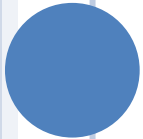




CHAPTER 2

Neuroscience and Behavior

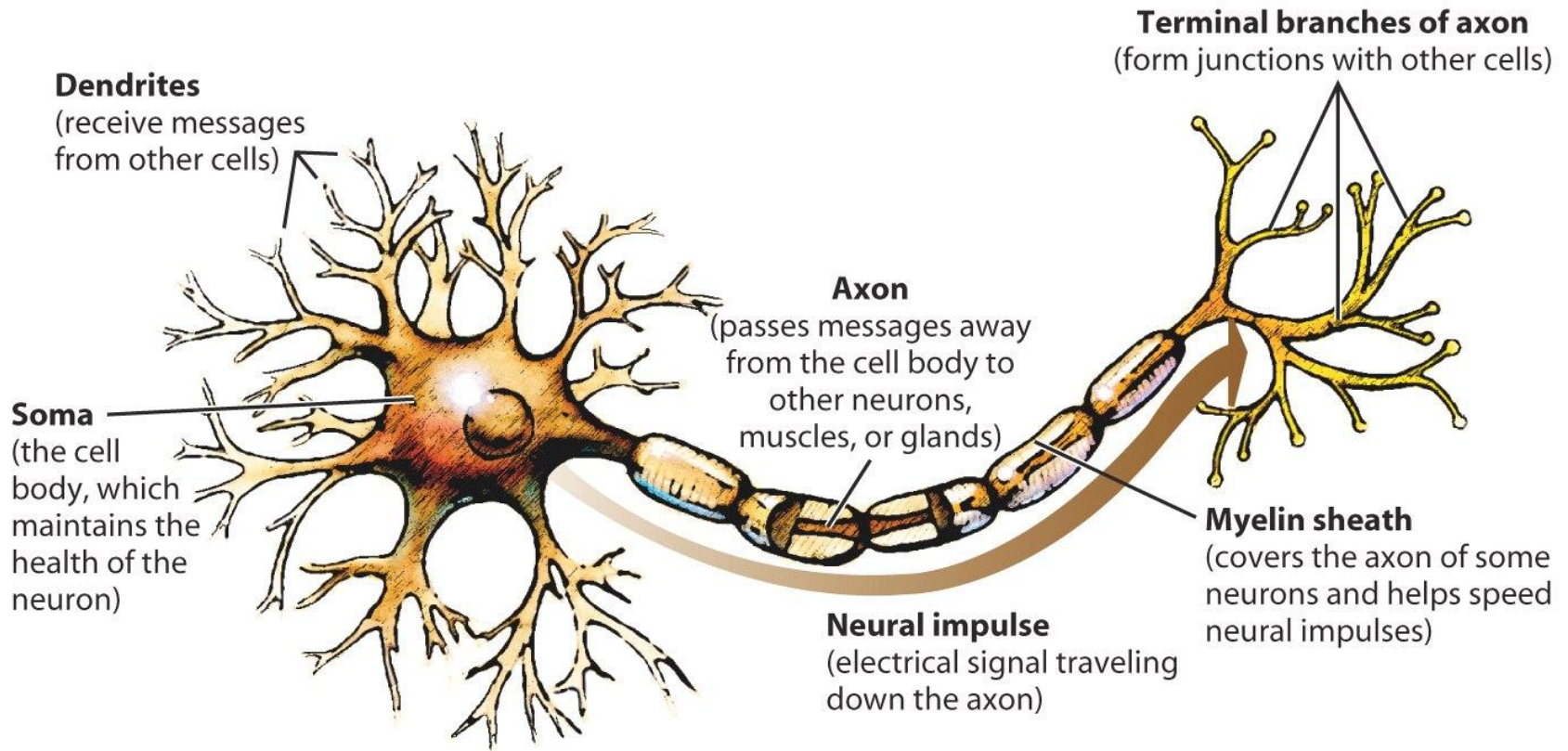


I. NEURAL COMMUNICATION

- Neurons – Nerve cells; Basic building block of the nervous system.
 - Dendrite – Bushy, branching extension that receives messages and conducts impulses toward the cell body.
 - Axon – Extension of a neuron, ending in branching terminal fibers, through which messages are sent to other neurons, muscles or glands.
 - Myelin Sheath – Layer of fatty tissues encasing the fibers of many neurons. It enables faster transmission speeds for the neural impulse.
 - Action Potential – Neural impulse; Brief electrical charge that travels down an axon.
 - Threshold – Level of stimulation required to trigger a neural impulse.

