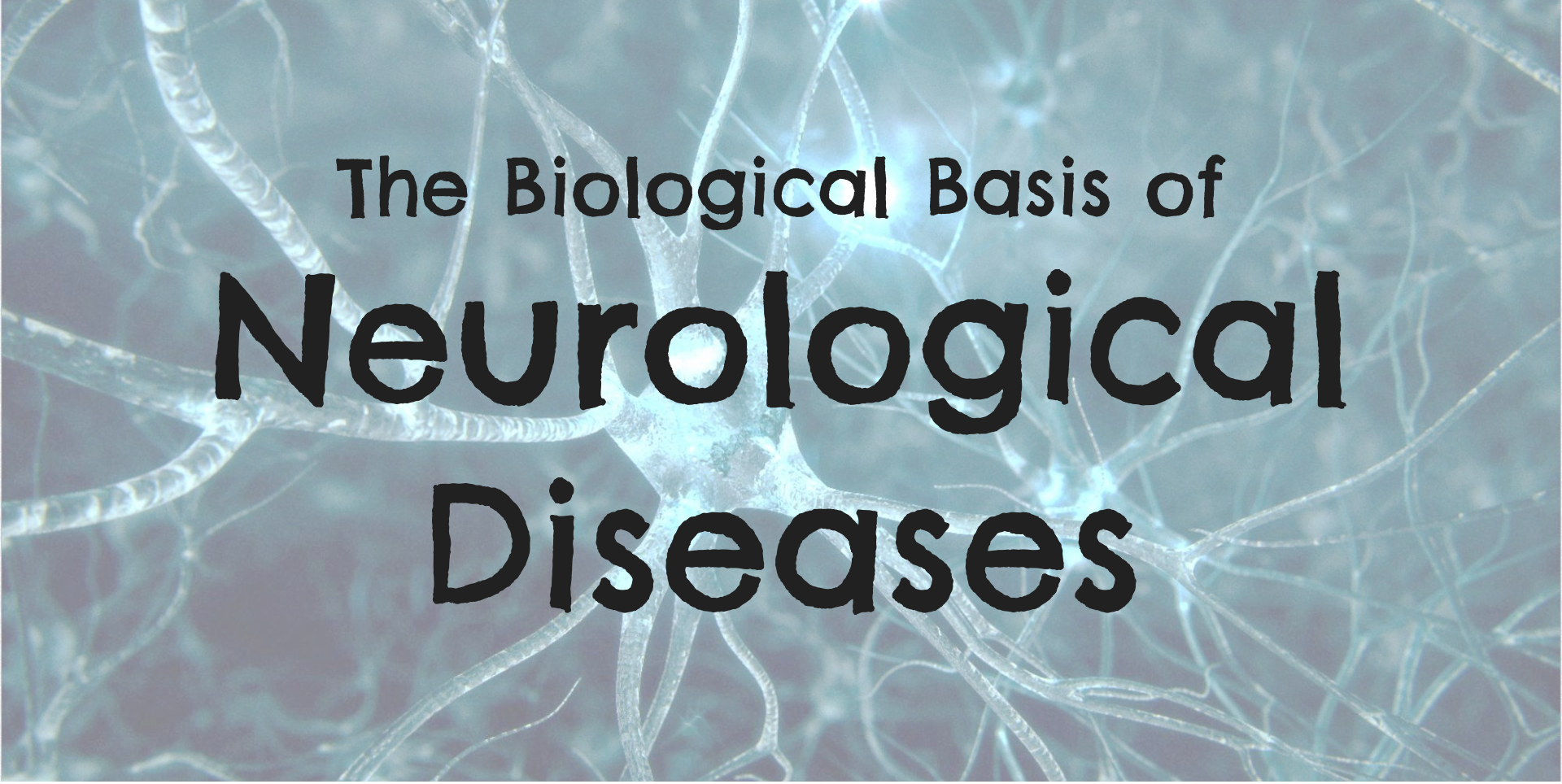
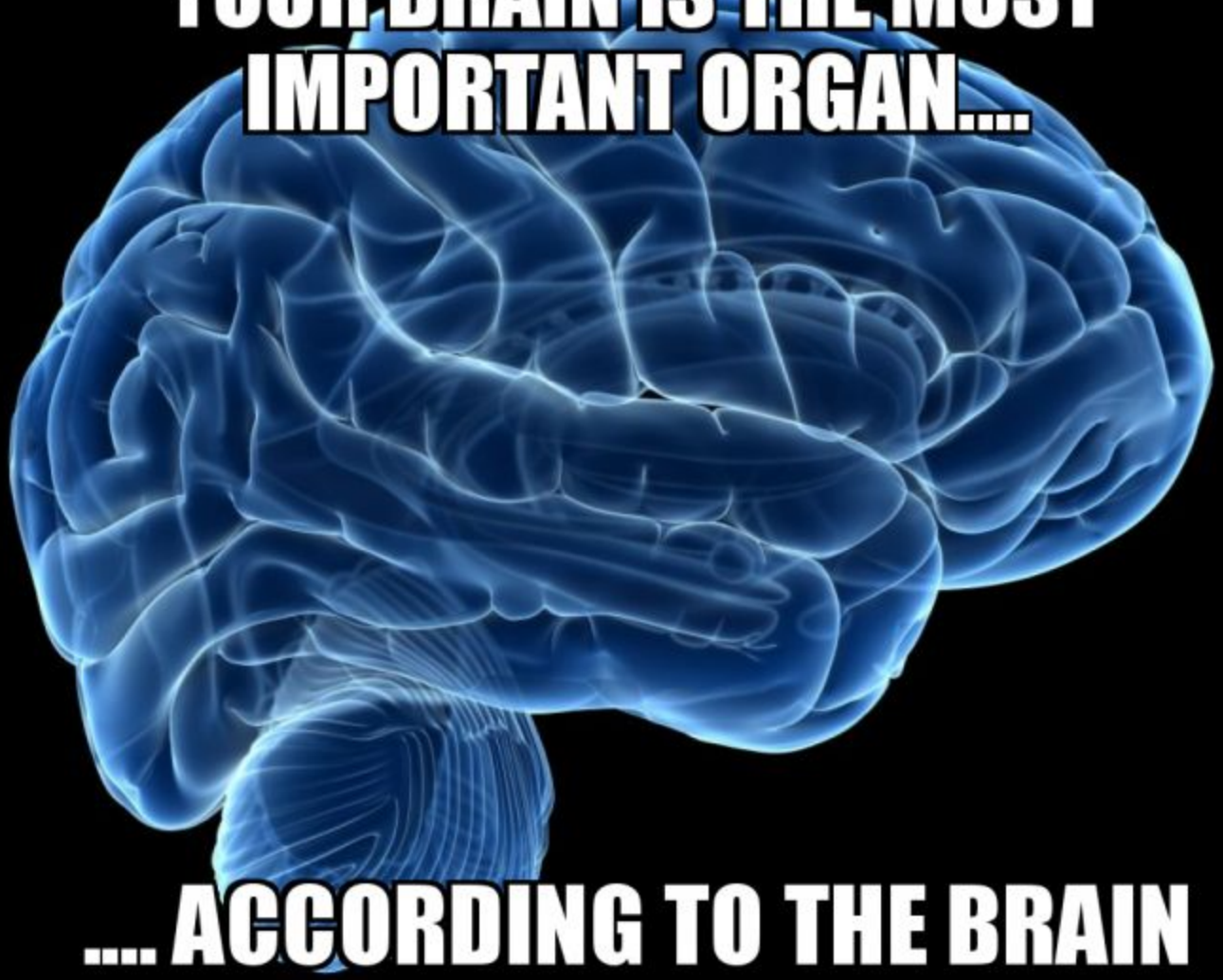


