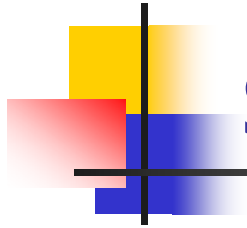


# Sensation and Perception

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# Sensation

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- 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”**

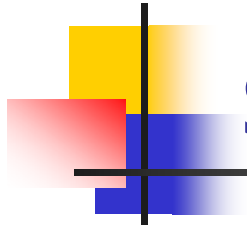
# Perception

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

Loch Ness Monster



or tree branch?

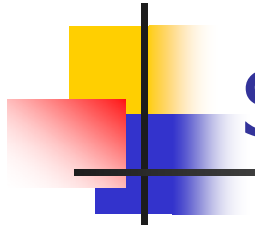


# Sensation

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- **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

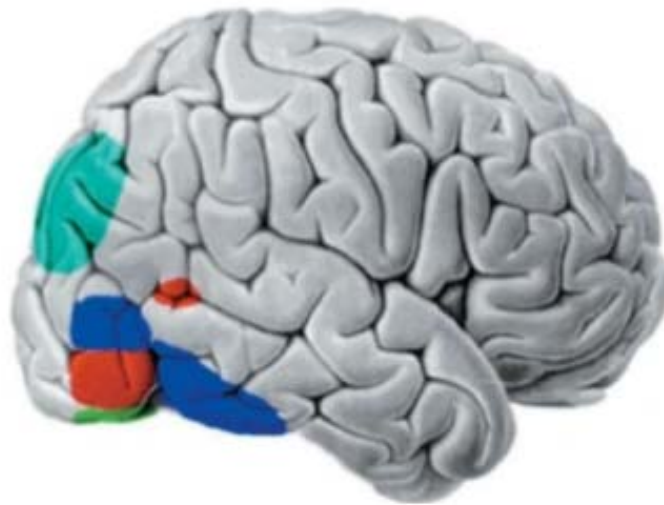


# Sensation

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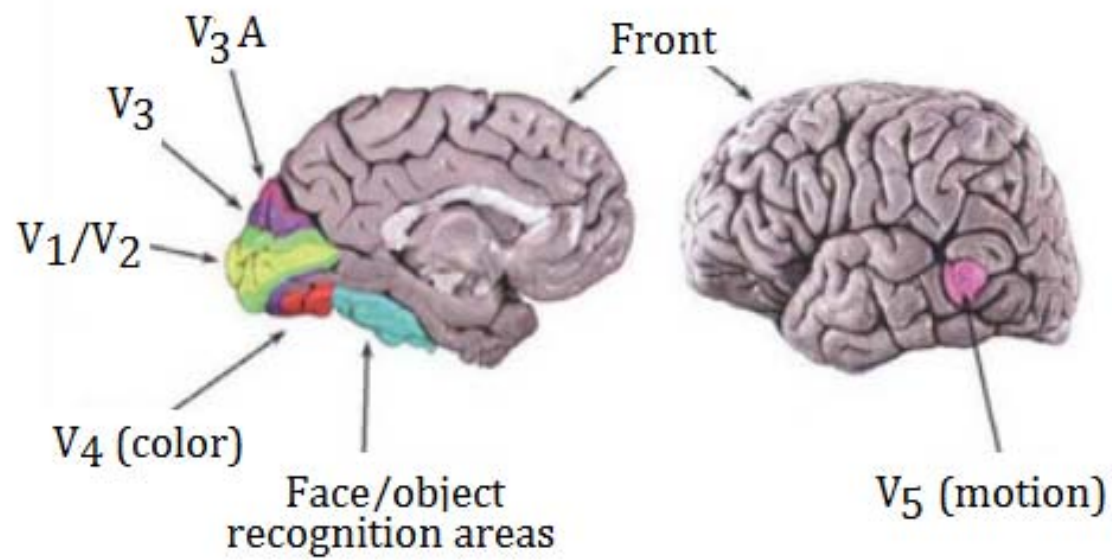
- **“Feature detector” cortical neurons**
  - Some cells in visual cortex respond to lines in specific orientations (e.g., horizontal)
  - Other cells respond to other shapes (spirals, faces, angles)

