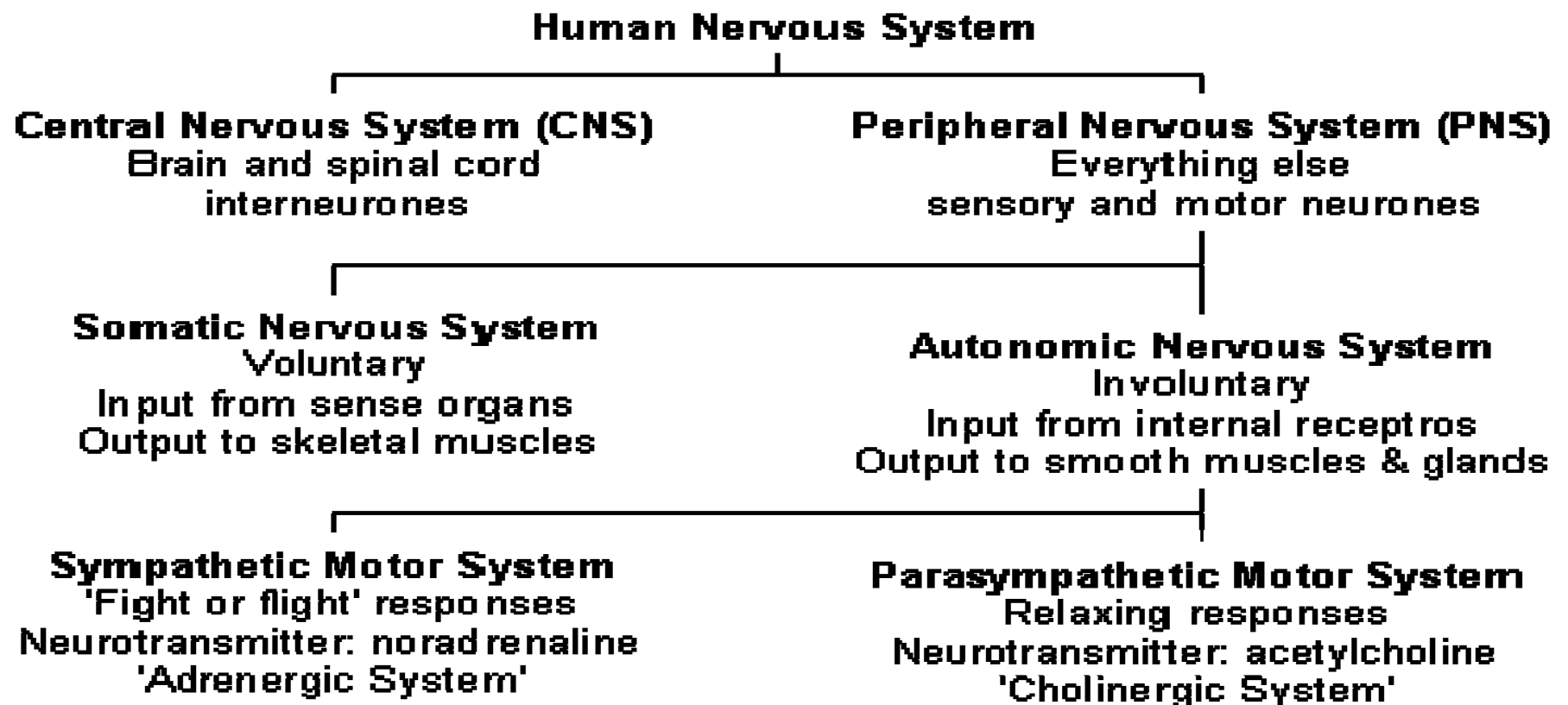


NERVOUS SYSTEM
GENERALITY
INTRODUCTION-HISTOLOGY
D.HAMMOUDI.MD
PART 1



Nervous System (NS)