07.11.2020

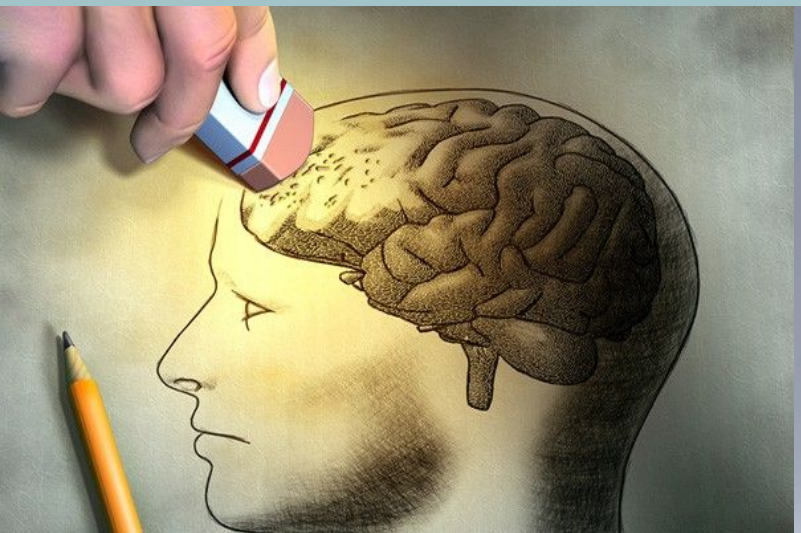
Daniel, Joyce, Andrés, and Audrey

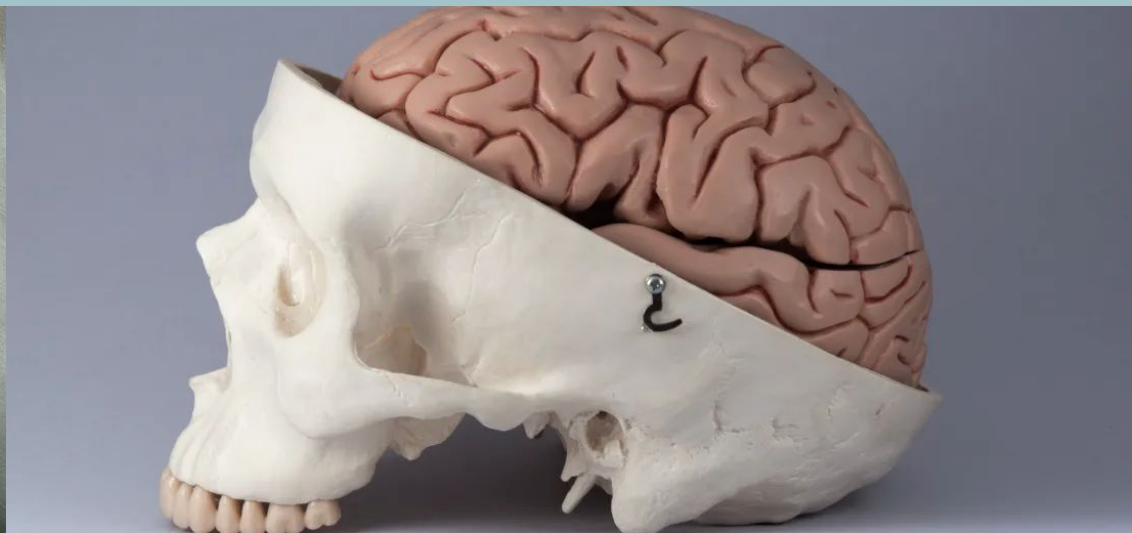
YOUR BRAIN IS THE MOST IMPORTANT ORGAN....



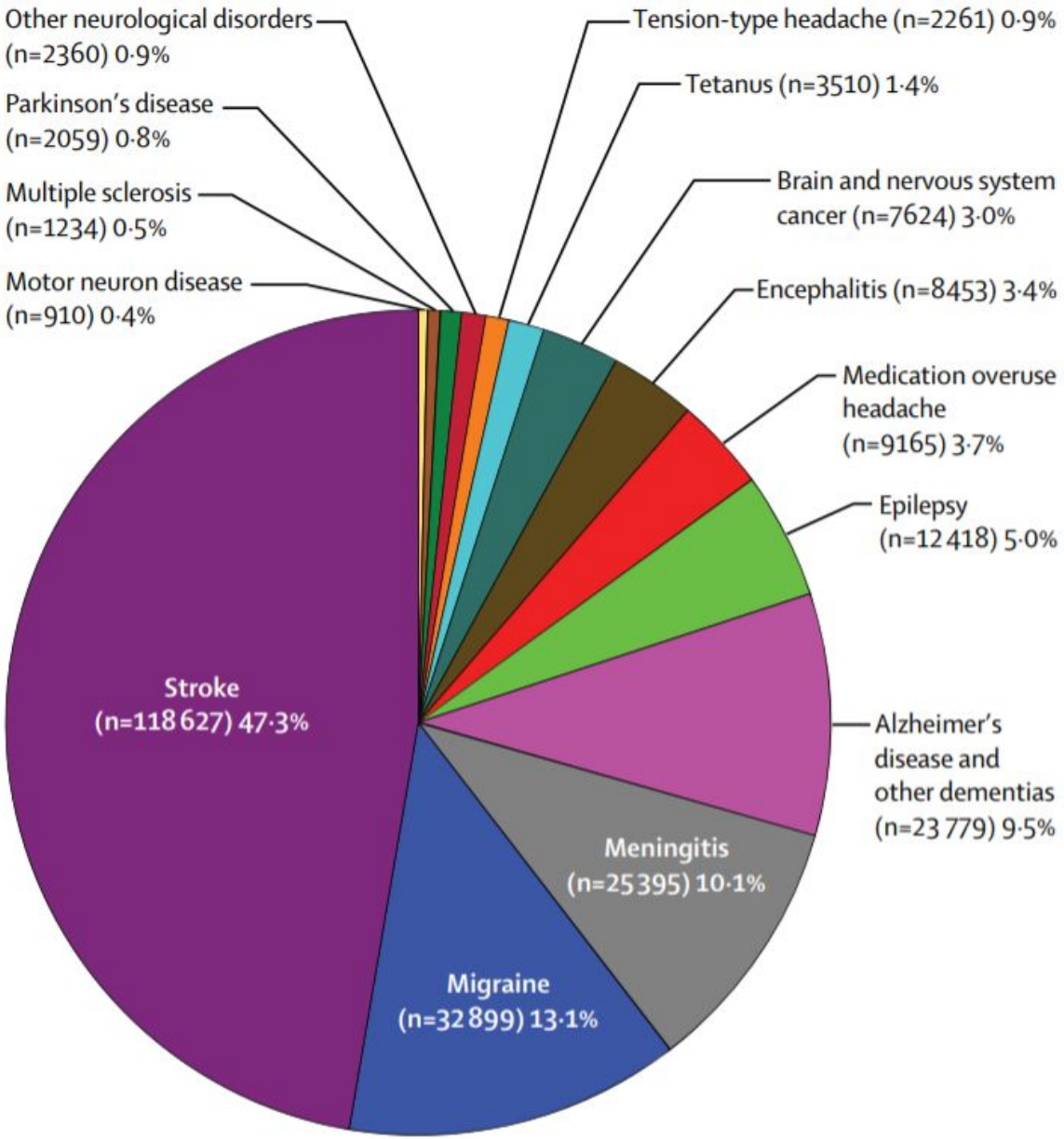
.... ACCORDING TO THE BRAIN

What brain disorders can you name?





Prevalence of Neurological Disorders



Course outline

7/11 (today) Intro to neuroscience
Epilepsy & brain lesions

7/18 Alzheimer's disease

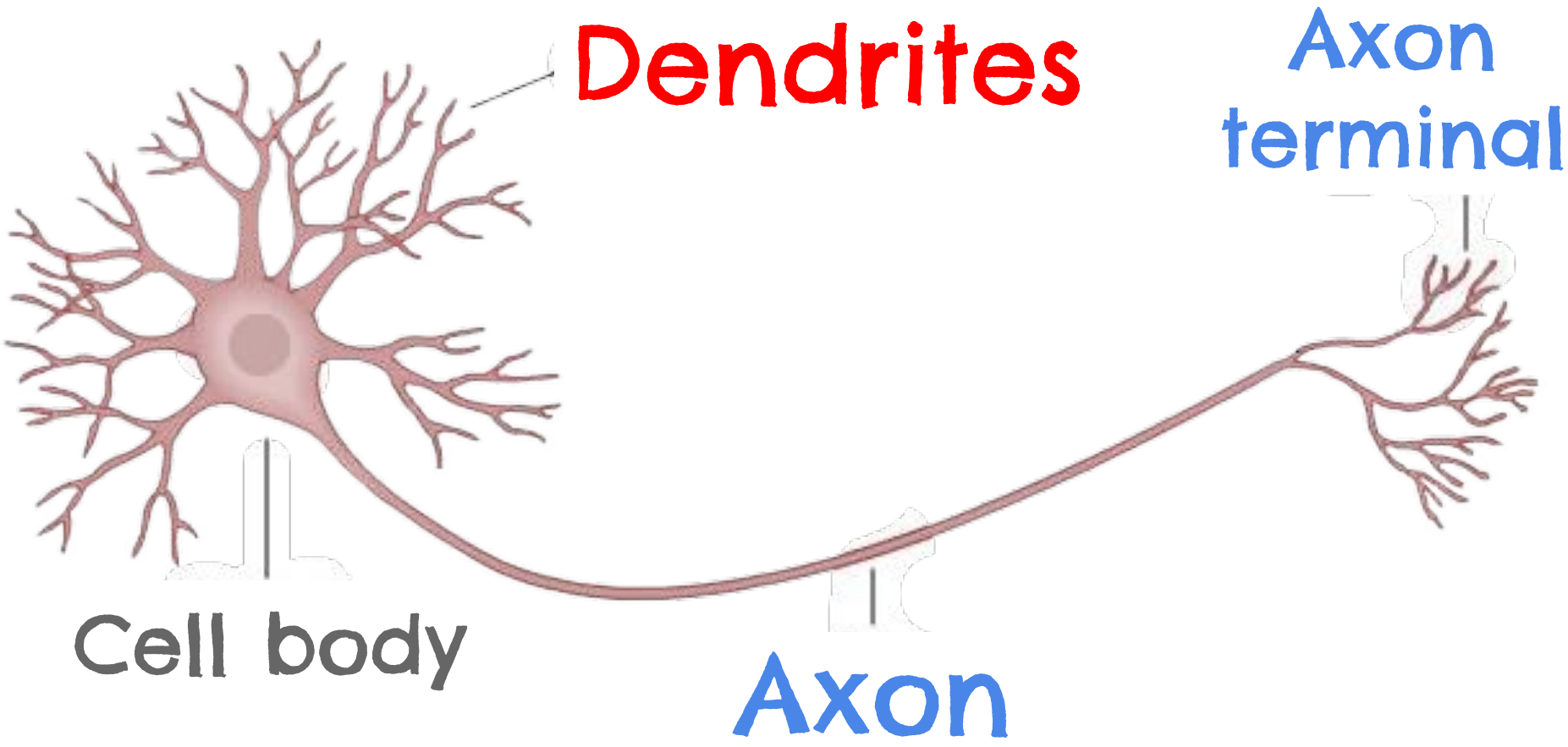
7/25 Parkinson's disease
(and other movement disorders)

