Foundations of Neuroscience

SPICE 2024

Neuroscience & Computational Psychiatry Module

Class I

27th of June 2024

Mount Sinai

Center for Computational Psychiatry

Neuroscience

Neuroscience is the scientific study of the **nervous system** its **functions** and **disorders.**

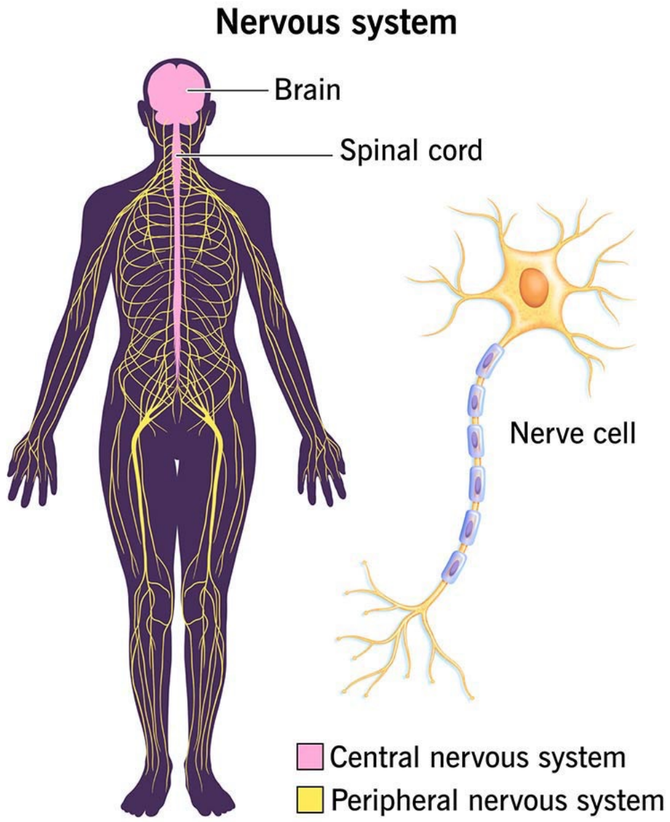


Image: Cleveland Clinic

Neuroscience

- Our brain constantly **communicates** with the rest of our body to allow us to walk, eat, sleep, speak, feel different emotions & much more.
- The brain **sends neural signals** through our spinal cord and nerves to give the body instructions.
- Our brain also **receives** neural signals from the body informing it about the environment around us.

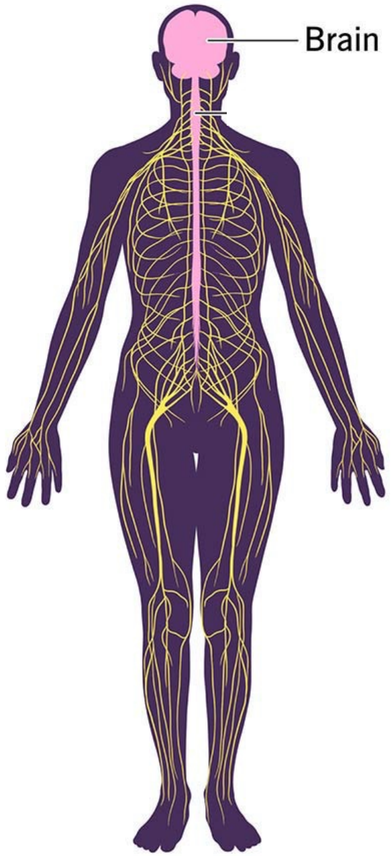


Image: Cleveland Clinic

Neuroscience

Communication via **neurotransmitter:**

- Signals travel as electrical impulses along nerves.
- Synapses are tiny gaps between neurons.
- Neurotransmitters are chemical messengers stored in vesicles.
- Electrical impulse triggers release of neurotransmitters.
- Neurotransmitters cross the synapse and bind to receptors on the next neuron.
- This triggers a new electrical impulse, continuing the message.

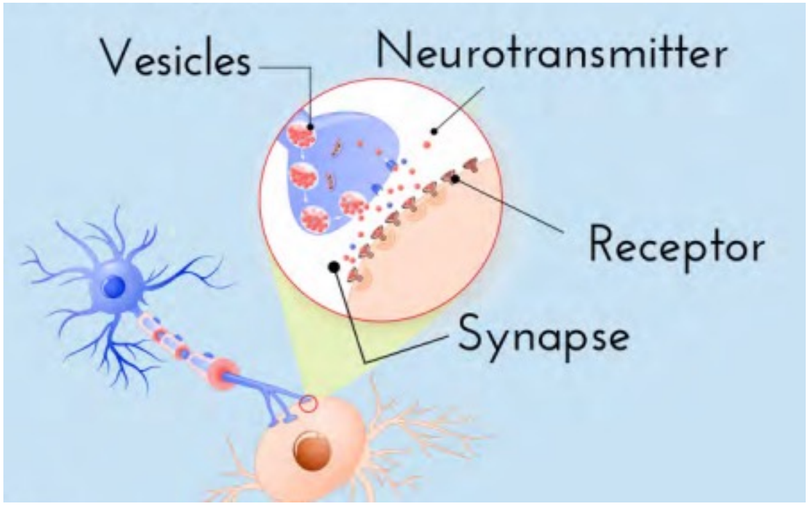
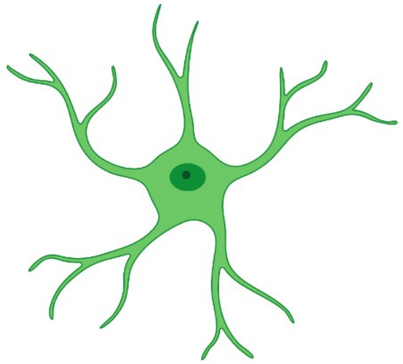
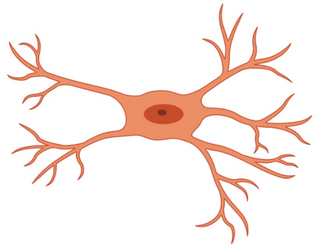
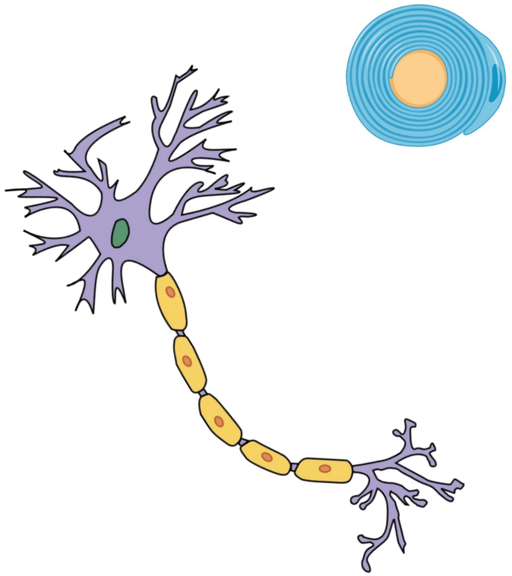


