Neuroeducation and Coaching

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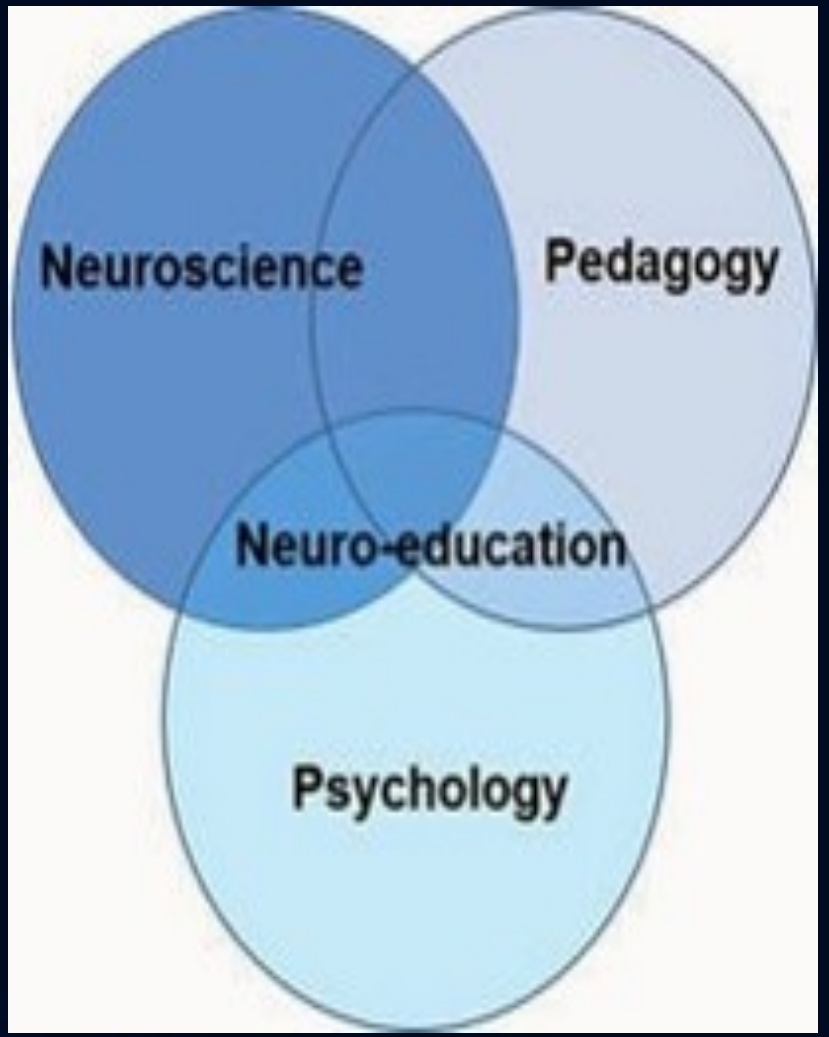
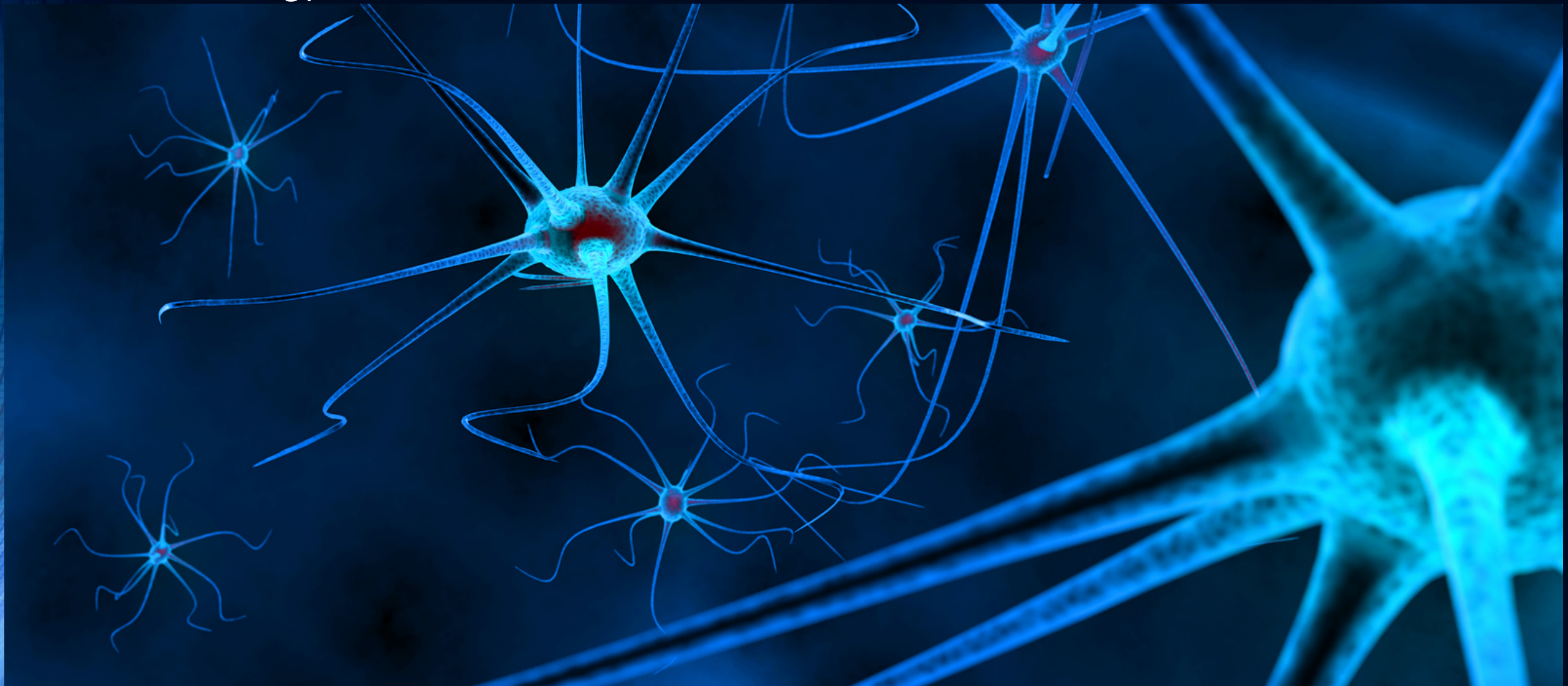
Neuroscience as an interdisciplinary science

