The Spinal Cord

Spinal Cord

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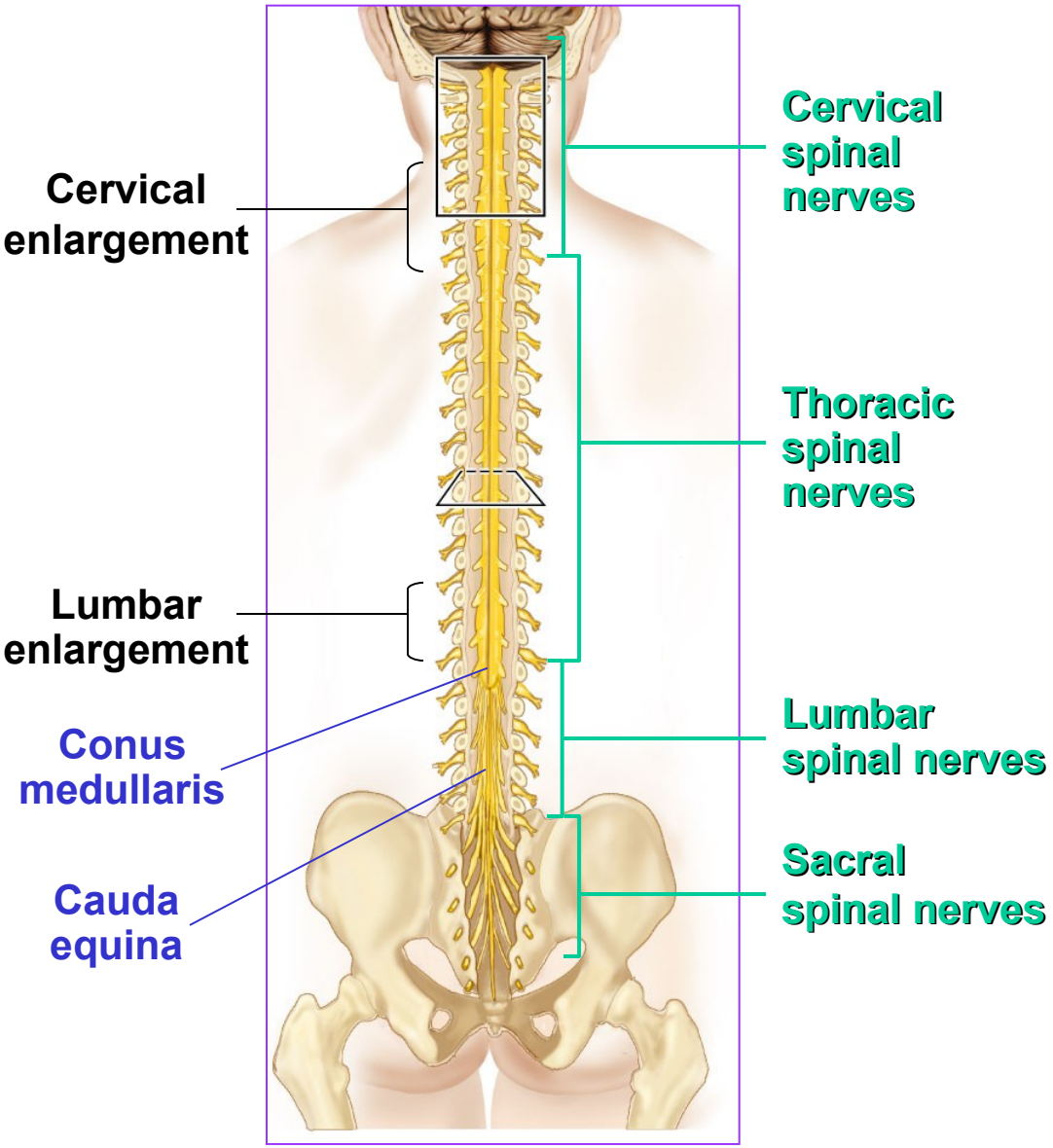
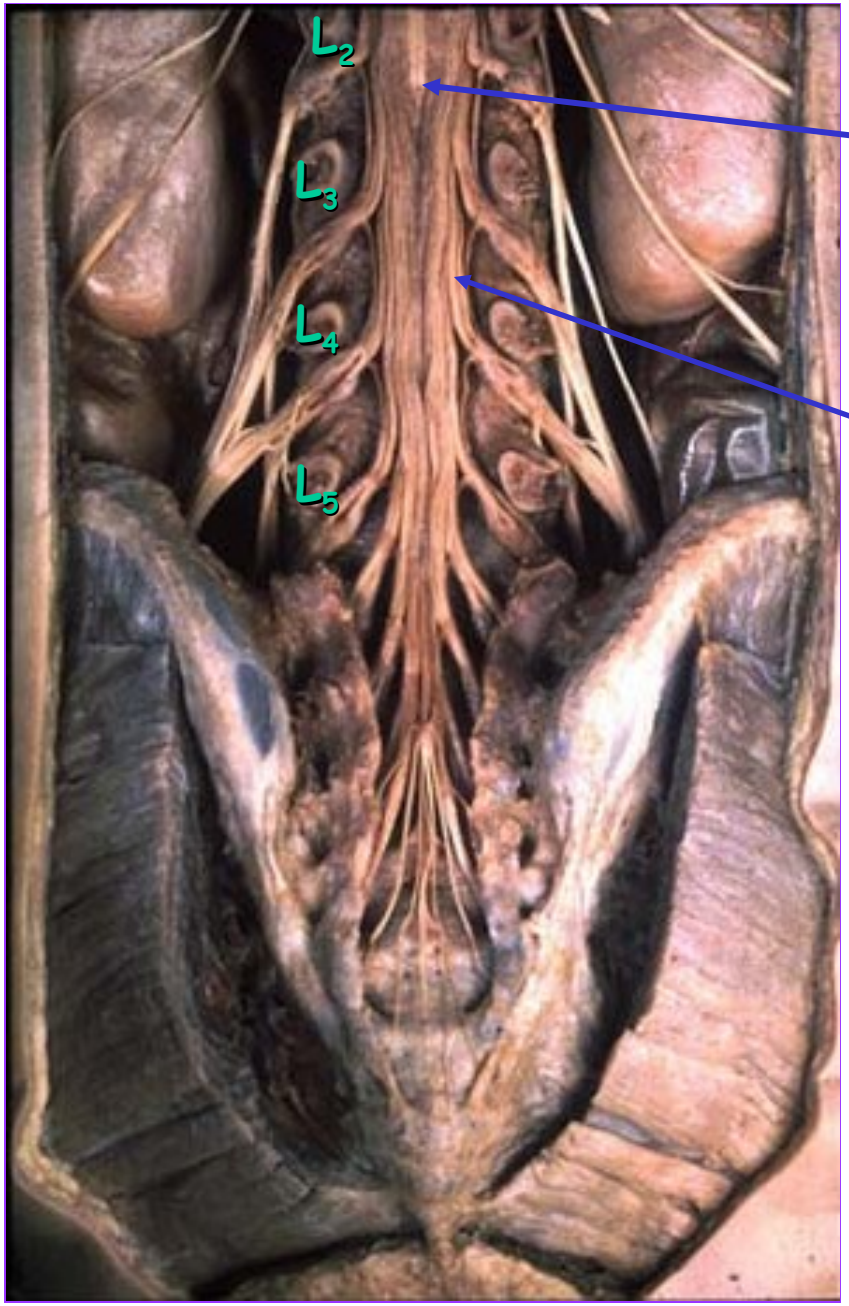