# Occipital lobe



-  Faces
-  Houses
-  Chairs
-  Houses and Chairs

# Occipital lobe





Penguin



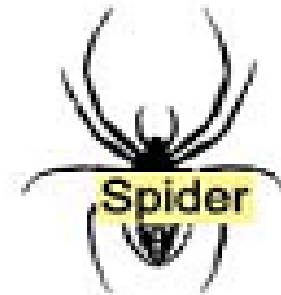
Giraffe



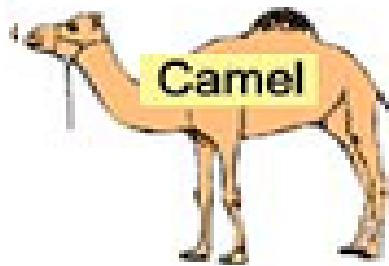
Bear



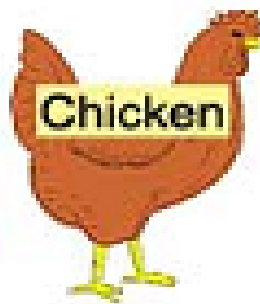
Bird



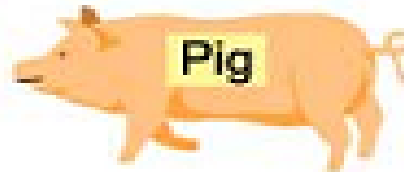
Spider



Camel



Chicken



Pig



Zebra



Snake



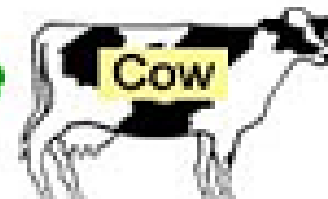
Tiger



Elephant



Turtle



Cow



Fish



Cat



Frog



Crab