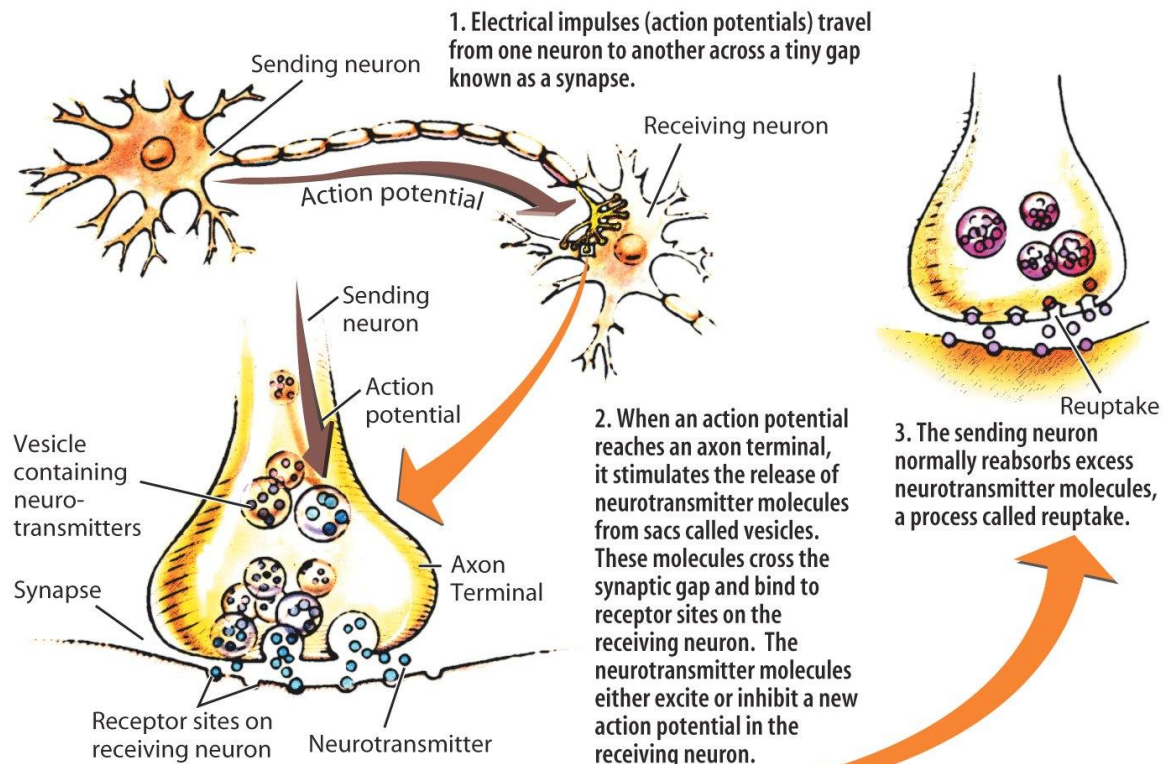


I. NEURAL COMMUNICATION



I. NEURAL COMMUNICATION

- Synapse – Junction between the axon of the sending neuron and the dendrite of the receiving neuron.
- Neurotransmitters – Chemical messengers that traverse the synaptic gap between neurons.



[Neuron Video](#)

