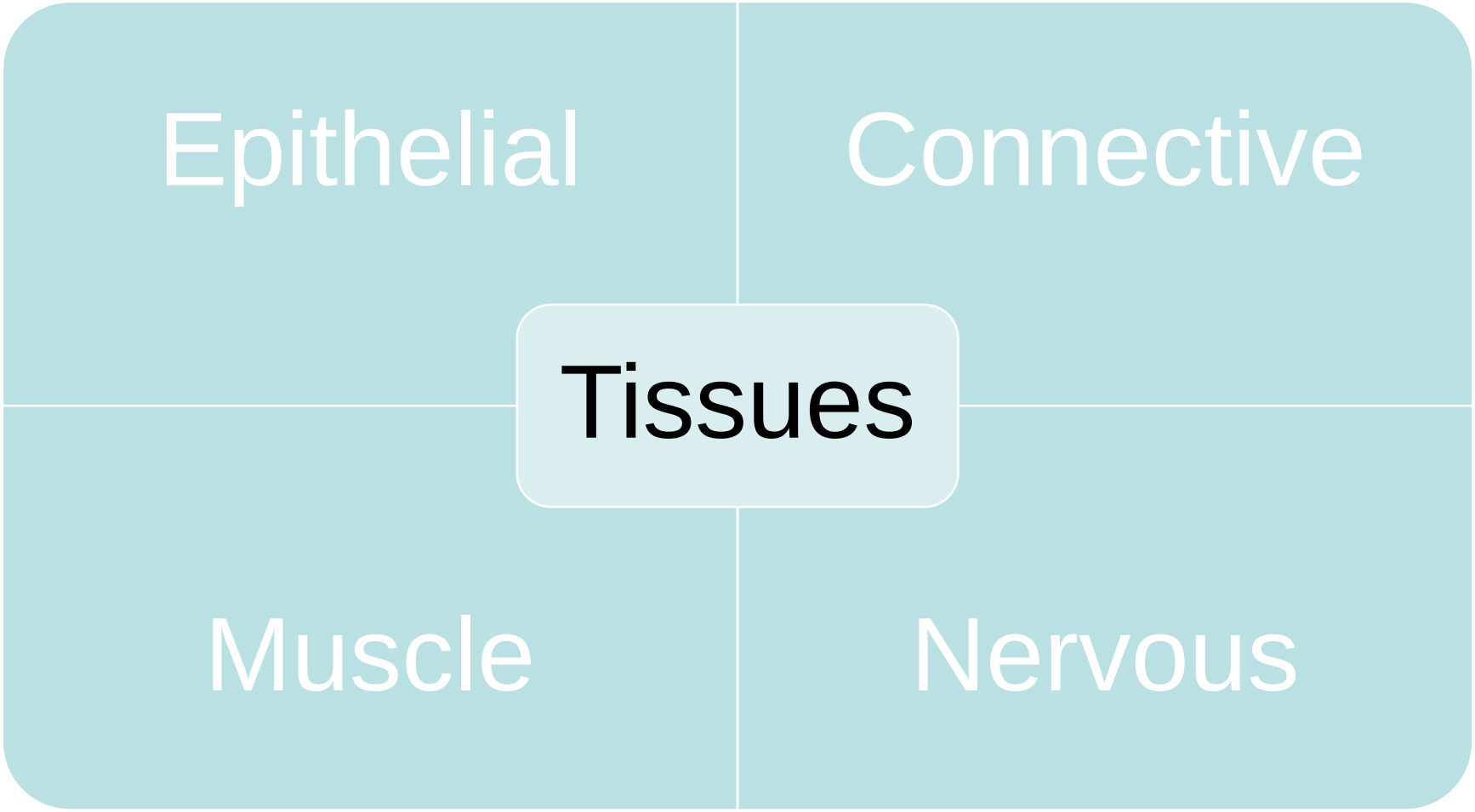
Body Tissues



Nervous system

Controlling & Coordinating System

Conducts nerve impulses between body structures and controls body functions

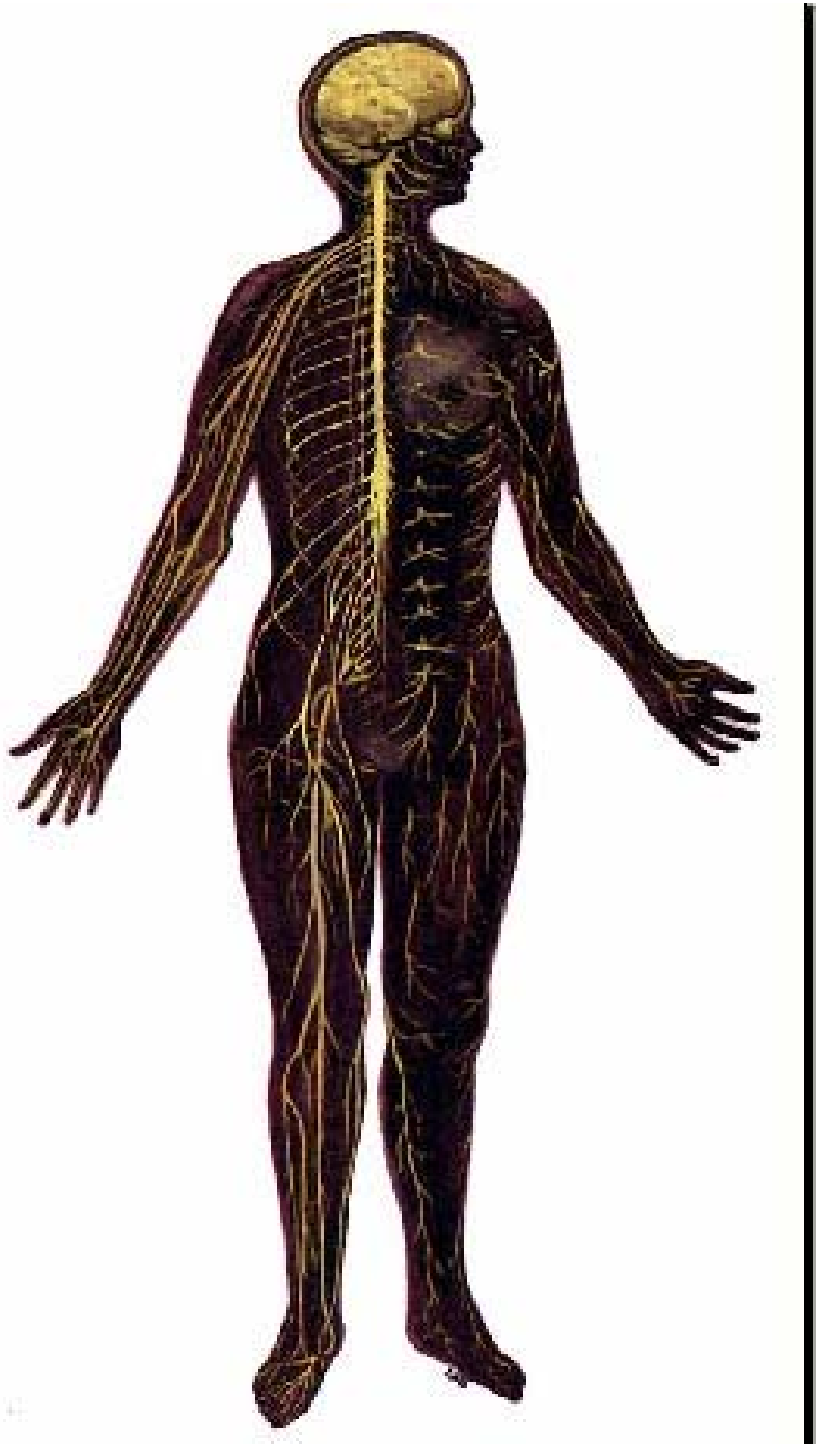
Functions

- Sensory — Internal
  External
- Integration> Analysis> storage>interpret>decide
- Motor> Response
- Regulates all activity (Voluntary & Involuntary)
- Adjust according to changing external and internal environment

Nervous System

Subdivisions:

- CNS (Central Nervous System)
- PNS(Peripheral Nervous System)
- ANS (Autonomic Nervous system)

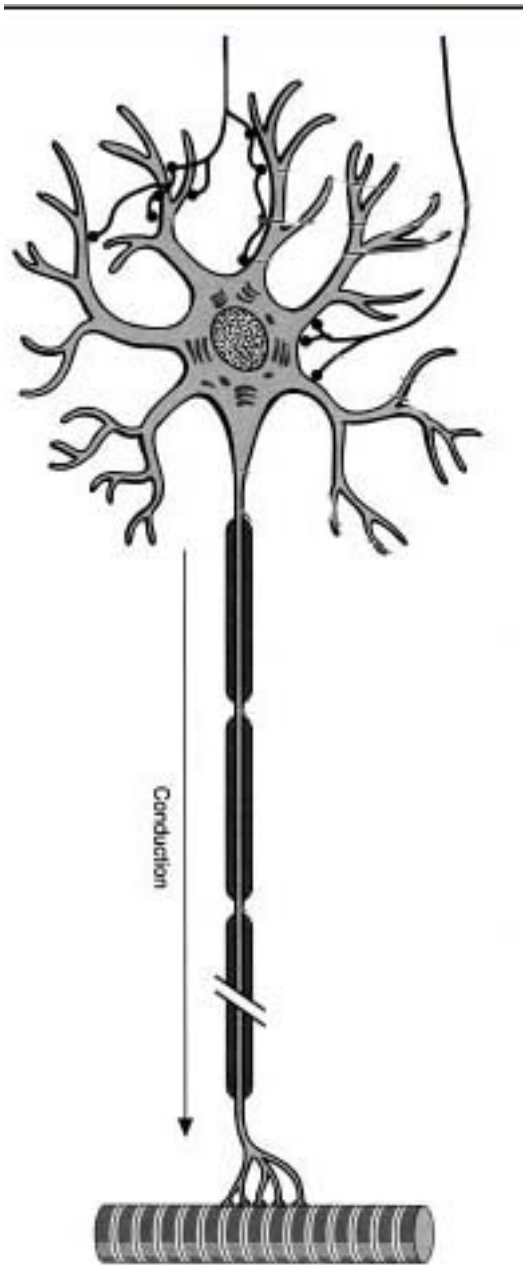


Nervous tissue - Cell Types

Functionally

- Neuron (Nerve Cell) -Conduction
  Variable Shape , Size, Function

- Neuroglia - Supportive
  -- Macroglia
  -- Microglia
- Ependymal Cells
- Schwann Cells - In PNS

