



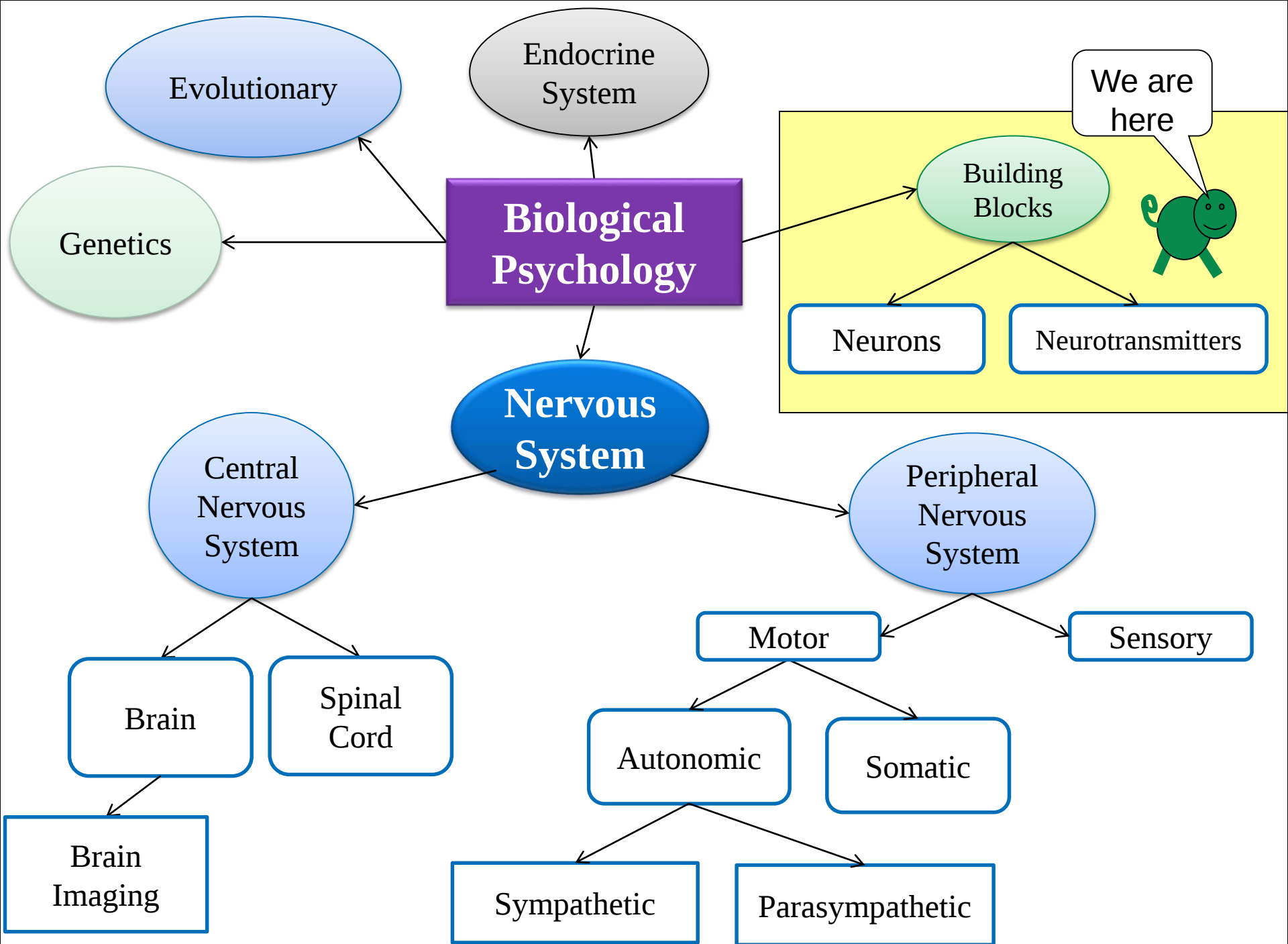
WHS AP Psychology



Unit 3: Biological Psychology

Essential Task 3-1:

Identify the basic parts of the neuron
(*dendrites, cell body, axon, terminal buttons, synaptic vesicles, and receptor sites*)





Essential Task 3-1:

[Outline](#)

- Biological Psychology [defined](#)
 - [Principles of Bio Psych](#)
- Basic parts of the [neuron](#)
 - [Dendrites](#) ([Receptor sites](#))
 - [Cell body](#)
 - [Axon](#) ([Myelin Sheath](#) and [Glial Cells \(White vs. Gray Matter\)](#))
 - [Terminal buttons](#) ([Synaptic vesicles](#))
- [Synapse](#)
 - *Terminal buttons (Synaptic vesicles)*
 - *Neurotransmitters*
 - *Synaptic Cleft/Space*
 - *Receptor Sites*



Biological Psychology

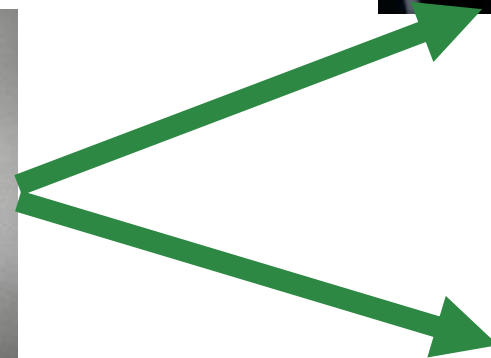
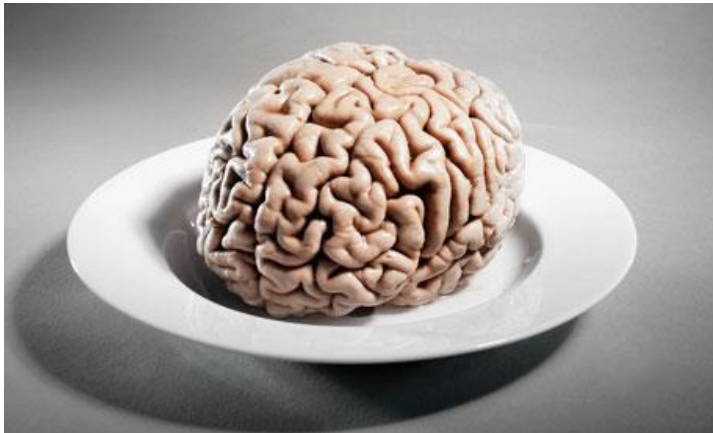
Outline

- branch of psychology that studies how the **body/physiology influences behavior and mental processes**
- some biological psychologists call themselves *behavioral neuroscientists, neuropsychologists, behavior geneticists, physiological psychologists, or biopsychologists*



Biological Psychology

[Outline](#)





Principles of Biological Psychology

- Everything psychological is simultaneously biological.
- The nervous system is complexity built from simplicity.
- The brain is both specialized and integrated.
- The nervous system is “plastic” (change) especially at early ages of development.