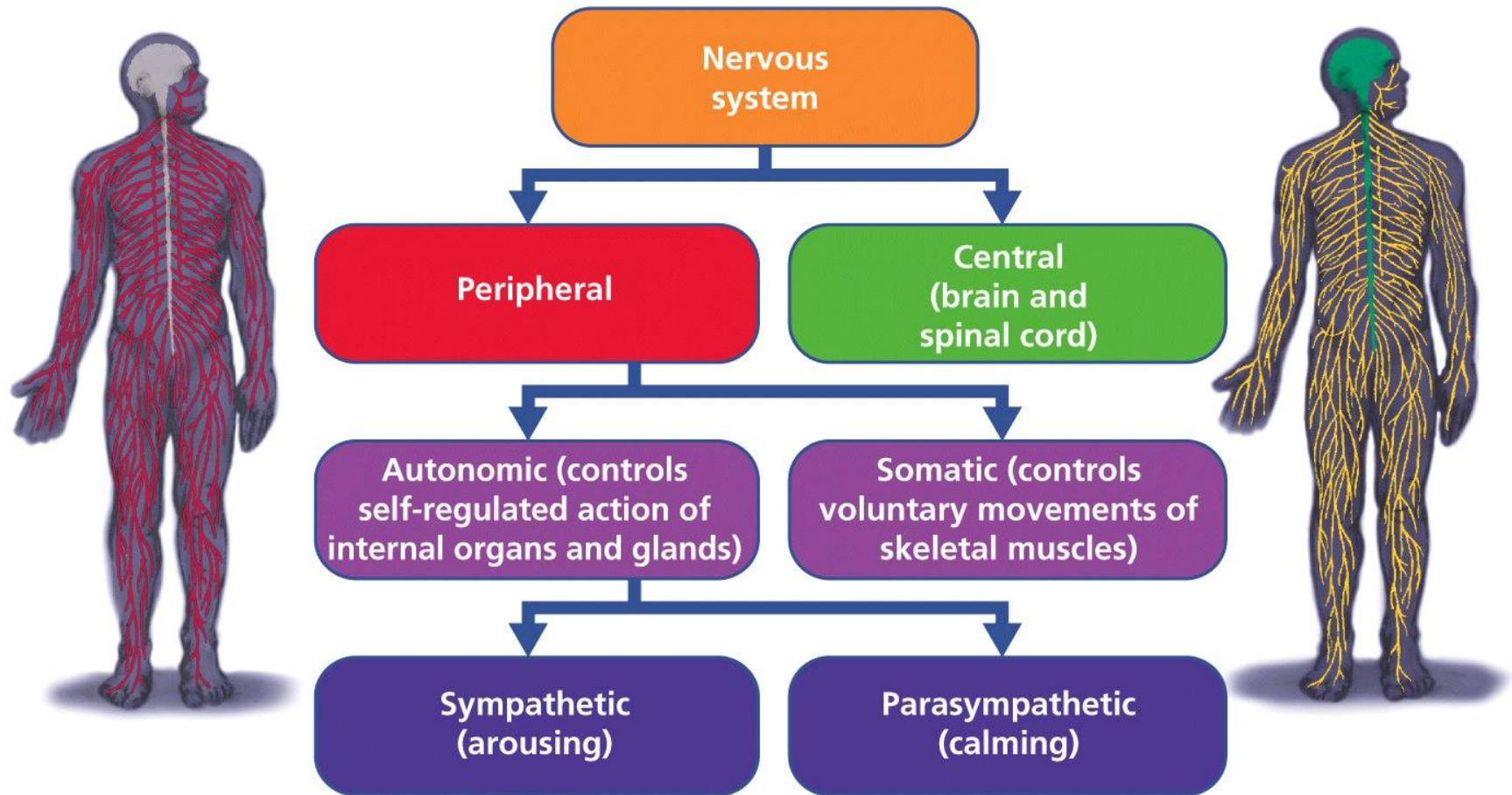


I. NEURAL COMMUNICATION

- Neurotransmitter's influence
 - Examples of neurotransmitters
 - Dopamine – influences movement, learning, attention and emotion
 - Serotonin – Affects mood, hunger, sleep and arousal
 - Norepinephrine – Control alertness and arousal
 - Acetylcholine (ACh) – Triggers muscle contraction and, if blocked, muscles cannot contract
 - Endorphines – Natural opiate like neurotransmitter linked to pain control
 - How drugs alter neurotransmission
 - Agonist – Drug that excites by mimicking a neurotransmitter
 - Antagonist – Drug that inhibits by blocking neurotransmitters or diminishing their release
 - Drug and neurotransmission [video](#)



II. THE NERVOUS SYSTEM



II. THE NERVOUS SYSTEM

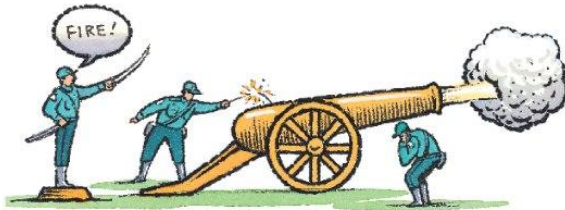
- Nervous System – Body's speedy electrochemical communication system, consisting of the central nervous system and the peripheral nervous system. ([video](#))
- Types of Neurons
 - Sensory Neurons – Carry incoming information from the sense receptors to the central nervous system.
 - Interneurons – Central nervous system neurons; Internally communicate and intervene between sensory inputs and motor outputs.
 - Motor Neurons – Carry outgoing information from the central nervous system to the muscles and glands. ([video](#))



