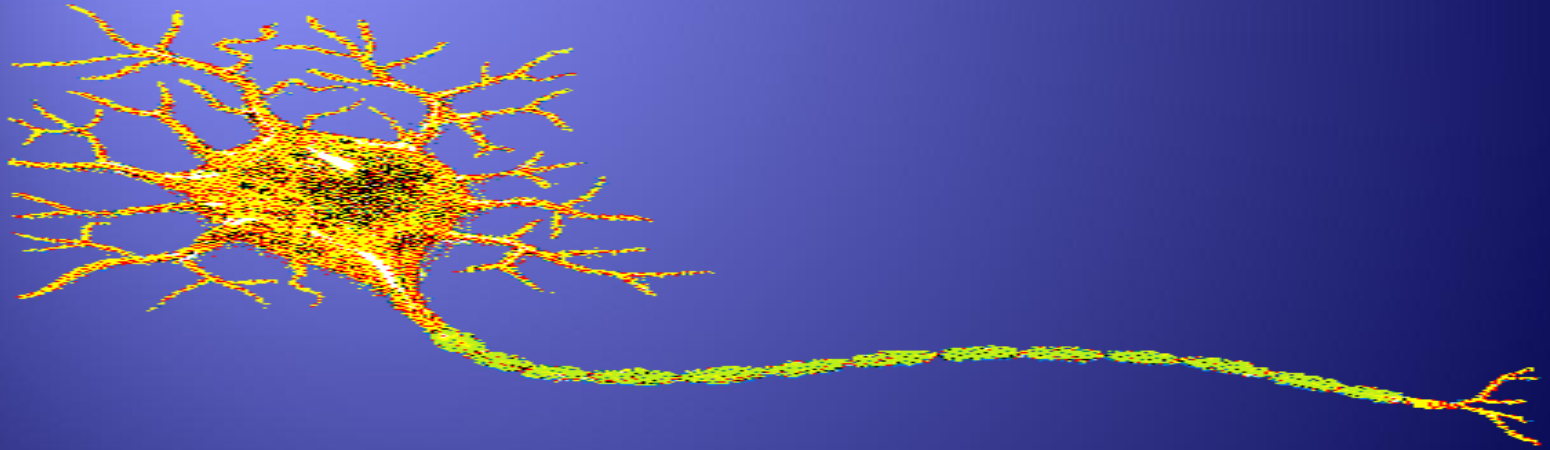


Neural and Hormonal Systems

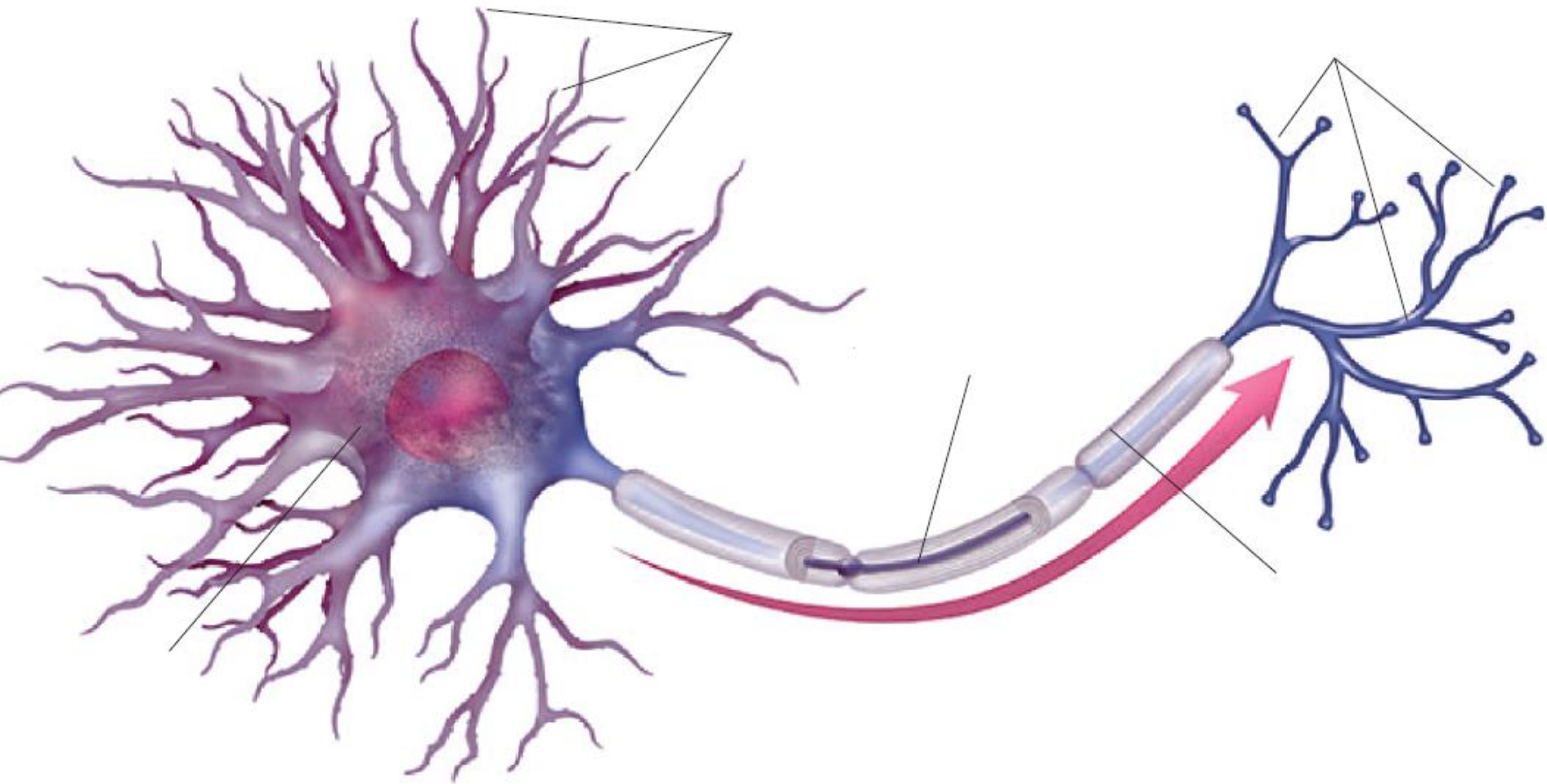
Explains why we feel strong, sad, happy & nervous.

It all Starts with the Neuron (Nerve)

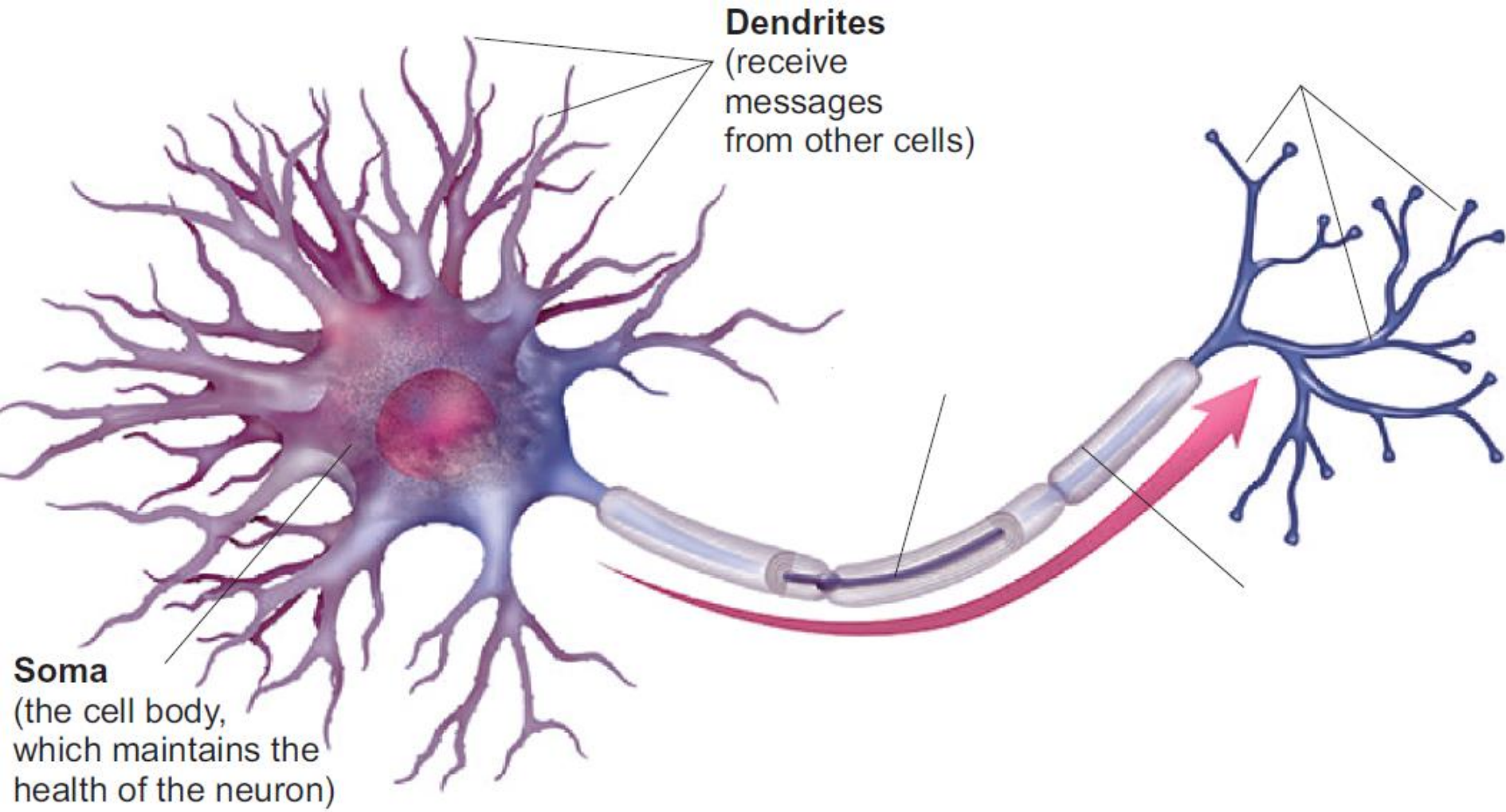


Neurons are specialized cells of the nervous system that transmit signals throughout the body

