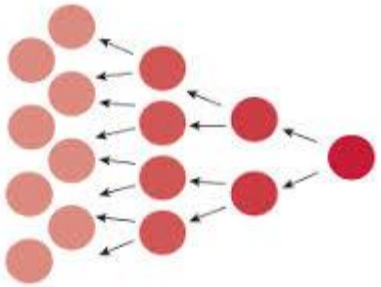
# Development of the Cognition

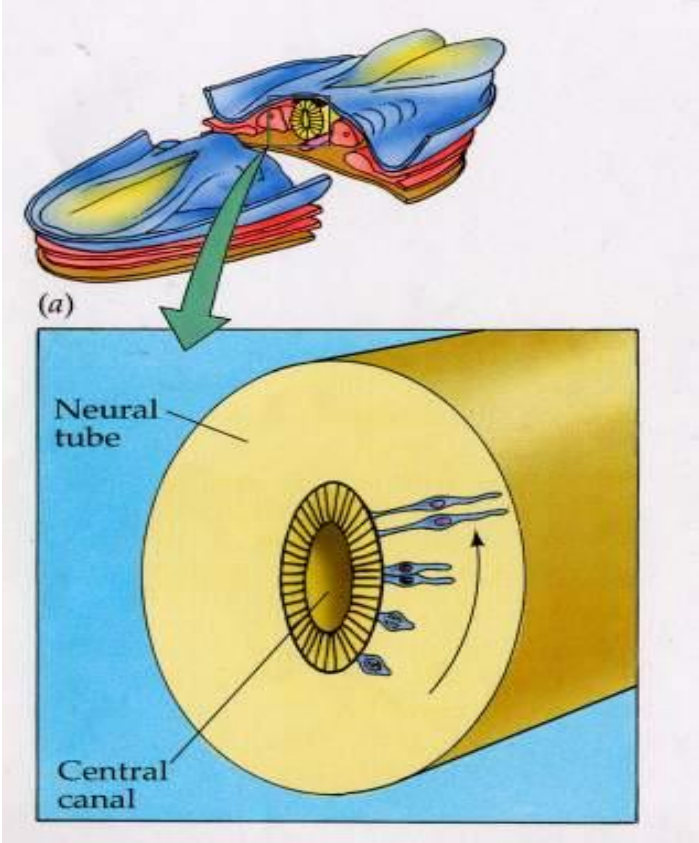
## (The role of brain organization)