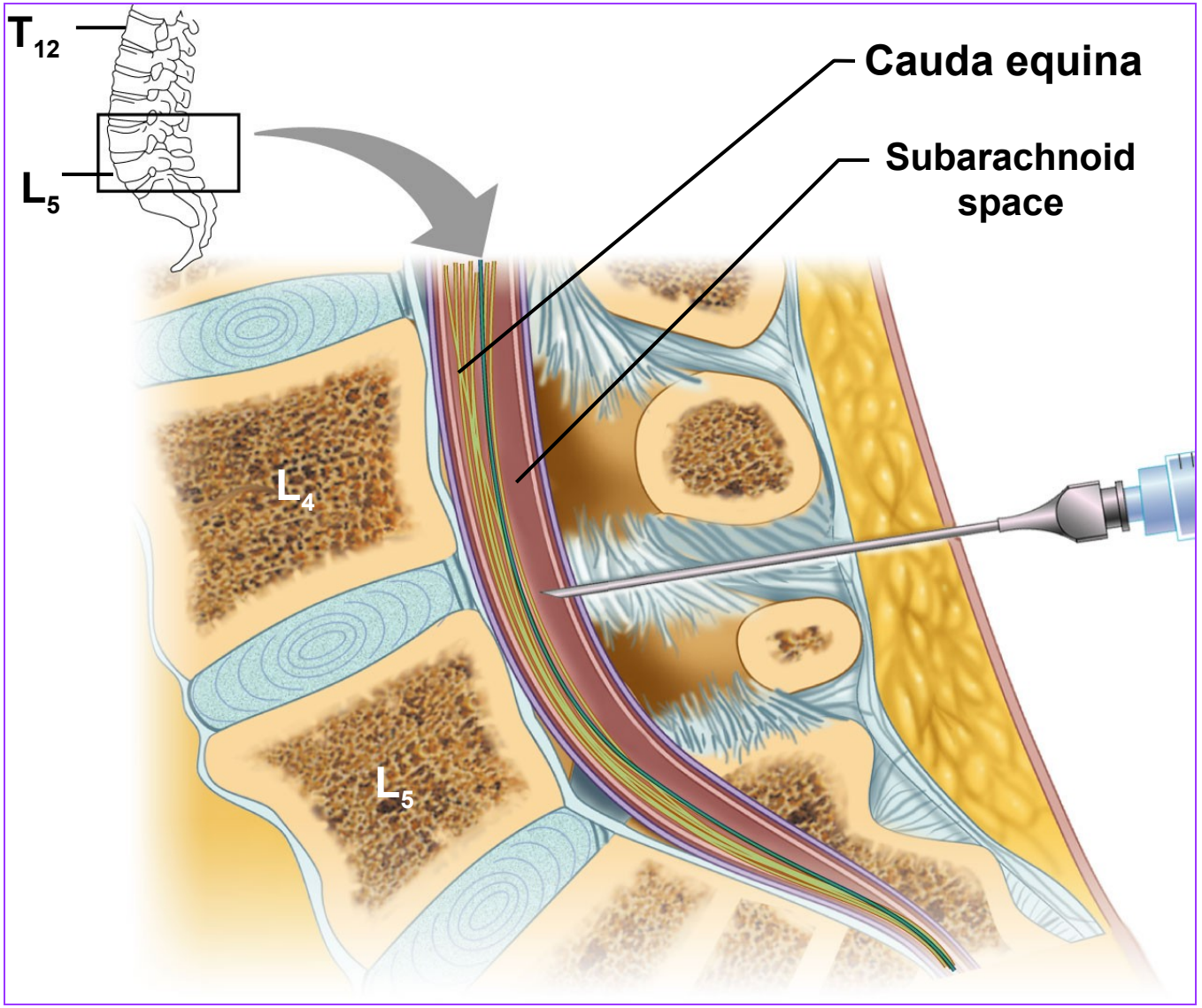


Conus Medullaris

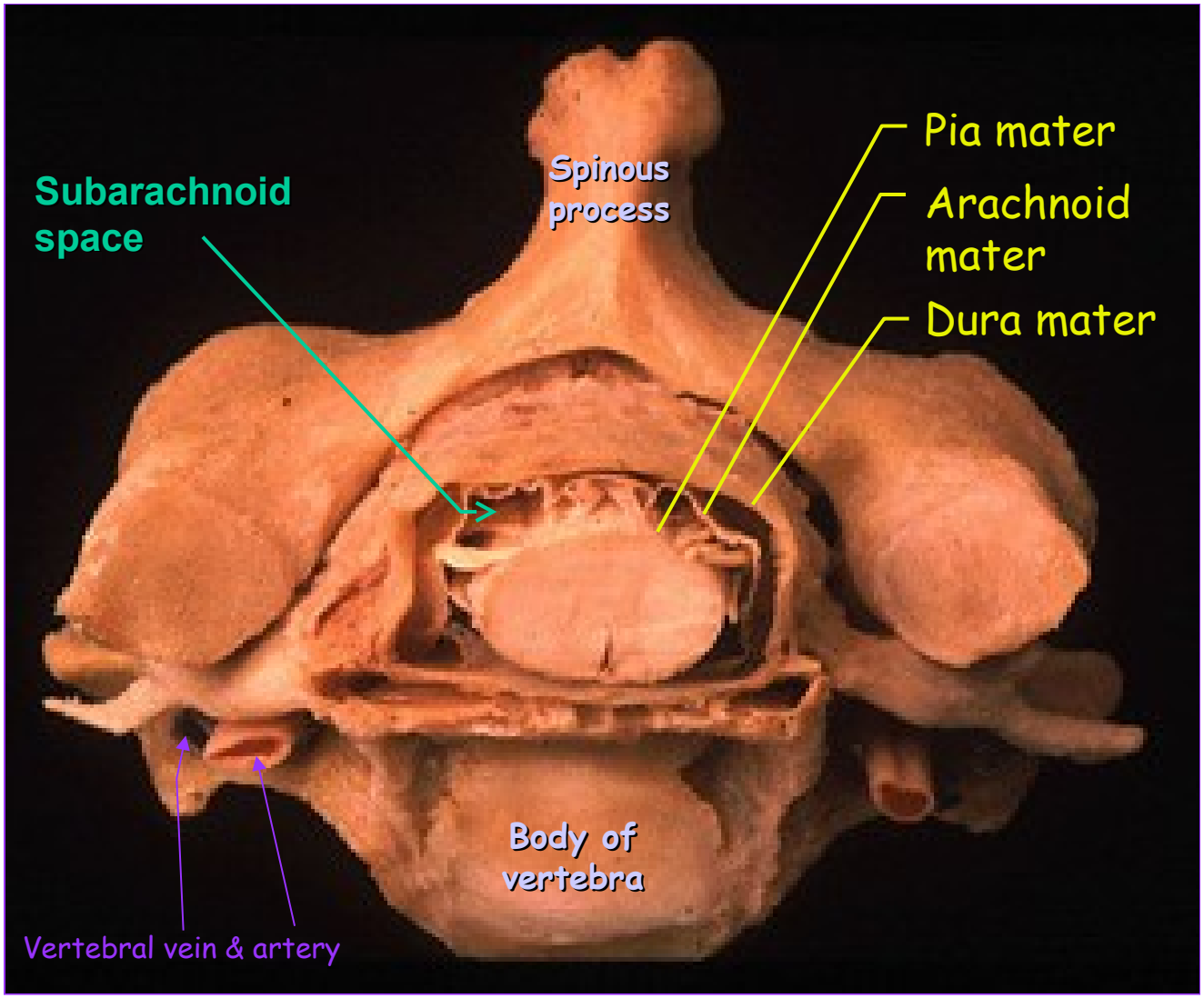
Cauda Equina

(horse's tail)

Lumbar Tap

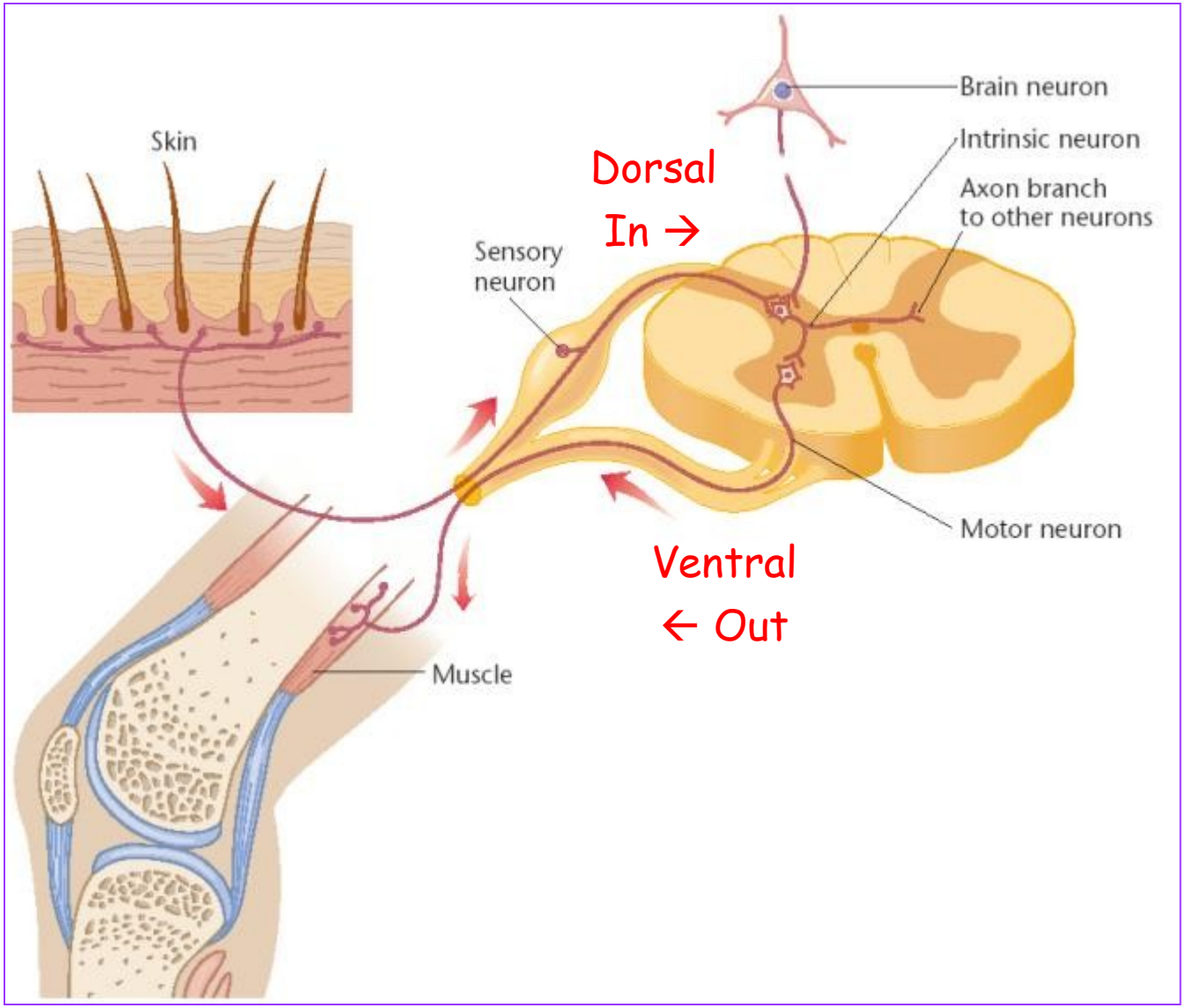


Cross Section of SC Between C2 and C3

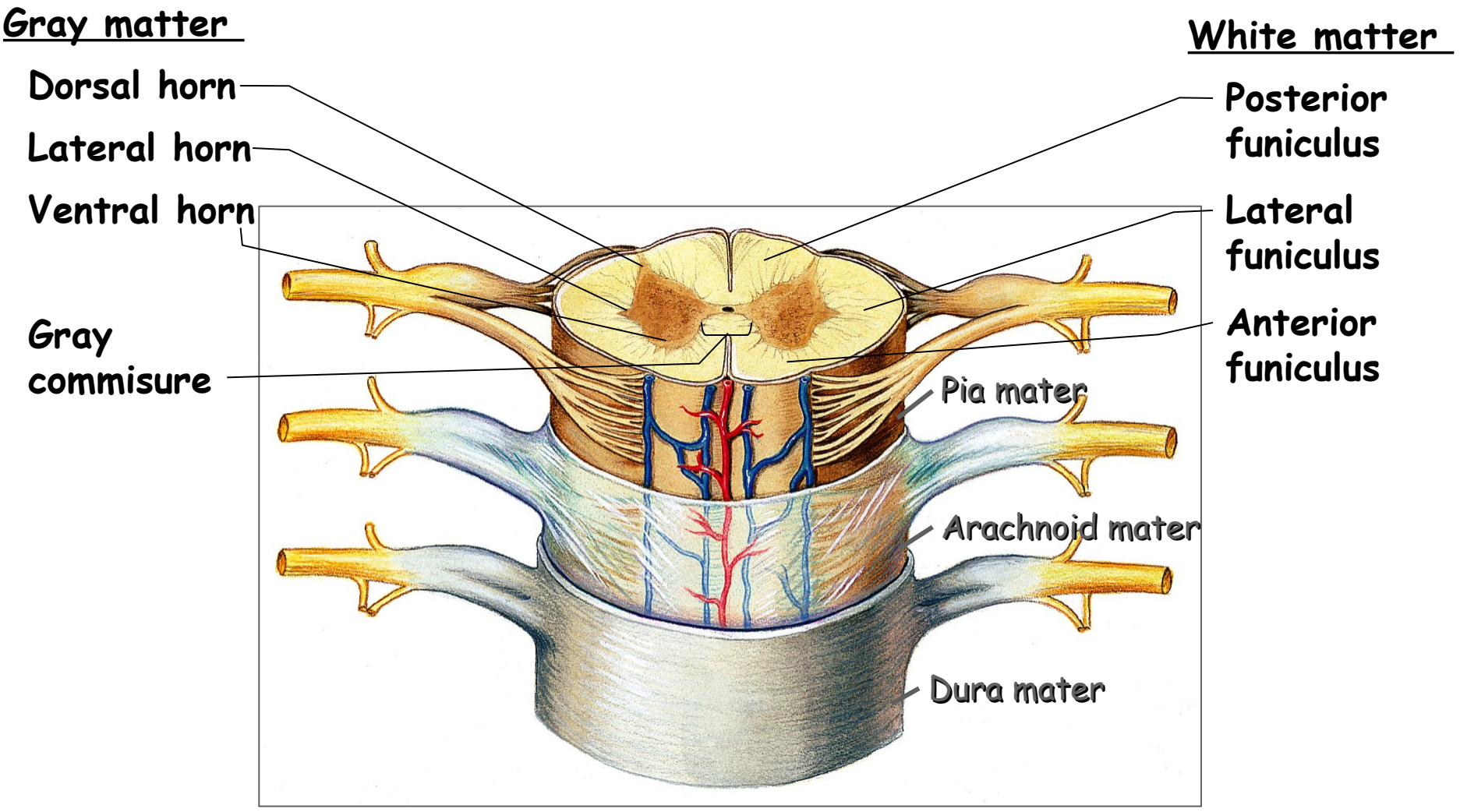


Which is the dorsal side?

