Perception & attention

PSY 1004 Essentials of Psychology

Hale Ögel-Balaban, PhD

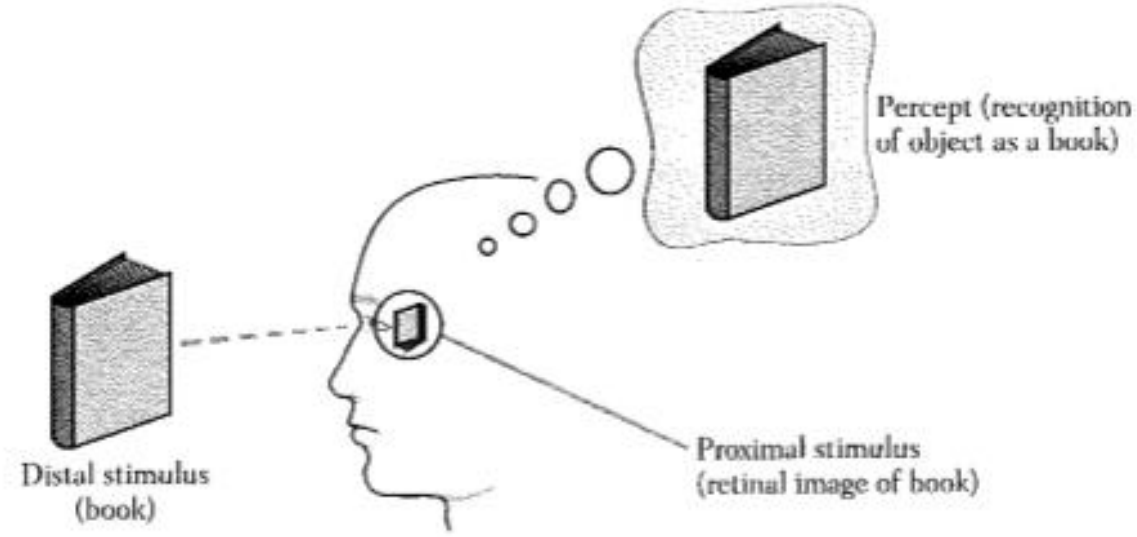
Sensation vs. perception

- Sensation: detection of physical energy by sense organs which then send information to the brain