8/1 Autism spectrum disorders

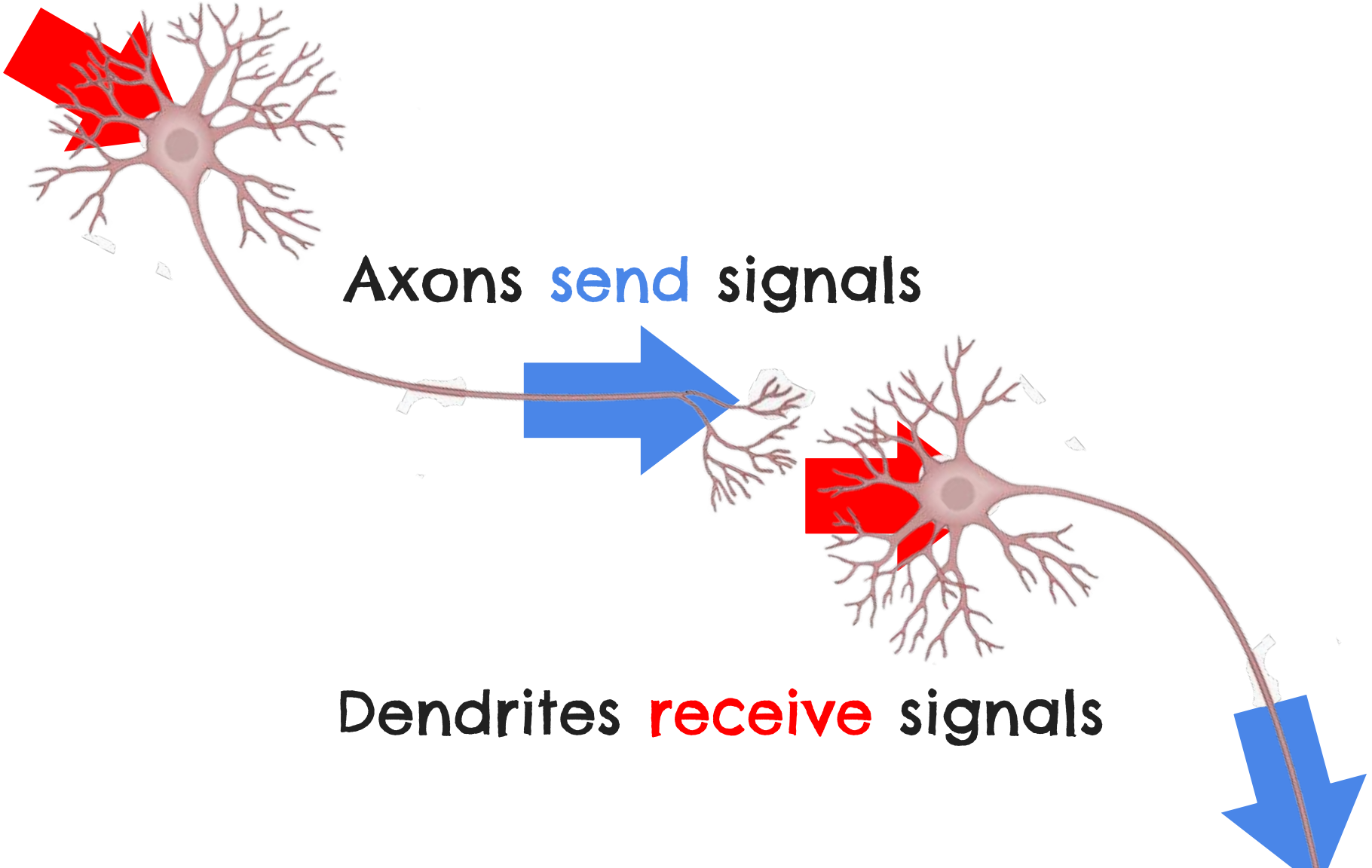
8/8 Anxiety & PTSD

8/15 Student's choice!

Anatomy of a neuron

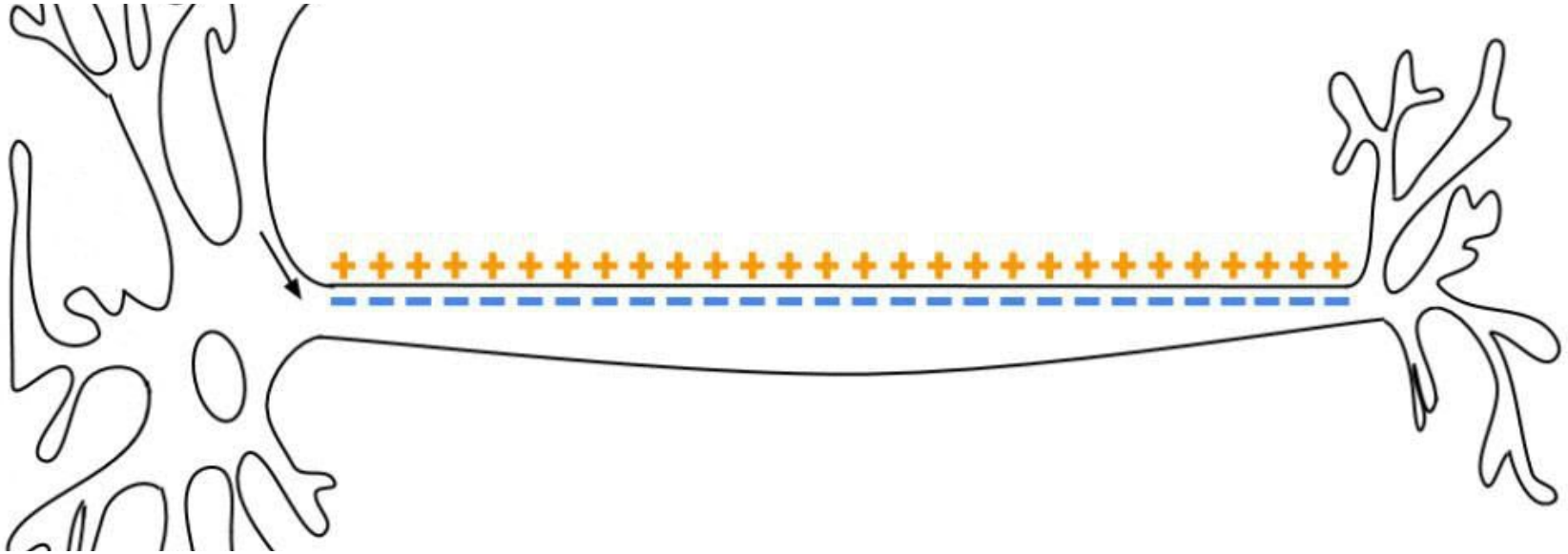


Neurons send signals

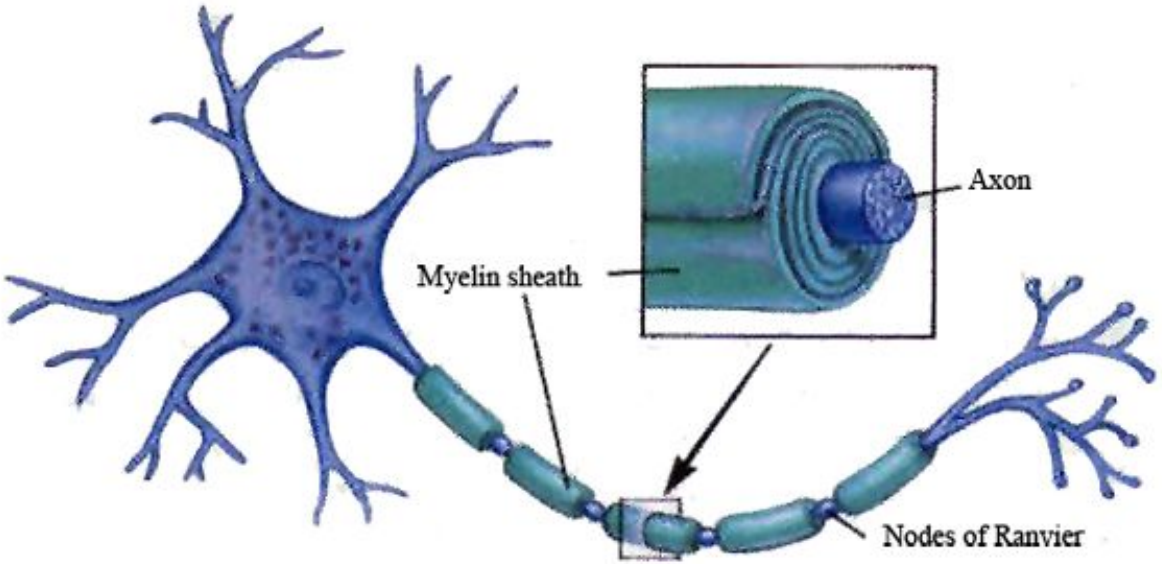


The action potential

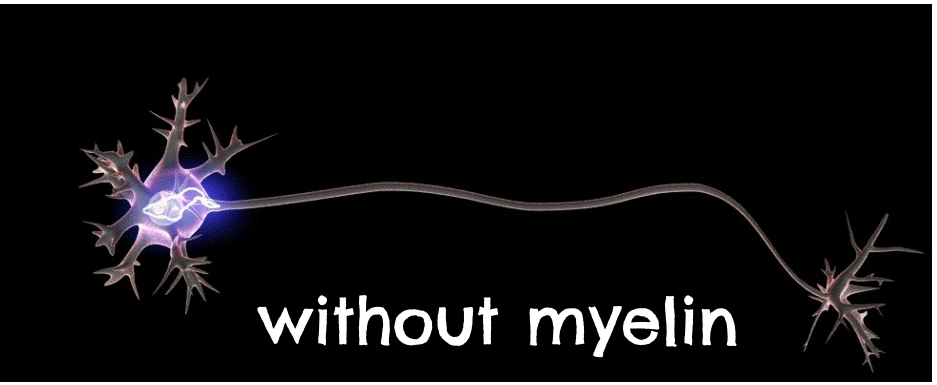
- Neurons send signals via changes in the **electrical potential** of their membranes
- **Action potential:** a fast “all-or-none” electrical signal

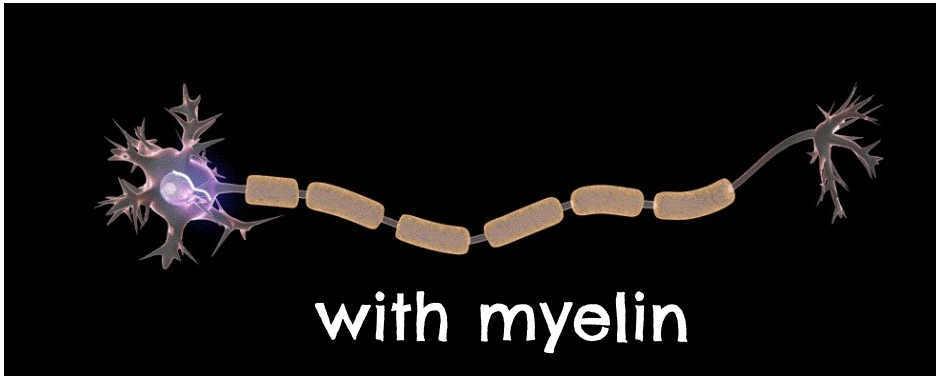


Speeding up the action potential



- Axons are insulated by **myelin**
- Myelin allows the electrical signal to “jump” down the axon





How many neurons does an average adult human have?

