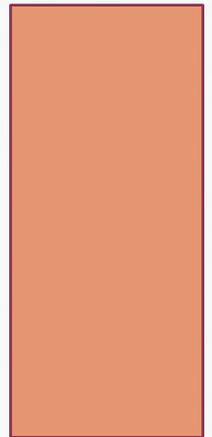


# NERVE FIBER

DR D S JANKAR



# OBJECTIVES

- Classification of nerve fibers: based on structure, diameter, functions and only for sensory nerves.
- Properties of nerve fibers.
- Strength duration curve: chronaxie and factors affecting it.
- Factors affecting conduction in a nerve.

# INTRODUCTION

- Nerve fiber?
- Nerve Tract
- Peripheral nerve

# NEURONAL INJURY

- **Causes:-**
- **Principles of neuronal response to injury:-**
  - If cell body damaged, the neuron dies, and is not replaced by cell division in mature brain.
  - If the axon is damaged or severed at a distance from the soma, there is a good chance of regeneration, primarily in the PNS.

# NEURONAL INJURY

- **Injury to nerve cell body :-**
- **Injury to Axon:-**
  - 1) Wallerian degeneration**
  - 2) Retrograde degeneration**
  - 3) Retrograde transneuronal degeneration**
  - 4) Anterograde transneuronal degeneration**

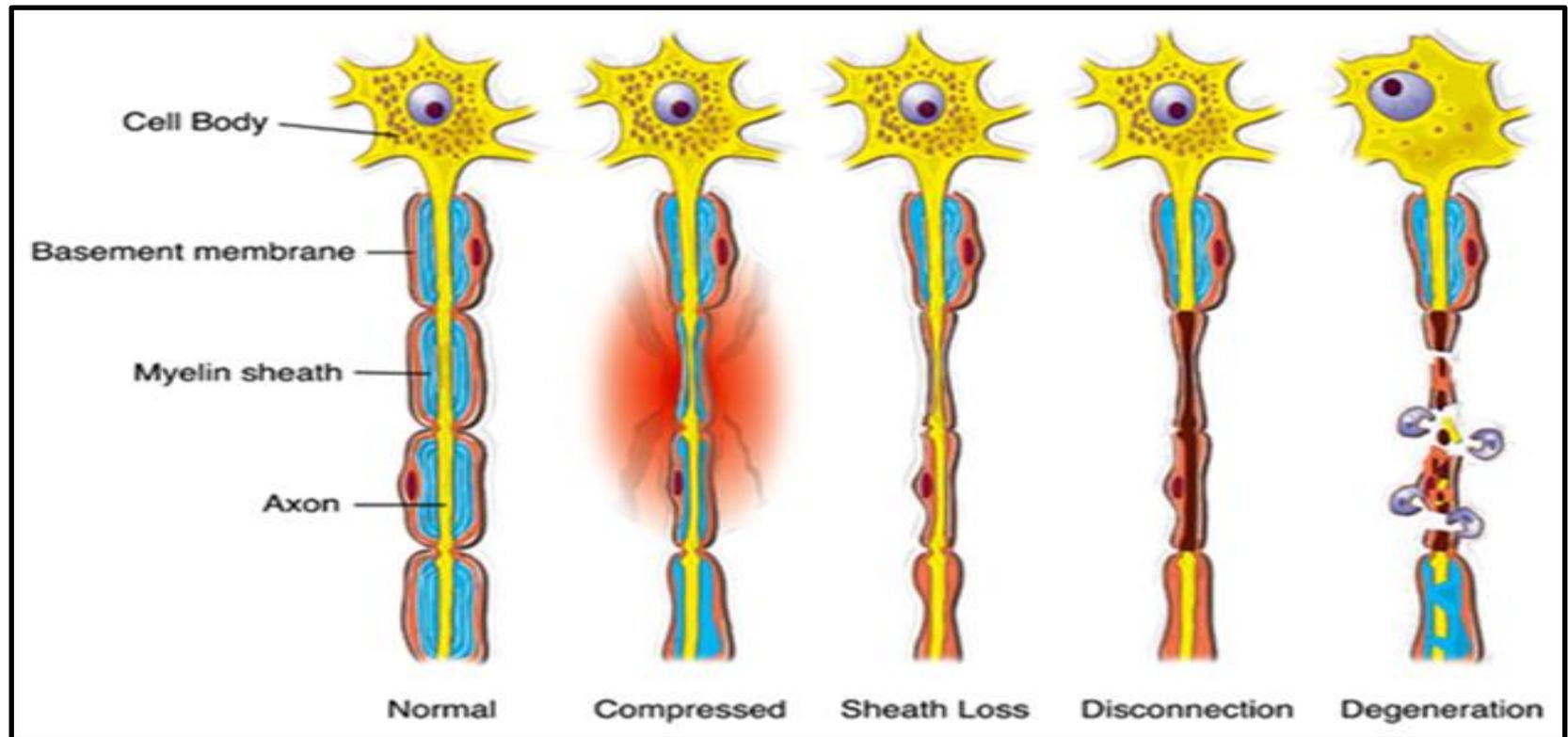
# INJURY TO AXON

## **1) Wallerian degeneration:-**

- a. Degeneration of pre-synaptic terminal**
- b. Degeneration of distal segment**
- c. Myelin degeneration**
- d. Scavanging of debris**