II. THE NERVOUS SYSTEM

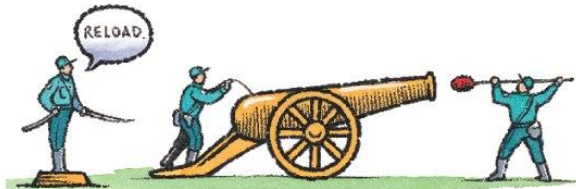
TABLE 7.1 THREE PHASES OF COMMUNICATION WITHIN A NEURON

Action potential



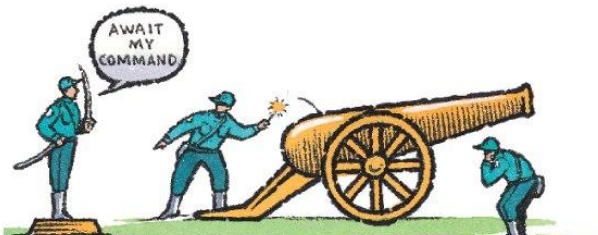
The neural impulse created when a neuron "fires." The impulse travels from the dendrites down the axon to the terminal branches.

Refractory period



The brief instant when a new action potential cannot be generated because the neuron is "recharging" after the previous action potential.

Resting potential



The state of a neuron when it is "charged" but waiting for the next action potential to be generated.

