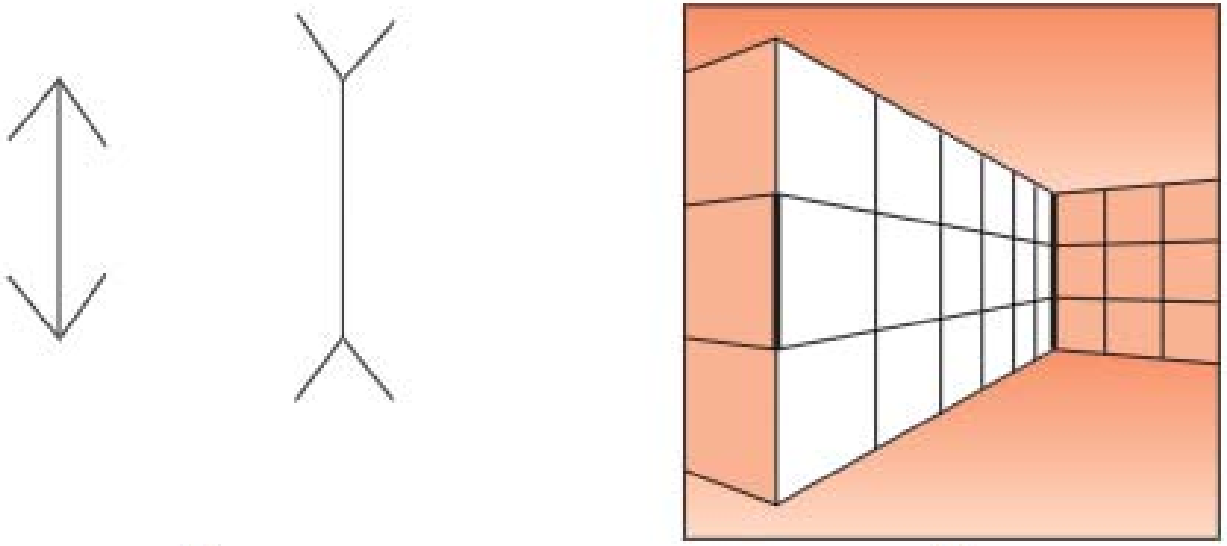
Perception?

- **Contrast sensitivity**
  - Detection of small changes in shades of gray against uniform backgrounds
  - Use if driving at night or poor-visibility conditions
  - Gamers playing 50+ hours improve contrast sensitivity
    - Effect only manifests for action games (vs. Sims)