Neurons: The Messengers

Outline

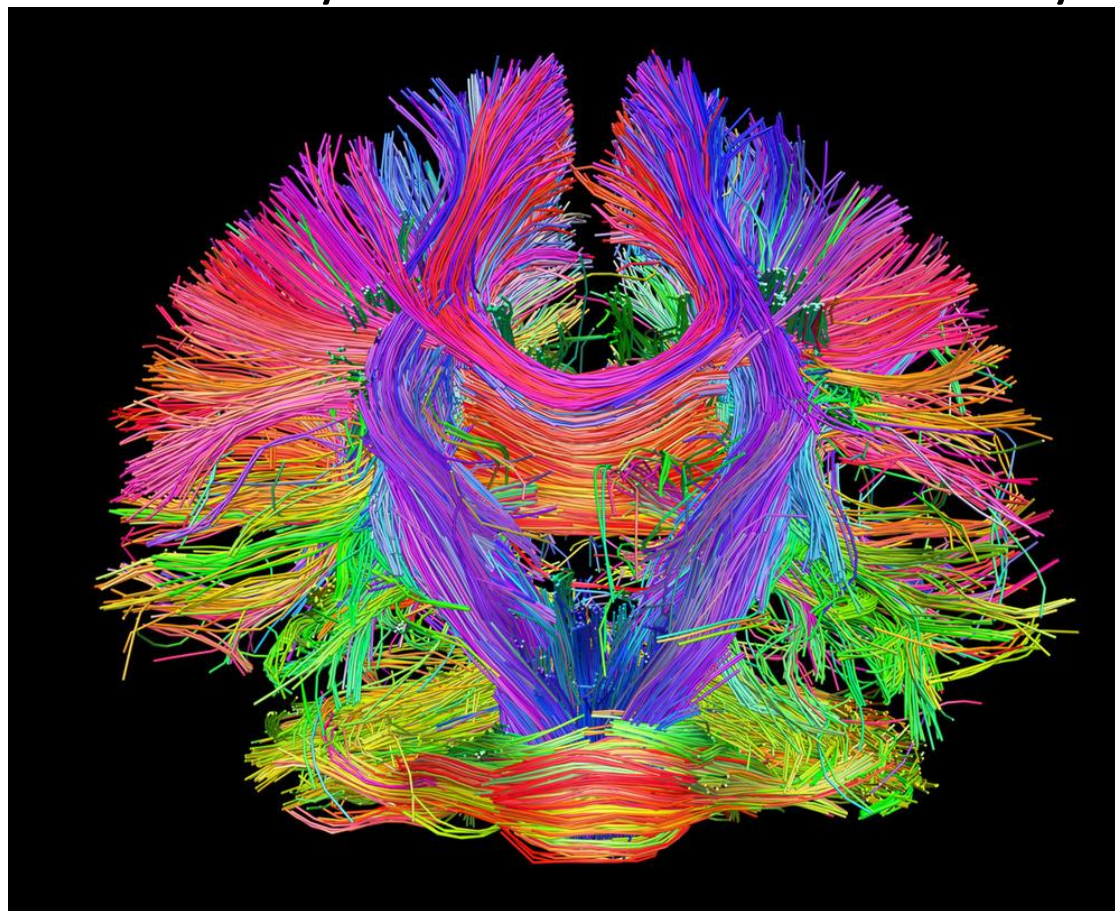
- About 100 billion neurons (nerve cells) in the human brain. Recent estimates put it at about 86 billion.
- About 100 trillion connections amongst these neurons.
- Neurons have many of the same features as other cells
 - Nucleus
 - Cytoplasm
 - Cell membrane
- What makes neurons unique is their shape and function



Brain Activity Map Project

Outline

- Started in 2013 this project is going to attempt to map the connection of every neuron in a human brain by 2023





I. STRUCTURE OF THE NEURON



Types of Neurons

Outline

- **Sensory** neurons
 - Carry information from sensory systems to the brain
 - Also referred to as *afferent neurons*
- **Motor** neurons
 - Carry information from the brain to muscles and glands
 - Also referred to as *efferent neurons*
- **Interneurons**
 - Carry information **between** other neurons