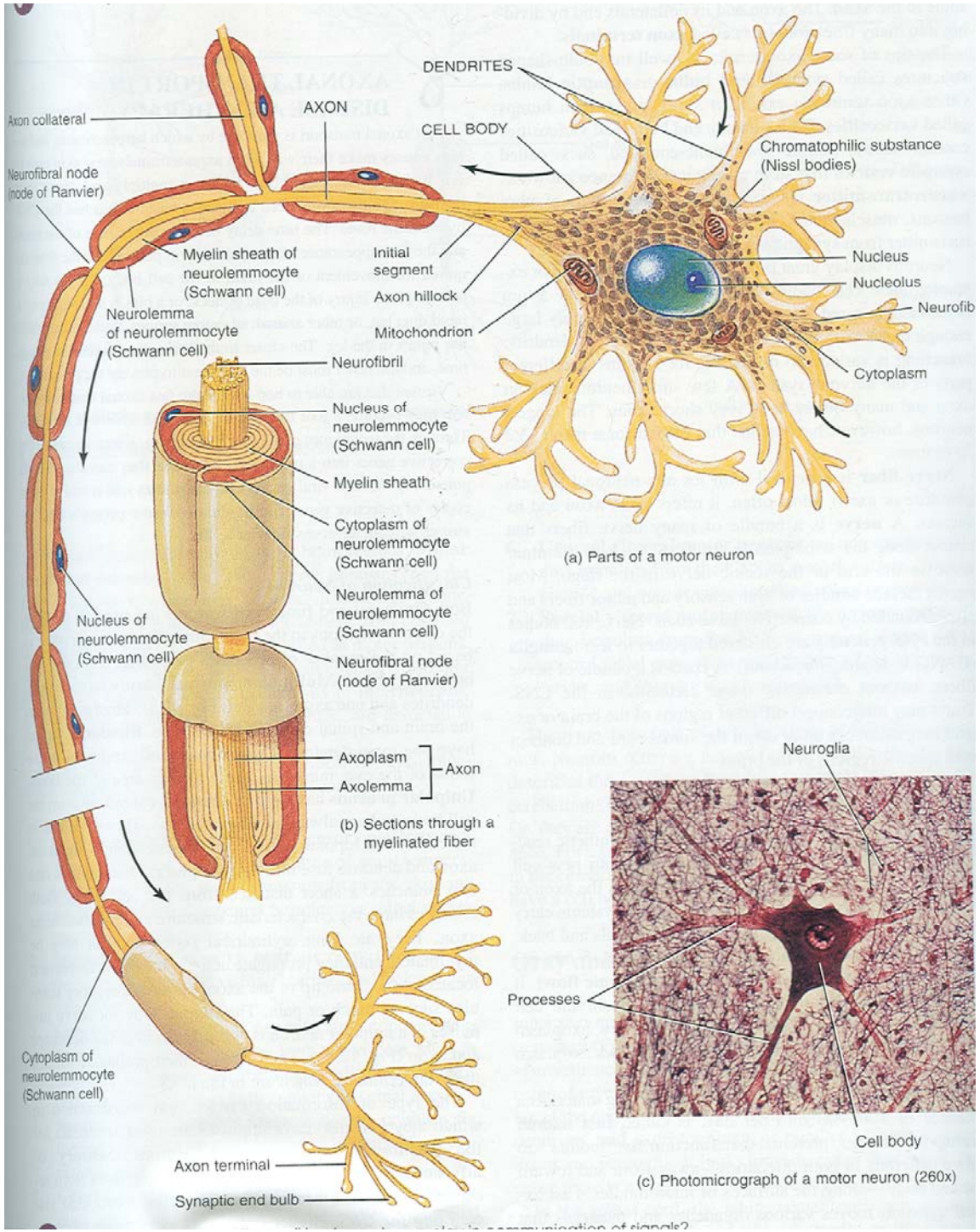


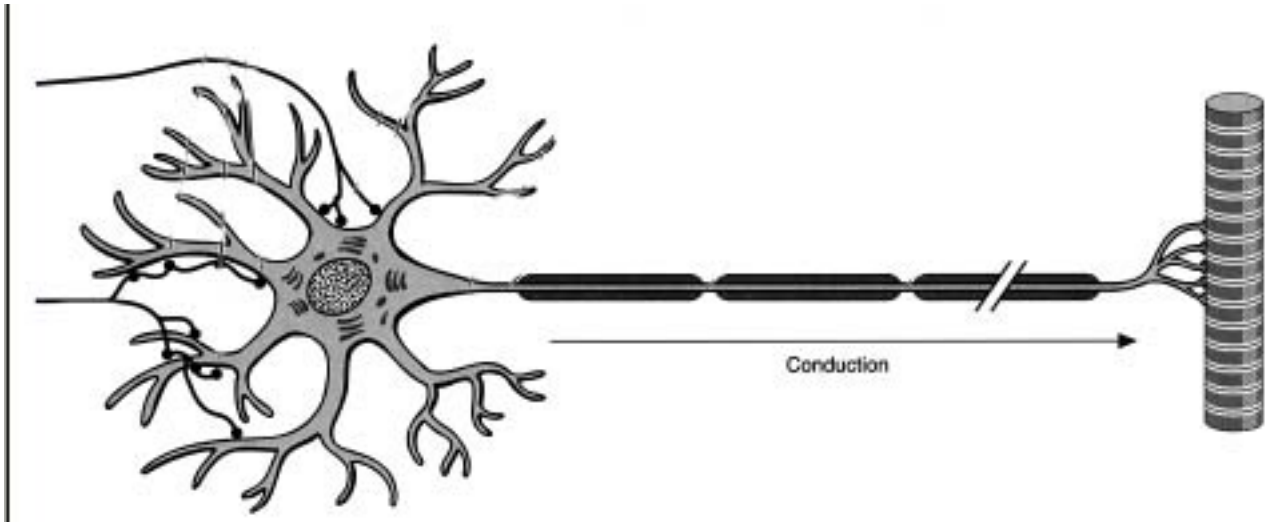
Neuron (Nerve Cell)

Components

1.Cell Body

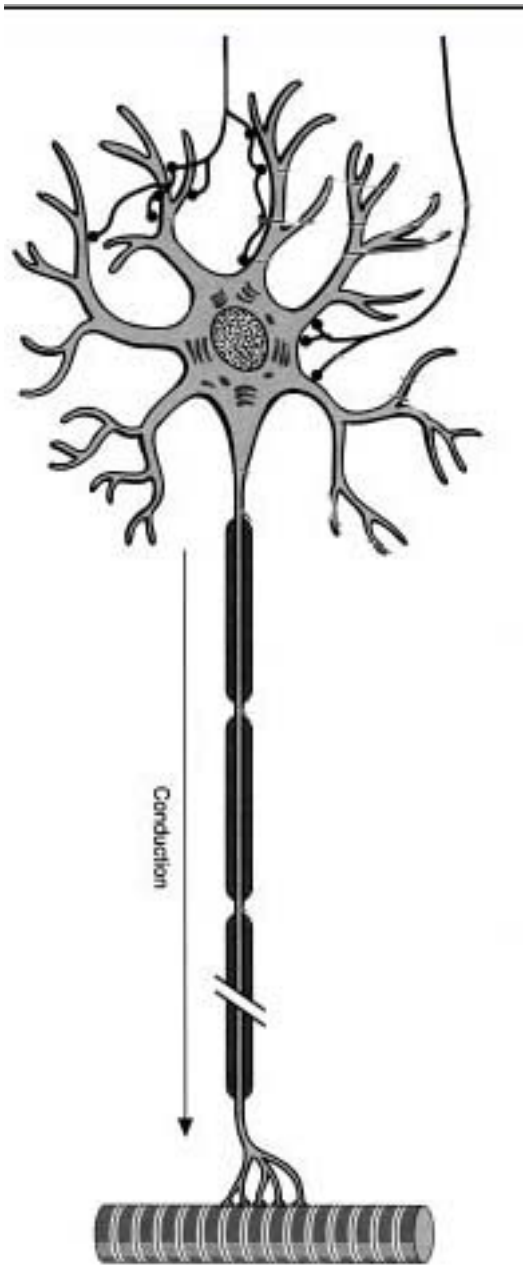
2.Cell Processes (Neurites)


DENDRITES
AXON
Axon collateral
CELL BODY
Chromatophilic substance
(Nissl bodies)
Neurofibral node
(node of Ranvier)
Myelin sheath of
neurolemmocyte
(Schwann cell)
Initial
segment
Nucleus
Nucleolus
Axon hillock
Neurofib
Neurolemma
of neurolemmocyte
(Schwann cell)
Mitochondrion
Neurofibril
Cytoplasm
Nucleus of
neurolemmocyte
(Schwann cell)
Myelin sheath
Cytoplasm of
neurolemmocyte
(Schwann cell)
(a) Parts of a motor neuron
Neurolemma of
neurolemmocyte
(Schwann cell)
Nucleus of
neurolemmocyte
(Schwann cell)
Neurofibral node
(node of Ranvier)
Axoplasm
Axon
Axolemma
(b) Sections through a
myelinated fiber
Neuroglia
Processes
Cytoplasm of
neurolemmocyte
(Schwann cell)
Cell body
Axon terminal
Synaptic end bulb
(c) Photomicrograph of a motor neuron (260x)



Cell Body - Size vary from 5 µm - 120 µm

(Perikaryon) – Plasma membrane
Nucleus
Cytoplasm
Axon Hillock
Neuronal Skeleton



Cell Processes

1.Dendrites : Short , irregular thickness. Freely Branching, Afferent processes , Contain Nissl Granules

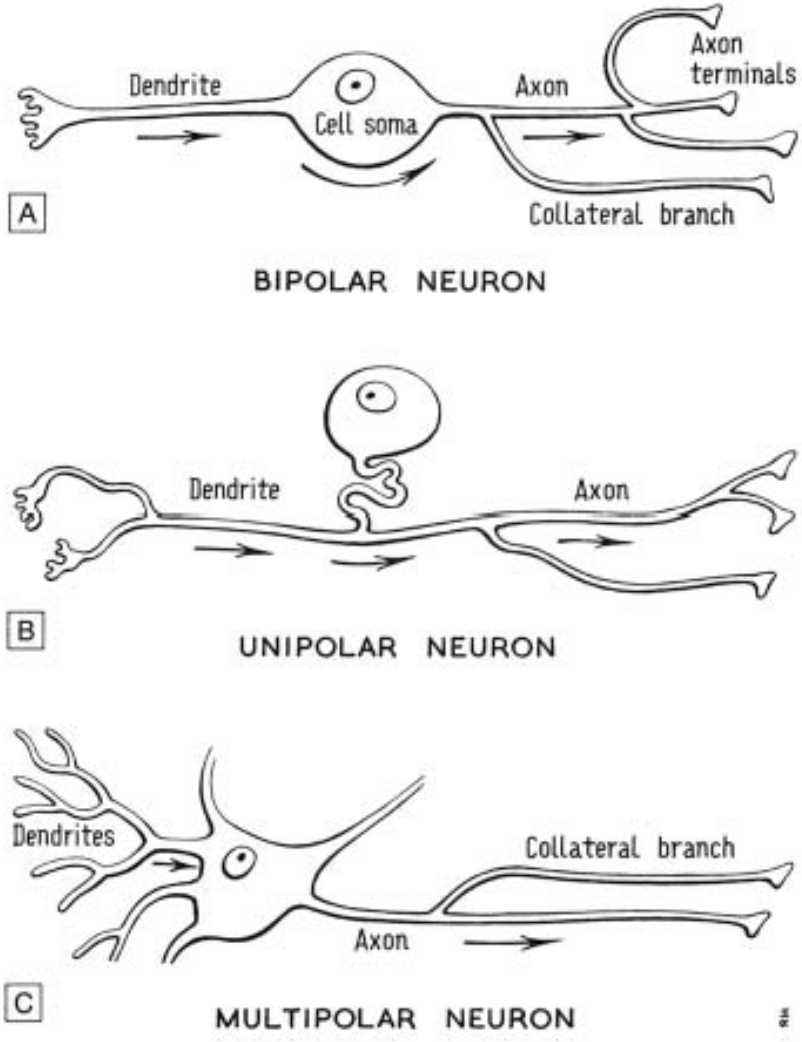
2. Axon –

Long , Single, Efferent process of Uniform Diameter, Devoid of Nissl Granules, Ensheathed by Schwann cells, Gives collateral branches Terminal branches called telodendria (axon terminals)

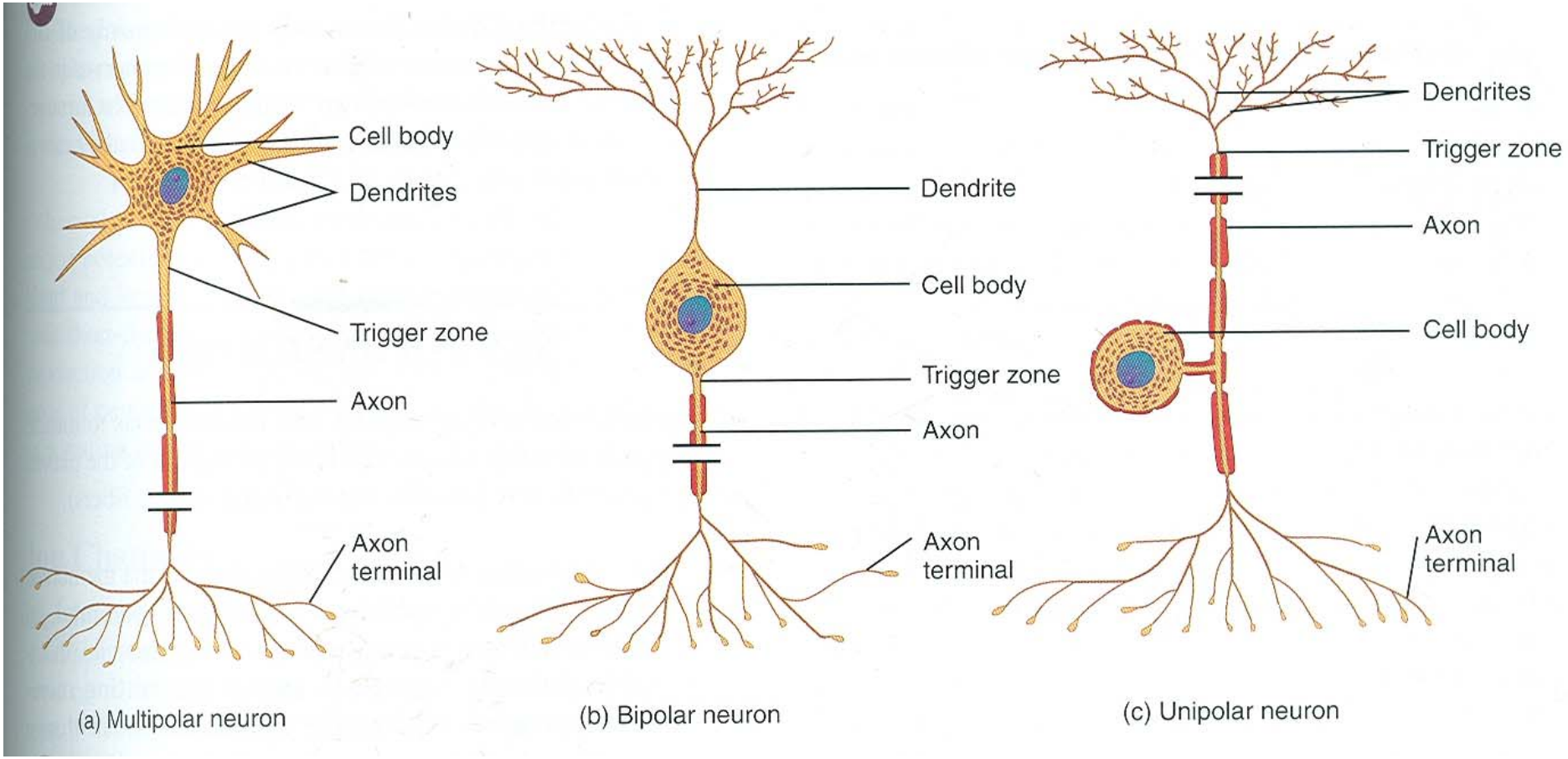
Terminate – within CNS - Always with another neuron

