

# **Anatomy of the nervous system 2**

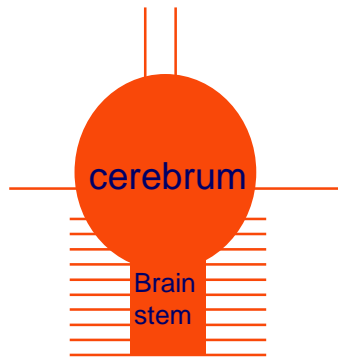
07/10/21

# Peripheral Nervous System

Cranial nerves

Spinal nerves

brain



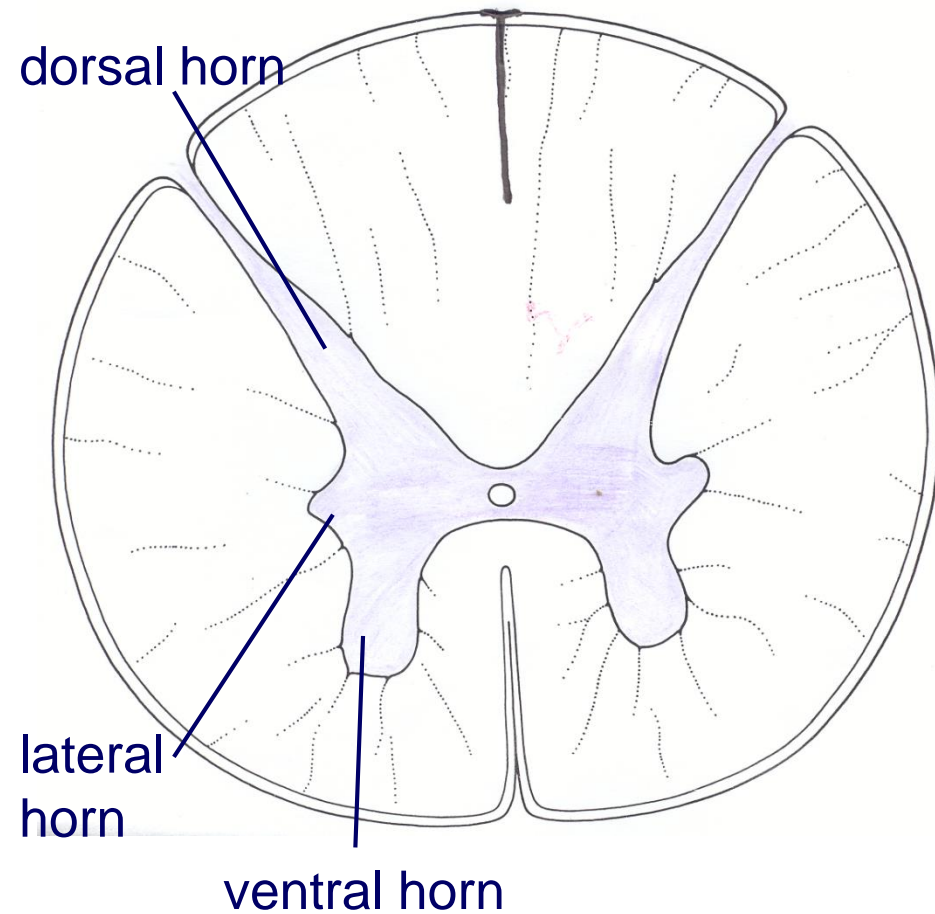
(12 pairs)

spinal  
cord



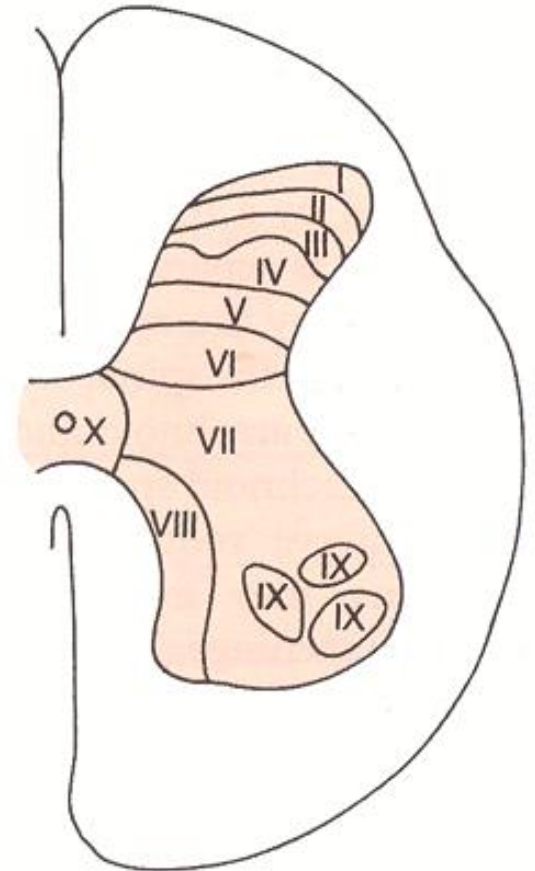
(31 pairs)

# Arrangement of Grey Matter



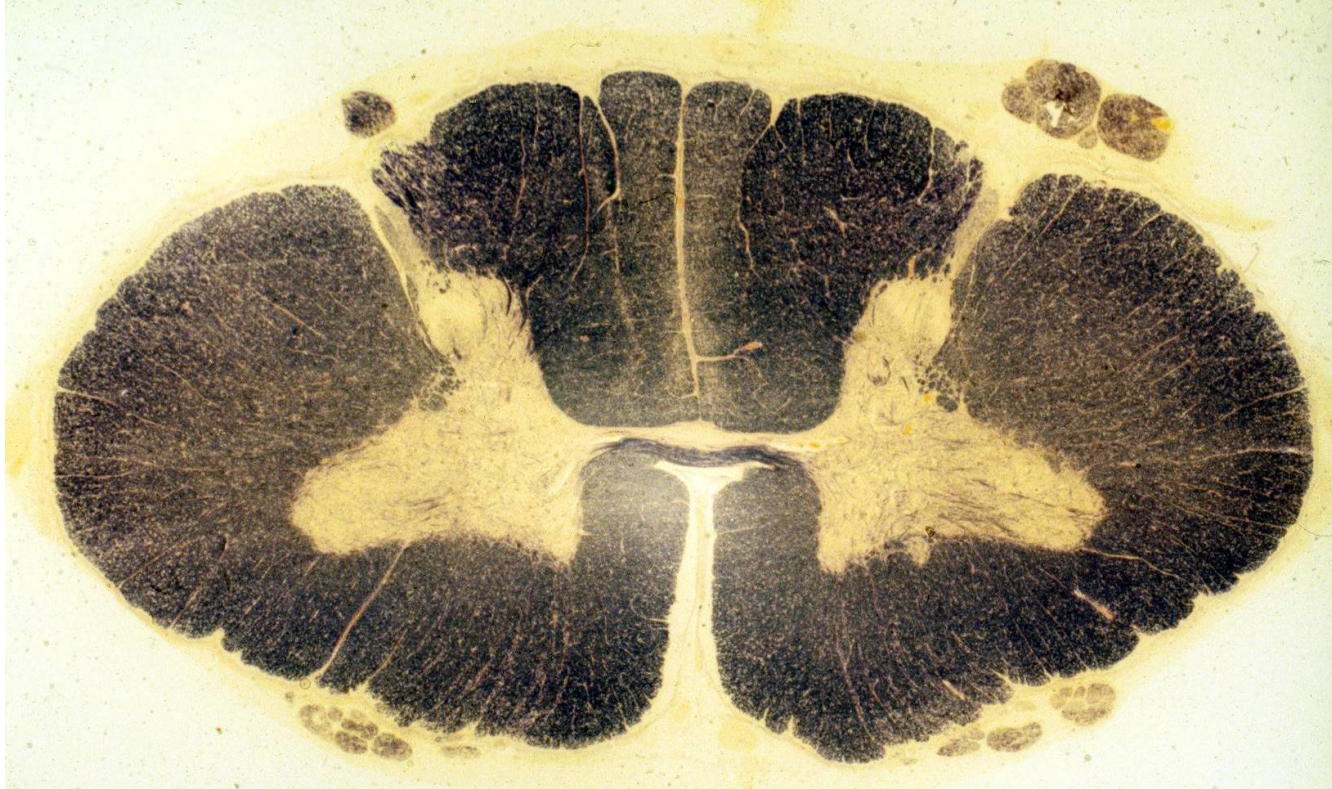
Anterior (ventral)