Parts of the Neuron

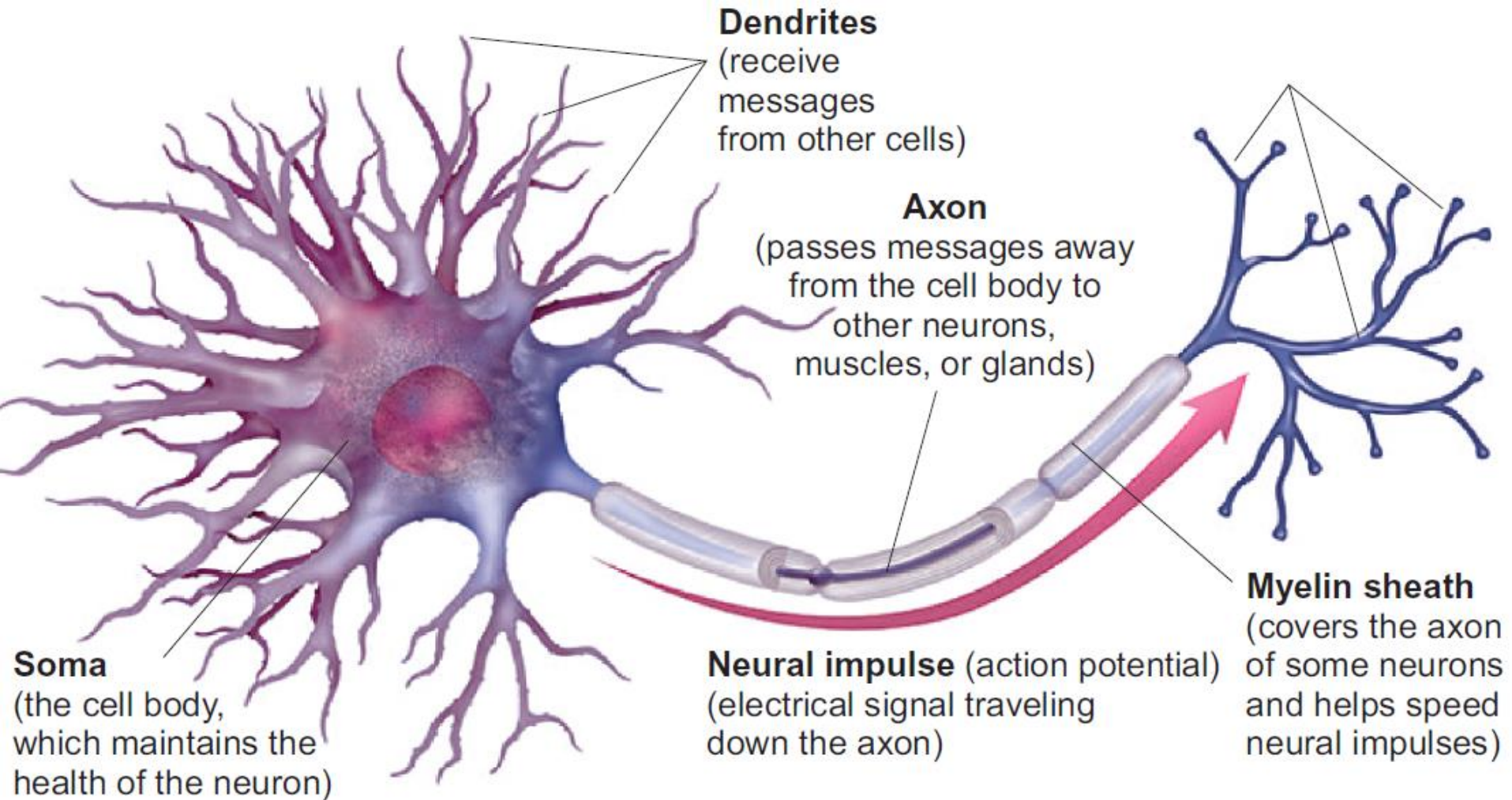


Parts of the Neuron - Soma



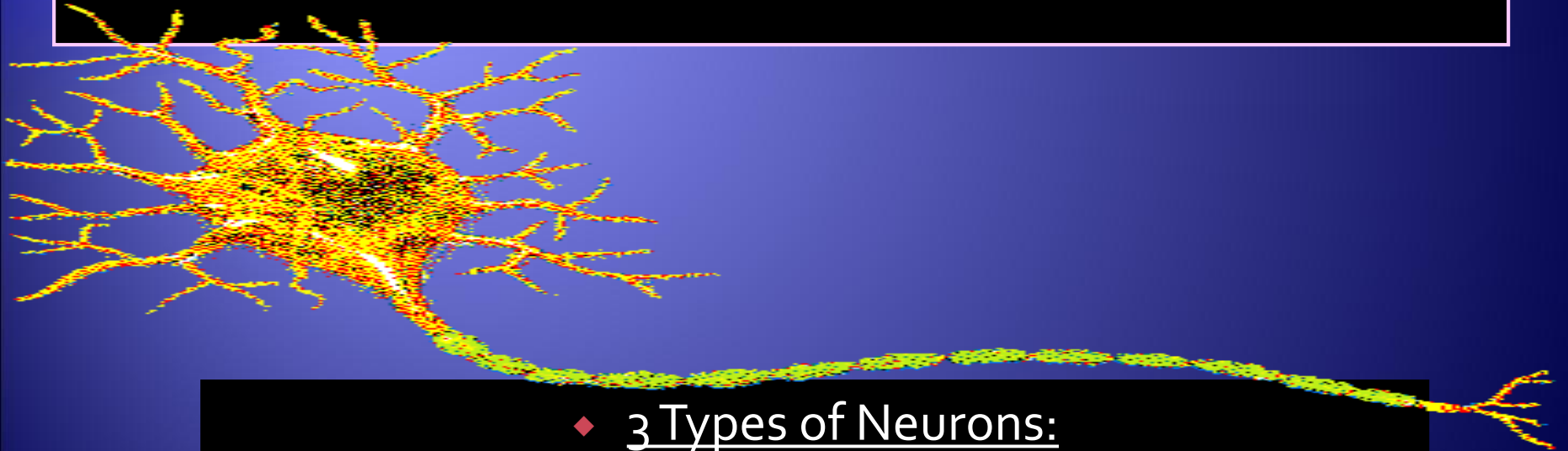
Soma – The cell body of a neuron, which contains the nucleus and other parts that keep the cell healthy

Parts of the Neuron – Myelin Sheath



Myelin Sheath – protects the axon and influences the speed of the neural impulse.

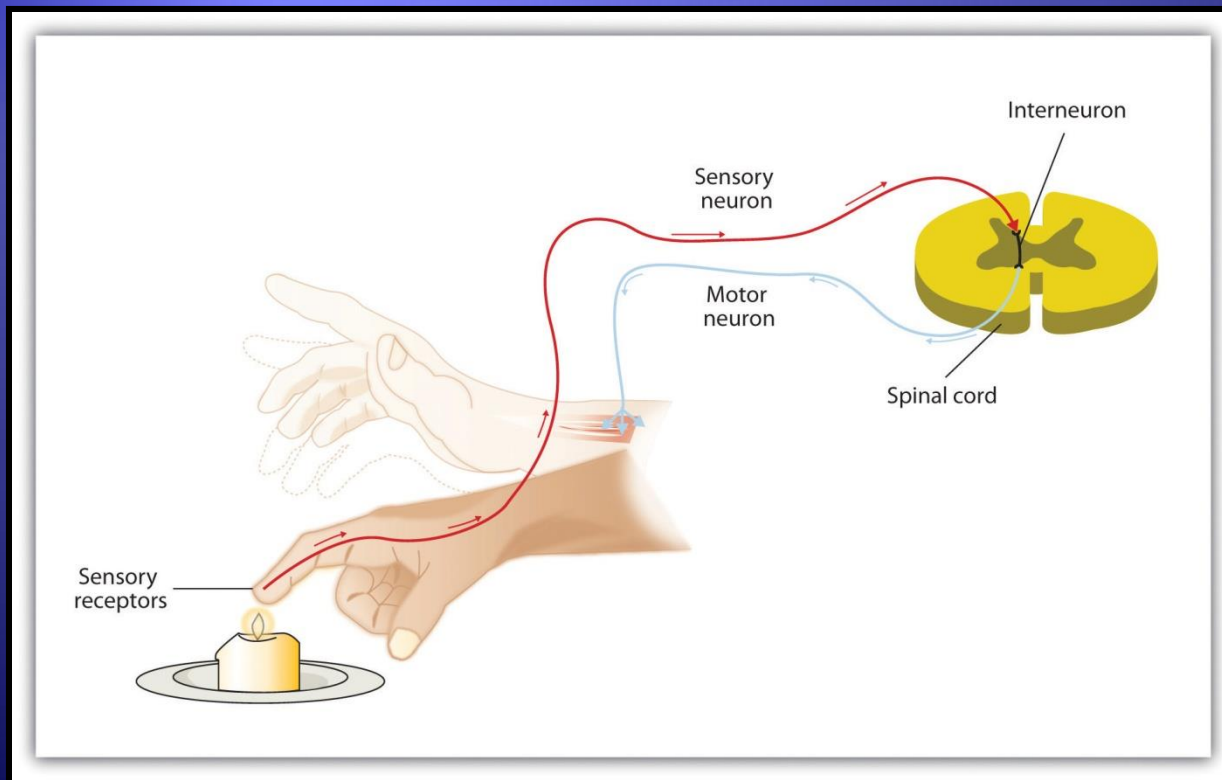
- ◆ Speed of a neuron impulse
 - ◆ Range from 2 to 200 MPH
 - ◆ Measured in milliseconds
 - ◆ (thousandths of a second)



- ◆ 3 Types of Neurons:
 - ◆ 1. Sensory Neuron
 - ◆ 2. Inter Neuron
 - ◆ 3. Motor Neuron

