



**University of Al-Mustaqbal**  
**College of Science**  
**Department of Medical**  
**Physics**



# **Neurophysics**

***Fourth Stage***

***NEURON AND THE PHYSIOLOGY OF  
NERVE IMPULSE***

**First Licture**

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## **Neurophysics (or neurobiophysics)**

Is the branch of biophysics dealing with the development and use of physical methods to gain information about the nervous system. Neurophysics is an interdisciplinary science using physics and combining it with other neurosciences to better understand neural processes. The methods used include the techniques of experimental biophysics and other physical measurements such as EEG mostly to study electrical, mechanical or fluidic properties, as well as theoretical and computational approaches. The term neurophysics is a portmanteau of neuron and physics.

## **The nervous system**

Your nervous system plays a role in everything you do. The three main parts of your nervous system are your brain, spinal cord and nerves. It helps you move, think and feel. It even regulates the things you do but don't think about like digestion. It contains the central nervous system and the peripheral nervous system. The nervous system can be divided into two parts:

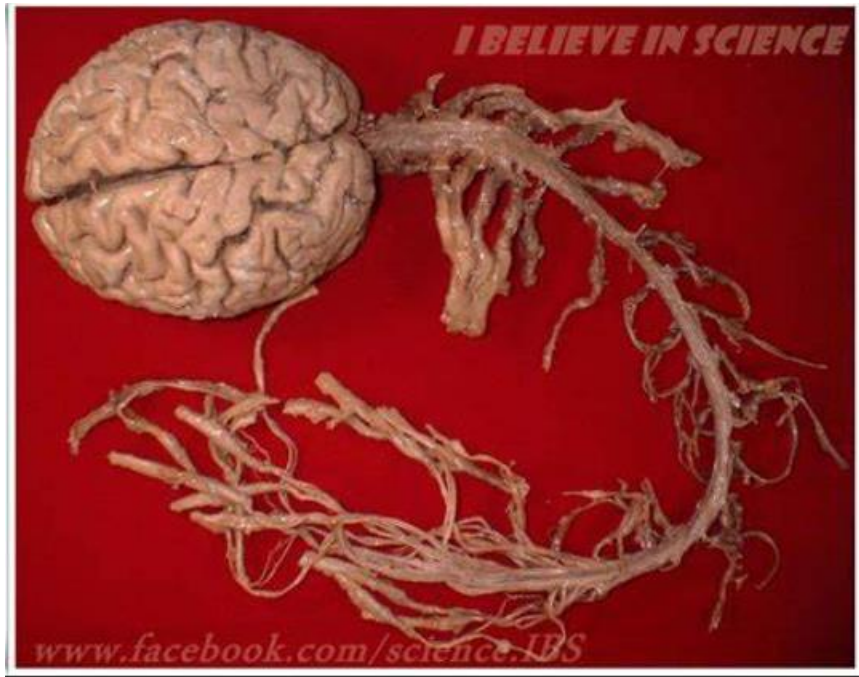
### **1. Central nervous system (CNS)**

That consists of:

- a- Brain
- b- Spinal cord
- c- Peripheral nervous or (nerve fiber)

### **2. Autonomic nervous system**

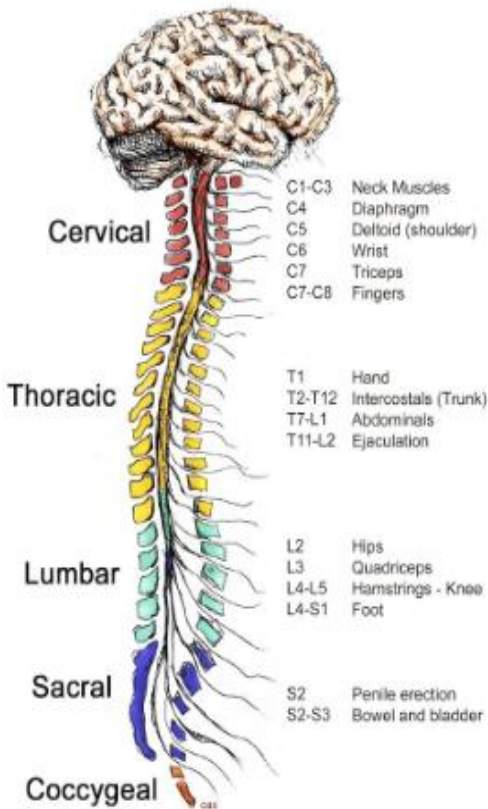
Control various internal organs such as the heart.