## Rexed's Laminae



(Crossman & Neary, 2019)

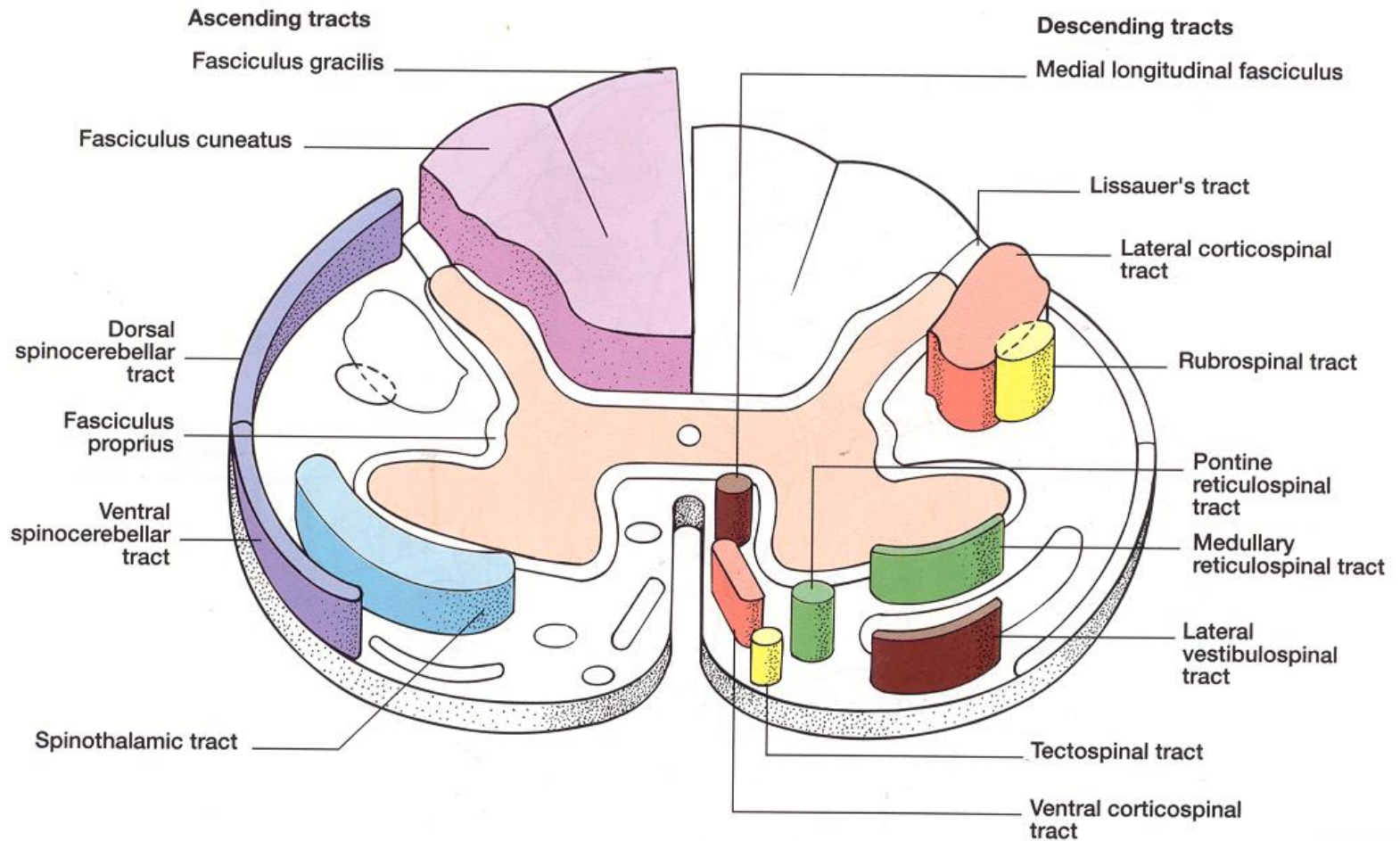
# Arrangement of White Matter



## Spinal tracts

- Ascending tracts: Carry information to the brain from the periphery (sensory)
- Descending tracts: Carry information from the brain to the periphery (motor)

# Spinal Tracts



Ascending tracts

Descending tracts

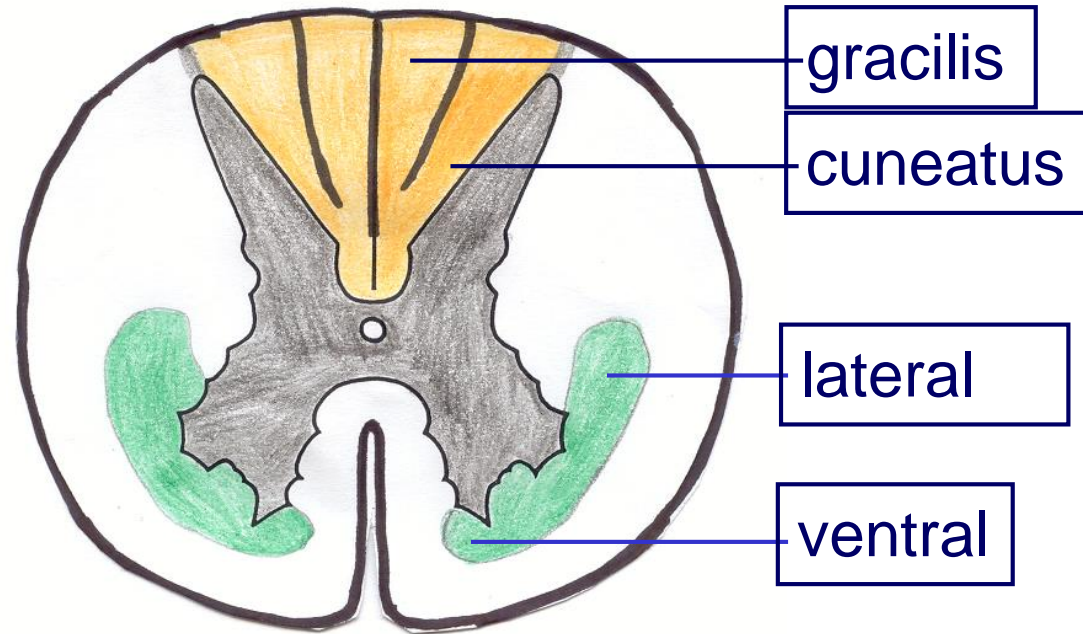
(Crossman & Neary, 2019)