Motor Neurons

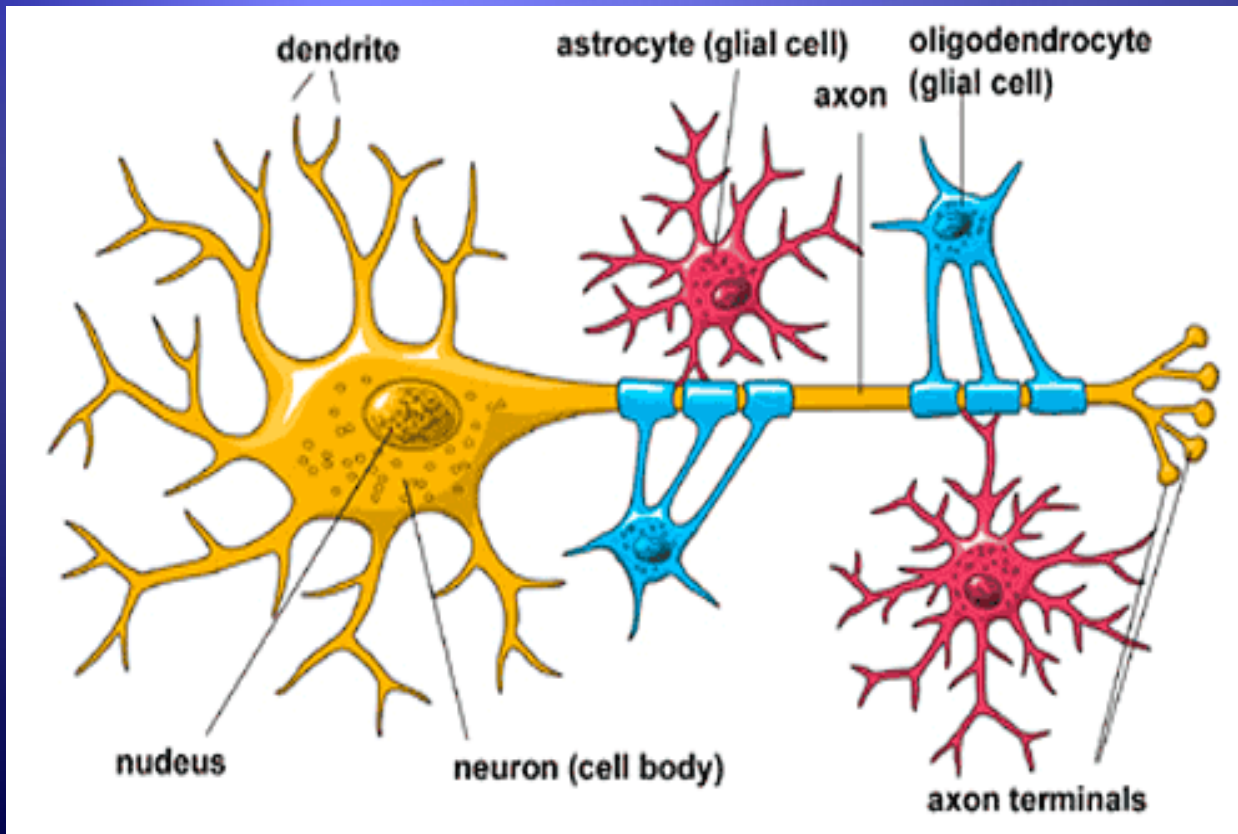
- ◆ Sends signals AWAY from the CNS.



For example, if you were about to hit a soccer ball a message will come away from the CNS to tell your leg to kick.

Neuroglia or *Glial Cells*

Your brain is composed of trillions of neurons and glial cells. Glial Cells-guide the growth of developing neurons and help provide nutrition for and get rid of wastes of neurons and help form an insulating sheath around neurons that speeds conduction.



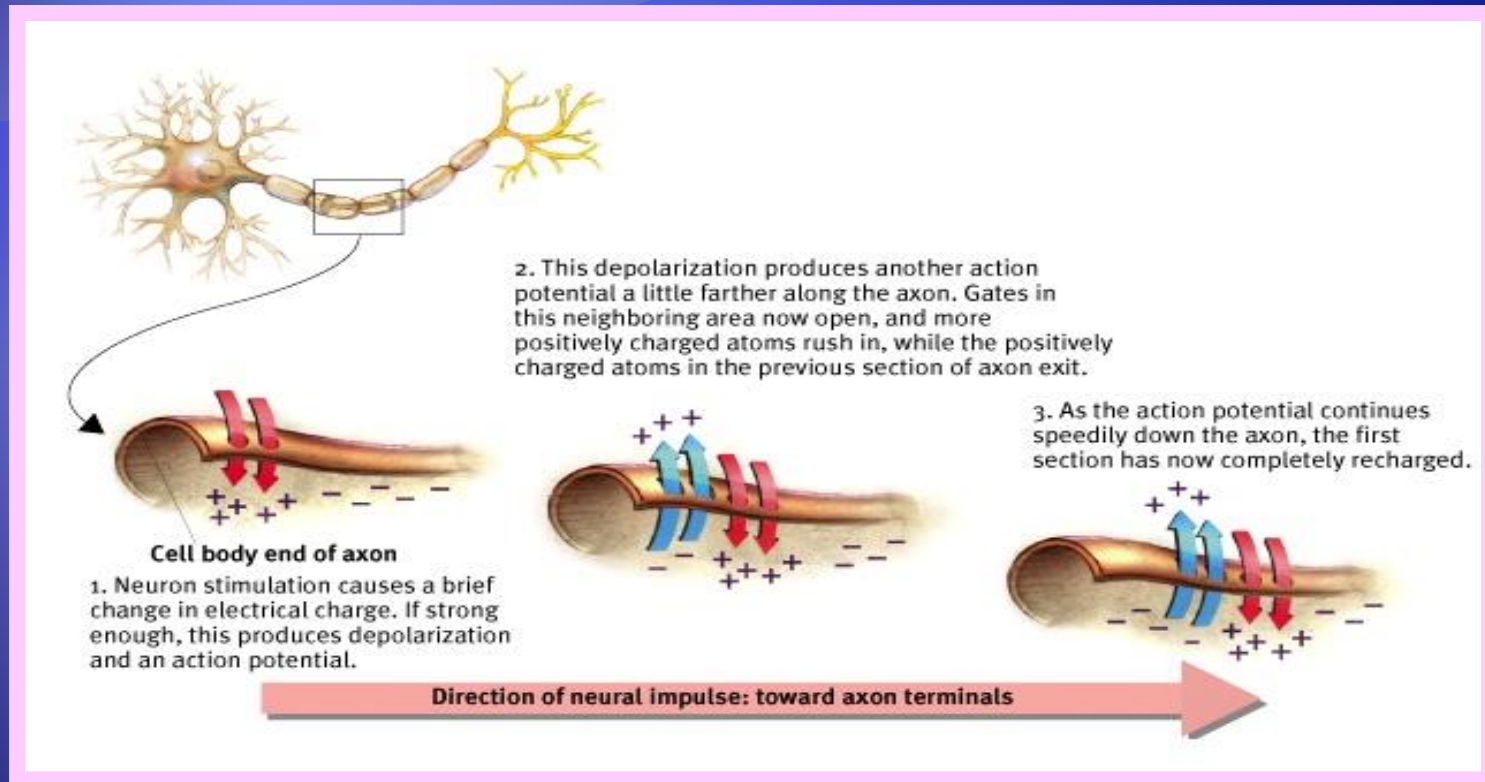
Neurogenesis:
the growth of new neurons. (get it grow a genius hahaha)

Action Potential

- ◆ **A neural impulse;**
- ◆ **a brief electrical charge that travels down the axon of a neuron.**
- ◆ Considered an “on” condition of the neuron

Action Potential

a neural impulse; a brief electrical charge that travels down an axon.



It is like a battery. There are positive and negative ion charges and the message is an electrical message. If the signals in the brain reach a specific minimum intensity, or **threshold**, they trigger **action potential**. The firing is an all or nothing response. Like a gun.

What are IONS?

Ions are atoms with extra electrons or missing electrons. When you are missing an electron or two, you have a positive charge. When you have an extra electron or two, you have a **negative charge**.

When the particles move, they create electricity, which is what the action potential is.



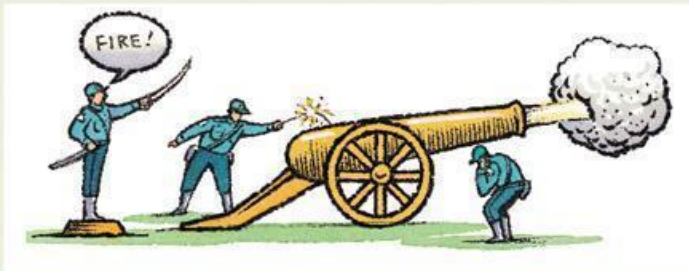
<http://www.youtube.com/watch?v=xzvZ11EutBY>

AC

Table 6.1

Three Phases of Communication within a Neuron

Action potential



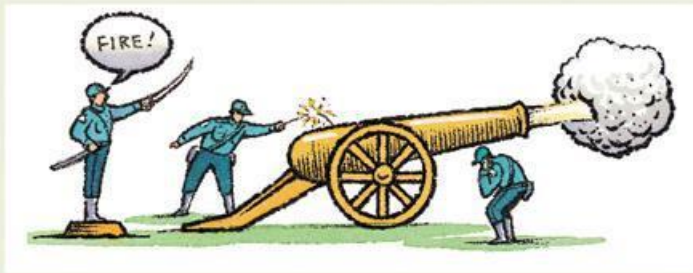
The neural impulse created when a neuron "fires." The impulse travels from the dendrites down the axon to the axon terminals.

Re

Table 6.1

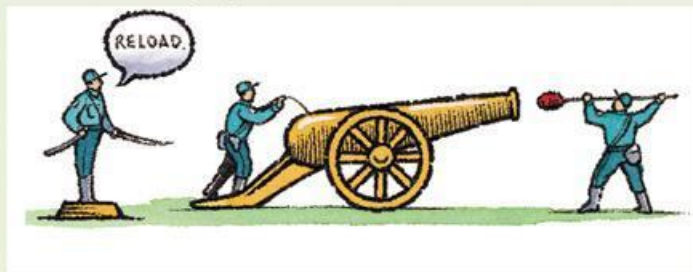
Three Phases of Communication within a Neuron

Action potential



The neural impulse created when a neuron “fires.” The impulse travels from the dendrites down the axon to the axon terminals.