- 1.What is neuroscience ?
- 2. What is neuroeducation ?
- 3. What can neuroscience offer to educators ?



What is Neuroscience?

- the study of a nervous system
- branch of biology
- interdisciplinary science
- cooperates with many other fields… including education



History of Neuroscience

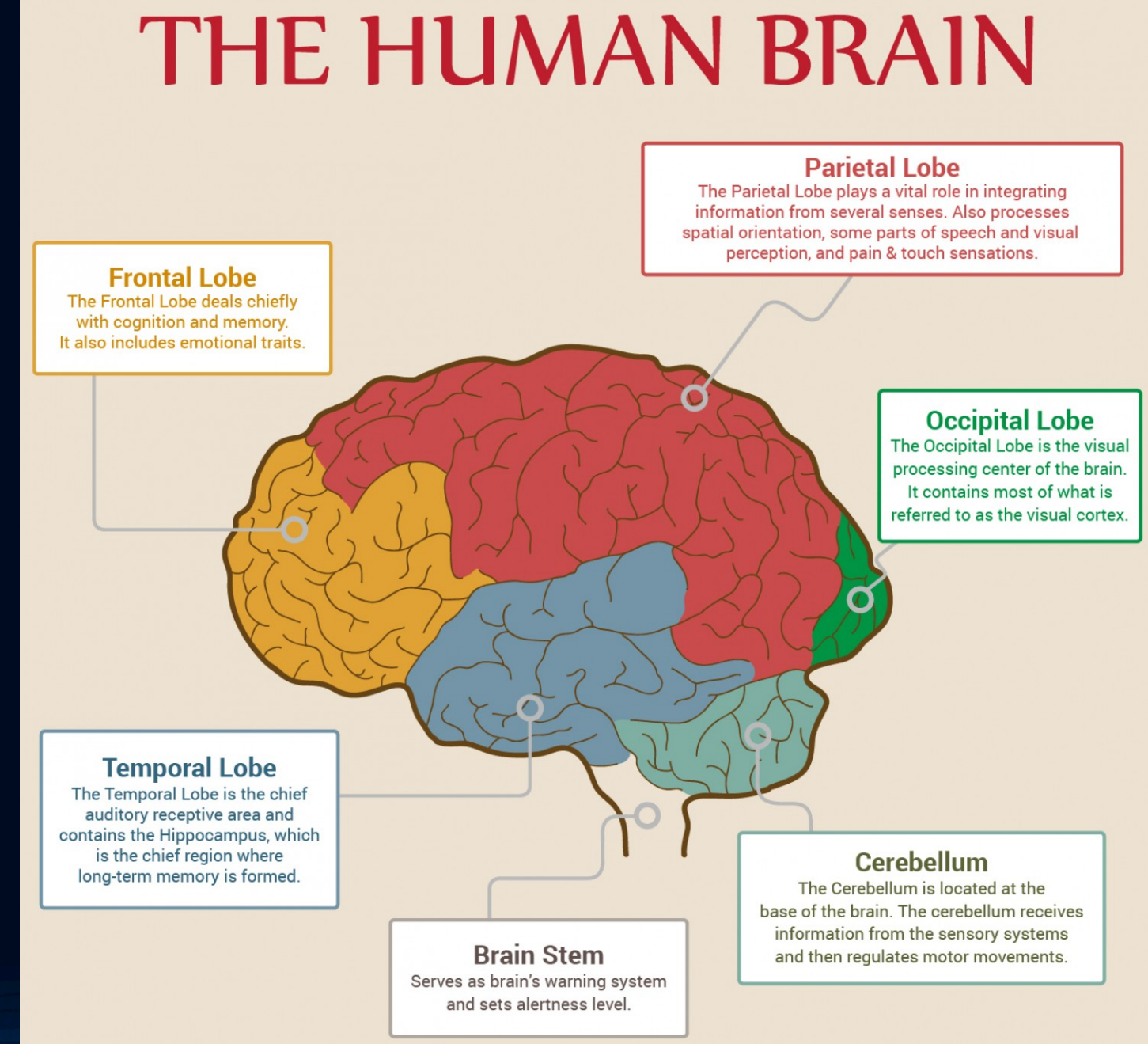
- Ancient Egypt – trepantation of skull
- believed heart is the seat of intelligence
- Hippocrates „brain as a seat of intelligence"
- Plato „Brain as the seat of the soul"
- Through the ages people observed medical problems with the brain