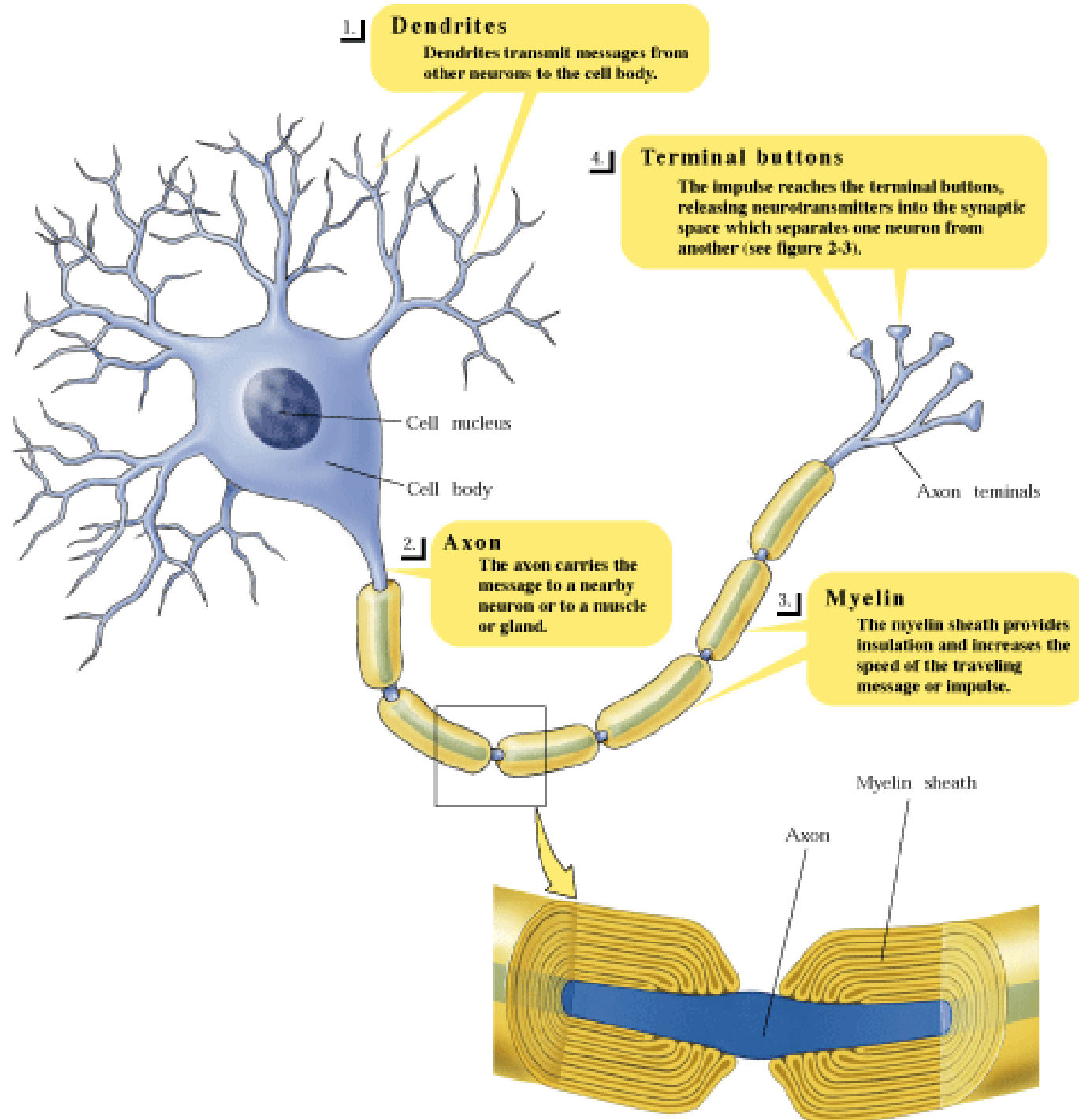
Structure of Neurons

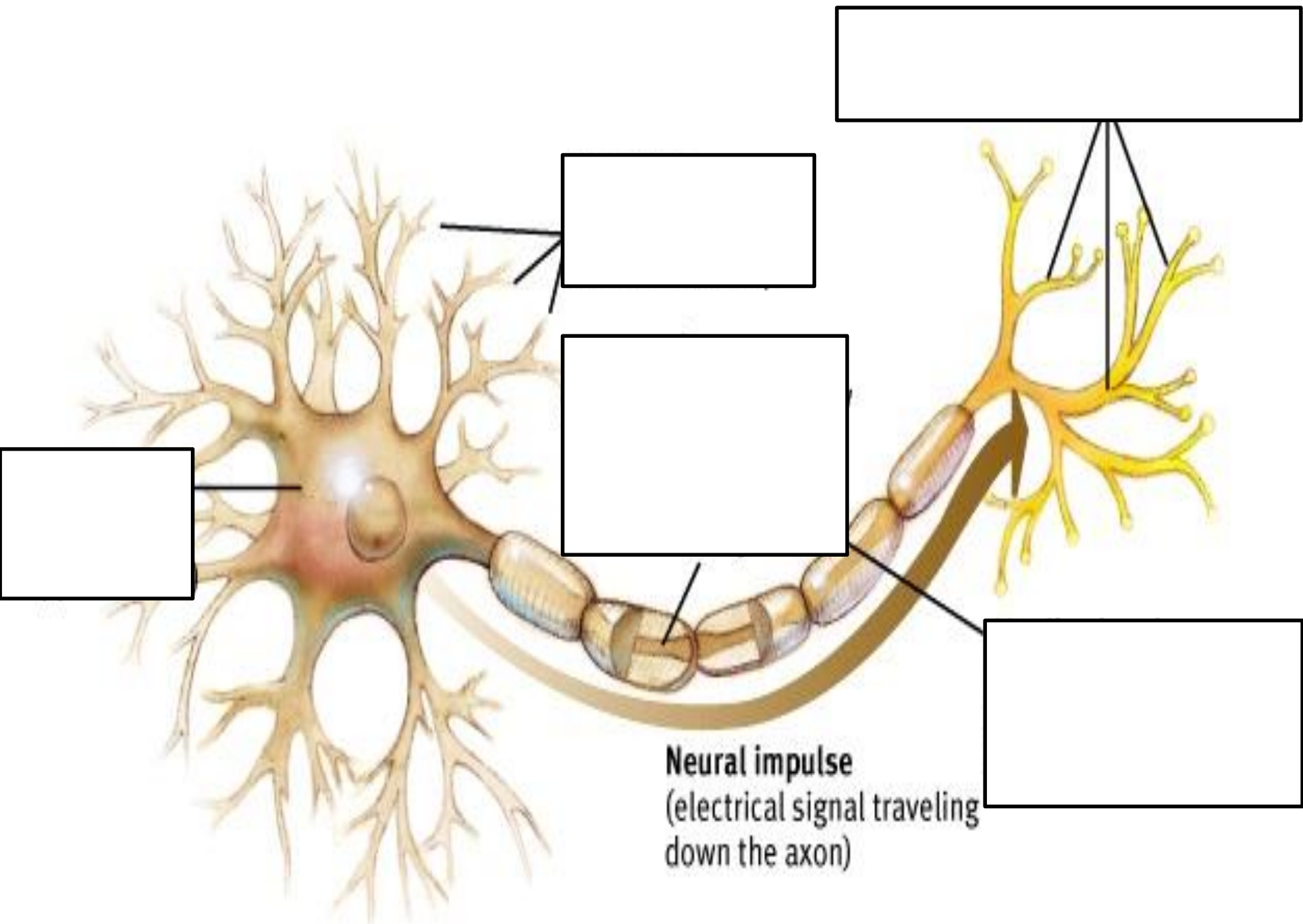
Outline

- **Dendrites**
 - Carry information to the cell body from other neurons
- **Cell Body (Soma)**
 - Contains nucleus
 - Soma means “Body”
- **Axon**
 - Carries information to the next cell
- **Myelin Sheath**
 - Insulates the axon and speeds up the neural impulse
- **Terminal button**
 - Enlarged area at the end of an axon that send out information