860 thousand

86 million

86 billion

8.6 trillion

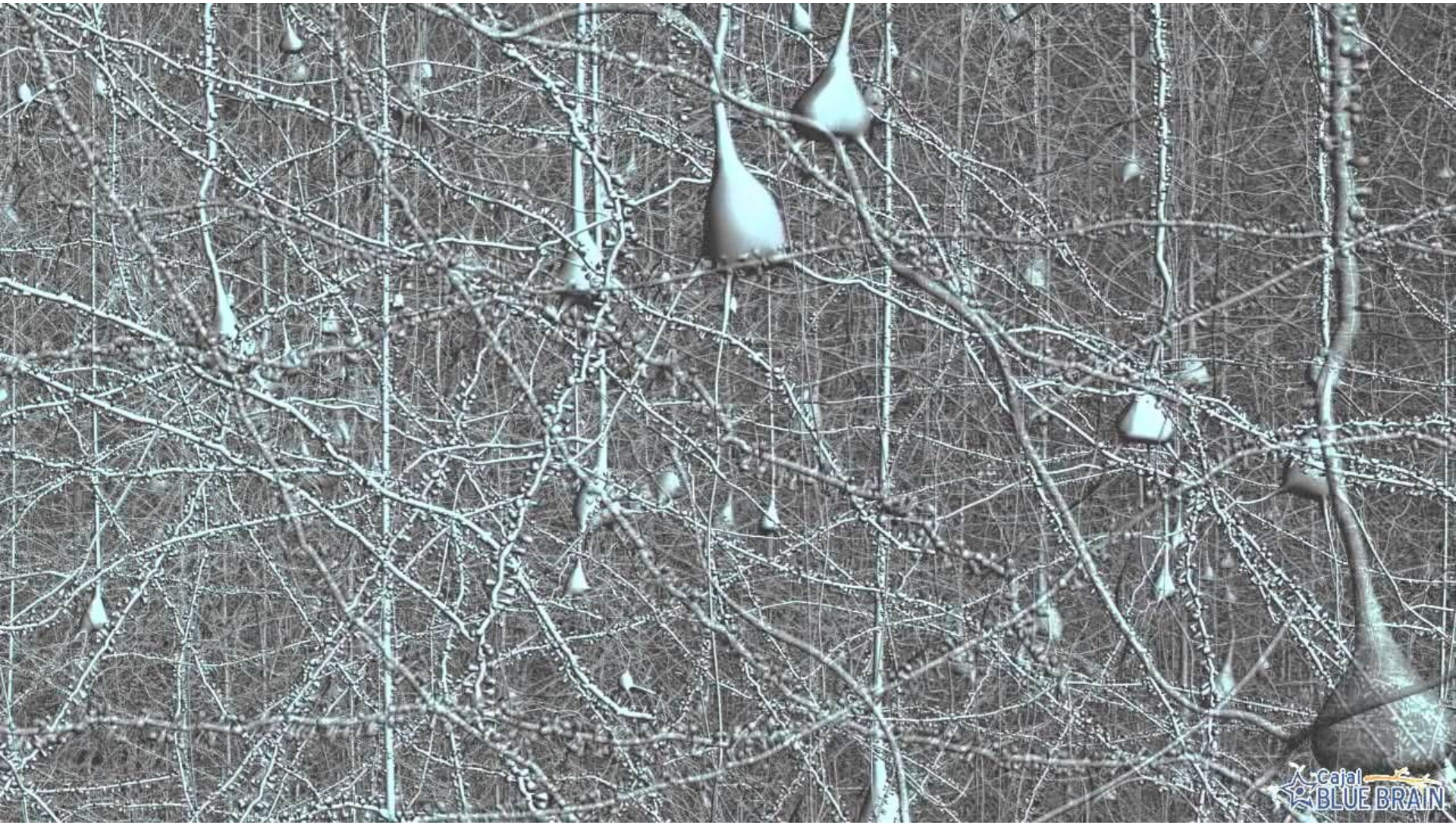
How many neurons does an average adult human have?

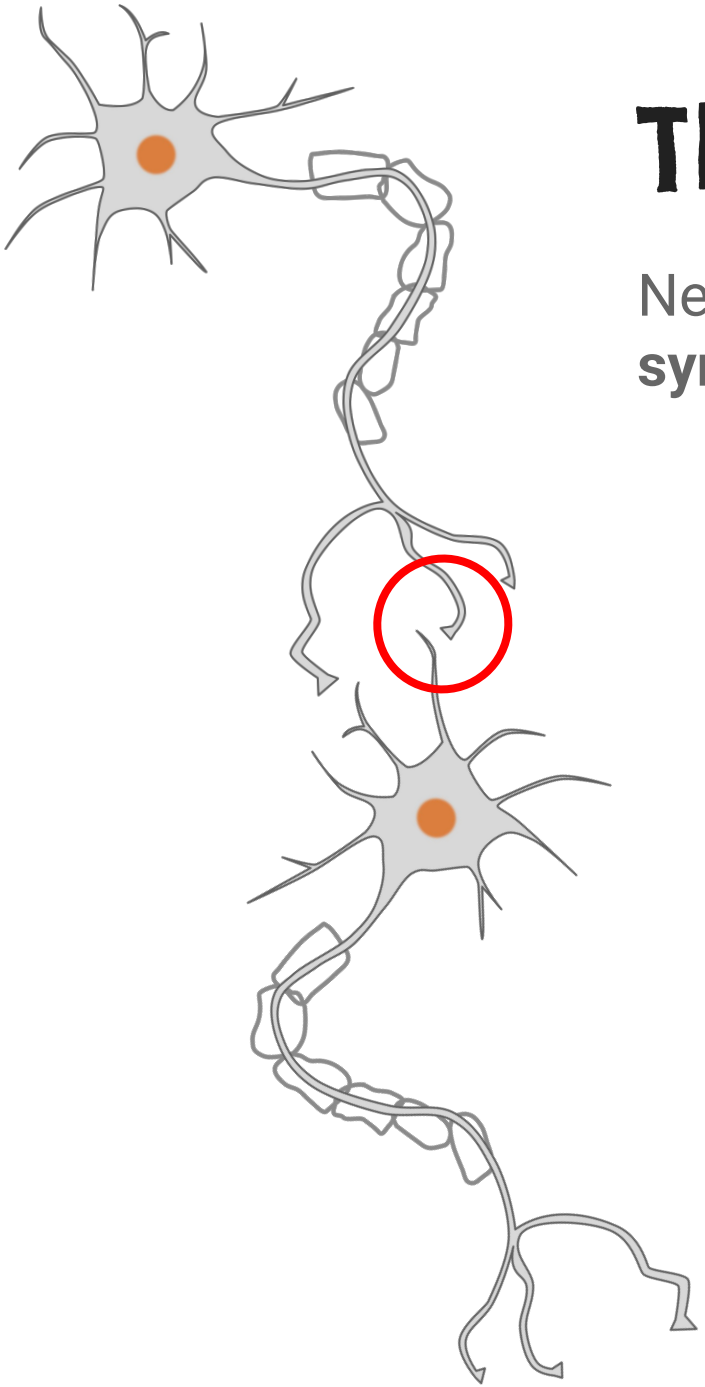
86 billion

How about the connections between those neurons?