Hans and Zacharias Jansen

- **16th century**
- the invention of a microscope
- helped to study the brain in a more sophisticated way

Thomas Willis

- 17th century English doctor
- Played an important part in the history of anatomy, neurology and psychiatry
- first discovered **the anatomy of the brain**
- the brain is divided into parts

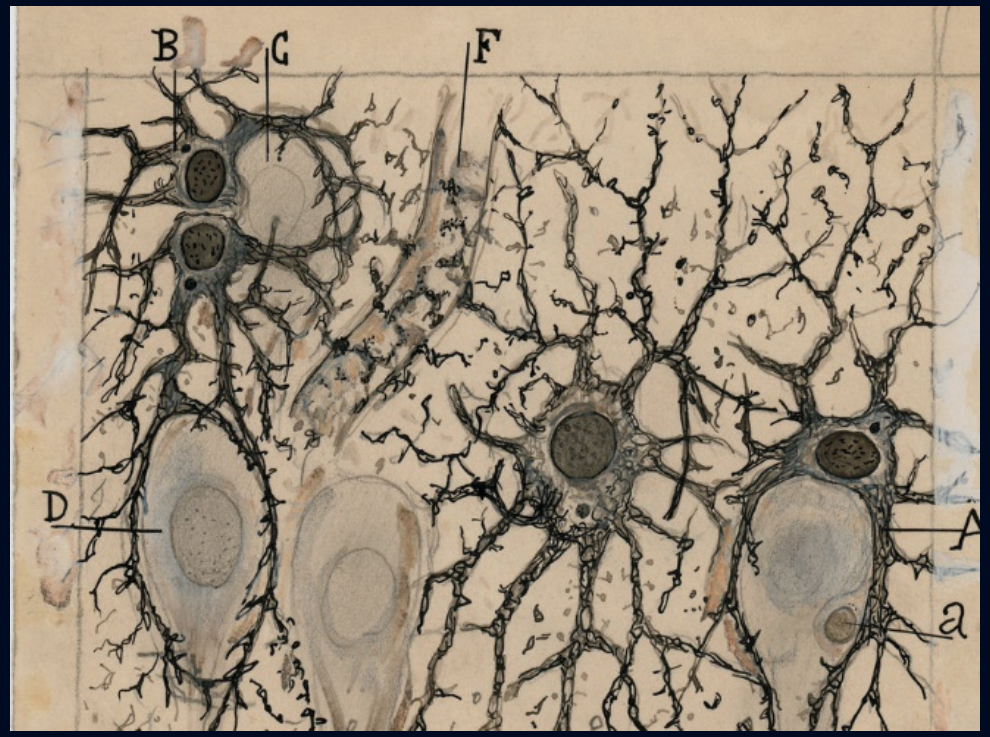


Luigi Galvani

- 18th century Italian physician, physicist, biologist and philosopher
- Discovered animal electricity
- Father of bioelectromagnetics
  - studies the electrical patterns and signals from tissues such as nerves and muscles