Image: Dana Foundation

The Nervous System







Major cell types:

- **Neurons**

- **Glia**

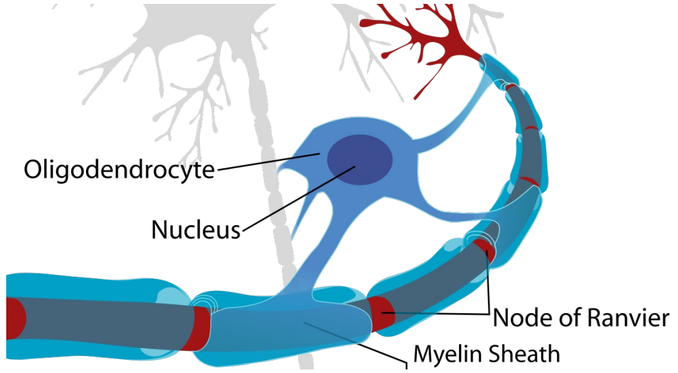
  Astrocytes

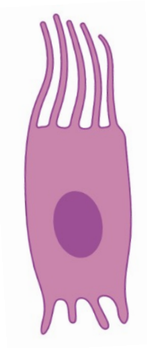
  Microglia

  Oligodendrocytes

  Schwann cells

  Ependymal cells

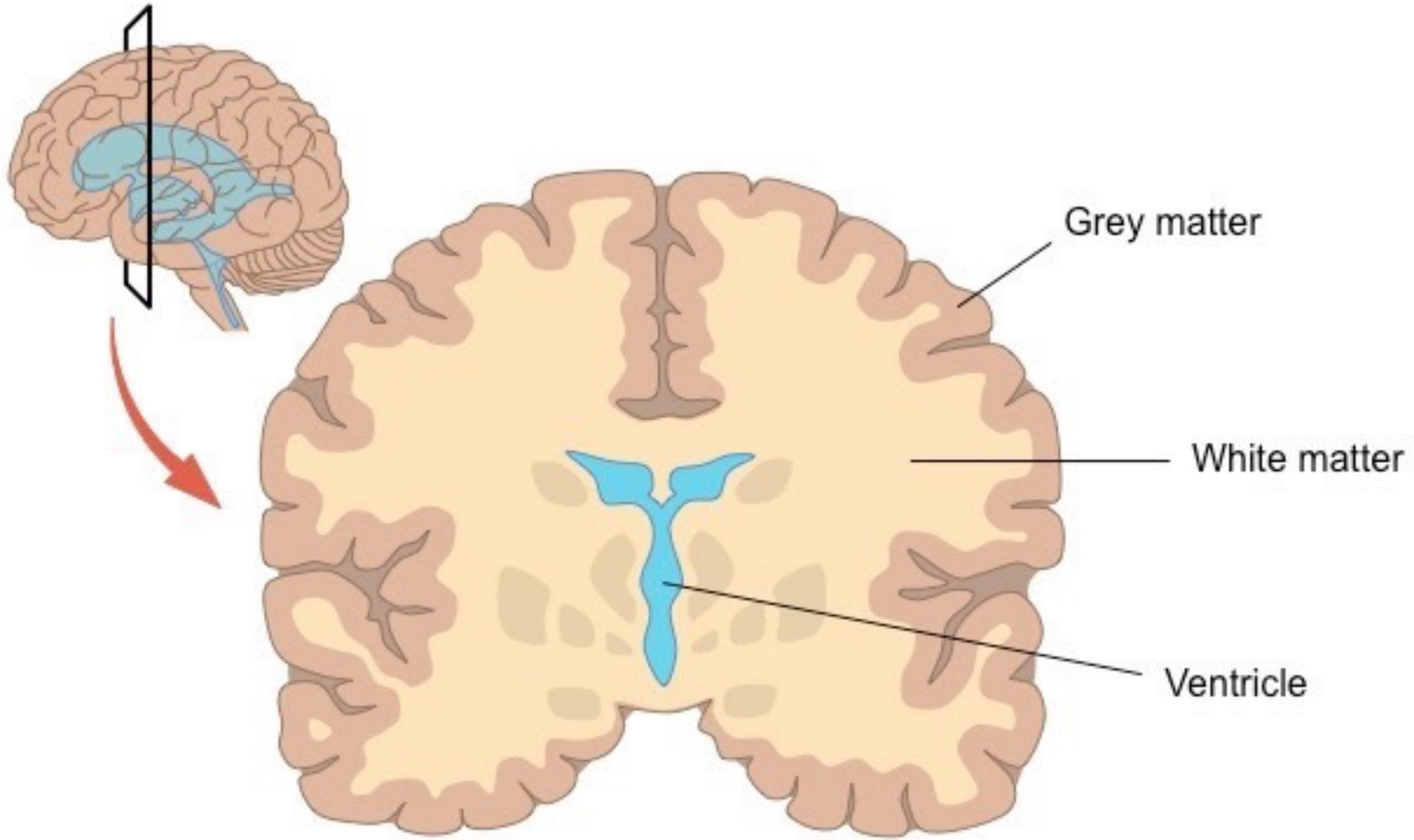




