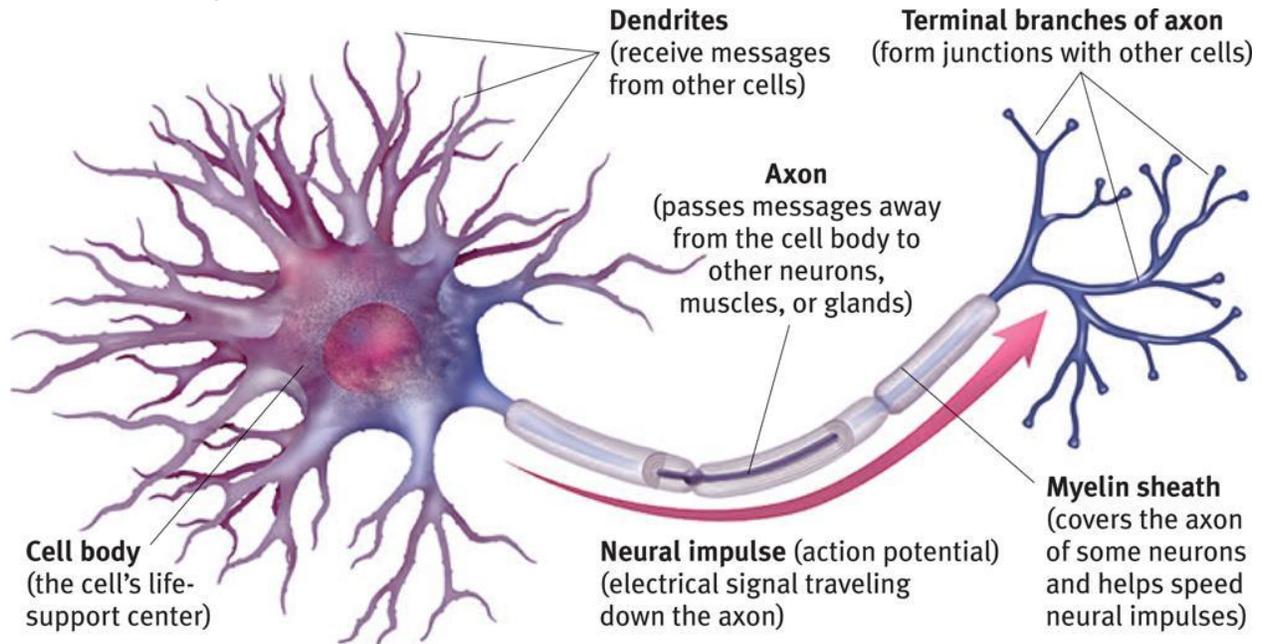
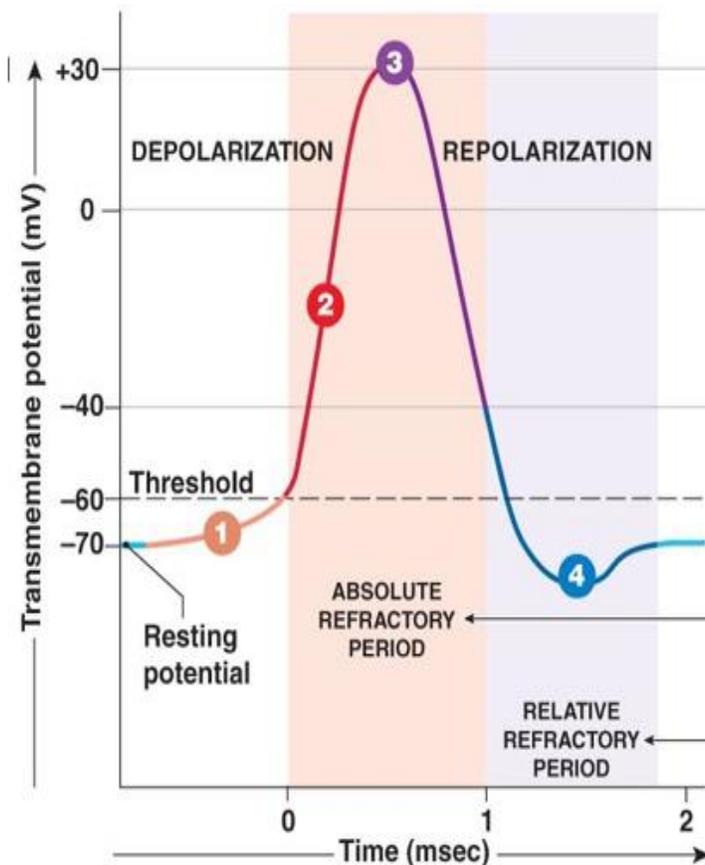