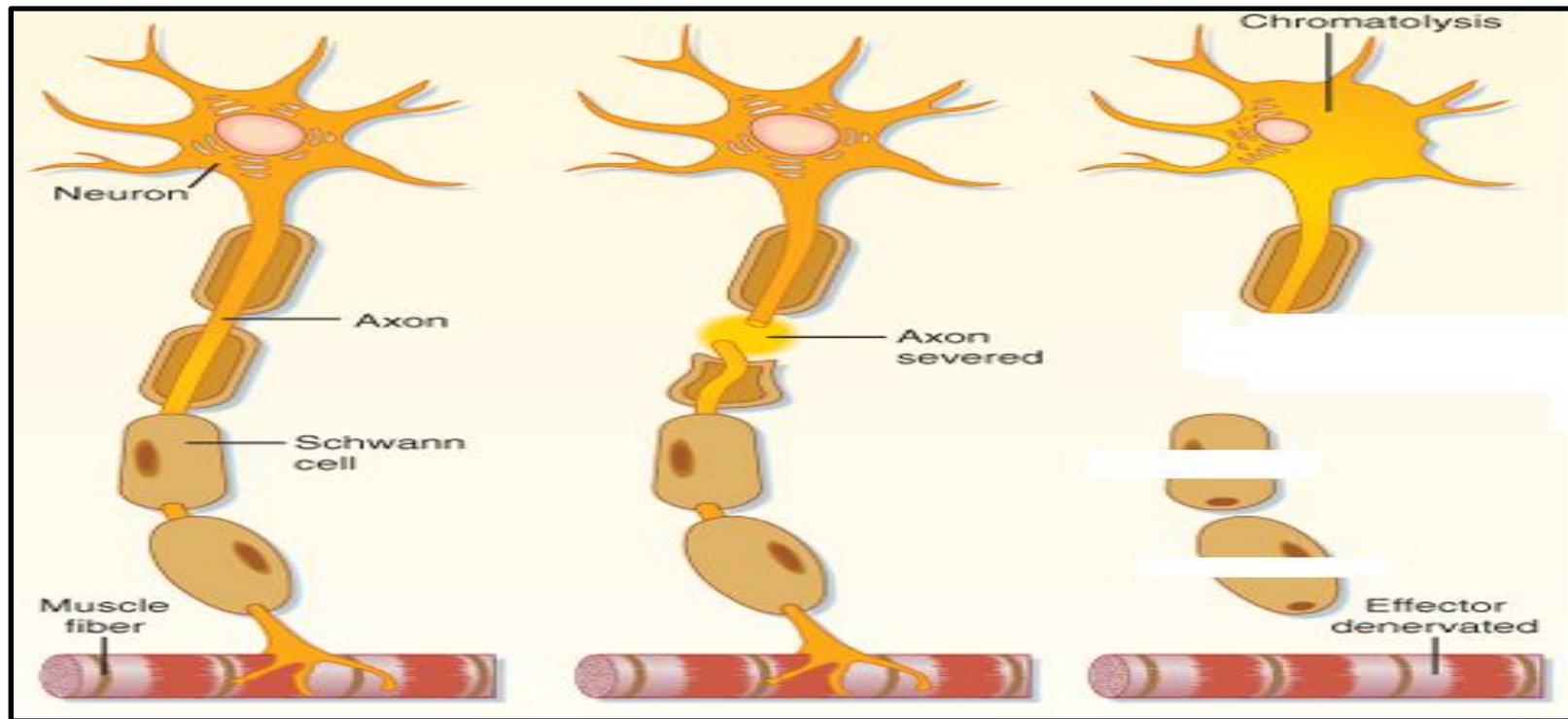
# INJURY TO AXON

## 1) Wallerian degeneration:-



# INJURY TO AXON

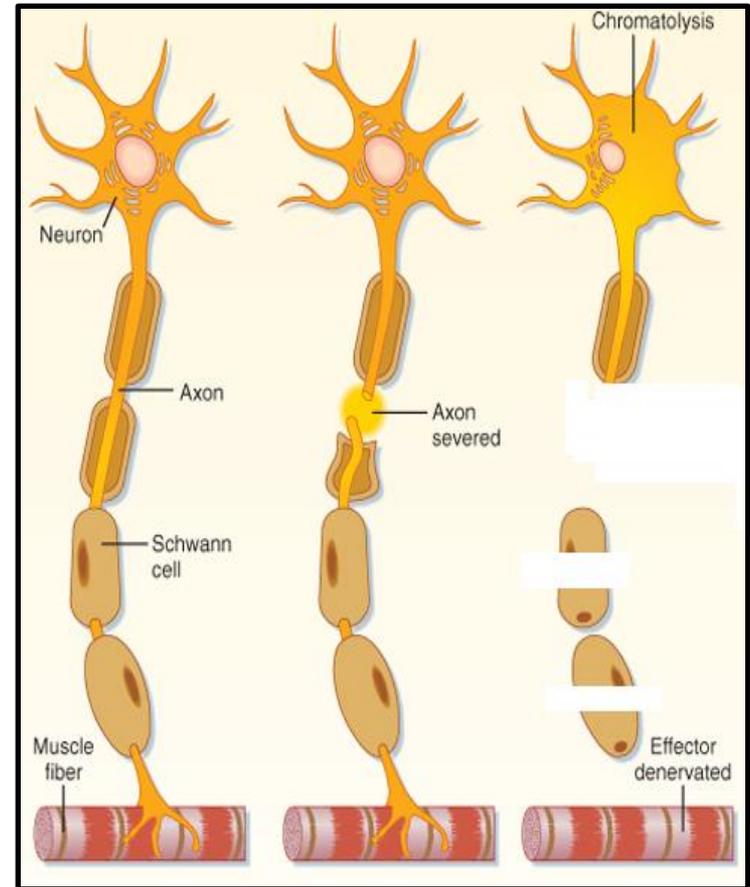
## 1) Wallerian degeneration:-



# INJURY TO AXON

## 2) Retrograde degeneration:-

- a. Changes in Proximal segment
- b. Changes in nerve cell body
  - **Chromatolysis**