Peripheral NS

Autonomic NS

Somatic NS

Sympathetic NS

Parasympathetic NS

Central NS

Brain

Spinal Cord

Forebrain

Midbrain

Hindbrain

Telencephalon

Diencephalon

Mesencephalon

Metencephalon

Myelencephalon

Cerebral Cortex
Basal Ganglia
Hippocampus
Amygdala

Thalamus
Hypothalamus

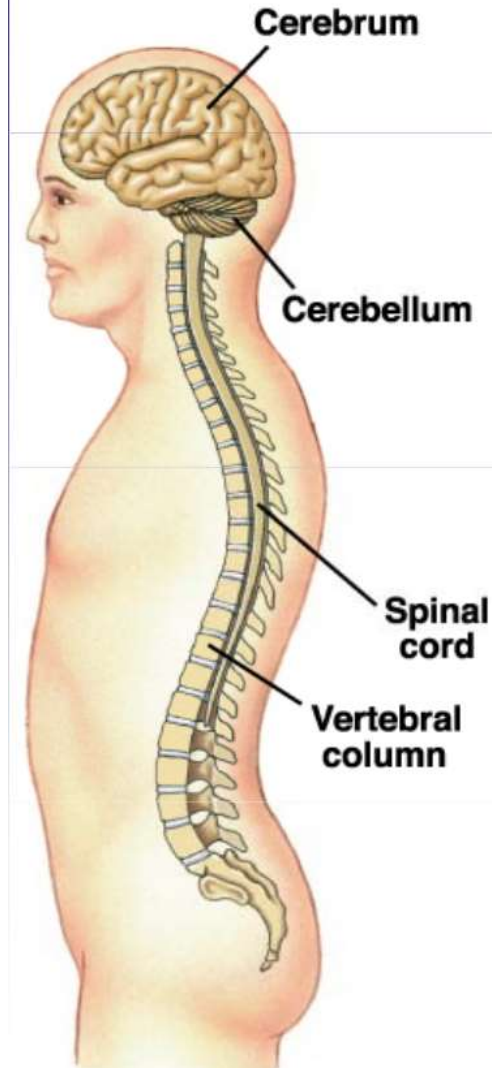
Tectum
Cerebellum

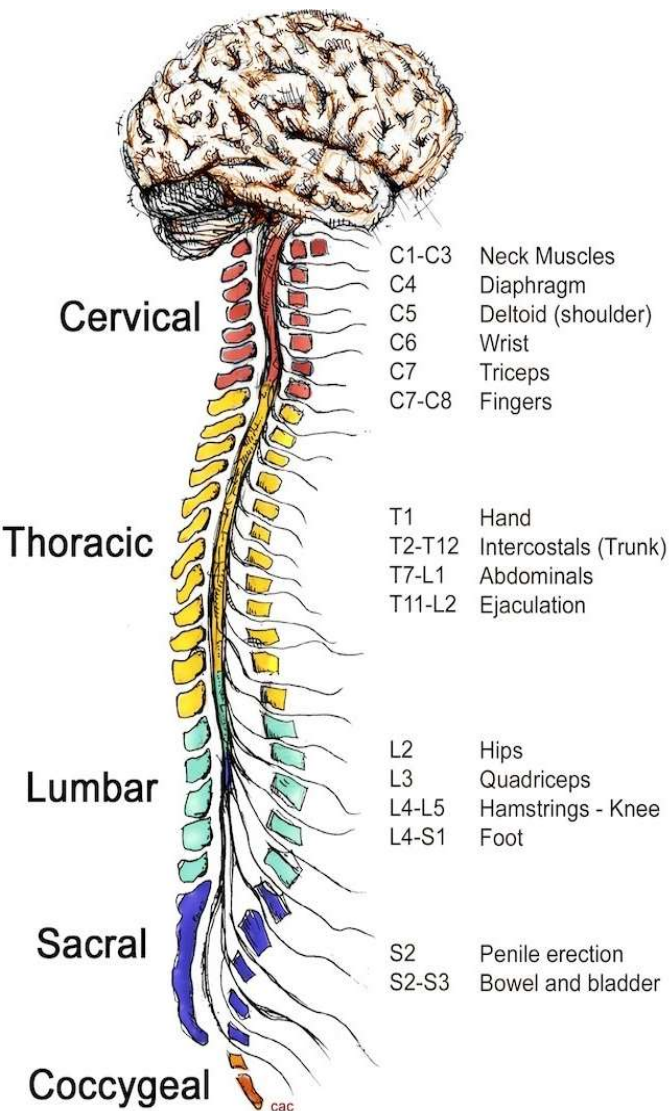
Pons
Cerebellum

Medulla

Organization of the Nervous System

- 2 big initial divisions:
 - 1. Central Nervous System** →
 - The brain + the spinal cord
 - The center of integration and control
 - 2. Peripheral Nervous System**
 - The nervous system outside of the brain and spinal cord
 - Consists of:
 - **31 Spinal nerves**
 - » Carry info to and from the spinal cord
 - **12 Cranial nerves**
 - » Carry info to and from the brain