Outline

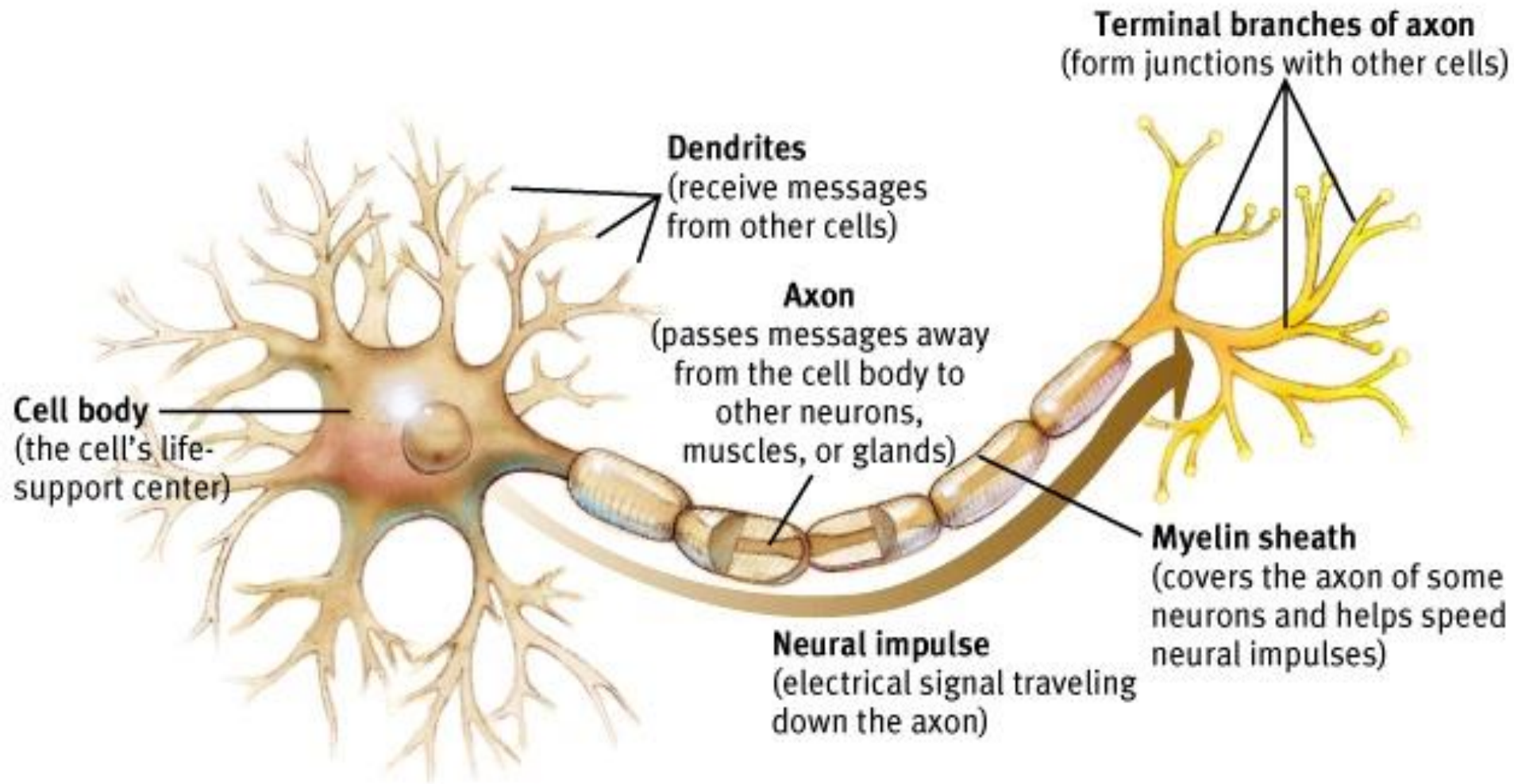






Neuron

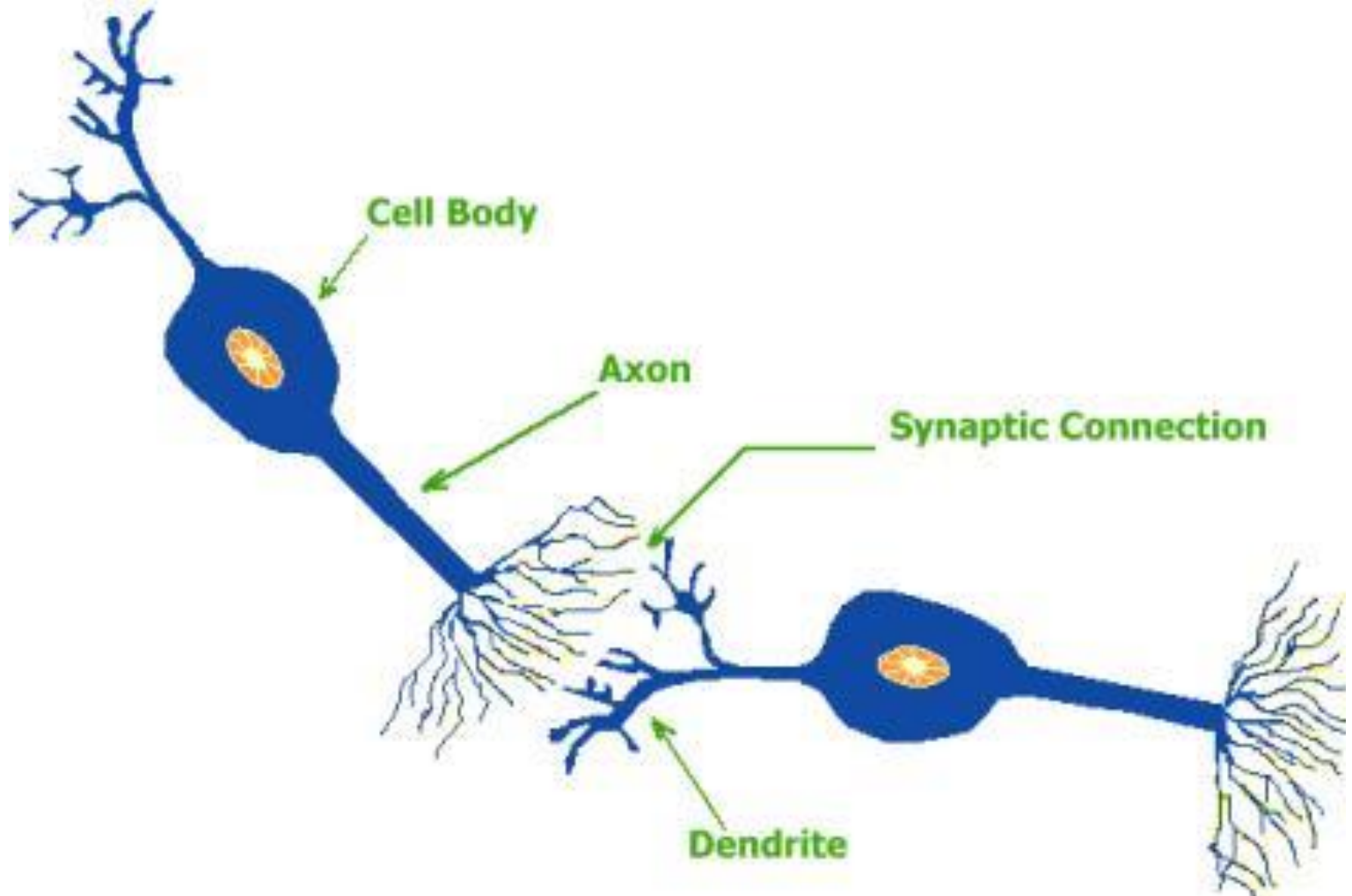
[Outline](#)





Neural Communication

[Outline](#)





The Synapse

Outline

- **The synapse**
 - Composed of the terminal button of one neuron, the synaptic space, and the dendrites or cell body of the receiving neuron
- **Terminal button**
 - Enlarged area at the end of an axon
- **Synaptic space** (synaptic cleft)
 - Tiny gap between neurons
- **Receptor Sites**
 - Sites on the dendrite of the receiving neuron where neurotransmitters bind fitting like keys into specially designed locks.



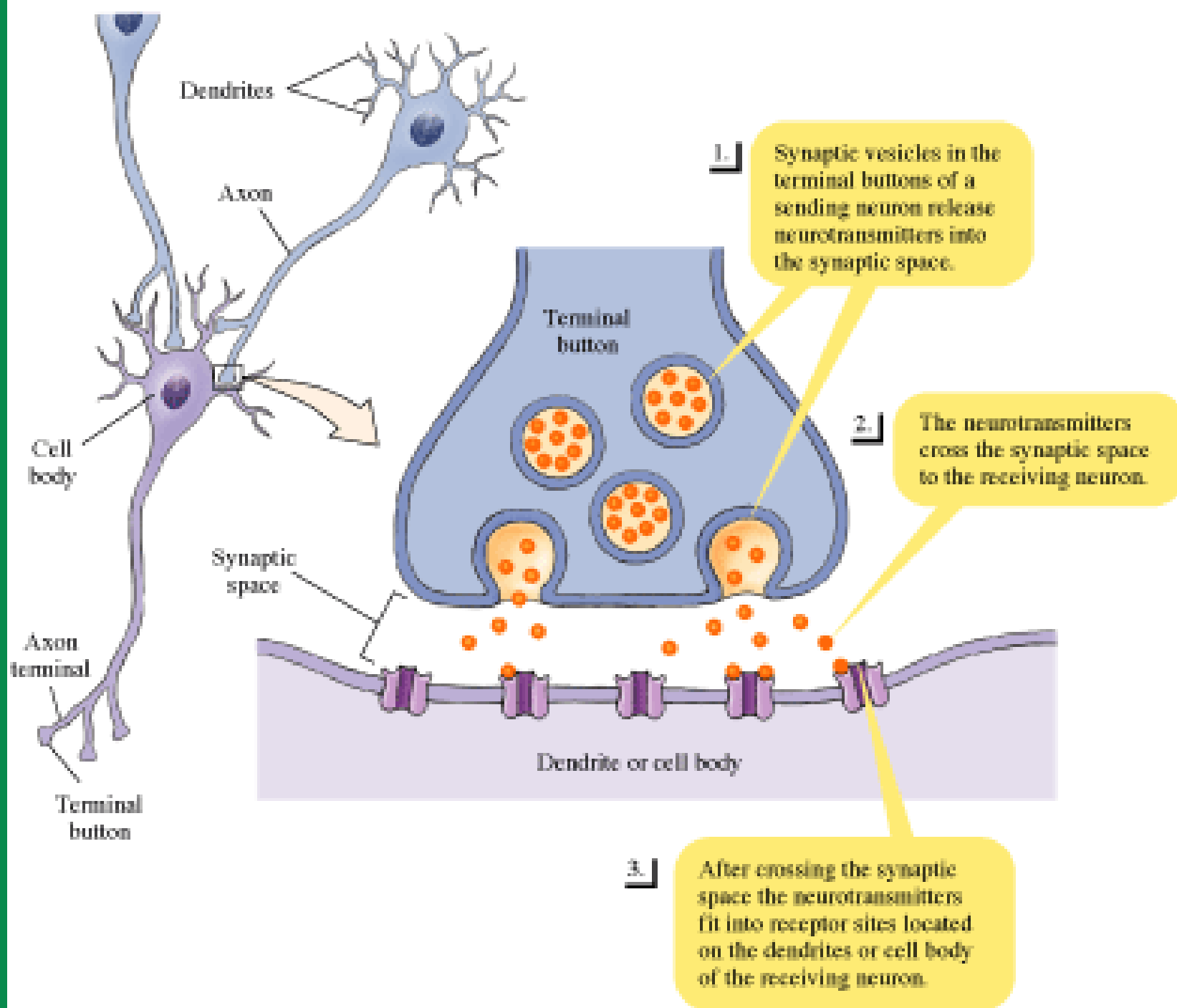
Chemical Transmission Between Neurons

Outline

- **Synaptic vesicles** release neurotransmitters that bind to receptor sites.
 - Sacs in terminal button that release chemicals into synaptic space
 - Chemicals released by synaptic vesicles
 - Sites on the dendrite of the receiving neuron where neurotransmitters bind fitting like keys into specially designed locks.