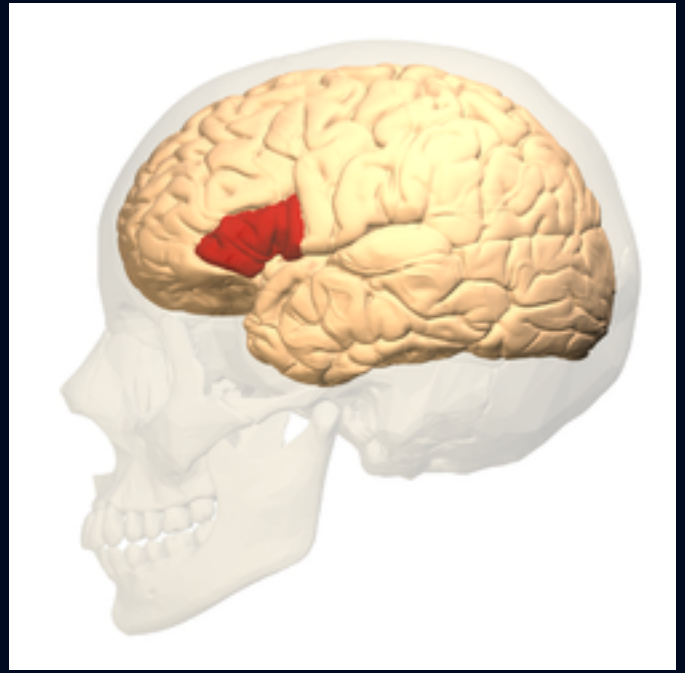
Santiago Ramon y Cajal

- 19th century Spanish pathologist, histologist, neuroscientist and Nobel laureate
- investigations of the microscopic structure of the brain
- illustrating the delicate *arborizations of brain cells
  - * fine branching structure at the end of a nerve fiber
- still in use today



Paul Broca

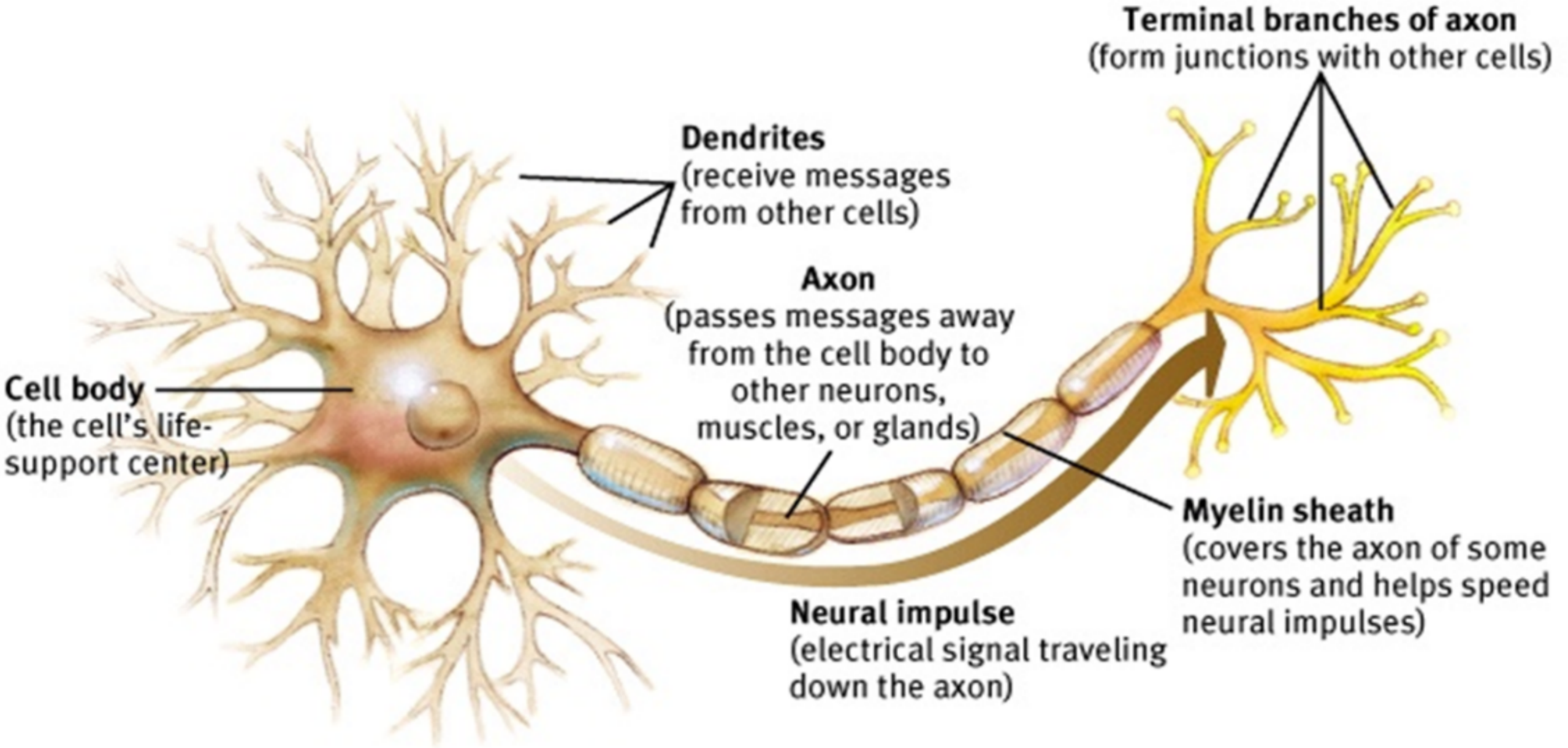
- 19th century French physician, anatomist and anthropologist
- Region of frontal lobe named after him Broca's area
- Area involved with language
- the brains of patients suffering from aphasia contained lesions in a particular part of the cortex, in the left frontal region
- this was the first anatomical proof of the localization of brain function



