

Nervous System

Prof. Sudhir K. Awasthi
Dept. Of Life Sciences
CSJM University
Kanpur

Nervous System: Control & Communication

- ▶ The nervous system controls and coordinates functions throughout the body and responds to internal and external stimuli
- ▶ Nearly all multicellular organisms have **communication systems**
 - **Specialized cells** carry messages from one cell to another
 - Smooth and efficient communication through the body

Nervous System

- ▶ Messages carried by nervous system are electrical signals called **impulses**
- ▶ Cells that transmit these impulses are called **neurons** (basic units of nervous system)
 - 3 types of neurons
 1. Sensory
 2. Motor
 3. Interneurons

Neurons

- ▶ **Sensory:** Carry impulses from sense organs (eyes, ears, etc) to the spinal cord and brain
 - ▶ **Motor:** carry impulses from the brain and spinal cord to muscles and glands
 - ▶ **Interneurons:** connect sensory and motor neurons and carry impulses between them
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Parts of a Neuron

▶ **Cell Body**

- Largest part; contains nucleus and most of cytoplasm
- Most metabolic activities occur here

▶ **Dendrites**

- Short, branched extensions
- Carry impulses from environment or other neuron toward cell body
- Neurons can have several dendrites

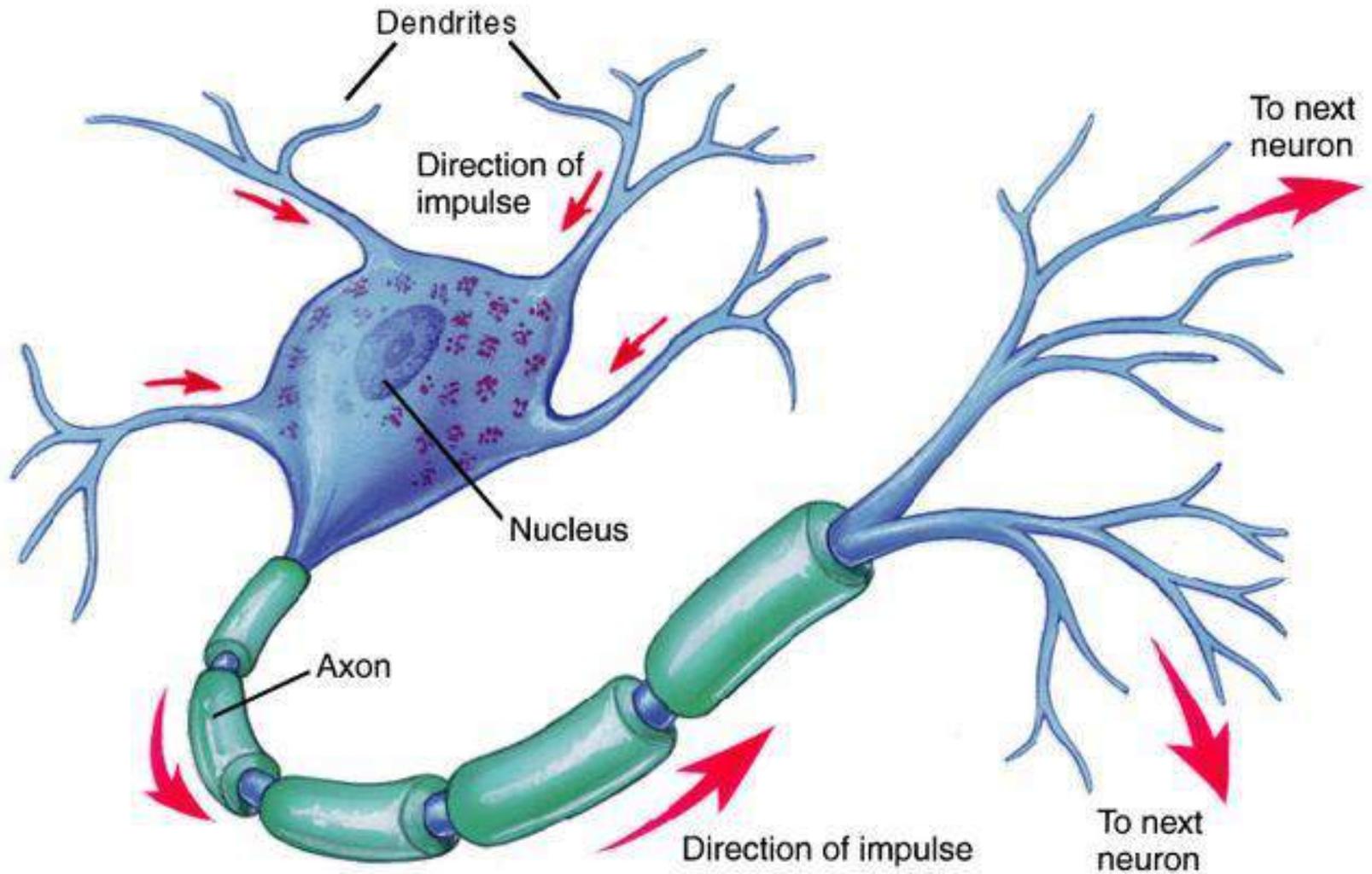
▶ **Axon**

- Long fiber which carries impulses away from cell body
- Ends in axon terminals, located a distance away from cell body
- Neurons only have one axon