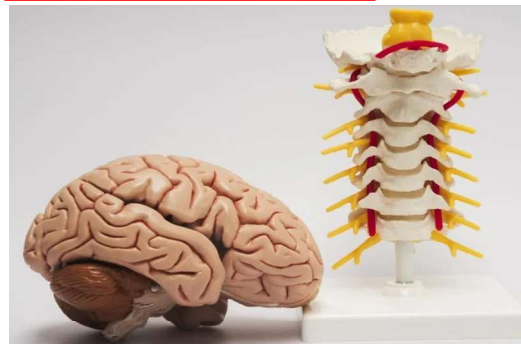




The central nervous system (CNS) is formed by :

- **The brain**
- **Spinal cord.**

• These elements are enclosed within **the skull and spinal Vertebral canal.**



• **They are covered by the meninges:**

- **the dura,**
- **arachnoid**
- **pia.**

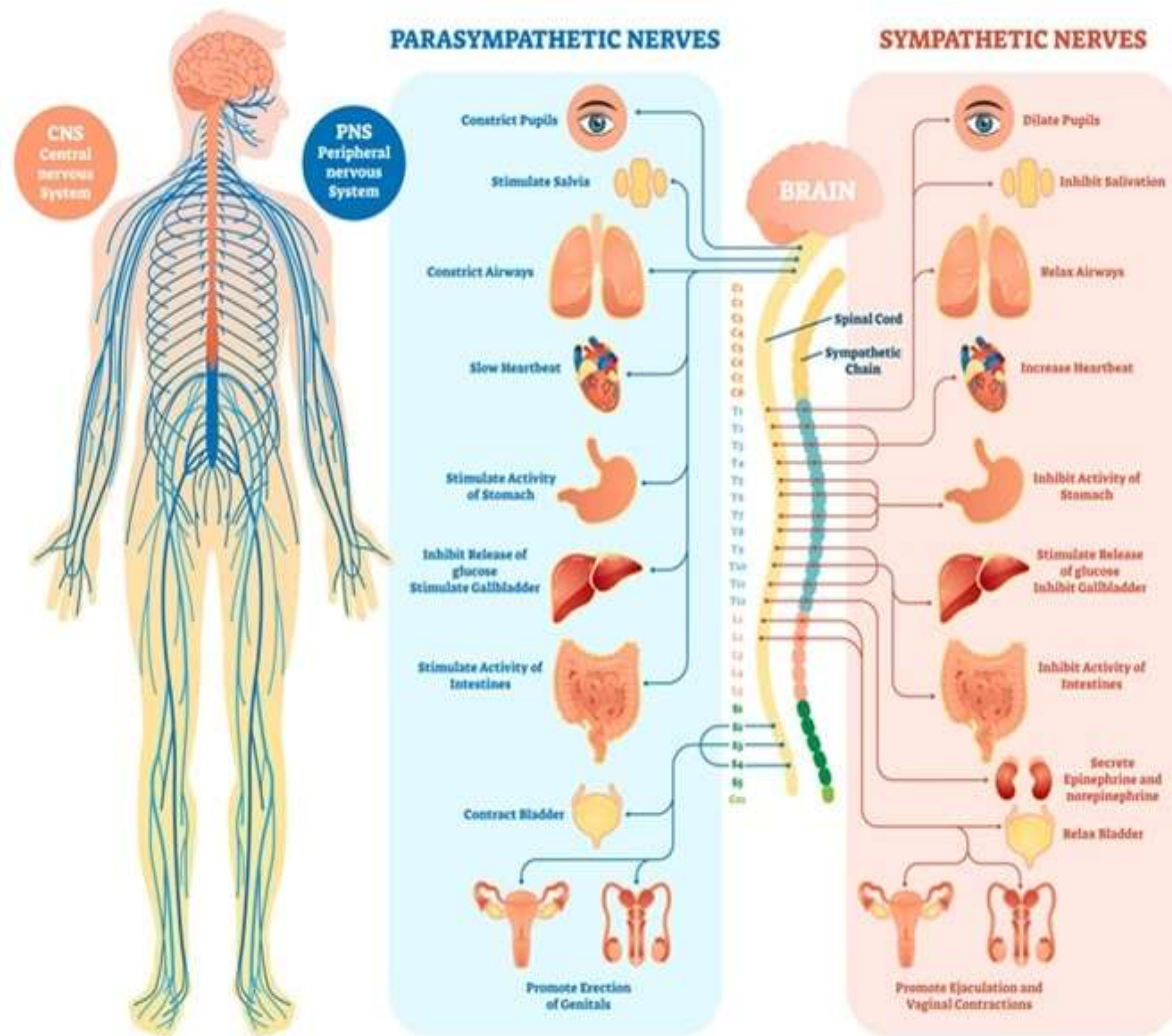
• **Cerebrospinal fluid** flows over the Surface and fills the chambers (**ventricles, central canal of the spinal cord**).