# Ascending tracts

## Spinothalamic tracts

lateral  
ventral



## Dorsal columns

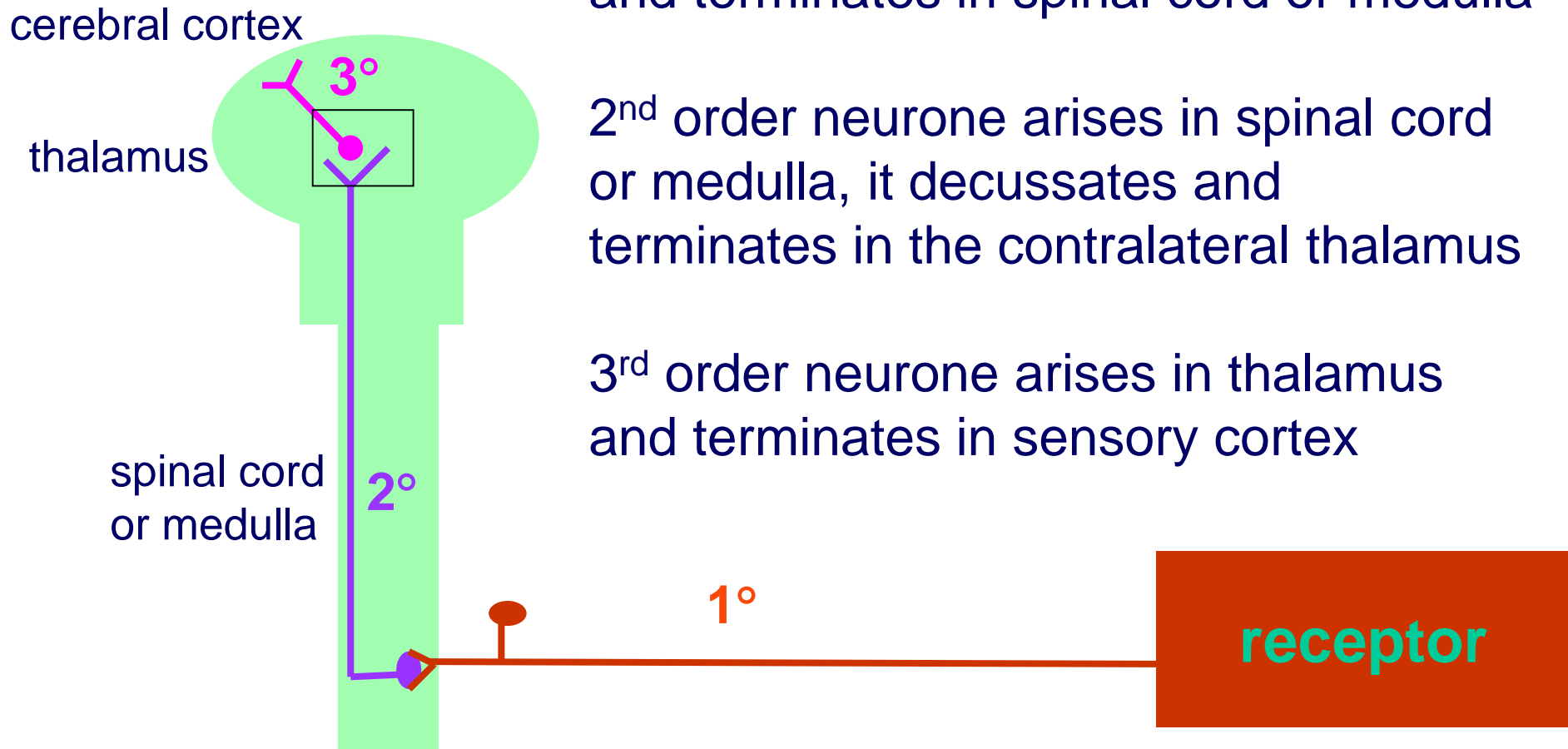
fasciculus gracilis  
fasciculus cuneatus

# Sensory Pathway

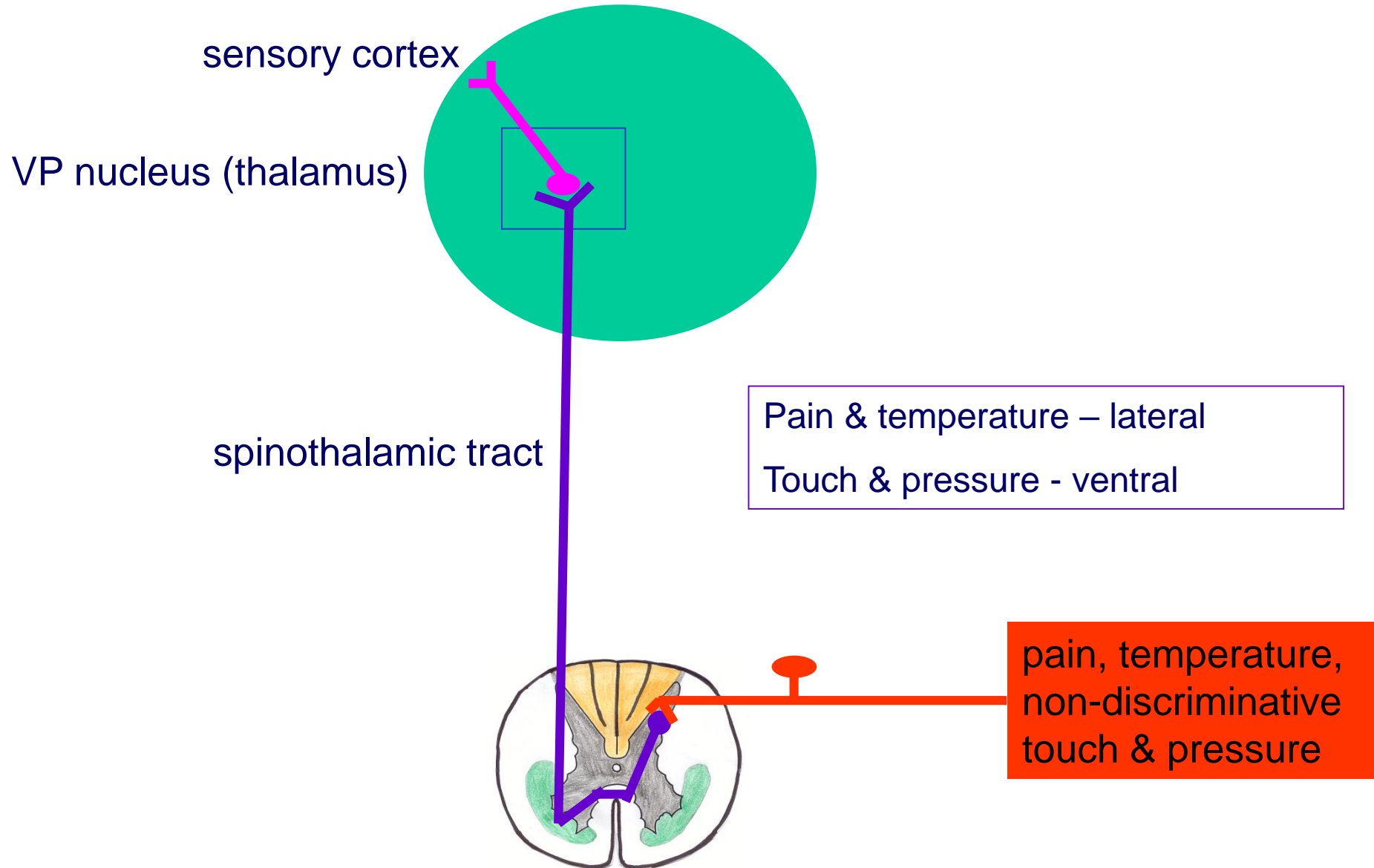
1<sup>st</sup> order neurone – remains ipsilateral and terminates in spinal cord or medulla

2<sup>nd</sup> order neurone arises in spinal cord or medulla, it decussates and terminates in the contralateral thalamus

