Left Handed Split Brain

- Case study V.J.: Gazzaniga, 1998
  - Left handed split brain patient
  - Spoke out of left hemisphere
  - Wrote out of right hemisphere
  - Writing = independent from language systems
- Frey et al. 2005
  - BOTH left handed and right handed split-brain patients use their left hemisphere when manipulating and naming tools

Learning Objectives Topics

- How are Sensation and Perception different?
- Bottom-up vs. Top-Down processing
- Bottom up Processing
  - Feature Detectors
  - Experience Dependent Plasticity
  - Recognition by Components
- Top Down Processing
  - Influence of prior knowledge
  - Perceptual Organization
    - Gestalt “Laws”
  - Motion
Does knowledge affect our perception?

- Give examples from the real world:

- How can our expectancies or prior knowledge lead us to view the world accurately at times and inaccurately at others?

- How might different people interpret the same stimulus differently?

Top Down Processing
Tox-Doxn Pxoxssxnxng

- To xllxstxatx, I cxn rxplxce xvexy txirx lextex of x sextexce xitx an x, anx yox stxll xan xanxge xo rxad xt – ix wxh sxme xifxicxltx

- Context and knowledge fills in the rest!
- The redundancy of stimuli provide more features than required

Oliva & Torralba (2007)

- Q: Does perception depend on more than just stimulation of receptors?
- Method:
  - Use same “blob” in multiple contexts
- Result:
  - Perceived as different objects due to top-down processing
Oliva & Torralba (2007)

- Conclusion:
  - Signal from object (visual system)
  - Signal from context (visual system)
  - Feedback signal: influence of knowledge (higher processing centers)
  - How does this go against the recognition-by-components theory?

Theory of perception

- Bottom-up AND top-down
- Bi-directional or connectionist model
How do we judge size?

- Depth perception
- Size on retina?
- Feedback signals – use context
- **Relative size** – size relative to other objects
- **Size constancy** – perceive objects as same size when move to different distances

How do we judge smell intensity?

Odor intensity: Tegotsoonian et al., 1978 study

- What should our DV and IV be?
- Results?
- Meaning?
- Adaptive?
How do we discriminate words?

- Perception of language
  - Speech segmentation

- https://www.youtube.com/watch?v=WakjpNgbTNo

Make sure that you know how top down vs. bottom up processing affects each of those examples.

- Size
- Smell
- Speech
Hollingworth (2005)

- **Question**
  - How does knowledge of what objects belong in a scene influence perception?
  - *Semantic regularities* (knowledge of function of objects)

- **Method**
  - Study scene 20s
  - IV: w/ or w/o target object
  - Test: Place target object in scene
    - By memory or expectation

- **Result**
  - Accurate position in both conditions
  - Prediction based on experience

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Palmer (1975) Demo

You will see a picture flash up on the right. Say what it is as fast as you can.
Which do you think was faster?

- Draw graph
- Appropriate = bread
- Inappropriate = Drum
- Misleading = Mailbox

Palmer (1975)

- **Method**
  - Present scene
  - Ss ID flashed pics
    - (a) or (b) or (c)
  - IV: type of picture
  - DV: accuracy

- **Conclusion**
  - Bottom-up perception interacts with prior knowledge (top-down) to influence response
Word recognition

- Flash stimulus
  - Word condition: FORK
  - Letter condition: K
  - Nonword condition: RFOK
- Choose letter that was presented
  - K or M
- Result:
  - Faster and more accurate when letter part of original stimulus (word condition)
  - Word superiority effect

Demonstration

- One half of the class, close your eyes
Demonstration

- Now other half, close your eyes
Demonstration

What is this? (write it down)
Rat-man demonstration

- Method:
  - Show 1 of 2 pictures (man or rat)
  - Then show ambiguous picture
  - What is it?
- Conclusion:
  - Effect of prior knowledge
  - “Priming”

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Perceptual Organization

- How do we know what is a face and what is not?
- How do we know what is going on when something is blocked?
- Gestalt Laws can help!
  - And we do this unconsciously!
- Remember: Gestalt = “whole is more than the sum of the parts”

Perceptual Organization

- “Old” view – structuralism
  - Perception involves adding up sensations
- “New” view – Gestalt psychologists
  - The mind groups patterns according to laws of perceptual organization
Principles of organization

- We make unconscious assumptions about what we perceive!
- Gestalt laws of “perceptual organization”
  - We organize our world and fill in the gaps
  - Based on what usually happens
- Laws or heuristics (“best guess”)?
  - Don’t always accurately predict what is going on
- For each of these – try to remember them. We will do an activity that requires you to know the heuristics without looking.

