

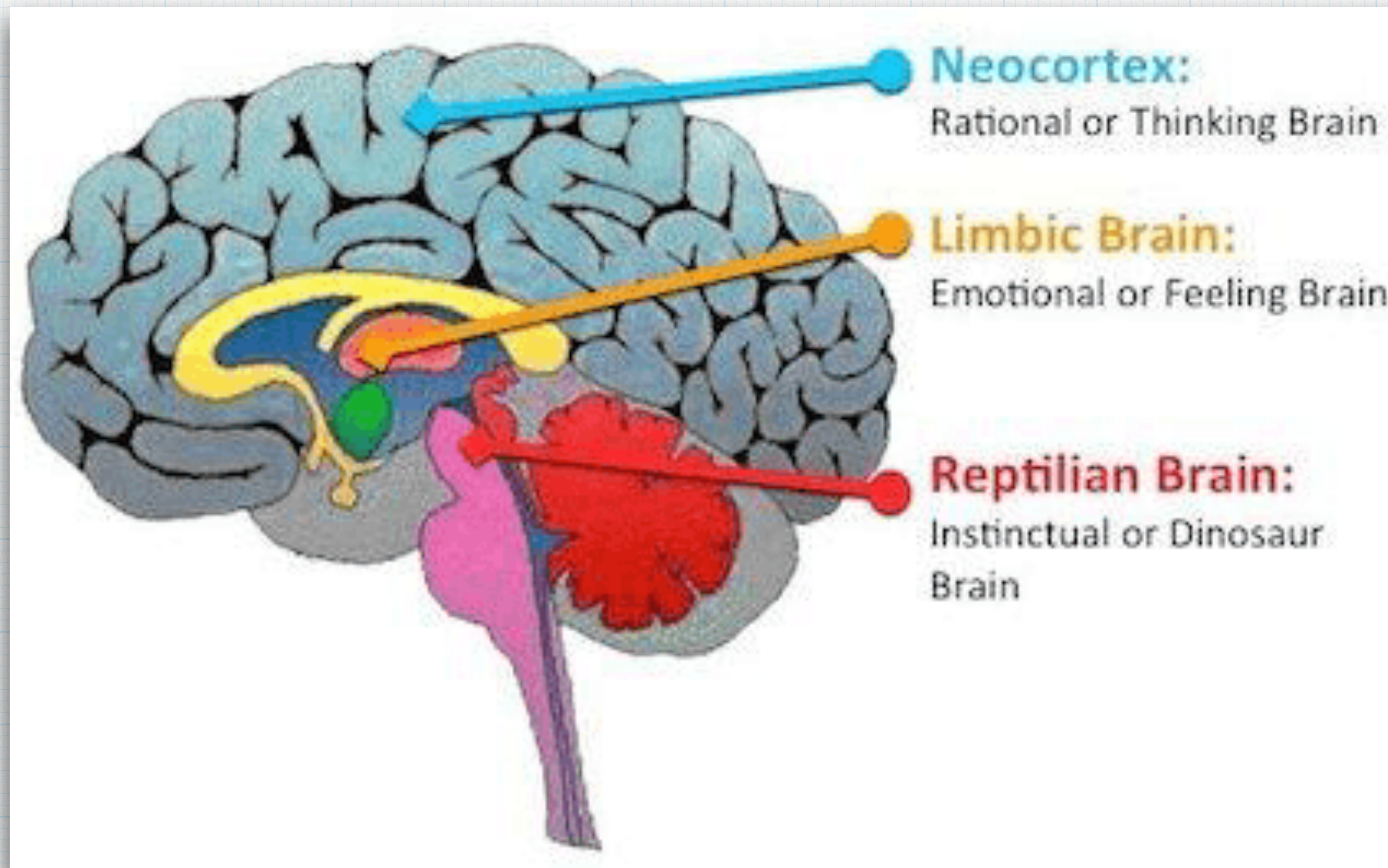
# The Neurochemistry and the Physiology of Addiction

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Pierce College -Spring 2022  
Addiction Studies 2

# The Brain Video



# The 3 Parts of the Brain



# Prefrontal Cortex

- \* Responsible for decision, logic, reasoning, problem solving
- \* Communicates with the limbic system
- \* Drug abuse cuts off the communication