Refractory period



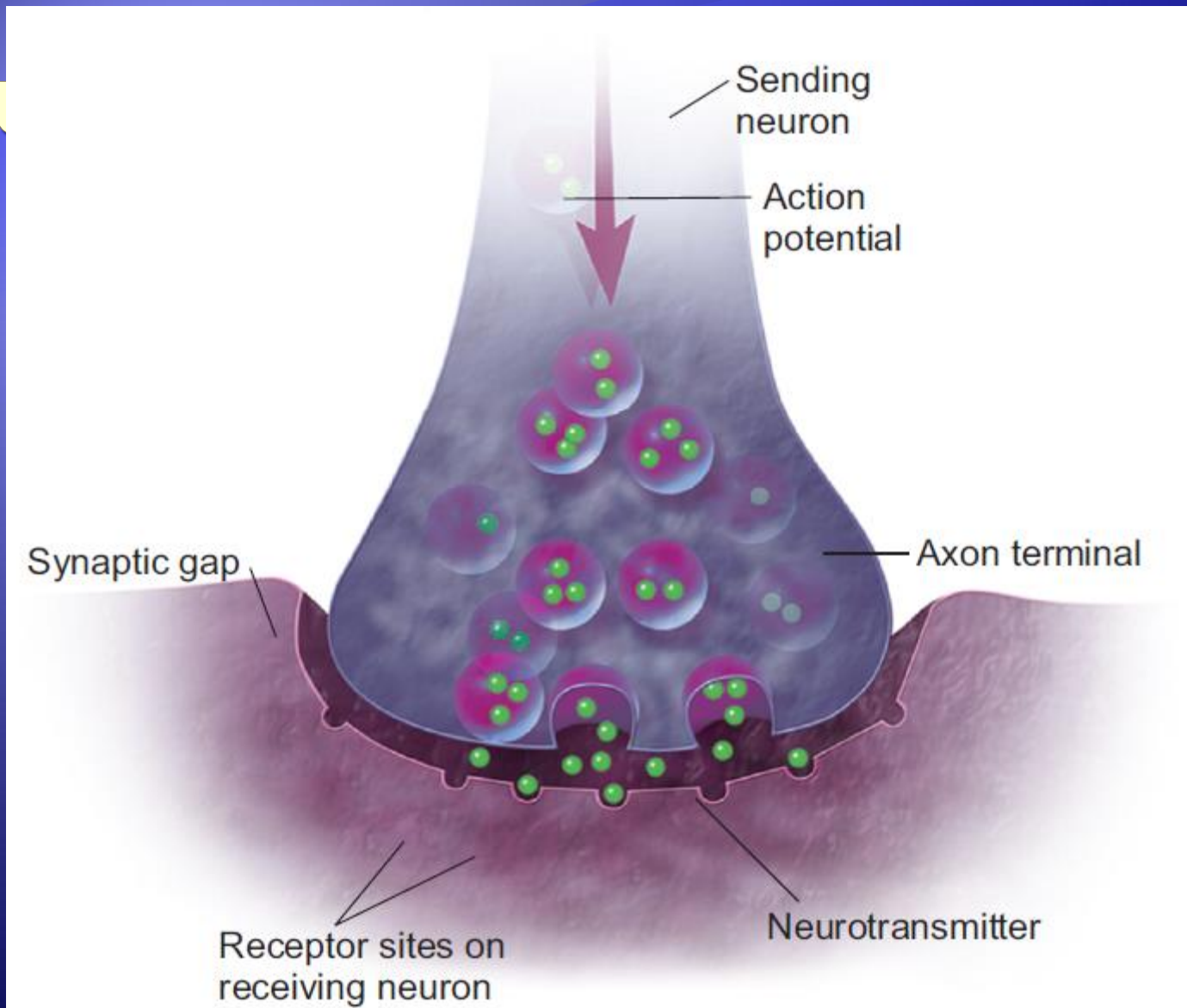
The brief instant when a new action potential cannot be generated because the neuron is “recharging” after the previous action potential.

Resting Potential

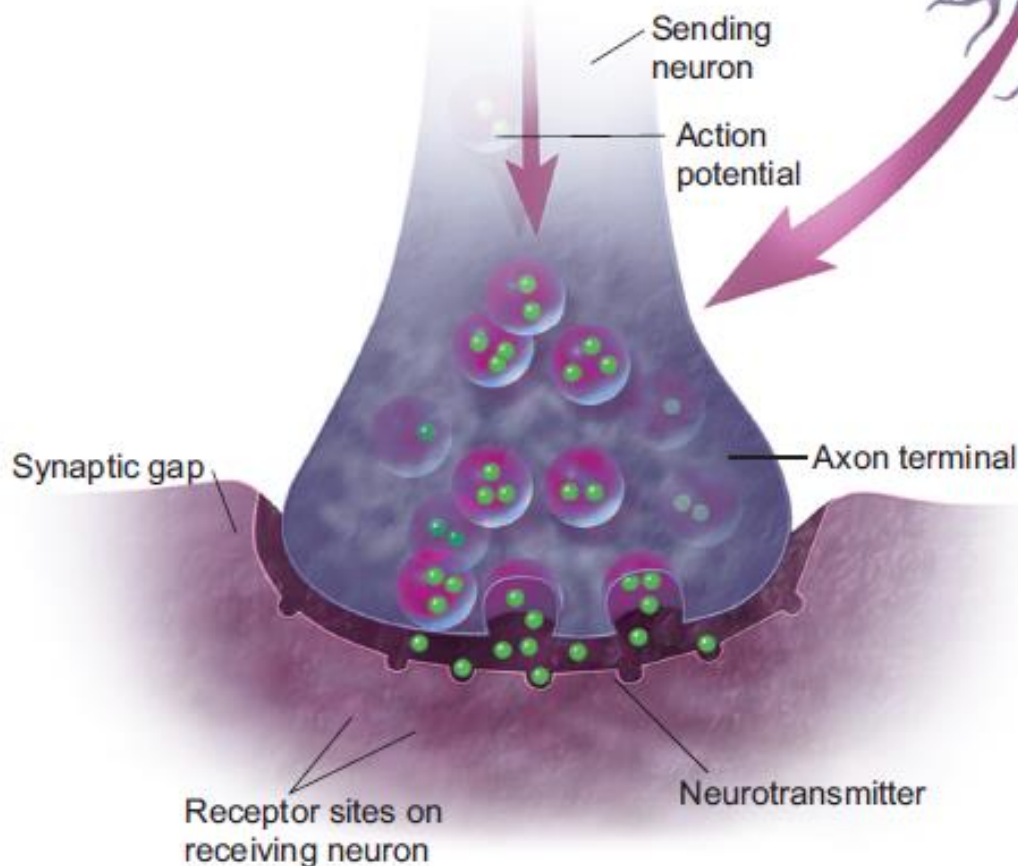
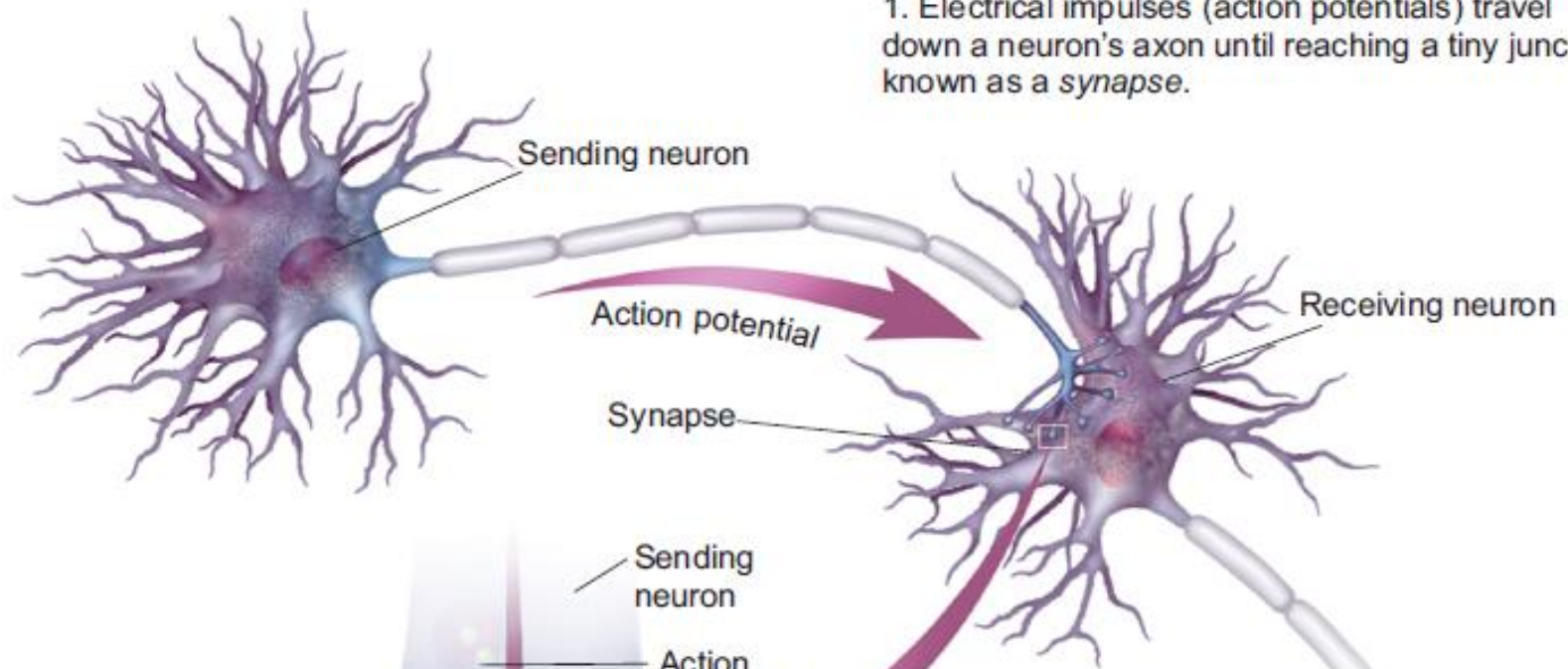
- ◆ **The state of a neuron when it is at rest and capable of generating an action potential.**
- ◆ The neuron is set and ready to fire

- ◆ **Salutatory Conduction**: is when the axon is myelinated, conduction speed is increased since depolarization's jump from node to node.