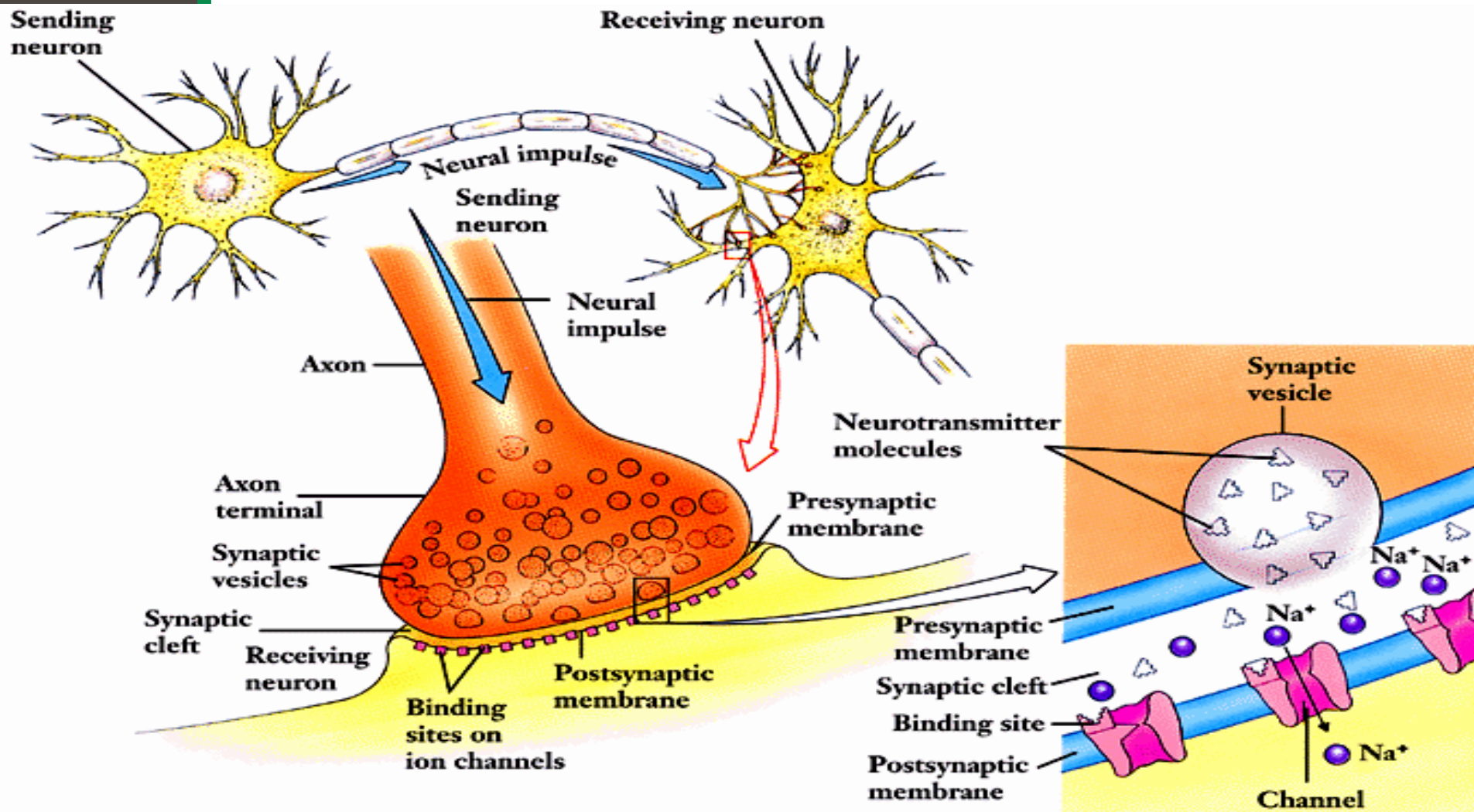
Outline





Chemical Transmission BETWEEN Neurons

Outline





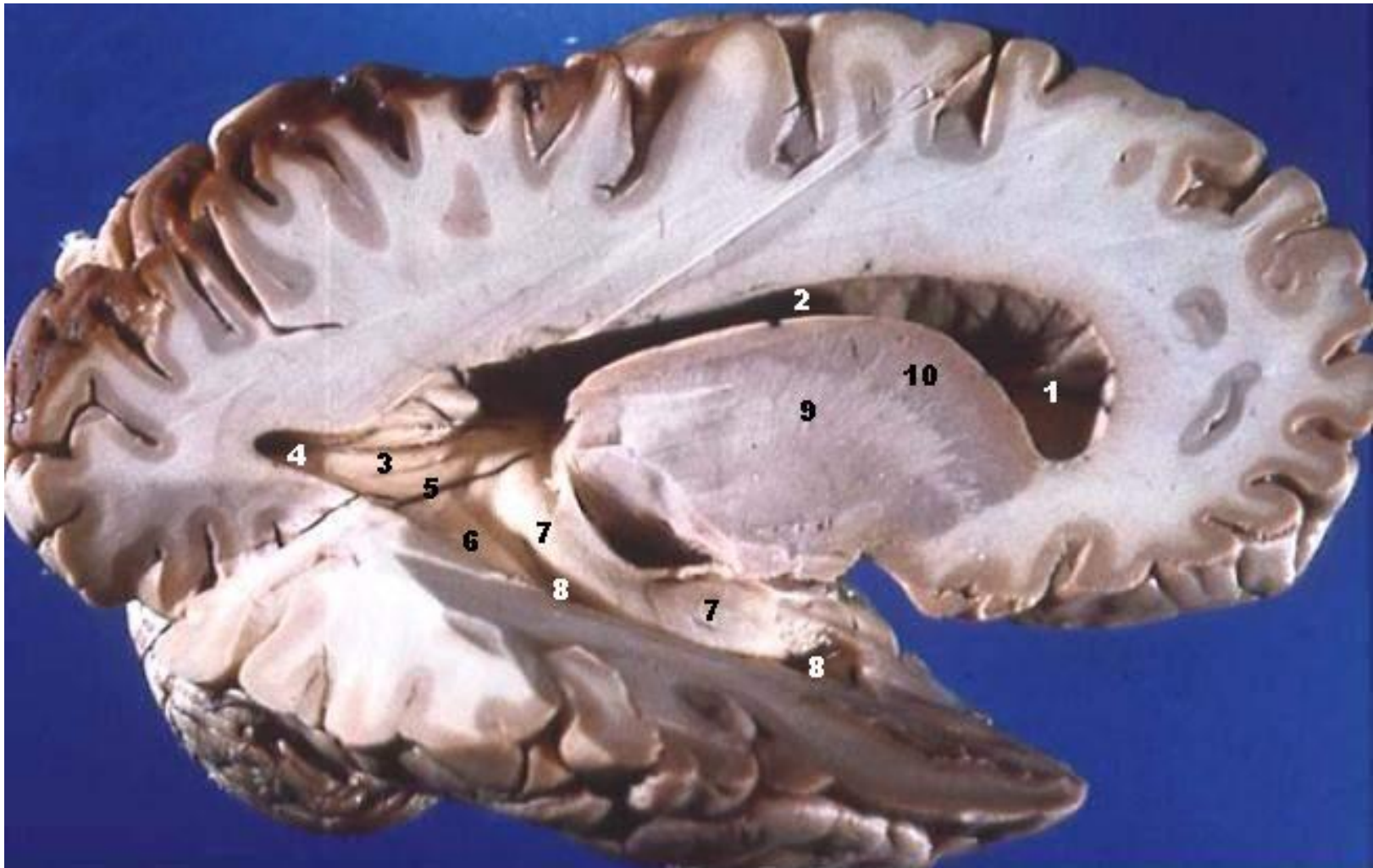
Glial Cells

Outline

- Cells that insulate and support neurons
- Create the myelin sheath
- Remove waste products
- Provide nourishment
- Prevent harmful substances from entering the brain
- Forms white matter in the brain helping communication across the brain
- Gray matter is un myelinated brain tissue.