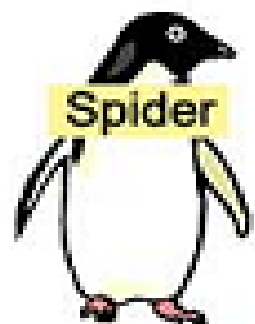


Bee



Horse

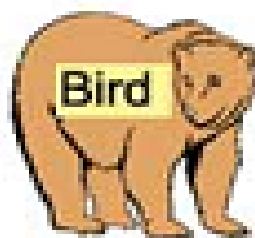




Spider



Camel



Bird



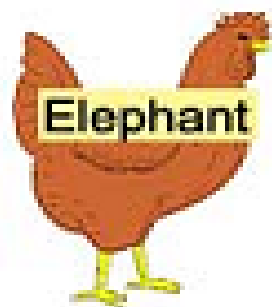
Cow



Horse



Tiger



Elephant



Fish



Snake



Zebra



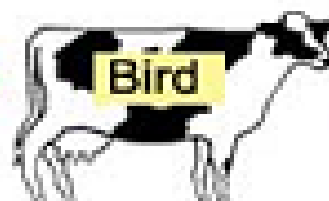
Bear



Giraffe



Penguin



Bird



Bee



Spider



Camel



Pig



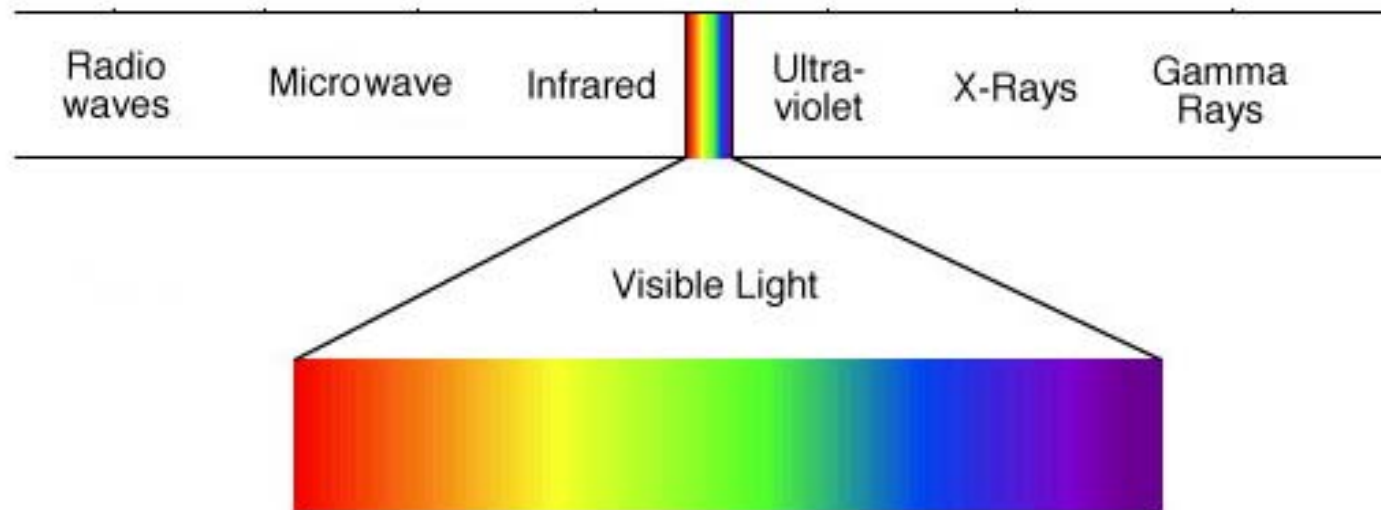
Chicken

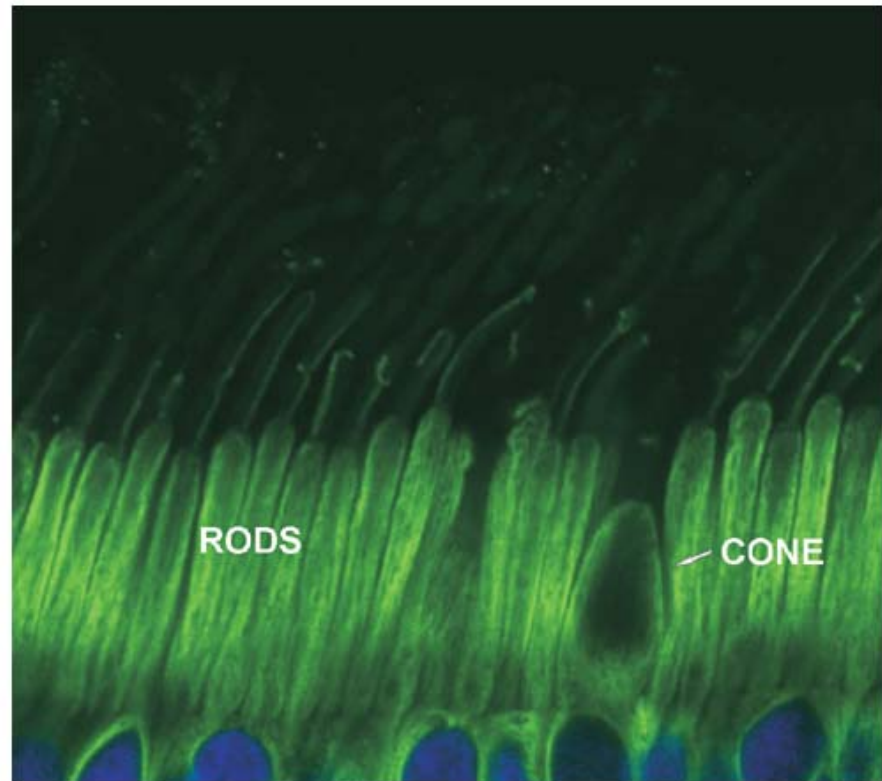
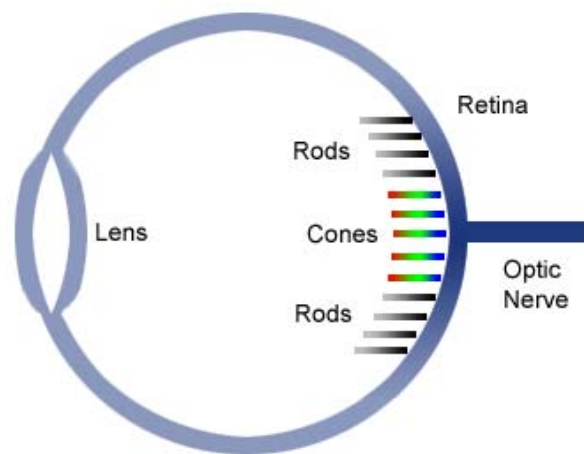