What does the nervous system do?

Your nervous system's main function is to send messages from various parts of your body to your brain, and from your brain back out to your body to tell your body what to do. These messages regulate your:

- 1.Thoughts, memory, learning and feelings.
- 2.Movements (balance and coordination).
- 3.Senses (how your brain interprets what you see, hear, taste, touch and feel).
- 4.Wound healing.
- 5.Sleep.
- 6.Heartbeat and breathing patterns.
- 7.Response to stressful situations, including sweat production.
- 8.Digestion.
- 9.Body processes, such as puberty and aging.



## How does the nervous system work?

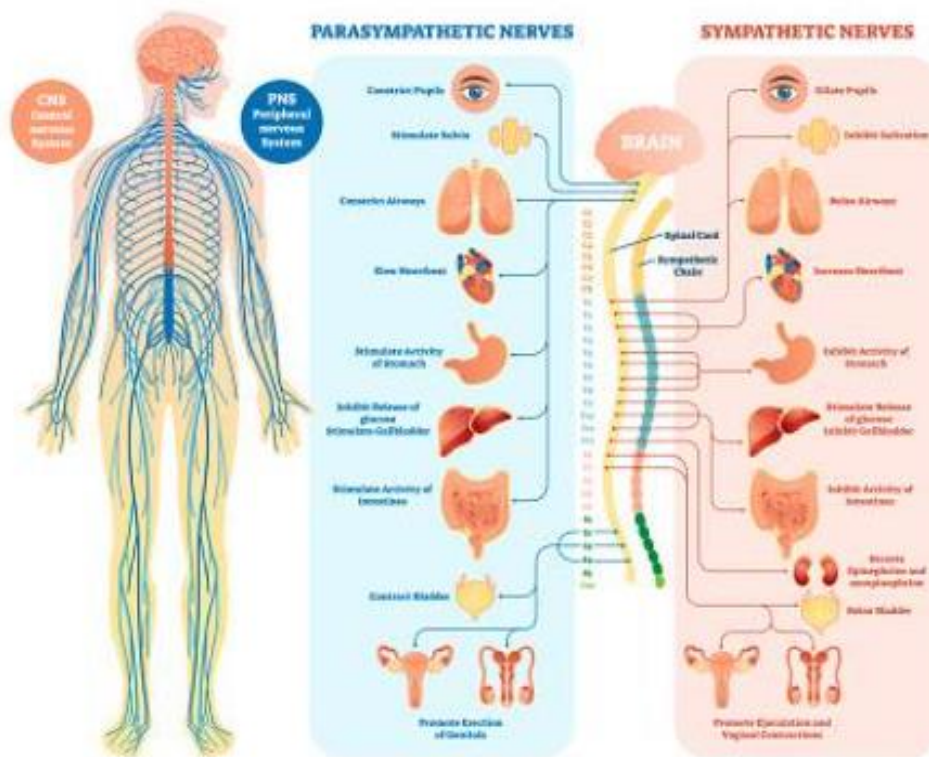
Luigi Galvani made the first contribution in this field in 1786 when he discovered animal electricity in a frog's leg.

Your nervous system uses nerve cells called neurons to send signals, or messages, all over your body. These electrical signals travel among your brain, skin, organs, glands and muscles.

The messages help you move your limbs and feel sensations, like pain. Your eyes, ears, tongue, nose and the nerves all over your body take in information about your environment. Then, nerves carry that data to and from your brain.