Biological Bases of Behavior

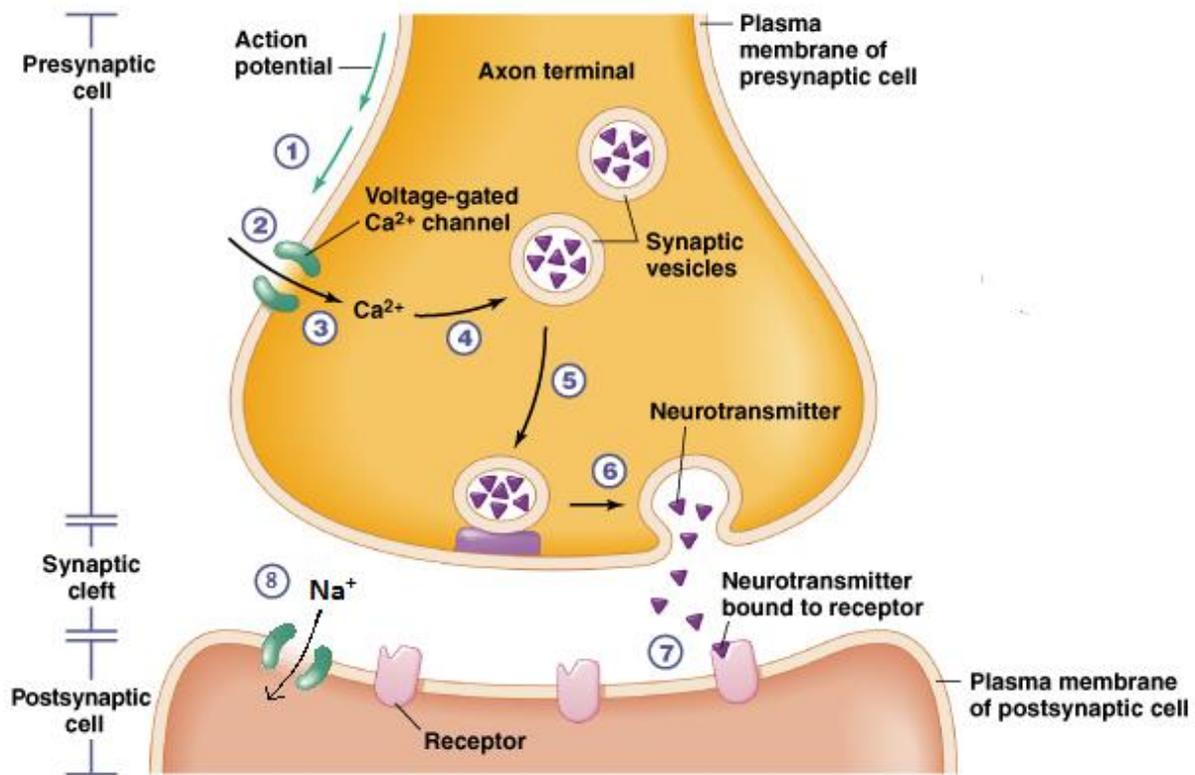
Neuroanatomy



How Neurons Fire



- 0) Resting State – neuron has negative charge (-70mv), with anions on the inside and cations outside the cell
 - 1) Depolarization – neuron receives neurotransmitters in receptor sites on dendrites, exceeds threshold
 - 2) Rapid Depolarization – cations rush into cell, causing cell to depolarize
 - 3) Repolarization – cations reach peak (+30mv), and begin to repolarize
 - 4) Return to Resting – neuron polarizes beyond resting, then returns to -70mv
- ARP = neuron cannot respond to further stimulation
- RRP = neuron is only able to respond to larger-than-normal stimulation