▶ **Myelin Sheath**

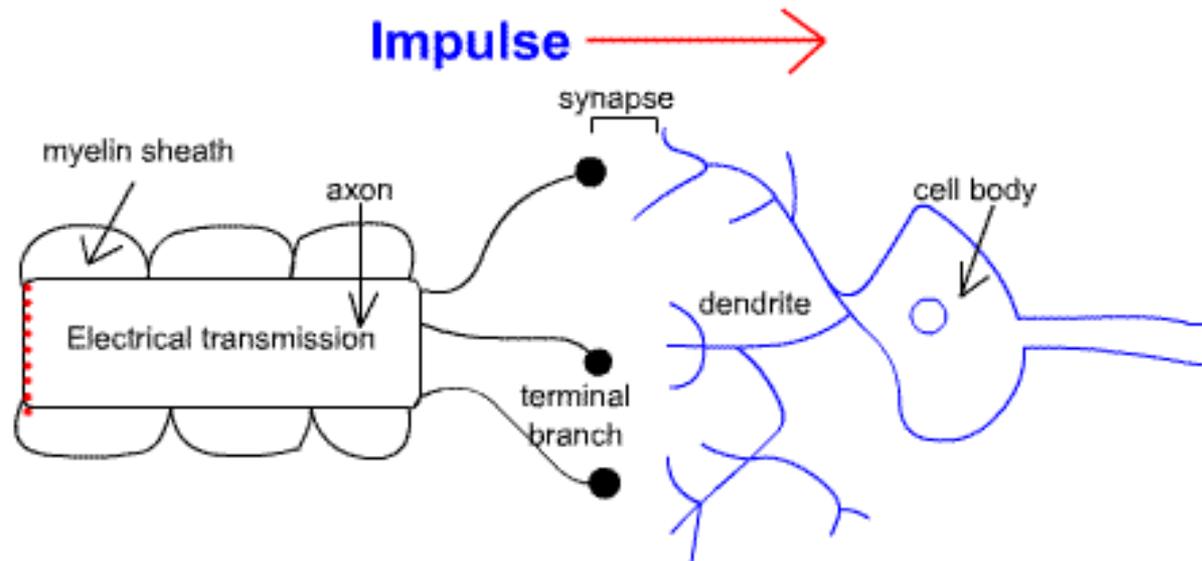
- Insulating membrane surrounding axon

Neuron



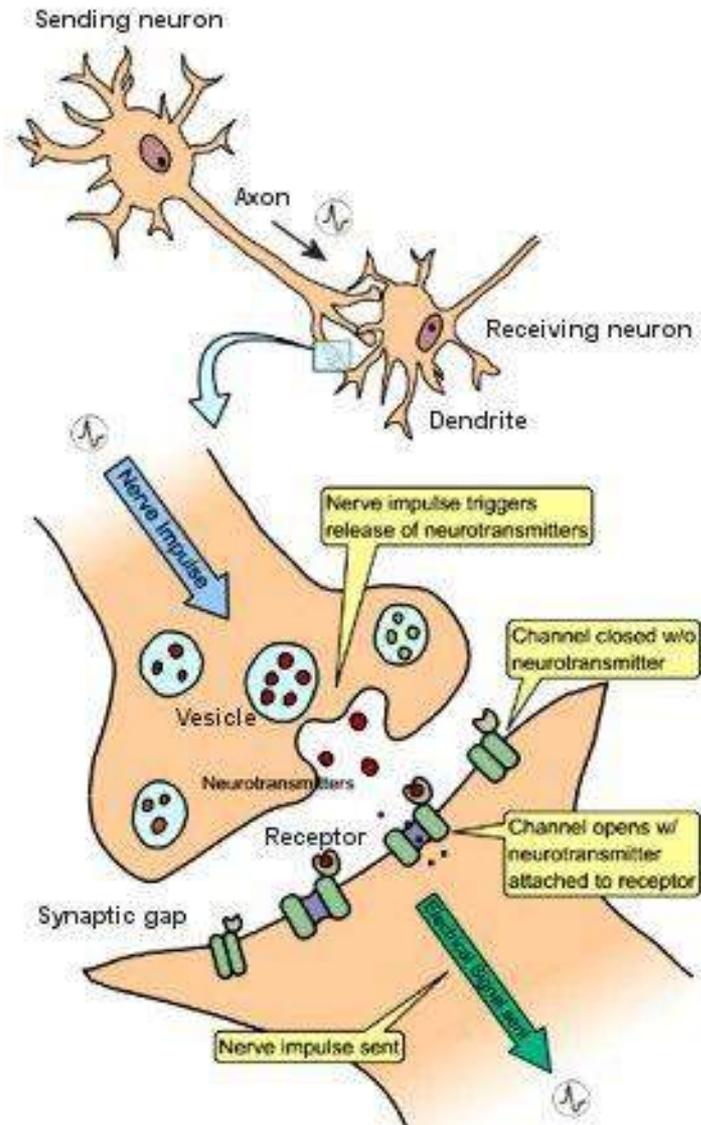
Nerve Impulse

- ▶ An impulse begins when a neuron is **stimulated** by another neuron or the environment



Synapse

- ▶ Location where a neuron can transfer an impulse to another cell
- ▶ Space between neurons
- ▶ Neurotransmitters are chemicals used by neurons to transmit an impulse across the synapse



Human Nervous System

- ▶ Divided into two major divisions:
 - Central Nervous System (CNS)
 - Relays messages, processes info and analyzes info
 - Peripheral Nervous System
 - Receives information from the environment and relays commands from the CNS to organs and glands