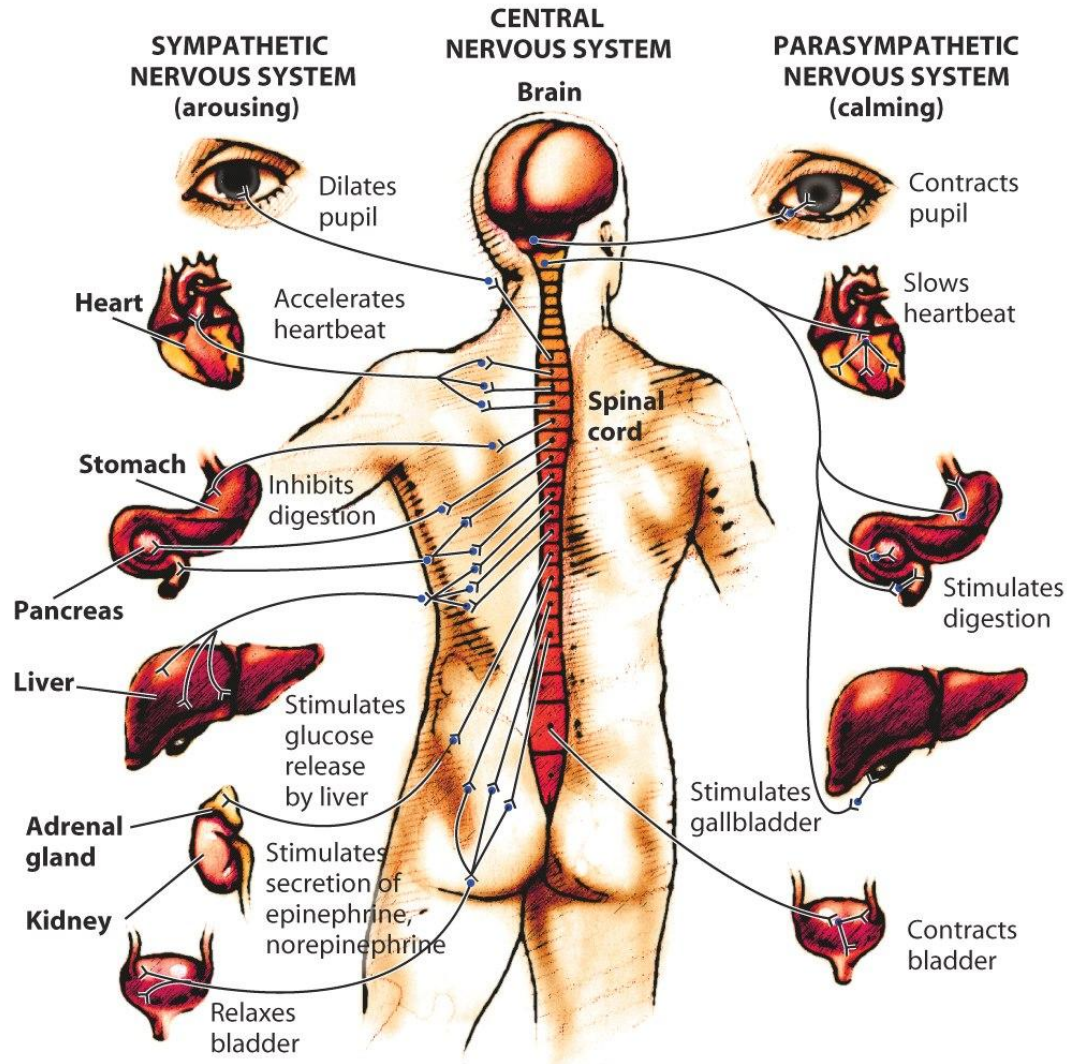


II. THE NERVOUS SYSTEM

- Peripheral Nervous System – The sensory and motor neurons that connect the central nervous system to the rest of the body.
 - Somatic nervous system – Controls the body's skeletal muscles.
 - Autonomic nervous system – Controls the glands and muscles of the internal organs.
 - Sympathetic nervous system – Arouses the body, mobilizing its energy in stressful situations (fight or flight)
 - Parasympathetic nervous system – Calms the body, conserving its energy



II. THE NERVOUS SYSTEM



II. THE NERVOUS SYSTEM

- Central Nervous System – The brain and spinal cord.
 - Reflexes – A simple automatic response to a sensory stimulus, such as the knee-jerk response.
 - Paralysis – Brain does not receive neural messages from neurons below the point of the severed spinal cord, resulting in loss of sensation.
- Neural Networks – Interconnected neural cells.



III. THE BRAIN

○ Tools of Discovery

- Lesion – Naturally or experimentally caused destruction of brain tissue.
- Clinical observation
- Manipulating the brain (ex. Magnetically stimulating the brain.)
- Recording the brain's electrical activity (ex. EEG)
- Neuroimaging techniques
 - CT Scan (Computed Tomography)
 - PET Scan (Positron Emission Tomography)
 - MRI (Magnetic Resonance Imaging)



III. THE BRAIN (VIDEO)

○ Brain Structures

- Brainstem – Central core of the brain, beginning where the spinal cord swells as it enters the skull. Responsible for automatic survival functions. (Medulla and Reticular Formation)
- Thalamus – Brain's sensory switchboard that directs messages to the sensory receiving areas of the cortex and transmits replies to the cerebellum and medulla.
- Cerebellum – Helps coordinate voluntary movement and balance.
- Limbic System
 - Amygdala – Almond shaped neural clusters linked to emotion.
 - Hypothalamus – Directs maintenance activities (eating, drinking, body temperature), governs the endocrine system and is linked to emotion.



III. THE BRAIN

○ Brain Structures

- Cerebral Cortex – Ultimate control and information processing center (like bark on a tree).
 - Glial cells – Cells in the nervous system that nourish and protect neurons.
 - Frontal lobes – Involved in speaking and movement and making plans and judgment.
 - Parietal lobes – Includes the sensory cortex.
 - Occipital lobes – Includes visual areas which receive information from the opposite visual field.
 - Temporal lobes – Includes auditory areas, receive information from the opposite ear.



III. THE BRAIN

○ Brain Structures

- Functions of the cortex
 - Motor cortex – An area at the rear of the front lobes that controls voluntary movements.
 - Sensory cortex – An area at the front of the parietal lobes that registers and processes body sensations.
 - Association areas – Higher mental functions such as learning, remembering, thinking and language.
 - Aphasia – Impairment of language caused by damage to Broca's Area or Wernicke's Area
 - Broca's area – Area that directs the muscle movements involved in speech. ([video](#))
 - Wernicke's area – Involved in language comprehension and expression located in the temporal lobe. ([video](#))
 - Plasticity – Brain's capacity for modification.



III. THE BRAIN

○ Our Divided Brain

- Splitting the brain
 - Corpus callosum – Large band of neural fibers connecting the two brain hemispheres and carrying messages between them.
 - Split brains – Condition in which the corpus callosum is severed, leaving the two hemispheres isolated. ([video](#))
- Hemispheric differences
 - Left – quick, literal interpretation of language
 - Right – excels in making subtle inferences



IV. ENDOCRINE SYSTEM

- Endocrine system – A set of glands that secrete hormones into the bloodstream.
- Hormones – Chemical messengers, mostly those manufactured by the endocrine glands, that are produced in one tissue and affect another.
- Adrenal glands – Pair of glands that secrete the hormones epinephrine (adrenaline) and nor-epinephrine, which help to arouse the body in times of stress.
- Pituitary gland – Most influential gland, under the influence of the hypothalamus, that regulates growth and controls the other glands.
- Neurotransmitters are released by neurons and hormones are released by glands.



IV. THE ENDOCRINE SYSTEM