White and Gray Matter

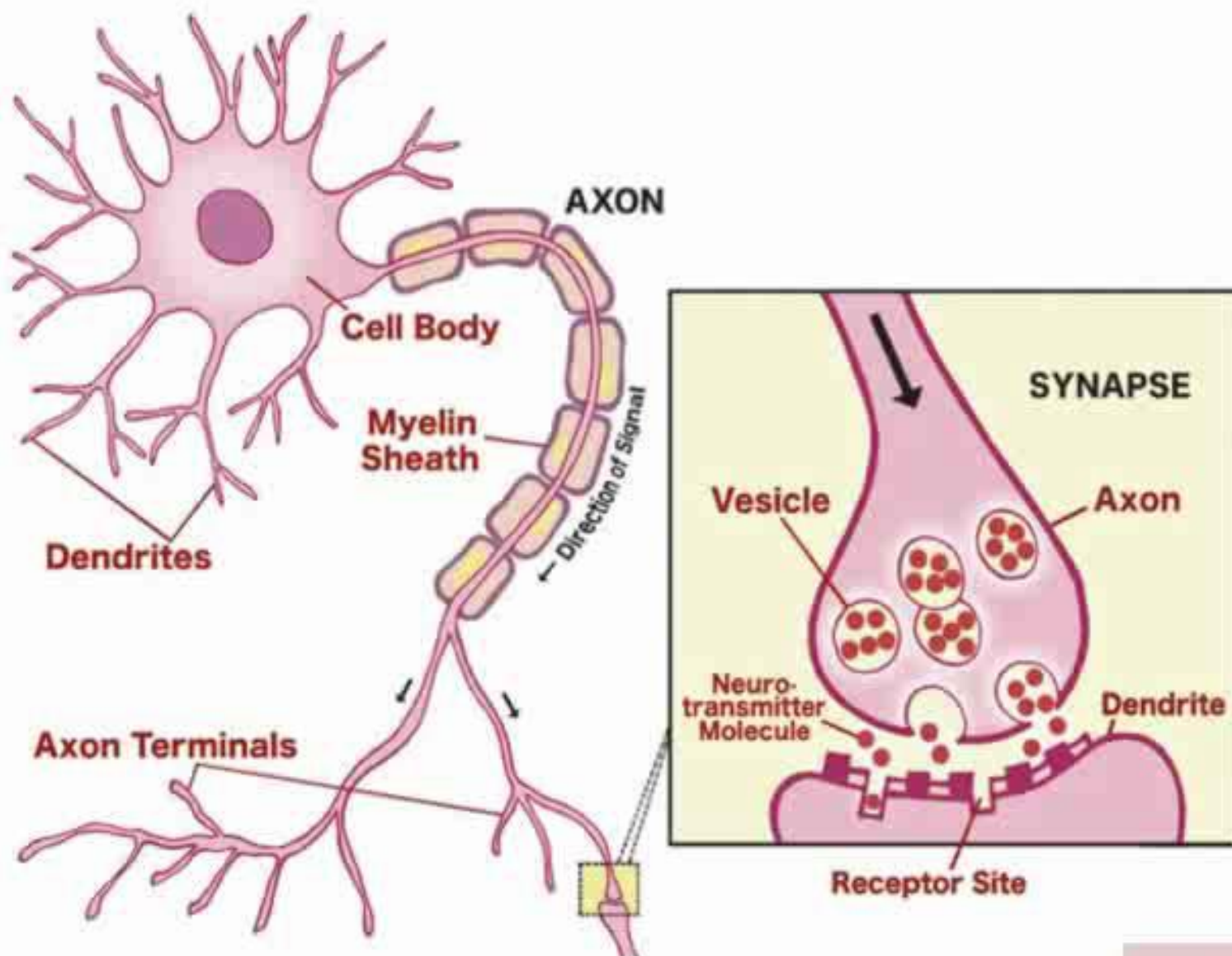




II. NEUROTRANSMITTERS



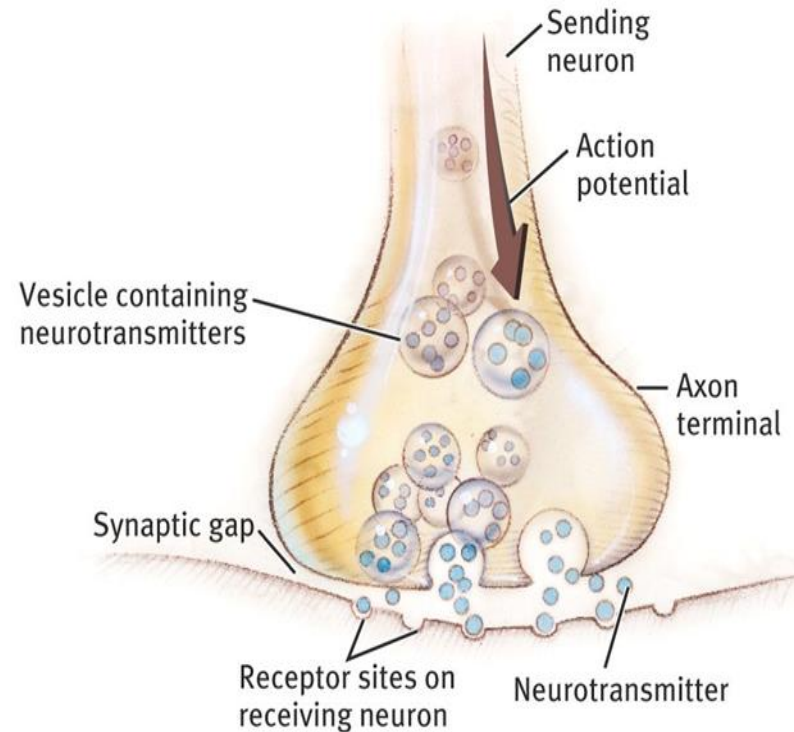
Neural Communication





Neurotransmitters

- **Neurotransmitters**
(chemicals) released from the sending neuron that travel across the synaptic cleft and bind to receptor sites on the receiving neuron, thereby influencing it to generate an action potential.



- Neurotransmitter is NOT a hormone!



Chemical Communication

Outline

Terminal button -

Enlarged area at the axon terminal

Synaptic vesicles -

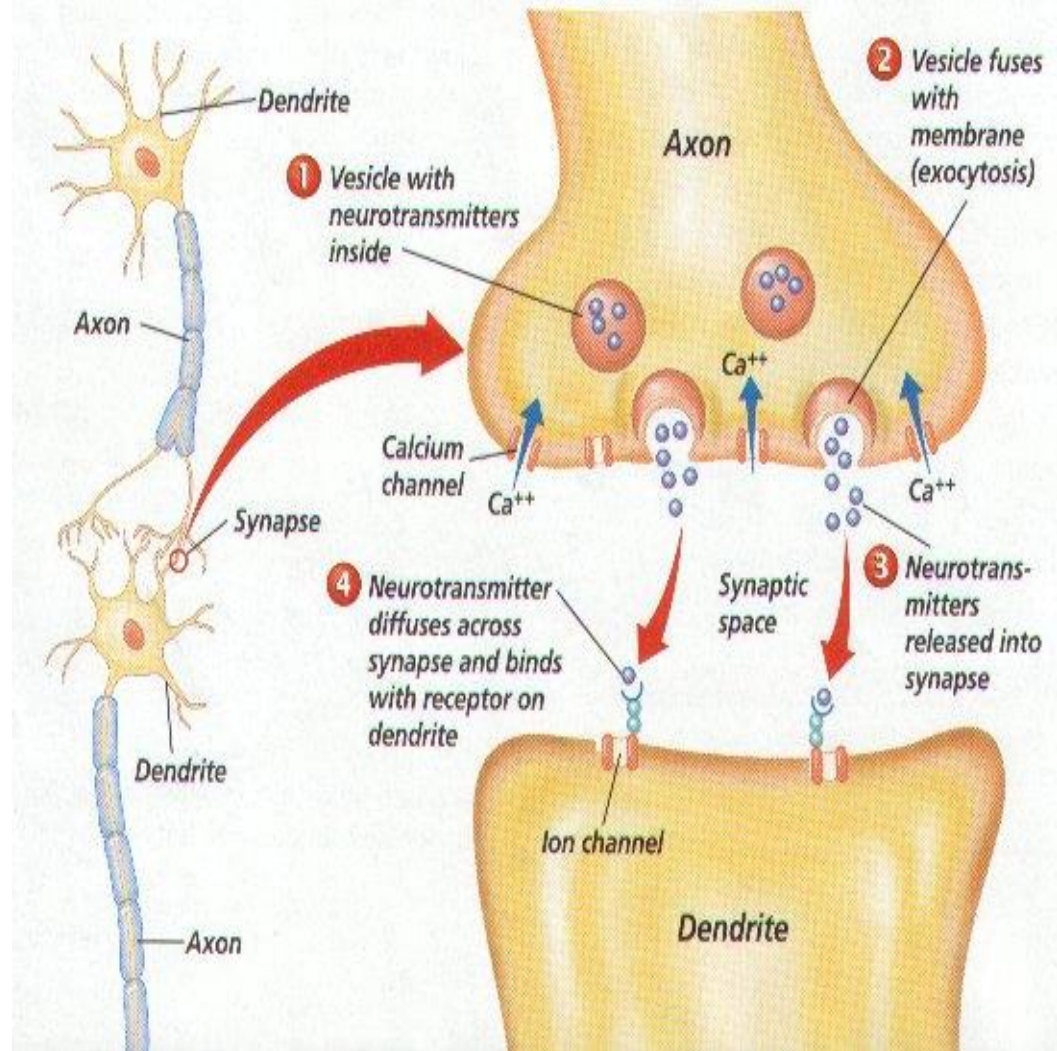
Sacs in the terminal button that release chemicals called neurotransmitters into the synaptic space