**Meysam. Mohammadi**
**Neuroscientist**

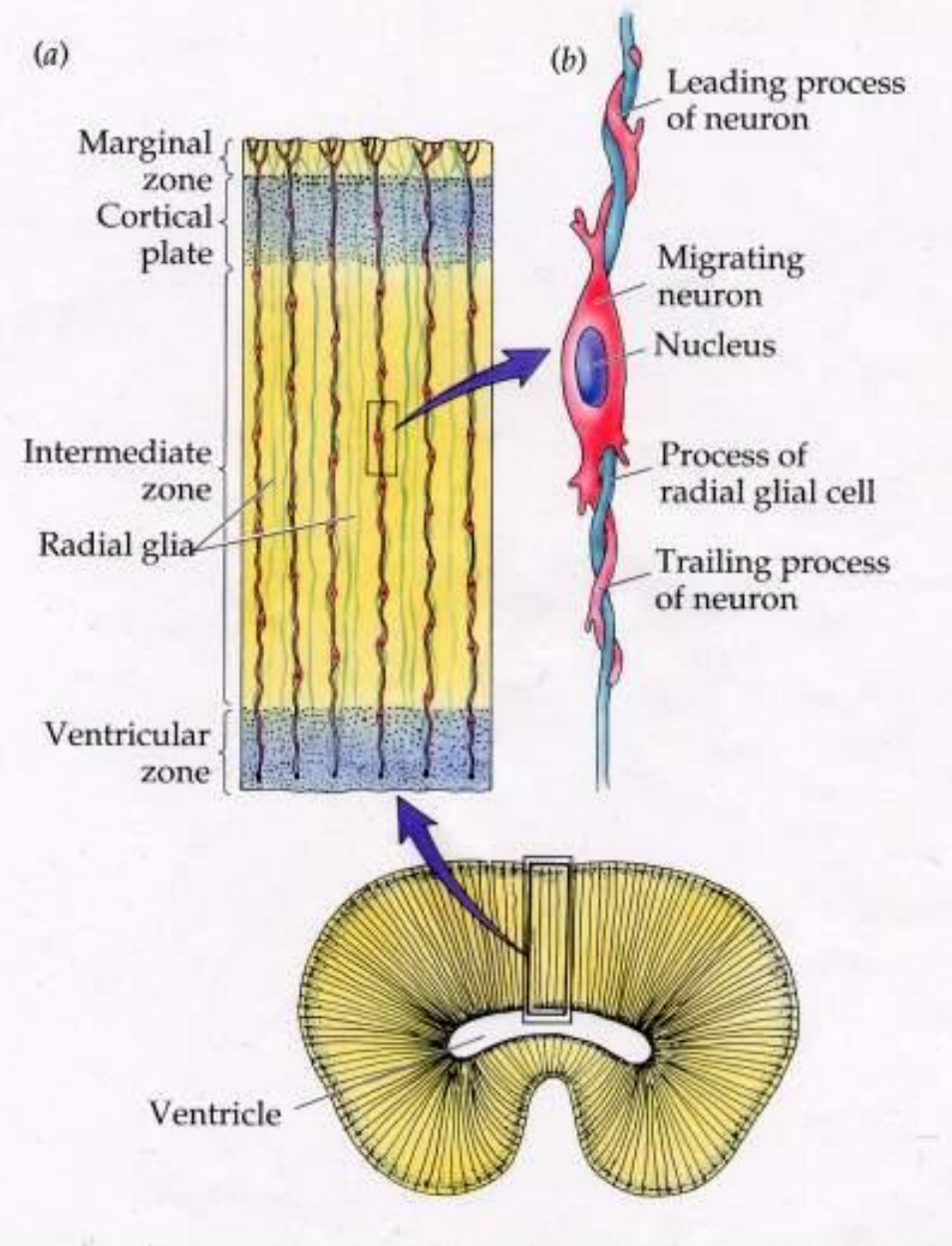
## ☐Proliferation

Generation of new cells





# Migration

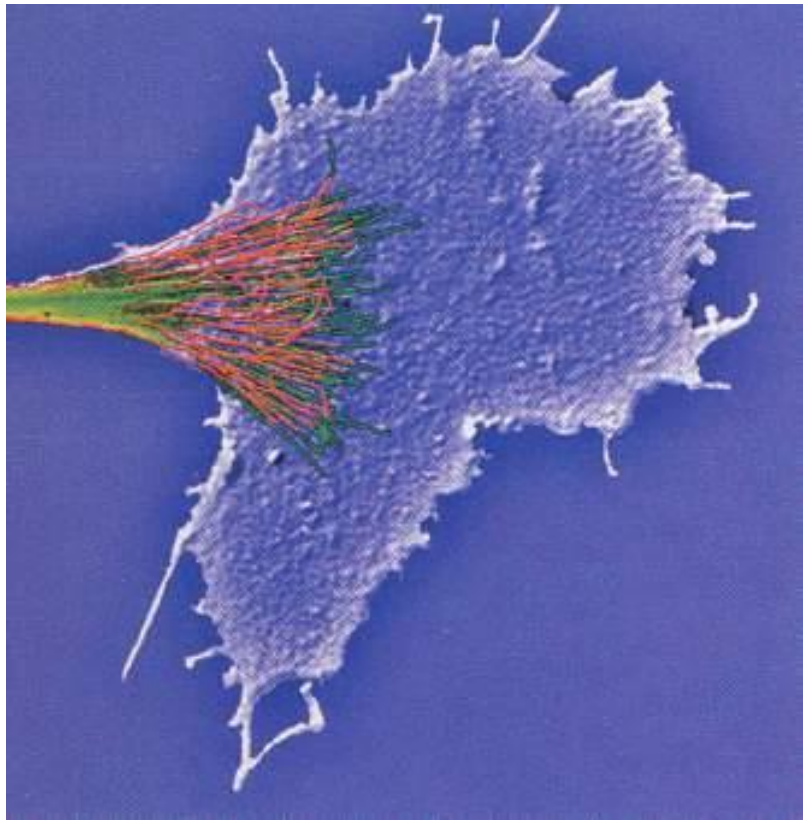



Radial glial cells act as guide wires for the migration of neurons

Migrating cells are immature, lacking dendrites

Cells that are done migrating align themselves with others cells and form structures

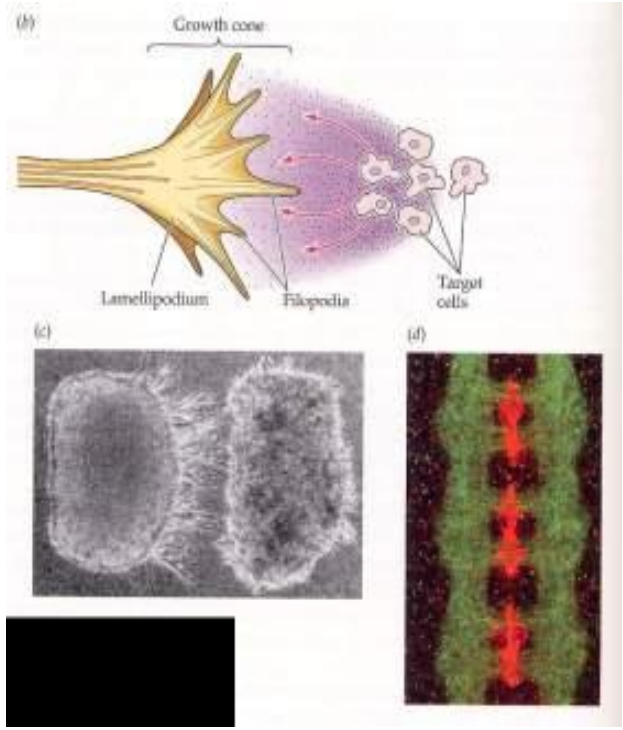
# Growth Cones: tips of axons on migrating, immature neurons



Growth cones crawl forward as they elaborate the axons training behind them. Their extension is controlled by chemical cues in their outside environment that ultimately direct them toward their appropriate targets.

# Axon Growth/Synaptogenesis

☐Axons (with growth cones on end) and dendrites form a synapse with other neurons or tissue (e.g. muscle)



# Synaptogenesis

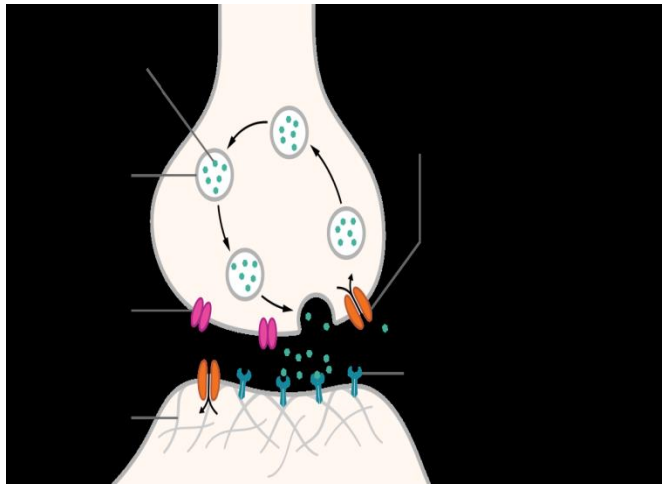
- Formation of new synapses
- Depends on the presence of glial cells – especially astrocytes
- Chemical signal exchange between pre- and postsynaptic neurons is needed