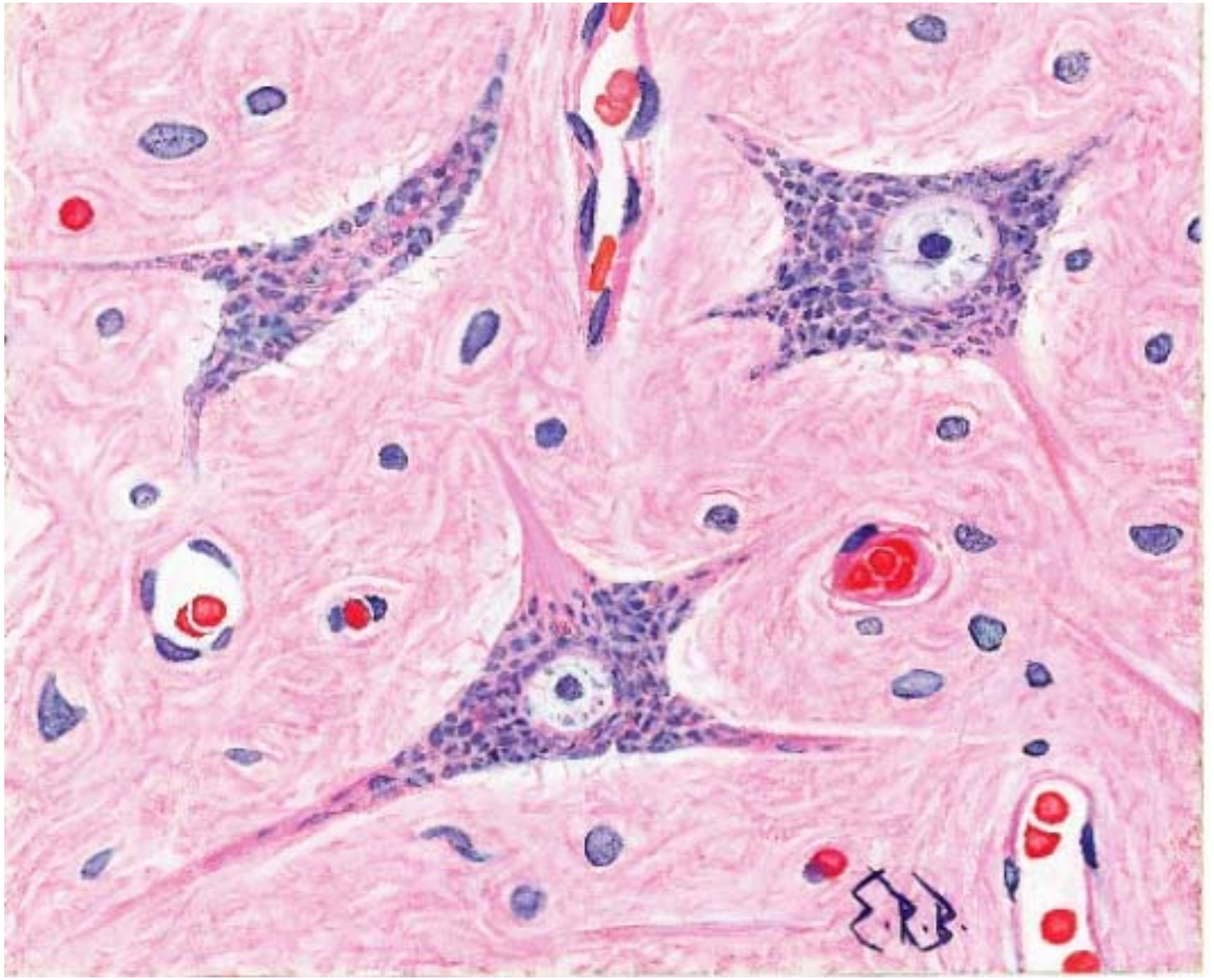
Outside CNS – Either may end in relation to the effector organ or Synapse with neurons of Peripheral ganglia

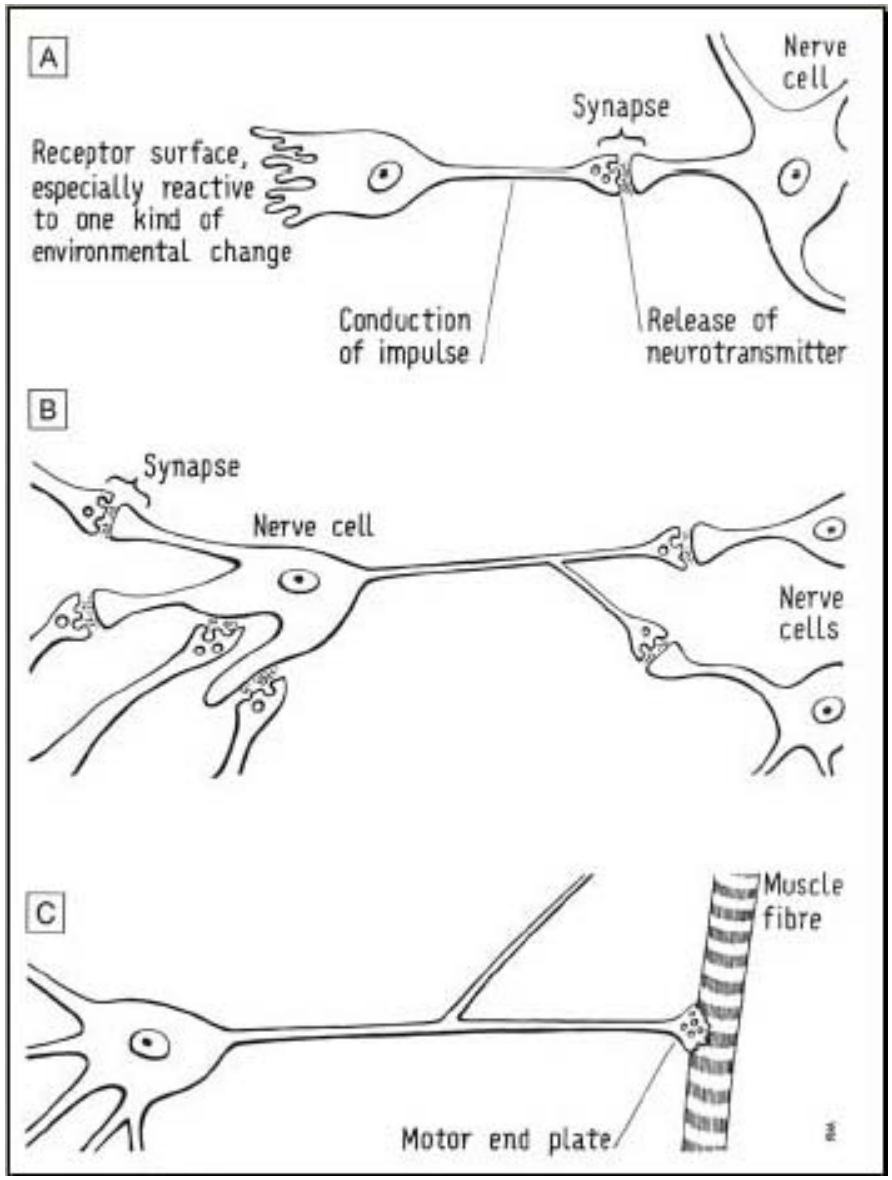
Types Of Neuron



1. Acc. To no of Processes
   - Bipolar
   - Multipolar
   - Pseudounipolar
2. Acc. To Function
   - Sensory
   - Motor
3. Acc. To Axon Length
   - Golgi type-1(long)
   - Golgi type-II


Cell body
Dendrites
Trigger zone
Axon
Axon terminal
(a) Multipolar neuron
Dendrite
Cell body
Trigger zone
Axon
Axon terminal
(b) Bipolar neuron
Dendrites
Trigger zone
Axon
Cell body
Axon terminal
(c) Unipolar neuron





Synapse

site of junction of neuron

Types

Axo- Dendritic

Axo – Somatic

Axo- Axonal

Neuroglia

- **Astrocytes** : Fibrous
  Protoplasmic

Metabolism of neurotransmitters

K+ Balance

Contribute in brain development

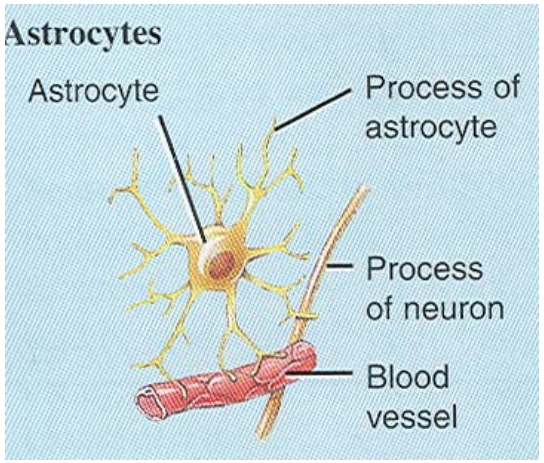
Blood brain barrier

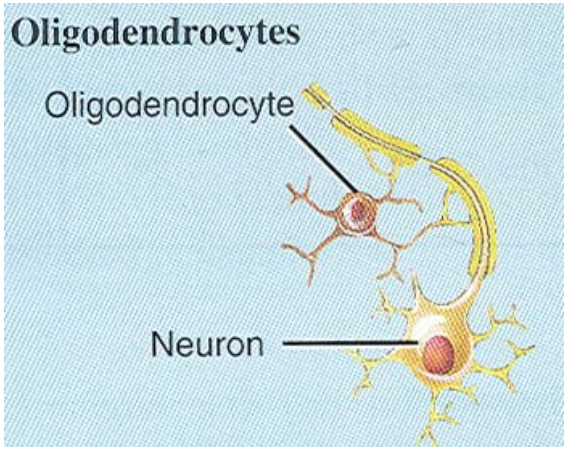
Link between neurons and blood vessels

- **Oligodendrocytes:**

  Form a supporting network around neurons

  Produce myelin sheath around several neurons

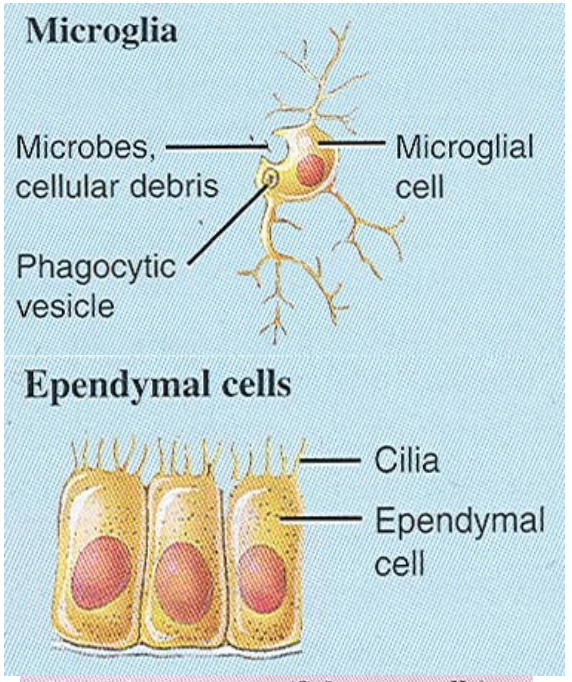


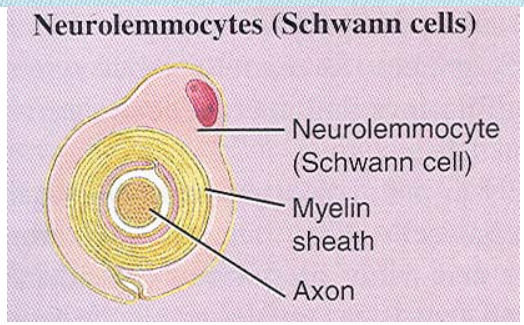


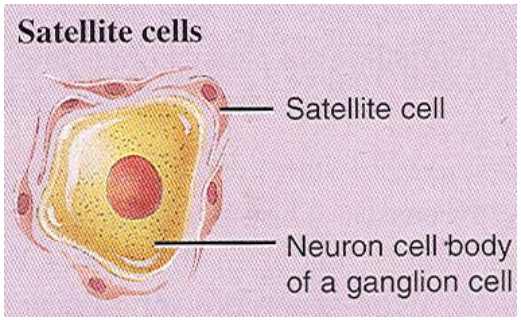
Neuroglia- contd.

- Microglia: Phagocytic cells; Migrate to area of injured nervous tissue.
- Ependymal cells: Line the ventricles of brain and central canal of SC.