Synaptic space

(synaptic cleft) - Tiny gap between neurons

Receptor sites -

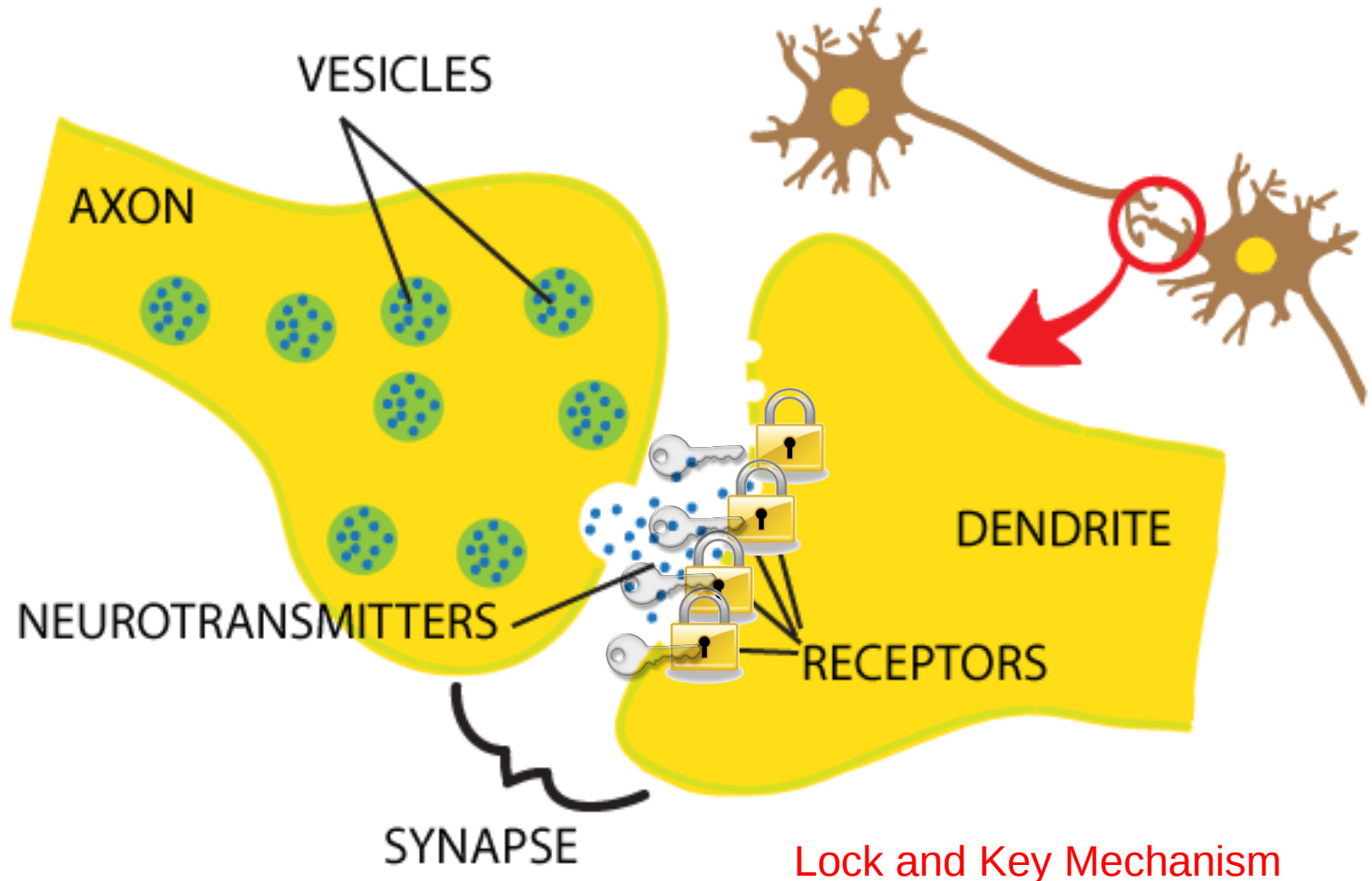
Location on receptor neuron where neurotransmitters can bind.





Neurotransmitters fit like chemical keys in chemical locks.

[Outline](#)





2 Categories of neurotransmitters:

Excitatory and Inhibitory

Outline

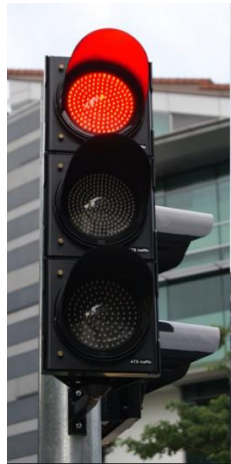
Excitatory

- The key fits and 'opens' the receiving neuron.
- Activation of the receptor causes **depolarization** of the membrane and **promotes** an action potential (firing of neurons) in the receiving neuron.



Inhibitory

- The key fits in but only **stops** any other keys.
- Activation of the receptor causes **hyperpolarization** and **depresses** action potential generation. (slows or stops firing)



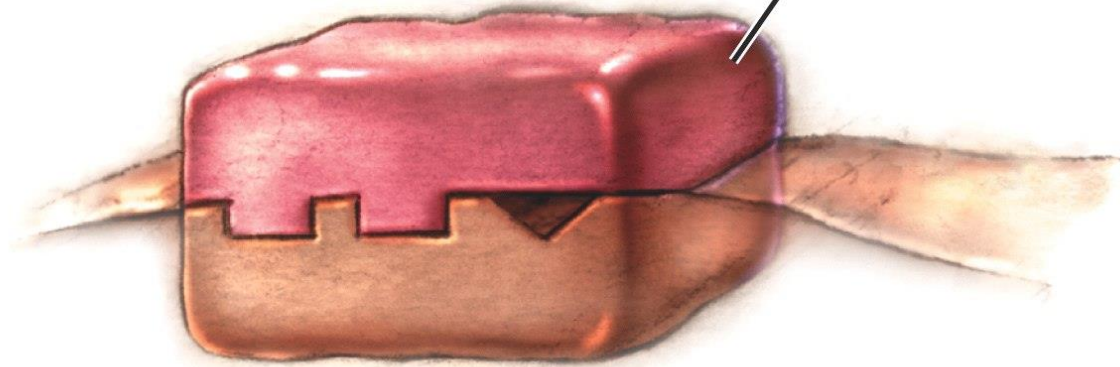


Drugs that excite a neuron are called Agonists

[Outline](#)

Agonist excites!!!

Agonist mimics
neurotransmitter



This agonist molecule excites. It is similar enough in structure to the neurotransmitter molecule that it mimics its effects on the receiving neuron. Morphine, for instance, mimics the action of endorphins by stimulating receptors in brain areas involved in mood and pain sensations.



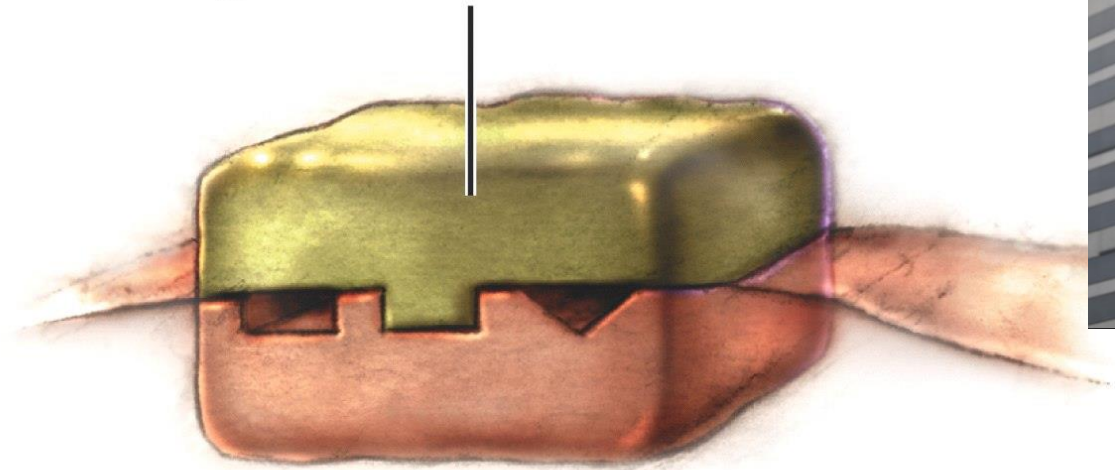
Drugs that inhibit a neuron are called antagonists

[Outline](#)

Antagonists

stops!!!