# Neuronal pruning

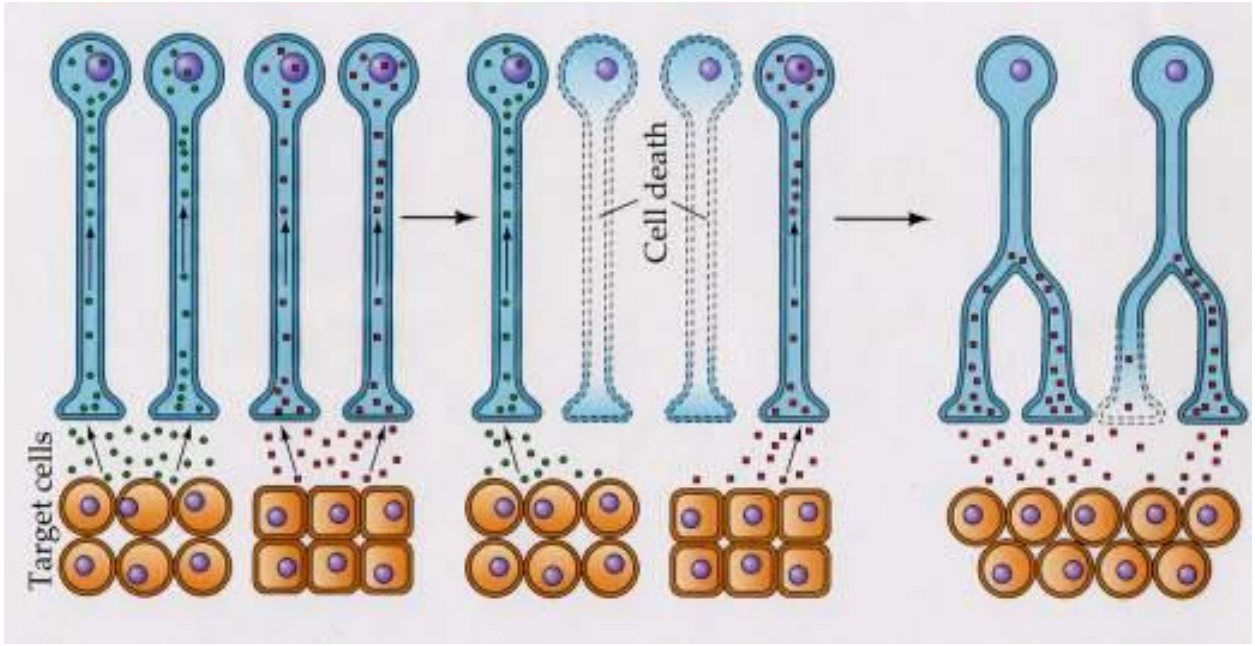
- Between 40-75% neurons made, will die after migration – death is normal and necessary !!

- Neurons die due to failure to compete for chemicals provided by targets

- Neurotrophins
  - promote growth and survival
  - guide axons
  - stimulate synaptogenesis