- Perception: the brain's interpretation of the sensory input

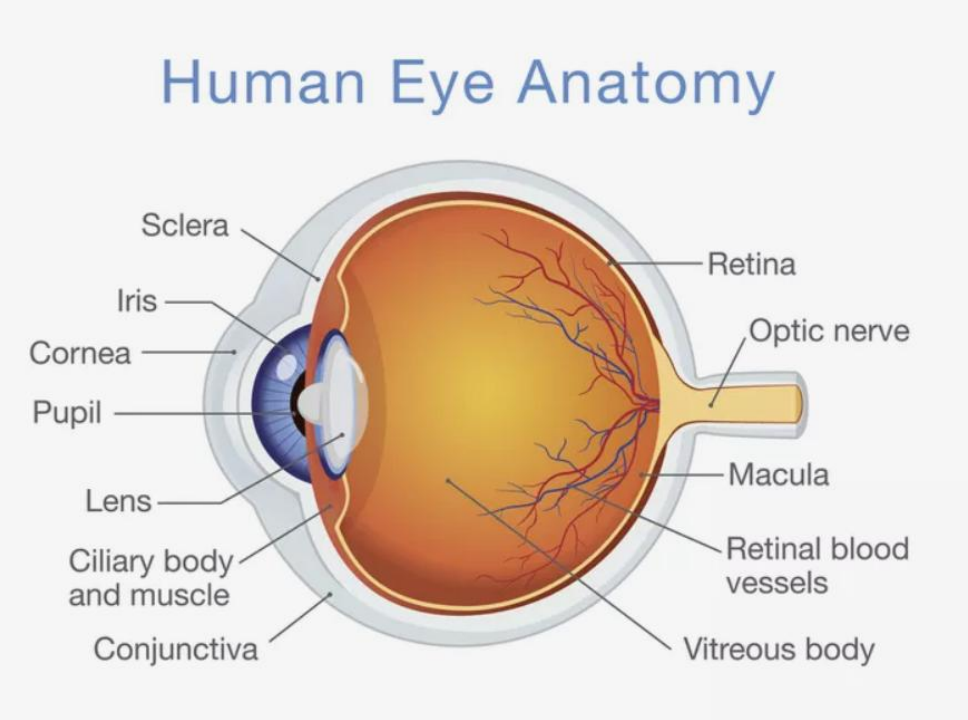
Visual perception

- Vision: dominant sense



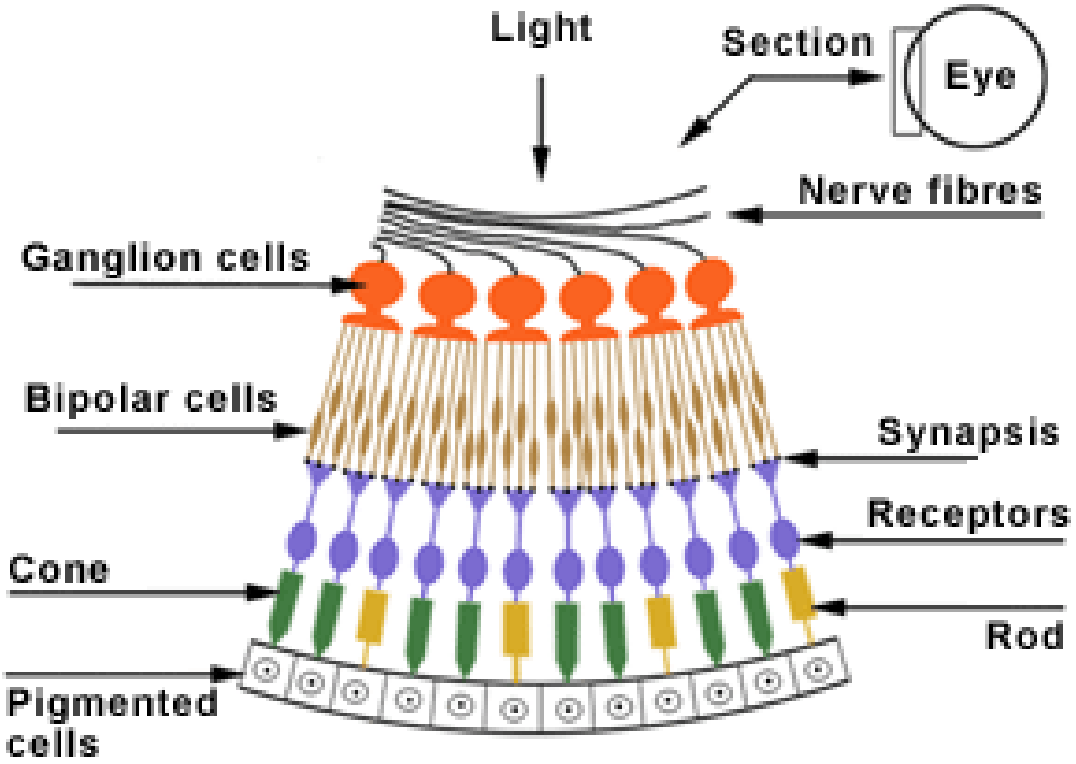
- Proximal stimulus: 2D, depends on the distance, upside down and reversed with respect to left and right
- Percept: meaningful interpretation

(Galotti, 2008, p.58)