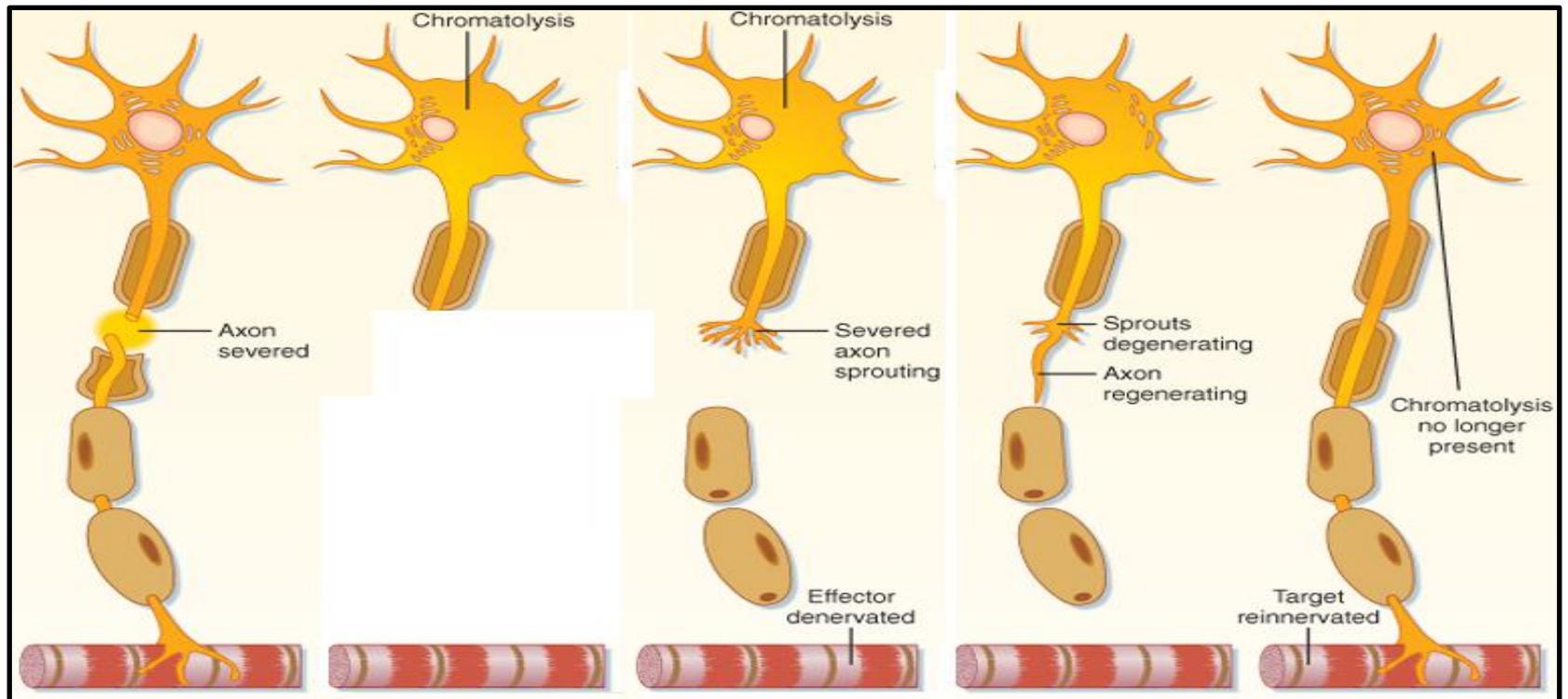




# NEURONAL RECOVERY

1) Recovery of Nerve Cell Body:-

2) Regeneration of Axons in PNS:-



# NEURONAL RECOVERY

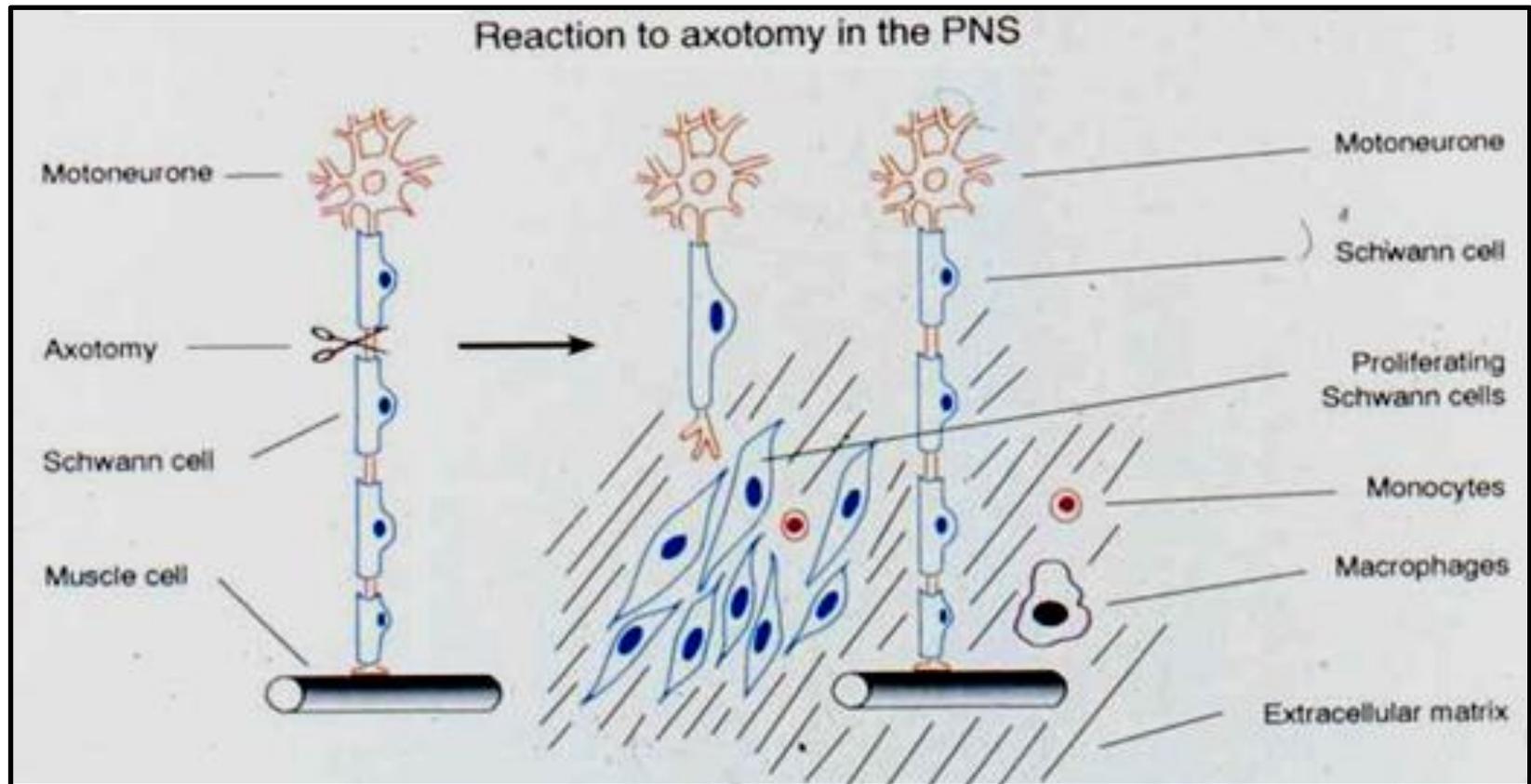
## 3) Axons in CNS DO NOT Regenerate:-

CNS axons can regrow, but...