# Synaptic rearrangment

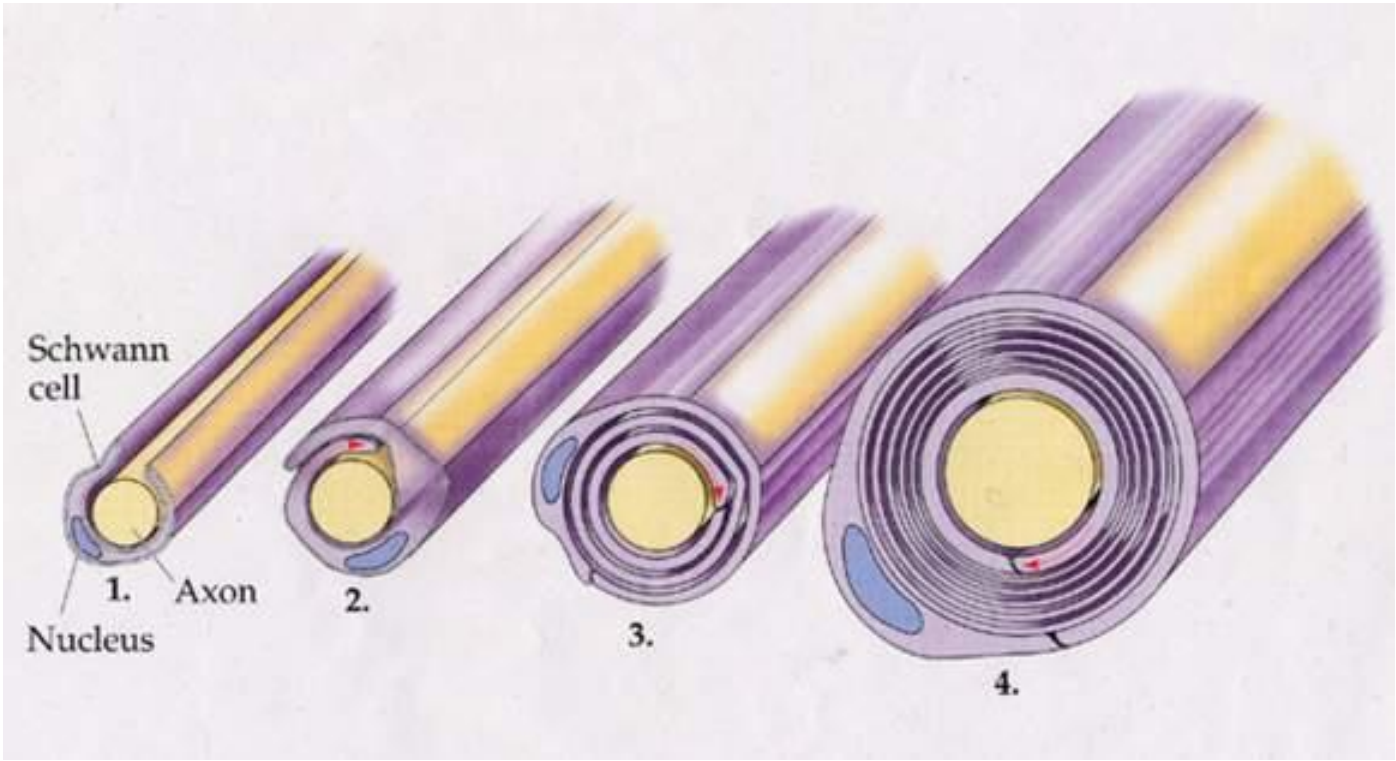



Release and uptake of neurotrophic factors

Neurons receiving insufficient neurotropic factor die

Axonal processes compete for limited neurotrophic factor

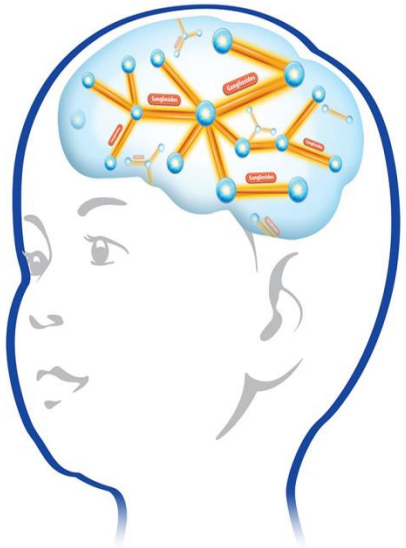
# Myelination

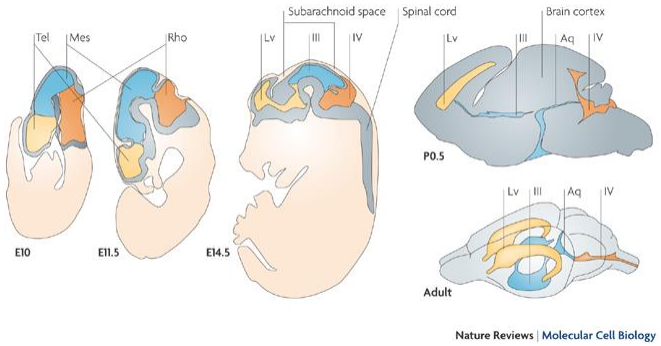


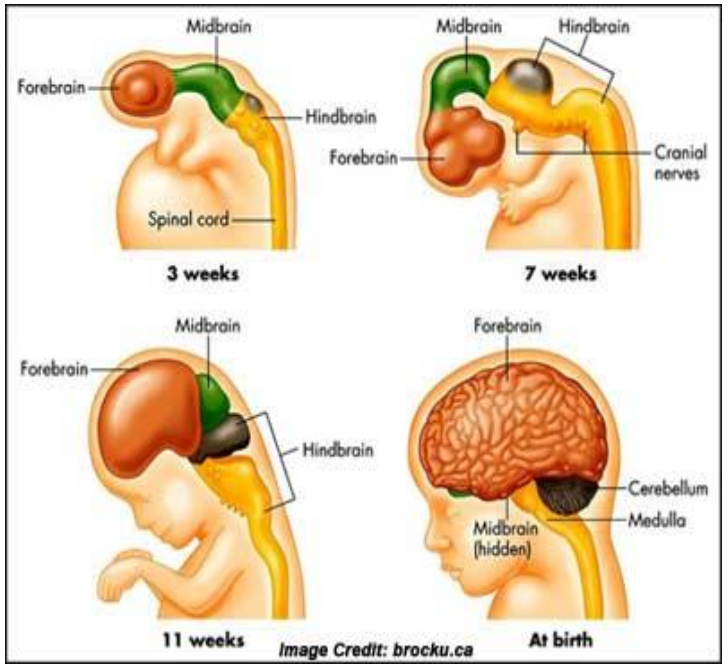

Time after synaptogenesis

# Brain Development

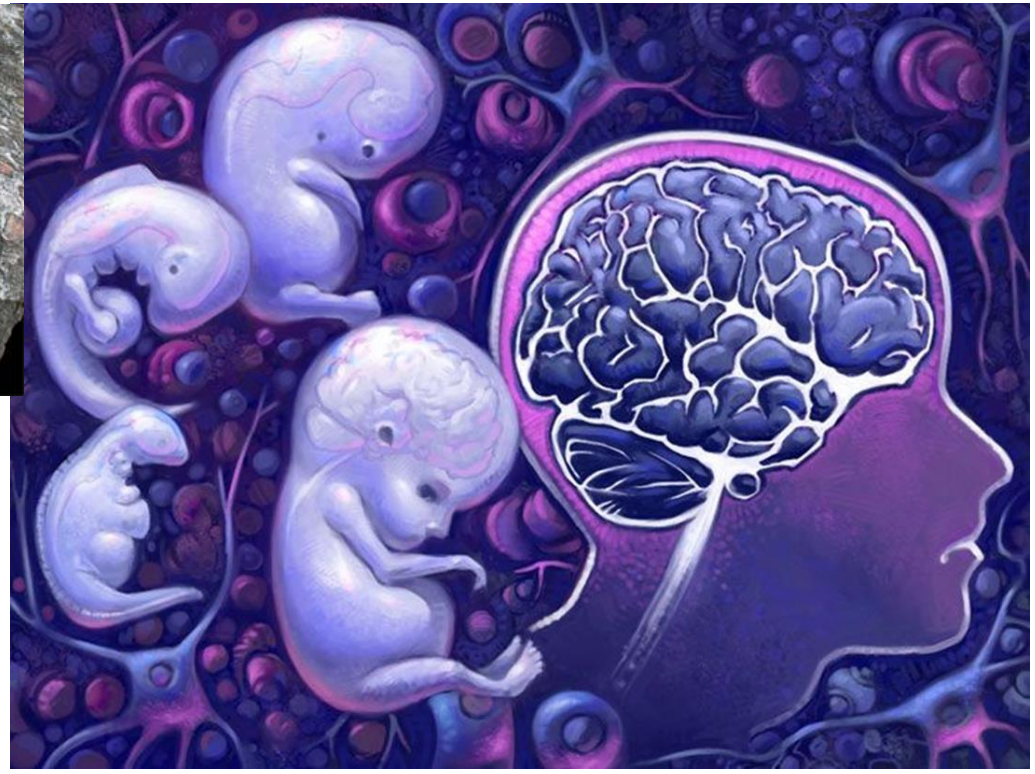
- Pathologic states
- Exceptional States