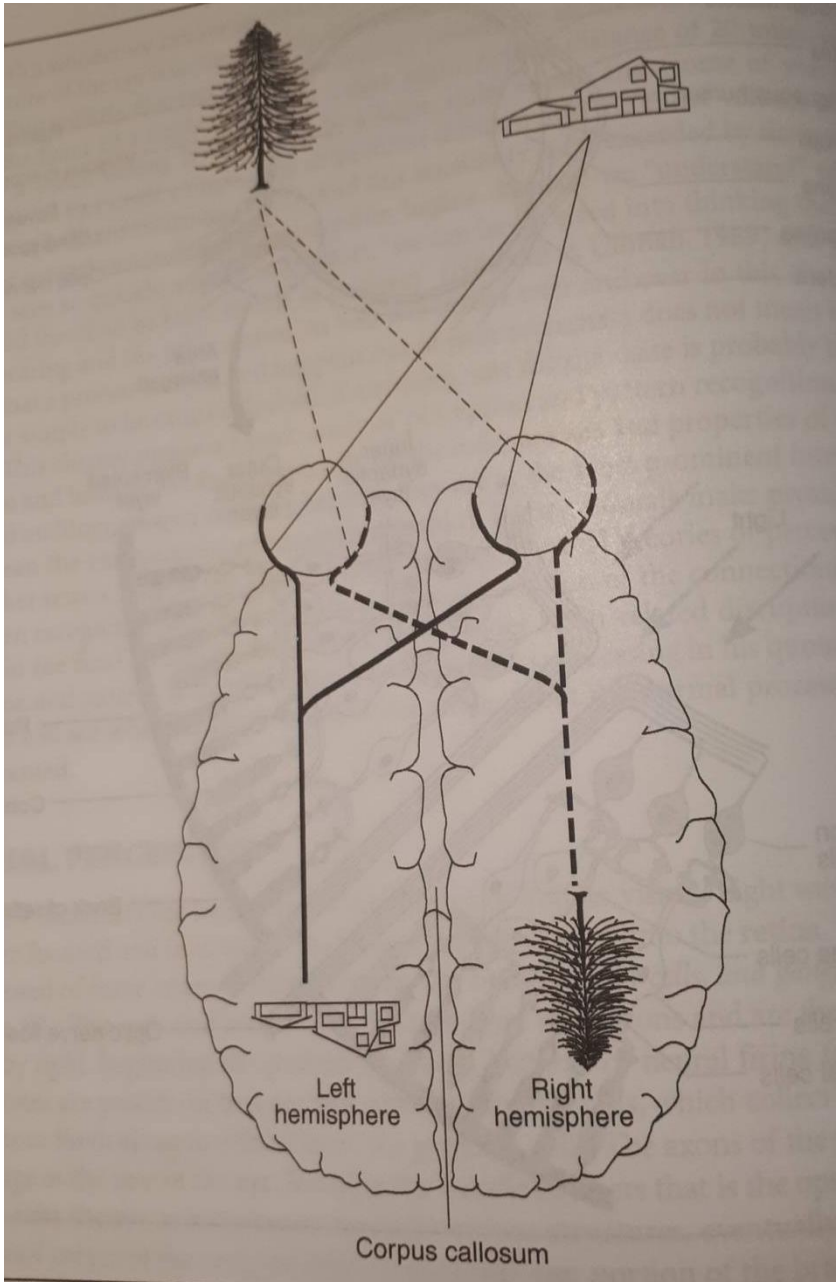


https://www.illusionsindex.org/ir/negative-afterimages

Structure of human eye

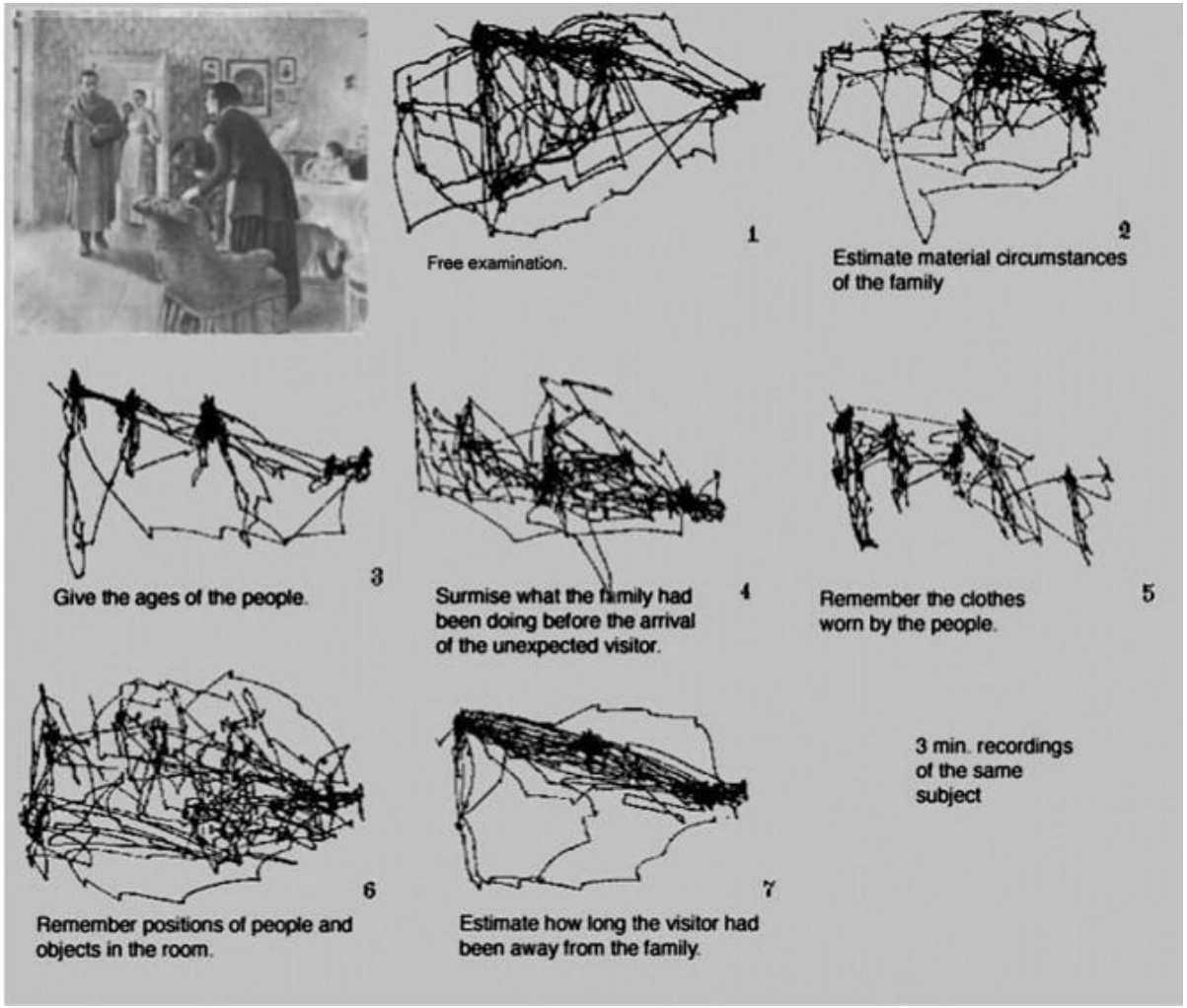


https://www.illusionsindex.org/ir/negative-afterimages



Binocular pathways of information flow from the eyes to the visual cortex

Ashcraft & Radvansky, 2014,p.86



Saccade and fixation paths of a participant looking at the photograph from Yarbus (1967)

https://www.sciencedirect.com/science/article/pii/S0042698912000922

http://serendip.brynmawr.edu/exchange/ambigfig

Visual perception

Perception depends on the stimulus input, but are not determined by it.

- Perception is in the eye of the beholder.