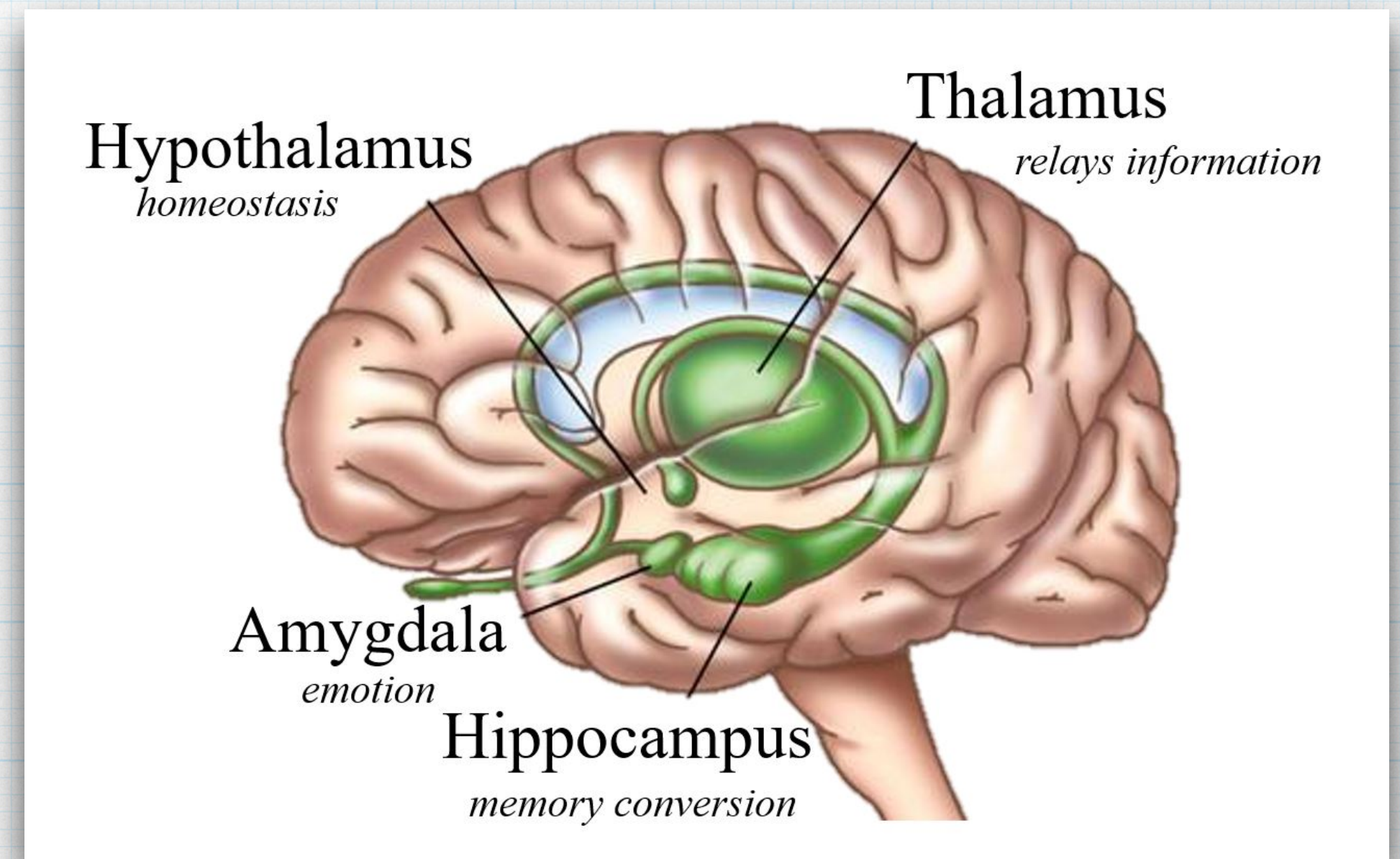


# The Primitive Brain

The "old" brain which houses the limbic system

# The Limbic System

- \* The limbic system is older than the cortex
- \* Hippocampus: form memory and learn
- \* Amygdala: contributes to emotions
- \* Striatum: crucial to forming habits, routine of behaviors do without thinking and processing reward



# Memory

- \* Old and new brain function (creating, storing and utilizing memories)
- \* Creation of memories
  - \* Pleasure rather than discomfort
- \* Storage of memories
  - \* Last a life time
- \* Utilizing of memories
  - \* Mind chooses solutions

# Memory and psychoactive drugs

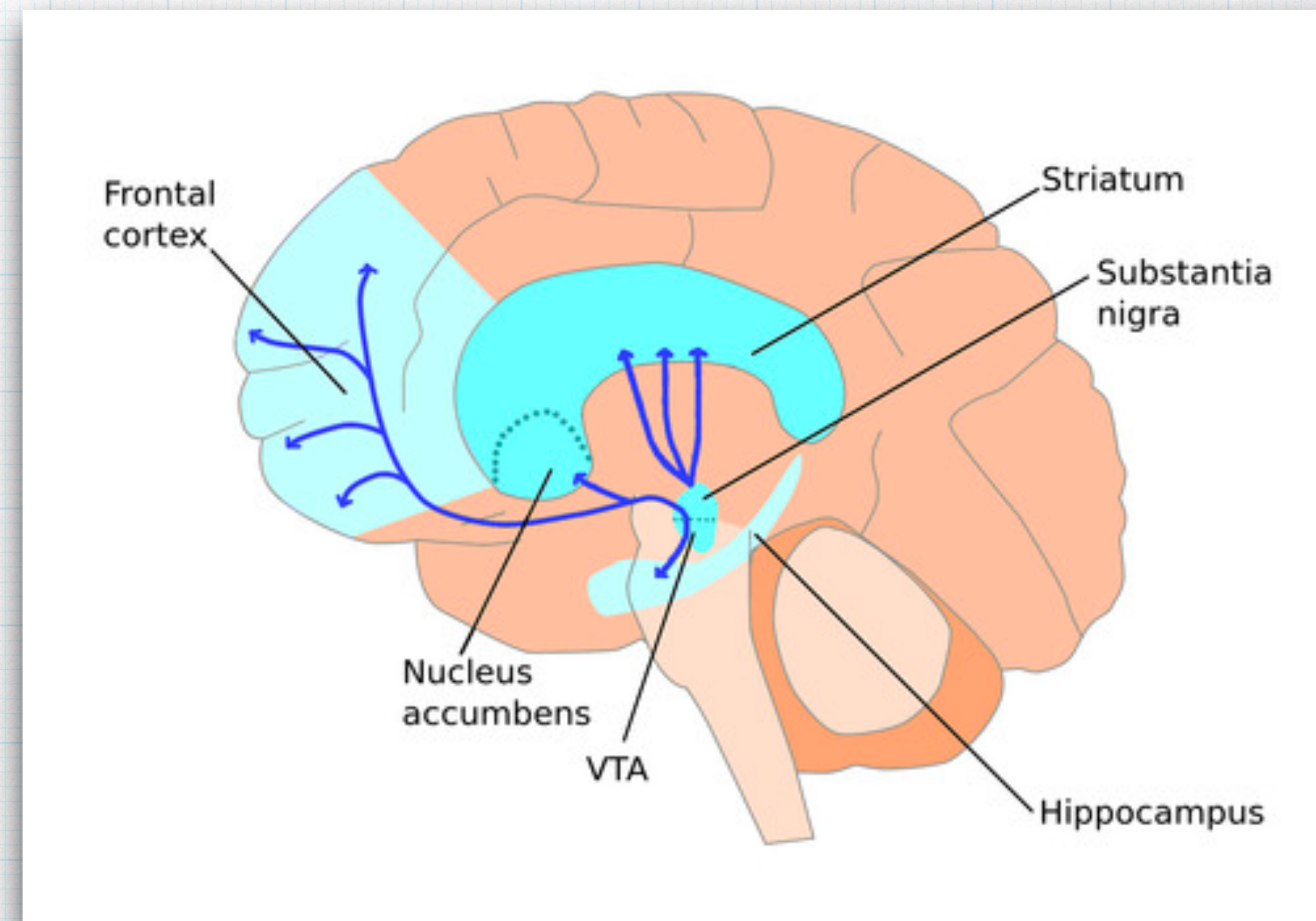
- \* Drugs create memory
- \* Stronger the drug = more memory bumps, deeply imprinted
- \* Earlier age= longer/stronger memories remains
- \* Euphoric recall = positive experience
- \* Craving is triggered by negative or positive experience