  Form CSF and assist in its circulation.
- Schwann cells: Produce a part of myelin sheath around a single axon of a PNS neuron.
- Satellite cells: Flattened cells around neurons in ganglia; support neurons







Cell bodies

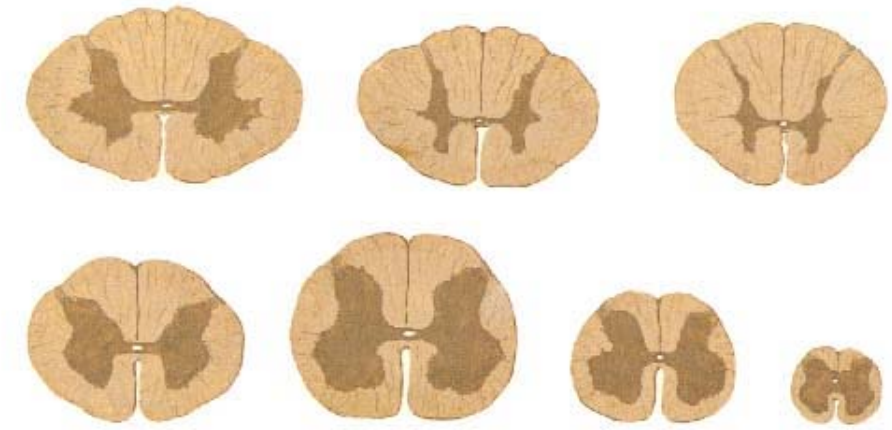
- Grey matter & Nuclei – in CNS
- Ganglia in PNS

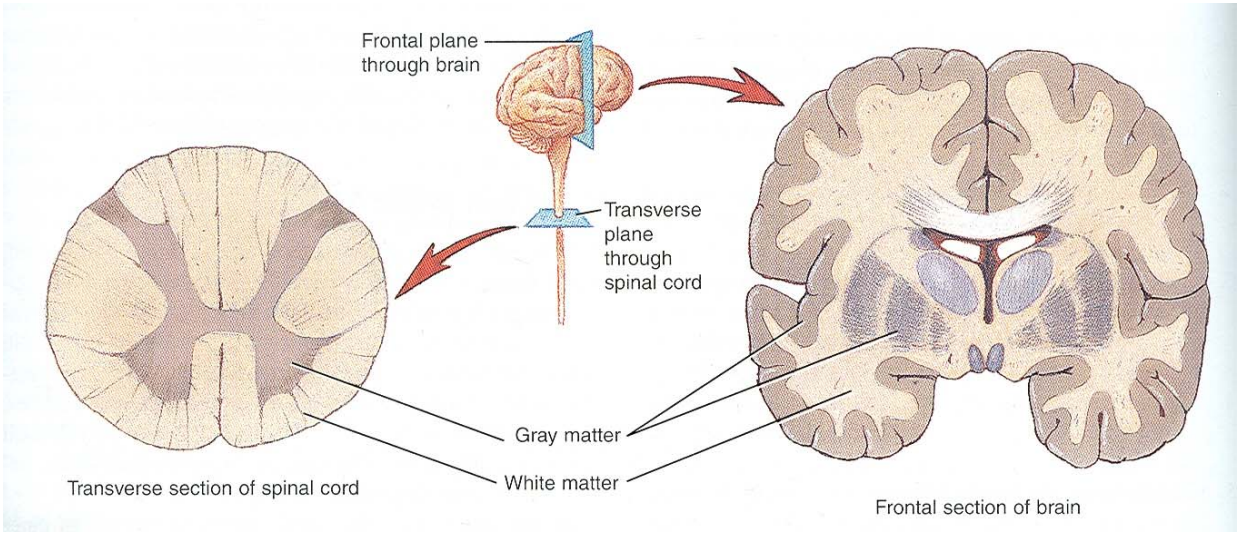
Cell processes

- Form tracts in CNS
- Nerves in PNS

Arrangement of grey and white mater

Proportion of grey and white matter vary at different levels



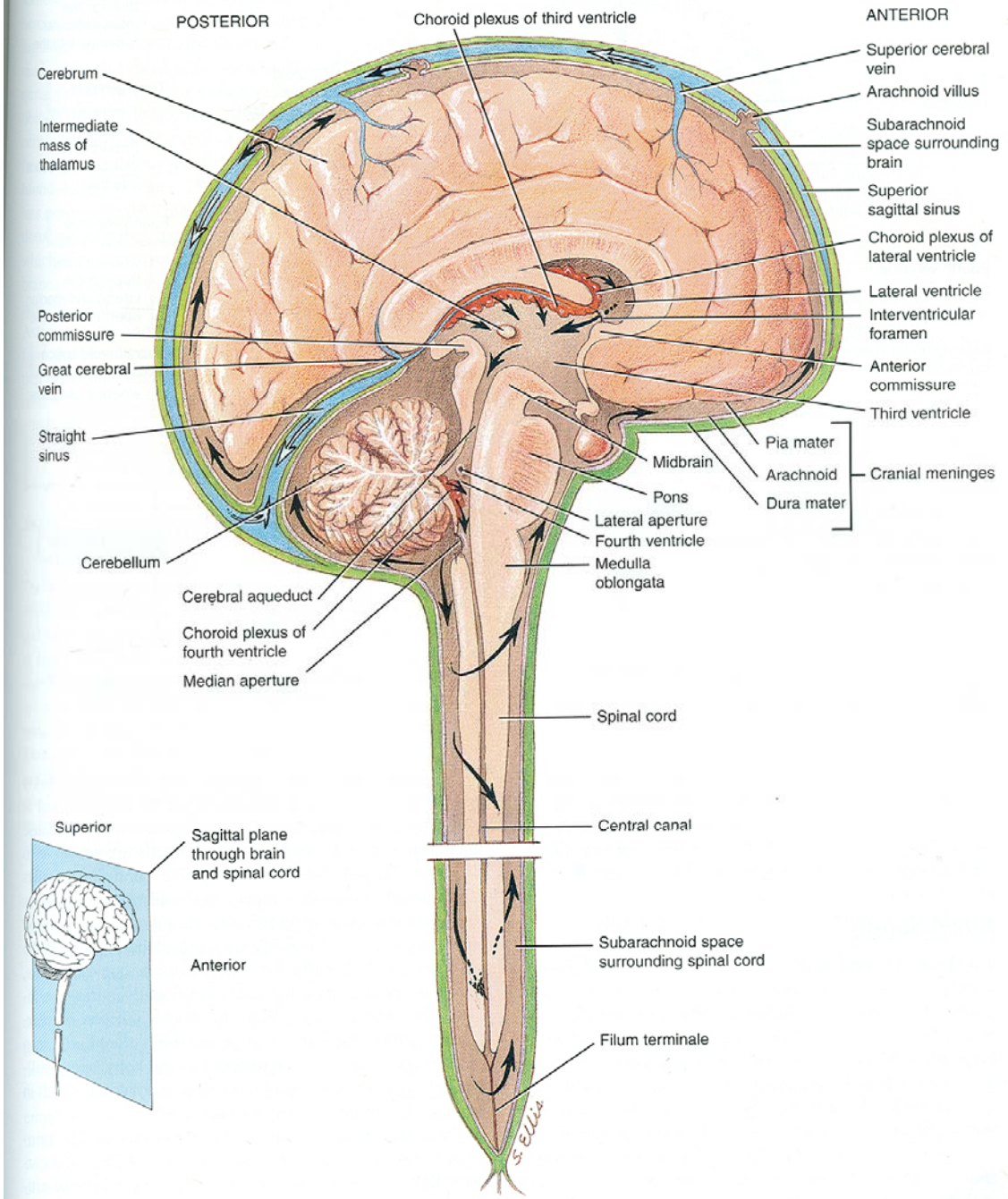


CNS

Brain

Spinal Cord

CSF is formed by ependymal cells that cover the choroid plexuses of the ventricles



(a) Sagittal section of brain, ventricles, spinal cord, and meninges

Figure continues

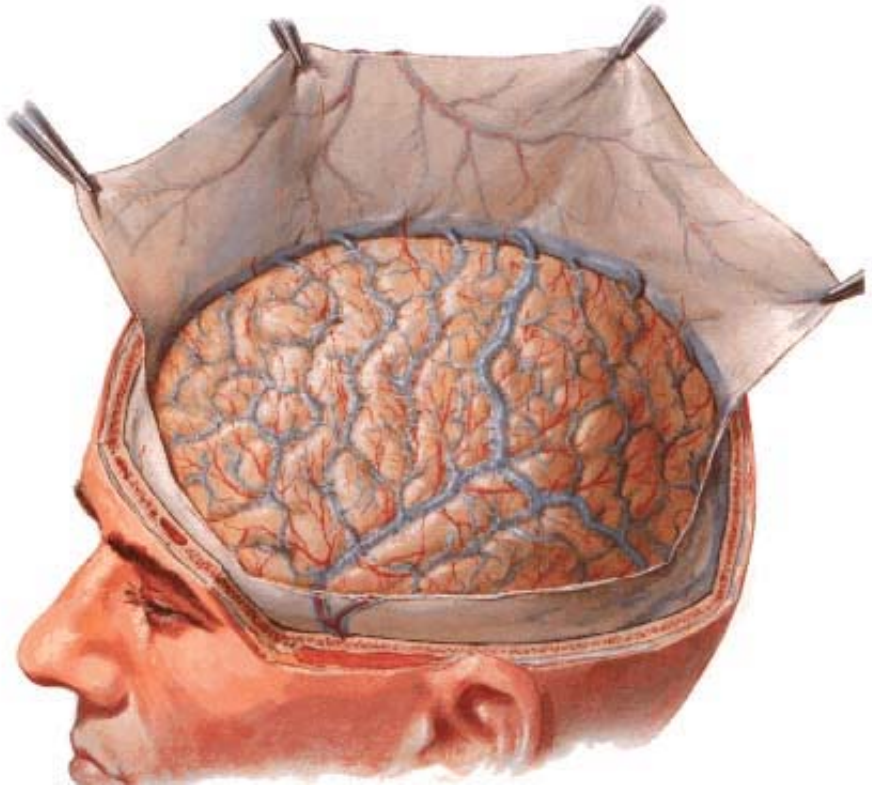
BRAIN

Content of Cranial cavity

Covered with membranes

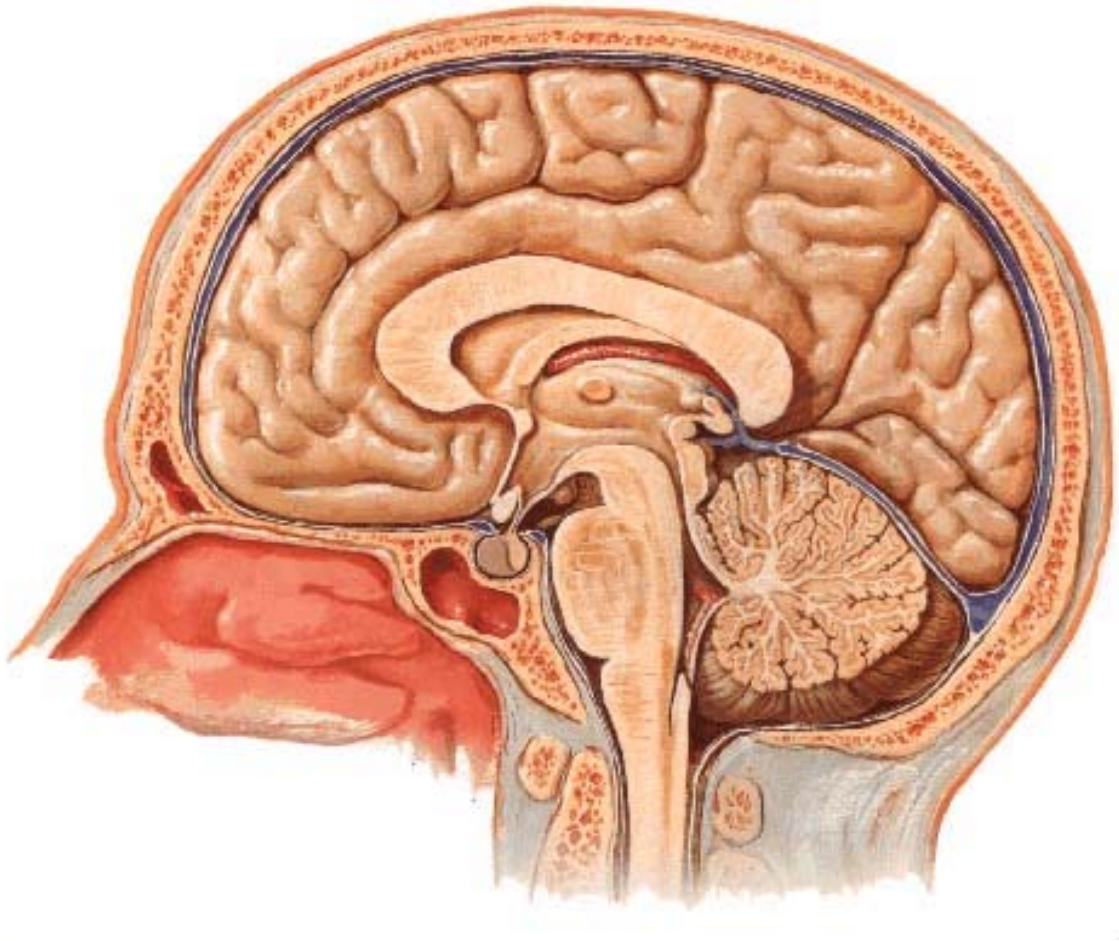
(Meninges)

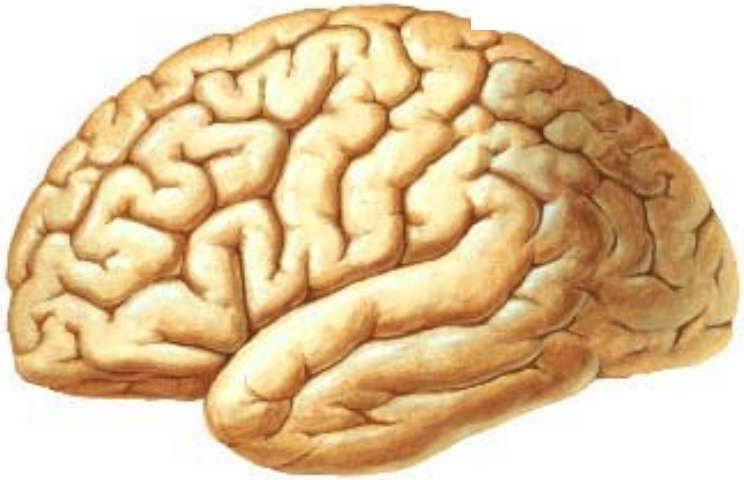
- Dura matter
- Arachnoid matter
- Pia matter