Physiology


Brain neuron
Intrinsic neuron
Axon branch
to other neurons
Skin
Dorsal
In →
Sensory
neuron
Motor neuron
Ventral
← Out
Muscle

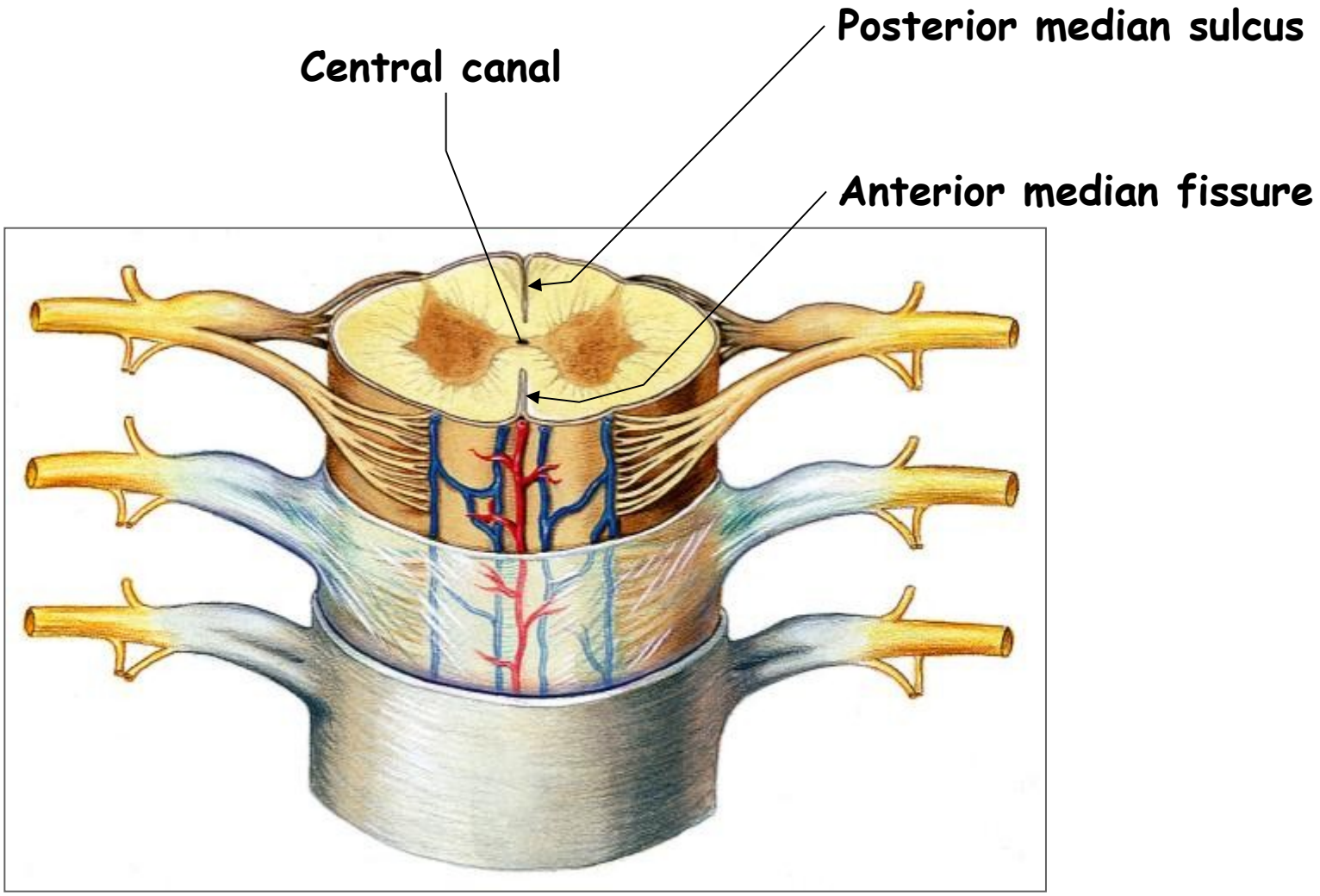
Spinal Cord Anatomy



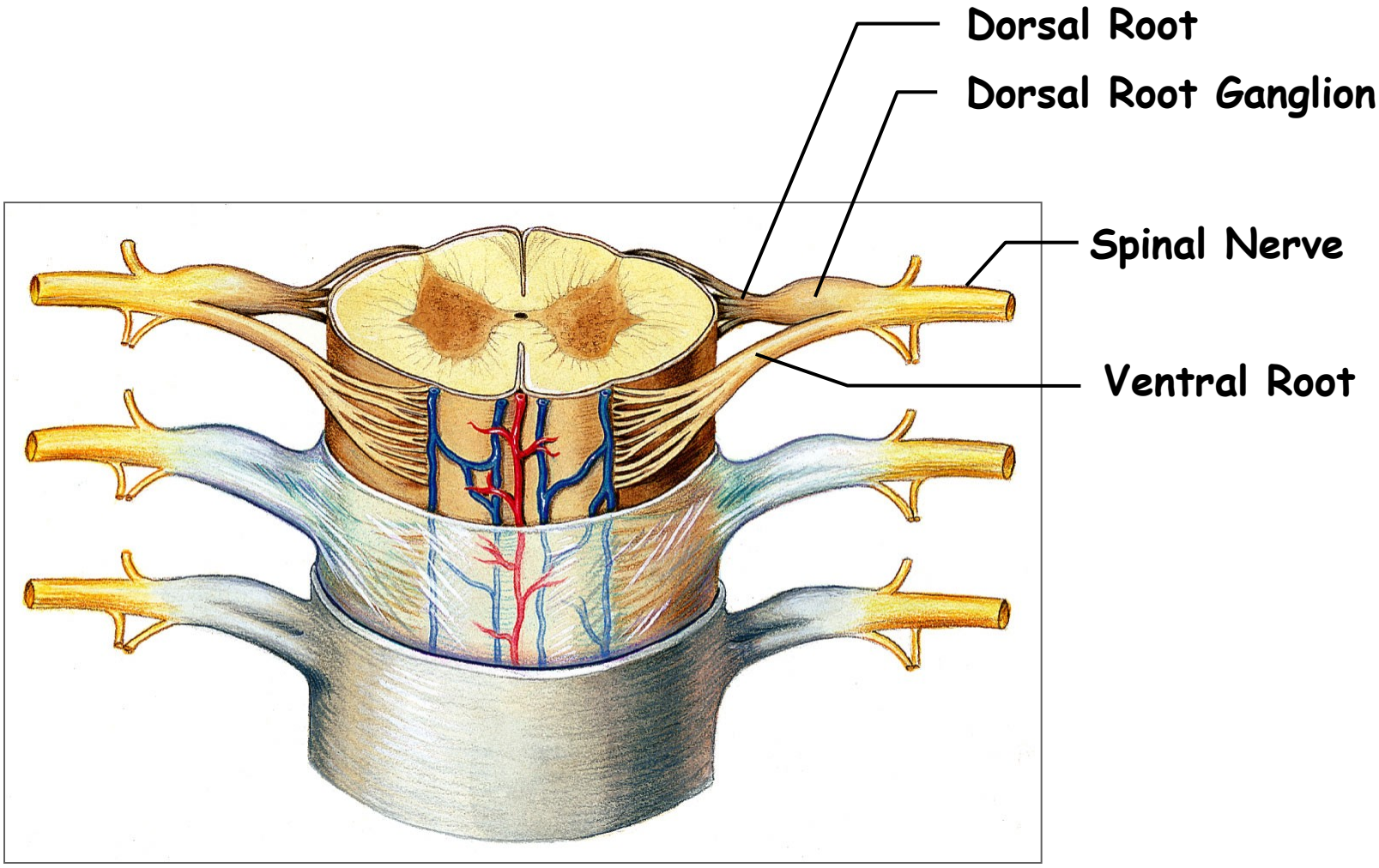
Gray matter = Inside, cell bodies & unmyelinated fiber tracts

White matter = Outside, myelinated fiber tracts

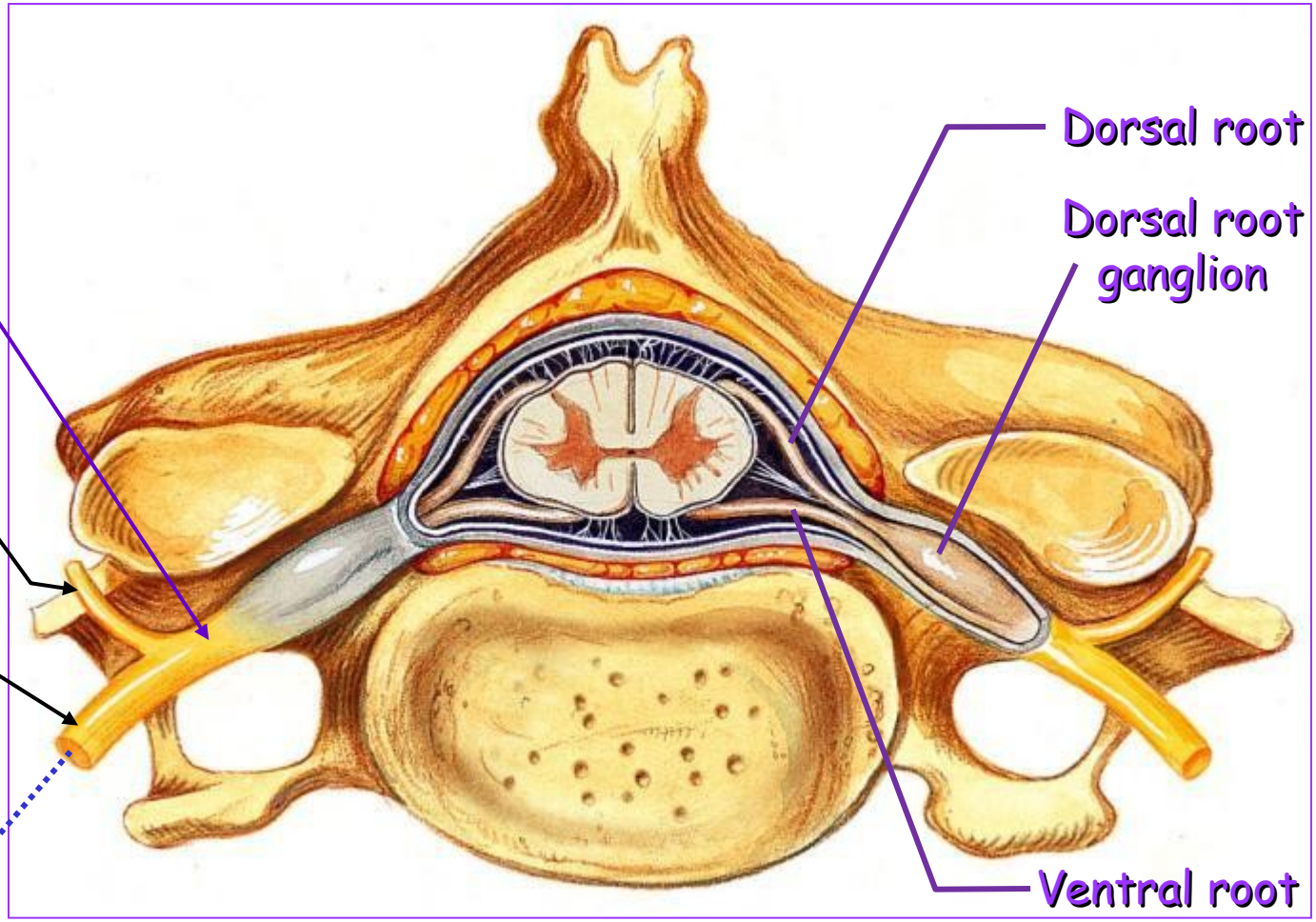
Spinal Cord Anatomy



Spinal Cord / Spinal Nerve Anatomy



Spinal Cord / Spinal Nerve Anatomy



Cross sectional anatomy of the spinal cord

A visual analogy?