20th century neuroscience

- Distinct academic discipline
- Significan increase in studies
- Studies of all aspects
  - How it is structured
  - How it works
  - How it develops
  - How it malfunctions
  - How it can be changed
- Understanding of complex processes within a single neuron

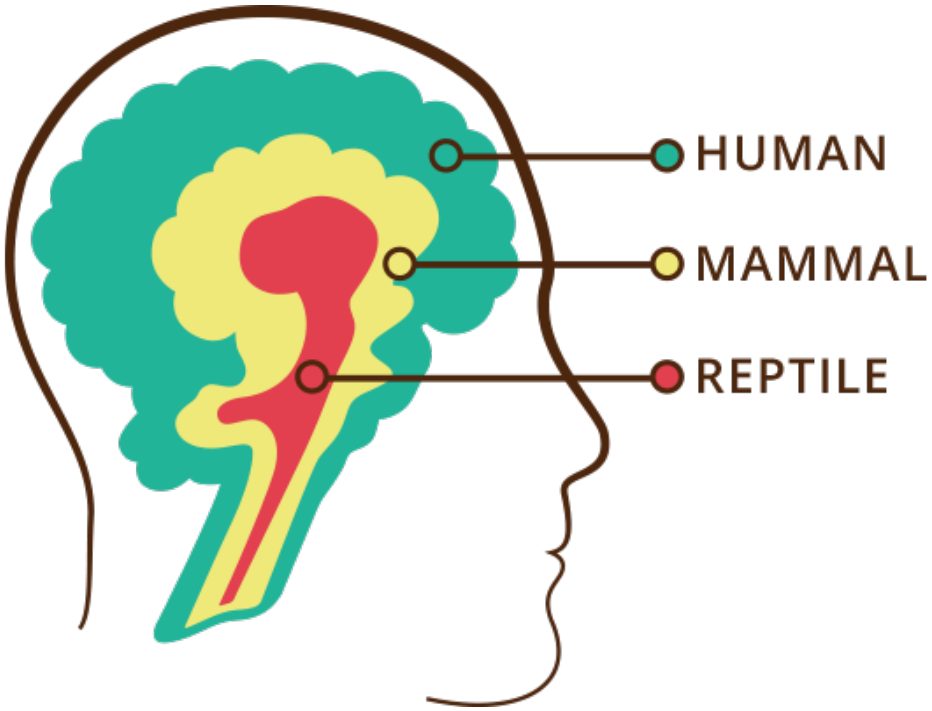
Firing neurons

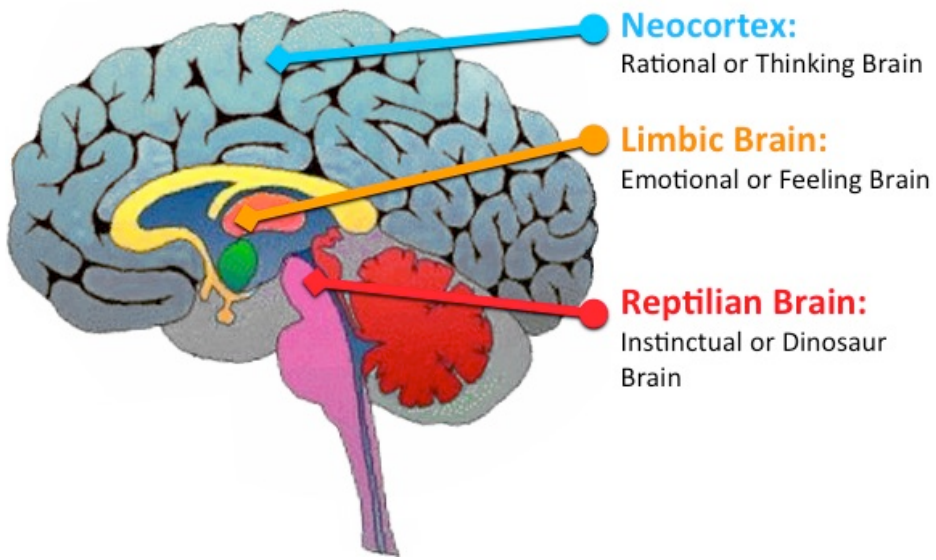

Terminal branches of axon
(form junctions with other cells)
Dendrites
(receive messages
from other cells)
Axon
(passes messages away
from the cell body to
other neurons,
muscles, or glands)
Cell body
(the cell's life-
support center)
Myelin sheath
(covers the axon of some
neurons and helps speed
neural impulses)
Neural impulse
(electrical signal traveling
down the axon)

How brain works

- Hundred billion neurons
- Hundred trillion synapses
- Messages transmited through electircal signals
- Structure of synapses change
- Resulting functions of synapses change
  - NEUROPLASTICITY
  - The brain doesn’t like to change and that is why we do not like change and need to restructure our thinking having heavily hardwired own perceptions