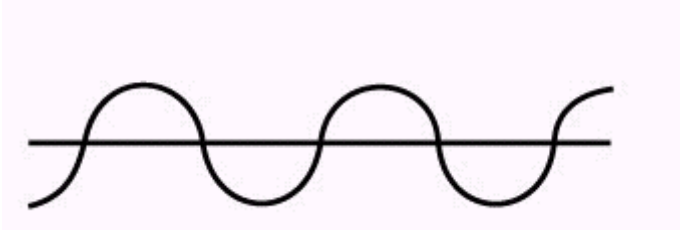
Visual perception

- Perception requires
  - perceiving the simple patterns in front of your eyes
  - organizing them
  - parsing the scene into appropriate components
    - Which parts are going together
- Gestalt principles of perceptual organization

Gestalt principles

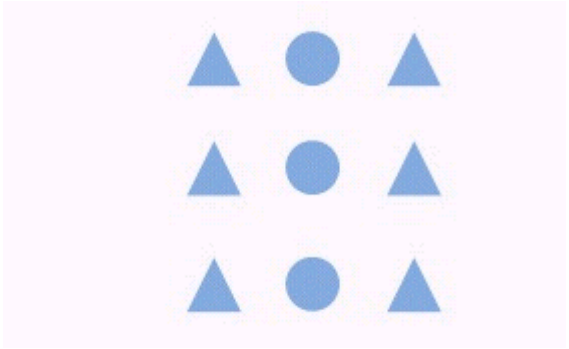
- Perceptual organization:
  - Proximity: tendency to perceive parts that are close together in time or space together.

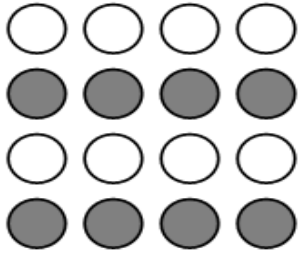
  - Continuity: tendency to connect elements in a way that makes them seem continuous or flowing in a particular direction.



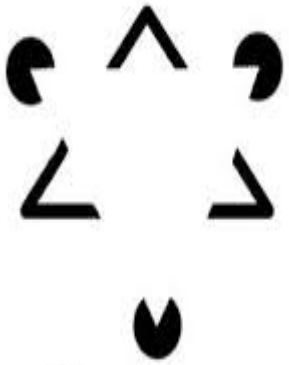
Gestalt principles

- Perceptual organization:
  - Similarity: tendency to see similar parts together as forming a group.





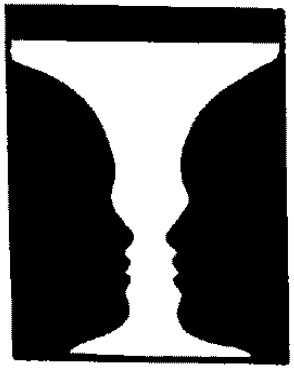
  - Closure: tendency to complete incomplete figures.



Gestalt principles

- Perceptual organization:
  - Simplicity: tendency to see a figure as being as good as possible.
    - Prägnanz; good form, i.e. symmetrical, simple and stable.

  - Figure/ground: tendency to organize perceptions into the object being looked at and the background against which it appears.

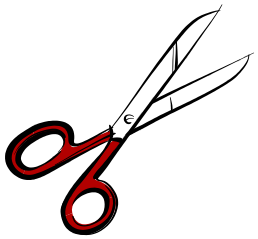


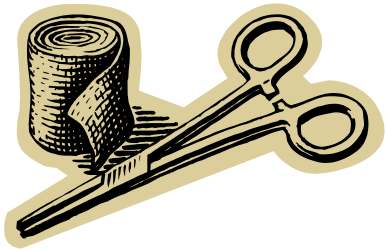
Visual perception-facts

- Ability to recognize a lot of objects

Visual perception-facts

- Perception is versatile.

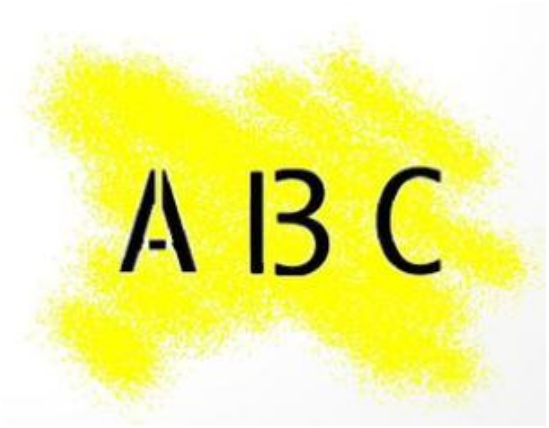




Visual perception-facts

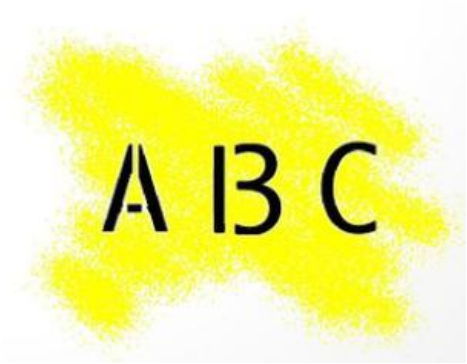
- We can recognize objects if only partial information is available or view is occluded.


12 13 14


A B C

Visual perception-facts

- Recognition of objects is influenced by the context.



Object recognition - theories

- Template Matching Theories
  - There are templates in the mind
  - Stimulus is compared with templates
  - Problems:
    - conflict with the fact that objects can be recognized in many different circumstances, under different orientations with different sizes.
    - how the templates are acquired.
    - Not fit to cognitive economy