Central nervous system

Peripheral nervous system

The Human Brain



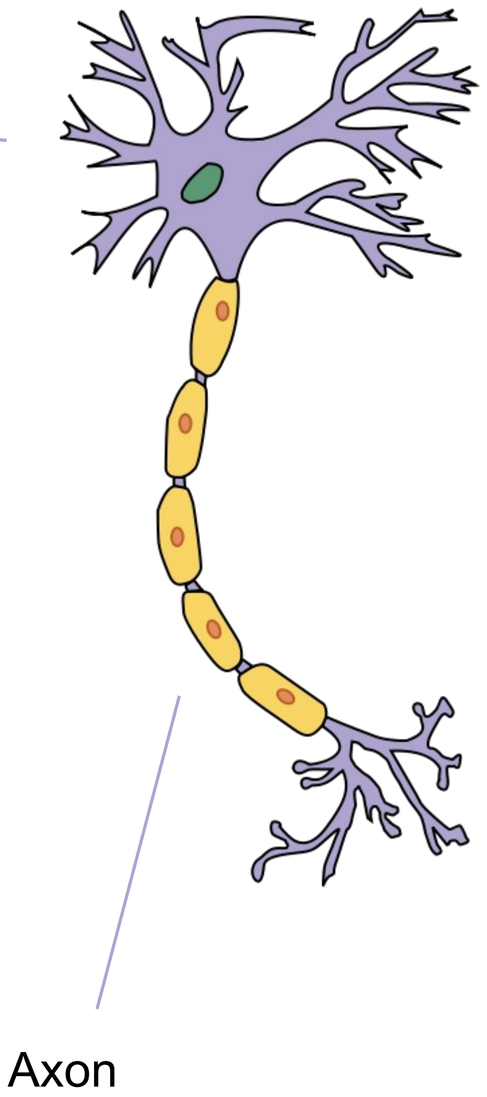
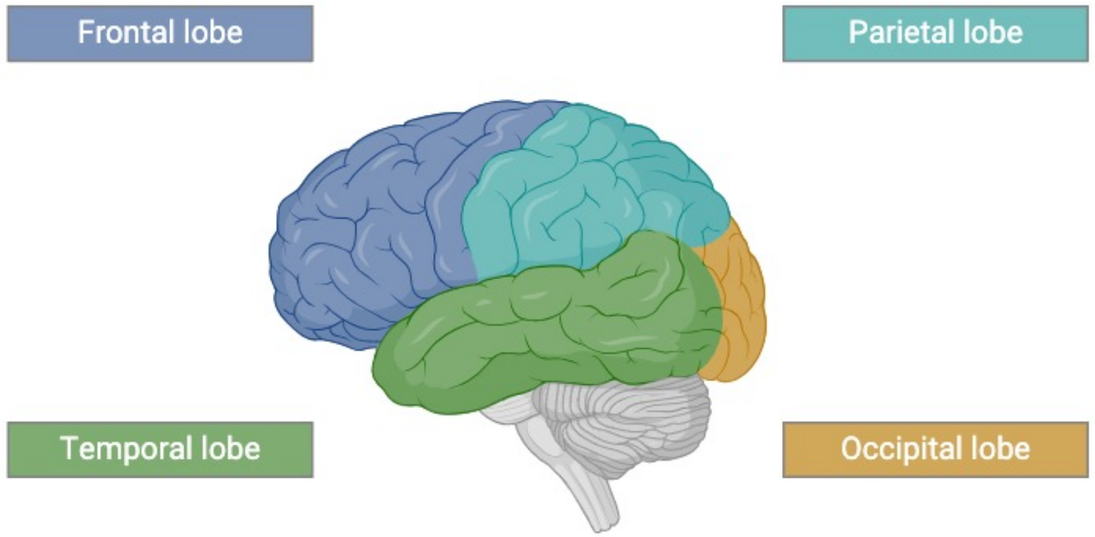


Image: Simply Psychology

The Human Brain



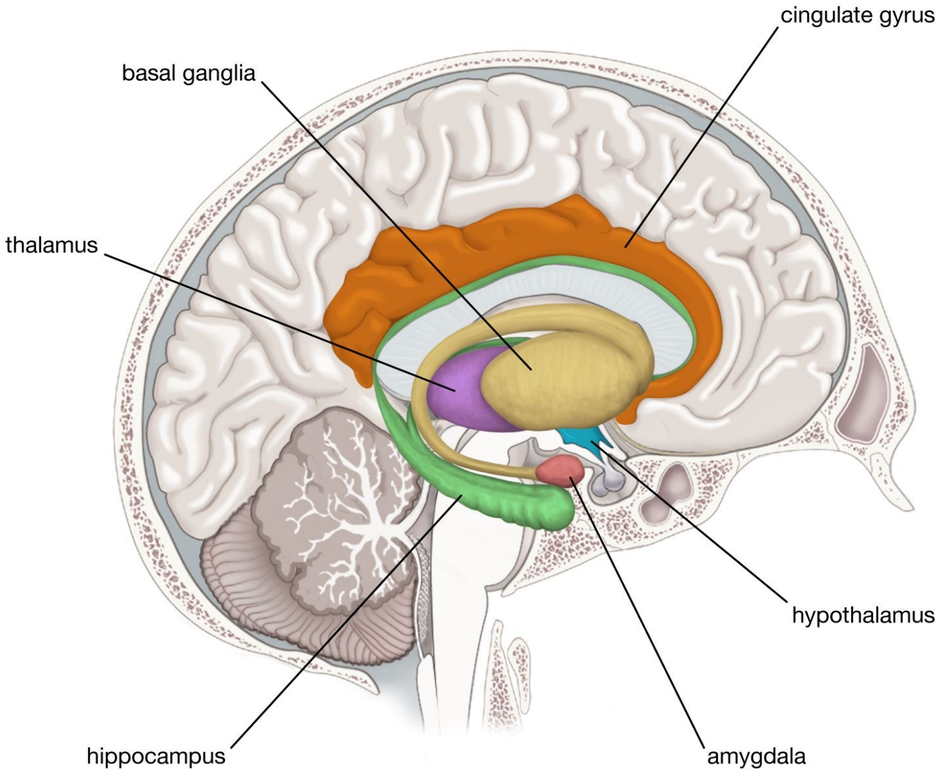
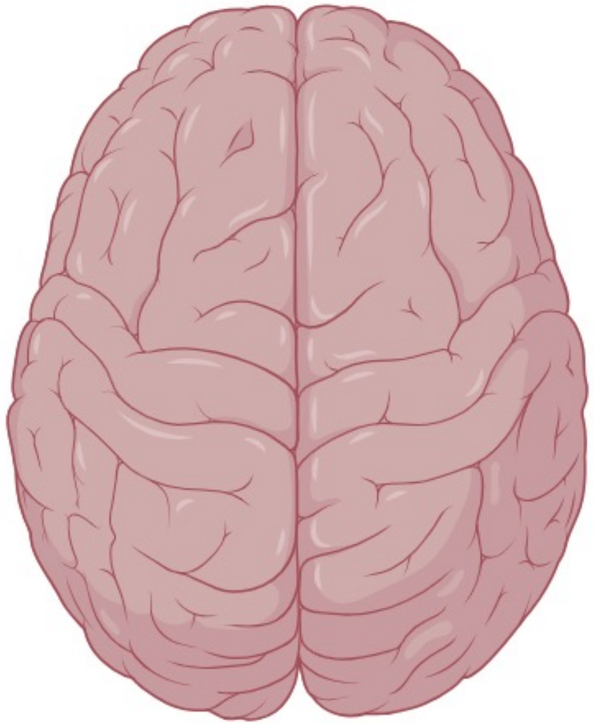