Snake

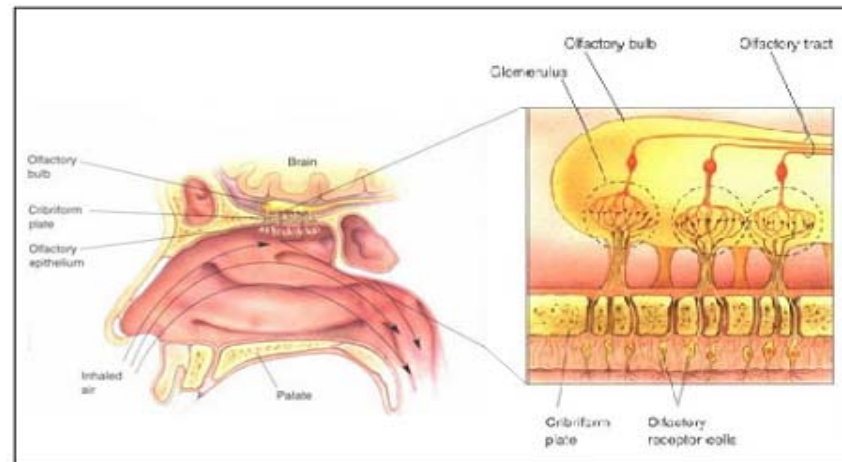
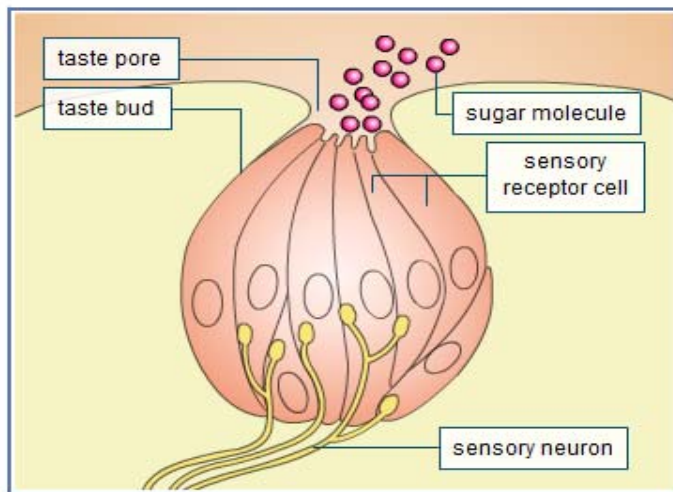
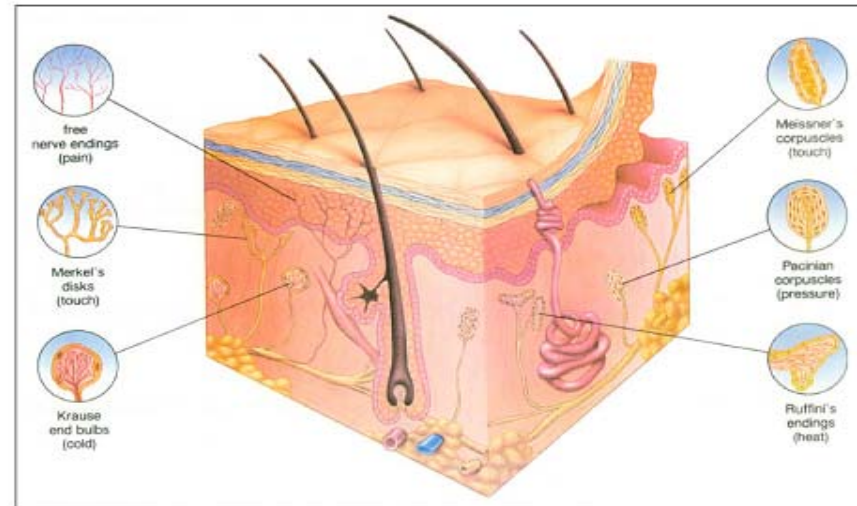
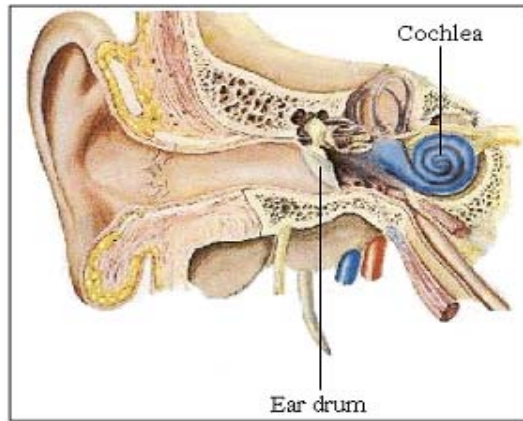
## Fundamental Features of the Human Senses