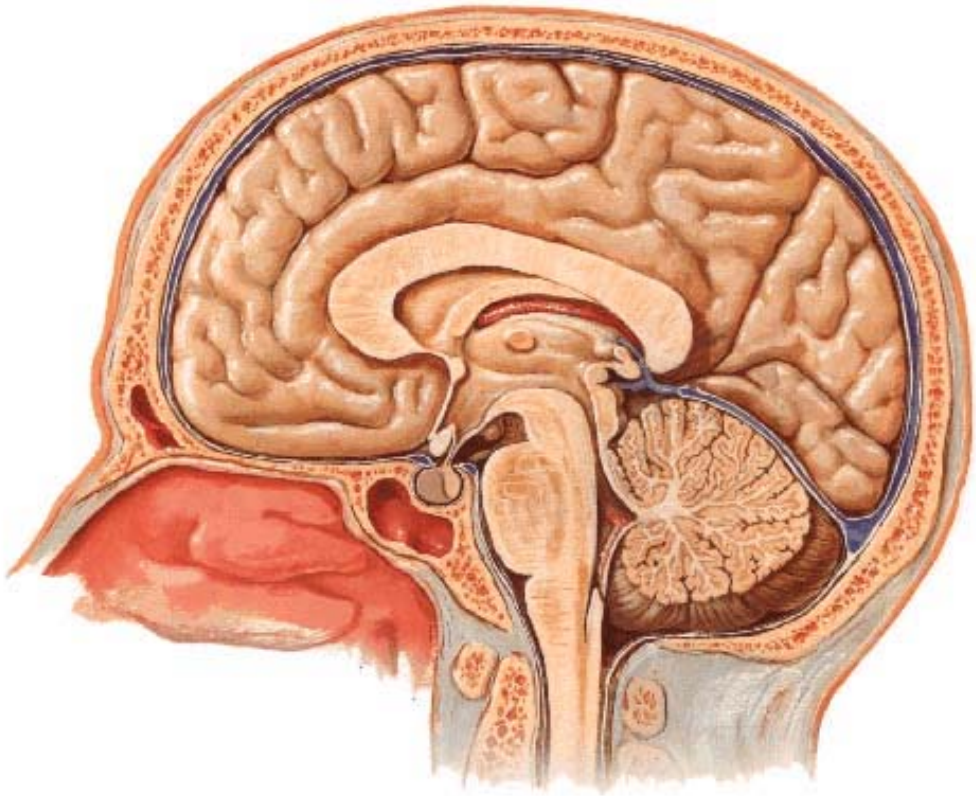


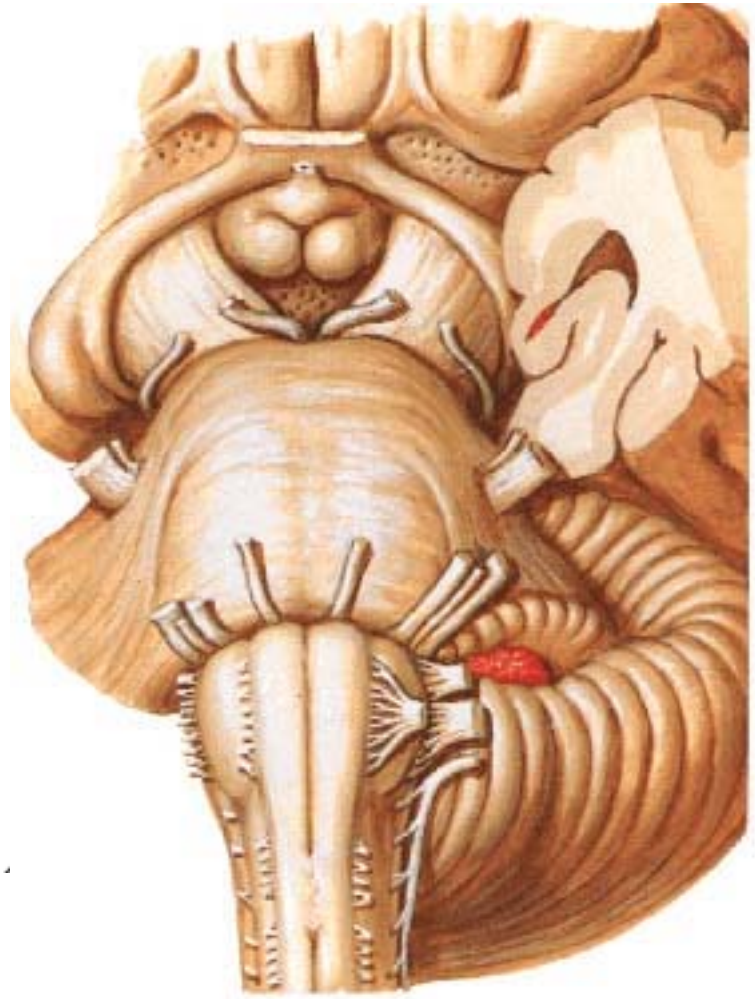
Parts

- Cerebrum
- Cerebellum
- Brain Stem
  - -Mid Brain
  - -Pons
  - -Medulla



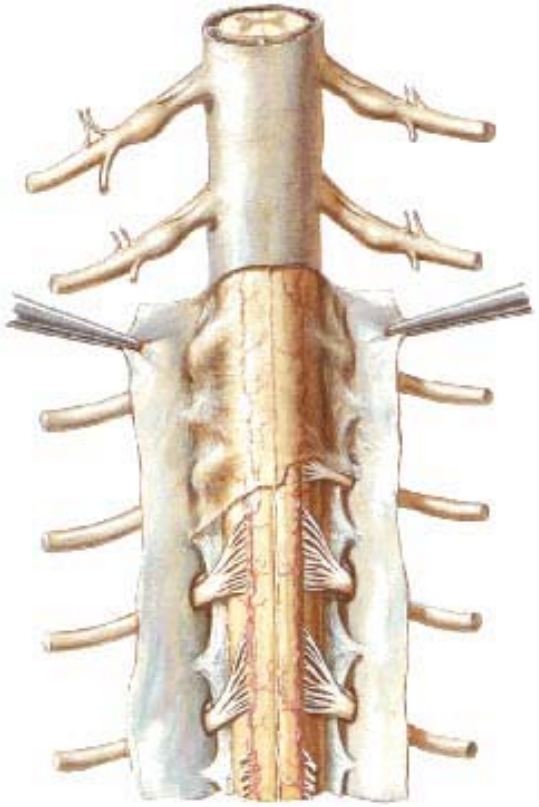




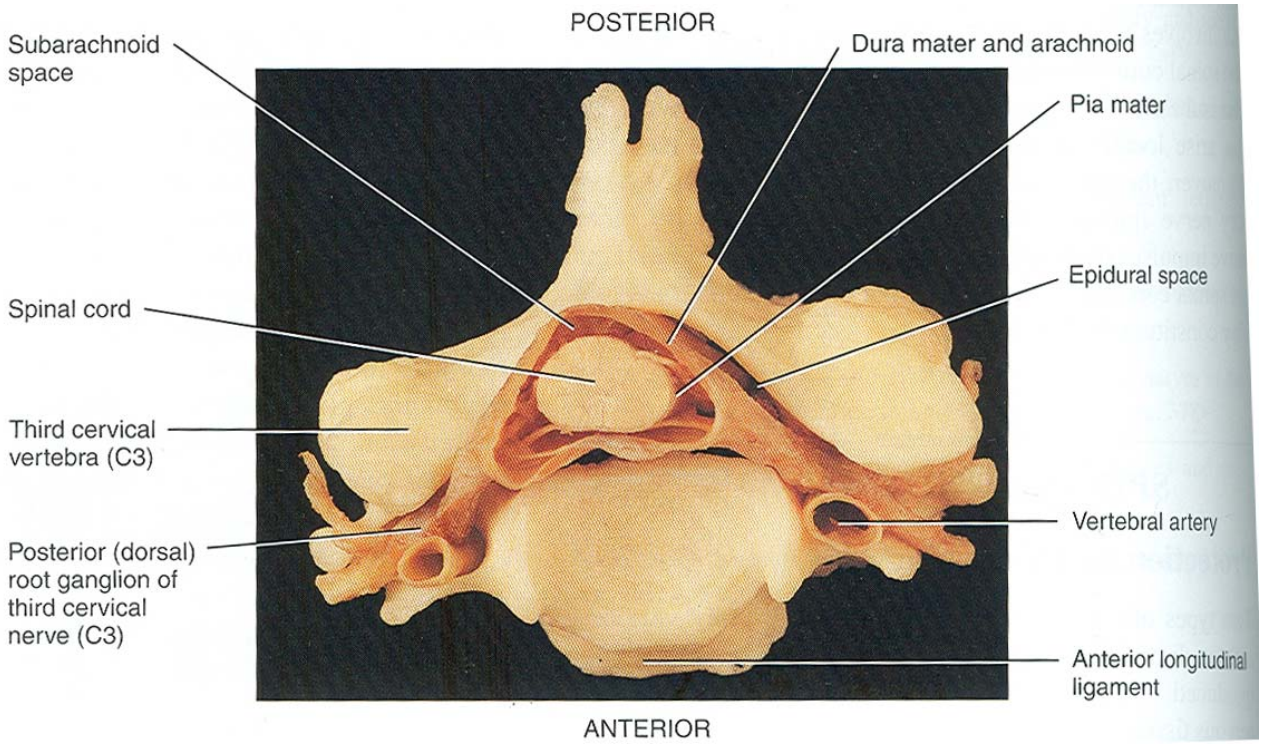


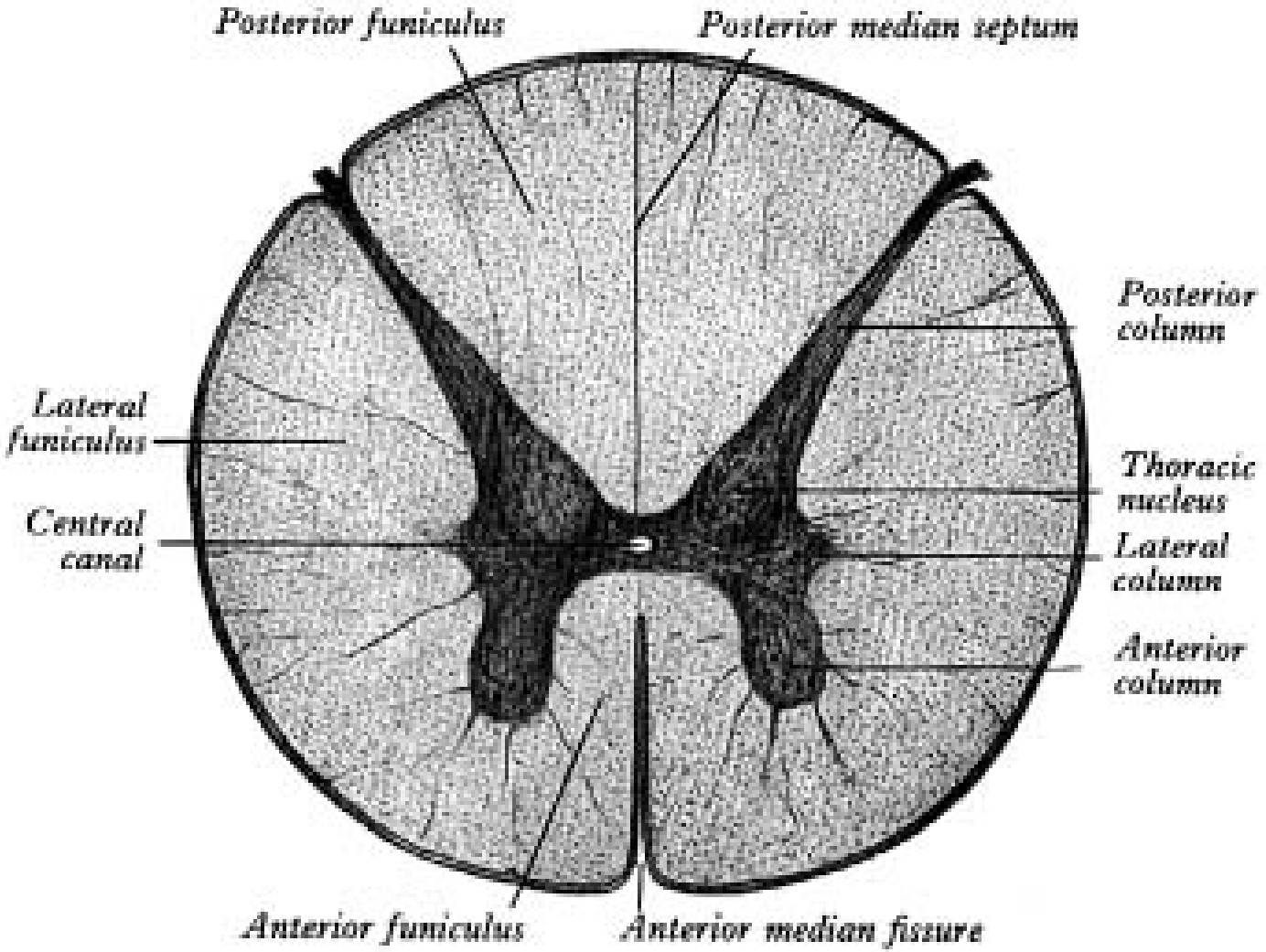
Spinal Cord

- Content of vertebral canal
- Almost rounded in shape
- Covered with meninges
- From F. magnum – Lower border of L1 Vertebra