Image: Biorender & Brittanica

The Human Brain



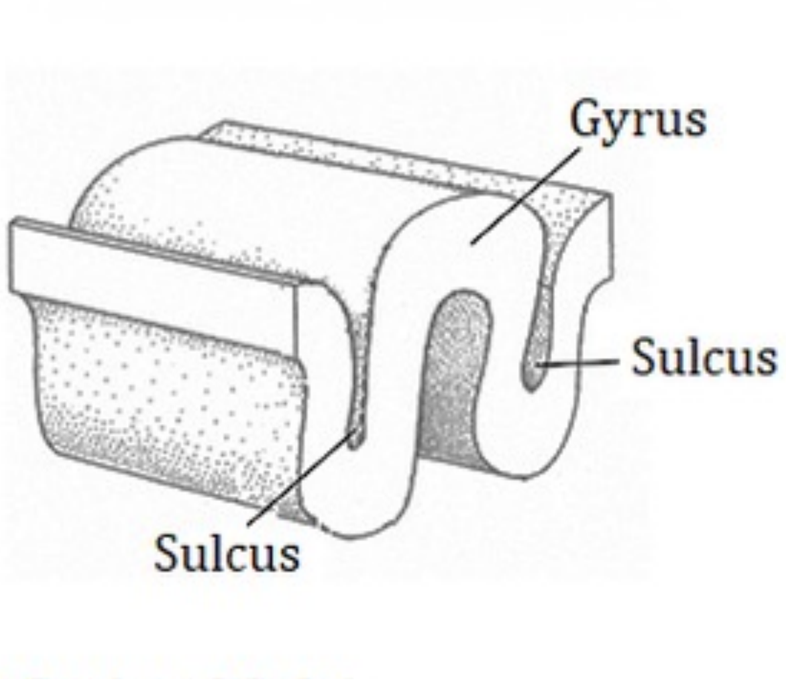


Image: Biorender

The Human Brain

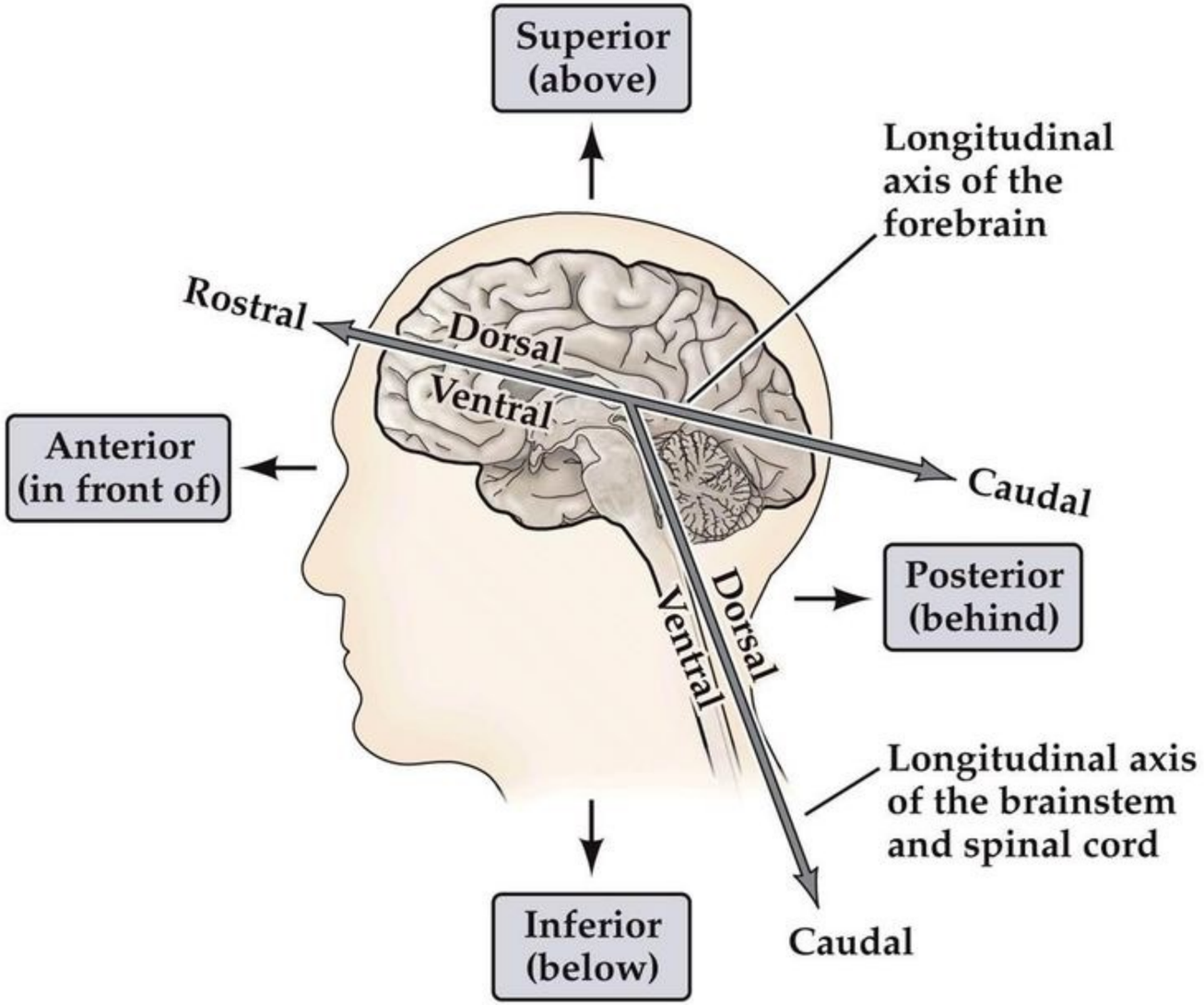
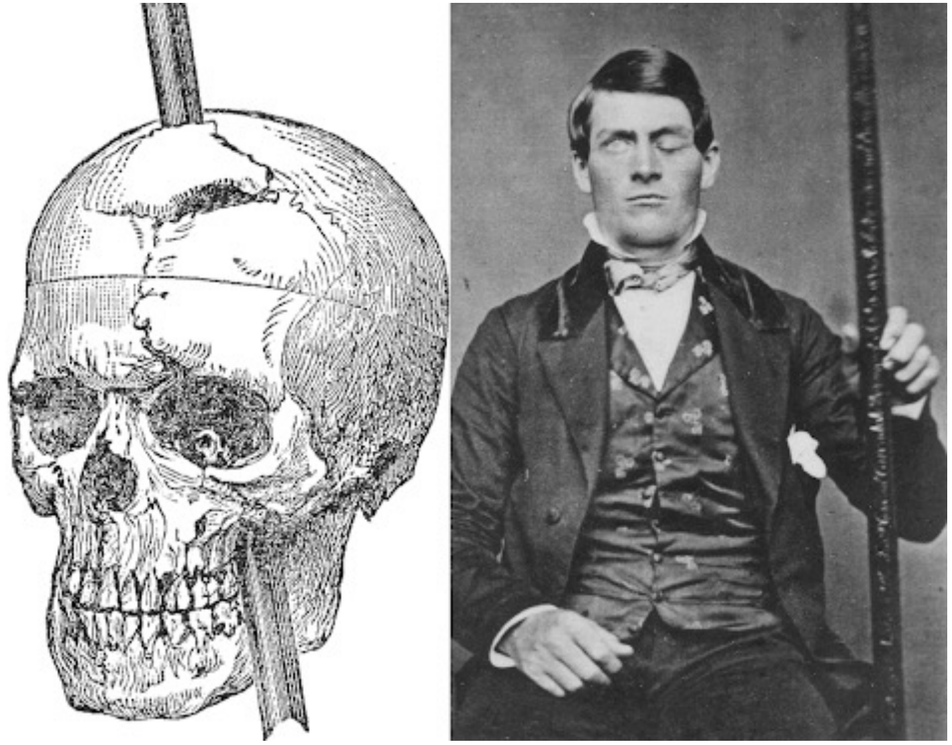