# Reward System (Limbic)

- \* Neurological disorder that affects the reward system in the brain
- \* Reward system reinforce important behaviors that are essential for survival
  - \* Eating/drinking, Sex, and social interaction
- \* Survival is the brains main function therefore all that is need to survive is pleasurable (eating, sex, sleeping)
- \* Addiction “highjacks” this process making drugs its main purpose for surviving

# Addiction Pathway

- \* Ventral Tegmental Area (VTA) release dopamine producing neurons and send signals to the limbic and frontal cortex when you engage pleasurable behavior
- \* VTA send signals to the Ventral Striatum (VS) where the Nucleus Accumbens is triggered
- \* Nucleus Accumbens is known as the brains pleasure center
- \* Electrical signal release neurotransmitters, how cells communicate with each other



# Drugs in the brain

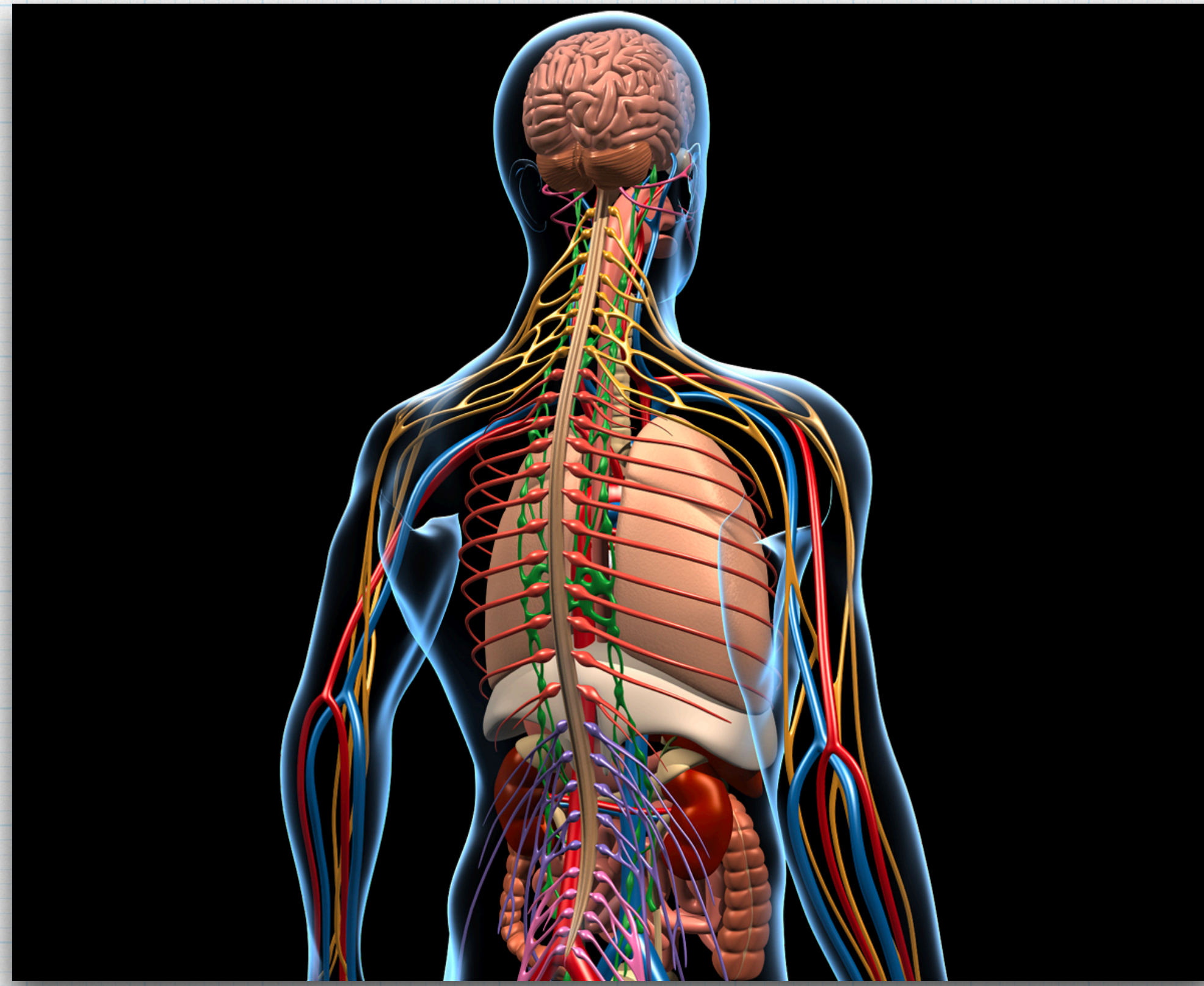
- \* Alcohol, Heroin, Nicotine indirectly excite dopamine producing neurons to they produce more action potentials
- \* Cocaine binds to dopamine transporter and blocks the re-uptake of dopamine
- \* Methamphetamine acts similar to cocaine and releases dopamine without action potential
- \* High: dopamine builds in the synapse to a large amount causing euphoria (over stimulation)