3<sup>rd</sup> order neurone arises in thalamus and terminates in sensory cortex

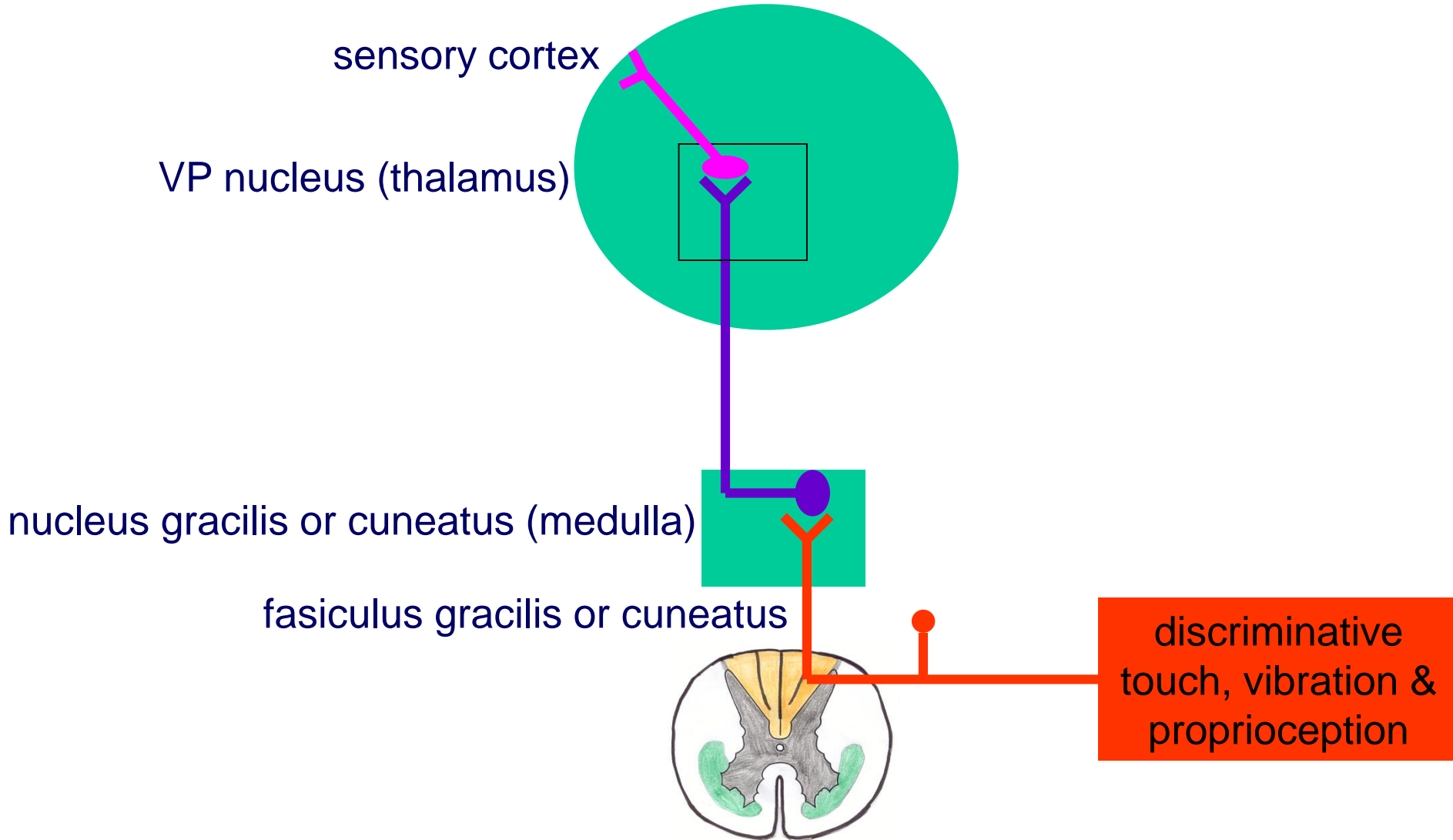


# Spinothalamic Tract





# Dorsal Columns

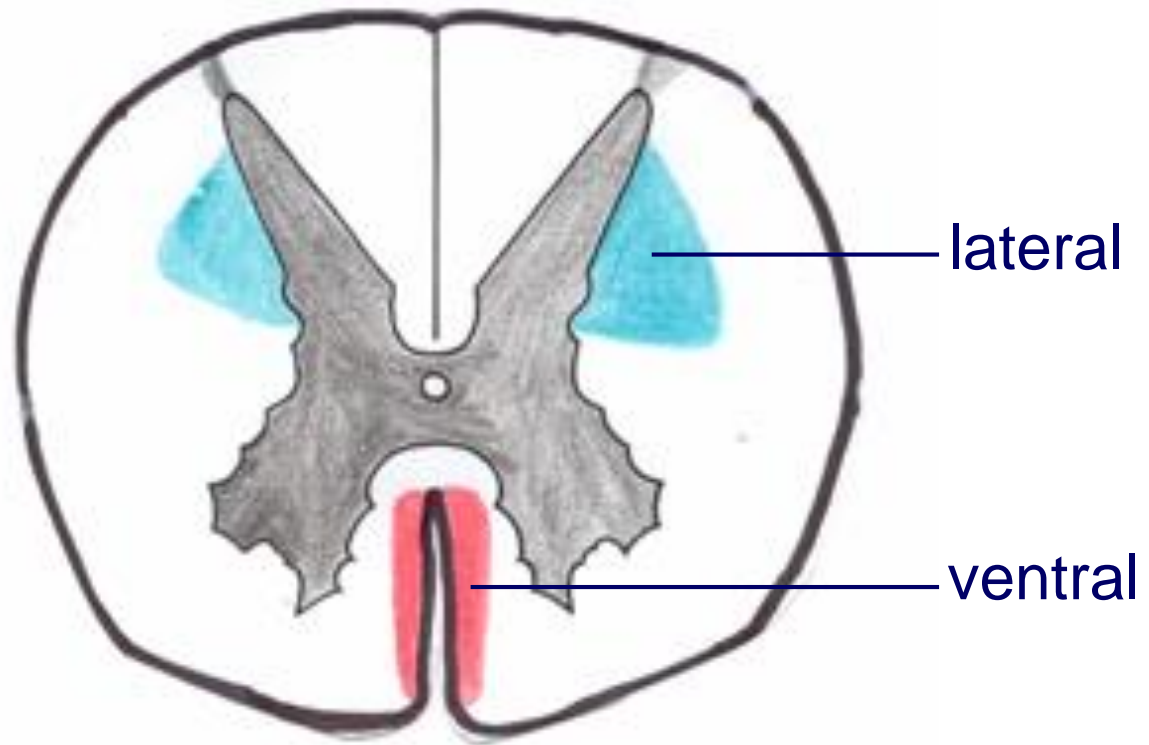


# Descending Tracts

Corticospinal

lateral

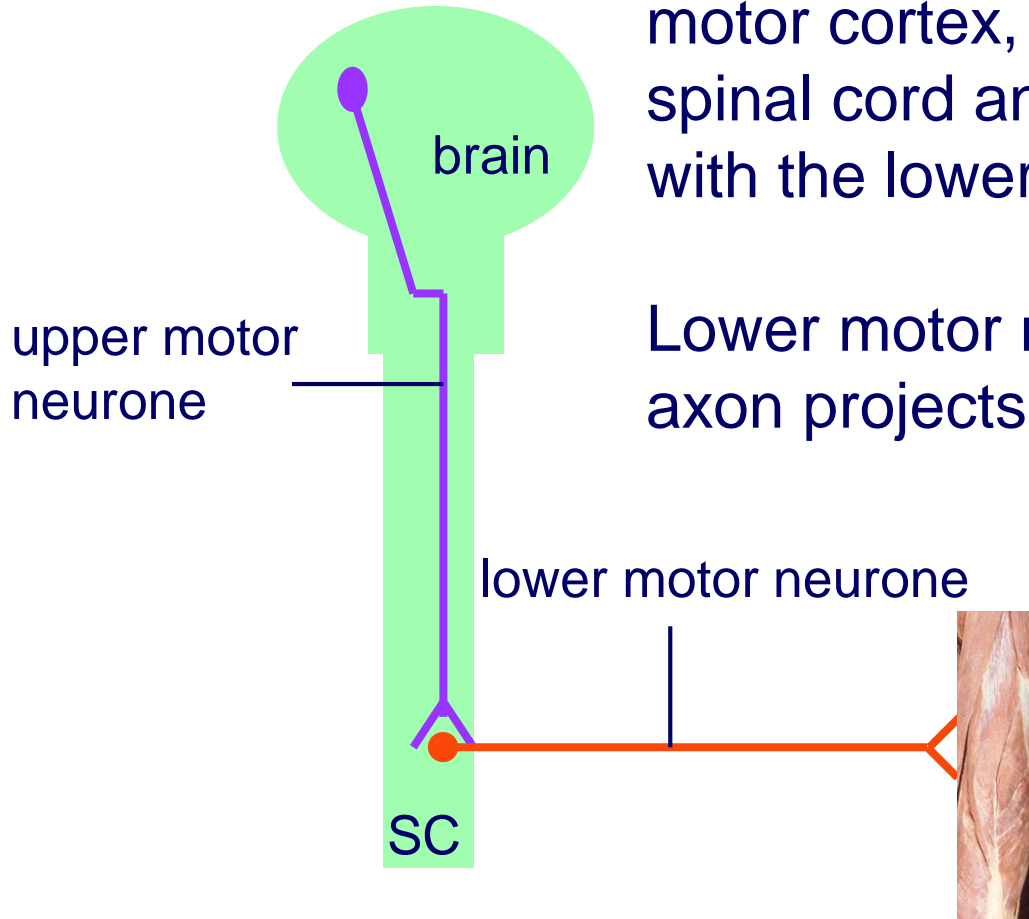
ventral



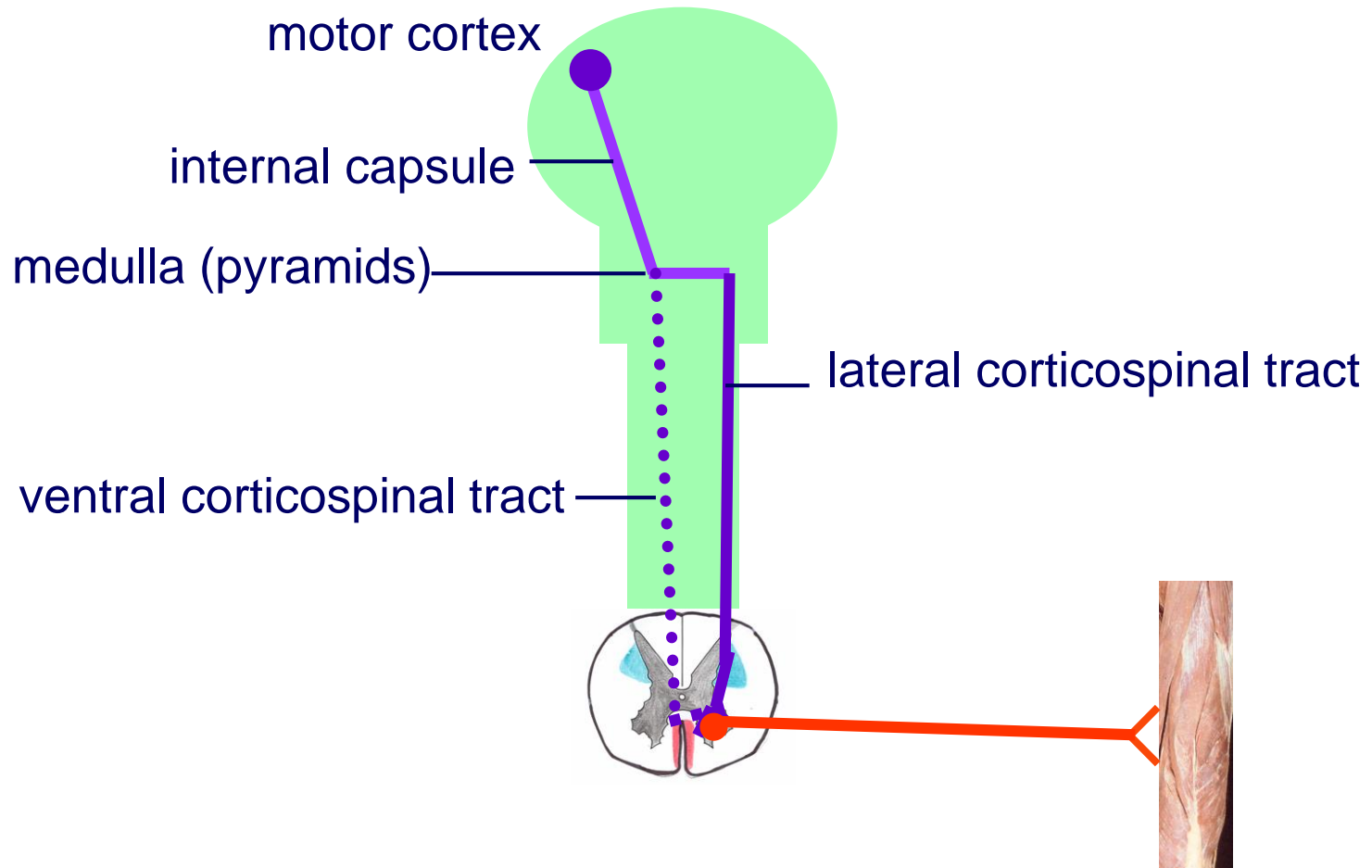
# Somatic Motor Pathway

Upper motor neurone arises in primary motor cortex, decussates in brainstem or spinal cord and terminates by synapsing with the lower motor neurone in spinal cord