- Oligodendrocytes do not form path for growing axon
- Myelin proteins inhibit axonal growth
- Lack of chemical signals
- Astrocytes form glial scar

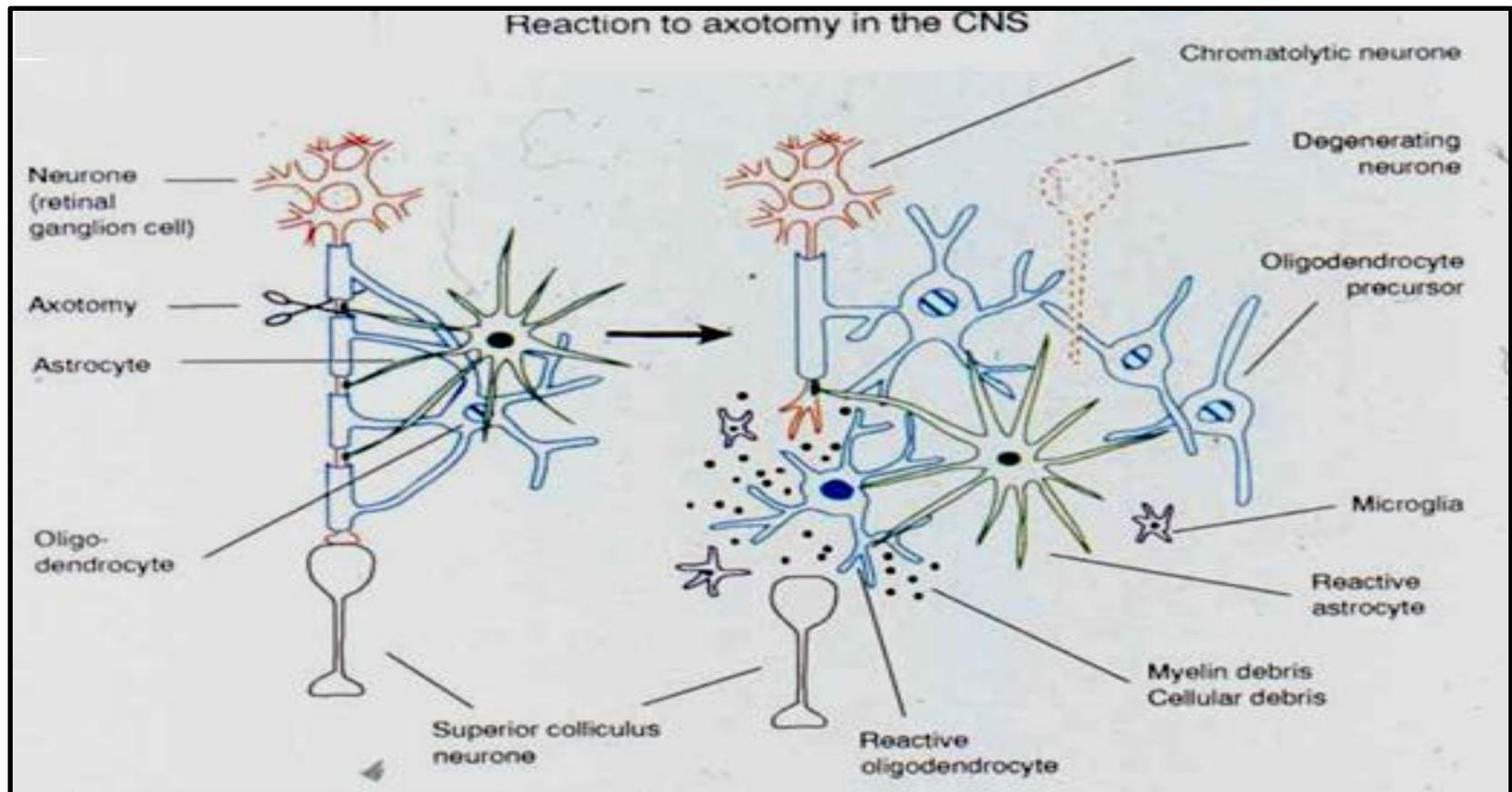
# NEURONAL RECOVERY

## 3) Axons in CNS **DO NOT** Regenerate:-



# NEURONAL RECOVERY

## 3) Axons in CNS DO NOT Regenerate:-



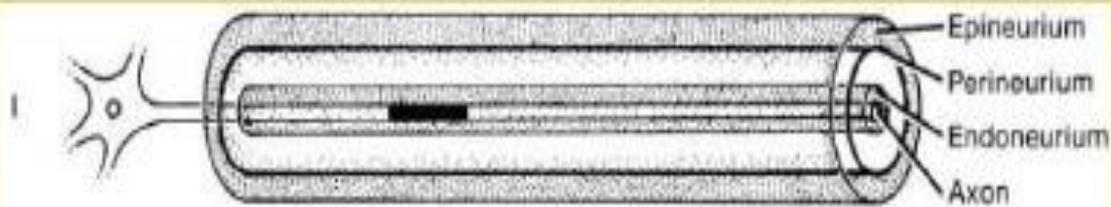
# NEURONAL RECOVERY

## **Seddon's Classification of neuronal injury:-**

- based on three main types of nerve fiber injury and whether there is continuity of the nerve
  1. Neuropraxia
  2. Axonotmesis
  3. Neurotmesis