- 1) Action potential arrives
- 2) Ligand gates open
- 3) Calcium rushes in
- 4) High calcium ion content causes synaptic vesicles to accumulate rapidly
- 5) Synaptic vesicles attach to membrane
- 6) Synaptic vesicles burst, releasing neurotransmitters
- 7) Neurotransmitters are received by post synaptic receptors
- 8) Sodium ions flow in to prepare for causing further action potentials

Neurotransmitter	Function	Problems with Excess or Deficit
Acetylcholine	Motor movement	- Lack of Ach is associated with Alzheimer's
Dopamine	Motor movement, Alertness	- Lack of DA is associated with Parkinson's - Too much DA is associated with schizophrenia
Endorphins	Pain control	- Involved in addictions
Serotonin	Mood control	- Lack of 5-HT is associated with depression
GABA	Inhibition, Memory	- Seizures - Sleep problems
Glutamate	Excitation	- Seizures - Migraines
Norepinephrine	Arousal, Alertness	- Depression

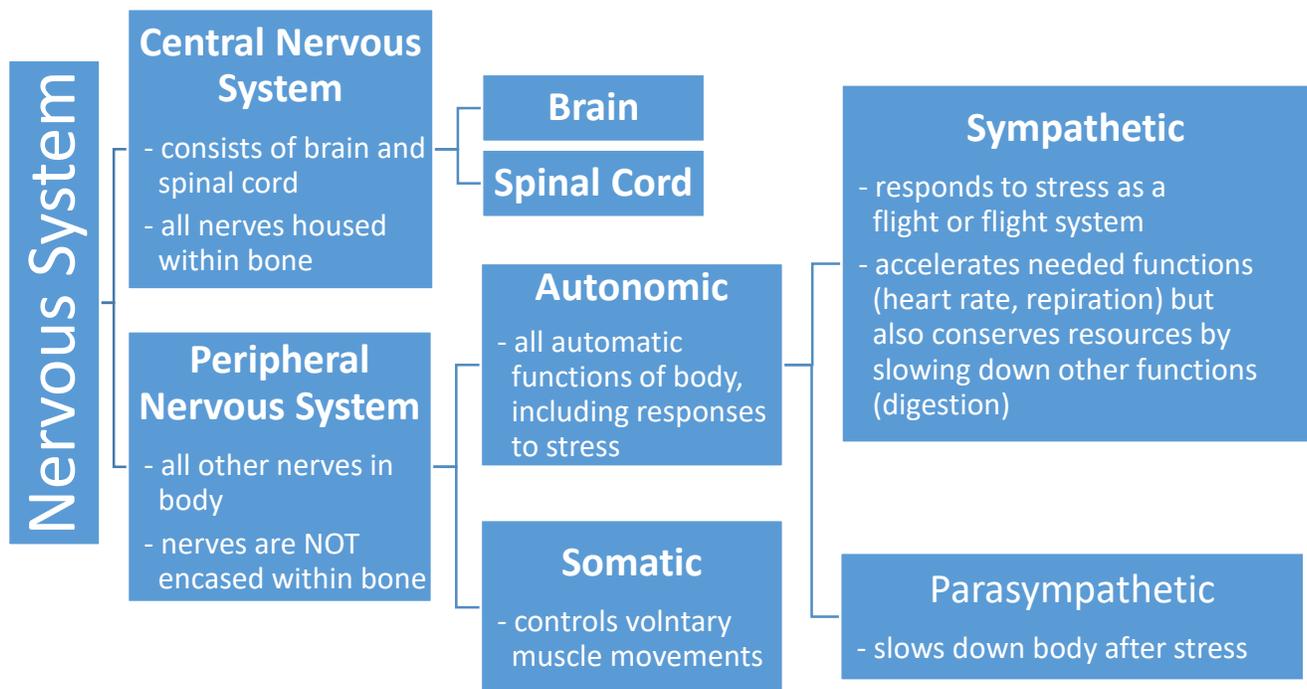
Nervous System

Afferent Neurons = take information from body to the brain

Interneurons = send messages from brain to elsewhere in brain or to efferent neurons

Efferent Neurons = take information from the brain to the rest of the body

Reflexes = bypasses conscious control of the body, such as extreme temperature evasion as well as patellar (kneecap) reflex