Object recognition - theories

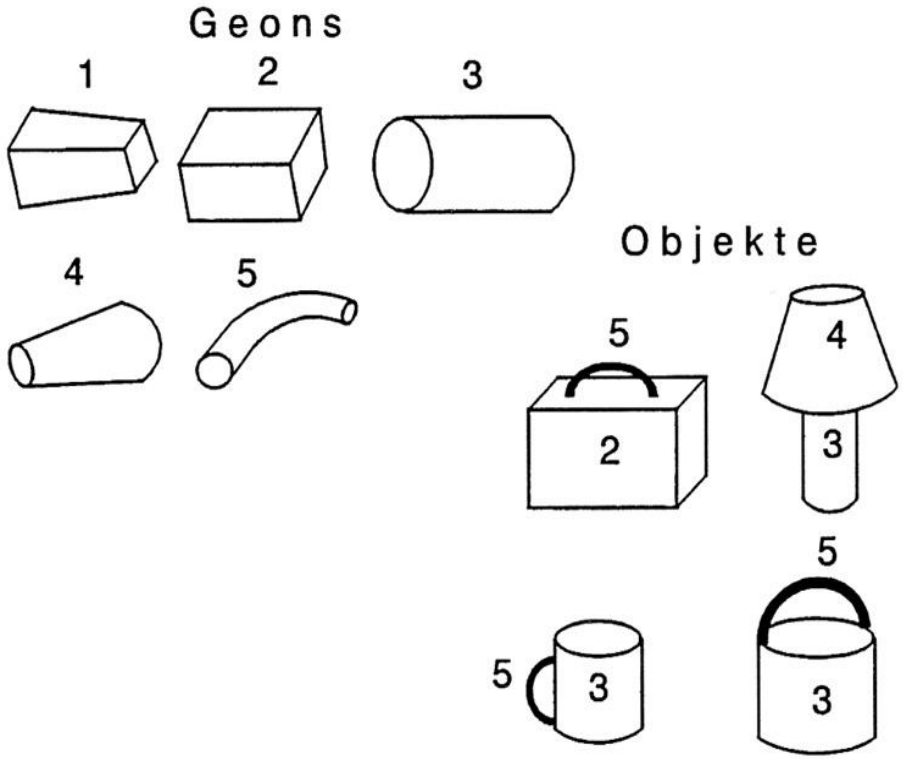
- Feature Based Theories
  - Recognition begins with the identification of features
    - vertical lines, curves or diagonals.
  - With the features appropriately catalogued, larger units are assembled.

Object recognition - theories

- Feature Based Theories
  - Advantages:
    - Features can be general purpose building blocks.
    - the possibility of a single pattern recognition system able to deal with patterns of many sorts.
    - Different variations of objects have the same features.

Object recognition - models

- Biederman's recognition by components model (RBC)
- 36 geons: the basic building blocks
- Features – Geons – Geon Assemblies – Object model

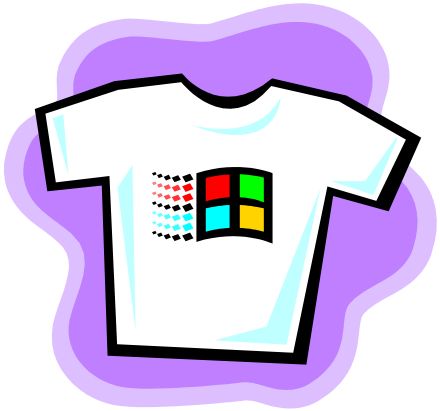


Object recognition - models

- Biederman's recognition by components model (RBC)
- Geons can be identified from any angle of view
  - view-point independent perception of objects
- most objects can be recognized from just a few geons.
  - Partial view of objects

Object recognition- faces

- Is face recognition different than object recognition?

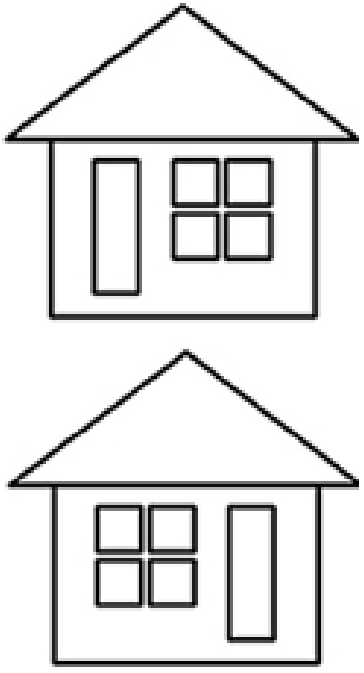


Object recognition- faces

- Is face recognition special?
- Neuropsychological evidence:
  - Prosopagnosia (inability to recognize faces, but not other objects)