## Neurapraxia

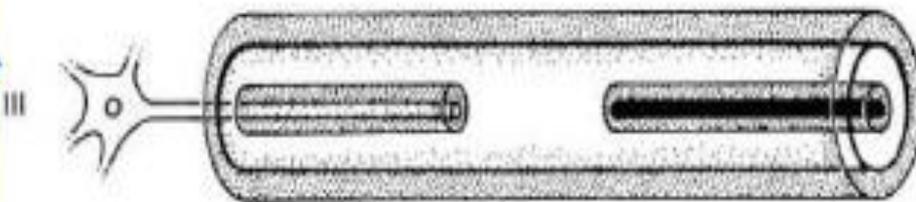
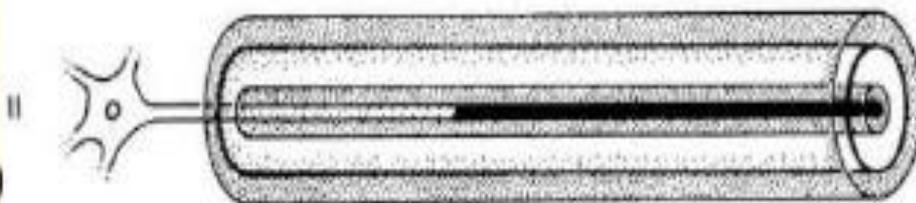
*no axonal discontinuity*



## Axonotmesis

*Wallerian degeneration (distal to lesion)*

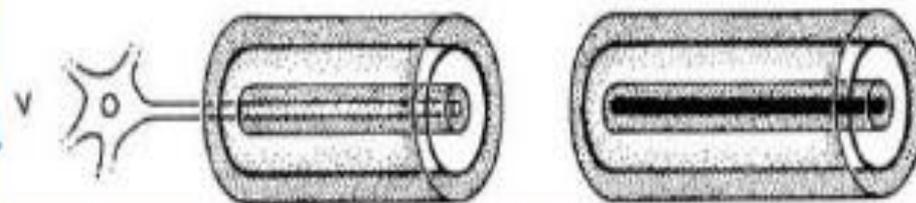
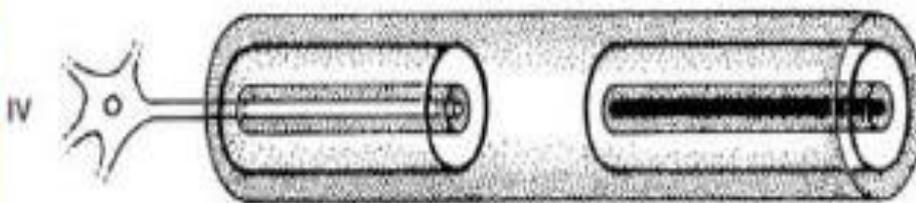
*Axoplasmic disruption, endoneural sheaths intact*



## Neurotmesis

*Wallerian degeneration (distal to lesion)*

*Axon disrupted, loss of tubules, support cells destroyed*



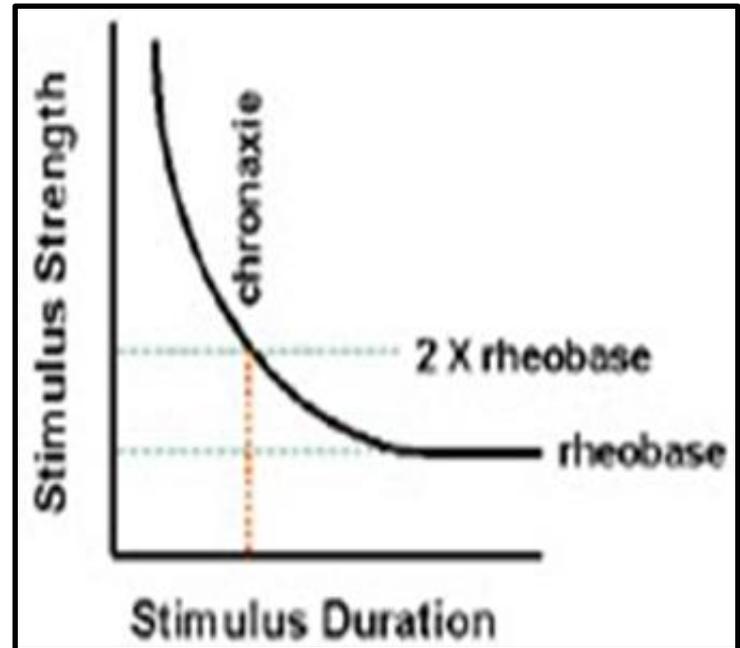
# NEURONAL INJURY

Methods of Functional Assessment of Nerve Injury:-

- 1) Strength-Duration curve
- 2) Assessment of Sensory nerve function
- 3) Assessment of Motor nerve function
- 4) Autonomic function tests
- 5) Nerve conduction study

# STRENGTH-DURATION CURVE

- Procedure:-
- Strength-Duration curve:-
  - a. Rheobase:-
    - Rheo means stimulus strength
    - base means foundation
    - The minimum stimulus strength that produces a response is called Rheobase