33 Vertebrae
7 Cervical
12 Thoracic
5 Lumbar
5 Sacral
4 Coccygeal


POSTERIOR
Subarachnoid space
Dura mater and arachnoid
Pia mater
Epidural space
Spinal cord
Third cervical vertebra (C3)
Vertebral artery
Posterior (dorsal) root ganglion of third cervical nerve (C3)
Anterior longitudinal ligament
ANTERIOR


Posterior funiculus
Posterior median septum
Posterior column
Lateral funiculus
Thoracic nucleus
Central canal
Lateral column
Anterior column
Anterior funiculus
Anterior median fissure

PNS (Peripheral Nervous system)

Two Components

1. ***Somatic*** (Cerebrospinal)

---12 Pair Cranial Nerves

----31 pair Spinal Nerves

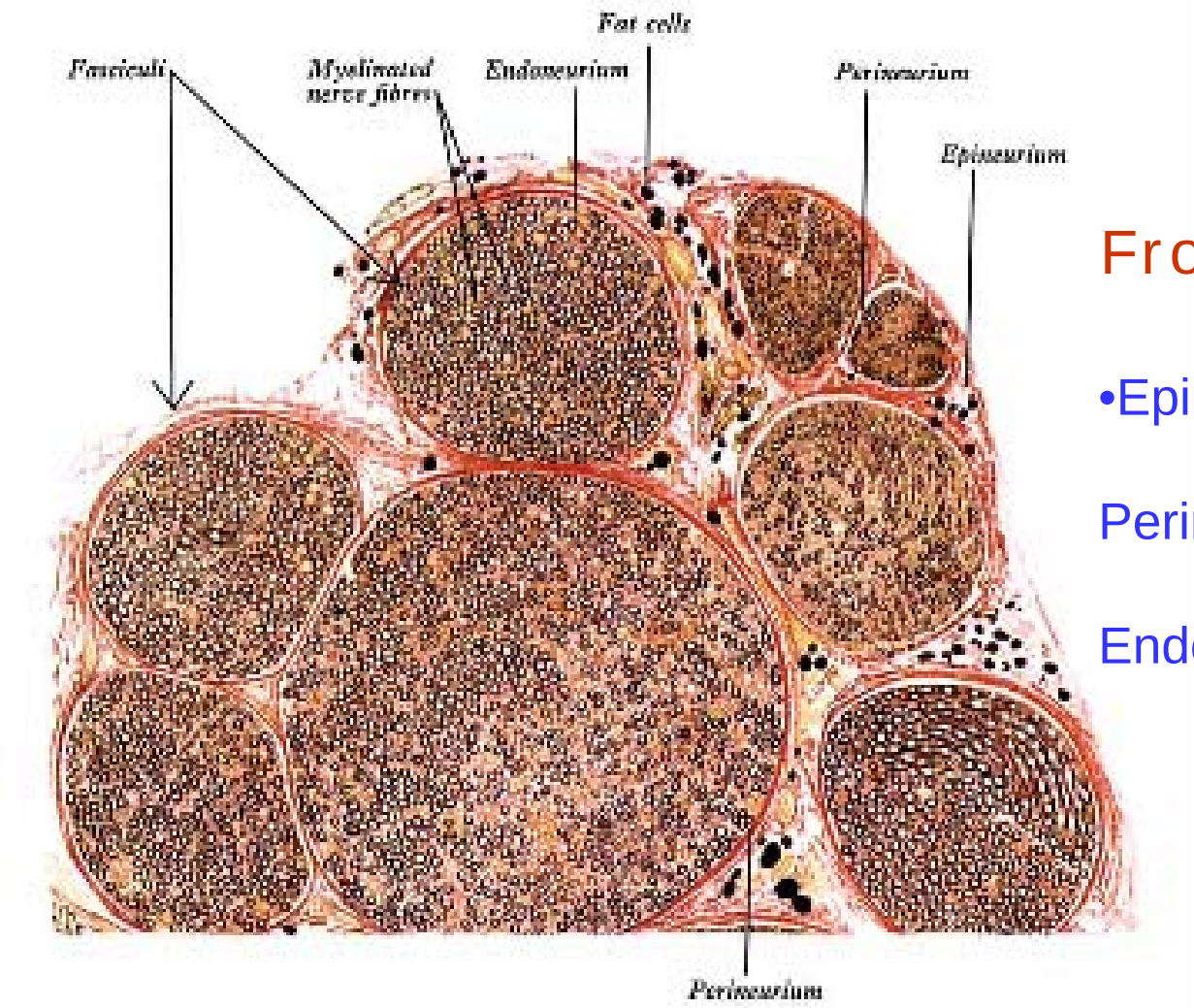
2. ***Visceral*** (Autonomic Nervous System – ANS)

----Visceral or Splanchnic nerves

two – subdivisions

i) Sympathetic

ii) Parasympathetic



From outside – inward

- Epineurium – whole nerve trunk
- Perineurium –each fasciculus
- Endoneurium – Each nerve fiber

Nerve – composed of bundle (Fasciculi) of nerve fibers (axon with) its covering bounded by connective tissue sheath

Somatic Component

- Deals with any change in external environment – Extroceptive or Proprioceptive

General Sensations like

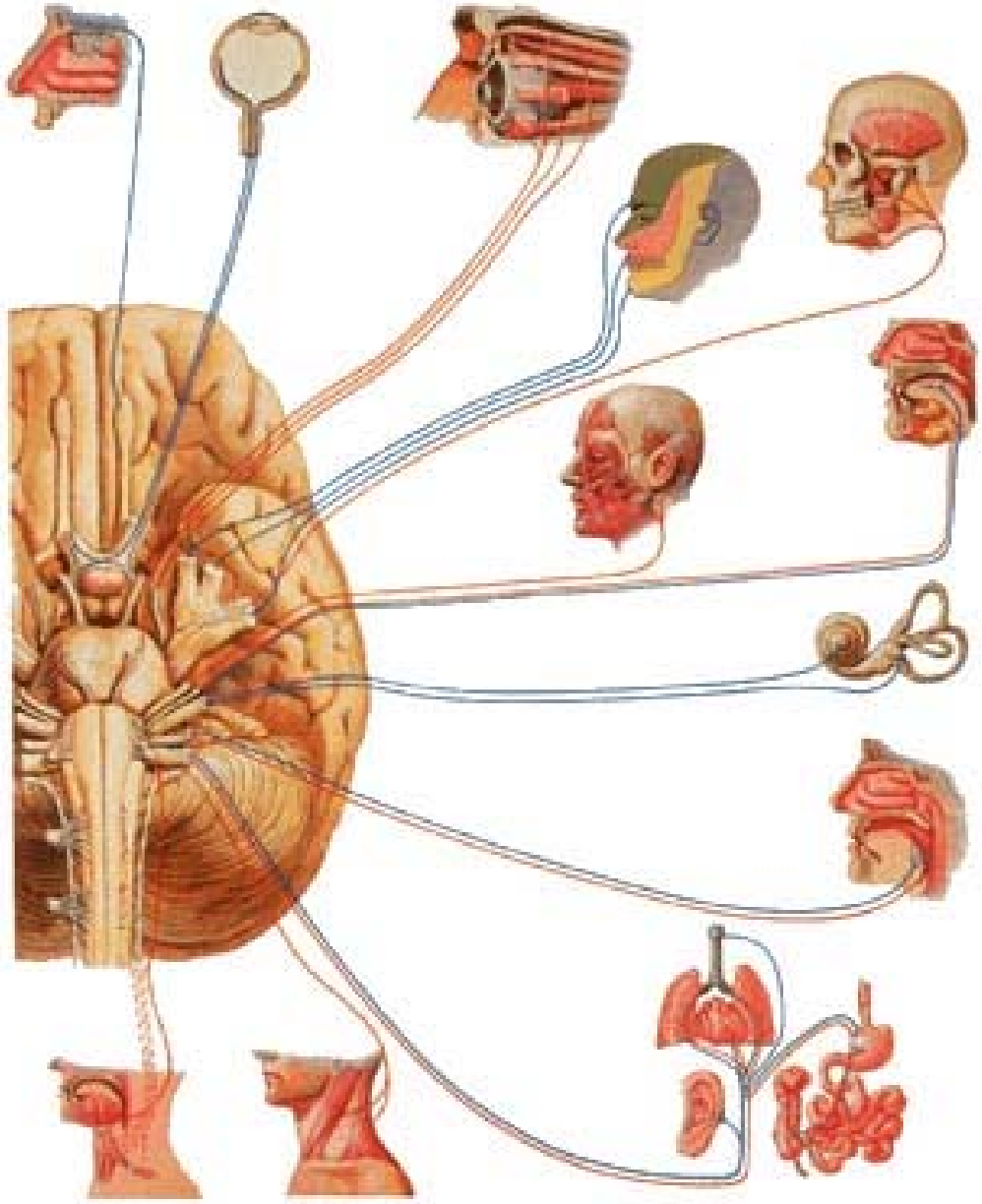
- Pain , Touch , Temp. --- From Skin
- Sensations from muscles , bones , joints, limbs

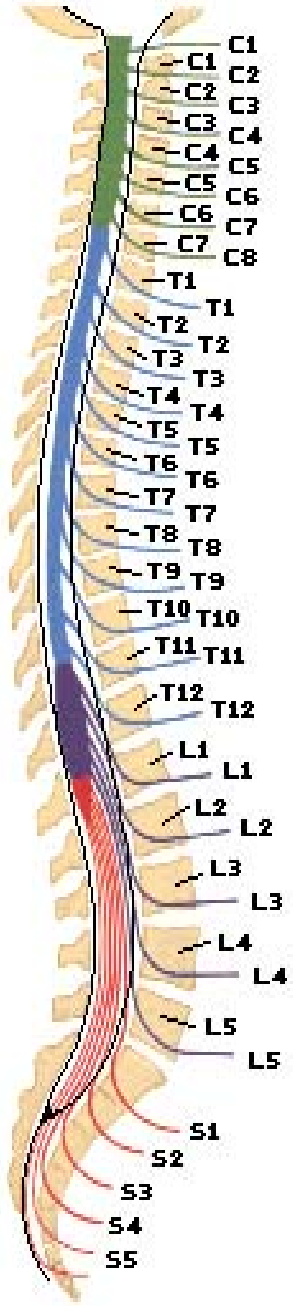
Special Sensations like

- Vision
- Hearing
- Balancing – Through vestibular receptors

Cranial Nerves

1. **OLFACTORY**
2. **OPTIC**
3. **OCCULOMOTOR**
4. **TROCHLEAR**
5. **TRIGERMINAL**
6. **ABDUCENT**
7. **FACIAL**
8. **VESTIBULO-COCLEAR**
9. **GLOSSOPHARYNGEAL**
10. **VAGUS**
11. **ACCESSORY**
12. **HYPOGLOSSAL**





31 Pairs Spinal Nerves

Includes

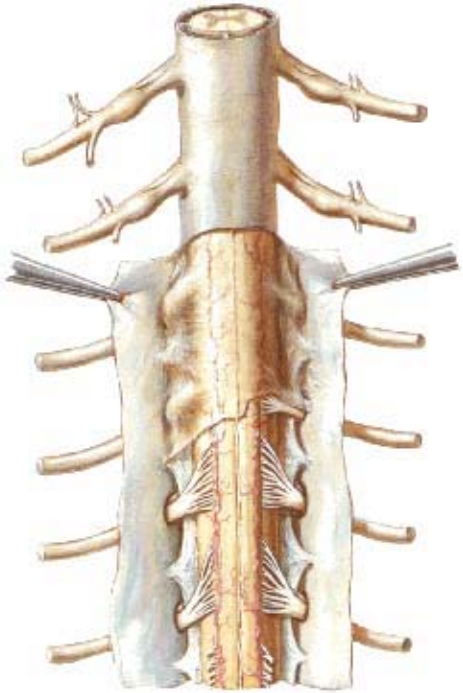
Cervical -8 (C1 ----C8)

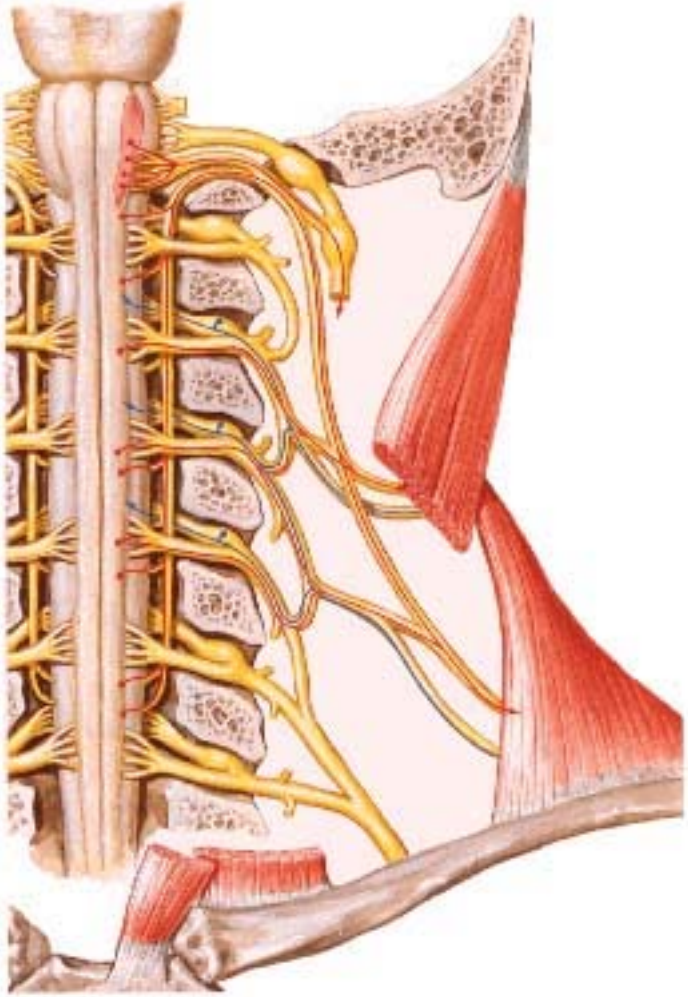
Thoracic -12 (T1-T12)