Ways of Studying the Brain

Lesions = removal or destruction of the brain, such as frontal lobotomy to control mentally ill patients

Electroencephalogram = detect brain waves to determine stages of consciousness and examine brain function – used for sleep research

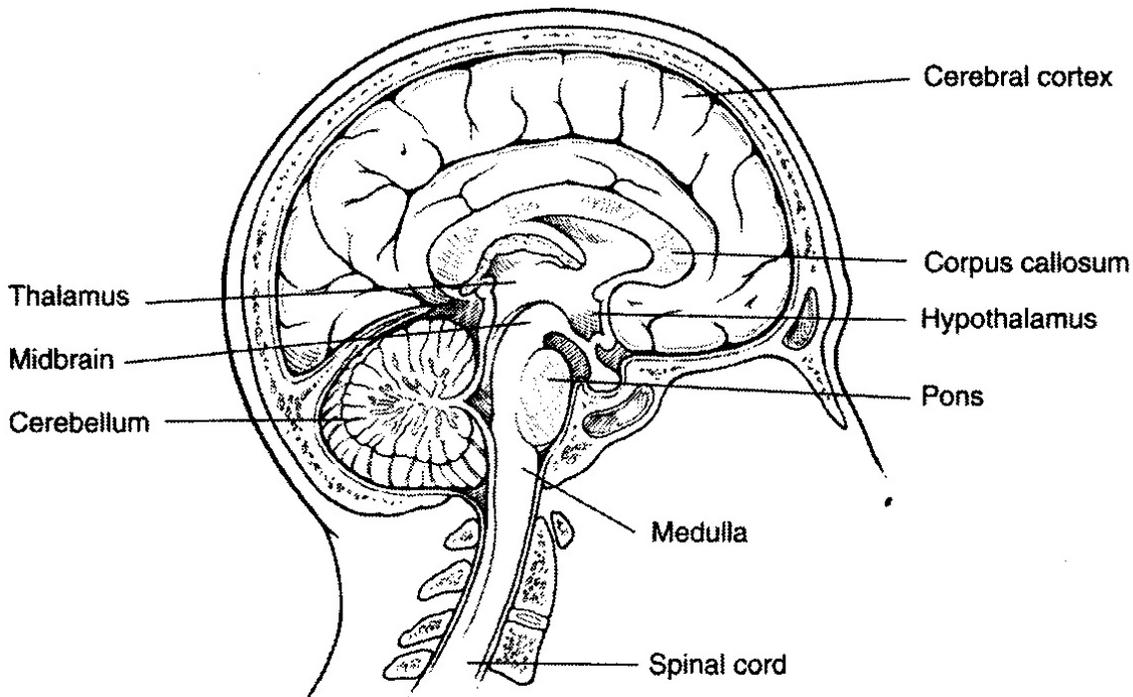
CT = multiple X-rays compiled together to obtain 3D picture of brain structure

MRI = magnetic fields used to measure density and location of brain material, gives information on both brain structure and function

PET = radioactive chemicals introduced into the body, and tracked to see how much certain chemicals go in different parts of the body