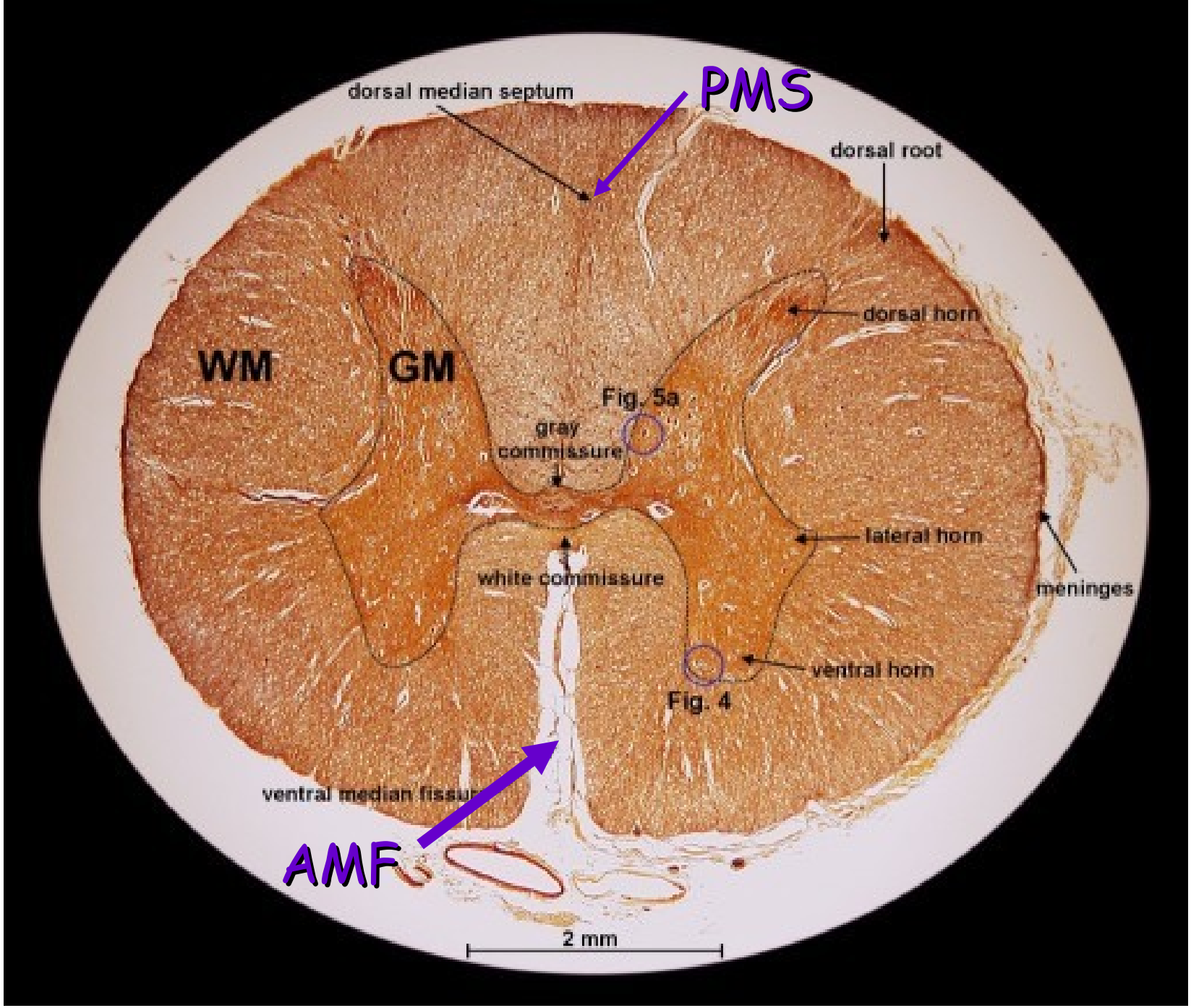
Dorsal horn?

Ventral horn?

Dorsal horns
•sensory neurons

Gray commissure

Ventral horns
•motor neurons


dorsal median septum
PMS
dorsal root
dorsal horn
WM
GM
Fig. 5a
gray commissure
lateral horn
white commissure
meninges
ventral horn
Fig. 4
ventral median fissure
AMF
2 mm