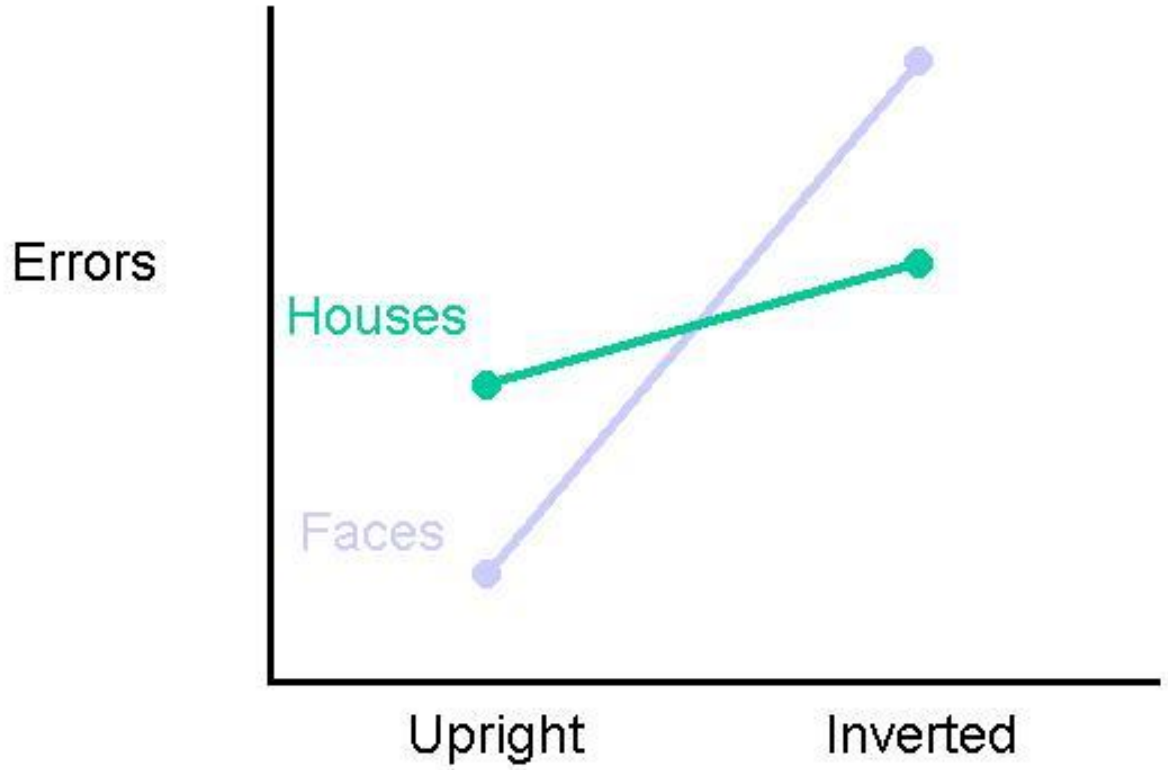
Object recognition- faces

- Is face recognition special?
- Experimental evidence:
  - Face recognition is better than object recognition.



Houses

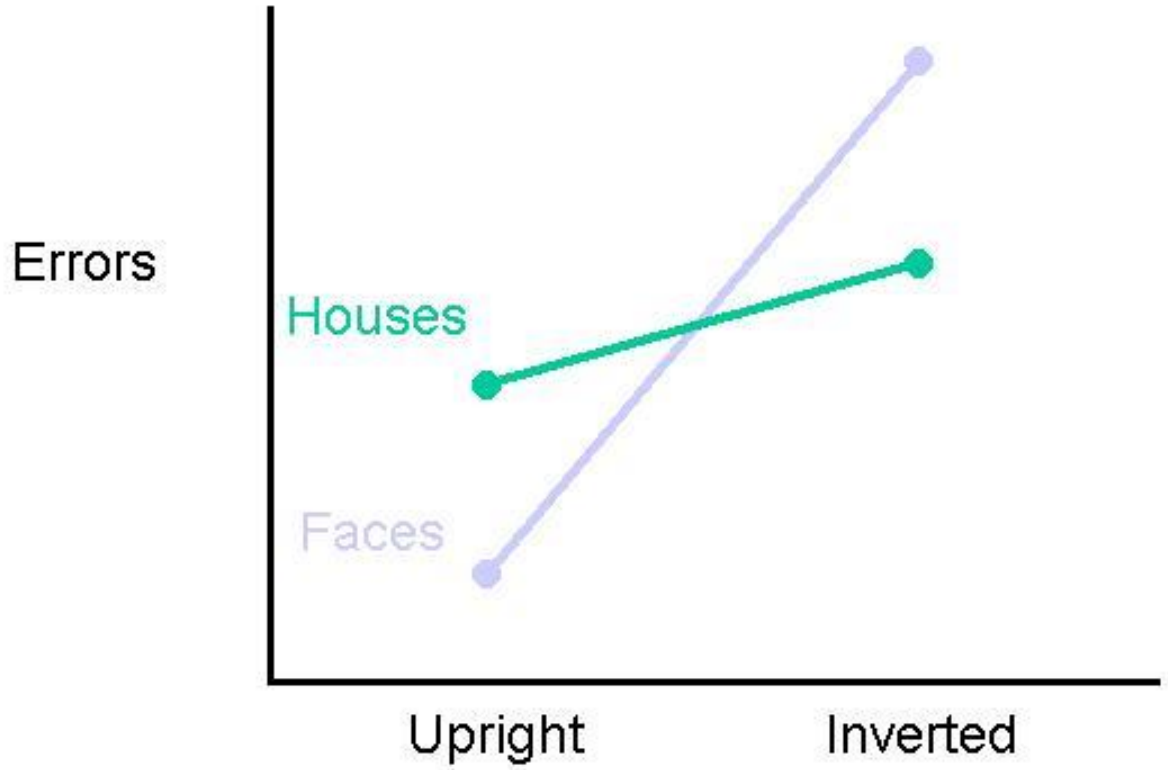
Face Inversion Effect (Yin,1969)



Object recognition- faces

- Is face recognition special?
- Experimental evidence:
  - Face recognition is better than object recognition.
  - Face inversion effect

Face Inversion Effect (Yin,1969)



Object recognition- faces

- Is face recognition special?
  - Configurations (spatial relations between features) are important in face recognition.
  - because of expertise
    - a farmer who lost his ability to recognize faces and cows;
    - a birdwatcher who lost the ability to discriminate between faces and birds
    - dog experts showing the face inversion effect for faces of dogs

Visual perception-summary

- two distinct pattern-recognition systems:
  - recognition of simple parts
  - recognition of larger configurations
- humans have a specialized recognition system for recognition of specific individuals within any highly familiar category.
- Wholistic recognition is most likely when
  1. Exemplars of the category share the same degree of visual complexity and structural similarity (as faces)
  2. Fast, accurate, and specific (expert) recognition of these objects is required.