Net



1. Electrical impulses (action potentials) travel down a neuron's axon until reaching a tiny junction known as a *synapse*.



2. When an action potential reaches an axon terminal, it stimulates the release of neurotransmitter molecules. These molecules cross the synaptic gap and bind to receptor sites on the receiving neuron. This allows electrically charged atoms to enter the receiving neuron and excite or inhibit a new action potential.

Examples of Neurotransmitter Functions

Neurotransmitter	Affected Functions	Associated Problems
Acetylcholine (ACh)	<ul style="list-style-type: none">• Muscle action• Learning• Memory	ACh-producing neurons have deteriorated in people with Alzheimer's disease.
Dopamine	<ul style="list-style-type: none">• Learning• Attention• Emotion	Excess dopamine activity is associated with schizophrenia.
Serotonin	<ul style="list-style-type: none">• Hunger• Sleep• Arousal• Mood	Low levels of serotonin may be associated with depression.

Acetylcholine (ACh)

I thought this was interesting:

- ◆ Botulism prevents the release of ACH causing leading to paralysis and death.
- ◆ Botox is used to paralysis muscles.
- ◆ Black widow spider's venom over stimulates flow of ACH causing convulsions followed by muscle paralysis.



◆ Parkinson's Disease and Dopamine



<http://www.youtube.com/watch?v=jyBakRkzswU>

Serotonin

- ◆ contributes to various functions, such as regulating body temperature, sleep, mood, appetite, and pain.

-Lack of serotonin has been linked to depression, suicide, impulsive behavior and aggressiveness all appear to involve certain imbalances in serotonin.



GABA Gamma-aminobutyric acid

"nature's VALIUM-like substance"

- ◆ is an inhibitory neurotransmitter that is very widely distributed in the neurons of the cortex. GABA contributes to motor control, vision, and many other cortical functions. It also regulates anxiety.

Some drugs that increase the level of GABA in the brain are used to treat epilepsy and to calm the trembling of people suffering from Huntington's disease. The disease destroys cells in the basal ganglia, the part of the brain that controls movement, emotion, and cognitive ability.

Epinephrine

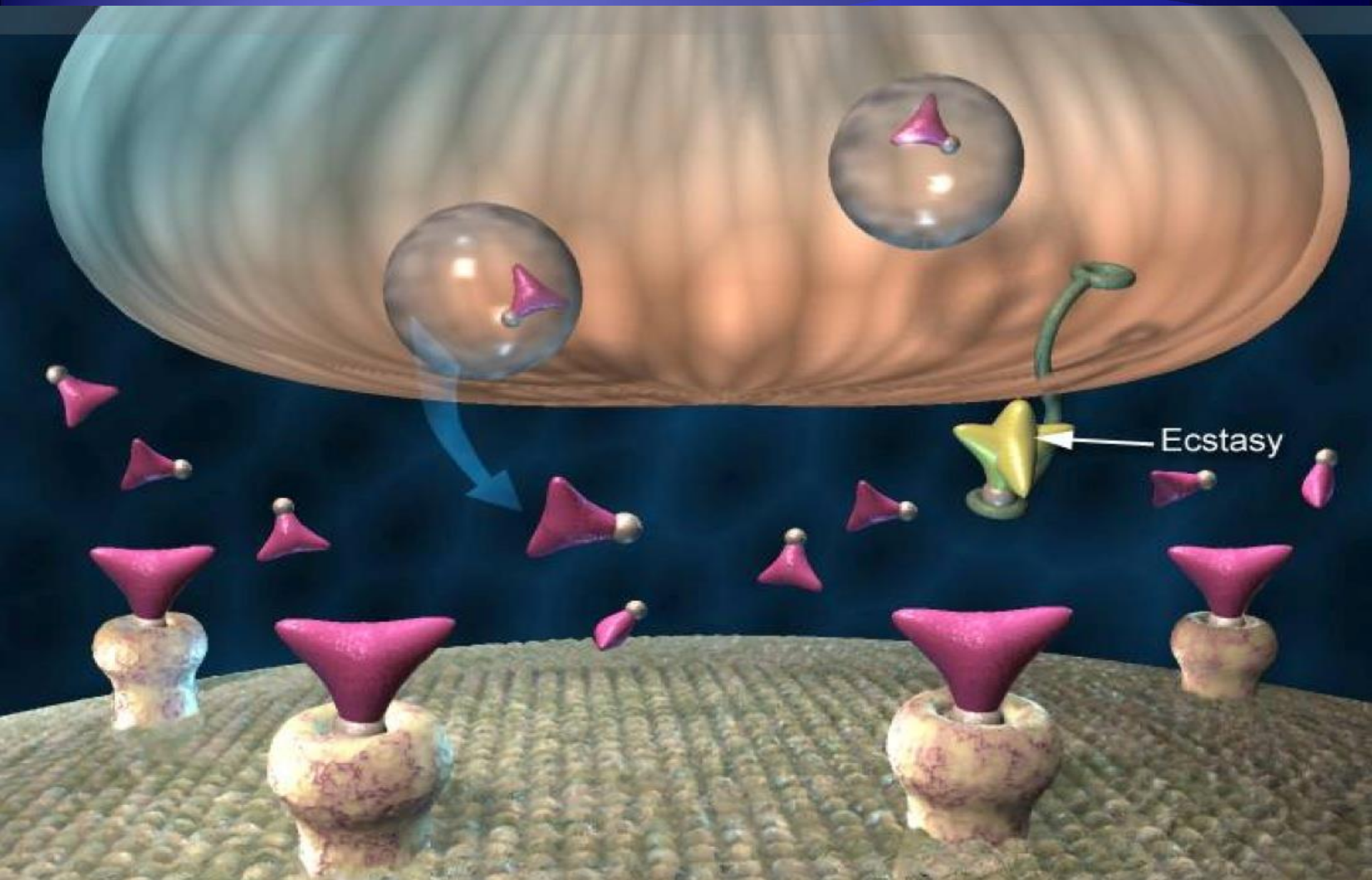
- ◆ involved in energy, and glucose metabolism
- ◆ Too little epinephrine has been associated with depression. Also called **adrenaline**



Excitatory Effect

- ◆ A neurotransmitter effect that makes it more likely that the receiving neuron will generate an action potential or “fire.”
- ◆ The second neuron is more likely to fire.

Drugs and alcohol bind important receptors on neurons



Why don't we just flood our brain with a bunch of opiates or heroin and feel good all the time?

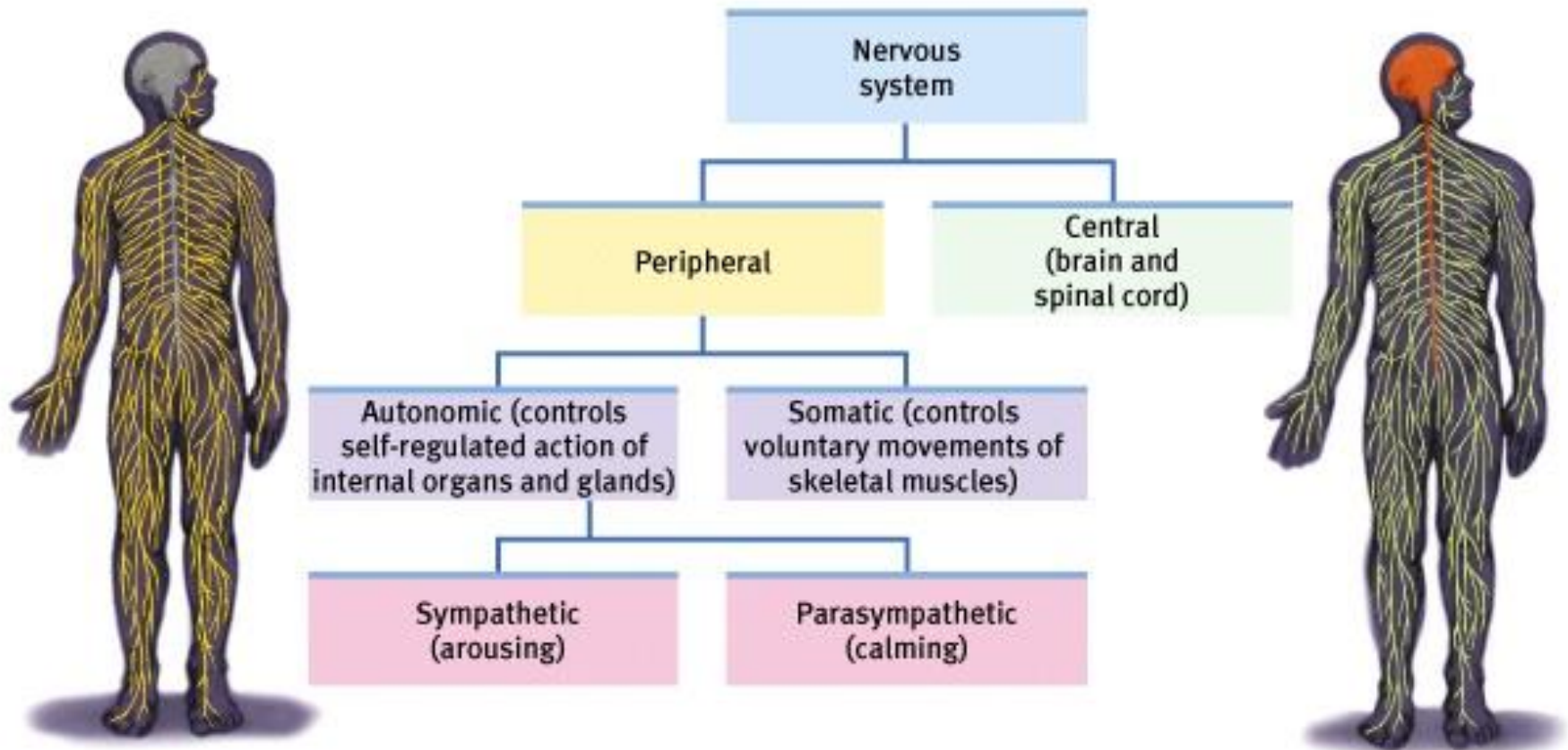
- ◆ When flooded our brain stops producing our own “feel good” neurotransmitters. When the drug is withdrawn then the person is uncomfortable and suffers withdrawal symptoms.