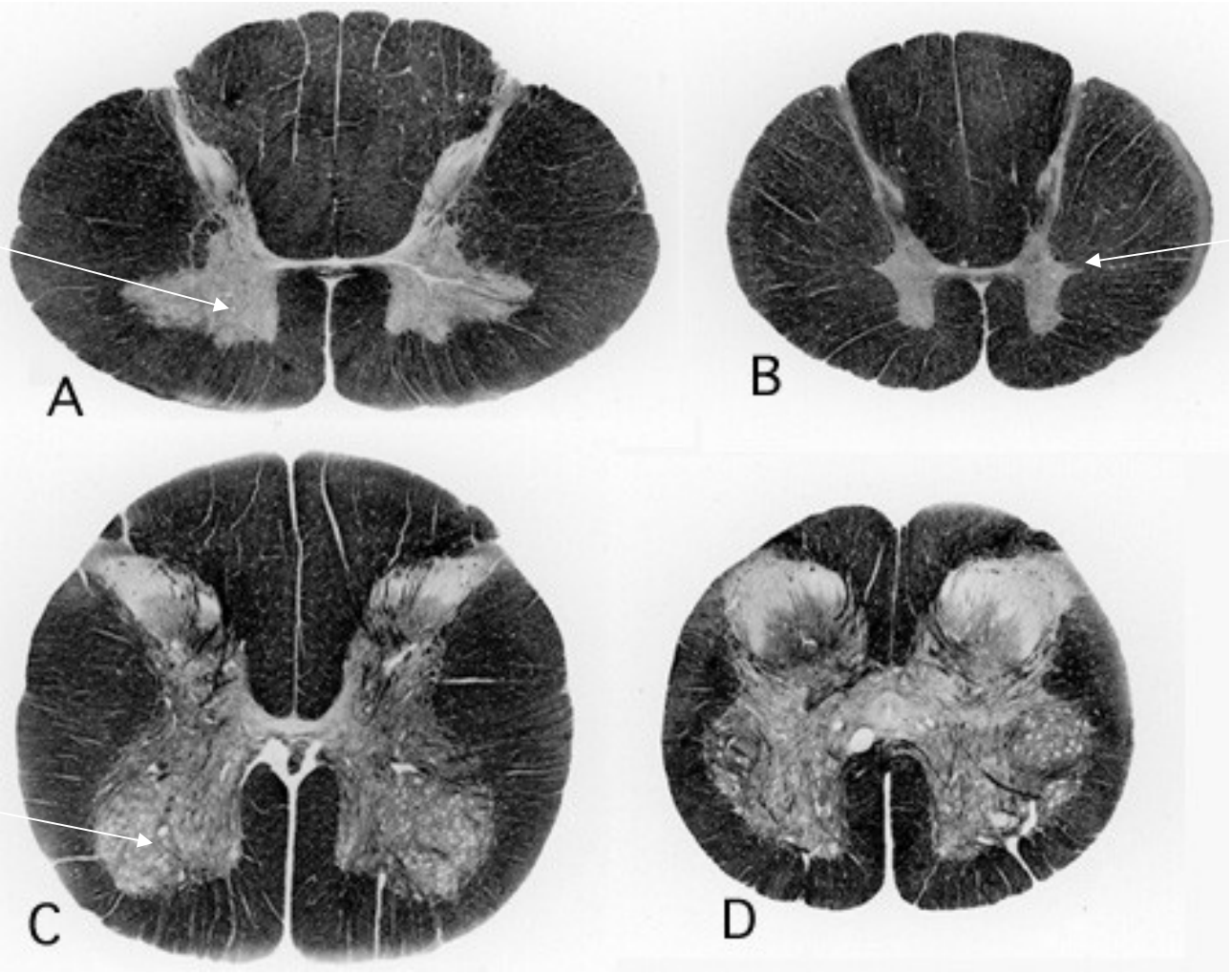
Regional Differences

Cervical

Thoracic

Cervical enlargement

Lateral horn



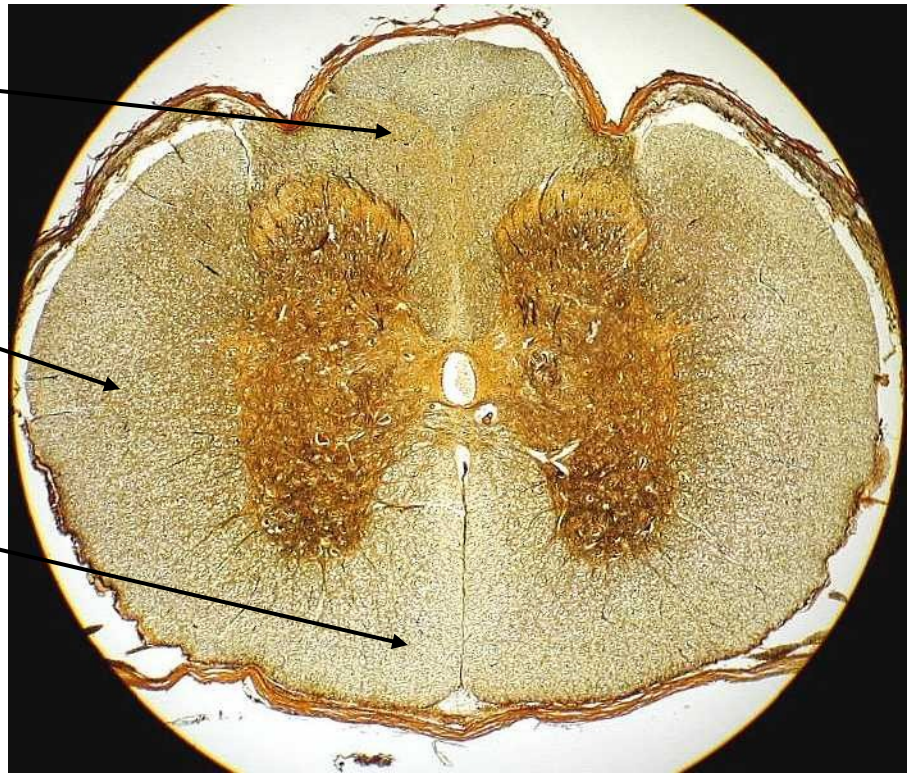
Lumbar enlargement

Lumbar

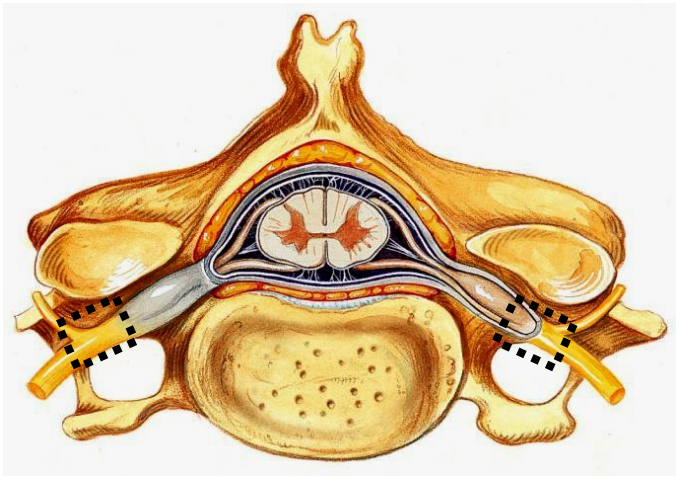
Sacral

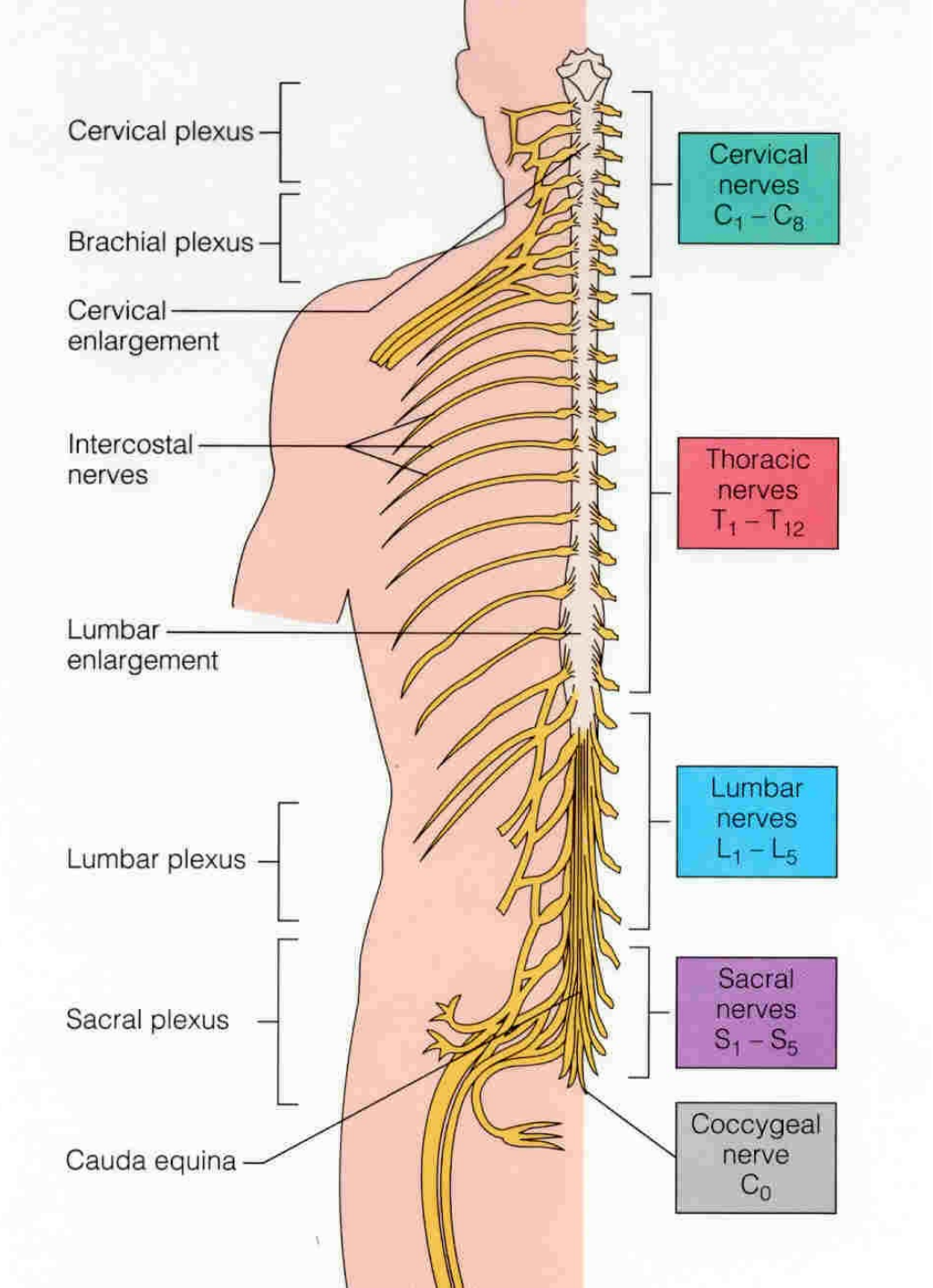
White Matter

- fiber tracts for transmission of information
- ascending (sensory) tracts
- descending (motor) tracts