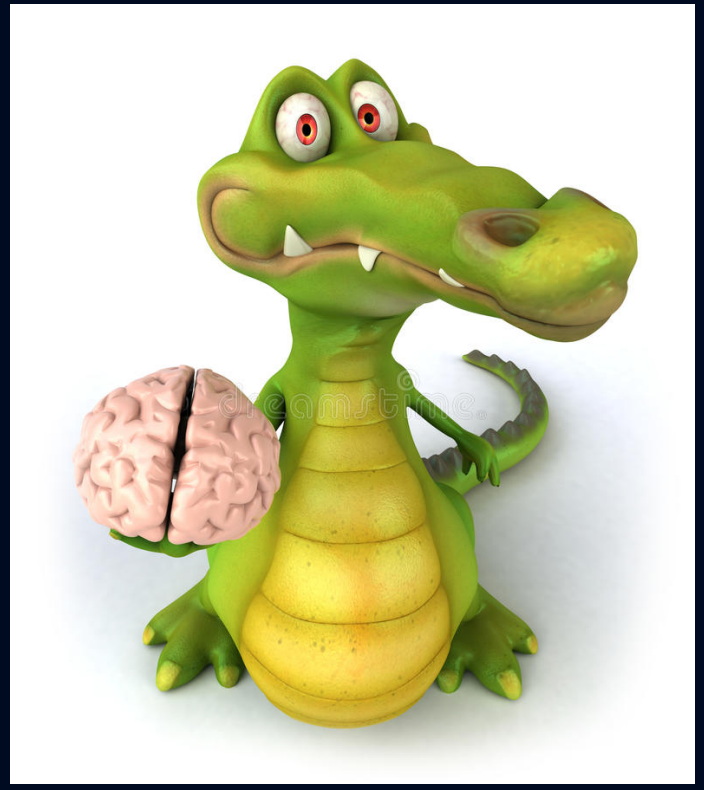
Triune brain

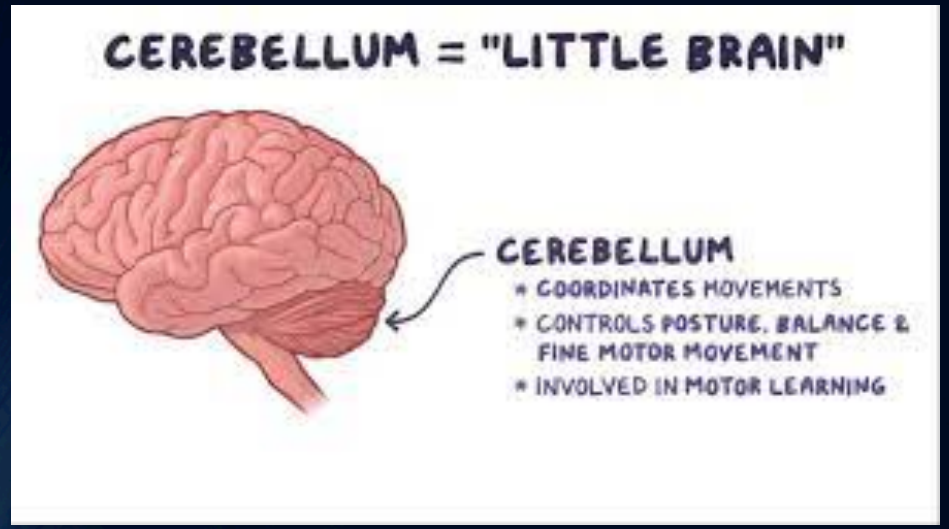


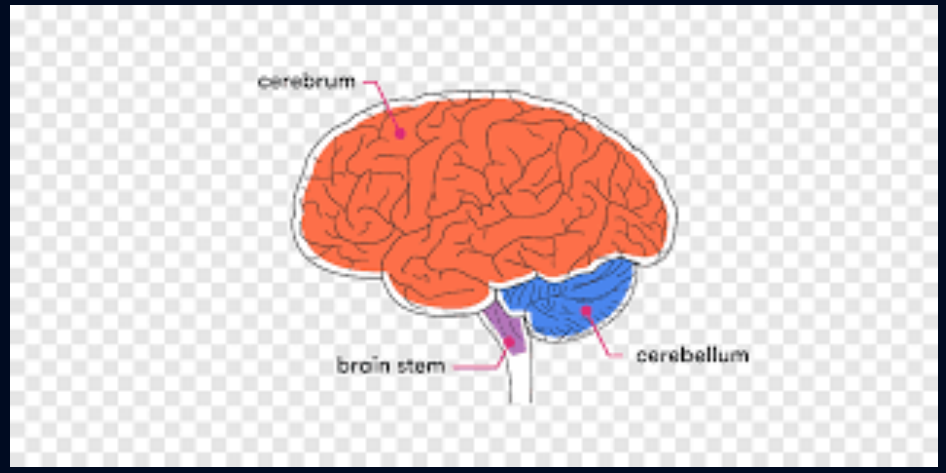


Reptilian brain

- innermost part
- the first to have evolved
- the *survival brain*
- or the *brain stem*
- controls essential functions
  - breathing and reproduction
  - reacting to danger
  - regulating hunger, temperature control