Antagonist blocks neurotransmitter



This antagonist molecule inhibits. It has a structure similar enough to the neurotransmitter to occupy its receptor site and block its action, but not similar enough to stimulate the receptor. Curare poisoning paralyzes its victims by blocking ACh receptors involved in muscle movement.

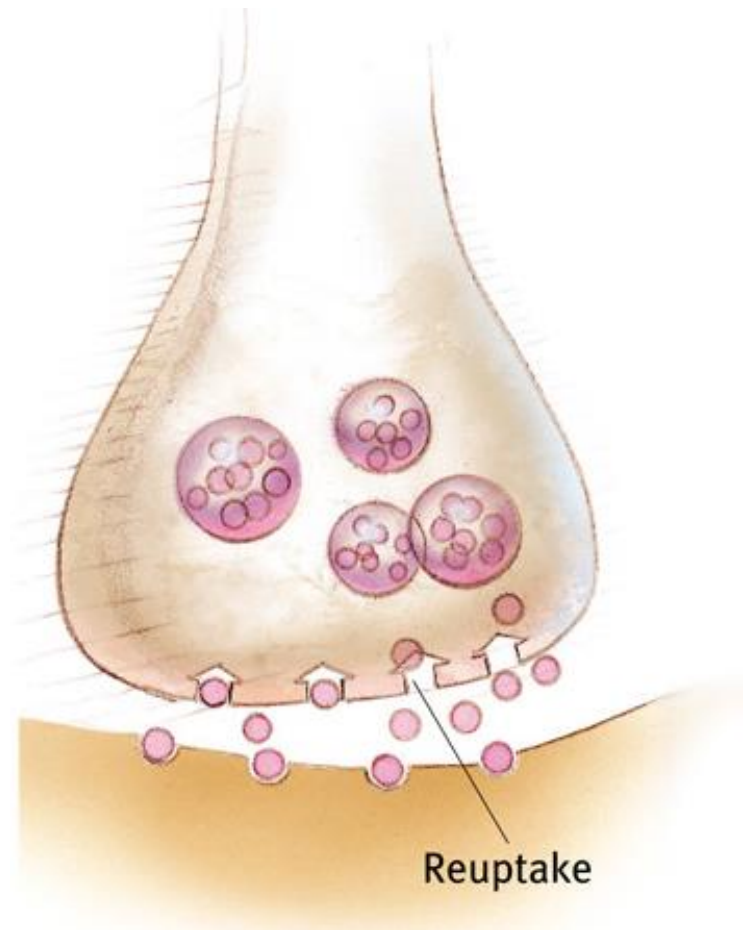


Reuptake

Outline

- Neurotransmitters in the synapse are reabsorbed into the sending neurons through the process of reuptake. This process applies the brakes on neurotransmitter action.

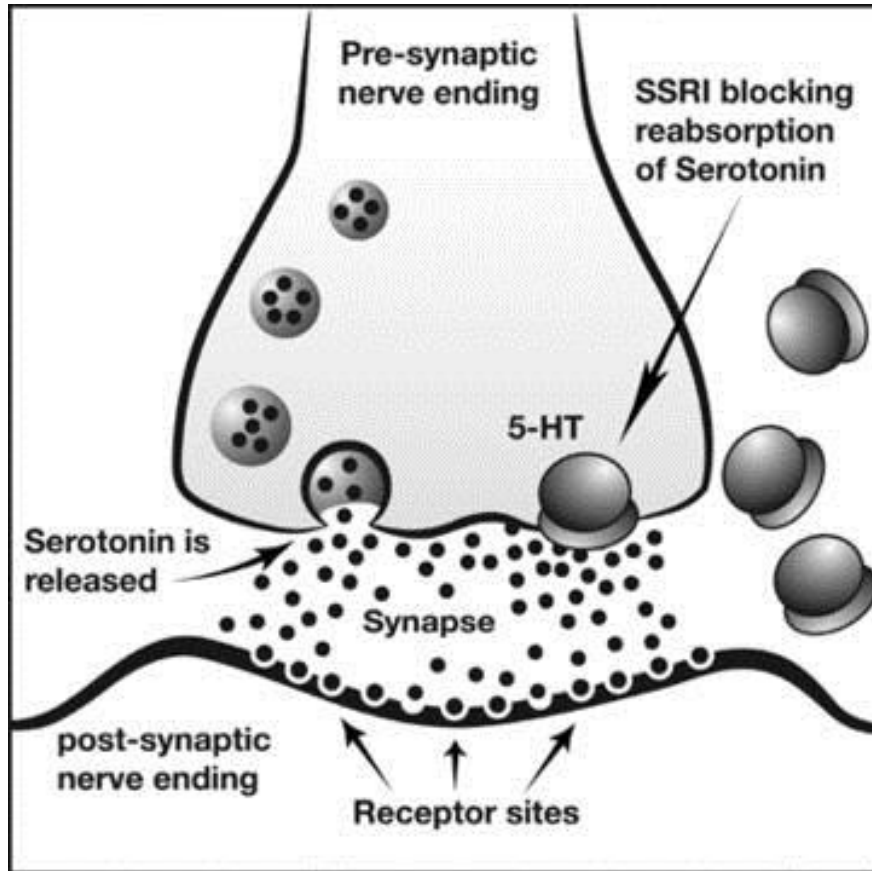
***Neurotransmitters are taken back**





Selective Serotonin Reuptake Inhibitors (SSRI)

Outline



Citalopram (Celexa)
Escitalopram (Lexapro)
Fluoxetine (Prozac)
Paroxetine (Paxil, Pexeva)
Sertraline (Zoloft)



Some Well-Known Neurotransmitters

- Acetylcholine (ACh)
 - Released at the neuromuscular junction (activates muscles)
 - Plays an important role in arousal and attention
 - Oversupply leads to spasms
 - Undersupply is linked to Alzheimer's disease and paralysis
- Dopamine
 - Affects neurons associated with pleasure and voluntary movement (muscle control)
 - Plays a role in learning, memory, and emotions
 - Undersupply leads to Parkinson's Disease
 - Oversupply leads to Schizophrenia



Dopamine

Drugs like cocaine and amphetamines triggers large amounts of dopamine production. The over production and the loss of production of dopamine is what causes addiction in these drugs.





Some Well-Known Neurotransmitters

- Serotonin
 - Found throughout the brain
 - Appears to sets an “emotional tone”
 - Affects mood, hunger, sleep, and arousal
 - Low serotonin levels are implicated in depression
 - Some antidepressant drugs raise serotonin
- Norepinephrine
 - Helps control alertness and arousal
 - Alerts body of danger
 - Undersupply are implicated in ADHD and depression



Serotonin

Key ingredient in ecstasy targets over production of serotonin.





Some Well-Known Neurotransmitters

- GABA (Gamma-aminobutyric acid)
 - Inhibitory neurotransmitter
 - involved in memory, movement, and sleep
 - linked to seizures, tremors, Huntington's disease, and insomnia
- Endorphins
 - Reduce pain by inhibiting or “turning down” neurons that transmit pain information
 - Endures pain (pain reliever)
 - “runner’s high”
 - No established problems



Other Neurotransmitters you may need to know

- Epinephrine
 - Adrenaline
 - Fight or flight response
 - when you are in an emergency!
- Glutamate
 - Primary excitatory neurotransmitter
 - Long-term memory