There are different types of neurons. Each type of neuron has a different job:

# HUMAN NERVOUS SYSTEM



## What are the parts of the nervous system?

The nervous system has two main parts:

1. **Central nervous system (CNS):** Your brain and spinal cord make up your CNS. Your brain reads signals from your nerves to regulate how you think, move and feel.
2. **Peripheral nervous system (PNS):** Your PNS is made up of a network of nerves. The nerves branch out from your spinal cord. This system relays information from your brain and spinal cord to your organs, arms, legs, fingers and toes.

There are two parts to your peripheral nervous system:

A.The somatic nervous system guides your voluntary movements.

B.The autonomic nervous system regulates the activities you do without thinking about them (involuntary movements).

### **What are common conditions or disorders that affect the nervous system?**

There are many conditions that affect your nervous system. Some of the most common include:

- 1.Alzheimer's disease.
- 2.Cancer.
- 3.Cerebral palsy.
- 4.Epilepsy.
- 5.Huntington's disease.
- 6.Infection (meningitis).
- 7.Parkinson's disease.
- 8.Stroke.
- 9.Traumatic brain injury.

**1-Alzheimers disease**-it is the more common type of the neurological disorder in which death of the brain cells, cognitive decline, and loss of memory. Where it involves the formation of plaques and tangles in the brain, Amyloid-beta is a key component of the brain plaques found during extent of Alzheimers disease for treated use (Donepezil, galantamine and rivastigmine)

**2-Parkinsonism** is a neurological syndrome characterized by rigidity, tremor, hyperkinesia, postural instability. A person with Parkinsons disease has untypically low dopamine levels dopaminergic neurons (types of nerve cells) in the substantianigra part of the brain will died (Dopamine-generating cells) , for treated use (Carbidopa ,levodopa )

### **What are common signs or symptoms of nervous system conditions?**

Signs and symptoms of nervous system conditions vary by type but may include:

- 1.Movement and coordination changes.
- 2.Memory loss.
- 3.Pain, numbness or a pins and needles feeling.
- 4.Behavioral and mood changes.
- 5.Difficulty with thinking and reasoning.
- 6.Seizures.