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

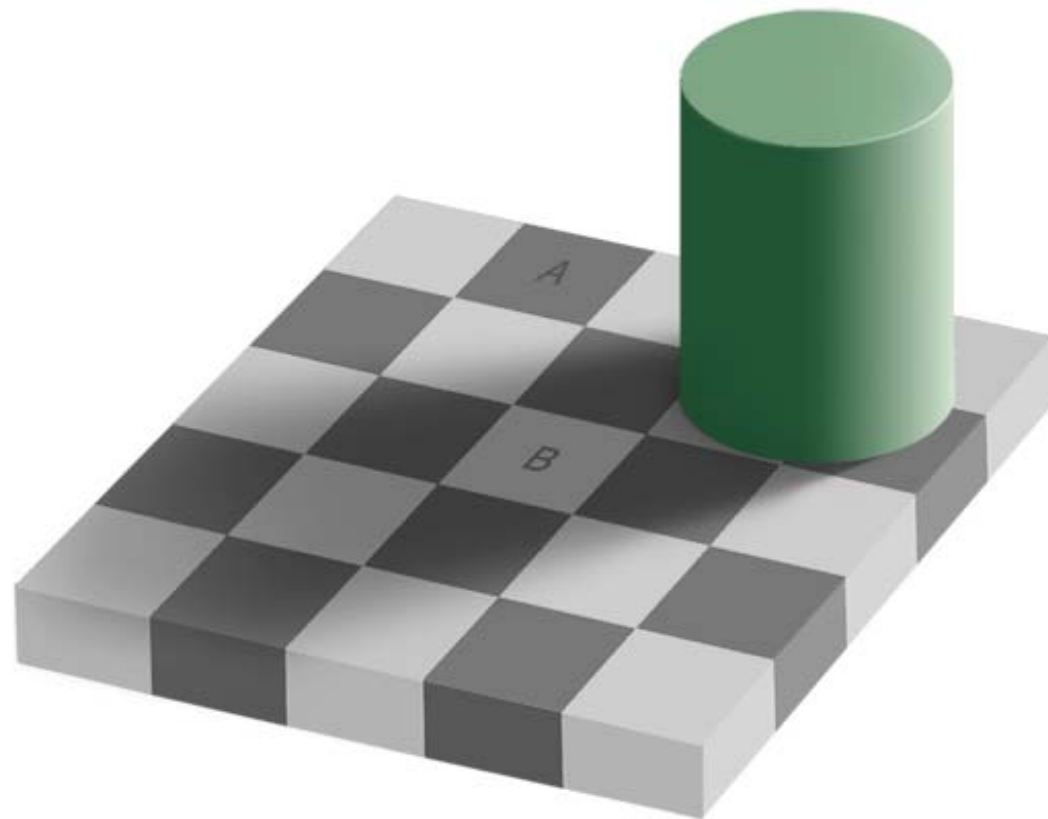






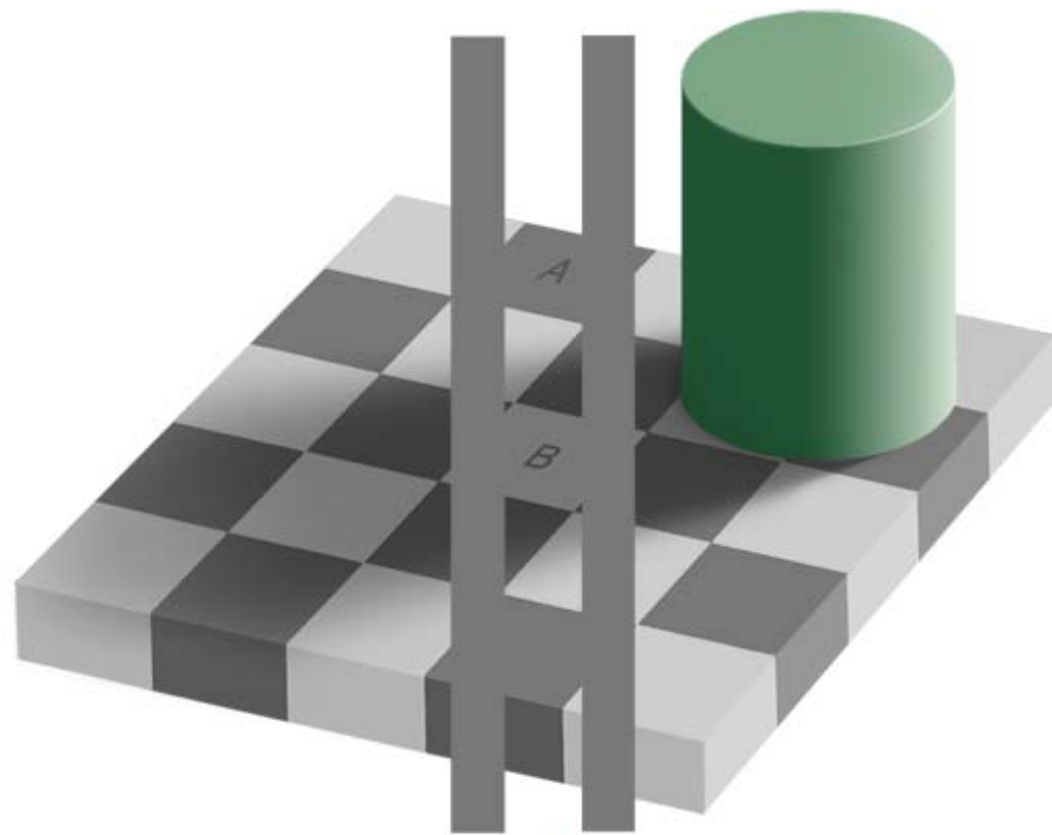