# Addiction and Tolerance

- \* Prolong and intense euphoria
- \* Desensitizes reward system, and longer responsive to every day stimuli
- \* Only thing that is rewarding is the drug
- \* After continued abuse, the drug is no longer rewarding (tolerance)

# Tolerance

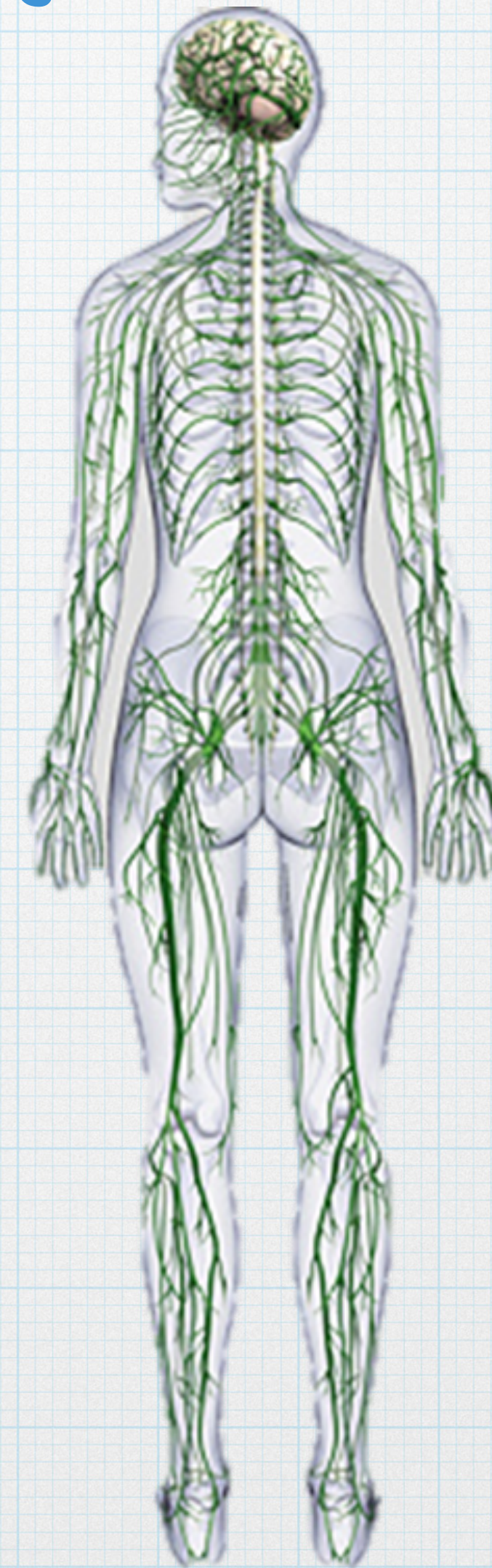
- \* The brain's way of protecting itself
- \* The brain needing to return to normal (everyone has a different normal)
- \* Homeostasis (balance) is reached because the brain needs to cope
- \* Same amount of drug is no longer producing the same effect as it once did