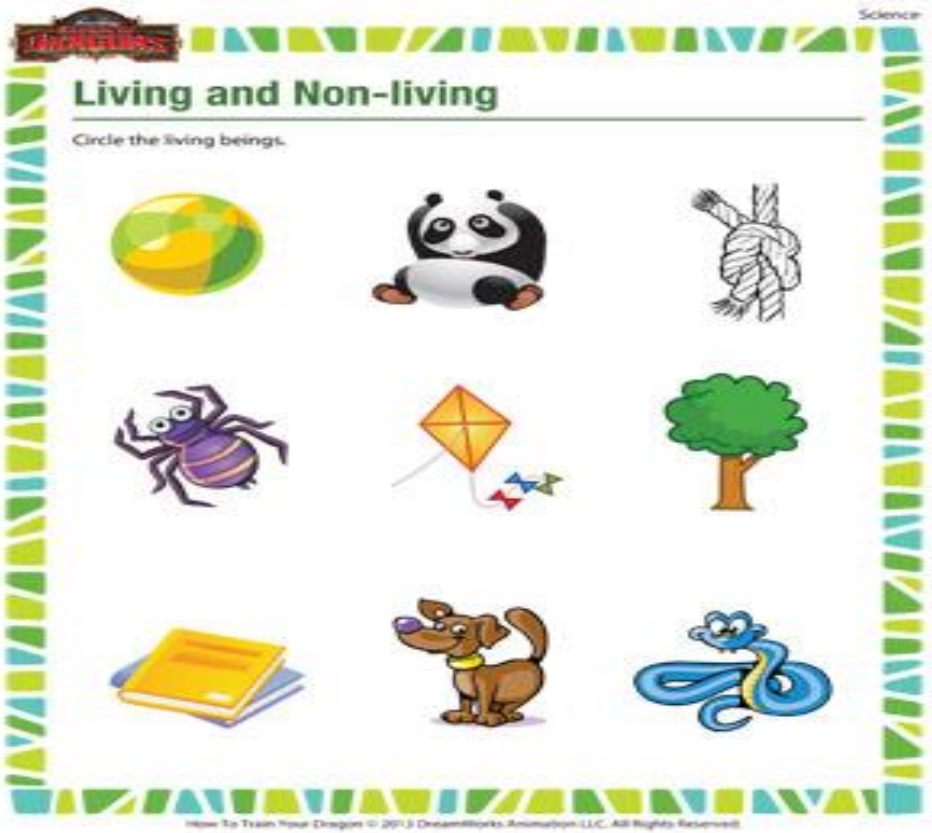
# Brain Development and self organization



**Gene ….. Environment**

# *From qualia to concept*

## Symbolization and Mapping of the World




**Categorization**

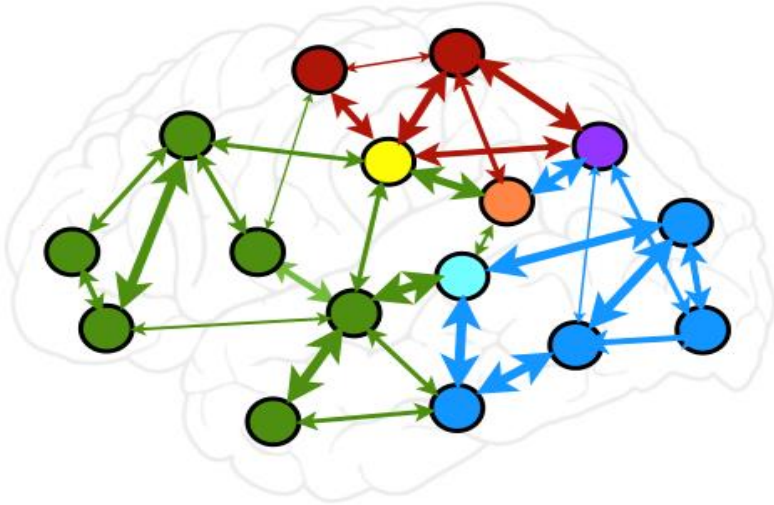
# Perceptual and Conceptual clustering

**Fig. 1.** Examples of the stimuli.

# Neural Network Modulation

A common approach to understanding neuronal processing is to reduce complexity by defining subunits and infer their functional role by selectively modulating them.