Lower motor neurone arises in spinal cord, axon projects to skeletal muscle

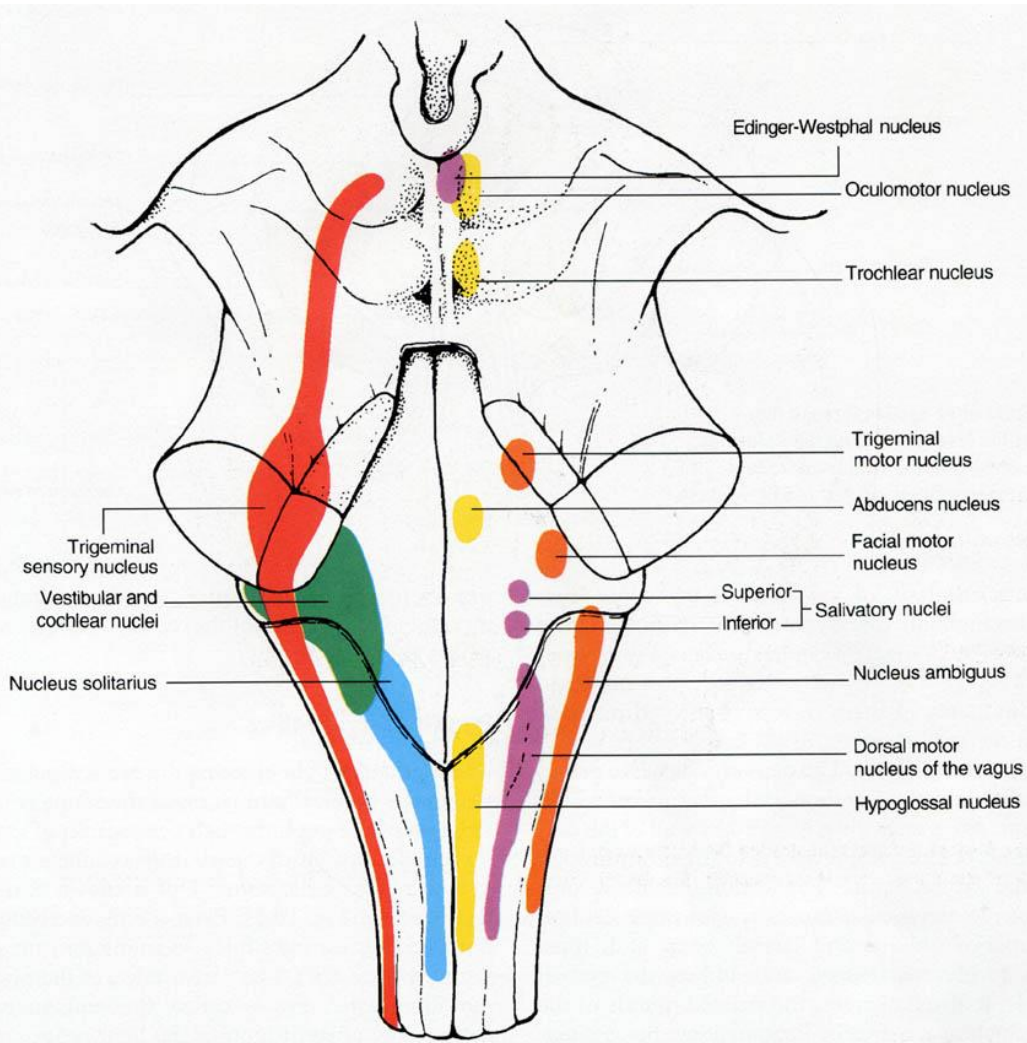


# Corticospinal Tracts



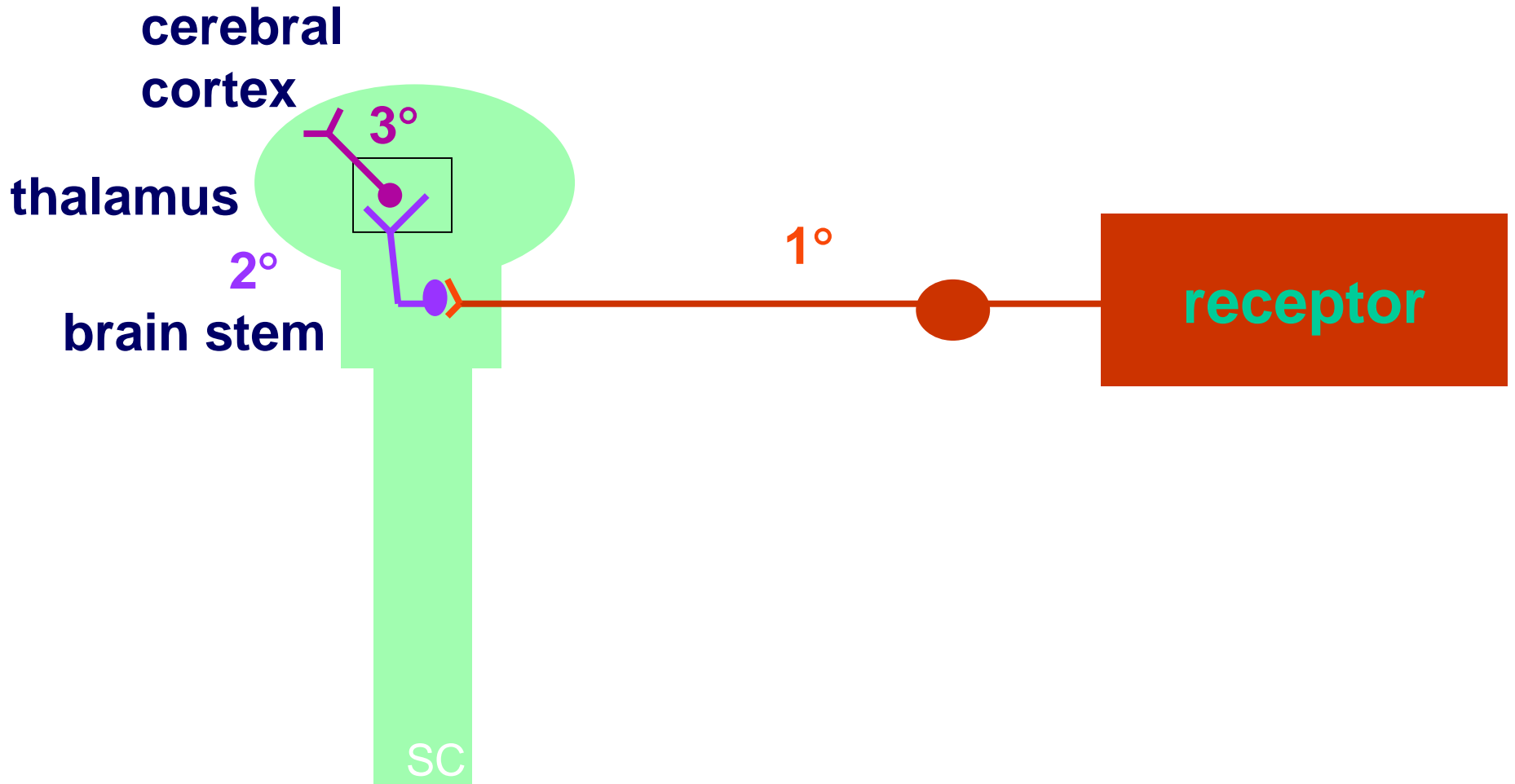
# Cranial Nerve Pathways

How do they compare to those of the spinal nerves?



**Nerve cell nuclei  
located in brain  
stem**

# Sensory Pathway





# General Sensory Pathways of Cranial Nerves

**1<sup>st</sup> order** - NCB in periphery

Trigeminal Ganglion – CN V