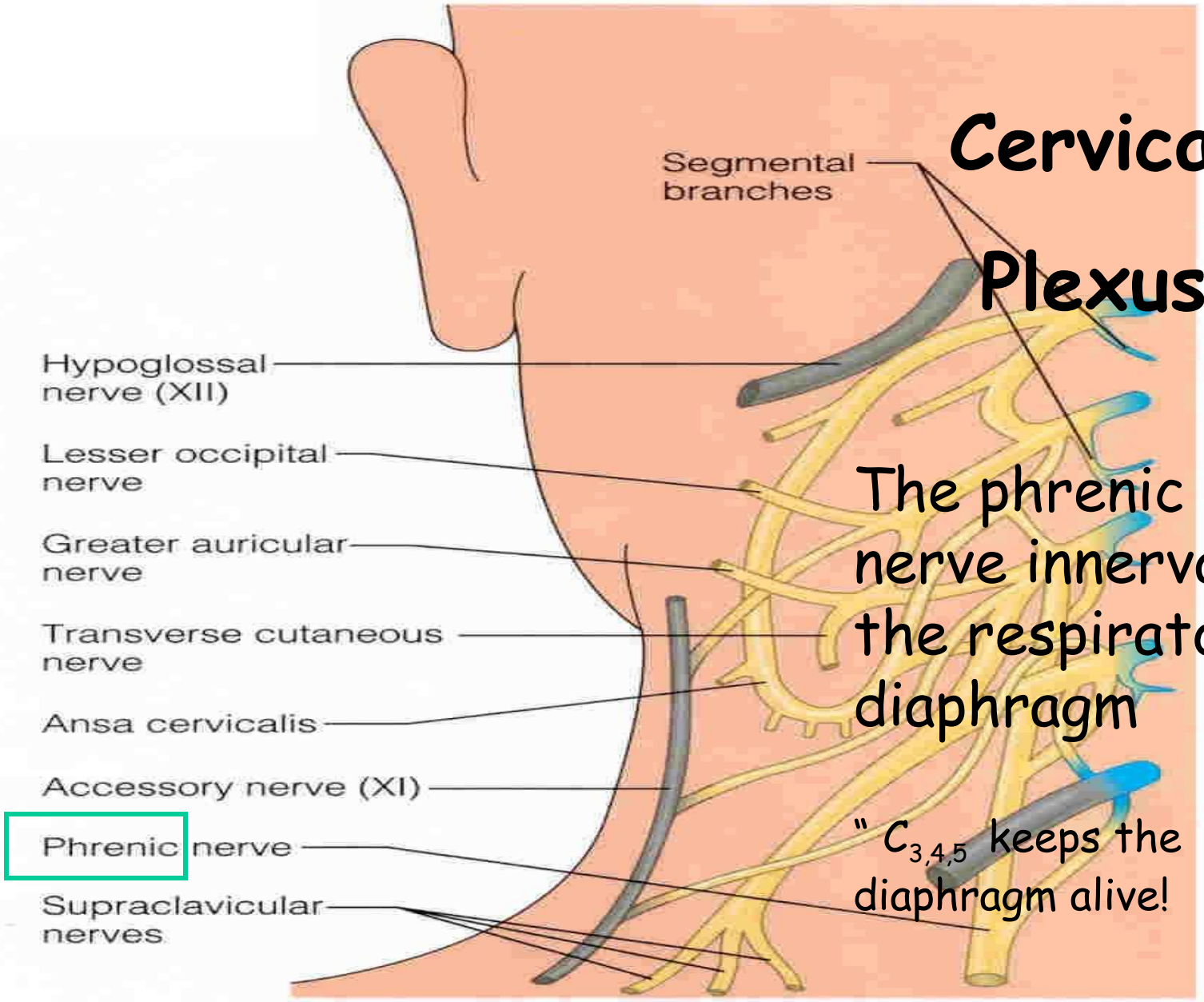


There are 31 pairs of spinal nerves





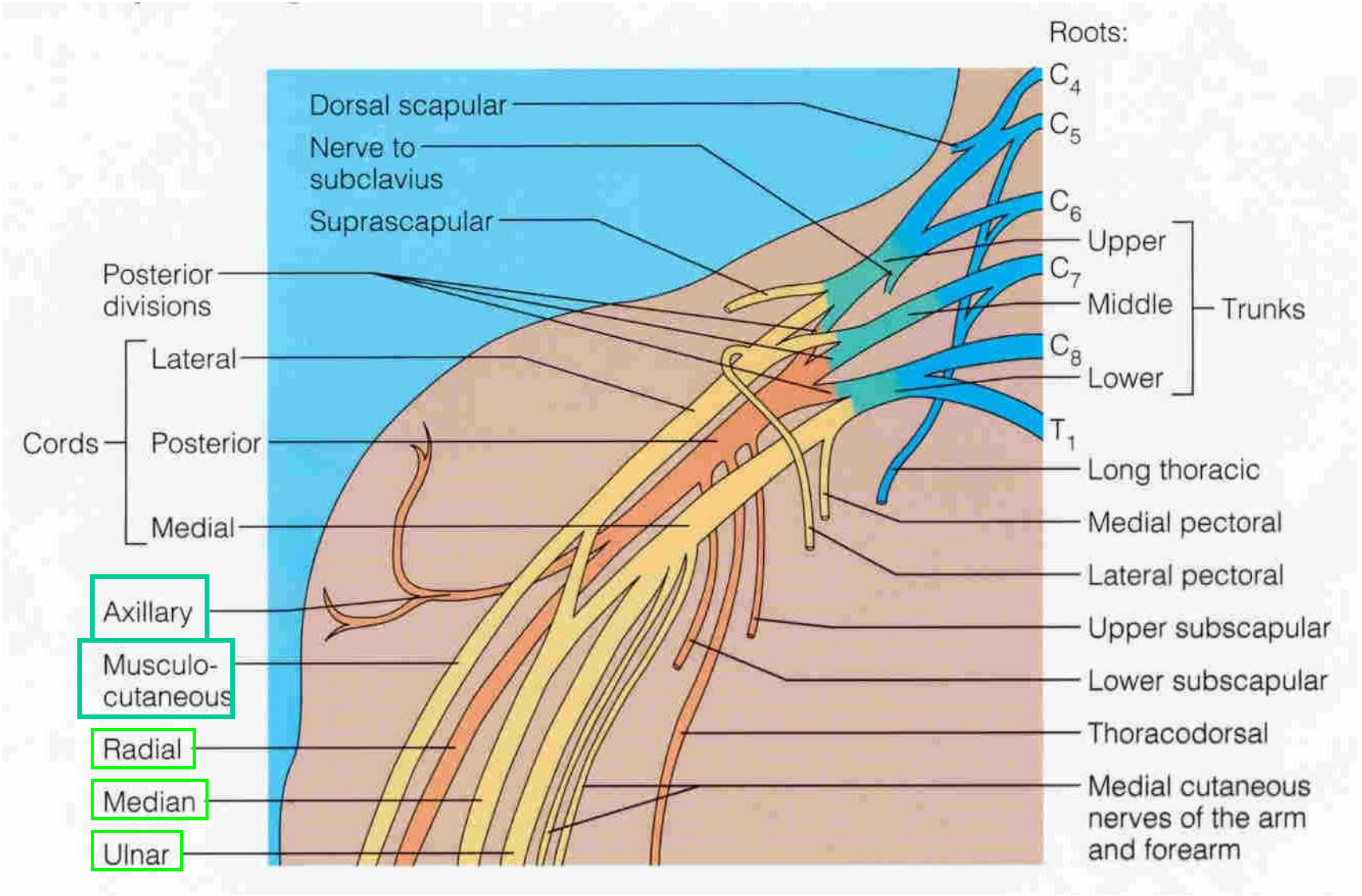
Cervical Plexus

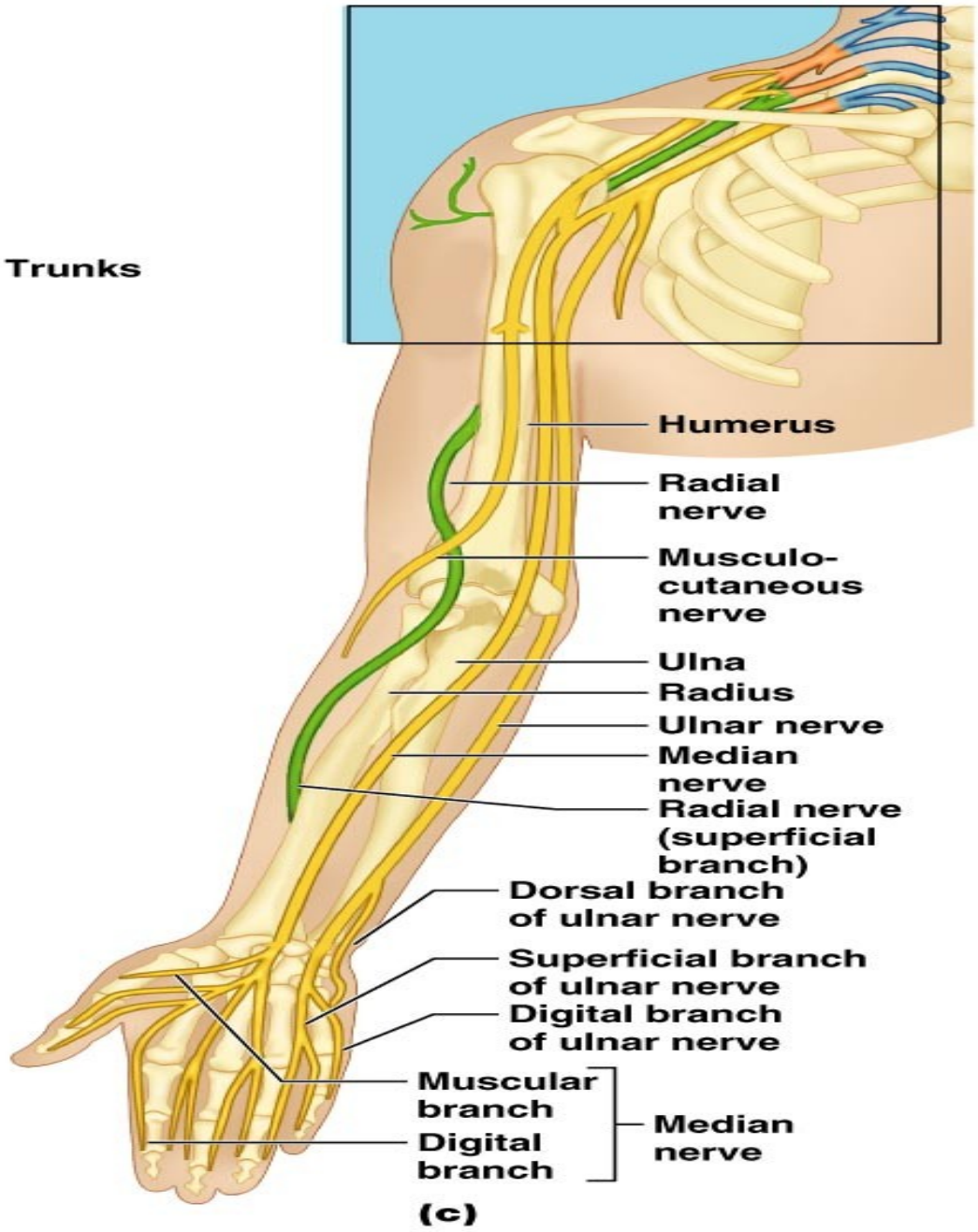


The phrenic nerve innervates the respiratory diaphragm

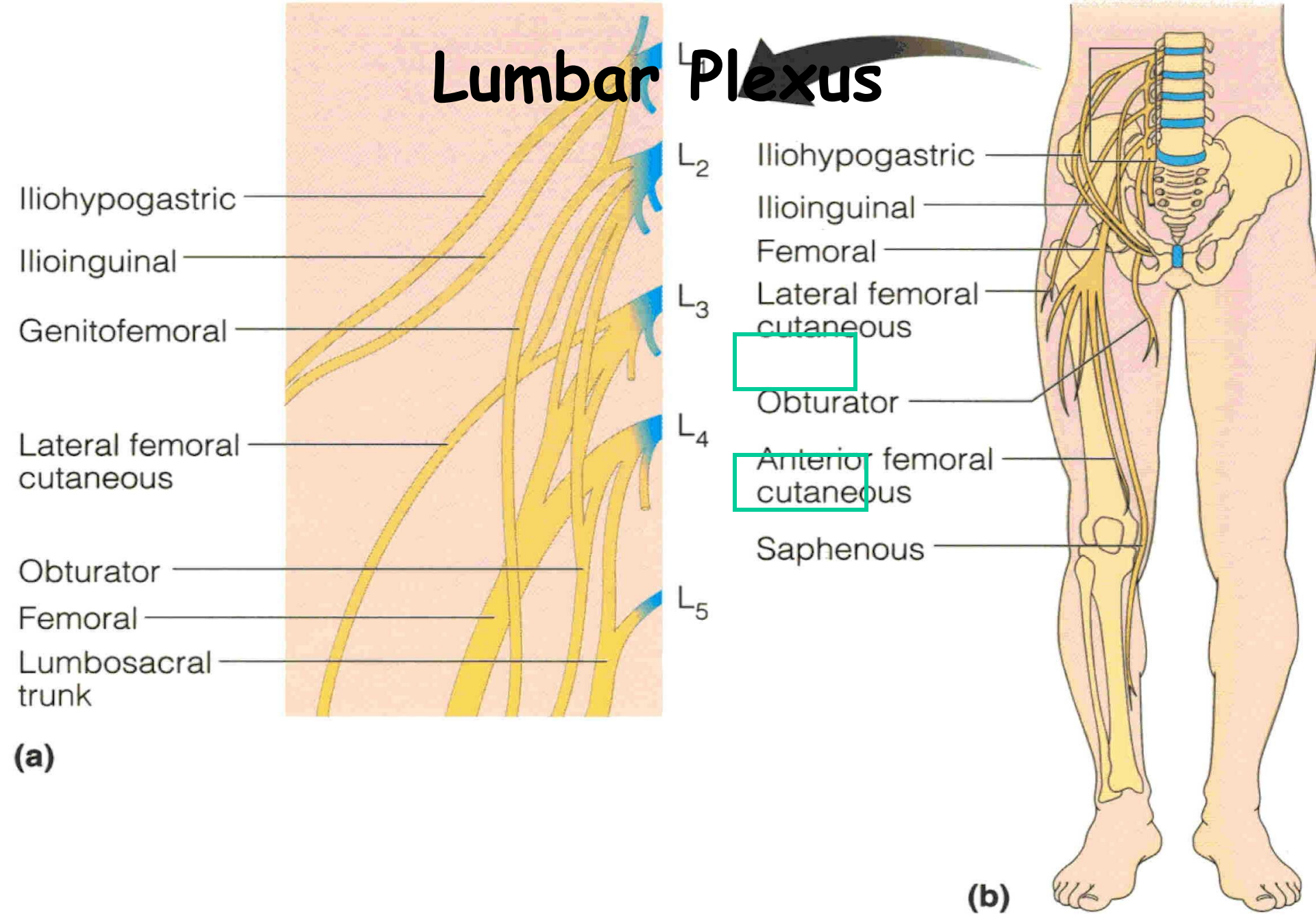
" $C_{3,4,5}$ keeps the diaphragm alive!