Mirror Neurons



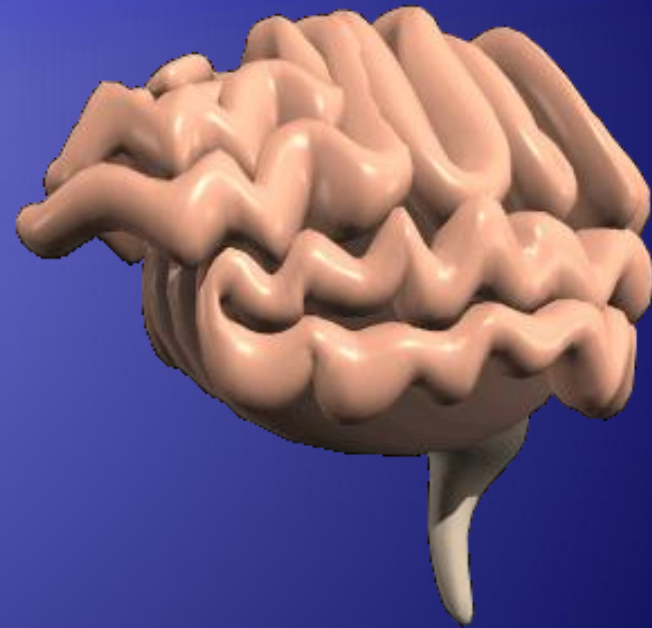
<http://www.pbs.org/wgbh/nova/sciencenow/video/3204/i01.html>

The Nervous System

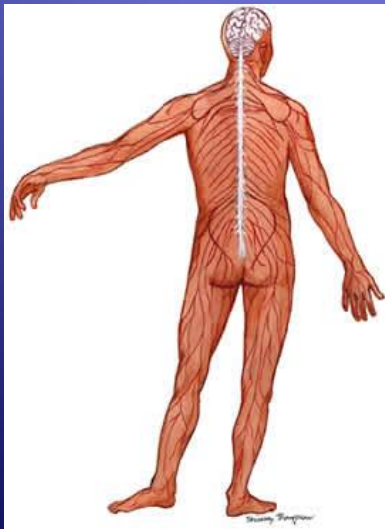


Central Nervous System

- ◆ The Brain and spinal cord
- ◆ CNS



Peripheral Nervous System



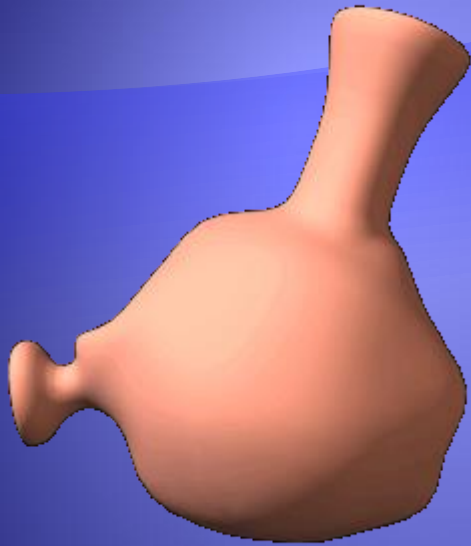
- ◆ All nerves that are not encased in bone.
- ◆ Everything but the brain and spinal cord.
- ◆ Is divided into two categories....somatic and autonomic.

Somatic Nervous System

- ◆ Controls voluntary muscle movement.
- ◆ Uses motor (efferent) neurons.



Autonomic Nervous System



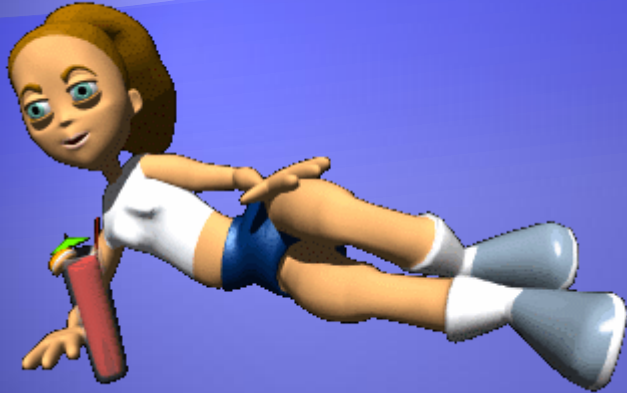
- ◆ Controls the automatic functions of the body.
- ◆ Controls breathing, blood pressure, and digestive processes
- ◆ Divided into two categories...the sympathetic and the parasympathetic

Sympathetic Nervous System

- ◆ Fight or Flight Response.
- ◆ Automatically accelerates heart rate, breathing, dilates pupils, slows down digestion.

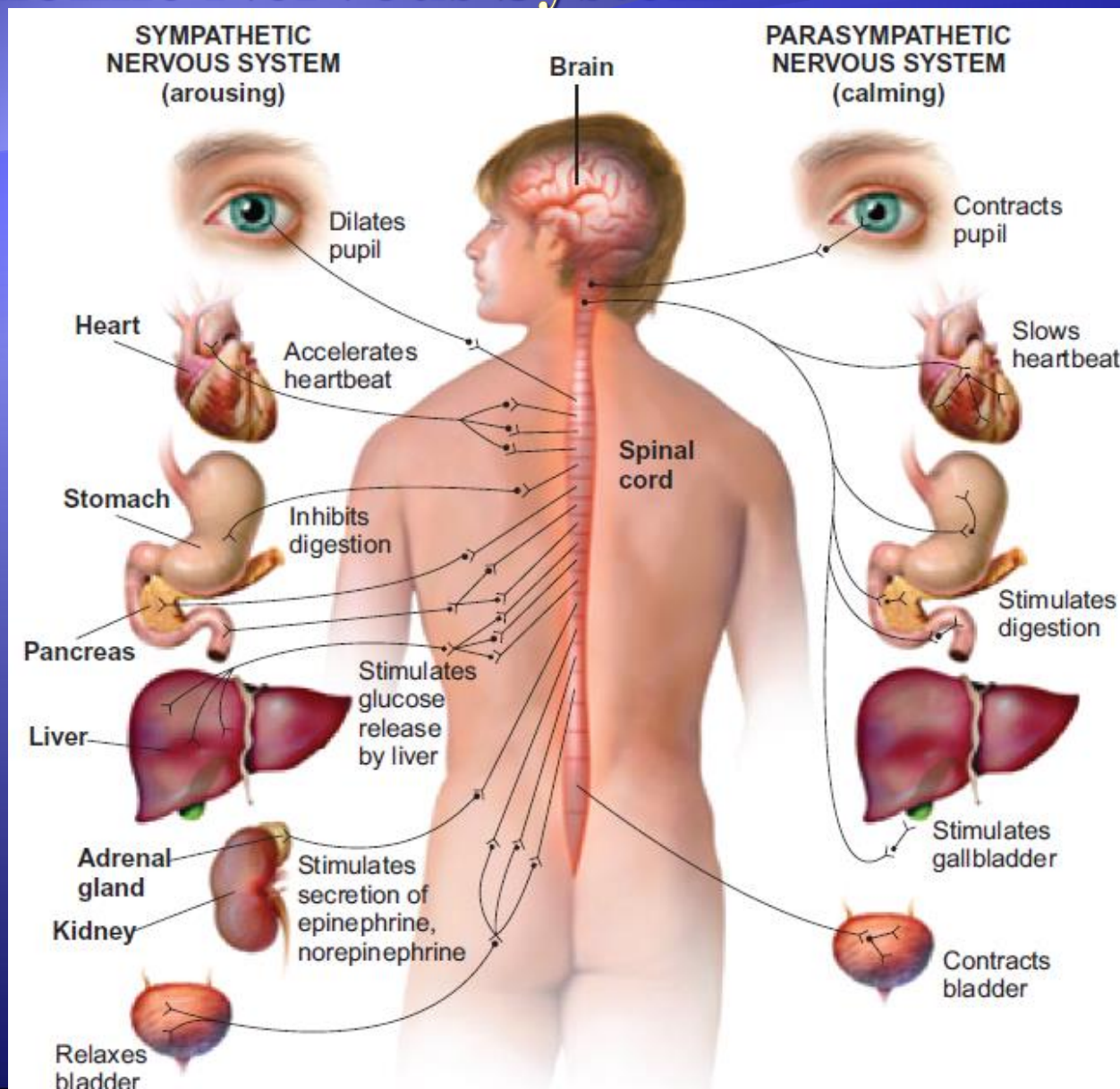


Parasympathetic Nervous System



- ◆ Automatically slows the body down after a stressful event.
- ◆ Heart rate and breathing slow down, pupils constrict and digestion speeds up.

The Sympathetic and Parasympathetic Divisions of the Autonomic Nervous System



Reflexes

- ◆ Normally, sensory (afferent) neurons take info up through spine to the brain.
- ◆ Some reactions occur when sensory neurons reach just the spinal cord.
- ◆ Survival adaptation.



Endocrine System

- ◆ One of the body's two communication systems;
- ◆ a set of glands that produce hormones, chemical messengers that circulate in the blood.