It’s complicated…

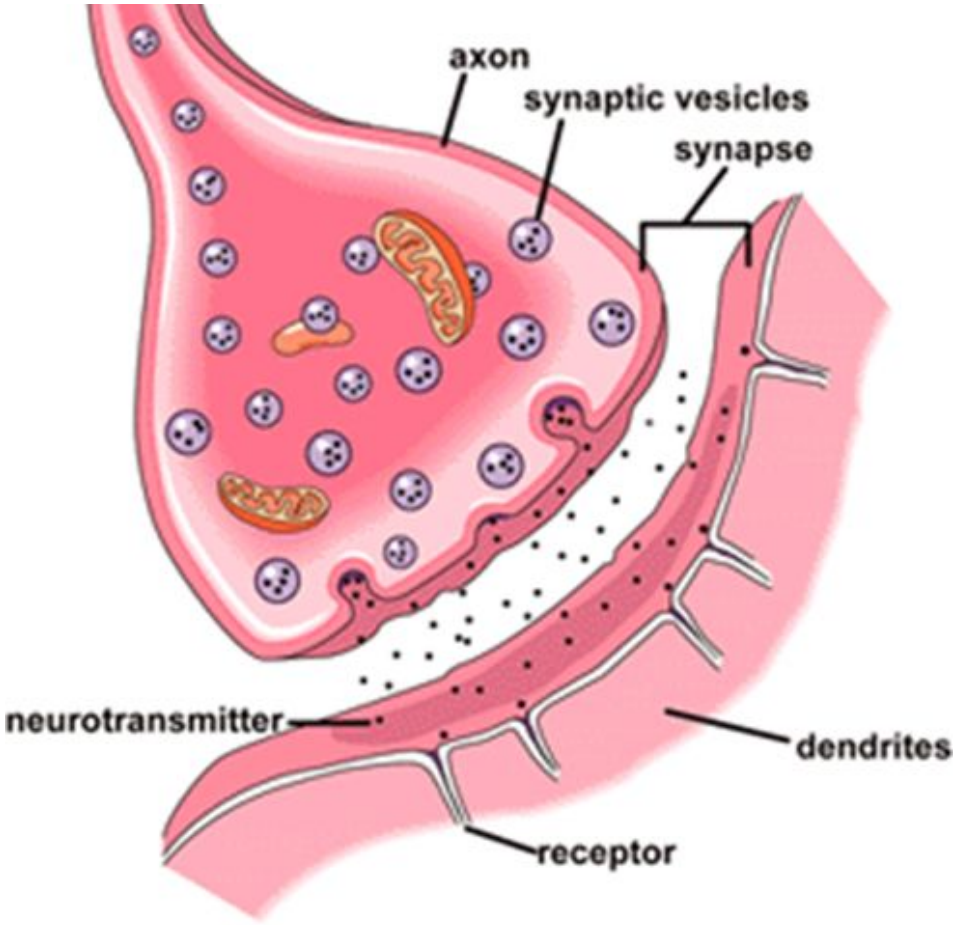
Neurons form complex networks





The synapse

Neurons release **neurotransmitters** at **synapses** to talk to each other.



How many **synapses** does an average adult human have?

1 million

100 million

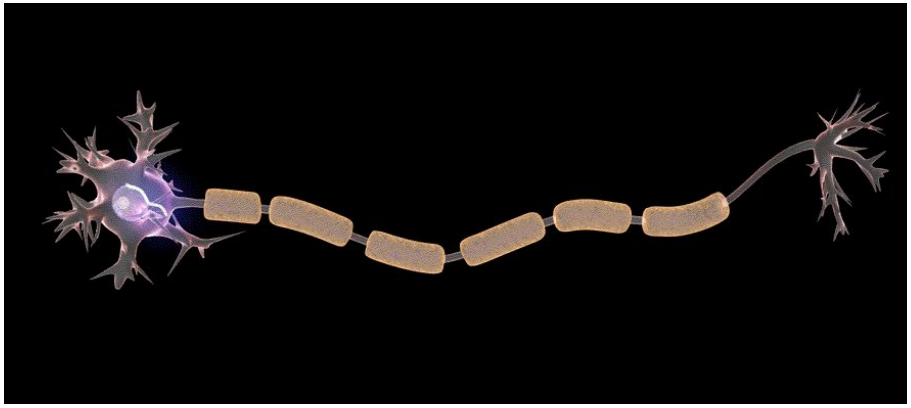
100 billion

100 trillion

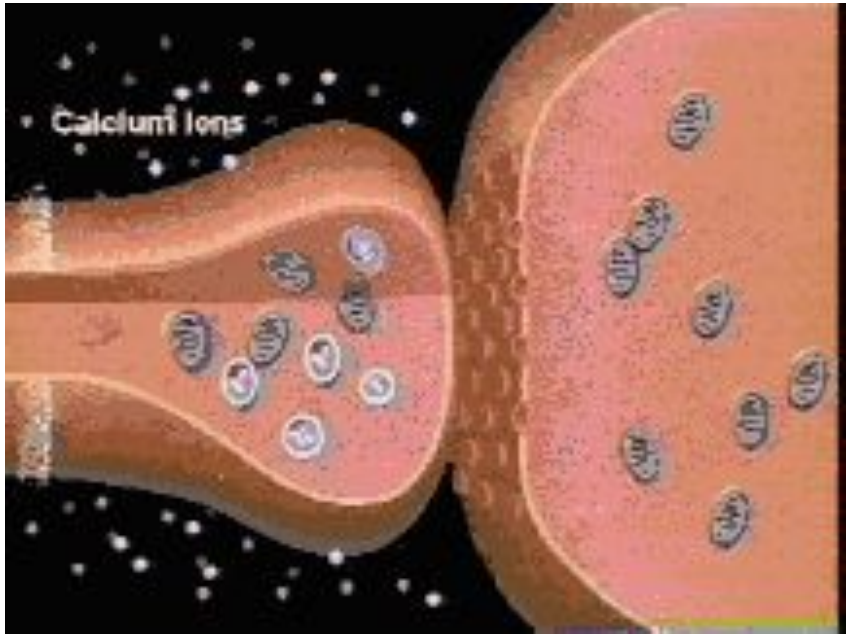
How many **synapses** does an average adult human have?

Summary

Electrical signals move within a neuron.

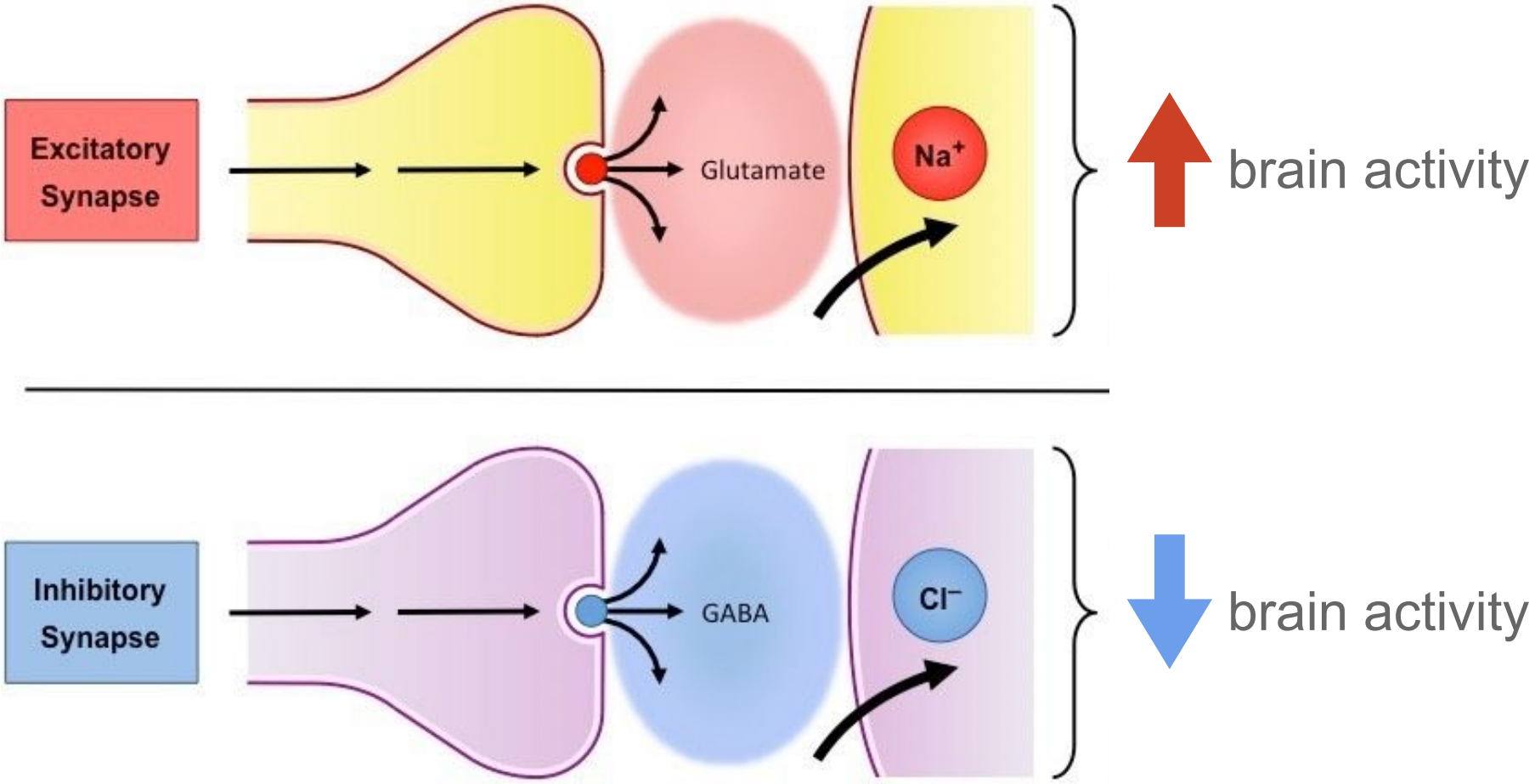


Chemical signals move between neurons.