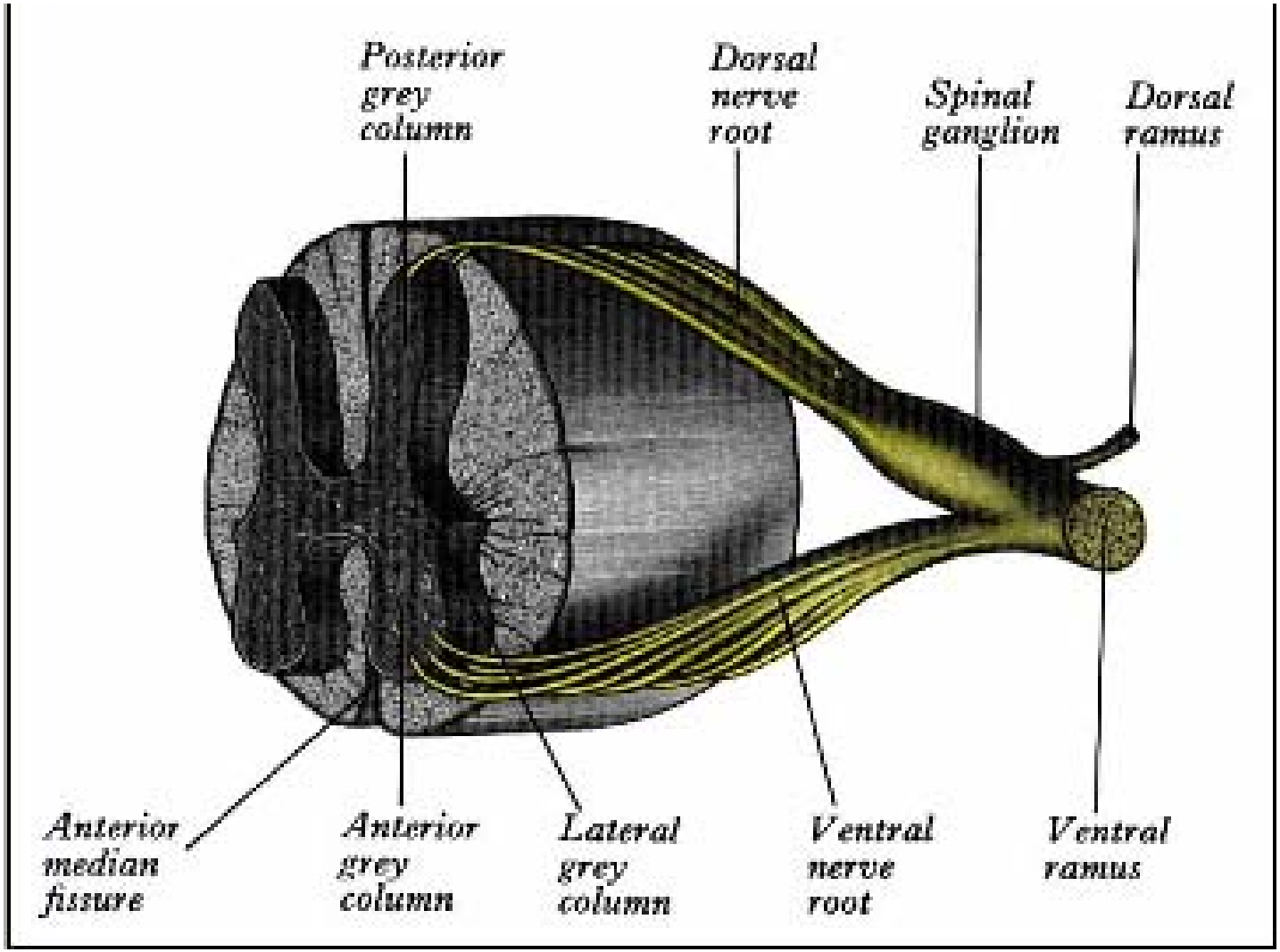
Lumbar – 5 (L1-L5)

Sacral _ 5 (S1– S5)

Coccyx – 1 (Co -1)






Posterior grey column
Dorsal nerve root
Spinal ganglion
Dorsal ramus
Anterior median fissure
Anterior grey column
Lateral grey column
Ventral nerve root
Ventral ramus

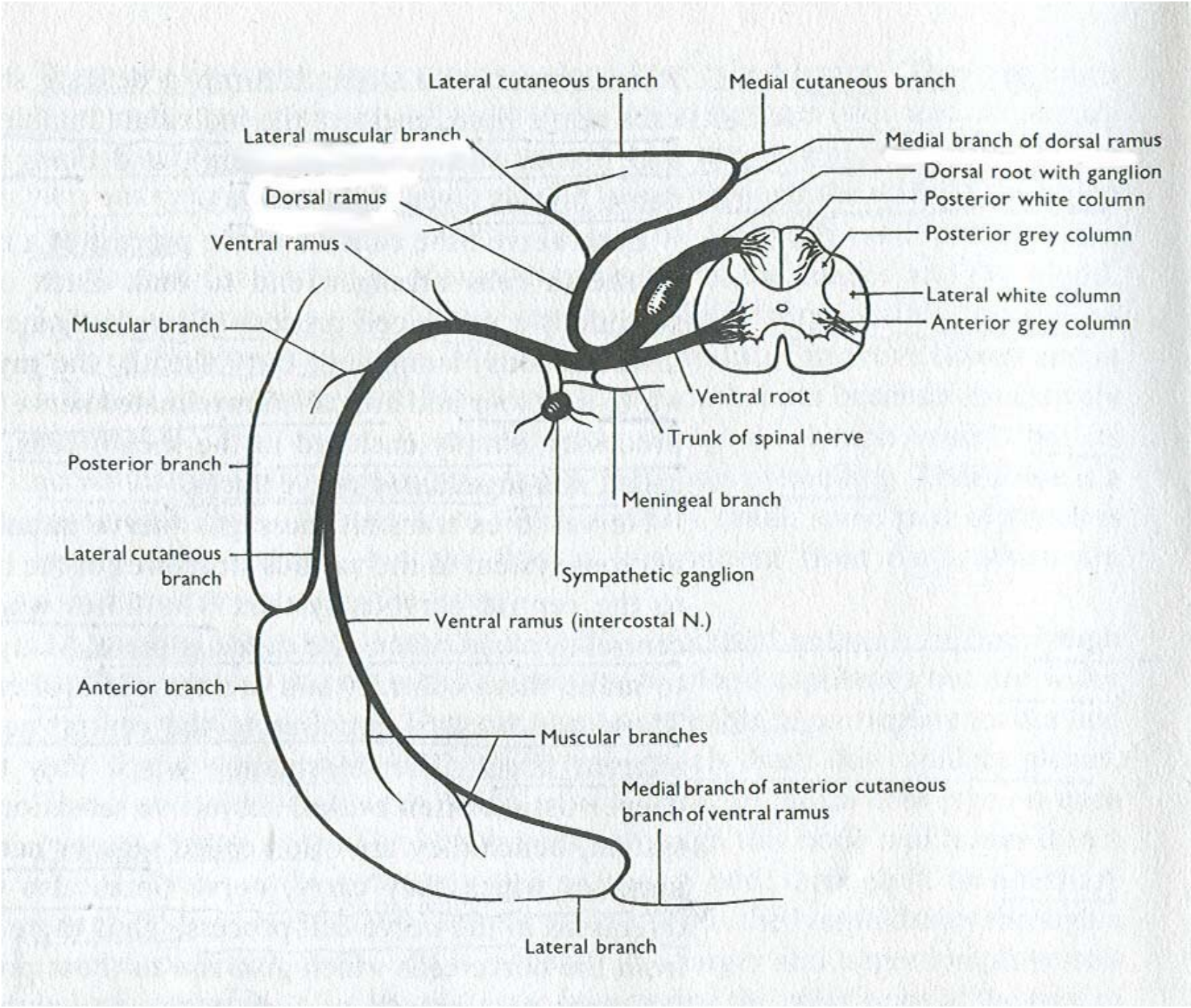
Spinal Nerve

Joining of anterior (ventral) and Posterior (dorsal) nerve roots arising from rootlets

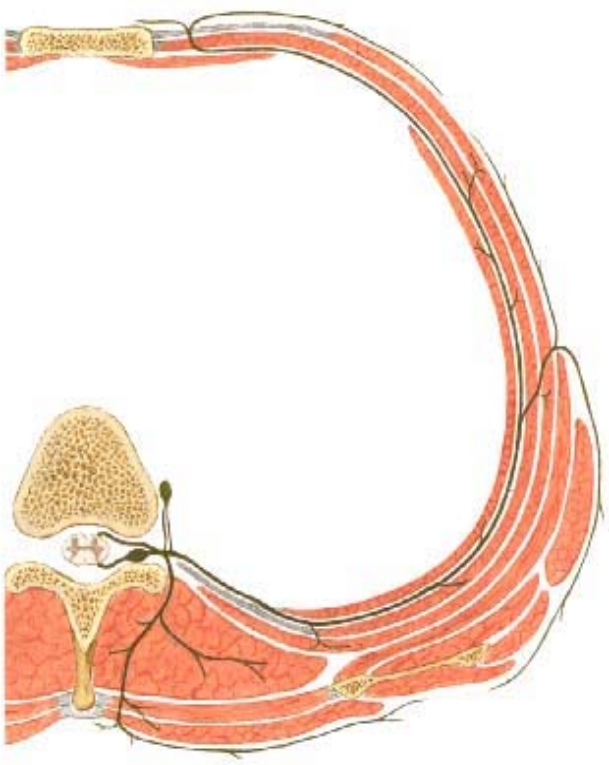
Spinal Segment

Length of the spinal cord originating rootlets of one spinal nerve

TYPICAL SPINAL NERVE



Spinal Nerve

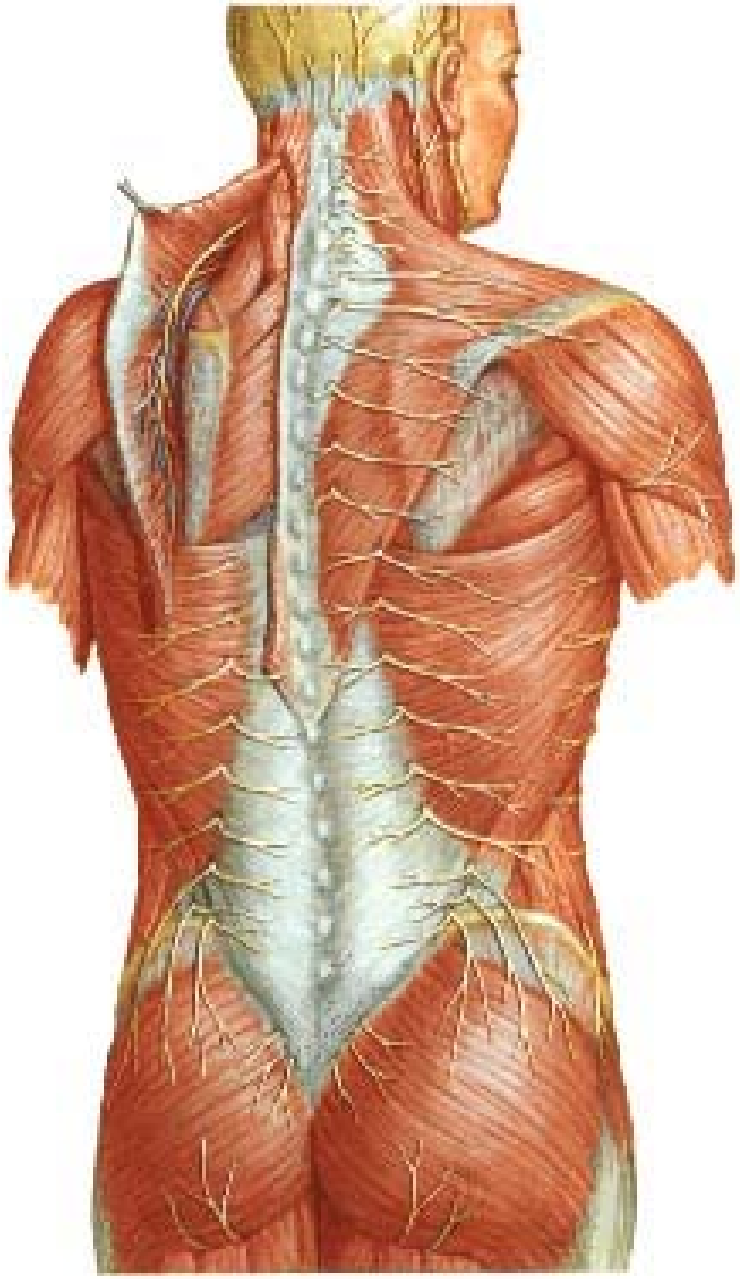


Dorsal Root & Ventral Root
Join to form trunk of spinal nerve
At intervertebral foramina