Gestalt Laws of Perceptual Organization

- Law of good continuation
  - Lines tend to be seen as following the smoothest path
Gestalt Laws of Perceptual Organization

- Law of good figure (simplicity or prägnanz)
  - Every stimulus pattern is seen so the resulting structure is as simple as possible

- Law of similarity
  - Similar things appear grouped together
Gestalt Laws of Perceptual Organization

- **Law of familiarity**
  - Things are more likely to form groups if the groups appear familiar or meaningful

- **Law of proximity**
  - Things near each other appear grouped together

- **Law of common fate**
  - Things moving in the same direction appear to be grouped together

https://www.youtube.com/watch?v=nuH6dIcgaoU
Other Perceptual Heuristics

- **Light-from-above heuristic**
  - Light comes from above
  - Is usually the case in the environment
  - We perceive shadows as specific information about depth and distance

- **Occlusion heuristic**
  - When object is partially covered by a smaller occluding object, the larger one is seen as continuing behind the smaller occluder
Gestalt law (or heuristics!) examples

1. Use the Gestalt laws to explain this picture.

Perceptual Organization

- Use the Gestalt laws to explain this picture.
Perception problems for computers

- Stimulus on receptors is ambiguous
  - Inverse projection problem
- Segmentation
  - Visual separation/overlap
  - Speech segmentation
- Visual or verbal noise
  - Occlusions or obscured
  - Blurred or degraded
  - Changes in shadowing (lightness/darkness)
- Human perception is different due to bottom-up AND top-down processing!

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Apparent motion/motion illusions

- Pikler-Ternus display:
  - http://michaelbach.de/ot/mot_Ternus/index.html
- “Rotating snake”
  - http://michaelbach.de/ot/mot_rotsnake/index.html
- “Freezing rotation”
  - http://michaelbach.de/ot/mot_freezeRot/index.html
- “Stepping feet”

- Apparent motion factors
  - Color, shape, perceived depth, context

Mitroff & Scholl (2005)
http://michaelbach.de/ot/mot_mib/index.html

- Method:
  - Motion-induced blindness (MIB)
  - Objects superimposed on global motion pattern
  - Change target objects during MIB
- MIB effect
  - Objects fade from awareness while looking
Mitroff & Scholl (2005)
http://michaelbach.de/ot/mot_mib/index.html

- Questions:
  - *What happens if change unseen objects?*
    - Add a bar between the dots
    - http://www.yale.edu/perception/Brian/demos/MIB-Updating.html
  - Do you have to be consciously aware for the gestalt rules of perception to apply?

Mitroff & Scholl (2005)

- Method
  - Ss press a key when experience MIB (dots disappear) and when reappear
    - Choice: simultaneous, one disk, not sure
  - IV: line changes (50% chance that connecting line changes)
Mitroff & Scholl (2005)

- Results
  - Report reappeared simultaneously if dots connected by bar, even if connection occurred during MIB
  - Object representations can be formed and updated without awareness (conscious perception)

![Graph showing simultaneous reports](image)

Both dots occurred simultaneously if connected by line after.

MIB with Grouping Cues

Result:
More likely to reenter awareness together if grouped together by gestalt principle!
Chapter 3: Perception

- Research questions
  - What are the processes responsible for perception?
  - How do we recognize objects?
  - Why is perception difficult for computers?
- Methods
  - Identify objects in pictures or read words
    - With or without “noise”
    - With or without prior information (context)
  - Indicate what you see with an illusion
- Results
  - Requires combination of bottom-up and top-down processing
  - Use (gestalt/heuristic) rules of perceptual organization
  - Experience-dependent plasticity: depends on experiences
- Future directions

Current research in perception
Presentations: Psychonomic society conference 2011&2012

- Metacontrast masking is processed before color-grapheme synesthesia
- Action-specific effects are immune to spiders
  - Perception is influenced by ability to act; examined perceptual processing of spiders (Conclusion: spiders were faster than balls)
- Picture ahead! Picture superiority in memory for road signs.
- Relative velocity and relative strength of illusory line motion
- Heuristic spatial updating across abrupt perspective changes in dynamic scenes
- Color, music and emotion
- Auditory perceptual learning through multimodal training