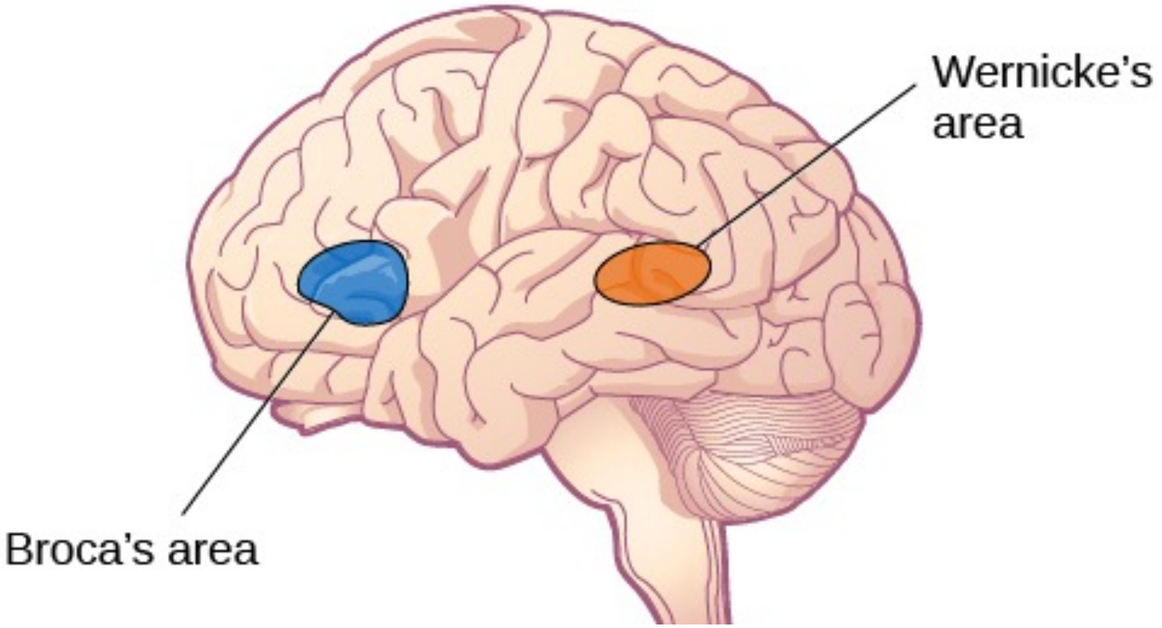
Image: Brainstuff.com

What comes to your mind when you think of a neuroscientist?