- Card Trick video

  https://www.youtube.com/watch?v=voAntzB7EwE

- Perceptual Blindness
  - Card Trick

    https://www.youtube.com/watch?v=voAntzB7EwE

➔ Conscious perception requires more than merely having a stimulus in front of our eyes. It requires attention.

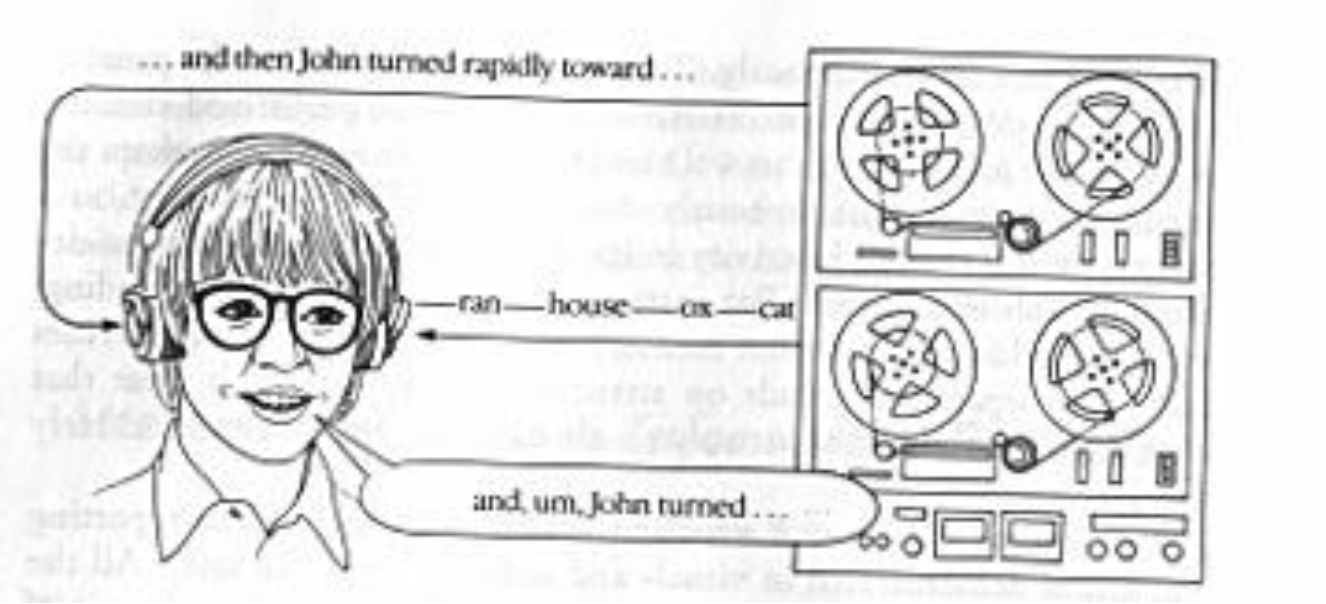
ATTENTION

"Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state which in French is called distraction" (James, 1890, p.403-404).

- Attention: the process that, at a given moment, enhances some information and inhibits other information.
  - Selecting some information for further processing
  - Setting some information aside.

SELECTIVE ATTENTION

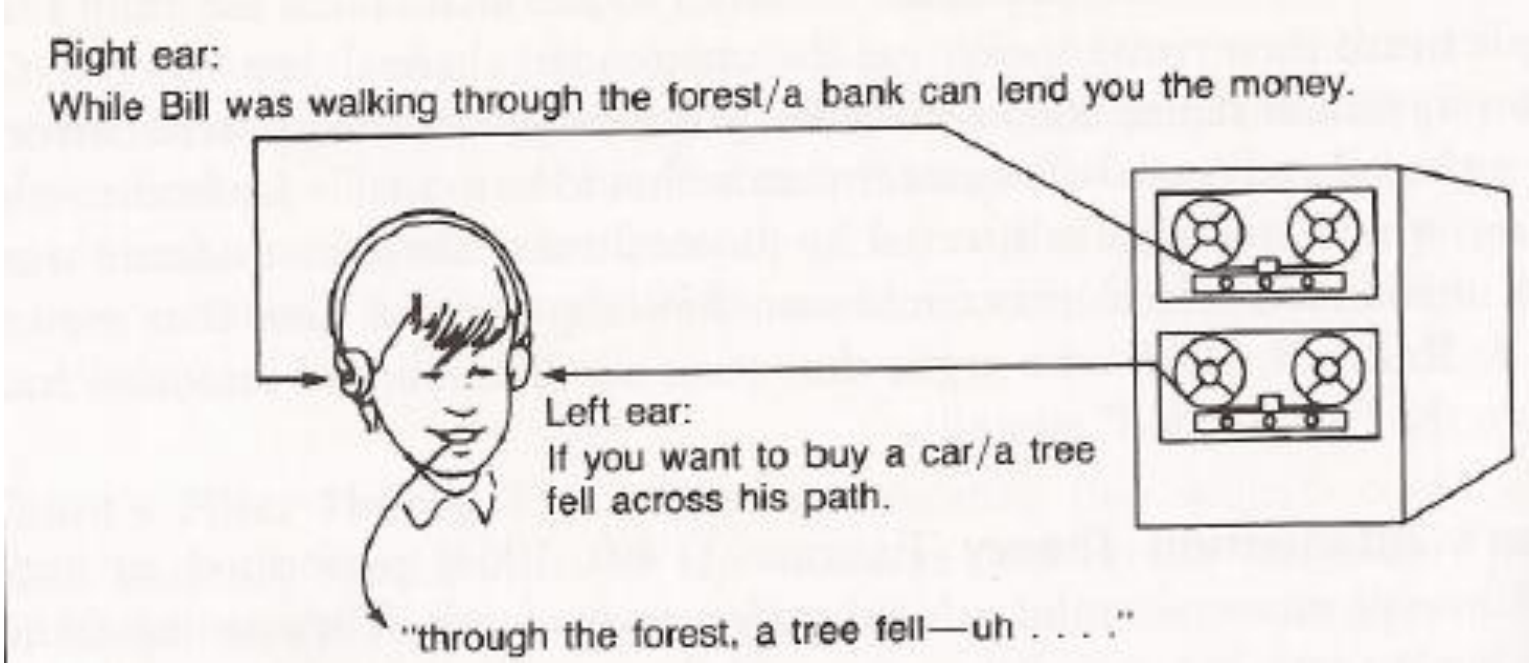
- Dichotic Listening Task (Cherry, 1953)
  - Hear two messages at the same time
  - Shadow one of the messages
  - Ignore the other message