Geniculate Ganglion – CN VII

Superior & Inferior Ganglia – CN IX & X

**2<sup>nd</sup> order** - NCB in trigeminal sensory nucleus of brainstem, fibres decussate

**3<sup>rd</sup> order** - NCB in VP thalamus, axons project to primary sensory cortex

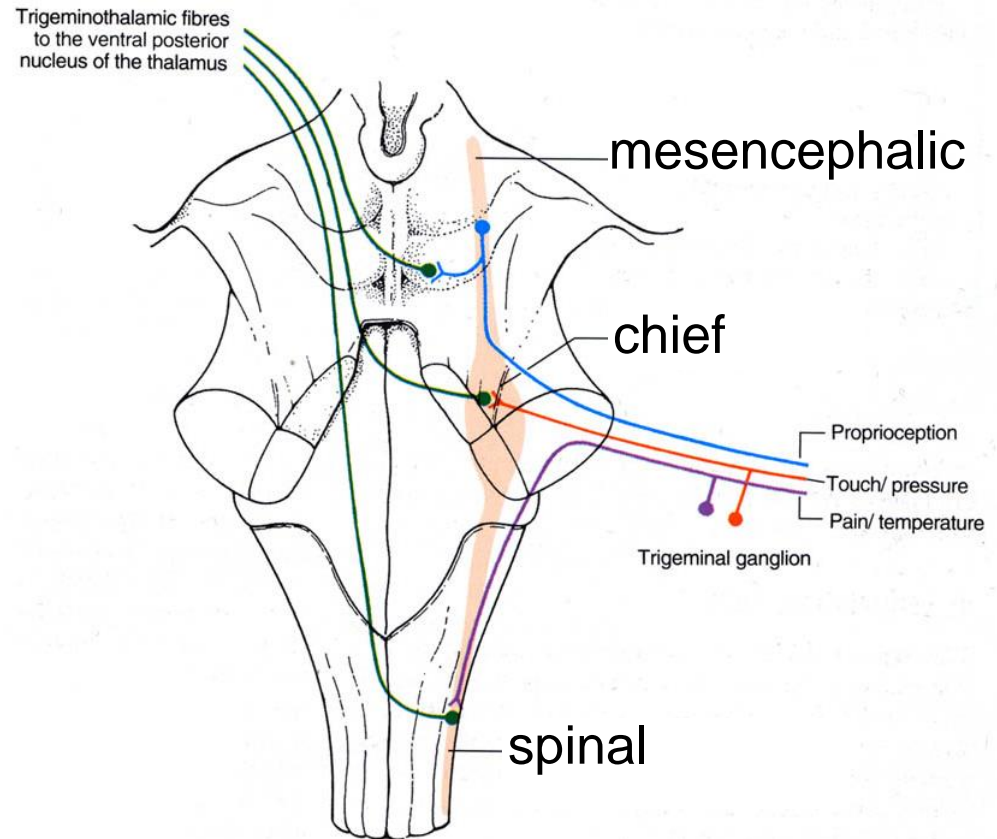
# Trigeminal sensory nucleus

## 3 subnuclei

**Chief sensory nucleus**  
(touch & pressure)

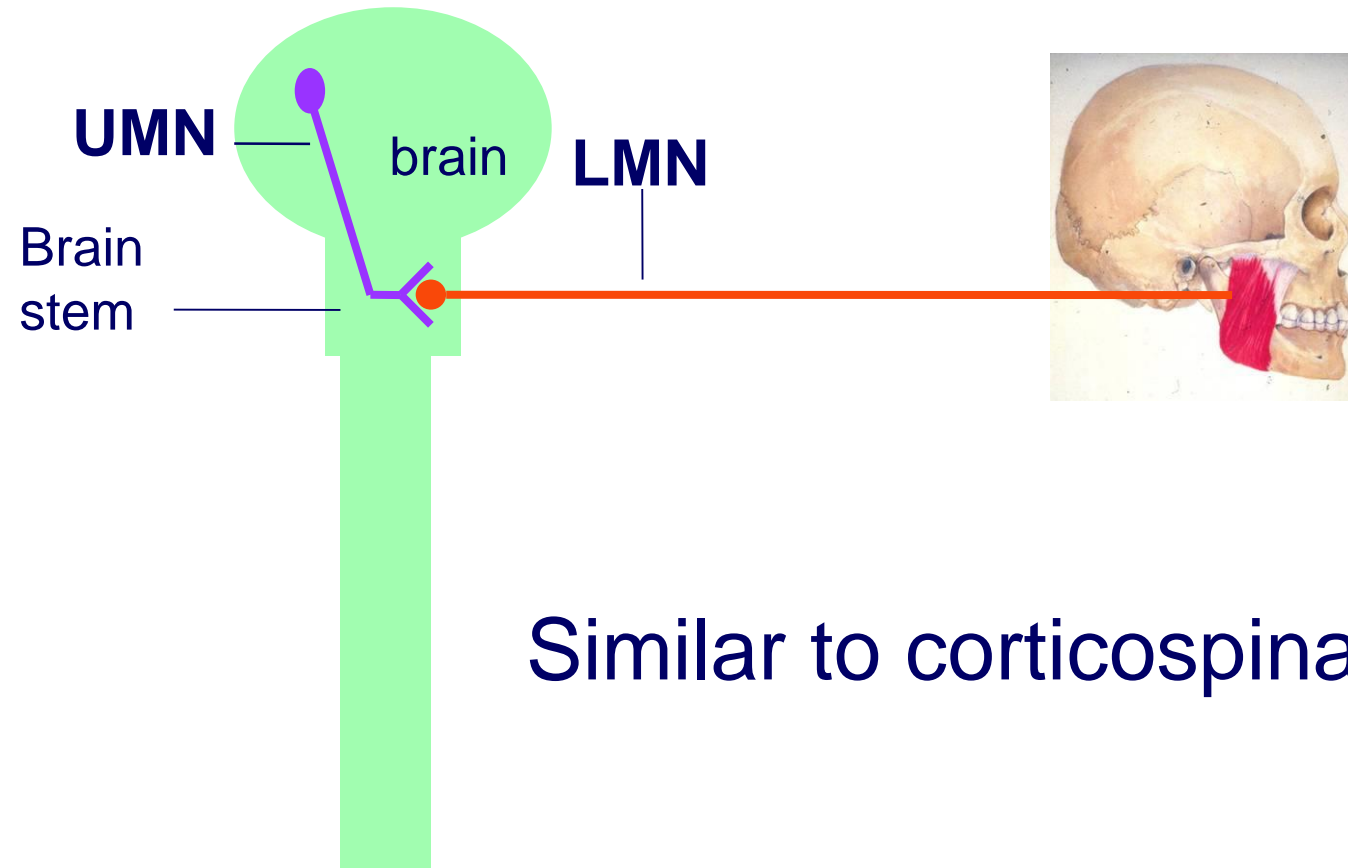
**Spinal nucleus** (pain & temperature)