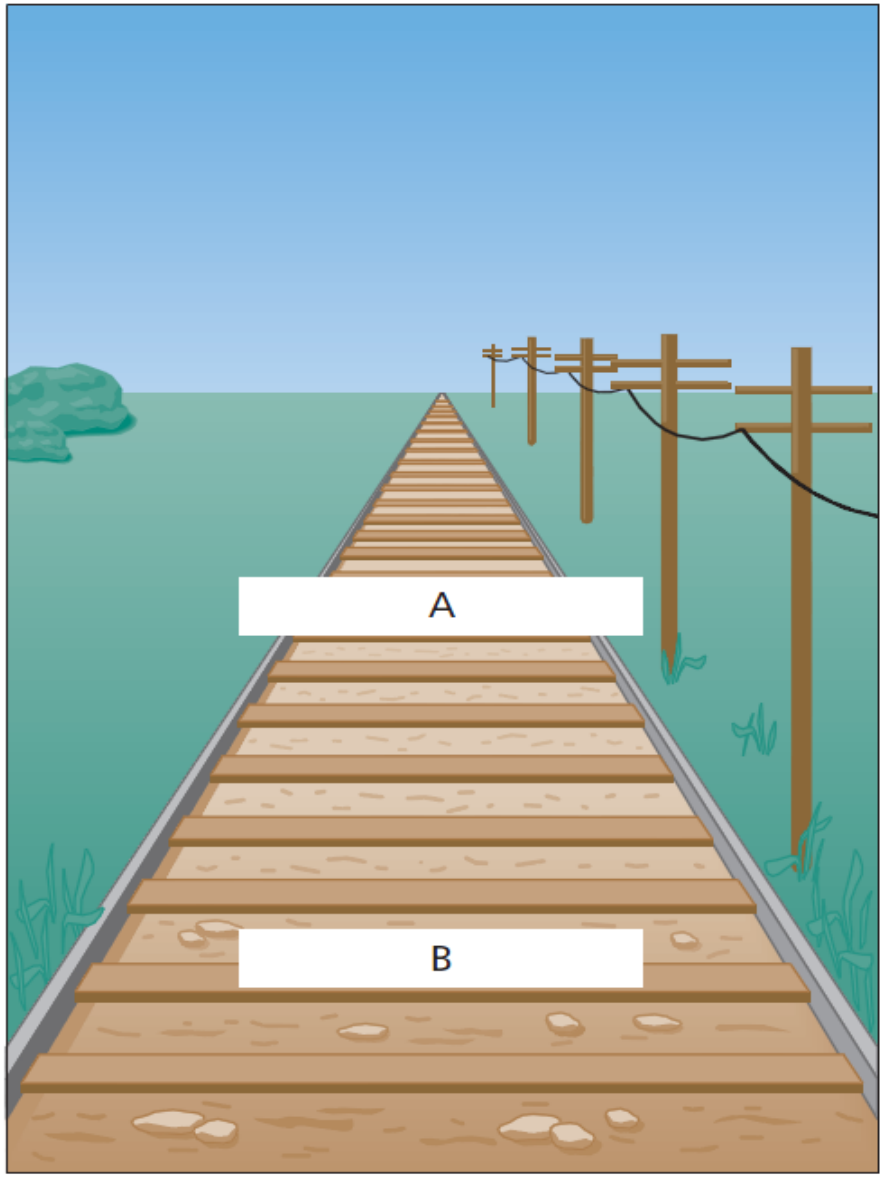




(a) (b)

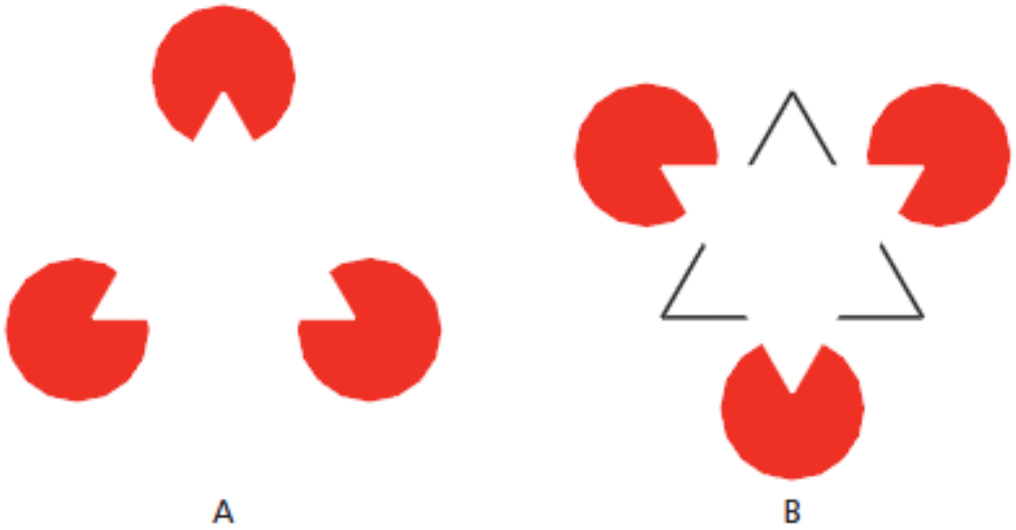
The Müller-Lyer Illusion

One explanation says that your brain thinks it is seeing the inside and outside corners of a building in perspective.

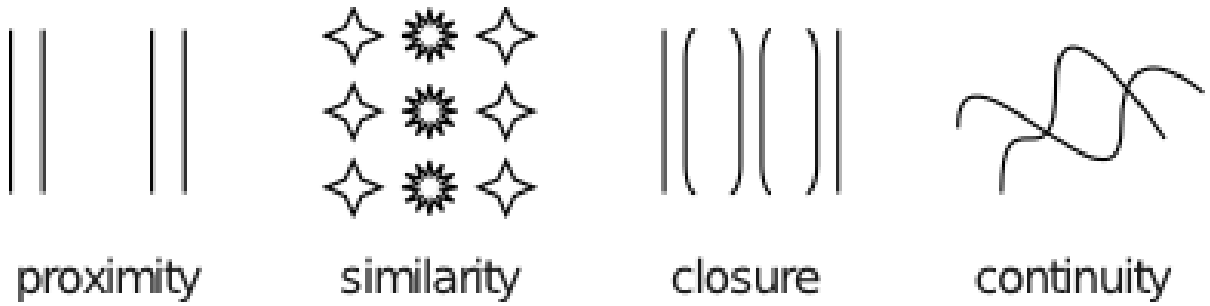


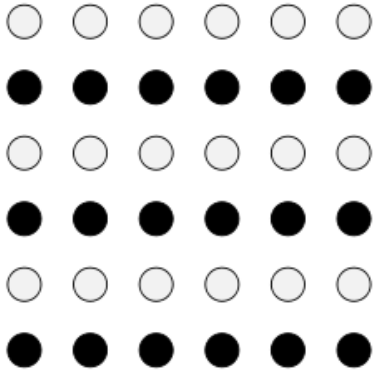
The two white bars superimposed on the railroad track are actually identical in length. Because A appears farther away than B, we perceive it as longer.