Early Neuroscience



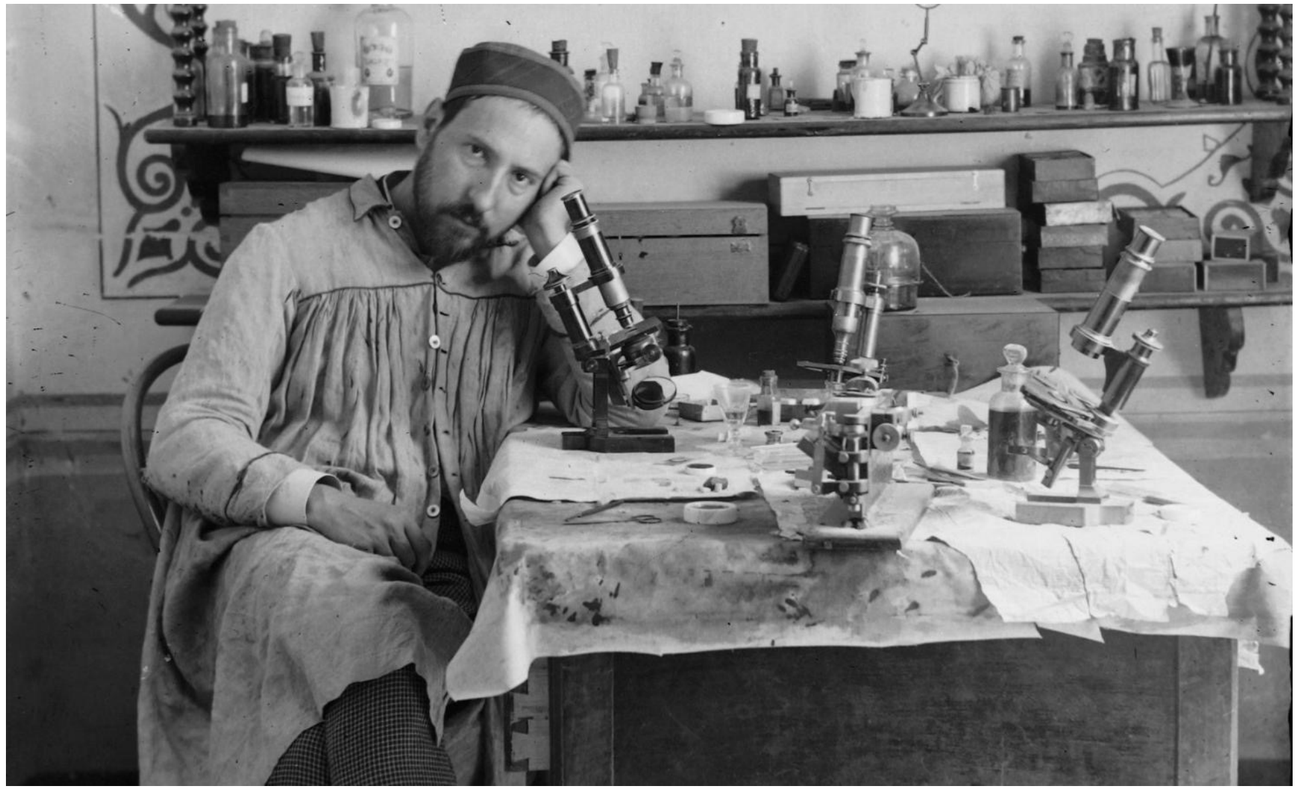
Phineas Gage



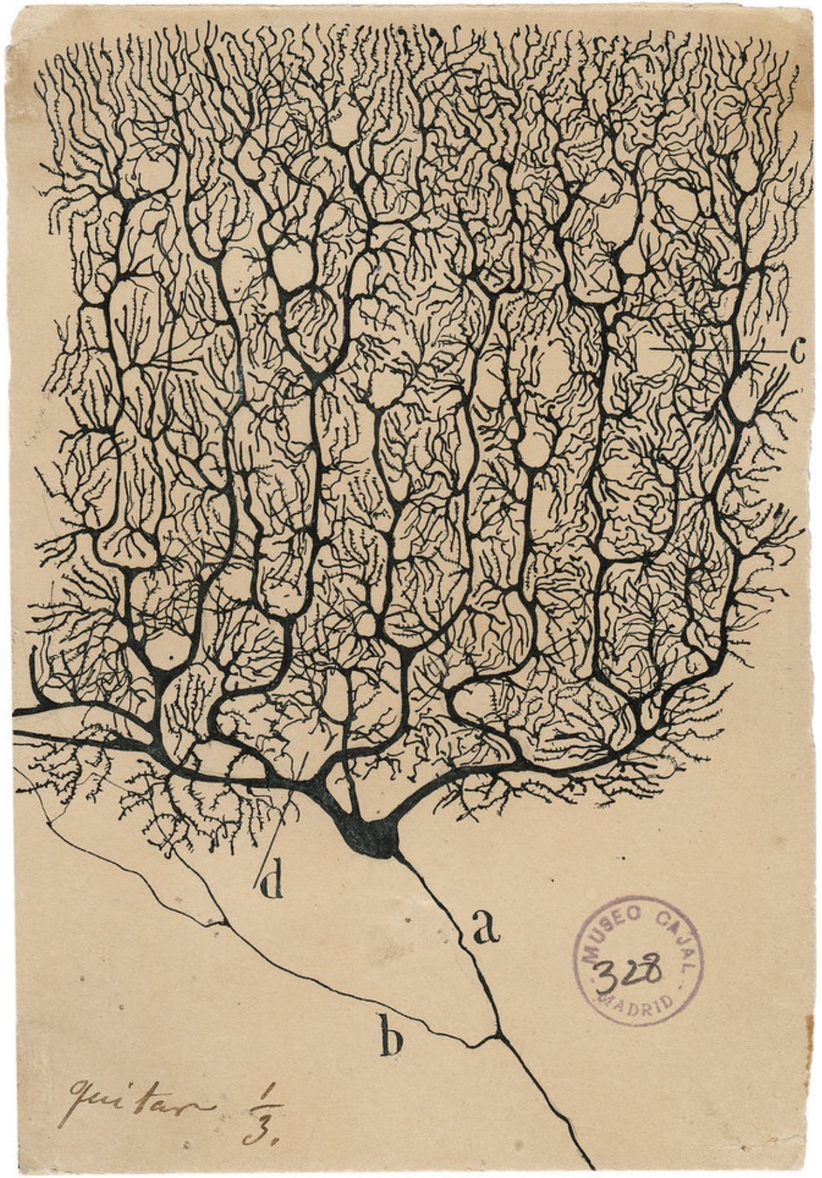
Paul Broca

Carl Wernicke

Early Neuroscience

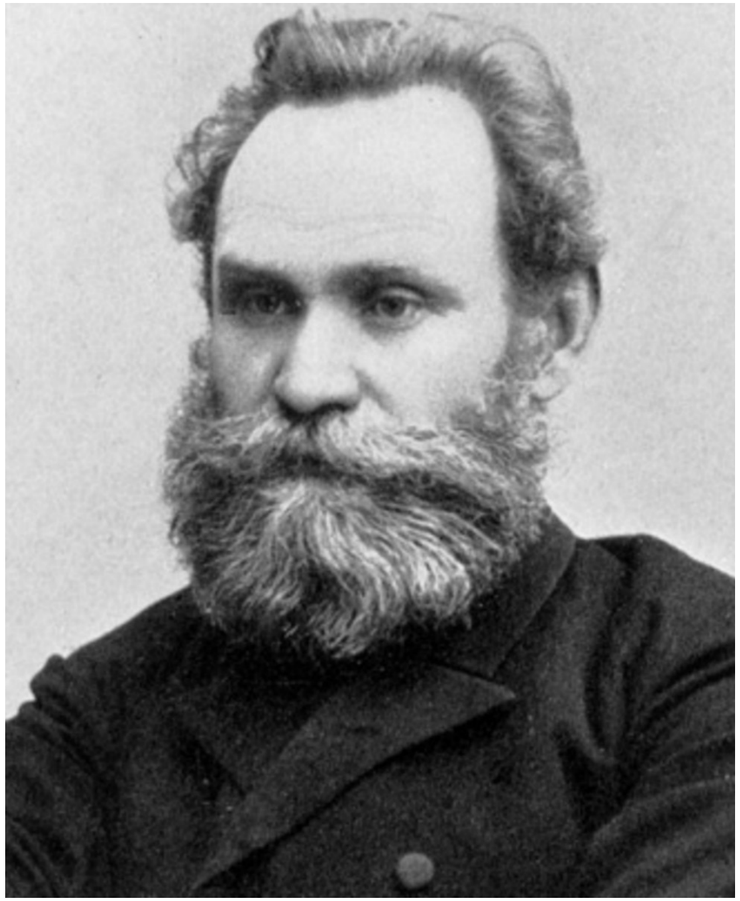


Ramón y Cajal



Images: Munoz et al., 2006

Early Neuroscience



Ivan Pavlov

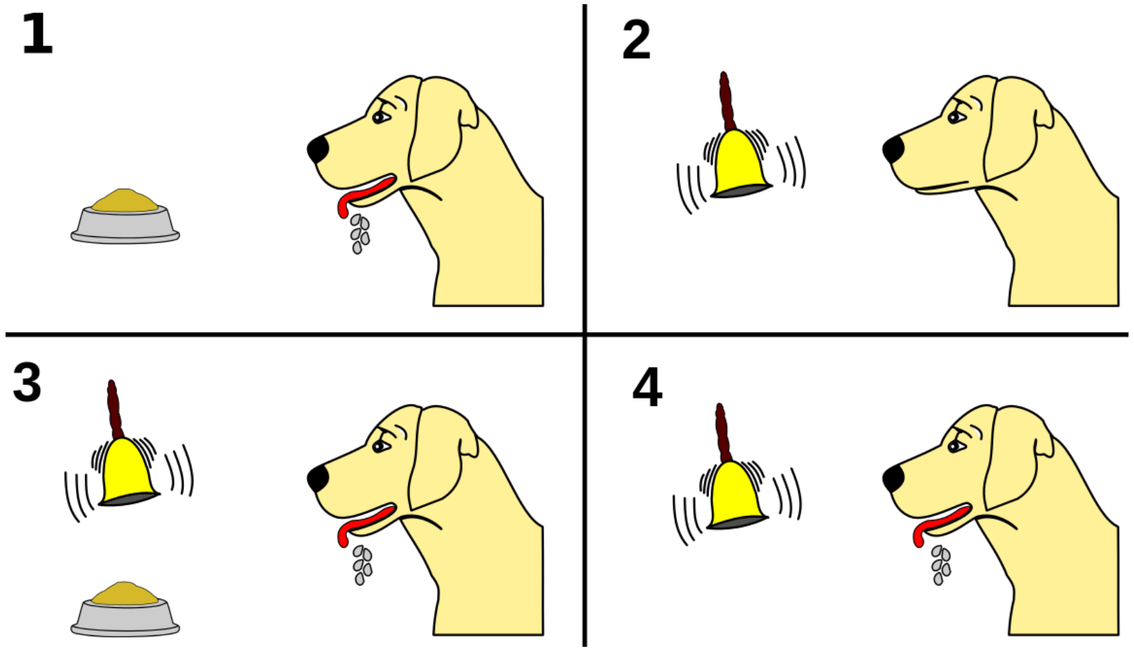