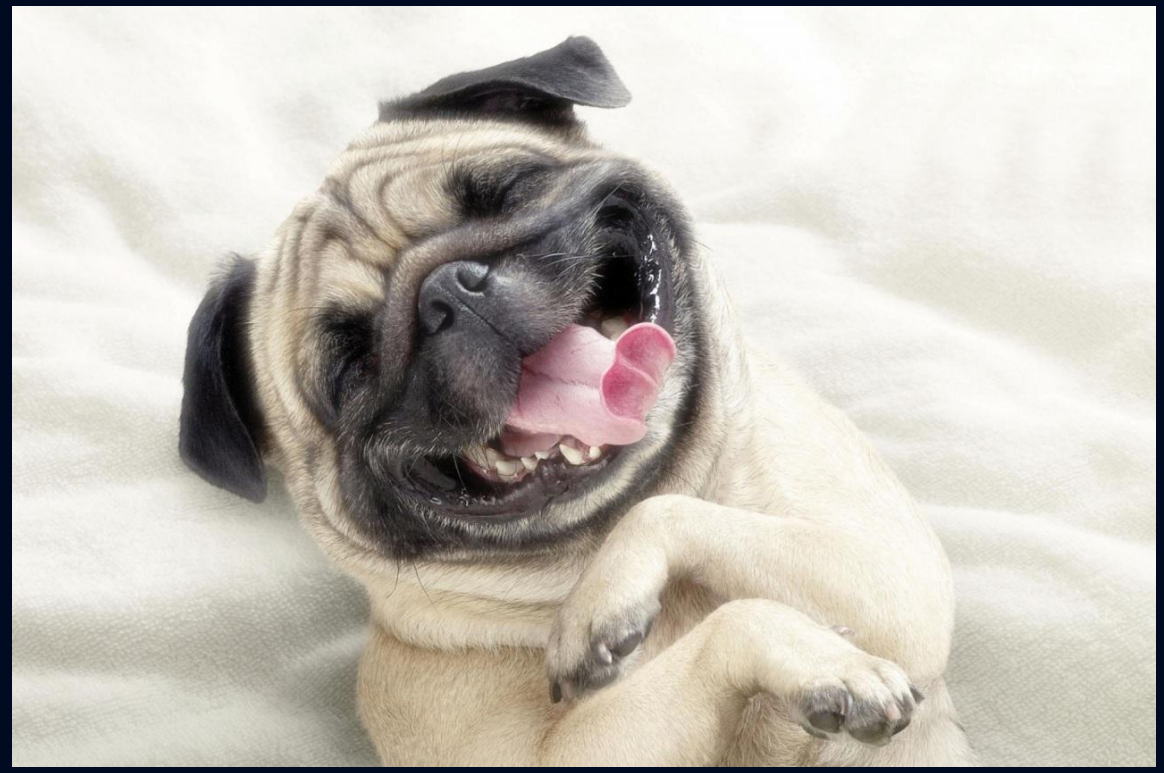



CEREBELLUM = "LITTLE BRAIN"
CEREBELLUM
* COORDINATES MOVEMENTS
* CONTROLS POSTURE, BALANCE & FINE MOTOR MOVEMENT
* INVOLVED IN MOTOR LEARNING


cerebrum
brain stem
cerebellum

Limbic brain

- The middle
- the *emotional* brain
- evolved after the reptilian
- sorts incoming information as pleasurable or painful (or as promising or threatening).
- Regulates mood, memory, hormones