• **Two primary cell types make up the CNS** - the neurons, and the glia [NEUROGLIA].

The organs of the nervous system include:

- The brain
- The spinal cord
- Sensory receptors of sense organs (**touch, taste, smell, sight, and hearing**)(Sensory receptors are **dendrites of sensory neurons** specialized for receiving specific kinds of stimuli)
- The nerves that connect the nervous system with other systems.
(Nerves in periphery, tract in the central)

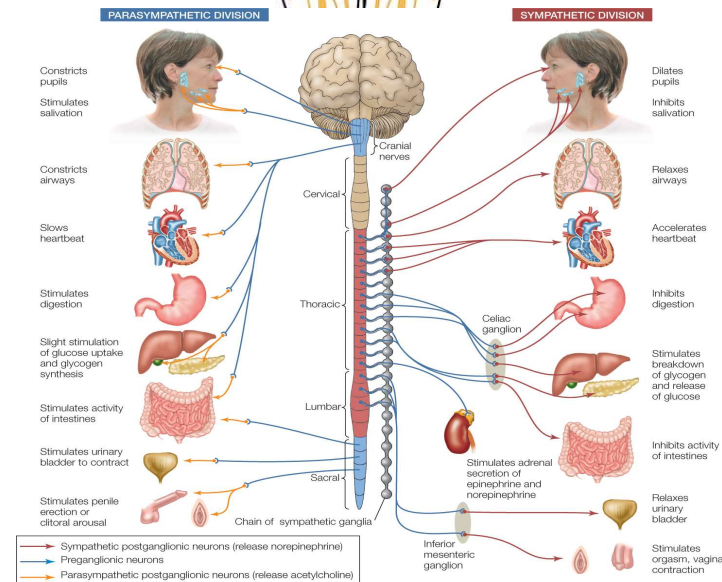
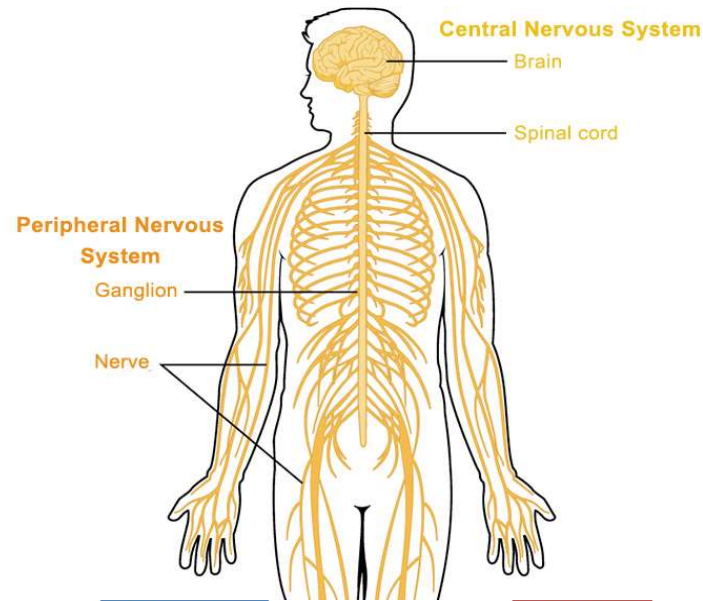
HUMAN NERVOUS SYSTEM



The CNS is responsible for processing and coordinating:

1. Sensory data from inside and outside the body.
2. Motor commands that control activities of peripheral organs such as the skeletal muscles.
3. Higher functions of the brain such as :

- intelligence
- memory
- learning
- emotion.