# The Nervous System

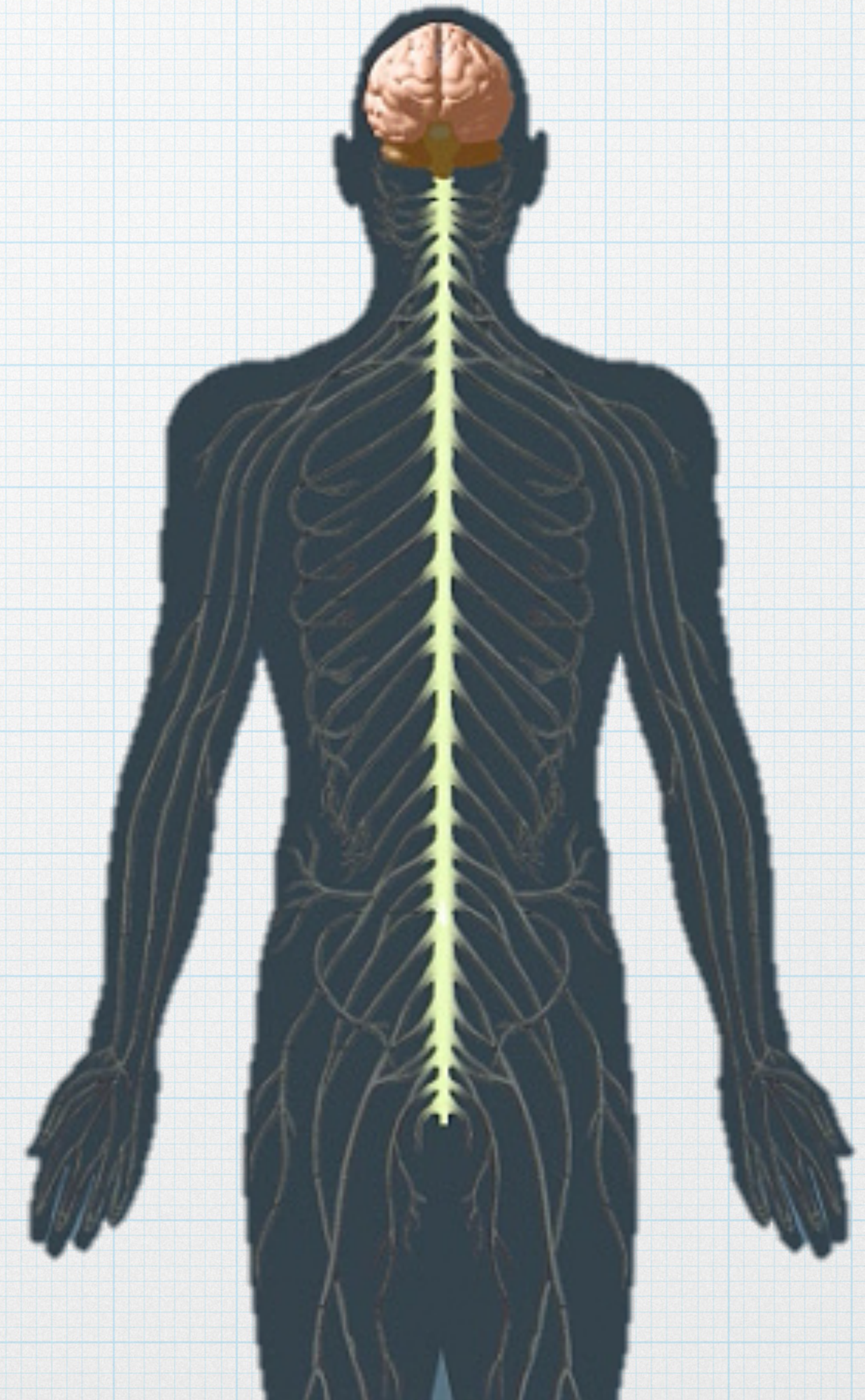
# The Nervous System

- \* Two Parts:
  - \* Central Nervous System (CNS)
  - \* Peripheral Nervous System (PNS)
  - \* Automatic and Somatic



# Central Nervous System (CNS)

- \* Brain and Spinal Cord
- \* Receives message from the PNS, analyzes them, and sends responses



# Spinal Cord

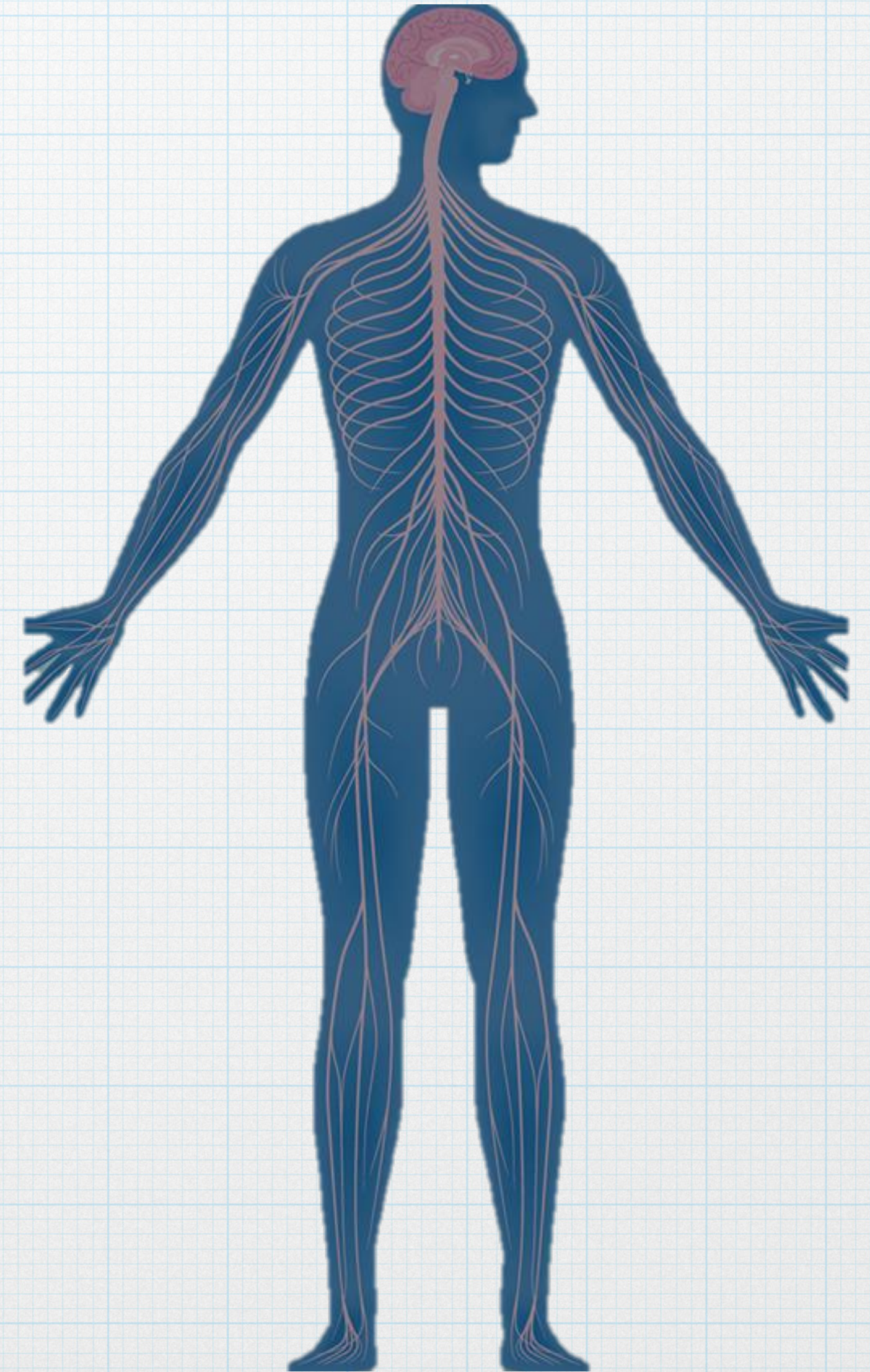
- \* Run along the full length of the back
- \* Carries information from the body and brain
- \* Along its length connects with PNS
- \* Contains circuits that control certain reflex responses
  - \* With or without input from the brain
  - \* spinal nerves can coordinate all of the muscles necessary to walk

# Peripheral Nervous System (PNS)

**\*Divided into two parts:**

**\*Automatic System**

**\*Somatic System**



# PNS

Primary function of the peripheral nervous system is to connect the brain and spinal cord to the rest of the body and the external environment.

- \* Nerves carry information from sensory receptors

- \* eyes, ears, skin, nose and tongue
- \* muscles, glands, internal organs

- \* Regulates internal homeostasis through the automatic nervous system

- \* modulating respiration, heart rate, blood pressure, digestion reproduction and immune responses.