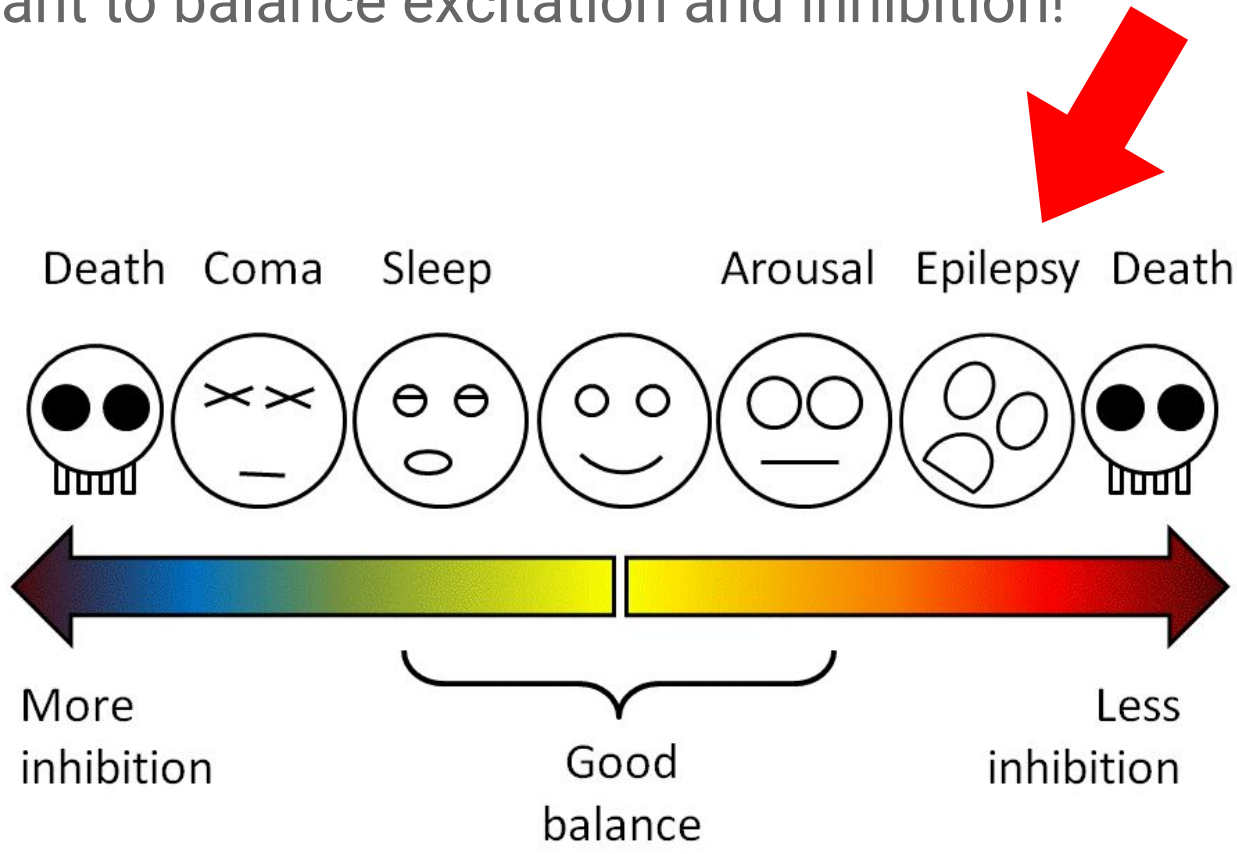
The brain is a network of neurons that use these signals to process and send information.

Excitation and inhibition



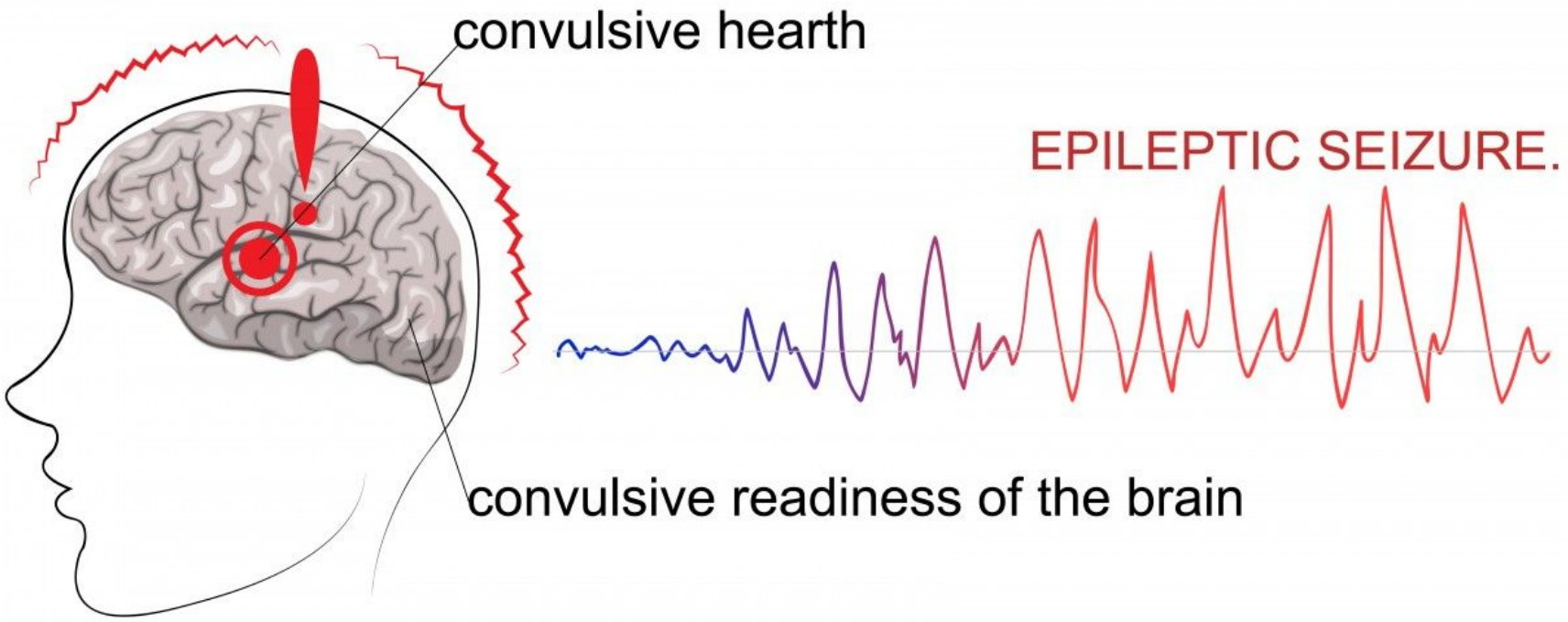
Excitation and inhibition

It’s important to balance excitation and inhibition!



Epilepsy

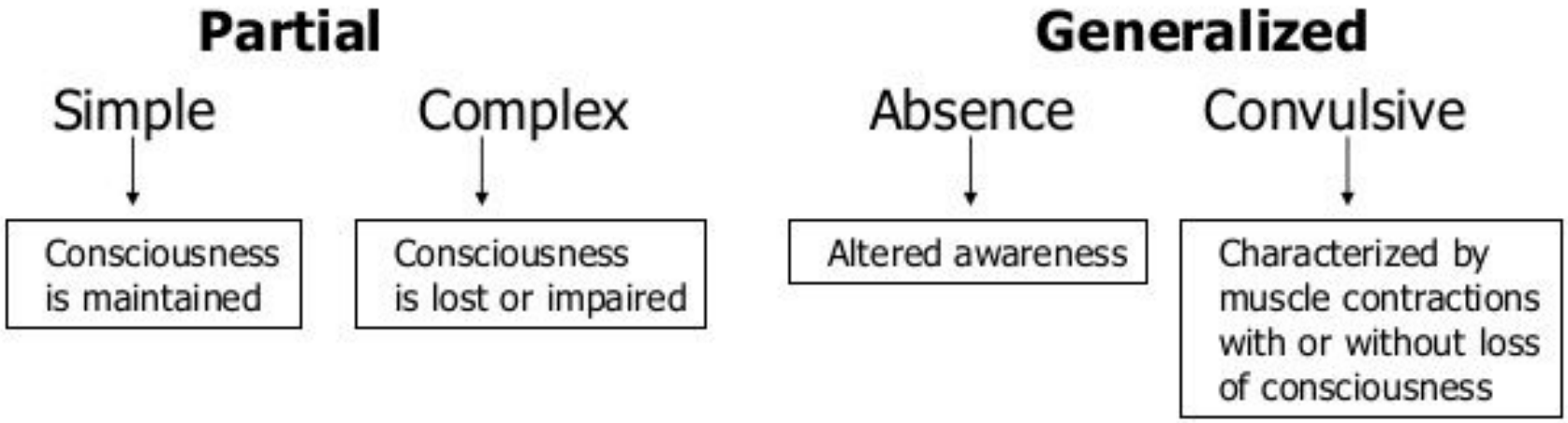
Seizures happen when excessive firing occurs in one location, then spreads to the rest of the brain.