Central Nervous System

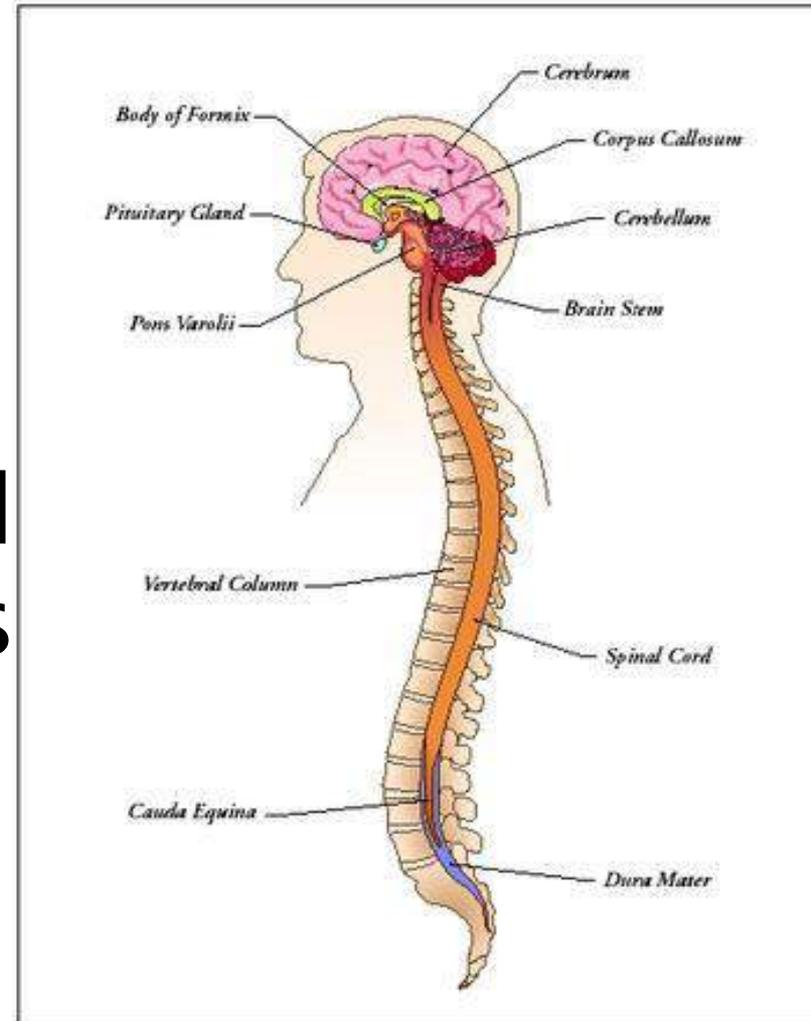
► Brain

Cerebrum

Cerebellum

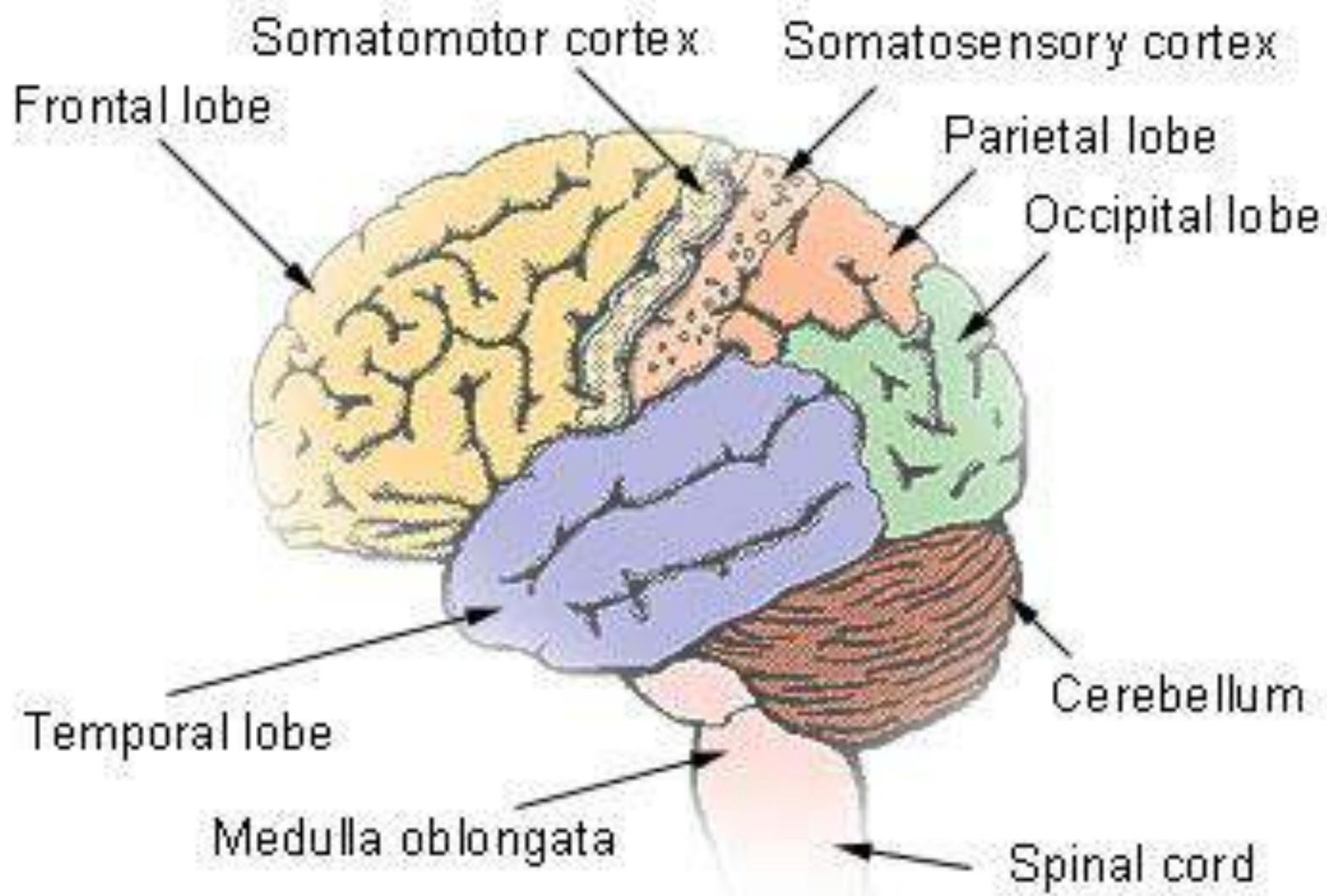
Brain Stem

Thalamus and
hypothalamus



Brain

- ▶ Made of 50–100 billion neurons
- ▶ 4 lobes or regions
 - **Frontal Lobe**– memory, judgment, inhibitions, personality
 - **Temporal Lobe**– Long term memory, auditory processing
 - **Occipital Lobe**– Vision processing
 - **Parietal Lobe**– Sensory integration



Lobes of the cerebrum

Spinal Cord

- ▶ Main communications link between the brain and the rest of the body
- ▶ Certain kinds of info (reflexes) are processed in spinal cord
- ▶ **Reflex** is a quick, automatic response to a stimulus
 - Sneezing and blinking
 - Allows your body to respond to danger immediately without thinking