Figure-and-Ground Perception



Gestalt Laws of Perceptual Grouping



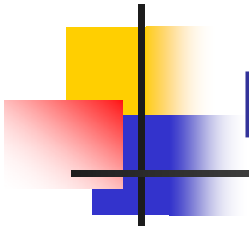



Silent Hill 2


Alan Wake

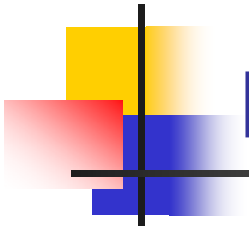

Left 4 Dead


Limbo



Perception

- Hearing
  - Variations due to physiological differences AND also to important contextual factors (e.g., education, experience, environment)

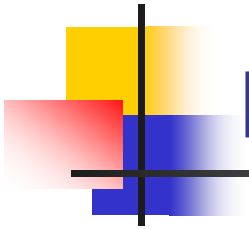


Perception

- Taste
  - Most humans are physiologically capable of differentiating sweet, sour, salty, bitter
  - Contextual factors play a very important role
    - "Sweet breads" in Europe
    - Oxtail stew

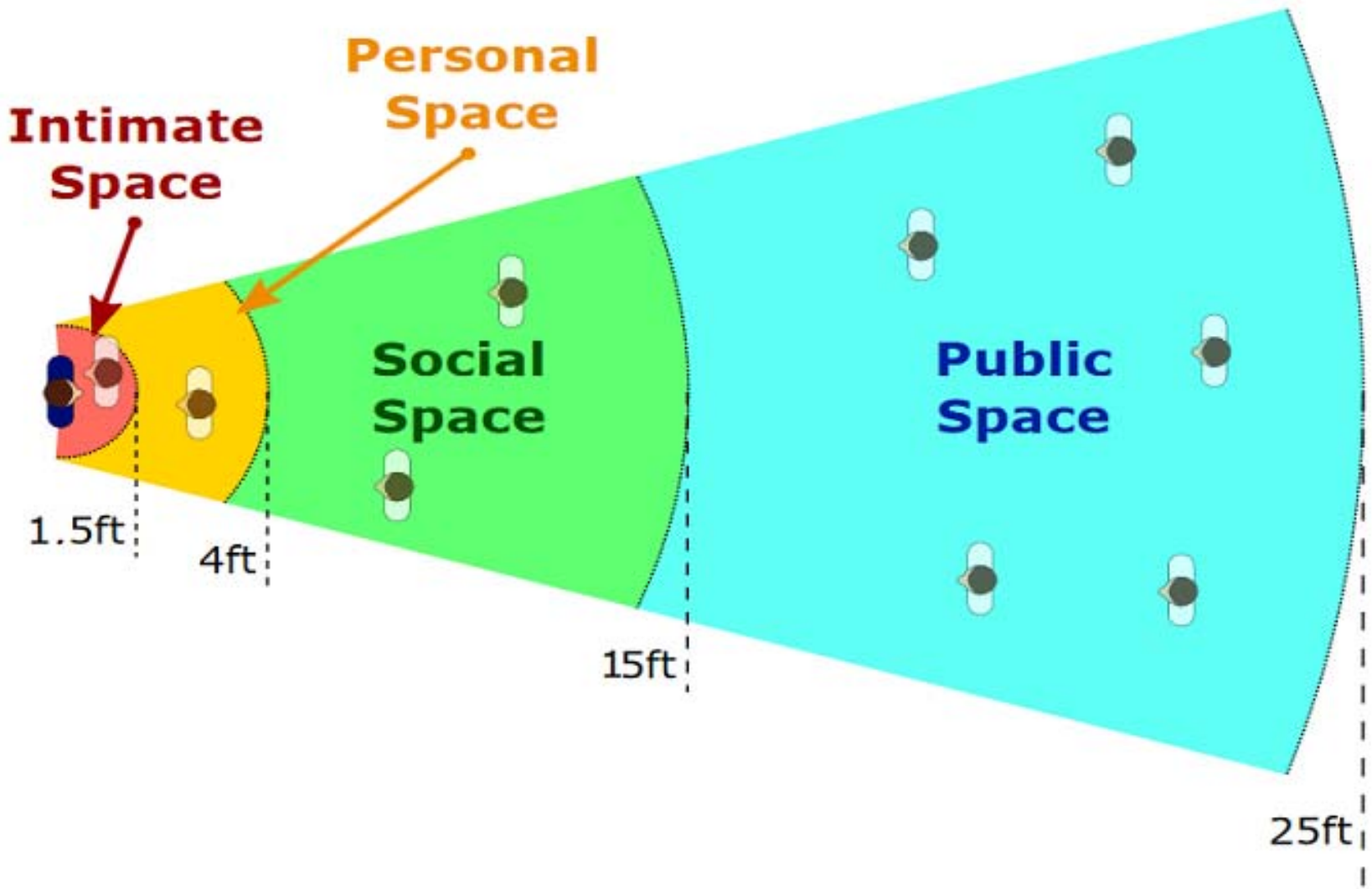
Perception

- Smell
  - Cross-culturally, scent preferences highly subjective
  - Underarm secretions impact level of arousal (for better, or for worse)



Perception

- Touch
  - Involves data about pressure, temperature, and pain
  - Some people have higher thresholds or tolerance levels than others
  - A quick note on personal space…


Intimate Space
Personal Space
Social Space
Public Space
1.5ft
4ft
15ft
25ft