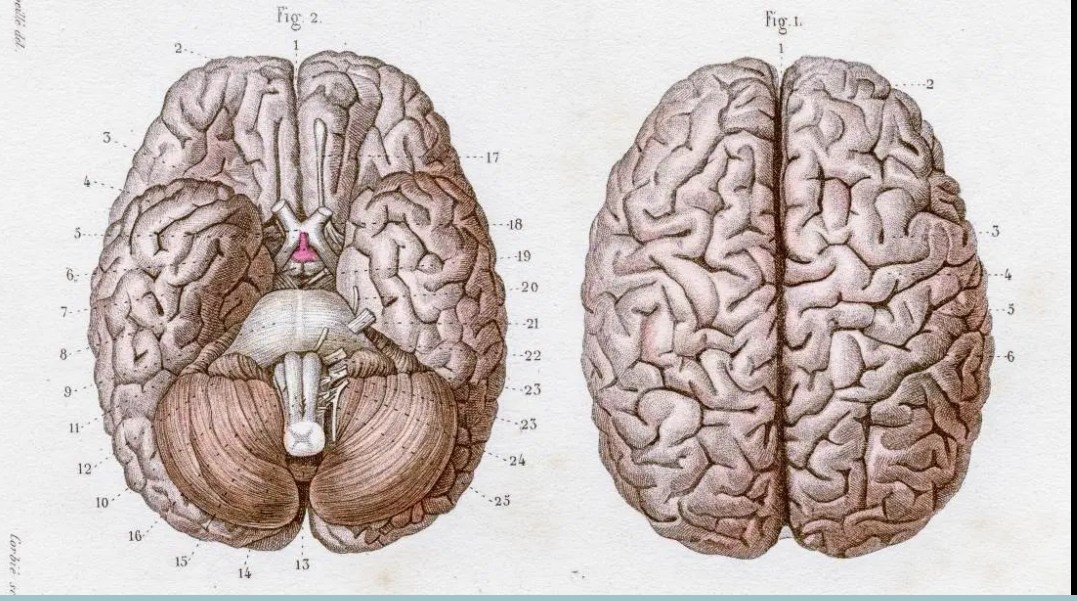


Types of seizures

Partial: initial activation of only part of one cerebral hemisphere

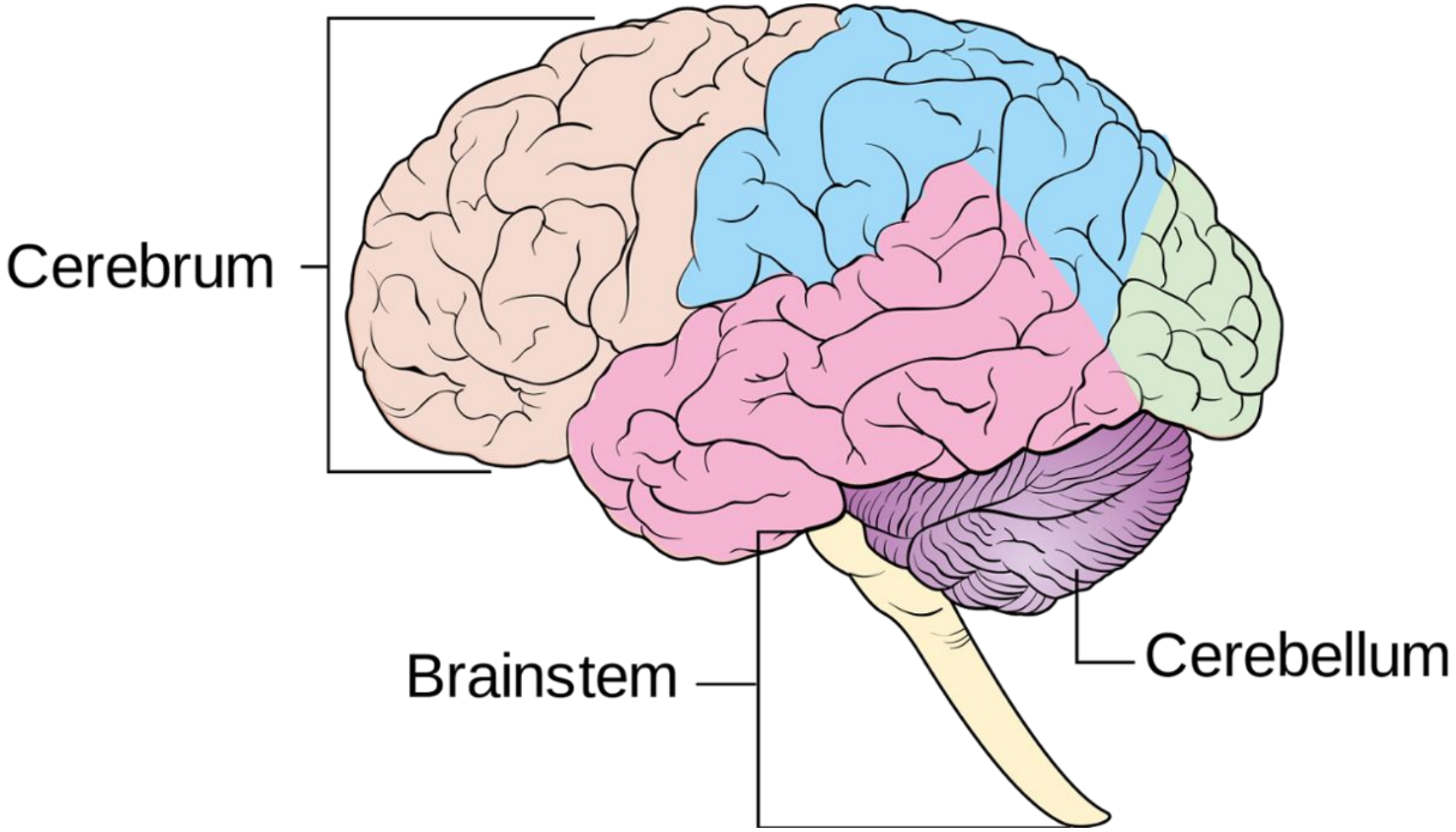
Generalized: discharge from both cerebral hemispheres





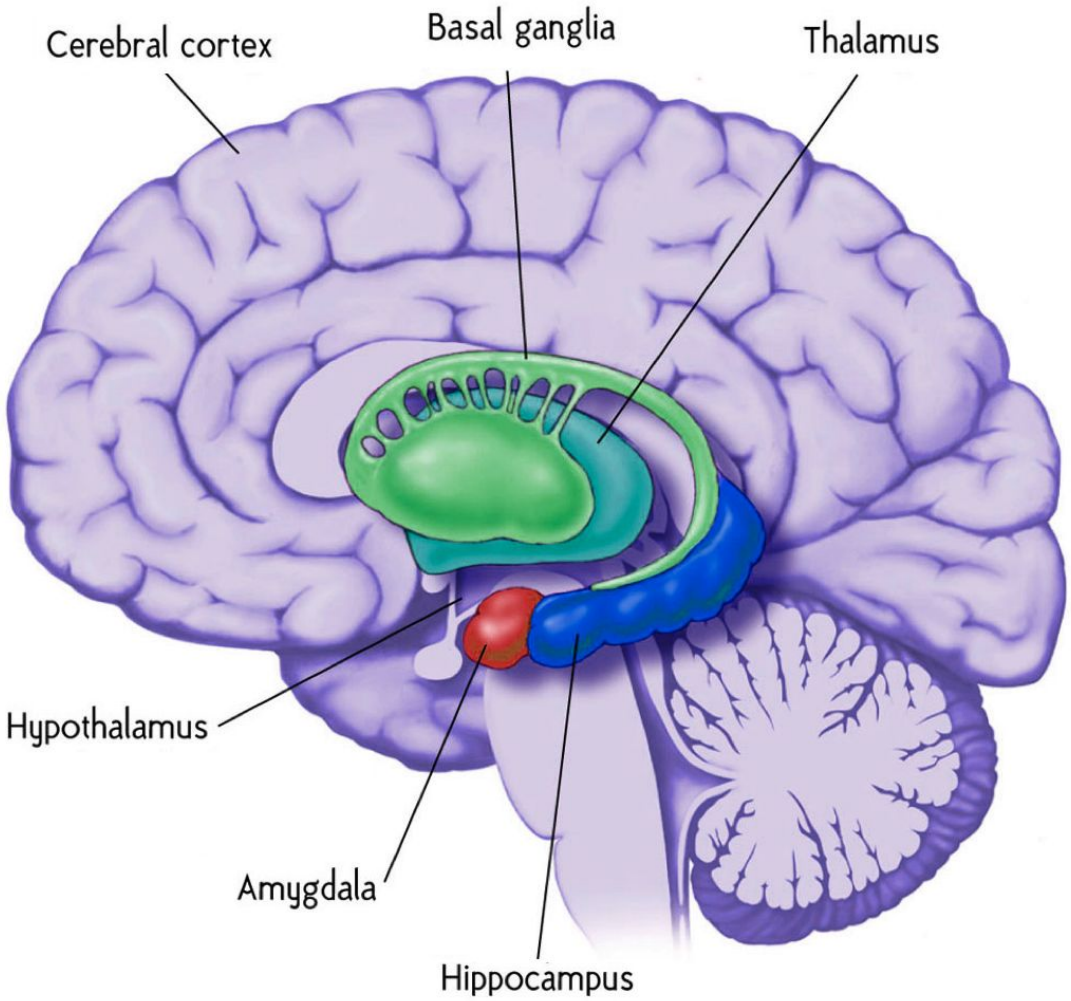
BRAINS!