Peripheral Nervous System

- ▶ Lies outside of **CNS**
- ▶ Consists of all the nerves and cells that are not a part of the brain or spinal cord
 - Cranial nerves
 - Divided into 2 divisions:
 - **Sensory**
 - **Motor**

Peripheral Nervous System

Sensory division:

transmits impulses from sense organs to the CNS

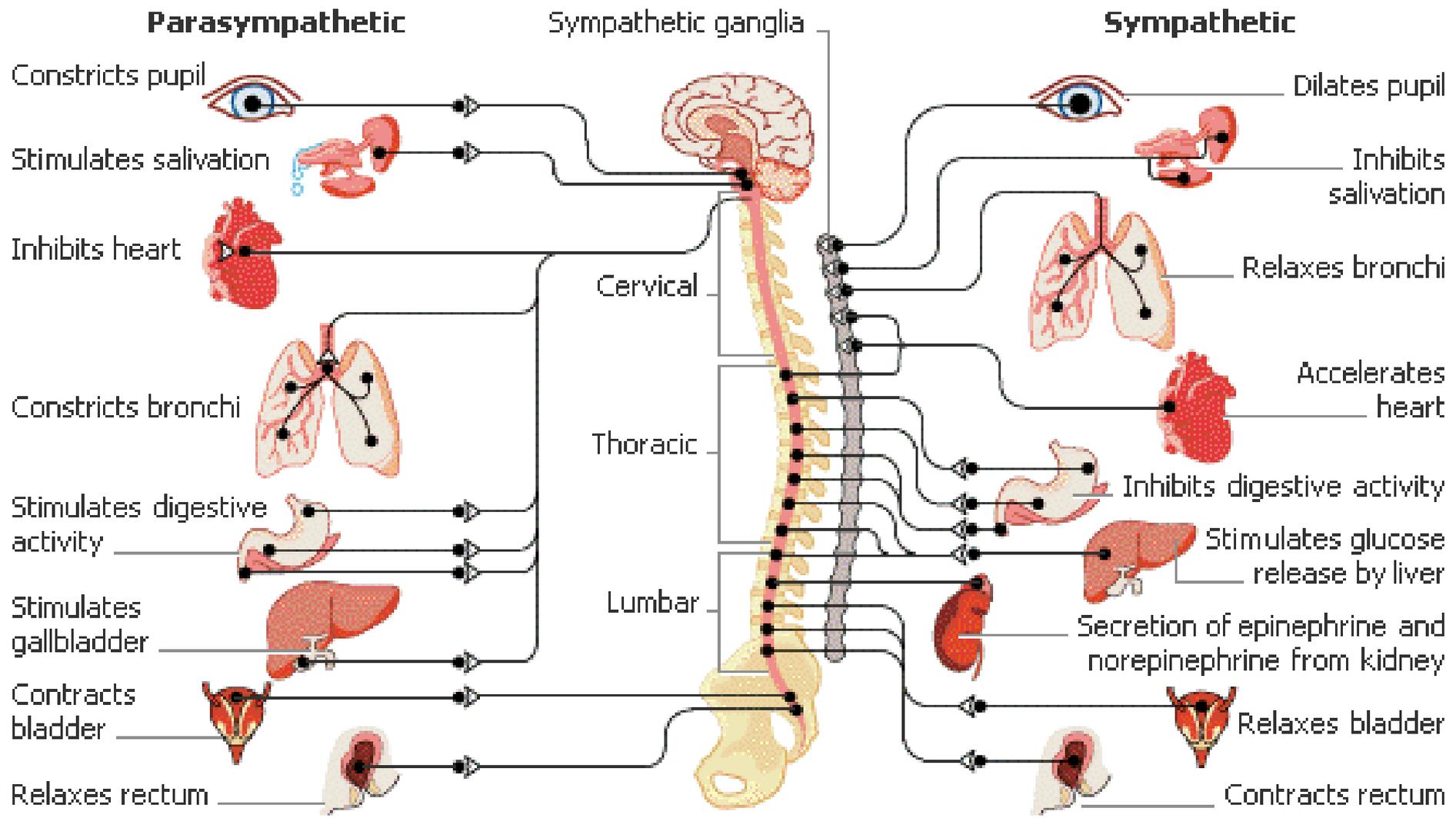
Motor division:

transmits impulses from CNS to muscles and glands

1. **somatic** nervous system– regulates conscious controlled activities

2. **autonomic** nervous system– regulates activities that are automatic or involuntary

~Divided into sympathetic and parasympathetic nervous system



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 - ▶ Neuroscience: Exploring the Brain– Pear, Connors, Paradiso (2019)
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 - ▶ Principles of Neural Science– Kandel et al (2018)
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