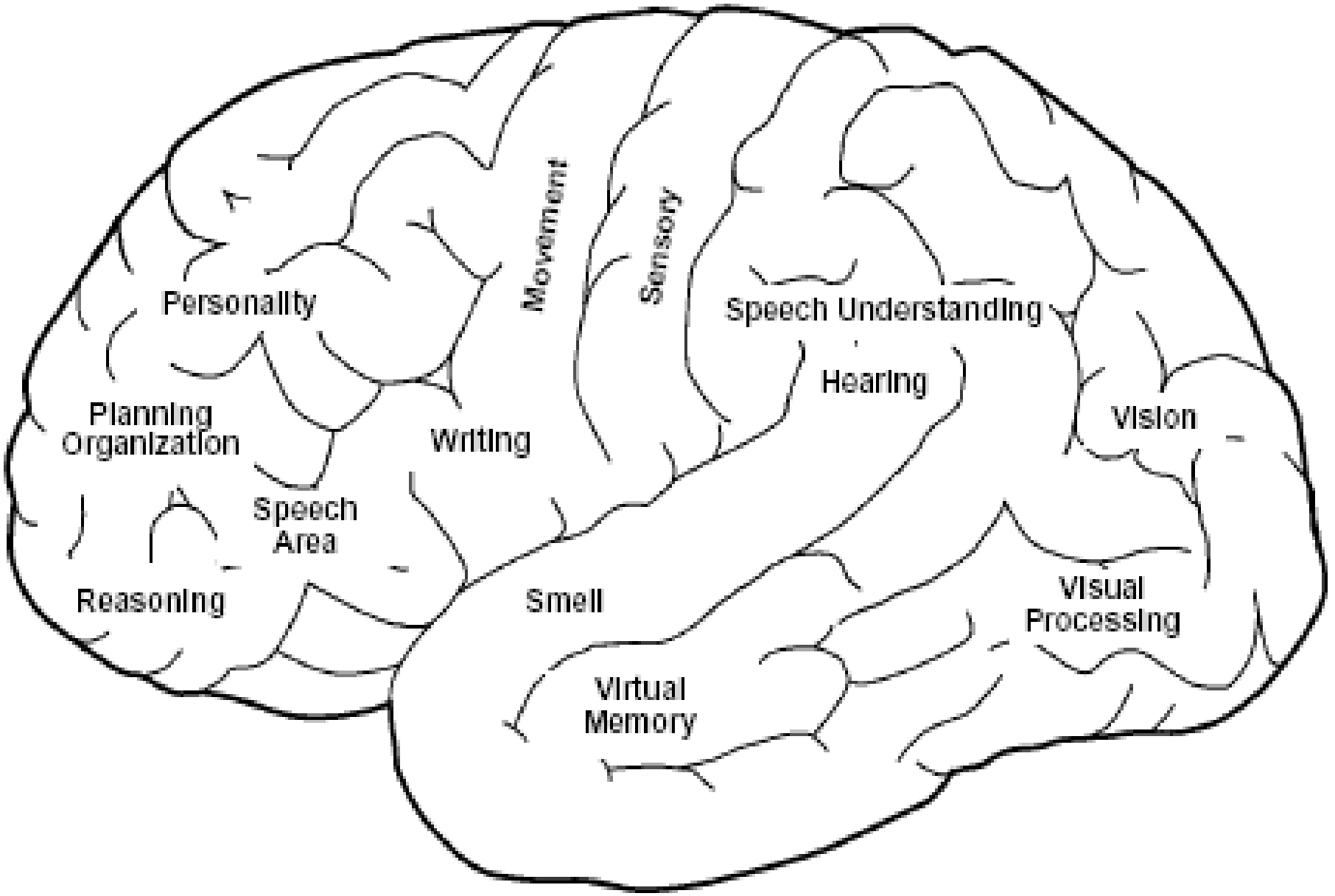
- Effortless work
- Energy saving



## Automatization

**Developmental periods**

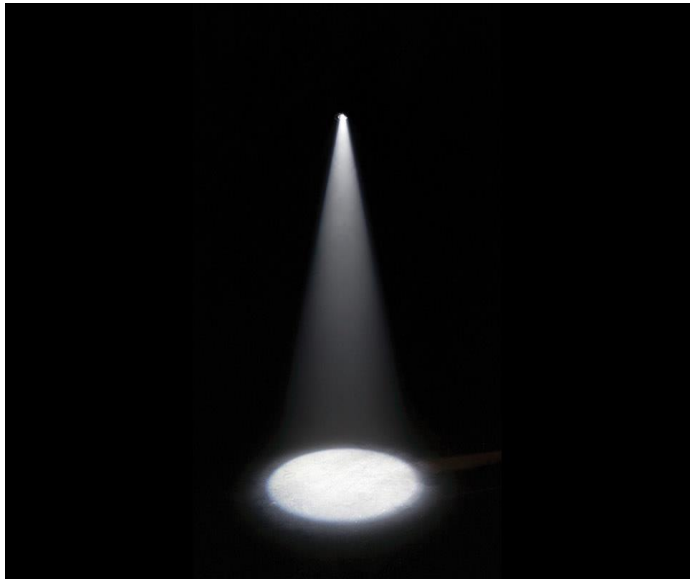
# Functional Areas of the Brain



# Conscious Attention

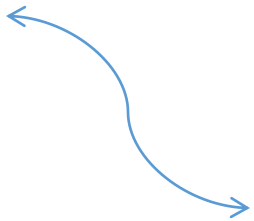
Transparent perception → Automatization

Door of refrigerator