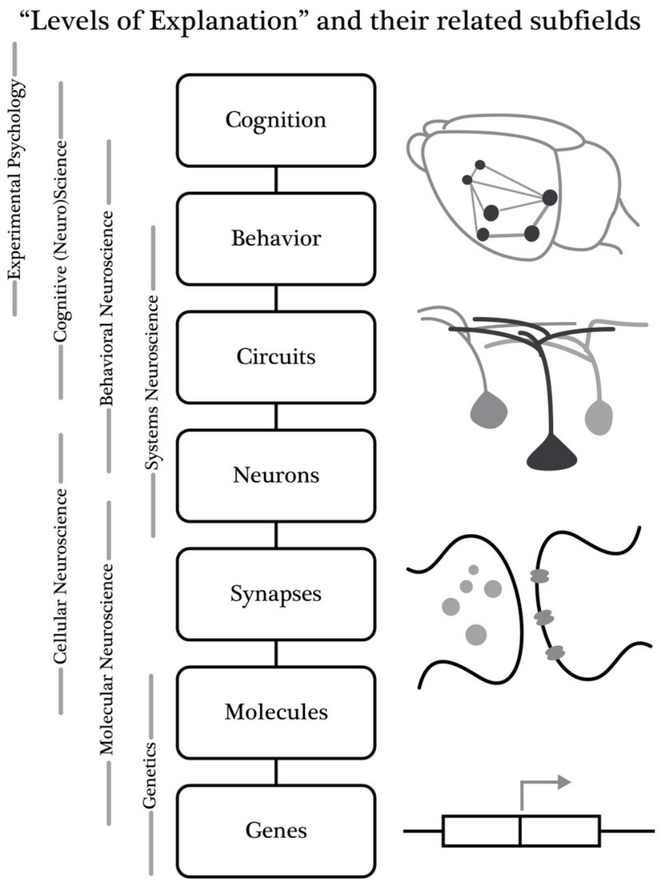
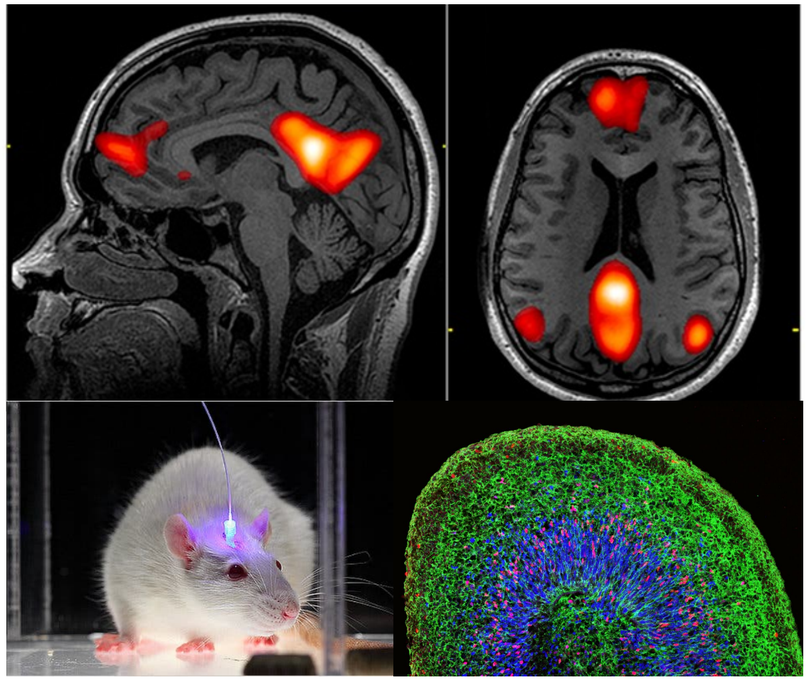
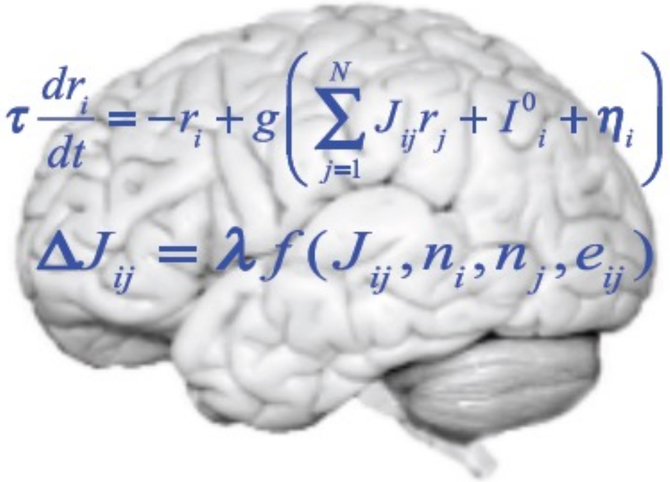


Image: Brooks, 2017

Early Neuroscience







Images: SPICE 2023

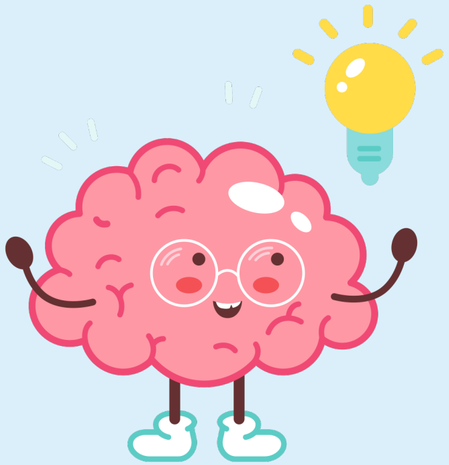
Fact

Fiction

Fact

Fiction

Your brain is fully developed by the time you are a teenager.