# PNS 1st Part: Automatic System

- \* Sympathetic

- \* Prepares the body for high active function
- \* Helps the body respond to stress “fight or flight”

- \* Parasympathetic

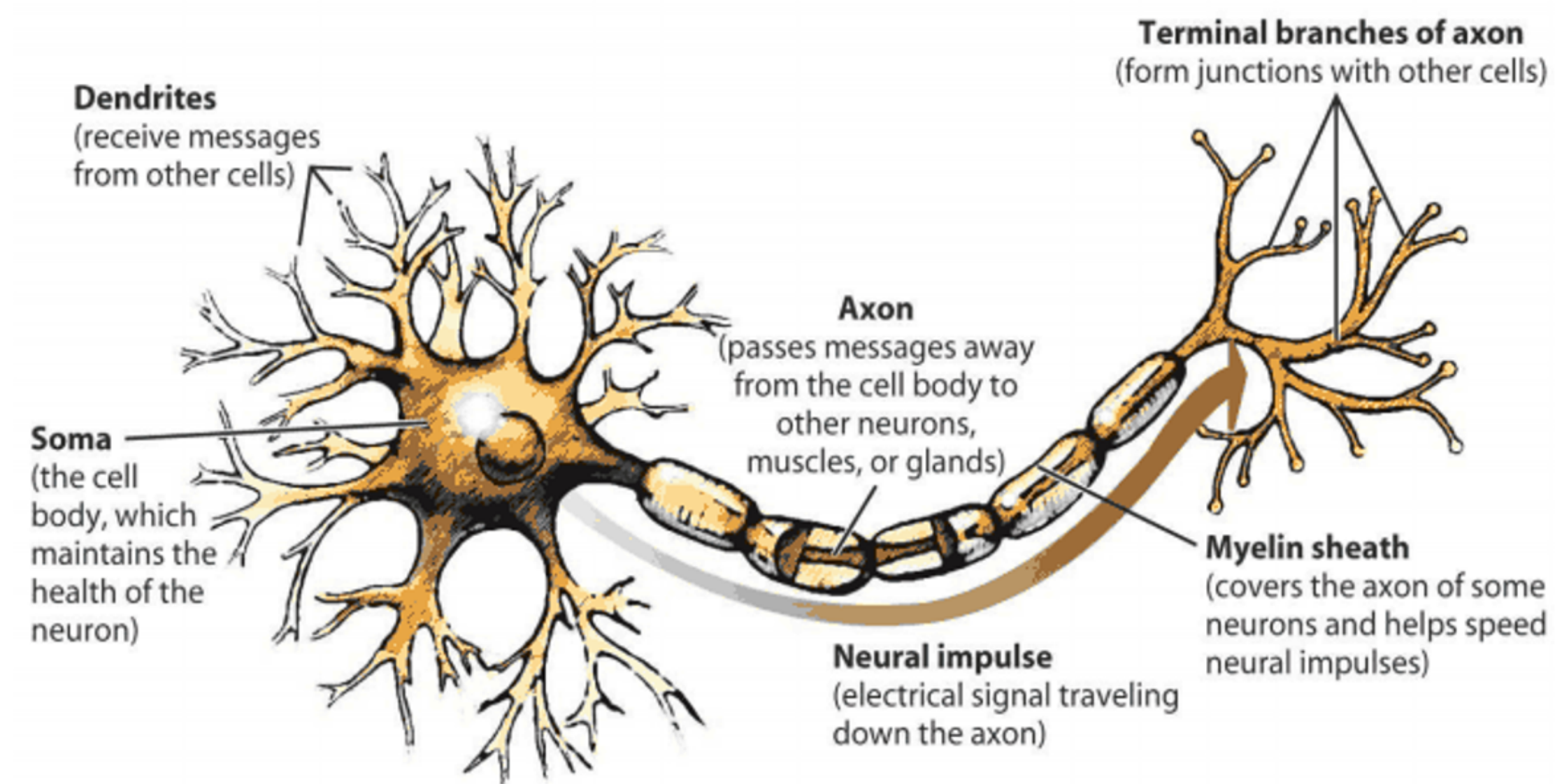