# Attention

External ..... Stimulations



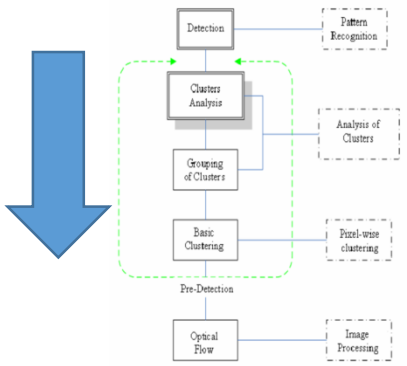
Internal

Emotional value

**Is attention the same as consciousness?**

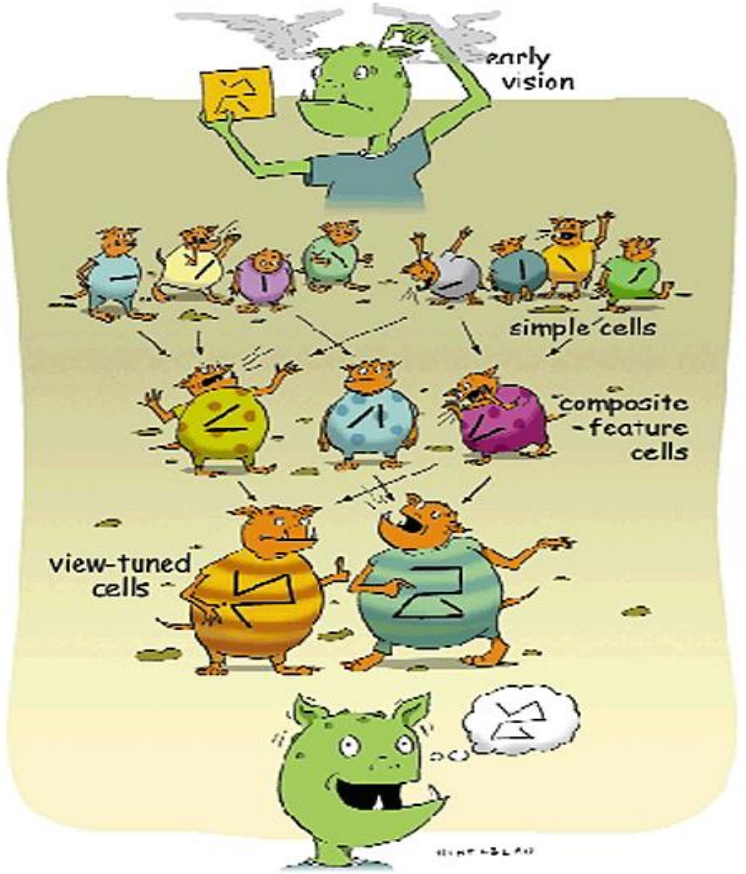
Attention

# Perception




# Mentality

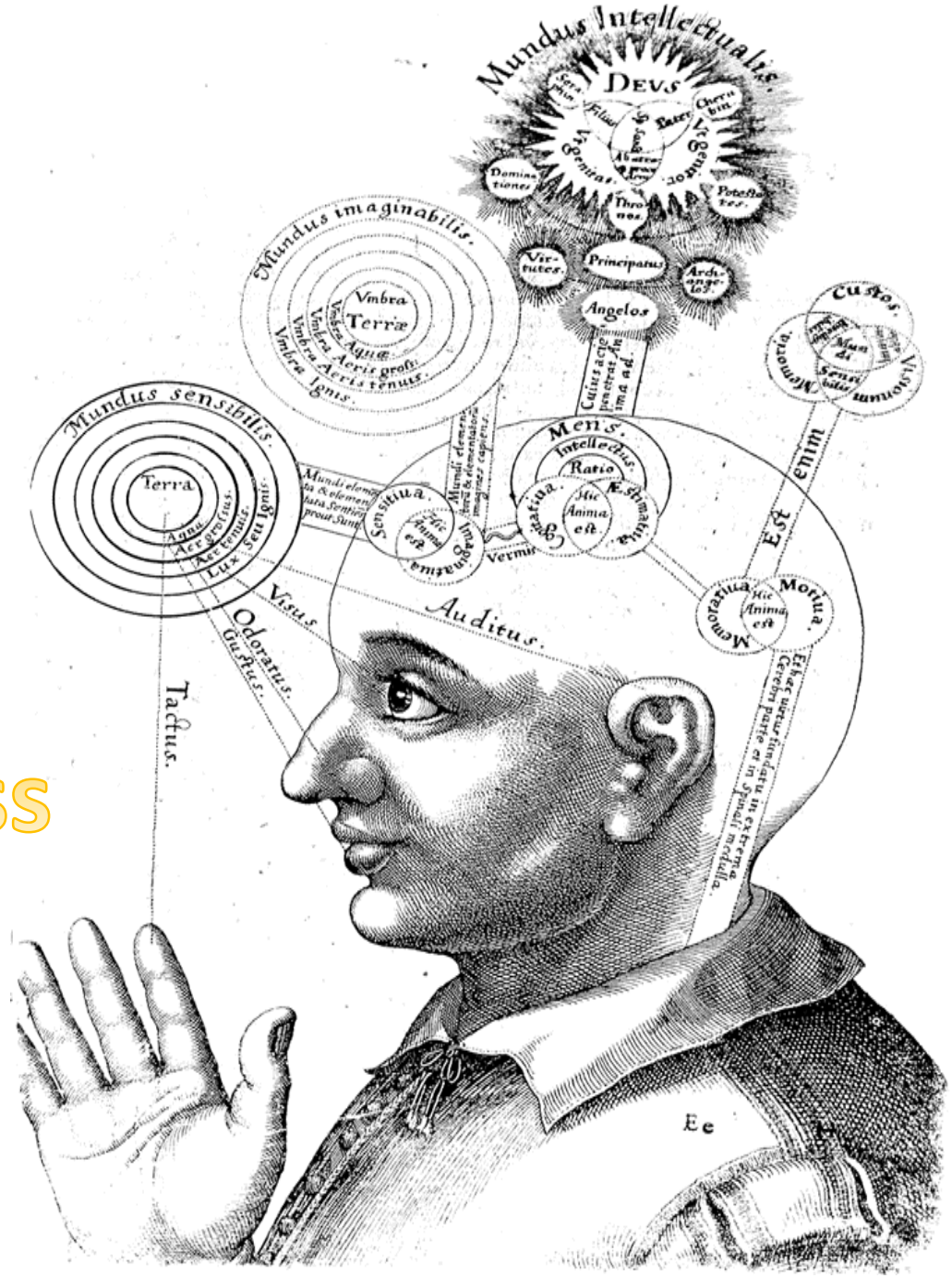
- Perceptual Integration
- Perceptual Comparison
- Attention role