Brachial Plexus

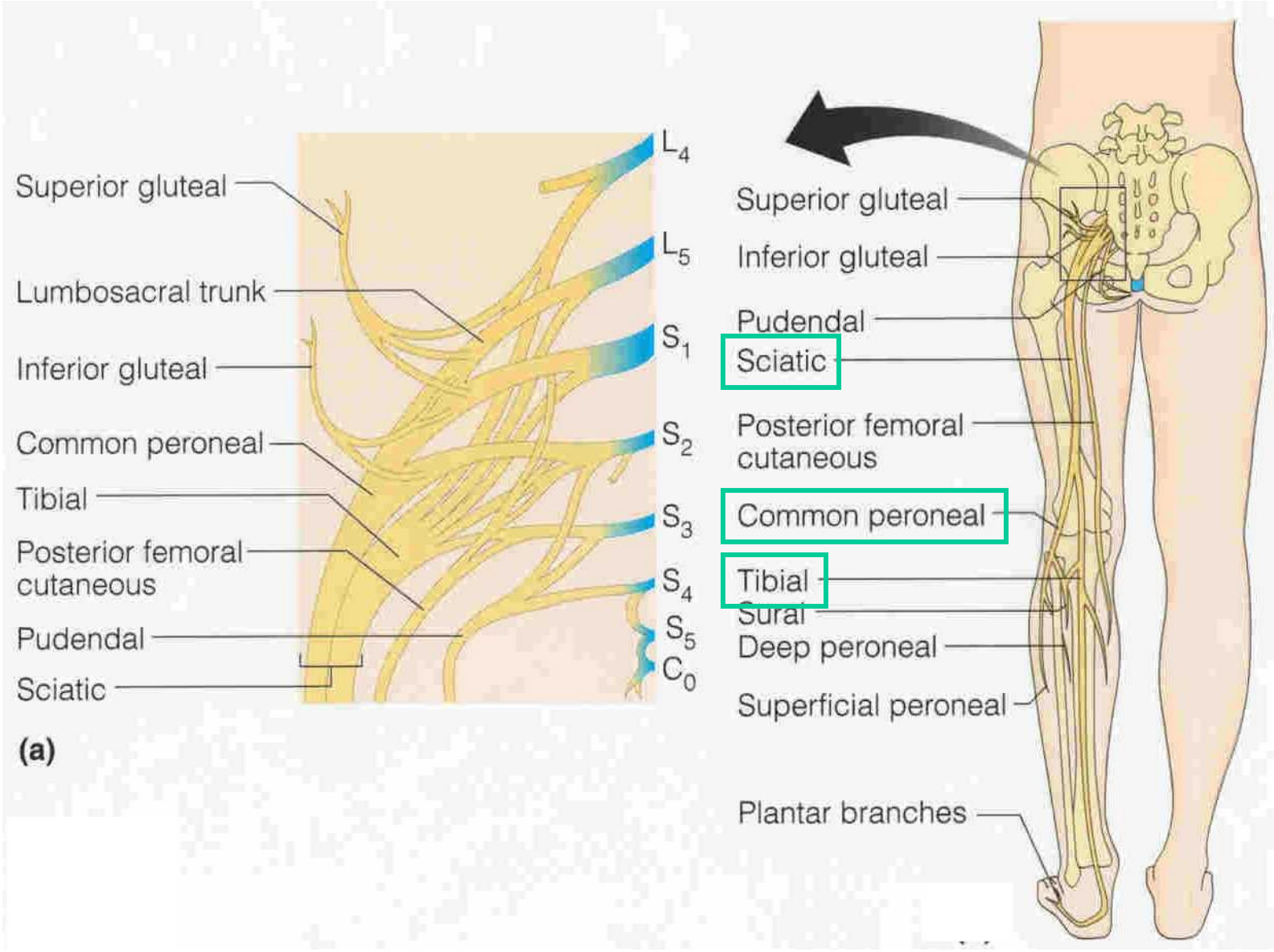



Trunks
Humerus
Radial nerve
Musculo-cutaneous nerve
Ulna
Radius
Ulnar nerve
Median nerve
Radial nerve (superficial branch)
Dorsal branch of ulnar nerve
Superficial branch of ulnar nerve
Digital branch of ulnar nerve
Muscular branch
Digital branch
Median nerve
(c)