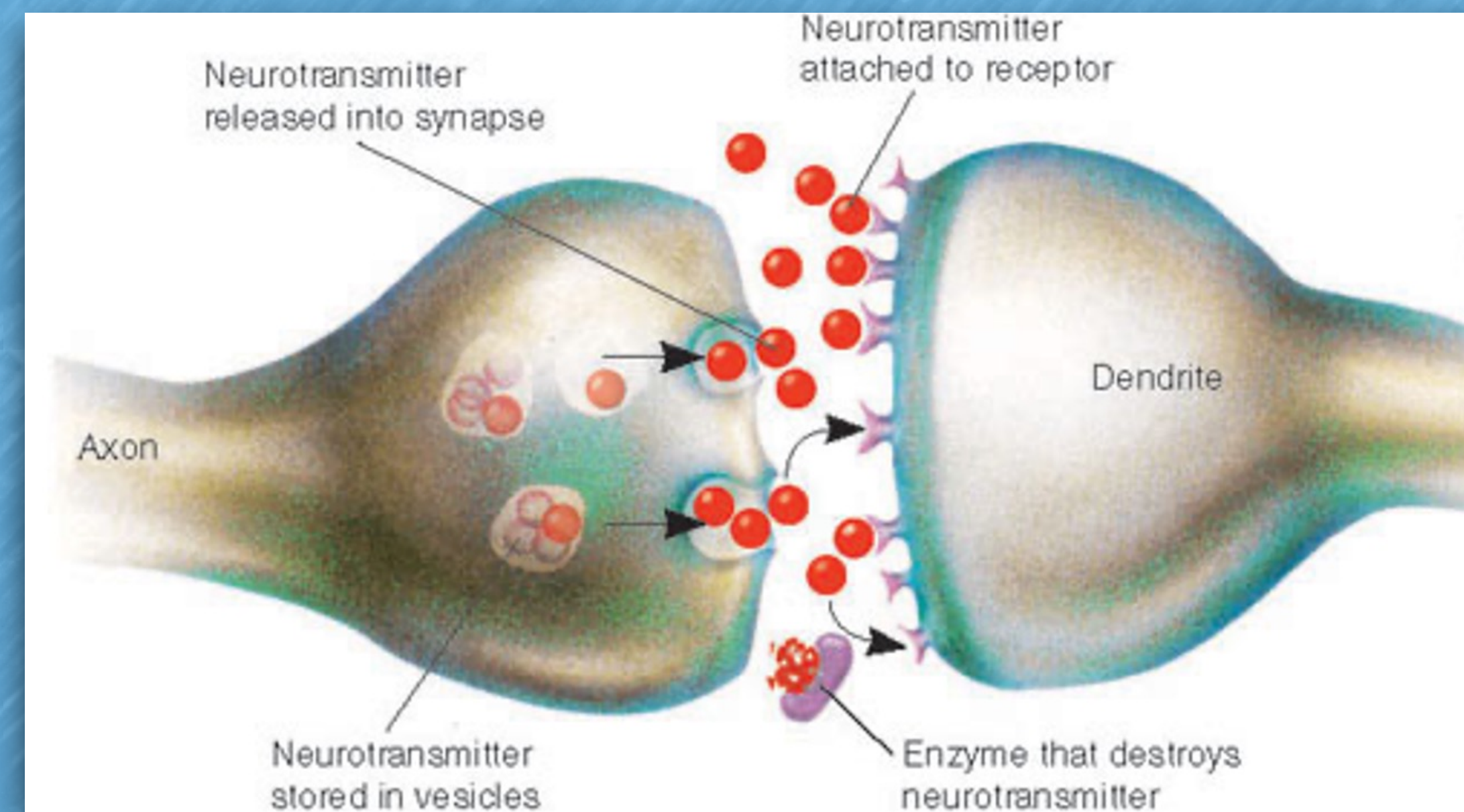
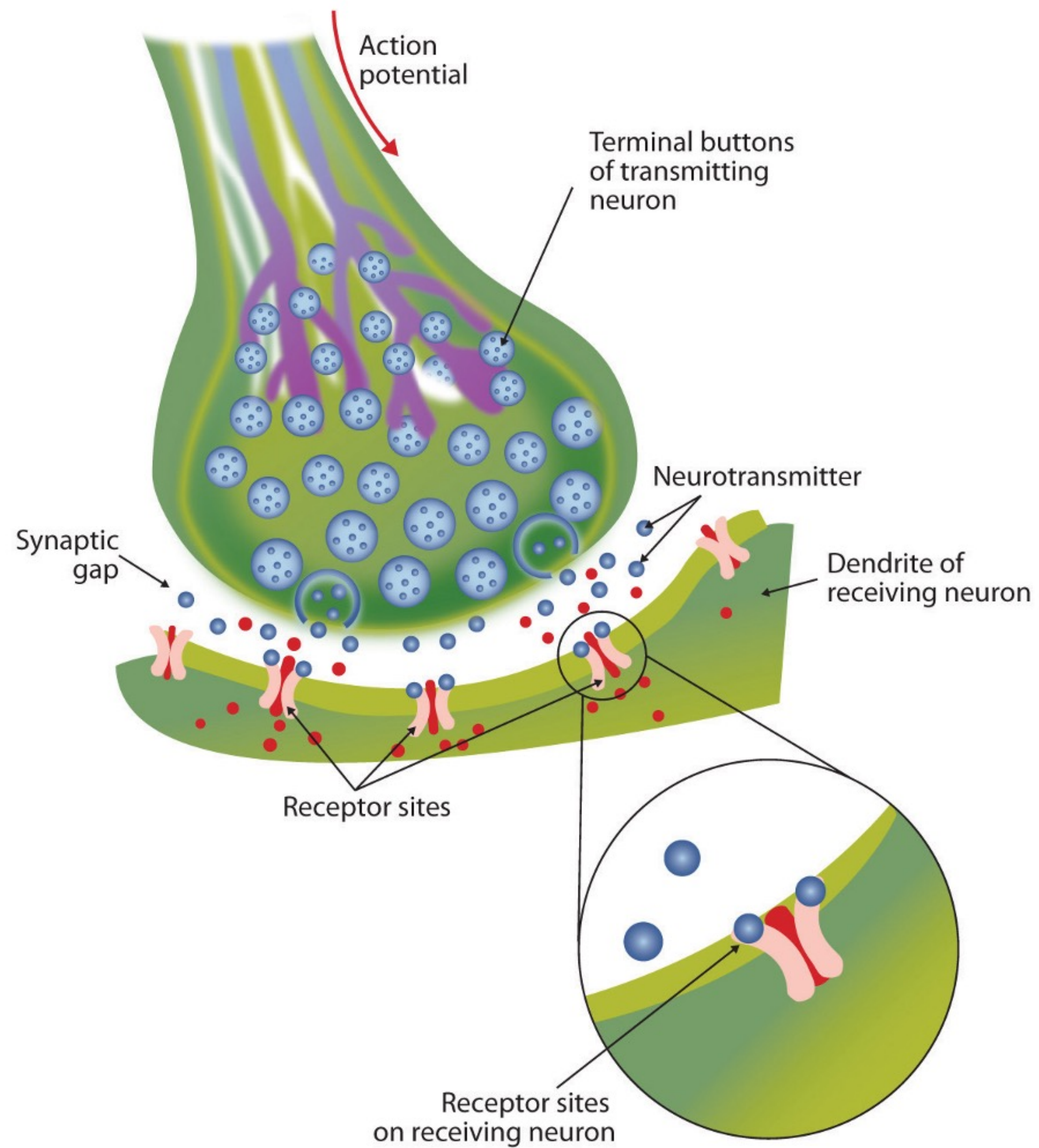
- \* Relaxes the body and inhibits or slows many high energy function
- \* Conserves resources
- \* Restores balance