Major parts of the brain



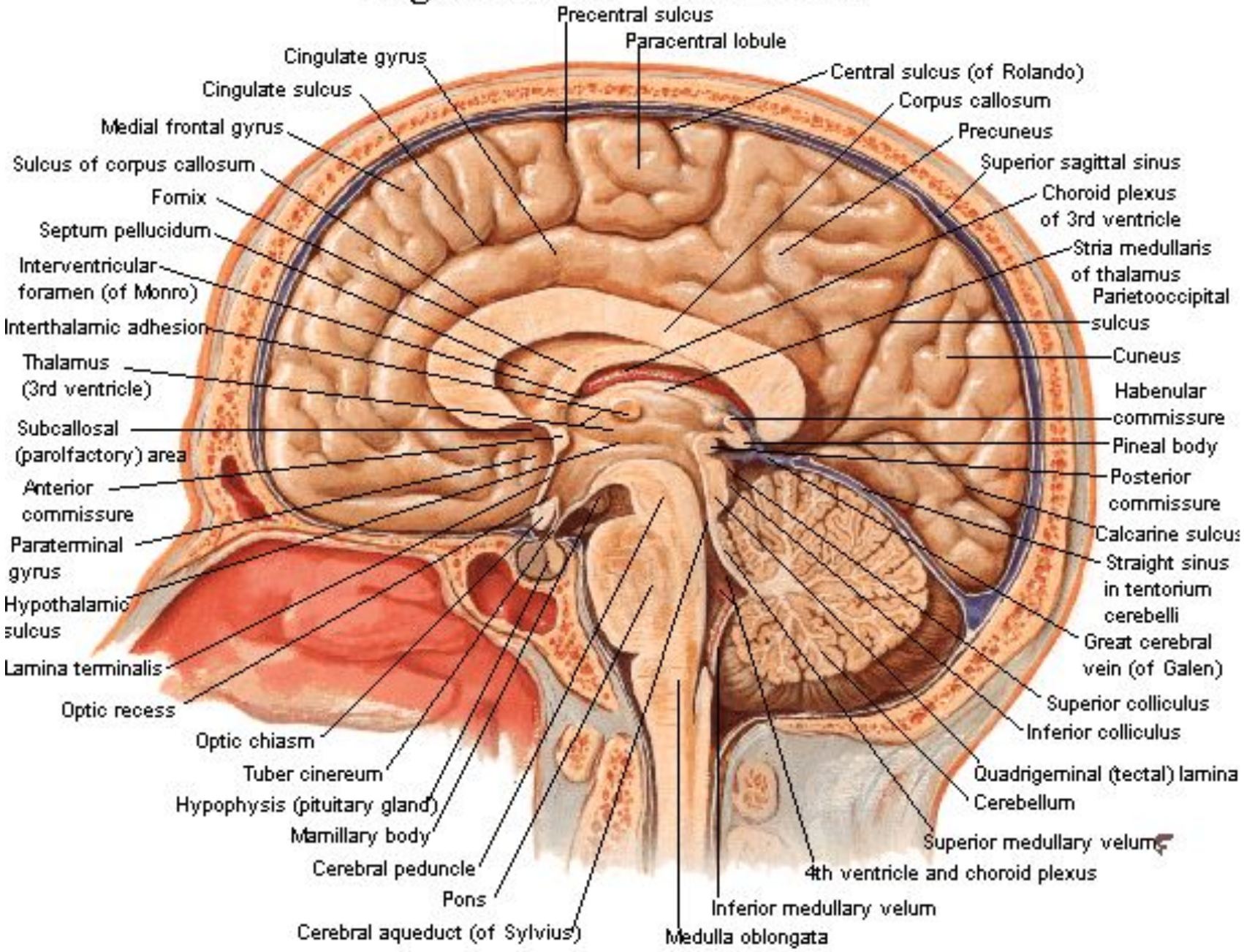
Other parts of the brain

- Basal ganglia
- Hippocampus
- Amygdala
- and more...

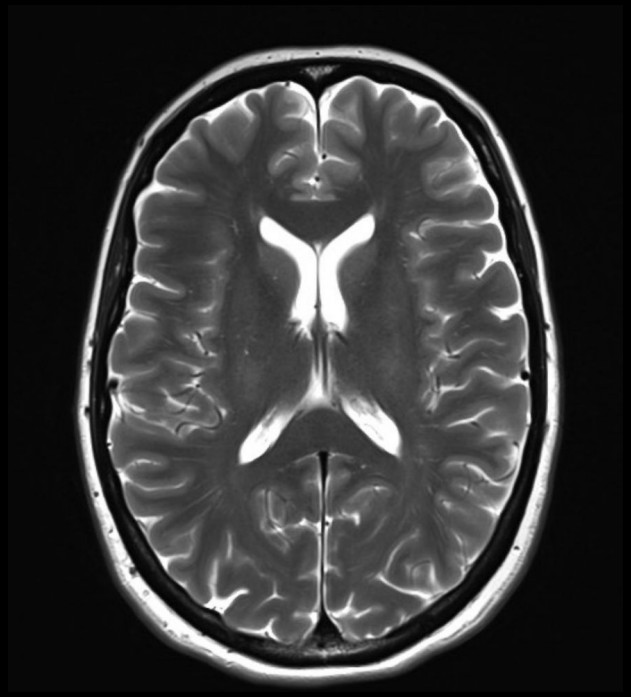


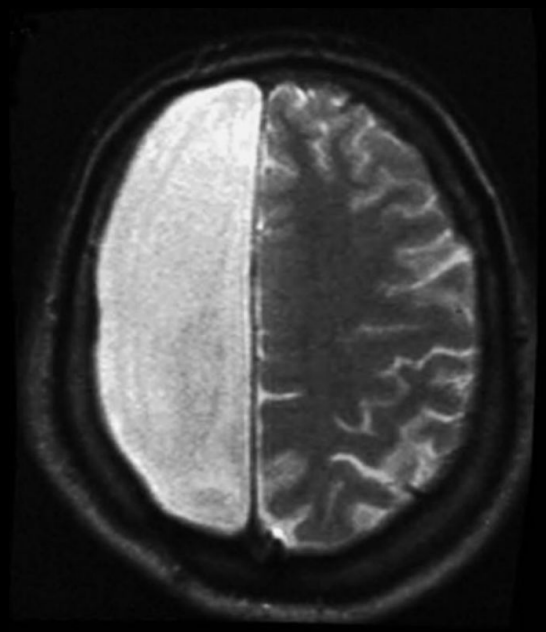
Cerebrum - Brain in Situ

Sagittal Section - Medial View

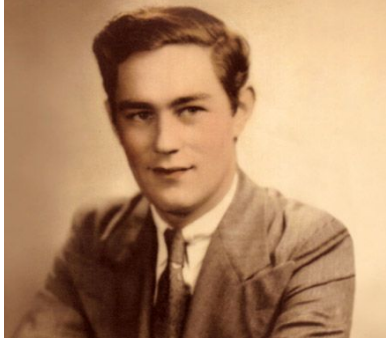


What happens if some of these parts are damaged?

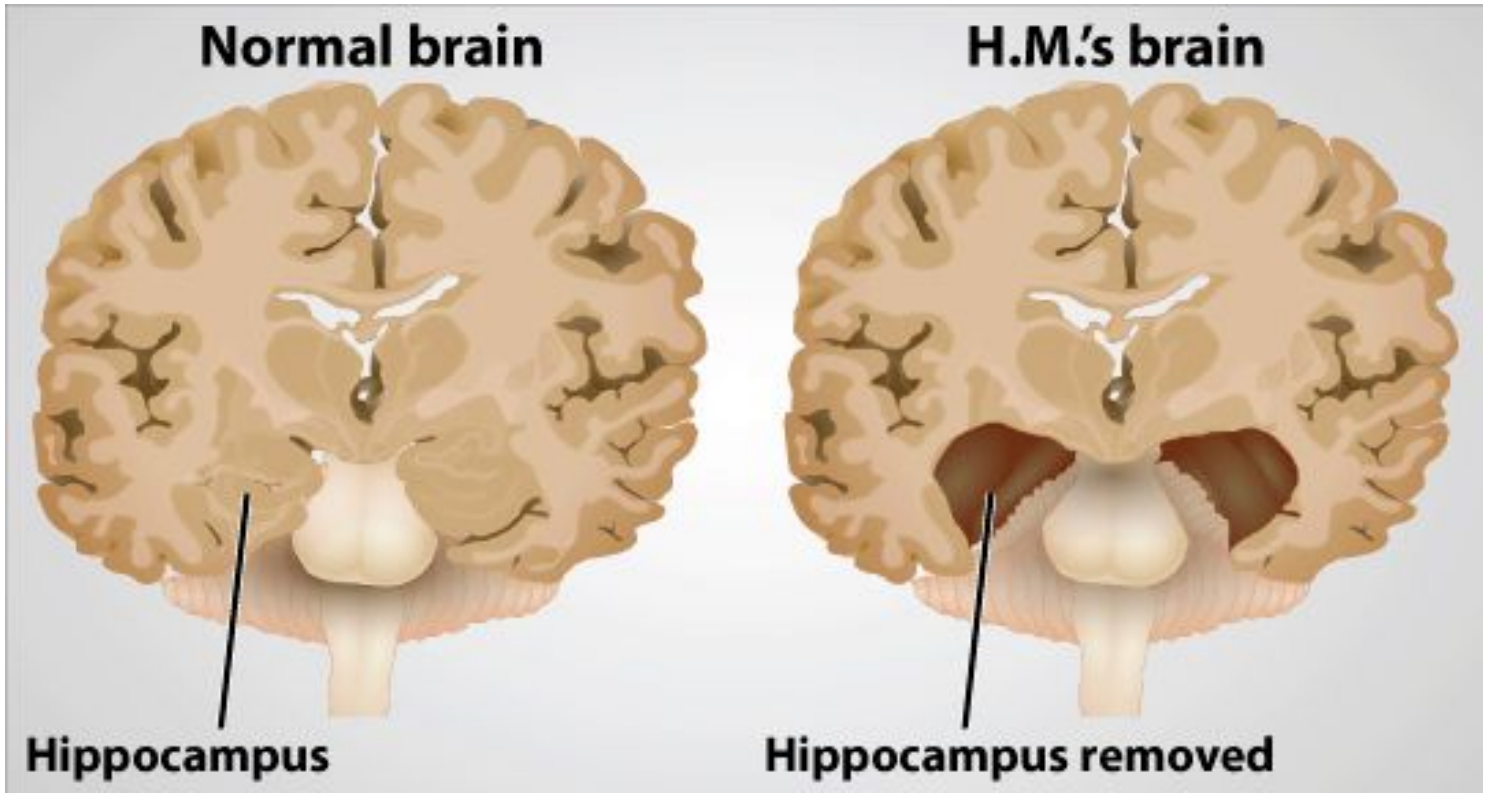




A famous case: Patient HM



- Bicycle accident at age 7, leading to epilepsy
- **Hippocampus** removed to treat epilepsy at age of 27
  - Lost the ability to form new memories



Brain lesion patient: Phineas Gage

- **Prefrontal lobe** damaged in railroad accident
  - No changes in memory, sensory, or motor abilities
  - Major personality changes!
  - Became antisocial, irritable, and impulsive