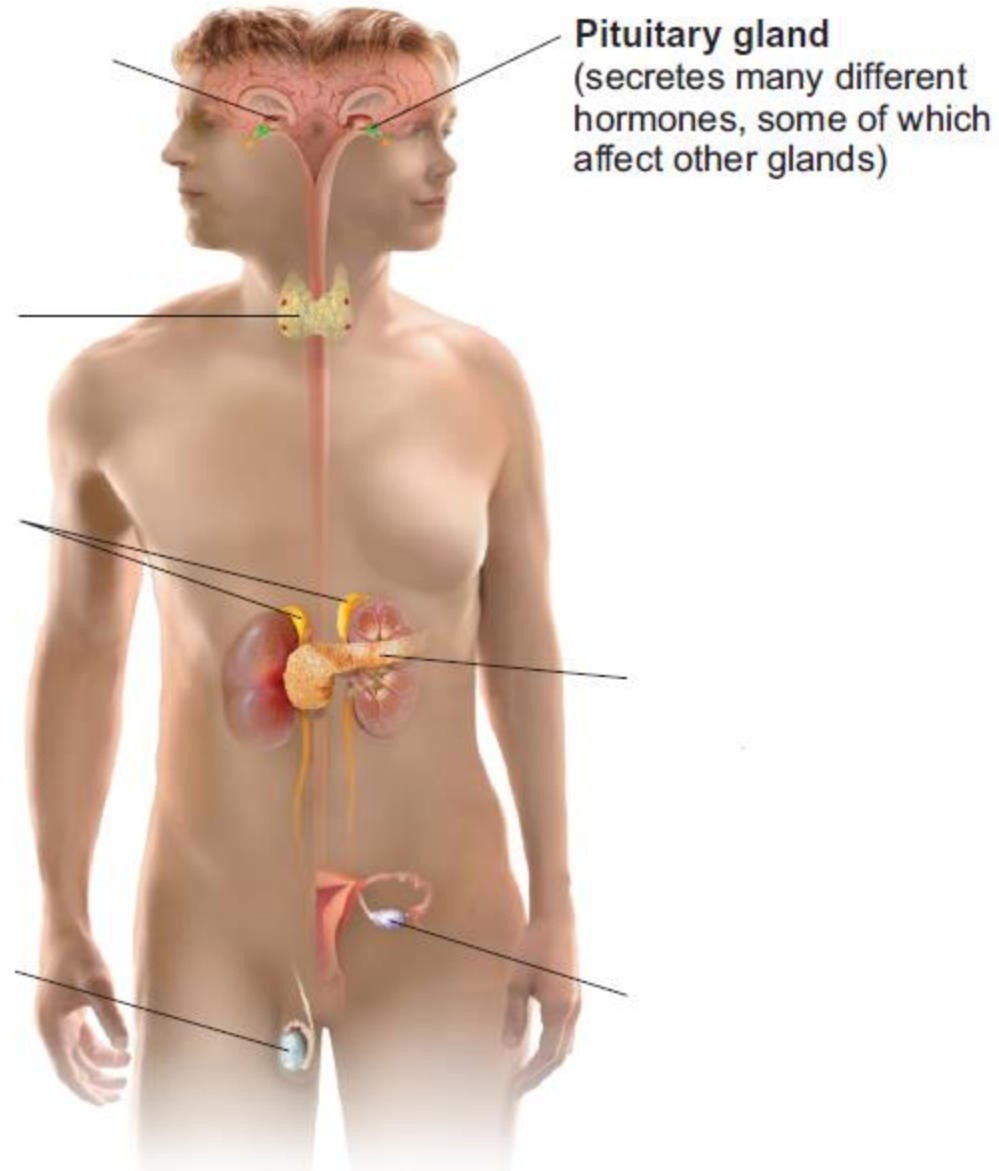
Hormone

- ◆ **A chemical messengers produced by the endocrine glands and circulated in the blood.**
- ◆ Similar to neurotransmitters in that they are also messengers
- ◆ Slower communication system, but with longer lasting effects

Pituitary Gland

- ◆ The endocrine system's “master gland” that,
- ◆ in conjunction with adjacent the brain area, controls the other endocrine glands.
- ◆ Called the “master gland”
- ◆ Located at the base of the brain and connects to the hypothalamus

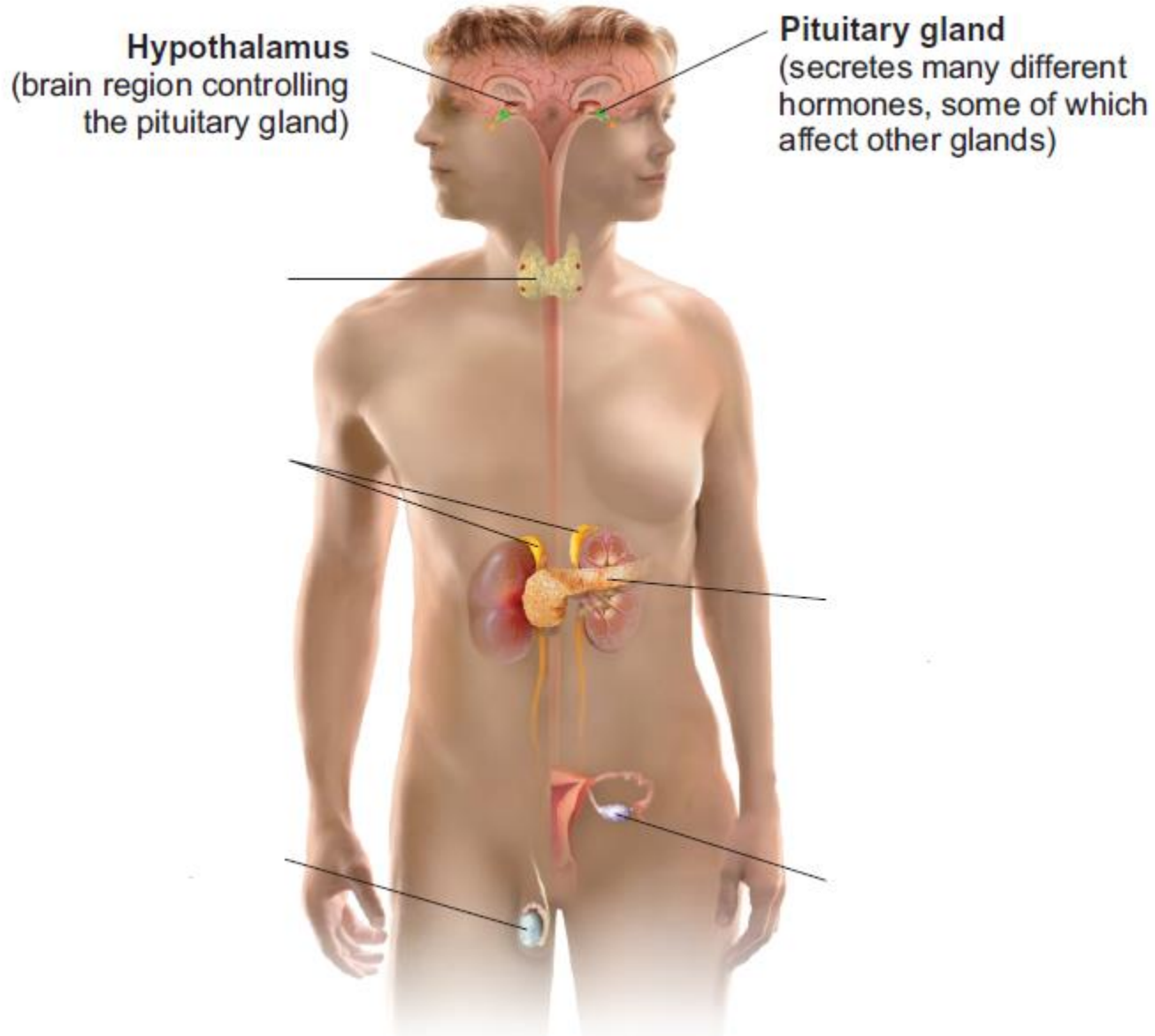
Endocrine System – Pituitary Gland



Hypothalamus

♦ the brain region controlling the pituitary.