**Mesencephalic\*\***  
(proprioception)

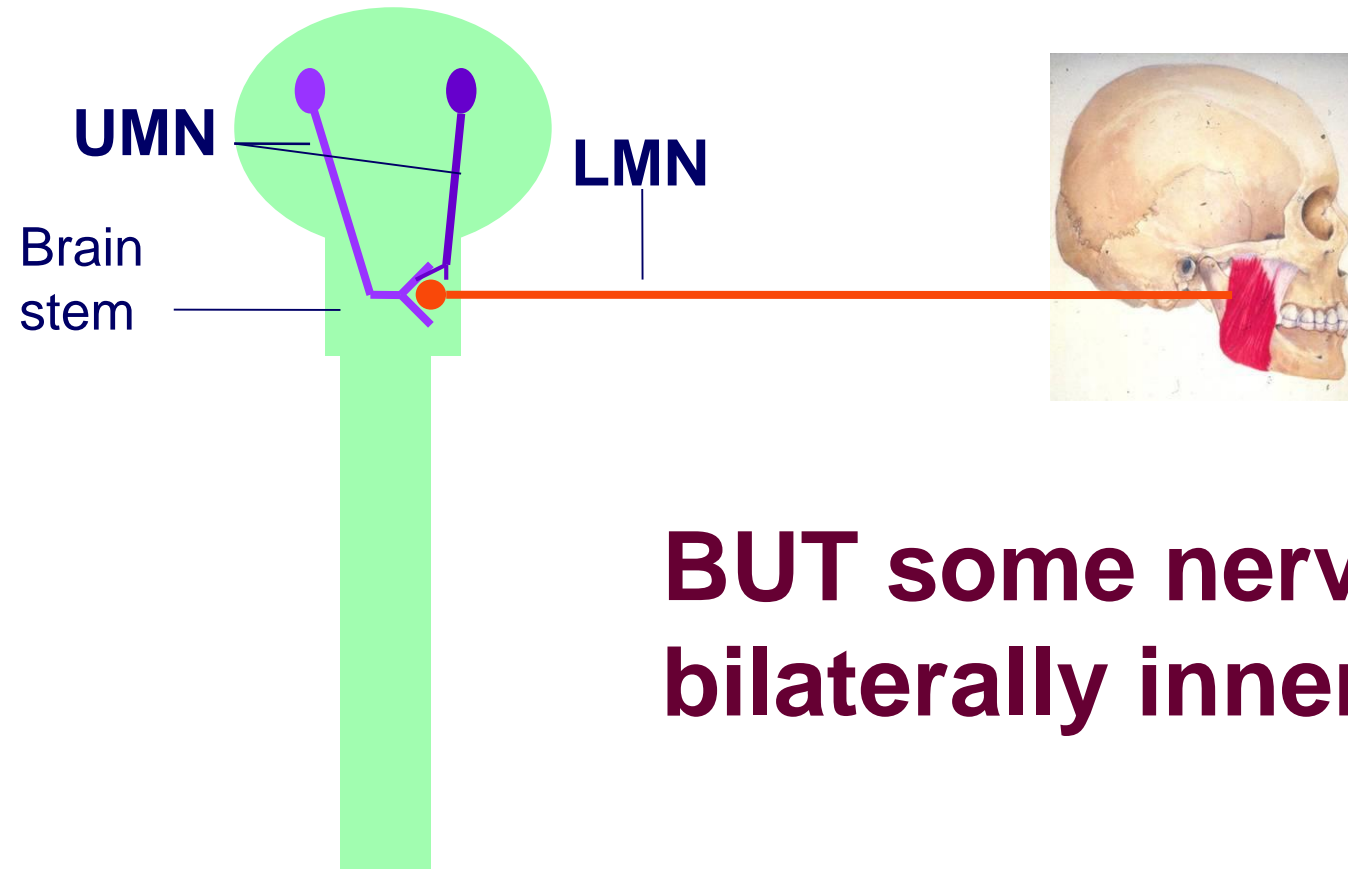


(Crossman & Neary, 2005)

# Corticobulbar Tract

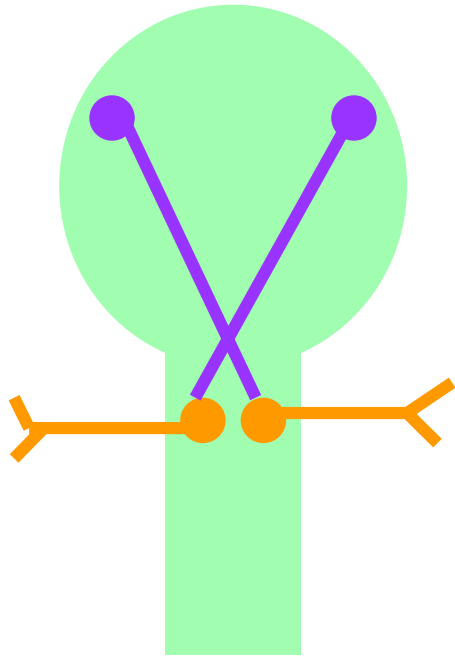


# Corticobulbar Tract



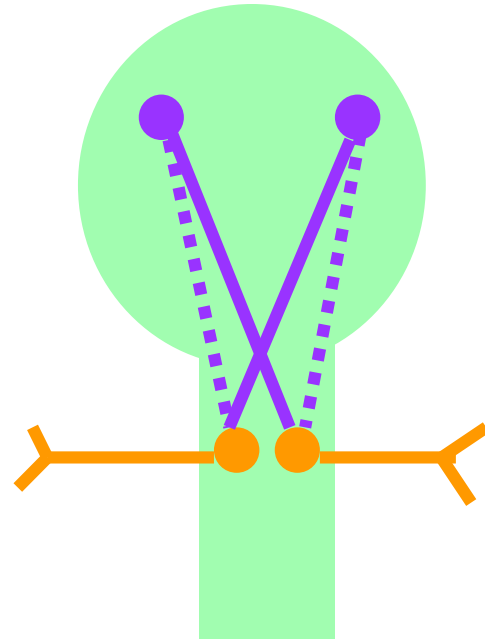
**BUT some nerves are bilaterally innervated**