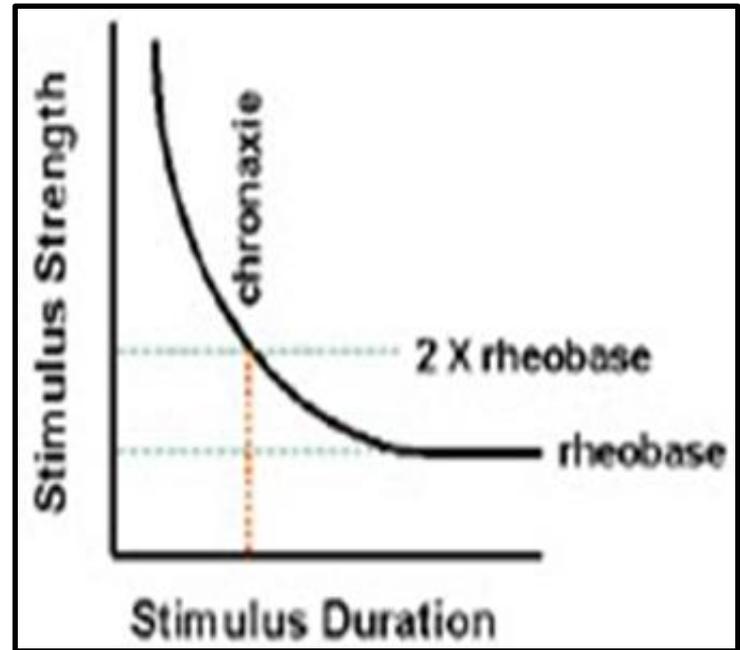


# STRENGTH-DURATION CURVE

- Strength-Duration curve:-

- b. Chronaxie :-

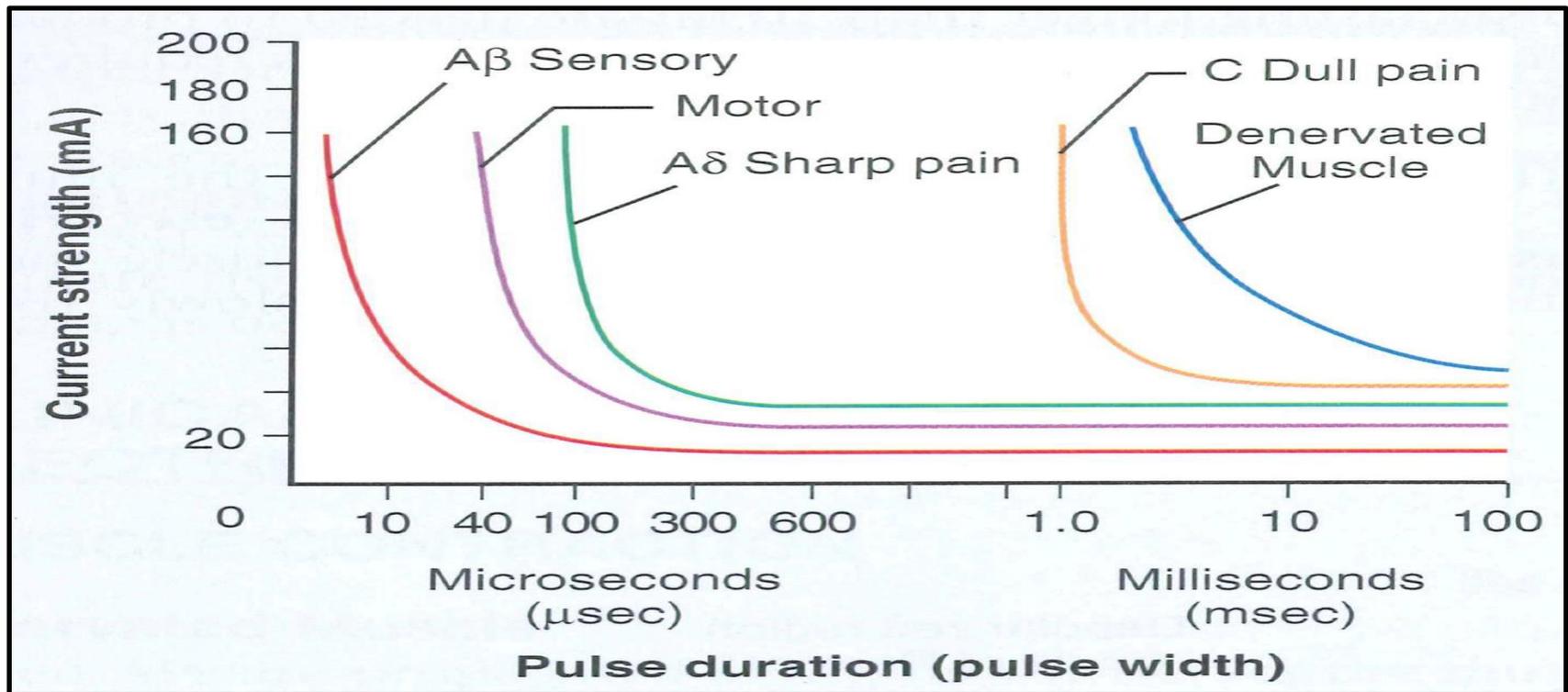
- Chron means time
    - axie means axis



- It is the duration for which a stimulus twice the strength of rheobase needs to be applied to elicit response

# STRENGTH-DURATION CURVE

- Strength-Duration curve:-



# PROPERTIES OF NERVE FIBER

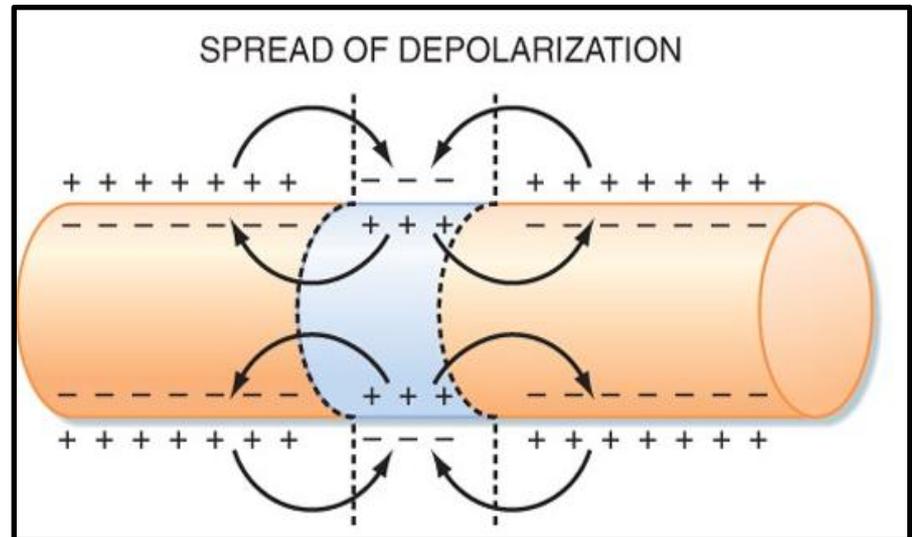
## **I] Excitability:-**

- It is the ability of generating electrochemical impulse (AP) at the cell membrane in response to any stimulus.
- Excited by negatively charged electrode
- Hyperpolarized by positively charged electrode

