

## Psychology 101

Action – Perception – Cognition

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### Action-perception coupling

« Classical » psychology (cognitivist approach)  
Perception  $\Leftrightarrow$  Cognition  $\Leftrightarrow$  Action

Coupling between action and perception

Action for perception

Move head to perceive depth

Manipulate object to perceive its shape

Perception for action

Adjust arm and hand motion to grasp an object

### Ecological theory of perception - J.J. Gibson

Co-evolution between the animal  
and its environment

Direct perception

« Information pick up »

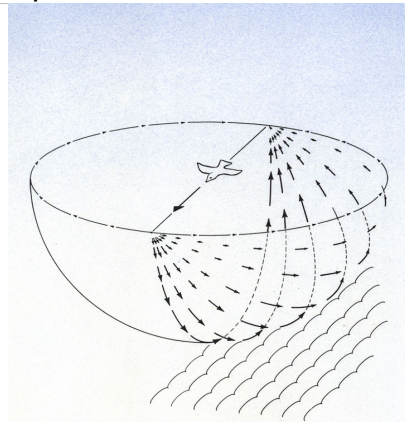
Visual perception

Perception of optical flow

Extract invariants

Example :

direction of motion =  
fixed point in the optical flow



### Sight

Visual field is about 180°

Focus of attention

Visual acuity: 0.04mm at 50cm

Peripheral perception

Less sensitive to colors,  
More sensitive to motion

Perception of color, motion, depth

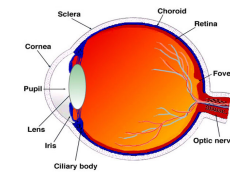
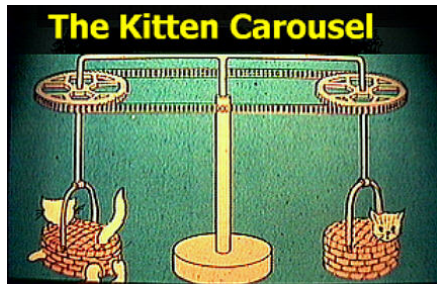


Fig. 4. Vertical sagittal section of the adult human eye.

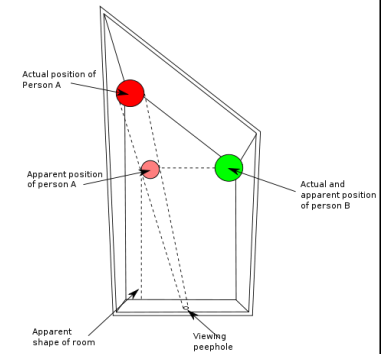
### Held & Hein (1963) Kitten Carousel

The role of experience in perceptual-motor development



Self-produced movement and concurrent visual feedback are essential for the development of visually guided behavior

### Depth illusion: Ames room



### Hearing

Very large sensitivity range

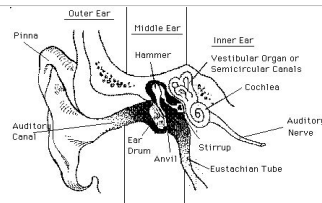
Hearing without listening  
« Cocktail-party » effect

Masking effects

- Distance between sources
- Distance between peak frequencies

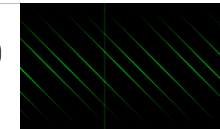
Localizing a source

- Correlation with visual localisation

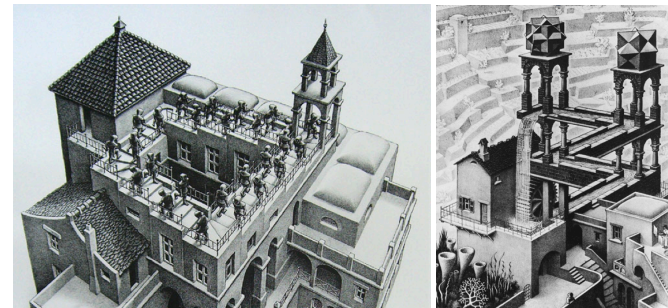


### Auditory illusion: Shepard-Risset tones

A sound that (seems to) always go down



Audio equivalent to Escher's stairs or fountain

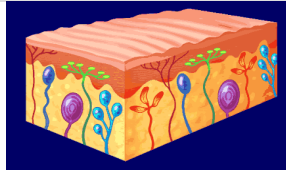


## Touch

Touch: 6 types of sensors

Hot, Cold, Pain

Pressure, Touch (2 sensitivities)