The peripheral nervous system (PNS) includes all neural tissue outside the CNS.

• The PNS is responsible for:

1. Delivering sensory information to the CNS
2. Carrying motor command to peripheral tissues and systems

-Sensory information and motor commands in the PNS are carried by bundles of axons (with their associated connective tissues and blood vessels) called peripheral nerves (nerves):

1. cranial nerves are connected to the brain

2. spinal nerves are attached to the spinal cord

Peripheral Nervous System

- Responsible for communication btwn the CNS and the rest of the body.

- Can be divided into:

- Sensory Division

- Afferent division

- Conducts impulses from receptors to the CNS
 - Informs the CNS of the state of the body interior and exterior
 - Sensory nerve fibers can be somatic (from skin, skeletal muscles or joints) or visceral (from organs w/i the ventral body cavity)

- Motor Division

- Efferent division

- Conducts impulses from CNS to effector (muscles/glands)
 - Motor nerve fibers

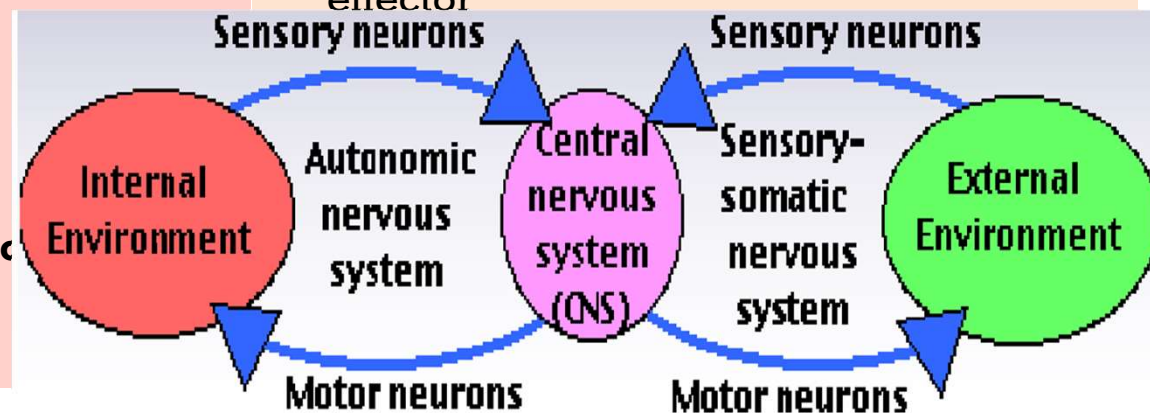
(PNS): Two Functional Divisions

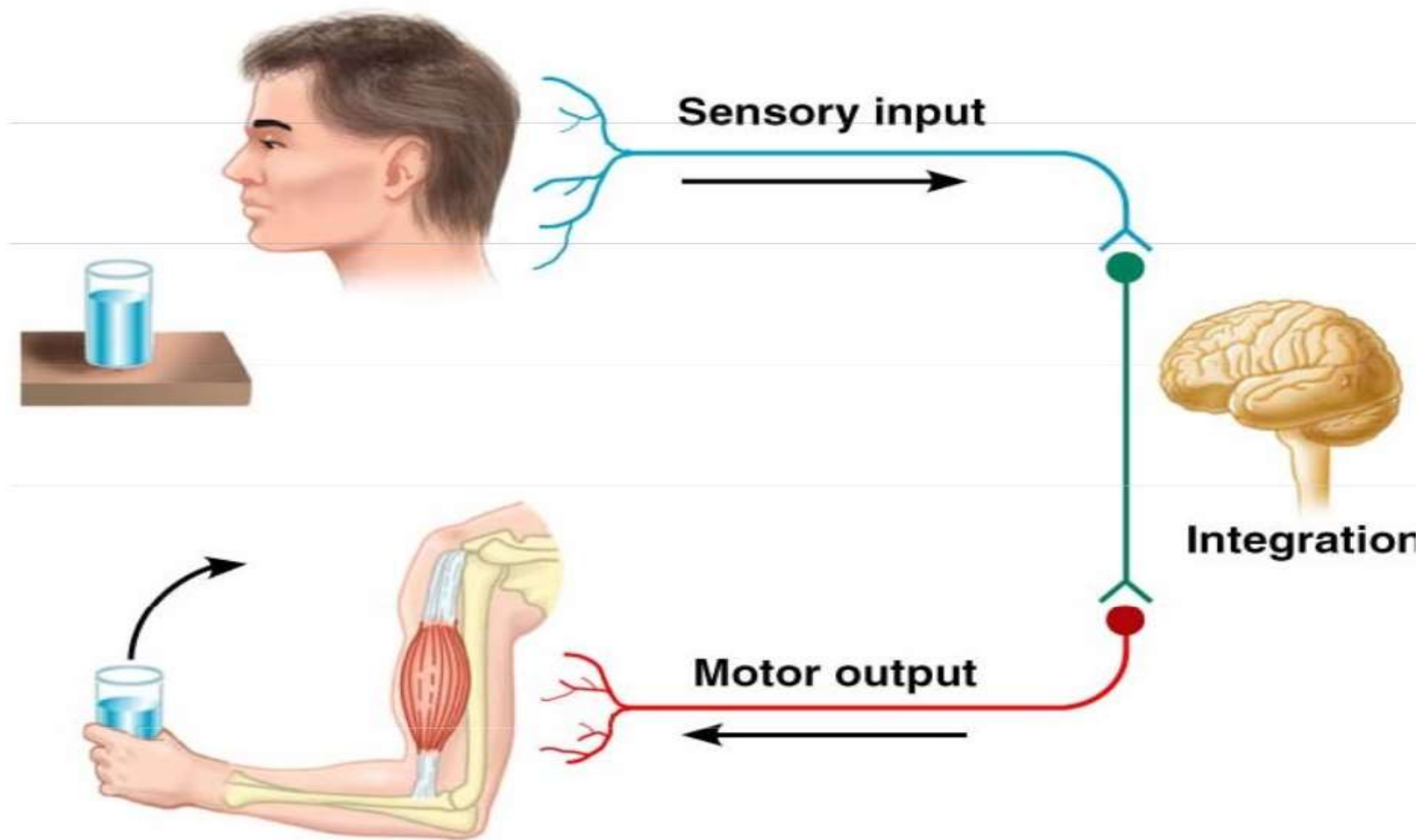
- Sensory (afferent) division

- Sensory afferent fibers – carry impulses from skin, skeletal muscles, and joints to the brain
 - Visceral afferent fibers – transmit impulses from visceral organs to the brain

- Motor (efferent) division

- Transmits impulses from the CNS to effector





Basic Functions of the Nervous System

1. Sensation

- Monitors changes/events occurring in and outside the body. Such changes are known as *stimuli* and the cells that monitor them are receptors. ← ⊕

2. Integration

← Brain
Spinal cord

- The parallel processing and interpretation of sensory information to determine the appropriate response

3. Reaction

- Motor output. motor neurons
 - The activation of muscles or glands (typically via the release of neurotransmitters (NTs))

Nervous vs. Endocrine System

Similarities:

- **They both** monitor stimuli and react so as to maintain homeostasis.

Differences:

- **The NS is a rapid**, fast-acting system whose effects do not always persevere.
- **The ES acts slower** (via blood The ES acts slower (via blood borne chemical borne chemical signals called **HORMONES** and its actions are usually **much longer lasting.**
are usually much longer lasting