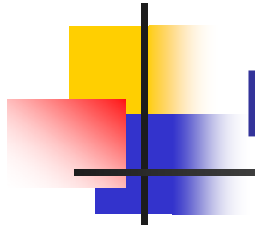


Are blocks A and B the same color?





Convinced yet?



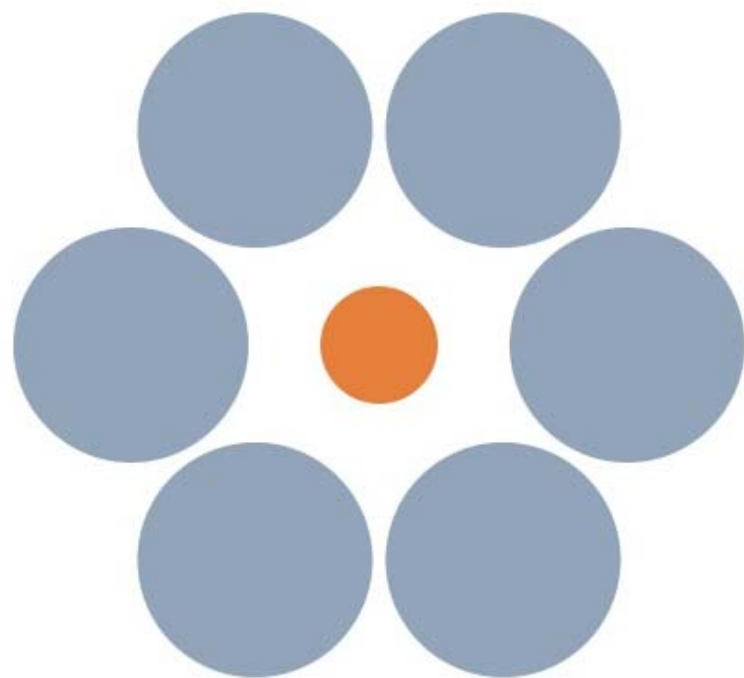
# Perception?