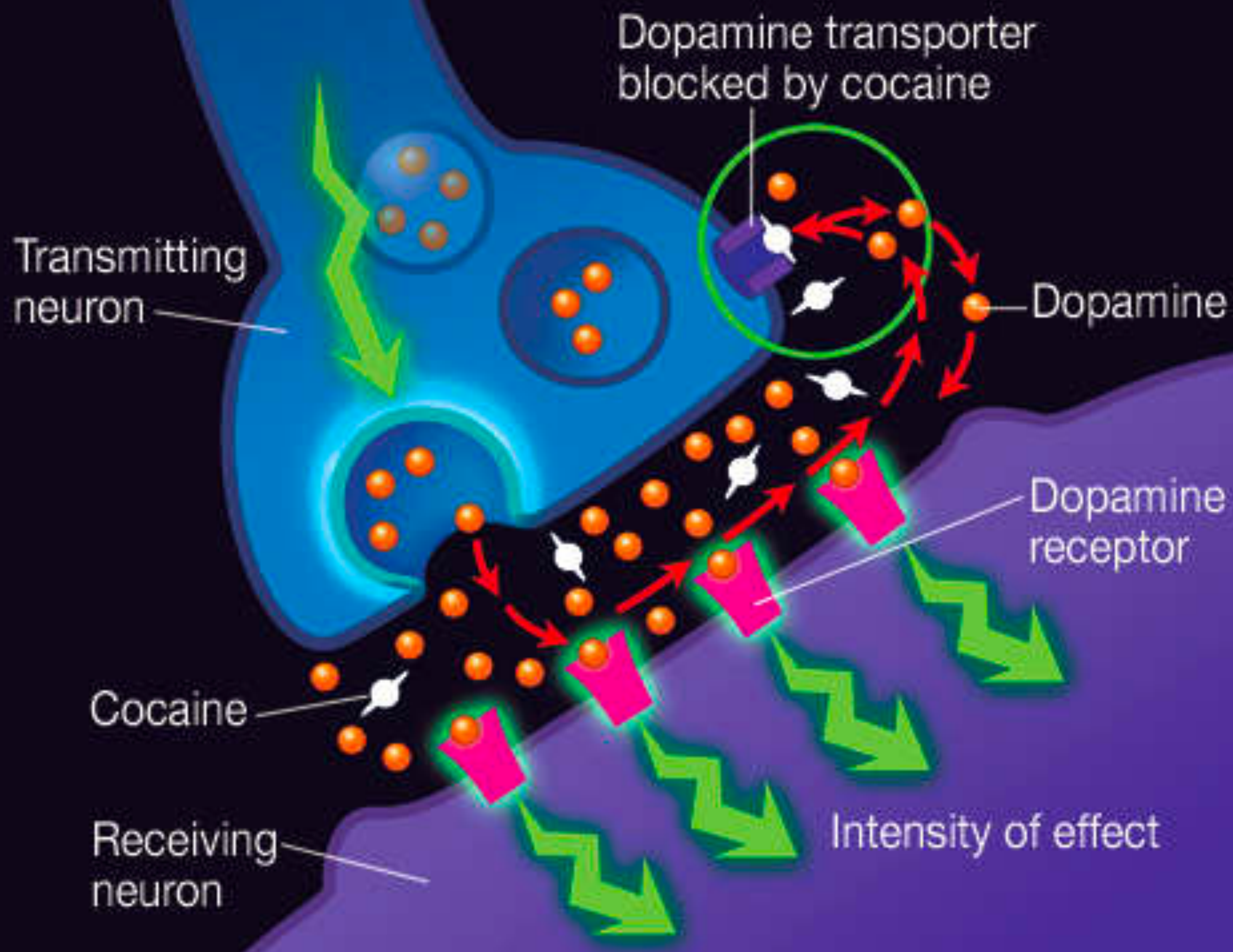
# Fight or Flight/Anxiety/Addiction

- \* All produced from adrenal gland
- \* Adrenaline (increase heart rate, surge of energy)
- \* Norepinephrine (arousal, responsive)
- \* Cortisol (steroid hormone)

# PNS 2nd Part: Somatic Nervous System

- \* Controls voluntary muscular movement of skeletal muscles
  - \* limbs, back, shoulders, neck and face
- \* Mediates reflex actions to quickly generate a response to stimulus
  - \* Protective responses





# Neurotransmitters

Dopamine	Eprinephrine	Norepinephrine	Serotonin
Arousal Emotions/Mood Motivation Reward	Aka Adrenaline Arousal Alertness	Arousal Alertness Energy Pleasure	Arousal Body temp Mood Homeostasis
Acetylcholine	GABA	Glutamate	Endorphins
Arousal Emotion/Mood Motor Function Short-term Memory	Arousal Judgement Impulsiveness Motor Control	Learning Memory Brain Functioning	Pain Reliever Reduce Stress Enhance Immune System Boost Pleasure

# Psychoactive Drug/Neurotransmitter Relationships

Drug	Neurotransmitter directly affected
Alcohol (D)	GABA, Serotonin
Benzodiazepine (D)	GABA, Glycine
Marijuana (A)	Acetylcholine
Heroin (D)	Endorphin, Dopamine
LSD (S)	Acetylcholine, Dopamine, Serotonin
Nicotine (S)	Epinephrine
Cocaine (S)	Dopamine, Serotonin
MDA, MDMA (A)	Serotonin, Norepinephrine
PCP (A)	Dopamine, Acetylcholine

# Next Monday 3/7

## \* Part II

- \* How drugs enter the body
- \* Hereditary, environment to addiction
- \* DSM 5 Diagnosis
- \* Psychoactive drugs
- \* Compulsive behaviors
- \* Methods of Treatment