### **What tests check the health of your nervous system?**

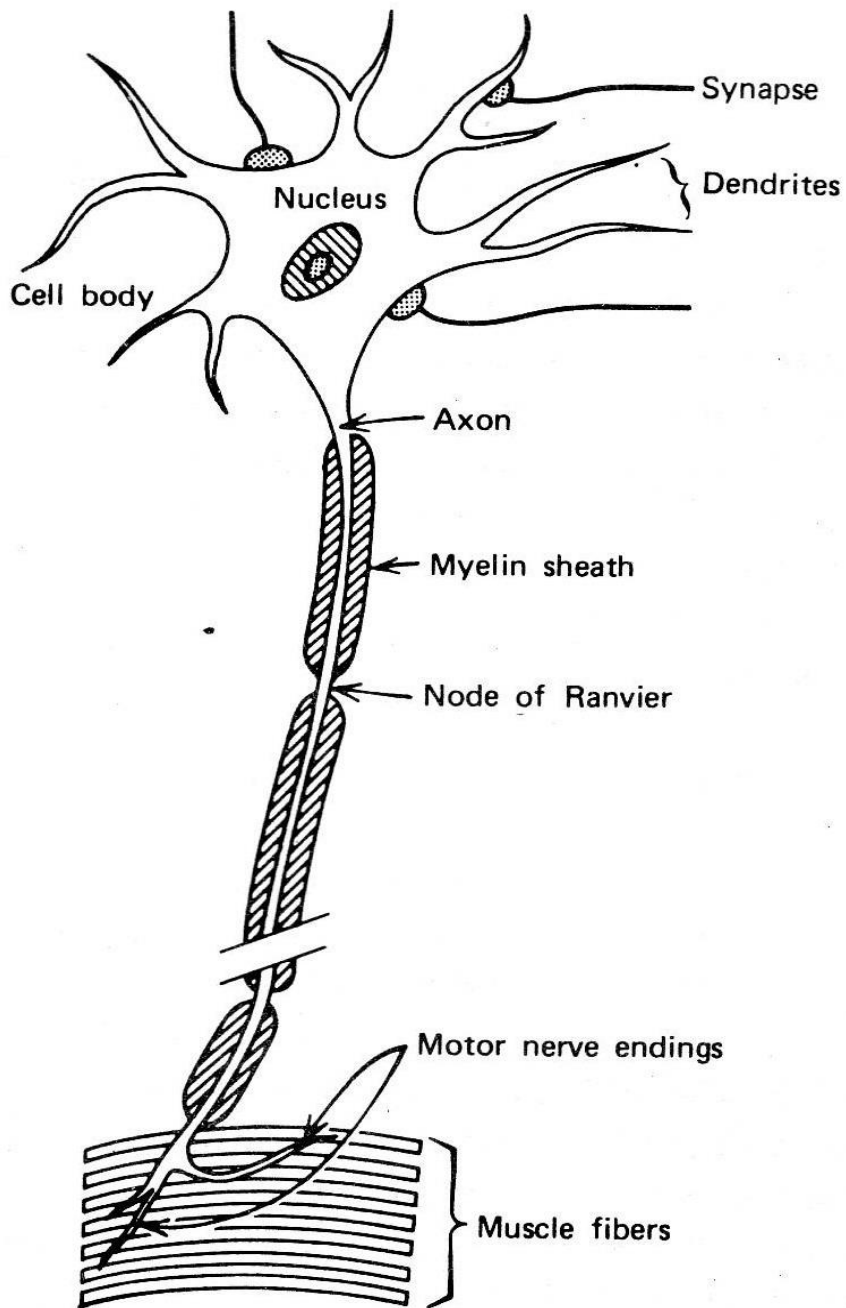
A healthcare provider may use one of the following tests to check the health of your nervous system:

- 1.Computed tomography (CT) scan.
- 2.Electrocardiogram (ECG or EKG).
- 3.Electroencephalogram (EEG).
- 4.Lumbar puncture (spinal tap).
- 5.Magnetic resonance imaging (MRI) scans.

### **The Neuron:**

1. It's the basic structural unit of nervous system.
2. Its specialized cell for reception, interpretation, and transmission of electrical messages.

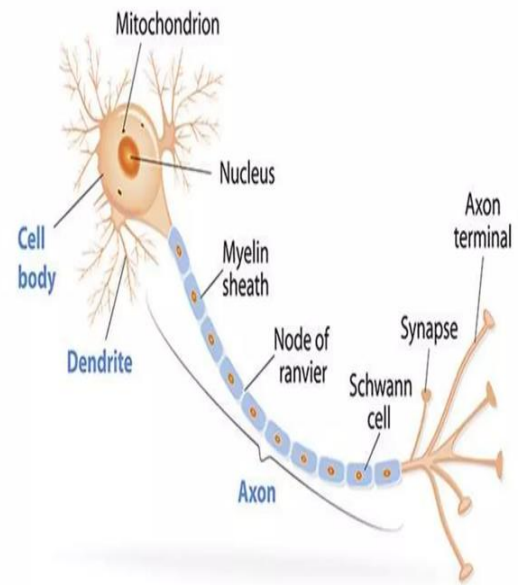
The neuron structure is shown in the fig.1





# STRUCTURE OF NEURONS

- ▶ The neuron is the basic building block of the brain and central nervous system.
- ▶ Neurons are specialized cells that transmit chemical and electrical signals.
- ▶ The brain is made up entirely of neurons and glial cells, which are non-neuronal cells that provide structure and support for the neurons.
- ▶ Nearly 86 billion neurons work together within the nervous system to communicate with the rest of the body.
- ▶ They are responsible for everything from consciousness and thought to pain and hunger.



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