SELECTIVE ATTENTION

- Dichotic Listening Task (Cherry, 1953)
  - What happens to unattended message?
    - Physical attributes:
      - human speech, musical instruments or silence.
      - Gender of the speaker
      - high or low voice – loud or soft voice
    - Semantic content
      - what the unattended message is about
      - Coherent message versus random words
      - Repeated words
      - But the name of the participant?

SELECTIVE ATTENTION



(Ashcraft, 2006, p.142)

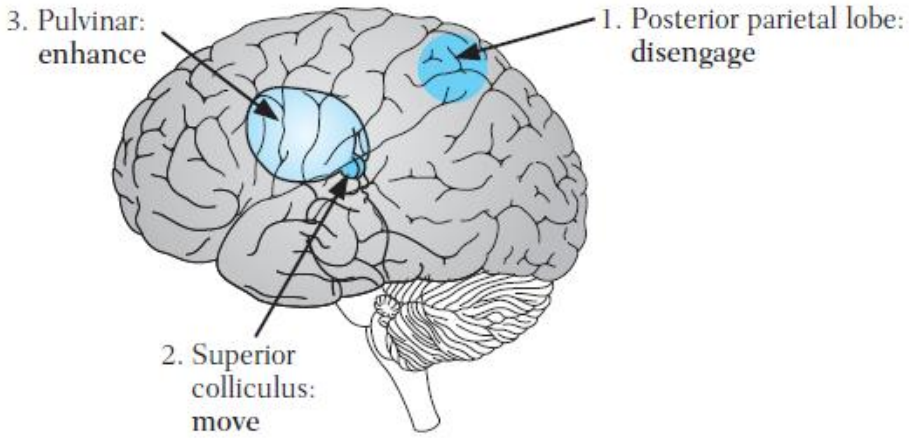
SELECTIVE ATTENTION

- Norman's Pertinence Model (1968)
  - attention is determined by the combination of
    - sensory activation (salient from a sensory standpoint) and
    - pertinence (momentary importance of information caused by permanent or transitory factors)
  - Selective attention is a continuous process, on a moment-by-moment basis.

ATTENTION

- Neurological network
  - Posner & Raichle (1994) claimed a network consisting of 3 operations and related brain regions:
  - *disengage attention*

from wherever it was previously directed.



- *move/orient attention*

the new to-be-attended stimulus

- *enhancement of the stimulus*

presented at the to-be-attended location

DIVIDED ATTENTION

- Doing multiple things at the same time.
- Sometimes it is easy, sometimes not
  - Sum of the task demands must be within the cognitive budget / limit
  - if not, performance on one of the tasks suffers

DIVIDED ATTENTION

- Doing multiple things at the same time.

- Similarity
  - Walking and chewing gum
  - Talking to your friend and texting

  ➔ task-specific resources

- Similarity is not the only factor.
  - Driving car and talking on the phone

  ➔ general resources

  - tasks interfere with each other if their combined demand for a resource is greater than the amount available, so the demand exceeds the supply.

PRACTICE

- practice makes divided attention easier
  - As a task becomes more practiced, it requires fewer resources or less frequent use of resources.
- practice makes performance better
  - With practice, resource demand of some components decreases and this makes resources available for other components
- Practice make processes automatic

- Say the words

Say the words

PURPLE	ORANGE	BLUE
BLUE	RED	PURPLE
BLACK	GREEN	YELLOW
GREEN	BLUE	RED
ORANGE	YELLOW	GREEN

- Name the COLOR of the words

Name the COLOR of the words

Practice

- Automatic processes
  - Advantages:
    - Automatic processes free resources for other tasks.
  - Disadvantages
    - But they are out of the control of the mind.
    - this might lead to problems.
      - For example: Stroop interference
        - mistakes, because word-recognition/number recognition is well-practiced and automatic.

For questions:

hale.ogelbalaban@eas.bau.edu.tr