Proprioception

Configuration of one's body in space,  
used to perceive, e.g., the shape of an object

Kinesthesia

Tension of one's muscles,  
used to assess the weight or resistance of an object

## Motor system

Controlling a gesture: target pointing

Fitts' law

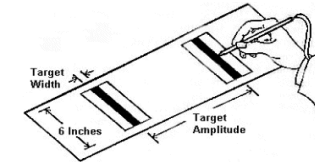
$$MT = a + b \log(1 + D/W)$$

MT, movement time

D, distance to target

W, width of target

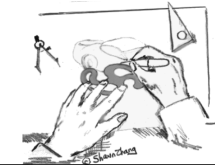
a, b, empirically determined constants



Bi-manual control (Guiard)

Non dominant hand: sets the context

Dominant hand: acts within that context



## Memory and learning

Short-term memory

Working memory

Low capacity ( $7 \pm 2$ )

Short-lived (10-30s)

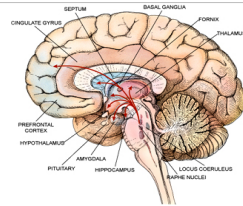
Long-term memory

Infinite capacity

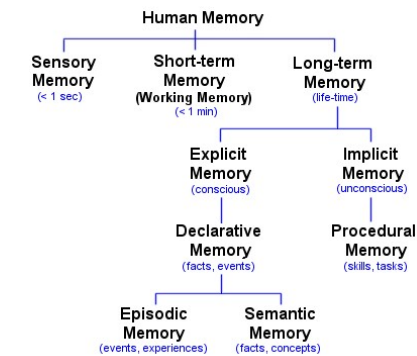
Unlimited duration

Associative access

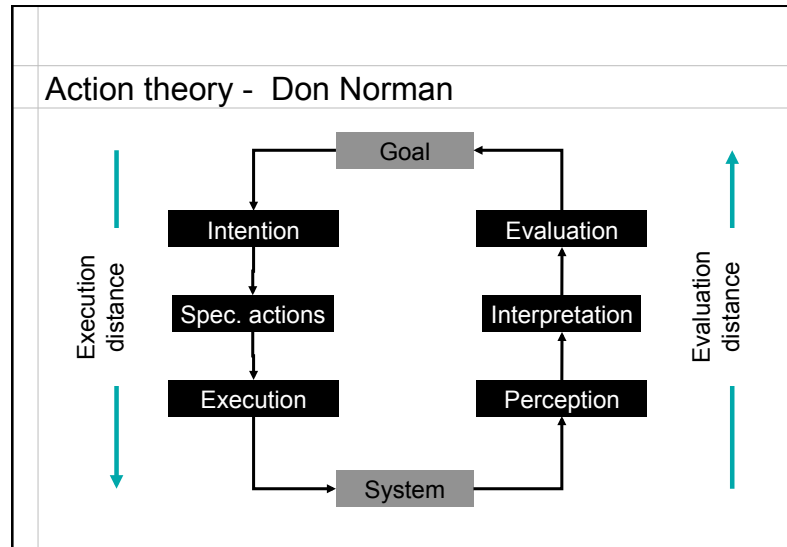
Repetition reinforces memory and learning



## Different types of memory



<http://www.human-memory.net/types.html>



### Plans and Situated Action (Suchman)

Humans do not always act according to a pre-made plan

Action is *situated*  
 The plan is revised / adapted according to the local situation

Example: empty printer

- add paper
- print to another printer
- give up printing