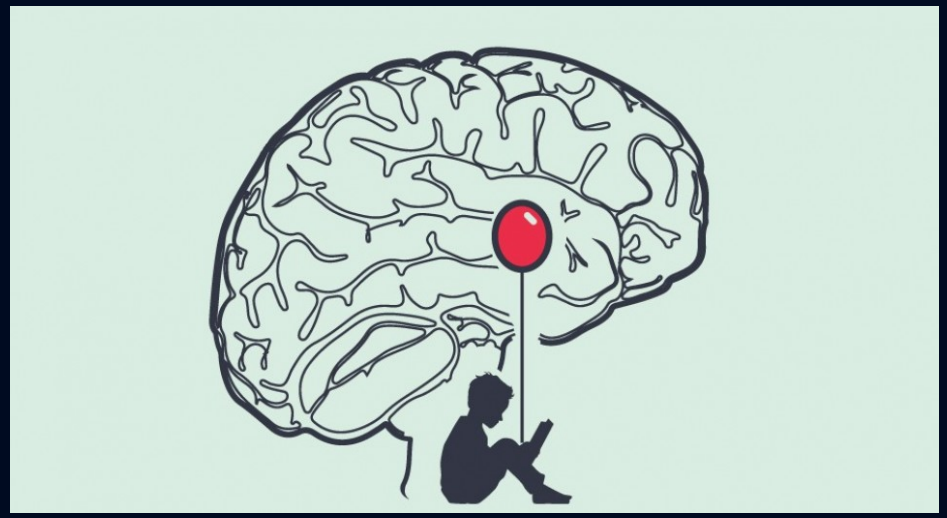
Neocortex

- the *rational brain*
- managing the emotion-laden brain activity
- Plans
- weighs alternatives
- makes decisions
- regulates emotional impulses
- produces an awareness of the other two parts, and of itself
- regulates cognitive processes responsible for planning/required for social behaviour

- takes years to fully develop, physically and functionally
- Psychologists tell us that this feature of brain growth helps explain young people's lack of ability to adequately regulate emotion and weigh alternatives, leading to impulsiveness.

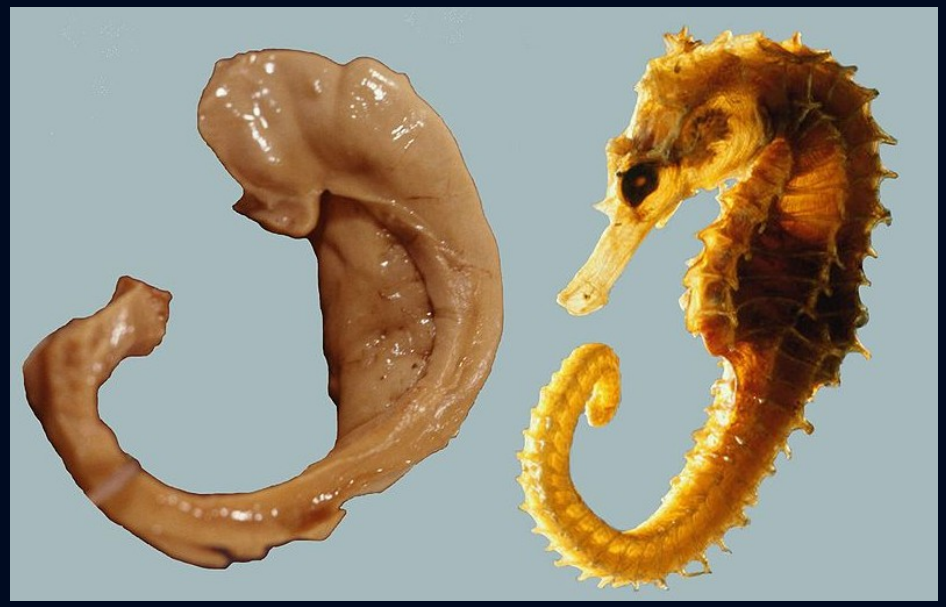
Amygdala

- small, "almond" shaped structure
- part of the brain's limbic system
- plays a role in the processing of emotions
- processes emotions and decides if reptile brain starts working or the primates, triggers emotions
- Cortizol which rises can affect activity



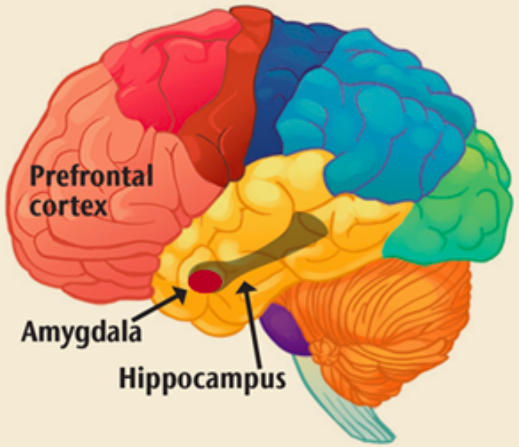
Hippocampus

- major component of the human brains
- belongs to the limbic system
- centre of short term memory
- connects emotion to the context
- can affect growth and performance
- Plays important role in:
  - consolidation of information from short-term memory to long-term memory
  - spatial memory that enables navigation



Prefrontal cortex

- link between a person's will to live
- Personality
- planning complex cognitive behaviour
- personality expression
- decision making
- moderating social behaviour
- orchestration of thoughts and actions in accordance with internal goals



Prefrontal cortex: Highly developed part of the frontal lobe that plays a role in the regulation of complex cognitive, emotional, and behavioral functioning

Amygdala: The emotional center of the brain

Hippocampus: Involved in forming, storing, and processing memory

Mirror neurons

- specific neurons activated both when performing an action as well as when observing someone else doing that same action
- Help to explain learning language, imitating motions, and the ability to understand others' intentions and mental states including human's ability to feel empathy
- When we perceive an action or emotion of another person, a number of neurons that would become active should we ourselves be conducting that action or expressing that feeling begin to fire. Thus, we simulate the actions and emotions of those we observe.