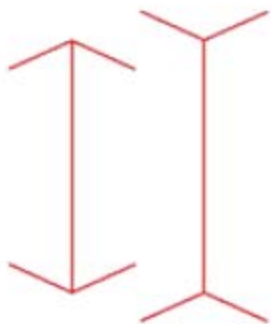
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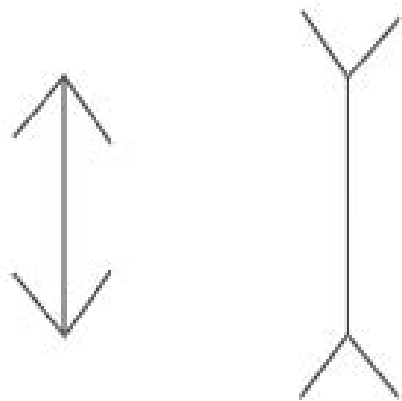
- **Contrast sensitivity**

- 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)

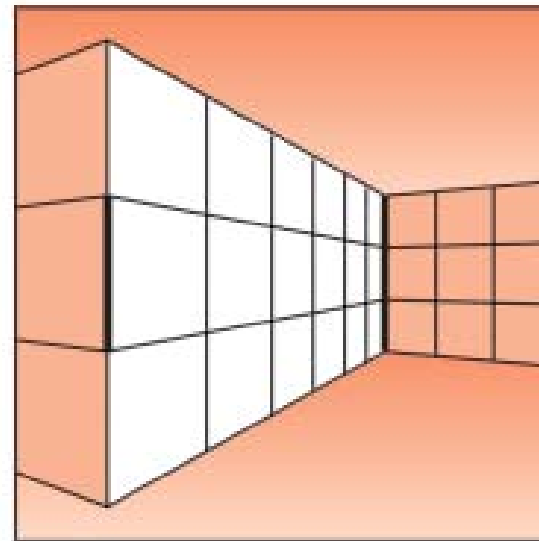








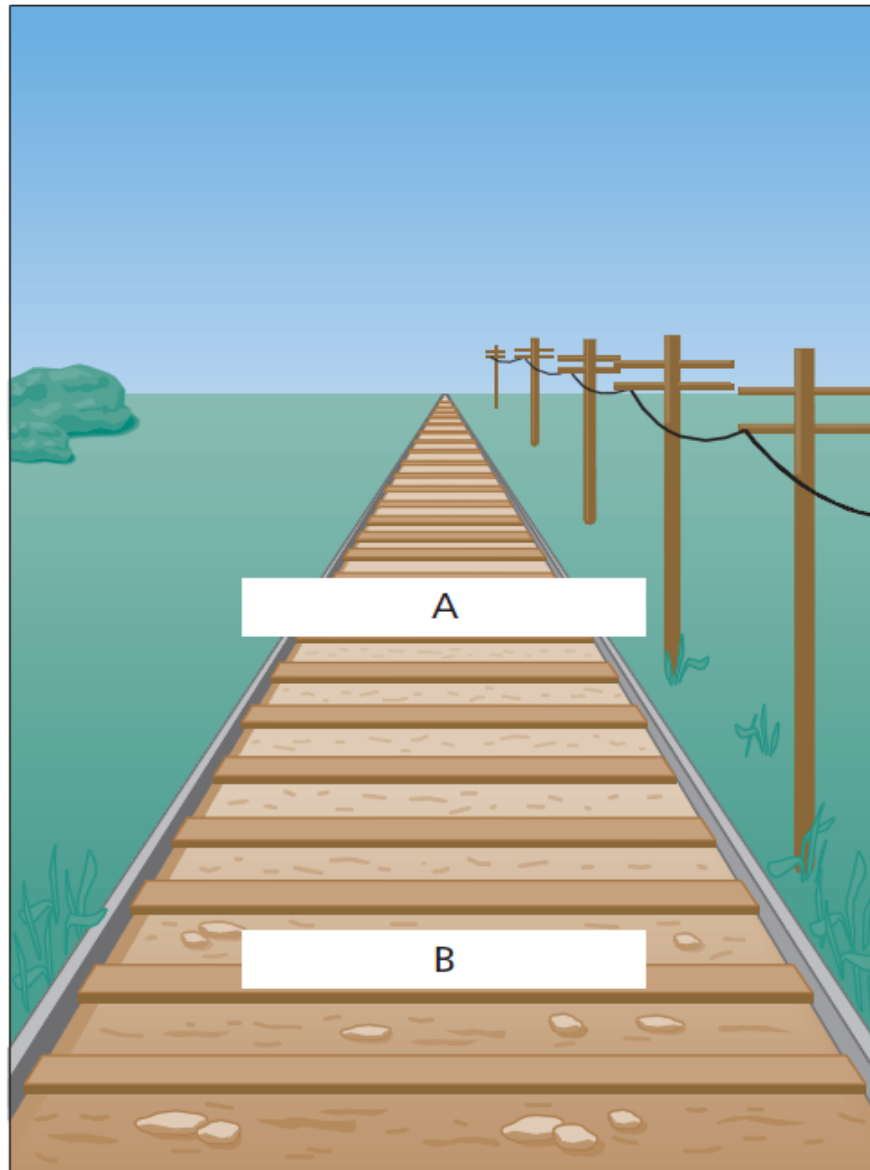
(a)