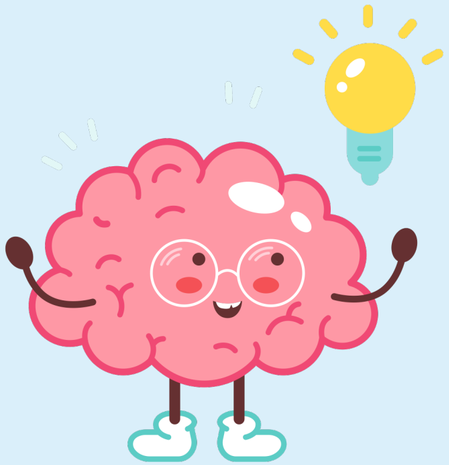
Fiction

While the brain reaches about 90% of its adult size by age 6, it continues to develop throughout adolescence and into your mid-20s.

Fact

Fiction

You have more brain cells than there are stars in the Milky Way galaxy.



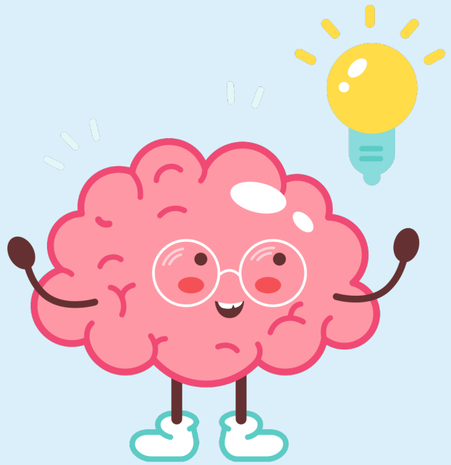
Fiction

The brain has an estimated 86 billion neurons, while the Milky Way is estimated to have 100-400 billion stars.

Fact

Fiction

Our brain feels no pain.



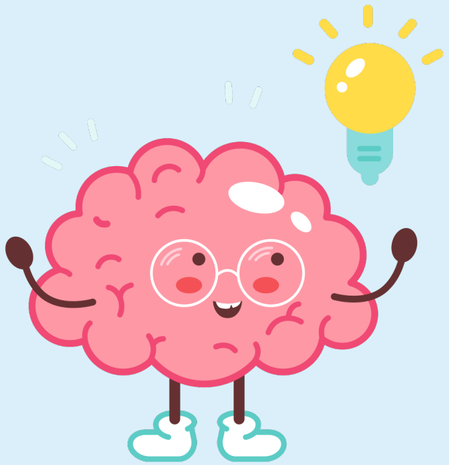
Fact

The brain itself lacks pain receptors.

Fact

Fiction

We only use 10% of our brains.



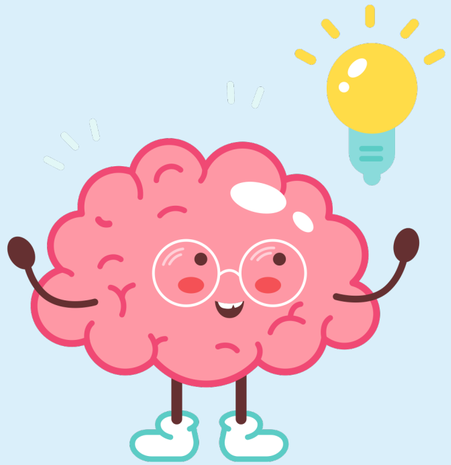
Fiction

This is a widespread myth. Brain scans show that we use our entire brain, but different areas are responsible for different functions.

Fact

Fiction

The brain is the largest organ in the human body.



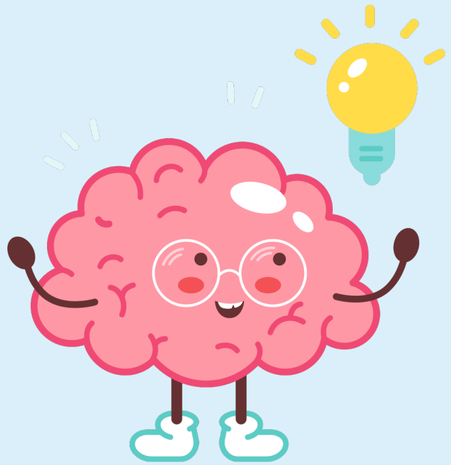
Fiction

Our skin is the largest organ of our body. The brain is, however, the most complex one.

Fact

Fiction

Messages from our brain to our body travel as fast as 268 miles per hour.



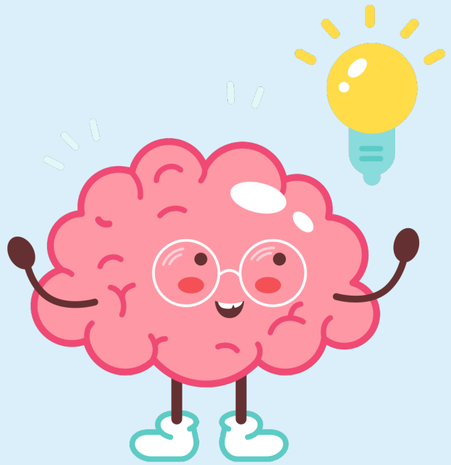
Fact

The fastest signals travel along large, myelinated axons at speeds of up to 268 miles per hour.

Fact

Fiction

Once we reach adulthood, our brain’s structure does not change anymore.



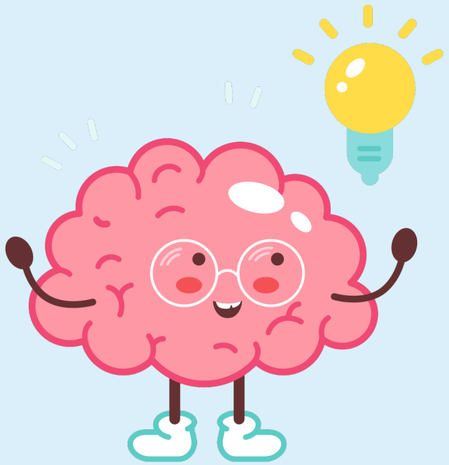
Fiction

The brain is incredibly adaptable throughout life, a concept called **neuroplasticity.**

Fact

Fiction

The bigger a human's brain, the more intelligent they are.



Fiction

While brain size varies slightly among individuals, it is not a strong predictor of intelligence.

Thank you!

Any Questions?

Thank you!

Any Questions?

Next Class:

Tomorrow, Friday the 28th

10am-11am