Endocrine System – Pituitary Gland

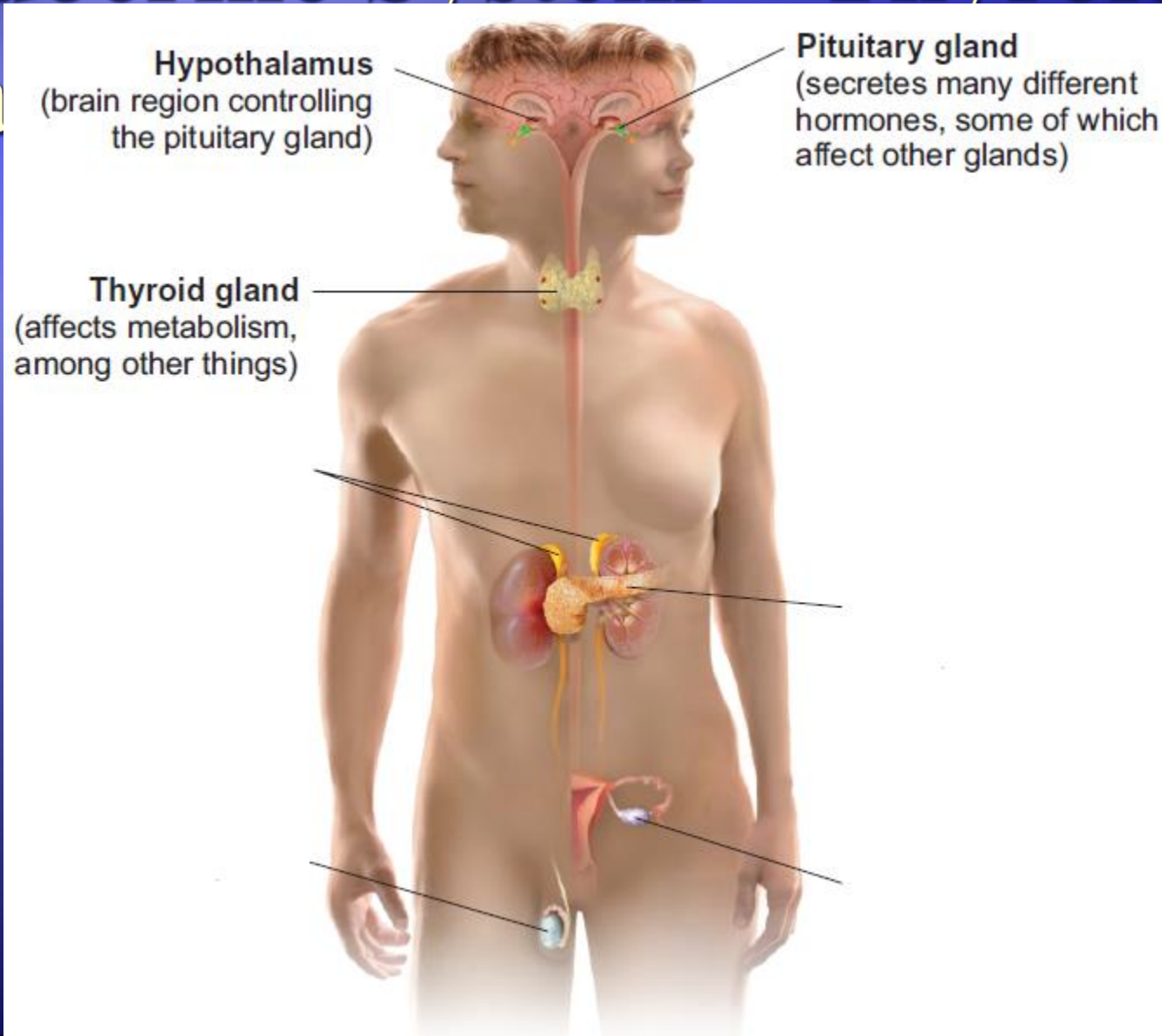


Thyroid Gland

- ◆ Endocrine gland that helps regulate the energy level in the body
- ◆ Located in the neck

Endocrine System – Thyroid

Gla

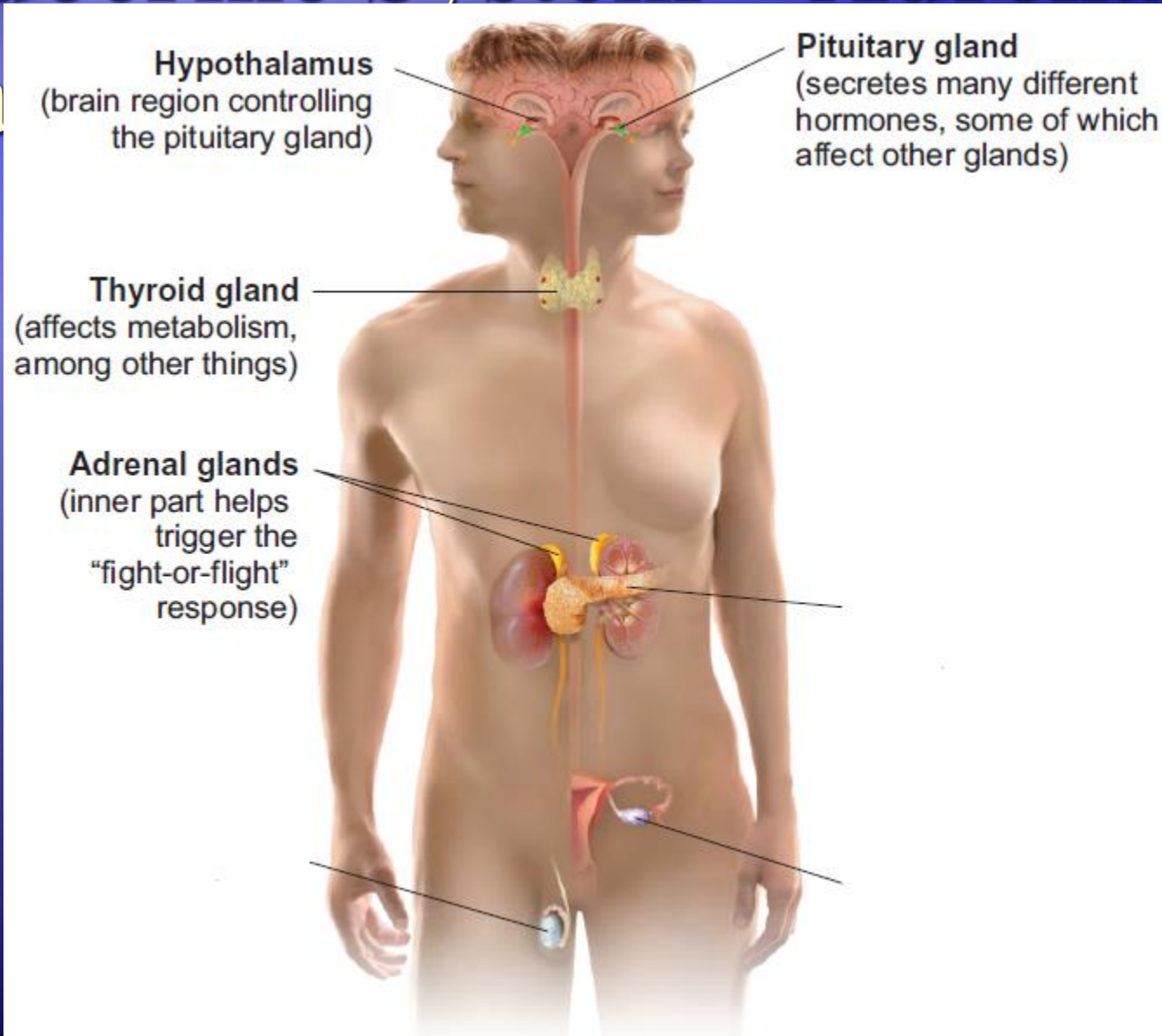


Adrenal Gland

- ◆ Endocrine glands that help to arouse the body in times of stress
- ◆ Located just above the kidneys
- ◆ Release epinephrine (adrenaline) and norepinephrine (noradrenaline)

Endocrine System – Adrenal

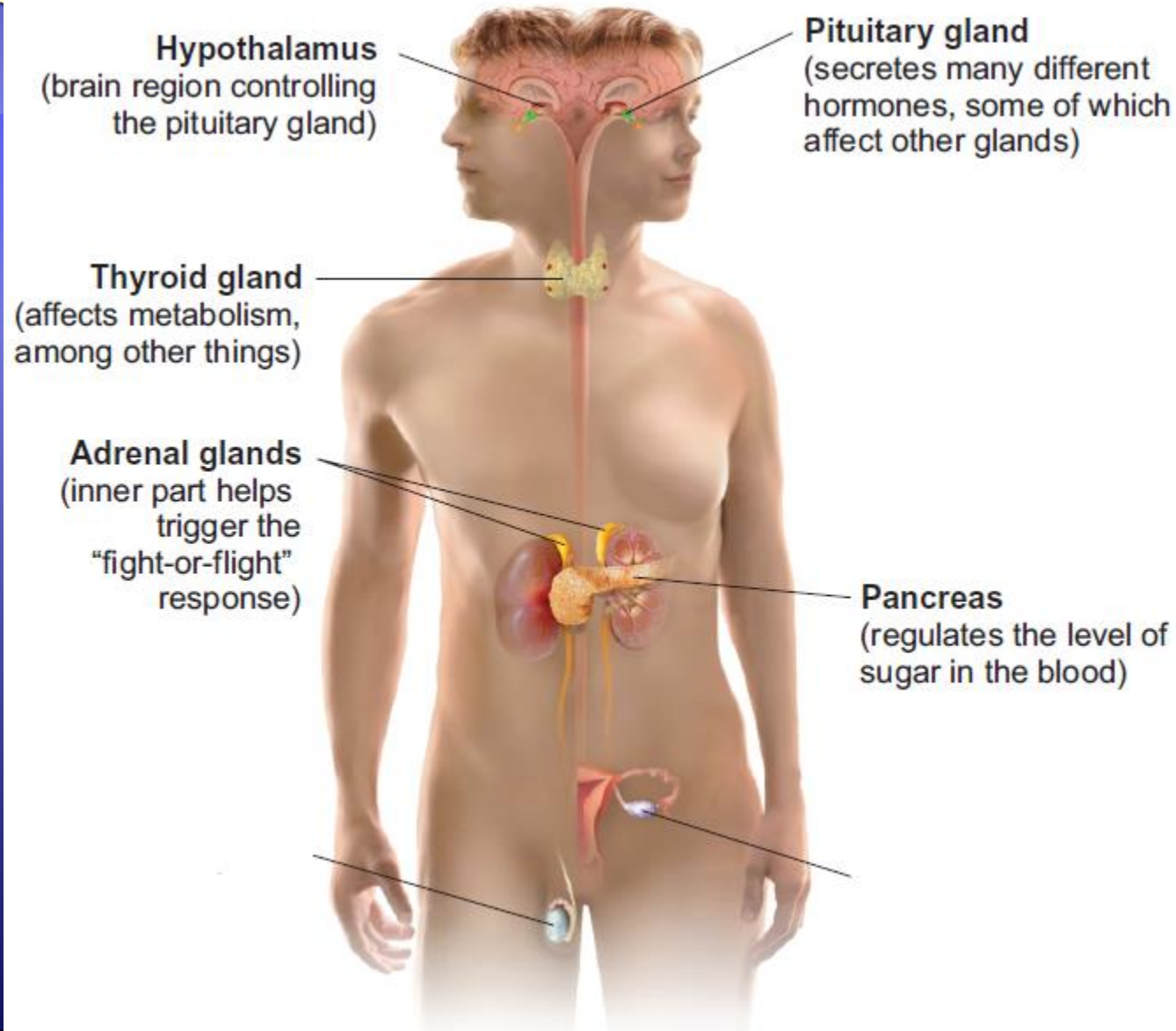
Gla



Pancreatic Gland

- ◆ Regulates the level of blood sugar in the blood

Endocrine System – Pancreatic Gland



Sex Glands

- ◆ Ovaries (females) and testes (males) are the glands that influence emotion and physical development.
- ◆ Testosterone – primary males hormone
- ◆ Estrogen – primary female hormone
- ◆ Males and females have both estrogen and testosterone in their systems.

Endocrine System – Sex

Gla