pandemonium architecture

# Consciousness

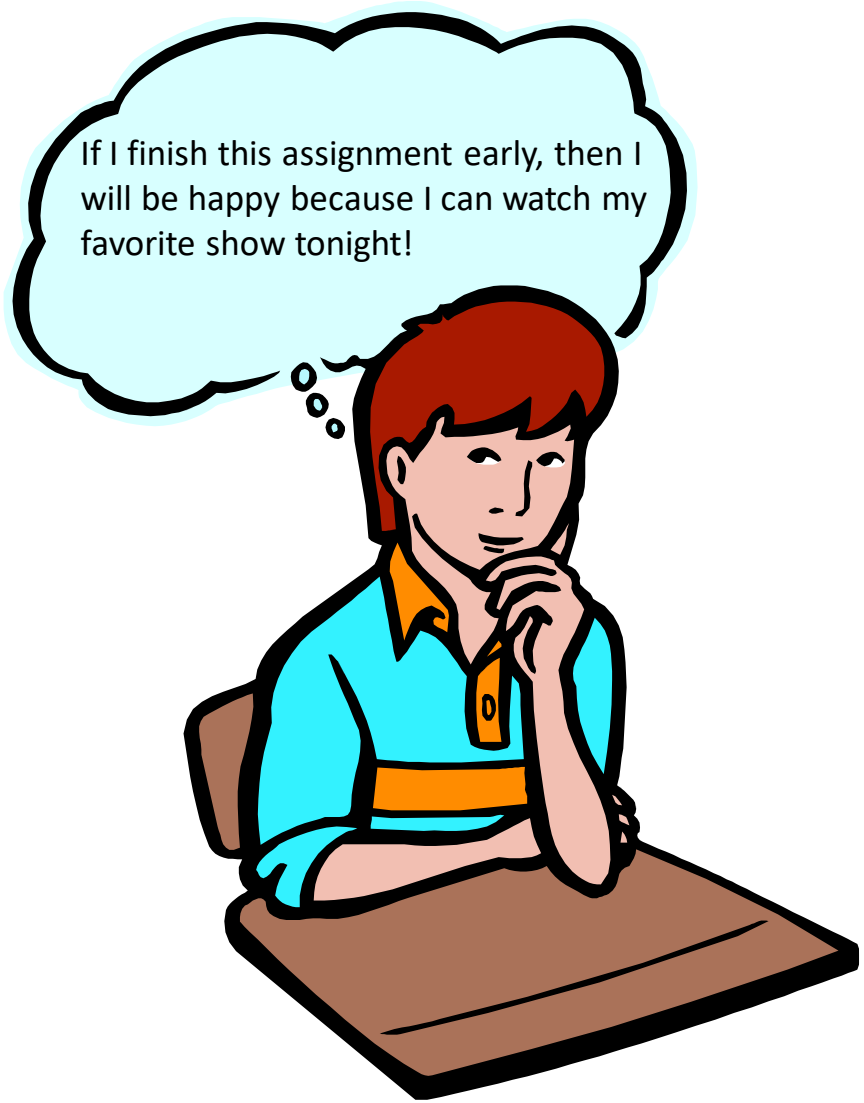
# Consciousness



# Motivation :

comes from imagining the emotion of the future.

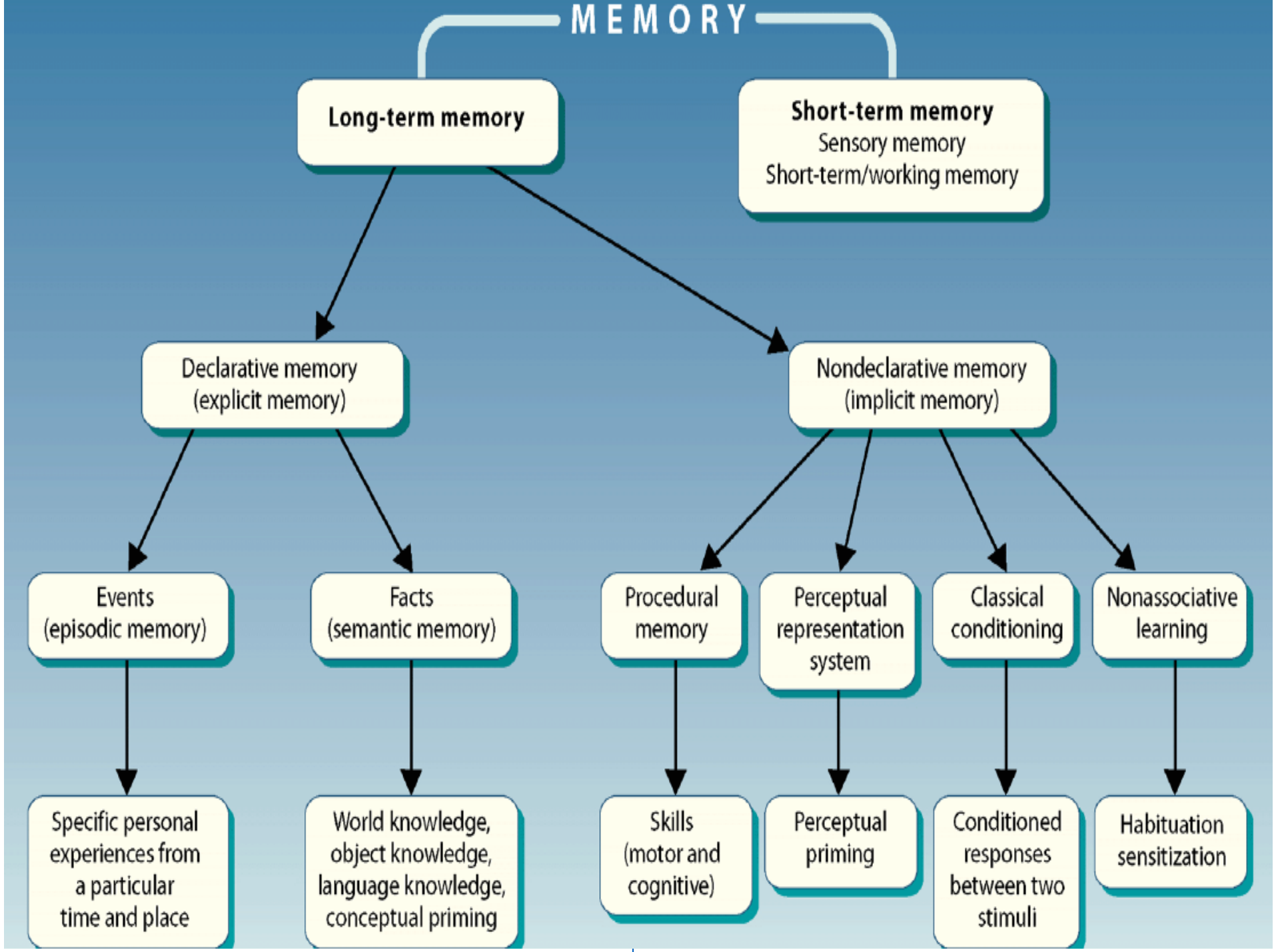
Motivation and Need




- Being in love and Blindness
- Addiction

# Learning and Memory

- **Learning and memory** are higher-level functions of the nervous system.
- **Learning** is the neural mechanism by which a person changes his or her behavior as a result of experiences.
- **Memory** is the mechanism for storing what is learned.


MEMORY
Long-term memory
Short-term memory
Sensory memory
Short-term/working memory
Declarative memory
(explicit memory)
Nondeclarative memory
(implicit memory)
Events
(episodic memory)
Facts
(semantic memory)
Procedural
memory
Perceptual
representation
system
Classical
conditioning
Nonassociative
learning
Specific personal
experiences from
a particular
time and place
World knowledge,
object knowledge,
language knowledge,
conceptual priming
Skills
(motor and
cognitive)
Perceptual
priming
Conditioned
responses
between two
stimuli
Habituation
sensitization