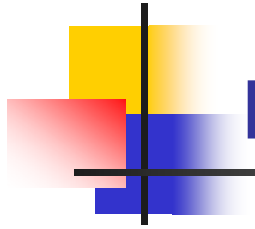
(b)

### **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.

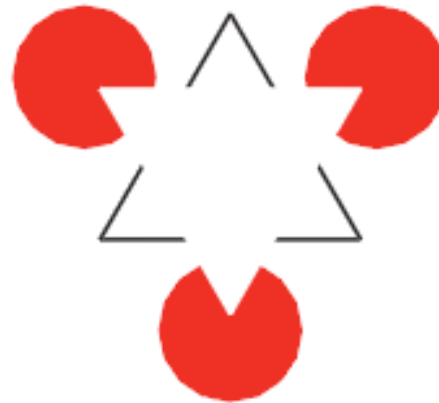


# Figure-and-Ground Perception

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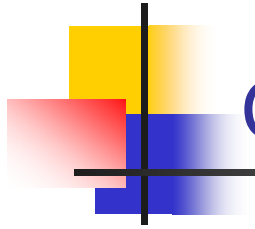


A



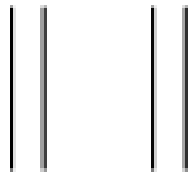
B



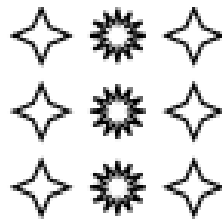


# Gestalt Laws of Perceptual Grouping

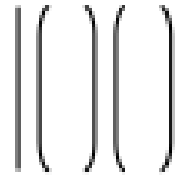
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proximity



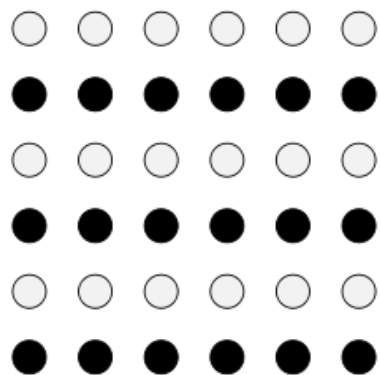
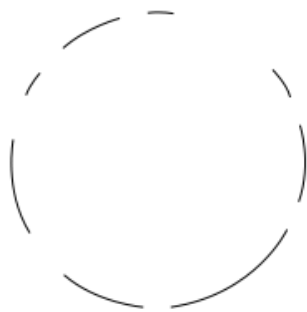
similarity



closure



continuity



Silent Hill 2



Alan Wake



Left 4 Dead



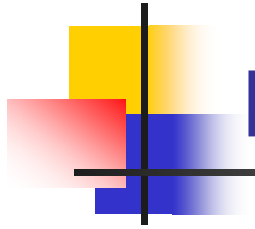
Limbo



# Perception

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

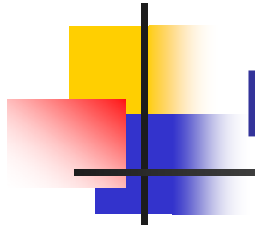


# Perception

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- Taste

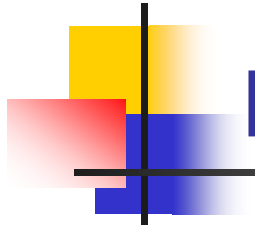
- Most humans are physiologically capable of differentiating sweet, sour, salty, bitter
- Contextual factors play a very important role
  - “Sweet breads” in Europe
  - Oxtail stew



# Perception

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



# Perception

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- Touch

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