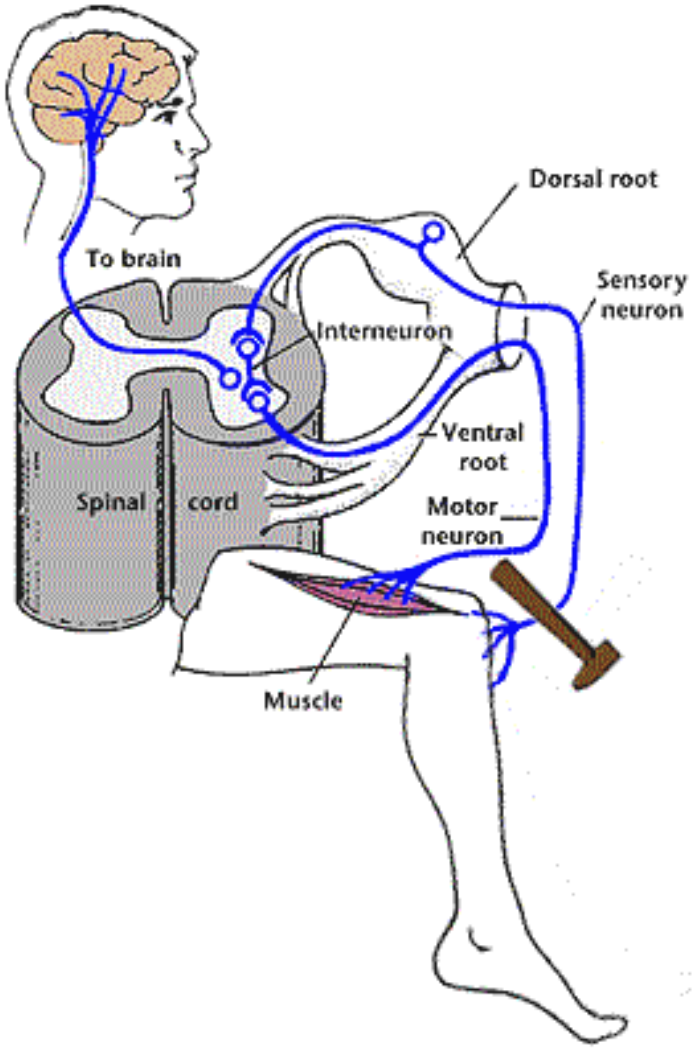
Lumbar Plexus



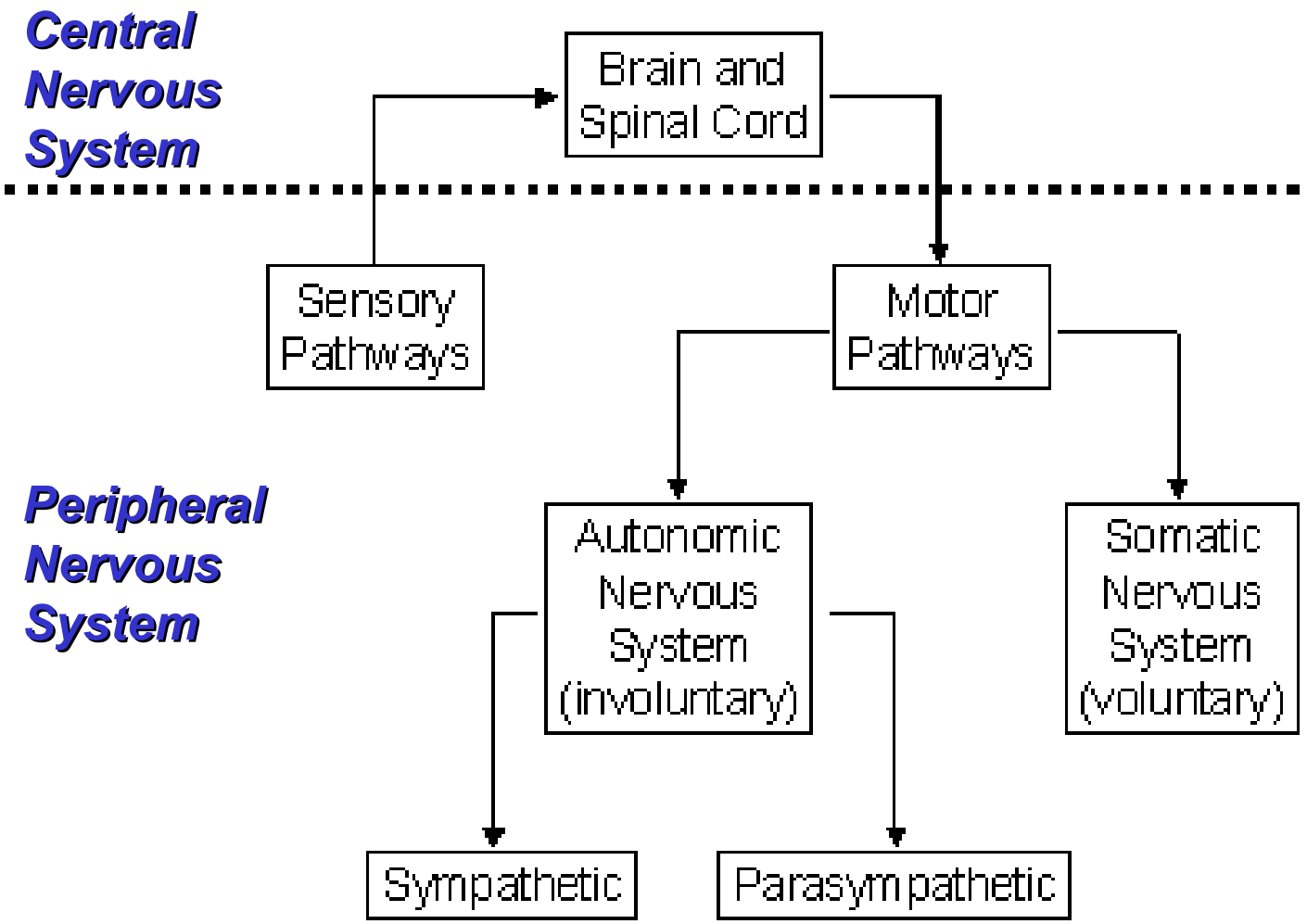
Sacral Plexus



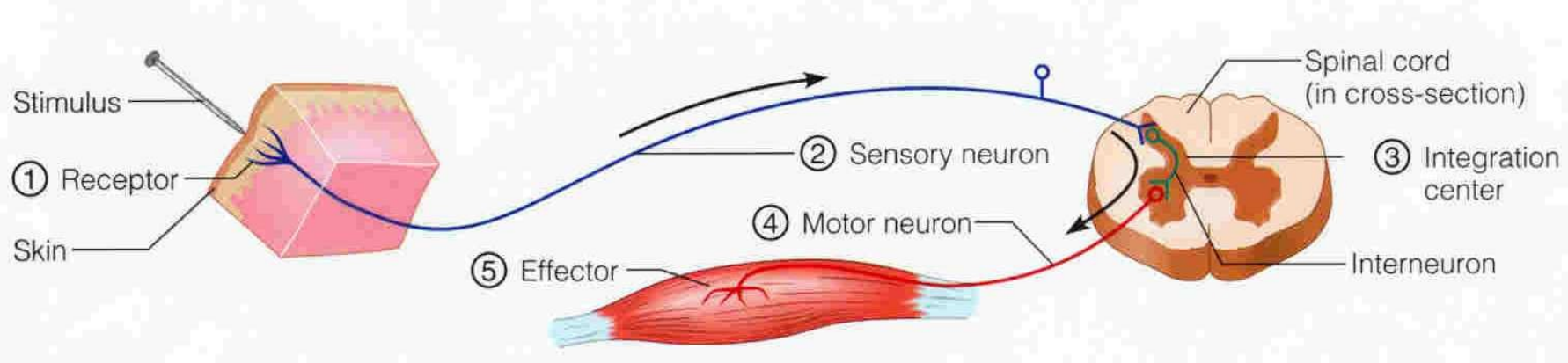
Human Reflex Physiology



Structural Organization of the Nervous System



Reflex Arc



1) Receptor - reacts to stimulus

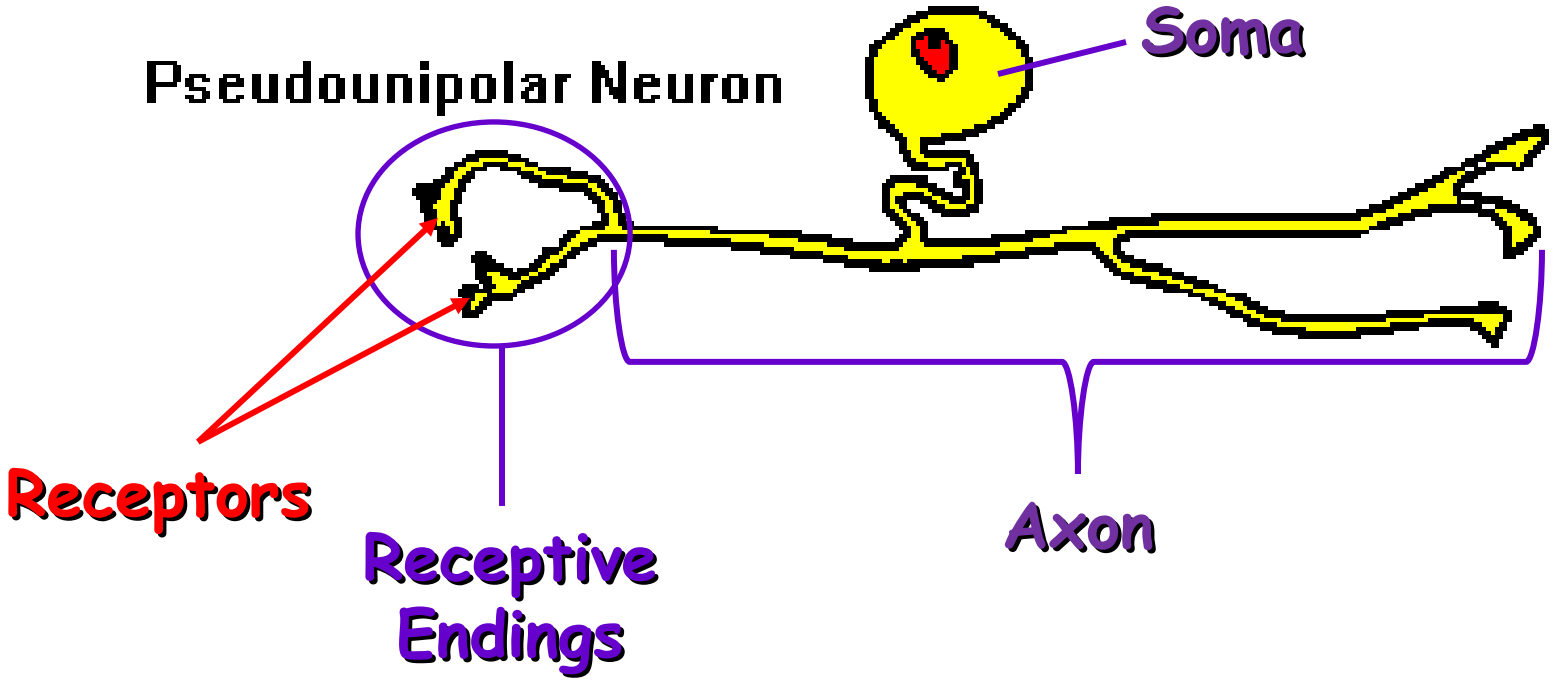
2) Sensory Neurons - afferent impulses to CNS

3) Integration centers - synapses in CNS

4) Motor Neurons - efferent impulses from Integration centers to effector

5) Effector - muscle or glands

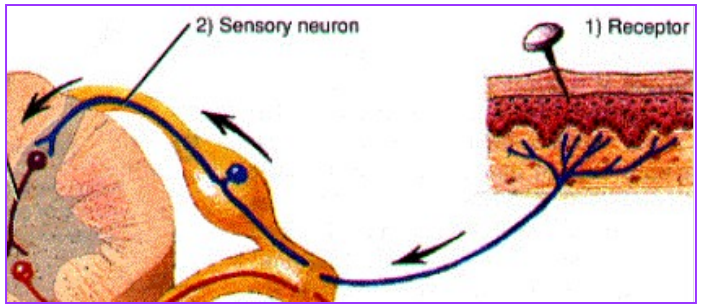
Sensory Receptors



Classifications of Sensory Receptors

by Location

Exteroceptors



Respond to stimuli arising outside the body:

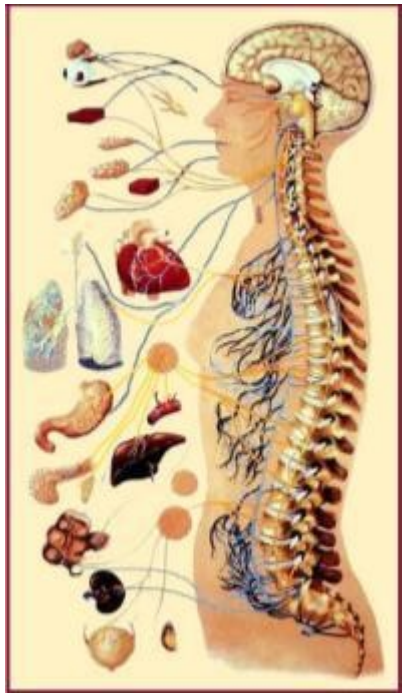
Touch

Pain

Temperature

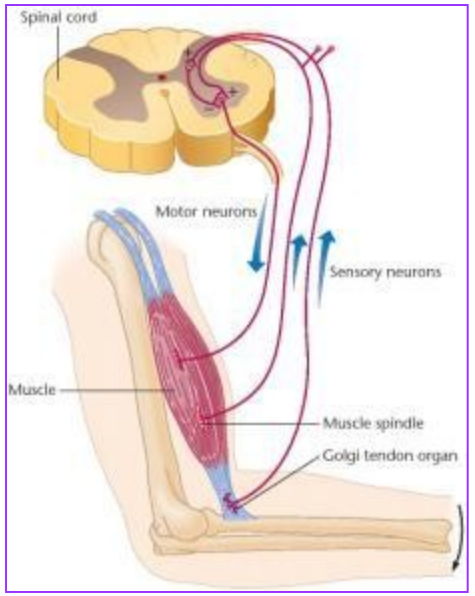
Pressure

Interoceptors



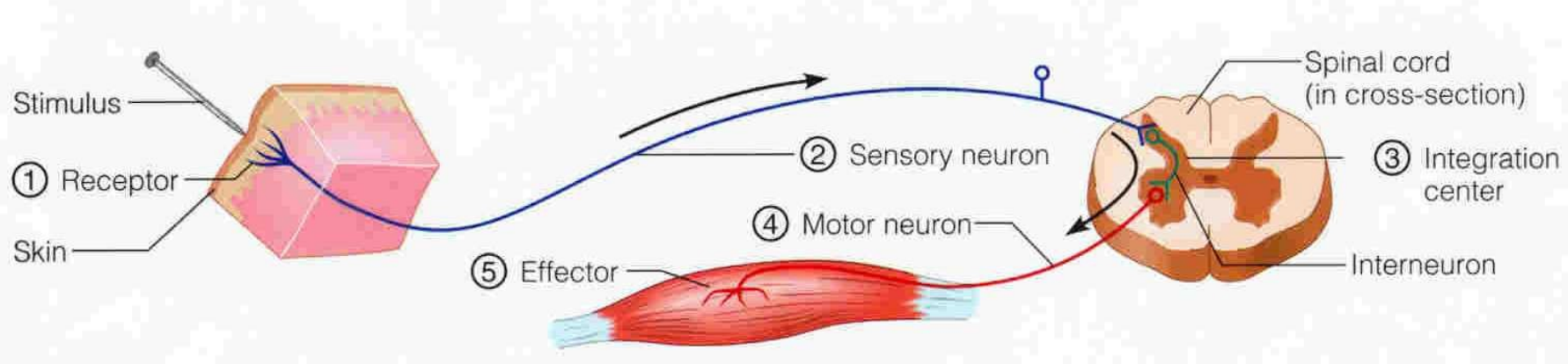
Respond to stimuli inside the body (viscera, vessels)

Proprioceptors*



Detect stretch

Therefore, for a Reflex Arc:



1) Receptor = Proprioceptors of ?? muscle

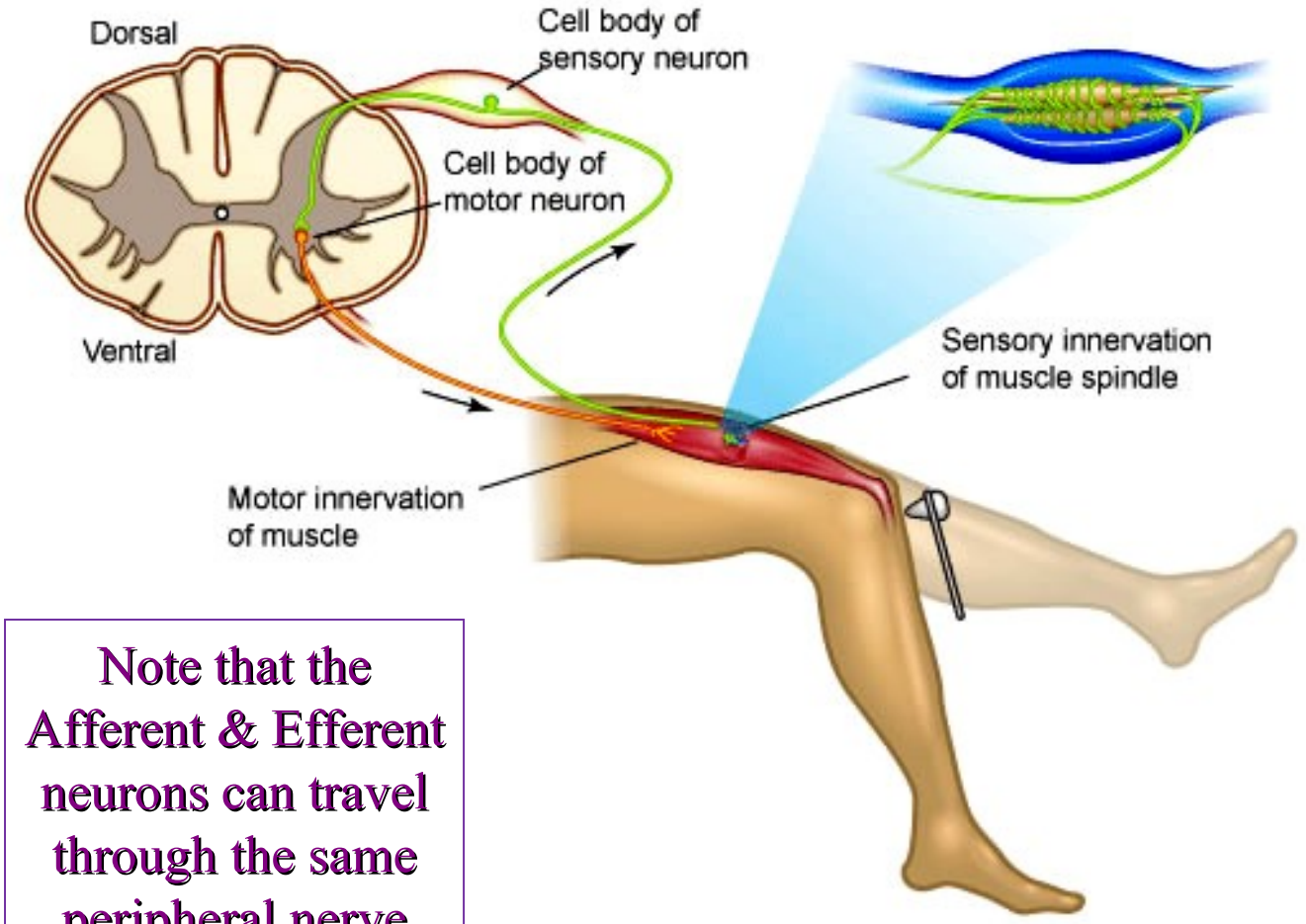
2) Sensory Neuron - ?? Nerve holding the sensory neurons

3) Integration centers – which CNS organ?

4) Motor Neurons - ?? Nerve holding the motor neurons

5) Effector - ?? Muscle

Patellar Reflex



Receptor is the proprioceptors of the muscle group associated with the tendon being tapped

Effector is the muscle group that contracts to extend the leg

Note that the Afferent & Efferent neurons can travel through the same peripheral nerve

THANK YOU