# PROPERTIES OF NERVE FIBER

## II] Conductivity:-

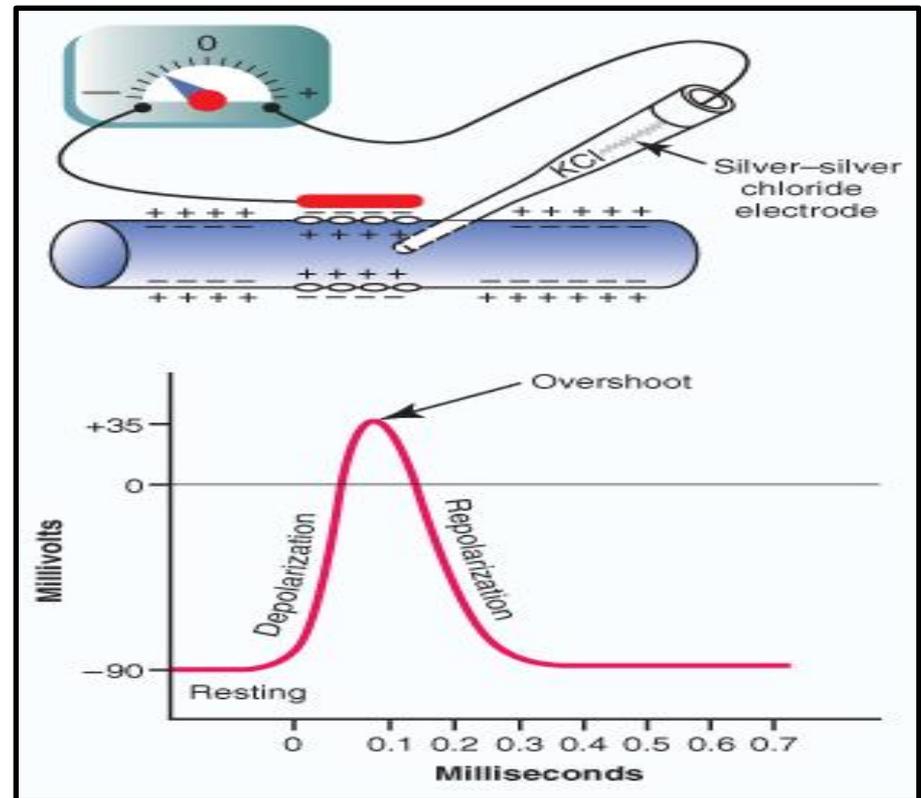
- It is the ability to propagate action potential from the point of generation to the rest of the membrane.
  - 1) Orthodromic conduction
  - 2) Antidromic conduction



# PROPERTIES OF NERVE FIBER

## III] Electrotonic & Action Potential:-

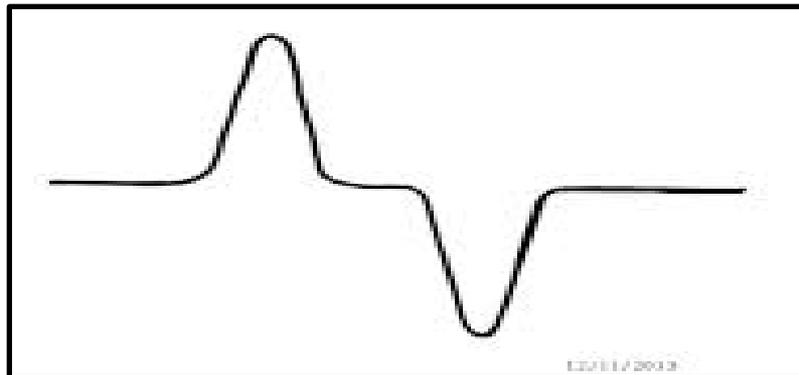
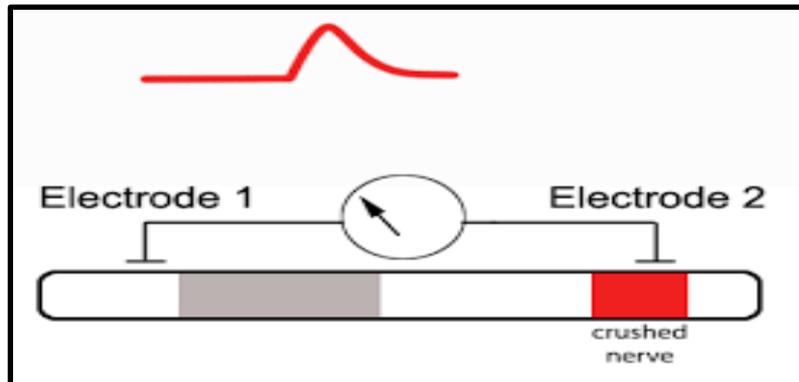
- 1) RMP
- 2) Electrotonic potential
- 3) Monophasic AP



# PROPERTIES OF NERVE FIBER

## III] Electrotonic & Action Potential:-

- 1) RMP
- 2) Electrotonic potential
- 3) Monophasic AP
- 4) Biphasic AP
- 5) Compound AP