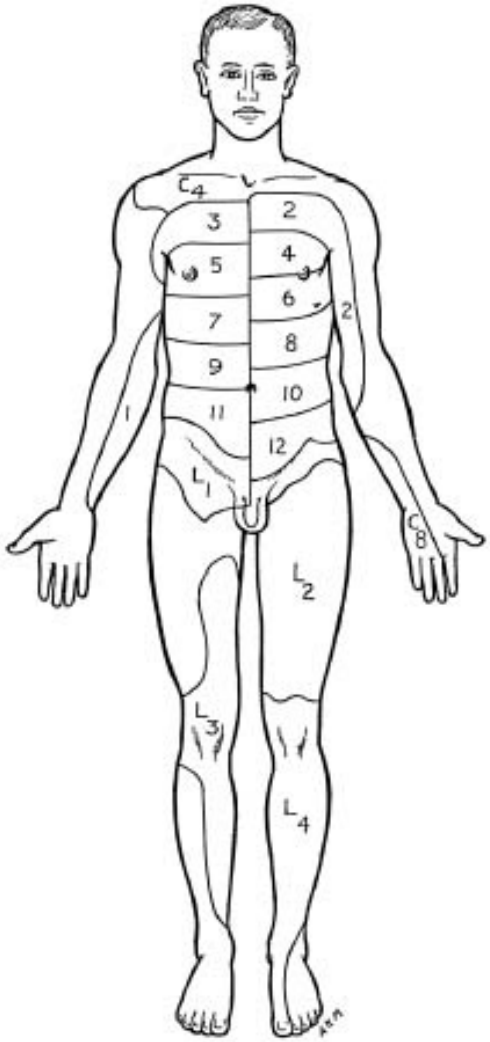
divide into Dorsal and ventral ramus

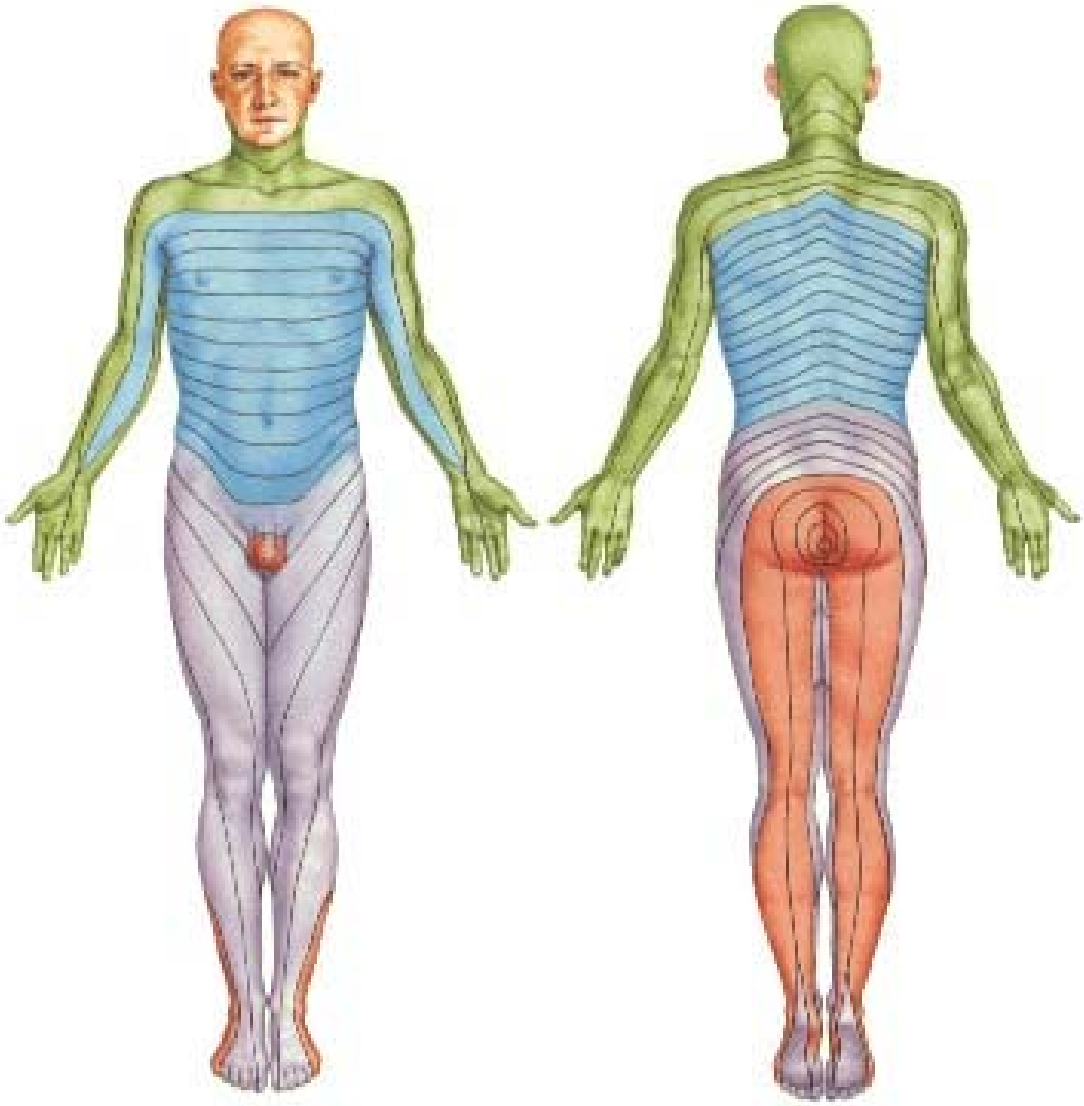
Dorsal ramus runs posteriorly and divide in Medial and Lateral Branches to supply muscles of back, and give Cut. Branches

Ventral ramus runs anteriorly and give lateral cutaneous br. which further subdivide In Anterior and Posterior branches
Rest continue as Ant. Cut. Branch

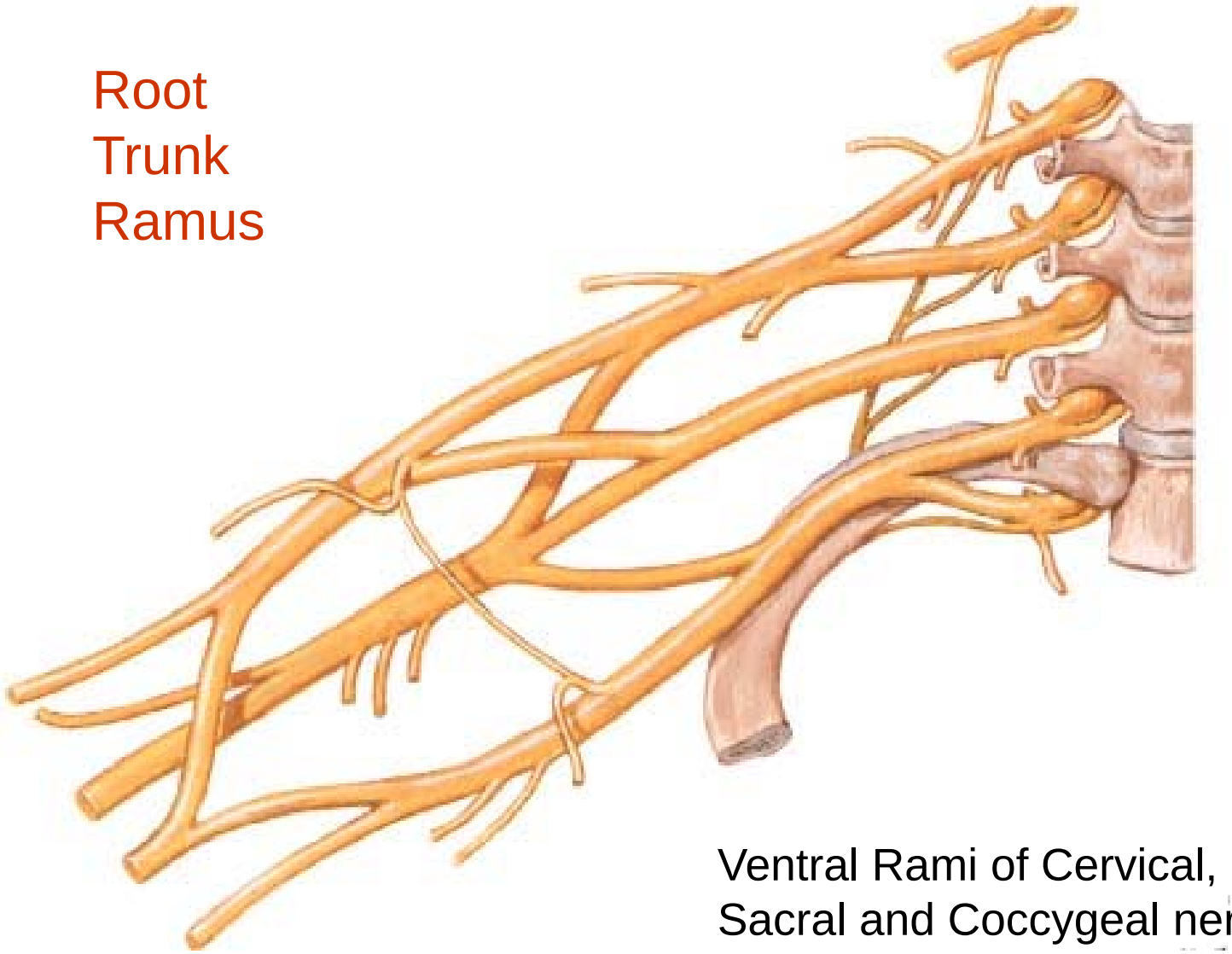


Dermatome – Area of the skin supplied by a single segment of spinal cord

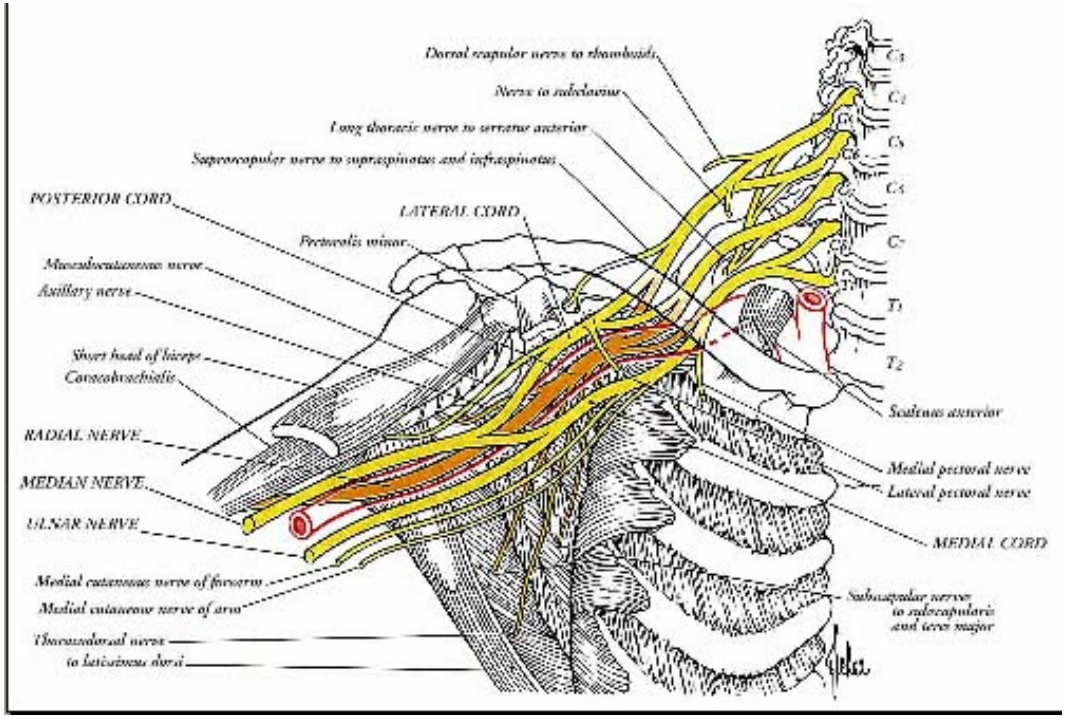




Root
Trunk
Ramus



Ventral Rami of Cervical, Lumbar.
Sacral and Coccygeal nerves join
To form Nerve Plexuses


Dorsal scapular nerve to rhomboids
Nerve to subclavius
Long thoracic nerve to serratus anterior
Suprascapular nerve to supraspinatus and infraspinatus
POSTERIOR CORD
LATERAL CORD
Pectoralis minor
Musculocutaneous nerve
Axillary nerve
Short head of biceps
Coracobrachialis
RADIAL NERVE
MEDIAN NERVE
ULNAR NERVE
Medial cutaneous nerve of forearm
Medial cutaneous nerve of arm
Thoracodorsal nerve
to latissimus dorsi
C5
C6
C7
C8
T1
T2
Scalenus anterior
Medial pectoral nerve
Lateral pectoral nerve
MEDIAL CORD
Subscapular nerves
to subscapularis
and teres major