Endocrine vs Nervous System

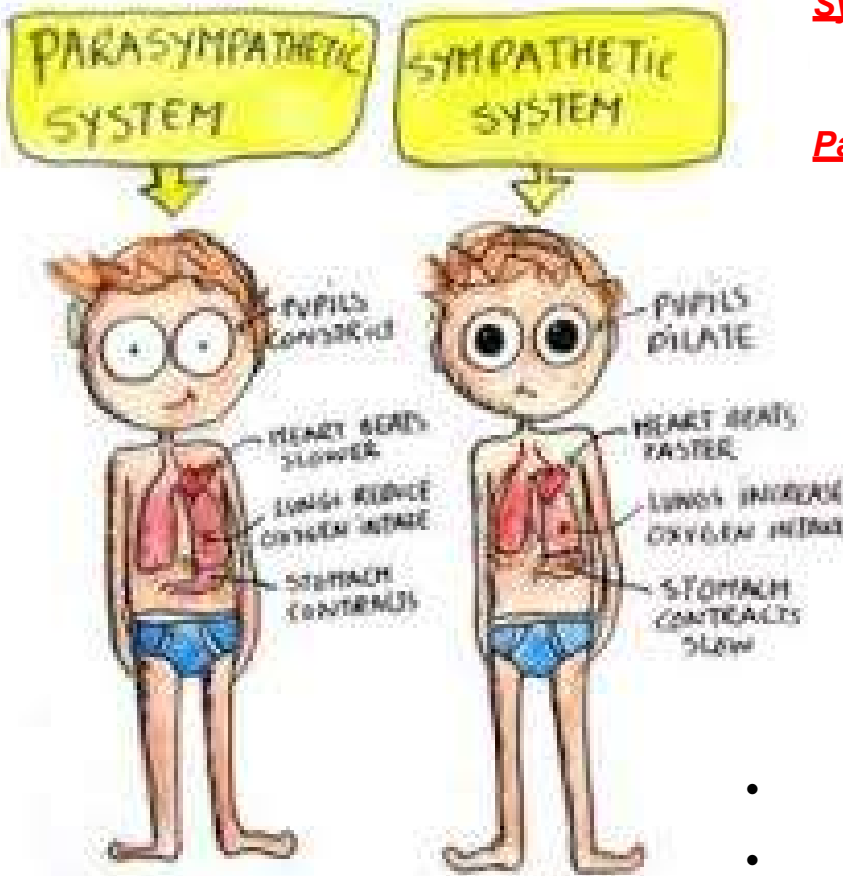
- Both systems function to maintain homeostasis
- Main differences:

Feature	Endocrine System	Nervous System
Effector cells	<u>Target cells</u> throughout the body	<u>Postsynaptic cells</u> in muscle and glandular tissue only
Chemical messenger	Hormone-chemical	Neurotransmitter
Distance traveled by messenger	Long – in blood	Short – across synaptic cleft
Regulatory effects	Slow to appear; long-lasting	Appear rapidly; short

Motor Efferent Division

- Can be divided further:
 - **Somatic nervous system**
 - VOLUNTARY (generally)
 - Somatic nerve fibers that conduct impulses from the CNS to skeletal muscles
 - **Autonomic nervous system**
 - INVOLUNTARY (generally)
 - Conducts impulses from the CNS to smooth muscle, cardiac muscle, and glands.

Autonomic Nervous System

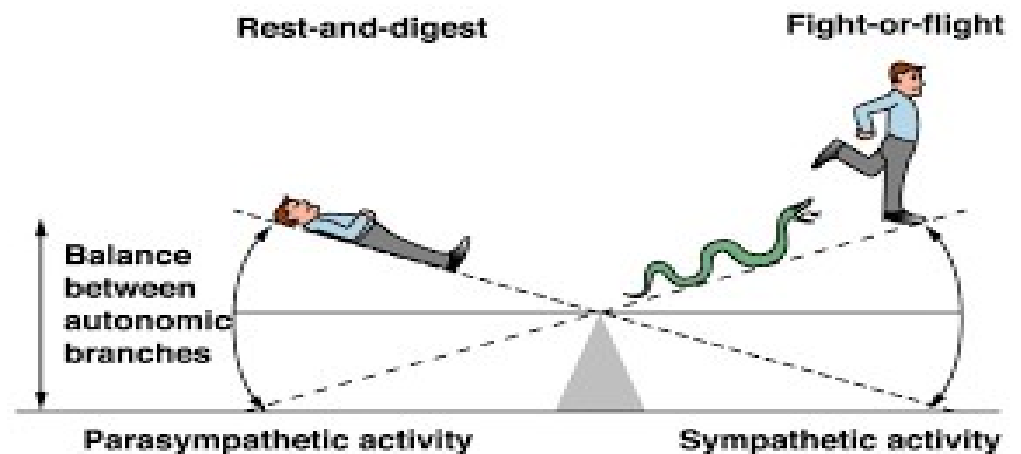


Sympathetic Nervous System

- "Fight or Flight"

Parasympathetic Nervous System

"Rest and Digest"



- These 2 systems are antagonistic.
- Typically, we balance these 2 to keep ourselves in a state of dynamic balance.

End of part 1

Next : Histology of the nervous system.