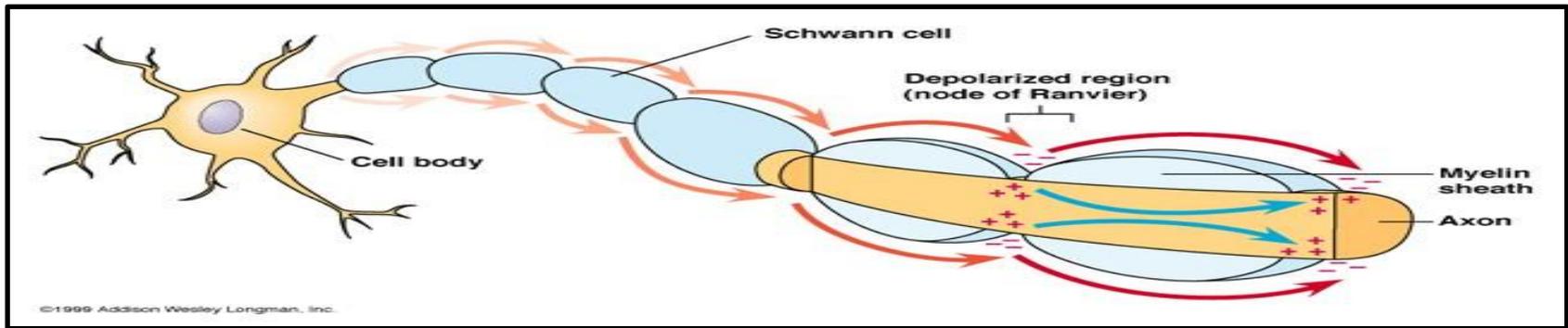
# PROPERTIES OF NERVE FIBER

**IV] All or None Law:-**

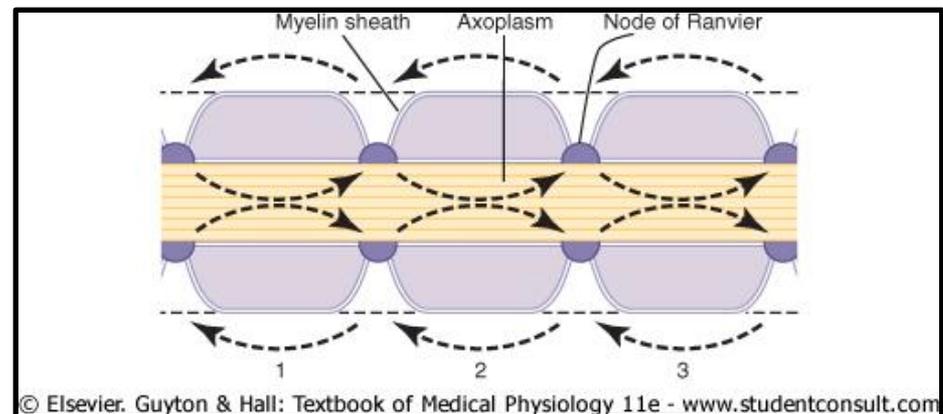
**V] Adaptation:-**

# PROPERTIES OF NERVE FIBER

## VI] Saltatory conduction:-



- Cause:-
- Importance:-



# PROPERTIES OF NERVE FIBER

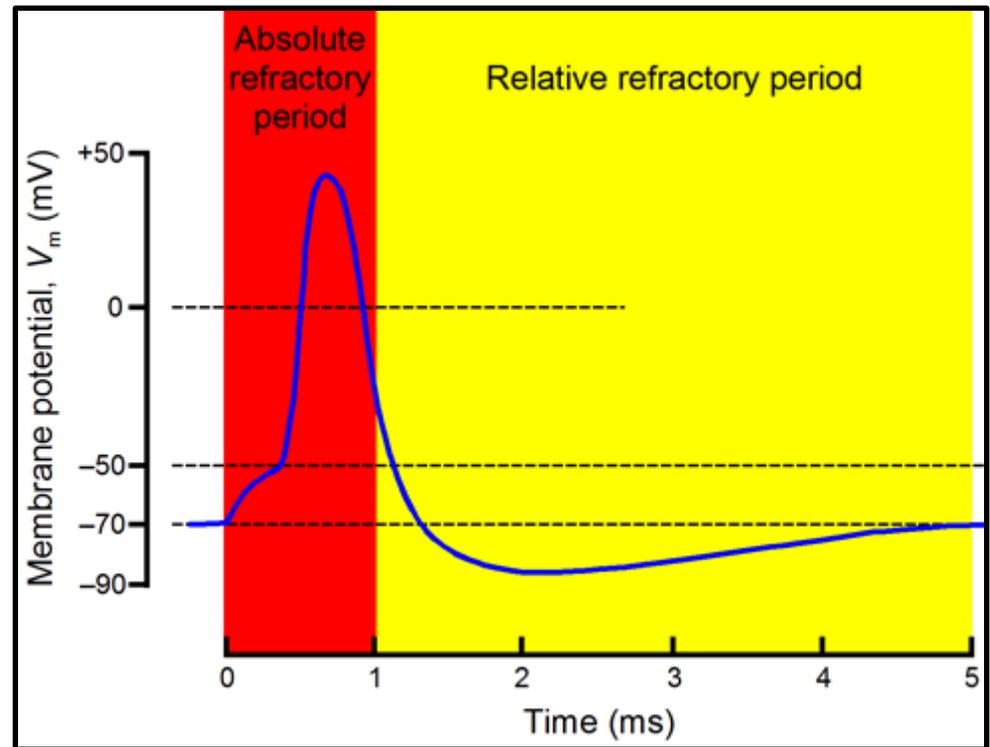
## VII] Refractory Period:-

1) Absolute

- cause

1) Relative

- cause



presence of calcium on nerve membrane may play a significant  
role in

- A. operation of sodium pump
- B. regulation of potassium outflow
- C. keeping sodium gates closed
- D. preventing protein anions from going out

All or none response in a nerve is applicable to

- A. A mixed nerve
- B. Only a sensory nerve
- C. Only a motor nerve
- D. A single nerve fibre

## Accommodation in a nerve is

- A. Decrease of excitability to constant stimulation
- B. Rise in threshold during stimulation
- C. Due to slow opening of K channels
- D. All of the above

First change to occur in the distal segment of cut nerves

- A. Myelin sheath degeneration
- B. Axonal degeneration
- C. Mitosis of schwann cell
- D. Axonal sprouting

Following injury to a nerve, regeneration changes in the nerve cell body begins in

- A. 10 days
- B. 20 days
- C. 30 days
- D. 40 days

Wallerian degeneration refers to

- A. Degenerative and regenerative changes in a cut nerve fibre
- B. Retrograde degeneration of the axon upto the cell body
- C. Degenerative changes in the distal part of cut nerve fibre
- D. Degenerative changes at the site of injury

not true of refractory period in a nerve

- A. it is length of it remains non responsive to restimulation
- B. increase with diameter of nerve fibre
- C. it puts a limit to the frequency at which a nerve conduct impulses
- D. because of it a nerve can conduct maximum of 1000 impulses/sec

THE REST OF YOUR LIFE...

AVERAGE

MEMORABLE



**CHOICE IS YOURS**



Thank You!!!