fMRI = measures metabolic function oxygen levels in blood flow to the brain

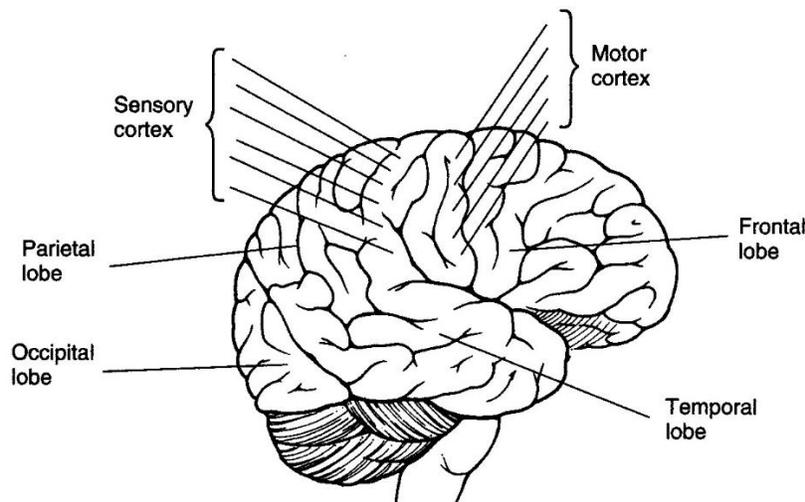
Brain Structure and Function



<p>Hindbrain</p> <ul style="list-style-type: none"> • Top part of spinal cord • Life support system, controls basic biological functions 	<p>Medulla</p> <ul style="list-style-type: none"> • Controls blood pressure, heart rate, breathing
	<p>Pons</p> <ul style="list-style-type: none"> • Controls facial expressions
	<p>Cerebellum</p> <ul style="list-style-type: none"> • Coordinates balance and habitual movements, such as tracking targets or playing instruments
<p>Midbrain</p> <ul style="list-style-type: none"> • Coordinates simple movements with sensory information 	<p>Reticular Formation</p> <ul style="list-style-type: none"> • Net-like collection of cells throughout midbrain • Controls general body arousal and ability to focus attention • If damaged or absent, can lead to deep comas
<p>Forebrain</p> <ul style="list-style-type: none"> • Controls thought and reason 	<p>Thalamus</p> <ul style="list-style-type: none"> • Receives sensory signals from spinal cord, and sends signals to appropriate areas in forebrain
	<p>Hypothalamus</p> <ul style="list-style-type: none"> • Controls metabolic functions, such as: body temperature, sexual arousal, hunger, thirst, biological rhythms and endocrine system
	<p>Amygdala</p> <ul style="list-style-type: none"> • Controls experiences of emotion
	<p>Hippocampus</p> <ul style="list-style-type: none"> • Processes memory system and sends information to other locations in cerebral cortex for permanent storage

Cerebral Cortex

- Thin layer of densely packed neurons – forms the gray, wrinkled (the wrinkles are called *fissures*) surface of the brain
- Brain is relatively plastic/flexible – parts of the brain can adapt and form new connections to repair or compensate for damages, or as a process of learning
- Divided into 2 hemispheres, connected by the *corpus collosum*:
 - Each hemisphere receives sensory messages and controls motor function on the opposite side of the body (*contralateral control*)
 - Left hemisphere associated with logic and sequential task
 - Right hemisphere associated with spatial and creative tasks
 - Specialization of function in each hemisphere is known as *brain lateralization* or *hemispheric specialization*



Frontal Lobe <ul style="list-style-type: none"> • Control important cognitive skills 	Prefrontal Cortex <ul style="list-style-type: none"> • Directing thought processes • Important in foreseeing consequences, pursuing goals, and maintaining emotional control
	Broca's Area <ul style="list-style-type: none"> • Usually in left hemisphere, controls muscle movements needed for speech
	Motor Cortex <ul style="list-style-type: none"> • Sends signals to muscles, controlling voluntary movements
Parietal Lobe <ul style="list-style-type: none"> • Heavily associated with sensory information 	Sensory Cortex <ul style="list-style-type: none"> • Receives incoming sensation from body
Occipital Lobe <ul style="list-style-type: none"> • Visual processing center 	<ul style="list-style-type: none"> • Information received from right retina goes to right occipital lobe, and vice versa for the left side
Temporal Lobe <ul style="list-style-type: none"> • Process sound sensed by ears 	Wernicke's Area <ul style="list-style-type: none"> • Interprets both written and spoken speech • Important for understanding language

Endocrine System

Adrenal Glands = produces adrenaline, which powers the body and signals for fight or flight, and also controls involuntary responses, such as heart rate or blood pressure

Ovaries and Testes = produce sex hormones – ovaries produce estrogen for women and testes produce testosterone for men

Genetics

- Genetic code heavily influences human traits
- Identical twins raised apart exhibit differences in IQ scores, implicating that both genetics and environment play a hand in human traits
- Chromosomal abnormalities may cause problems, such as:
 - Turner's Syndrome = a female with only one X chromosome, causing shortness, webbed necks, and differences in sexual development
 - Klinefelter's Syndrome = a male with an extra X chromosome, resulting in minimal sexual development and extreme introversion
 - Down Syndrome = extra chromosome on 21st pair, resulting in rounded face, shorter fingers and toes, slanted eyes set far apart, and mental retardation