# Contralateral

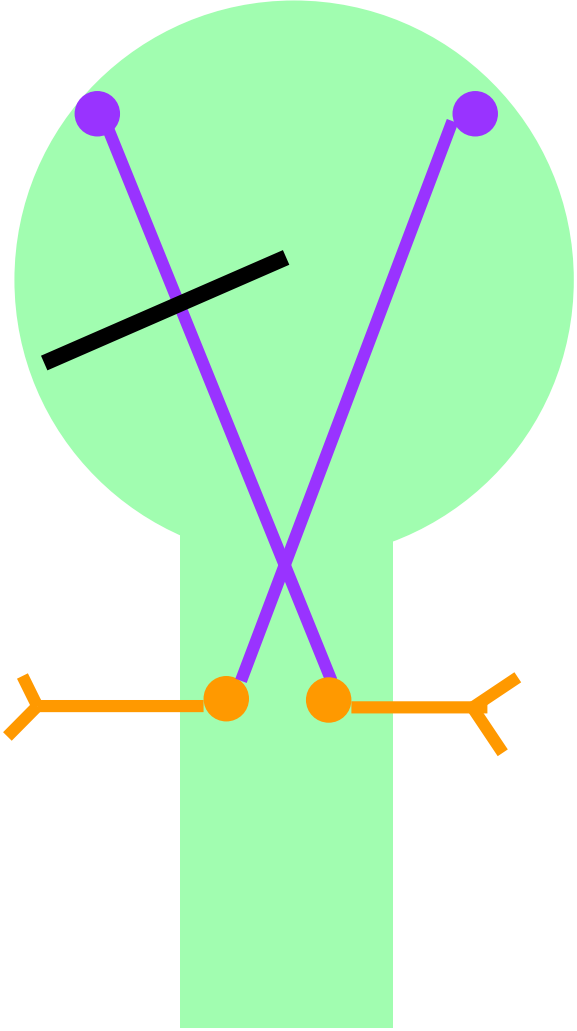


Hypoglossal  
(CN XII)

# Bilateral

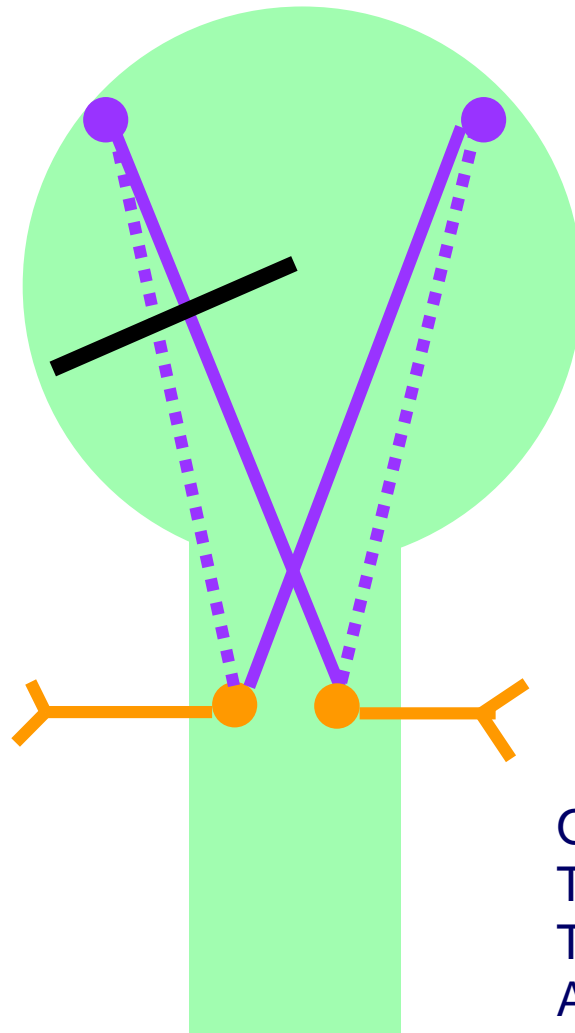


Oculomotor (CN III)  
Trochlear (CN IV)  
Trigeminal (CN V)  
Abducens (CN VI)  
Glossopharyngeal (CN IX)  
Vagus (CN X)  
Accessory (CN XI)



Hypoglossal

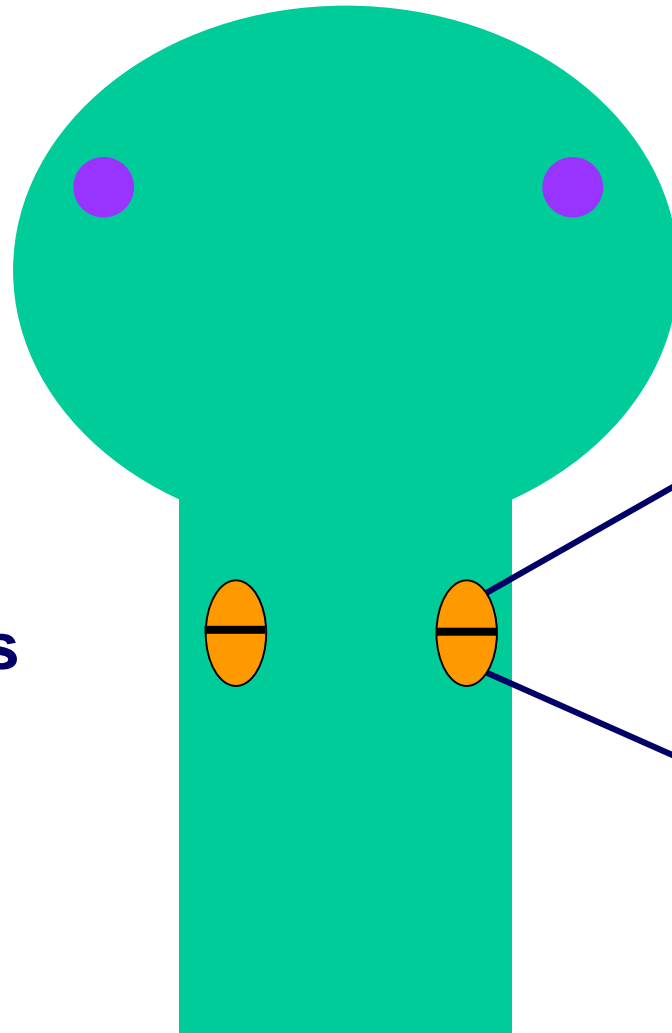




- Oculomotor (CN III)
- Trochlear (CN IV)
- Trigeminal (CN V)
- Abducens (CN VI)
- Glossopharyngeal (CN IX)
- Vagus (CN X)
- Accessory (CN XI)

# Facial nerve

**The facial motor nucleus is made up of two parts**



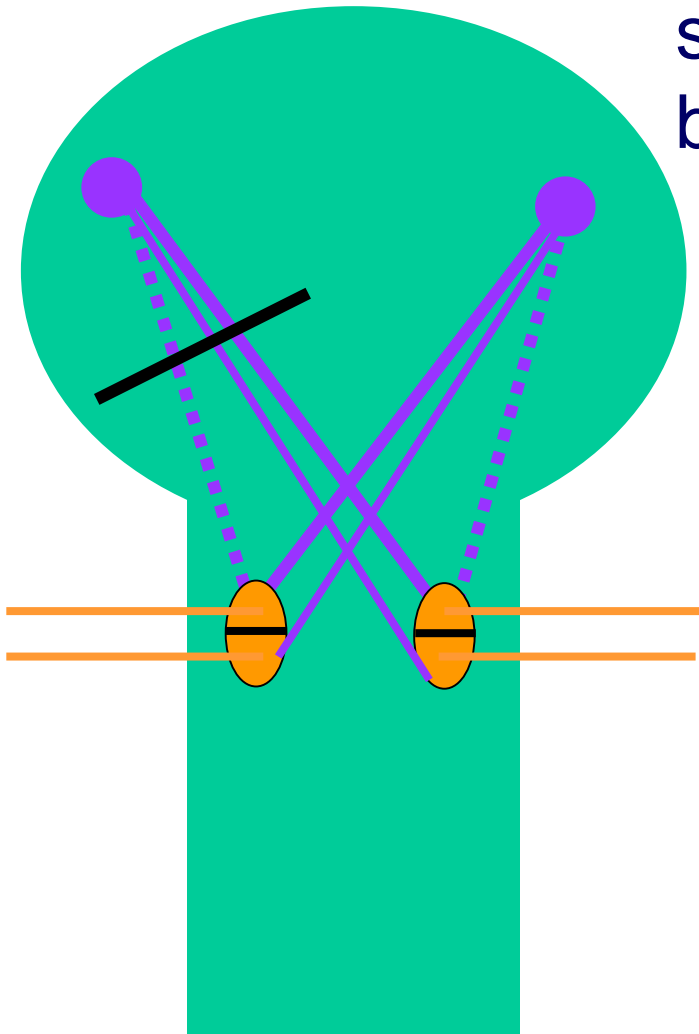
superior part  
supplies muscles  
on upper half of  
the face

inferior part  
supplies the  
muscles on lower  
half of the face

# Facial nerve

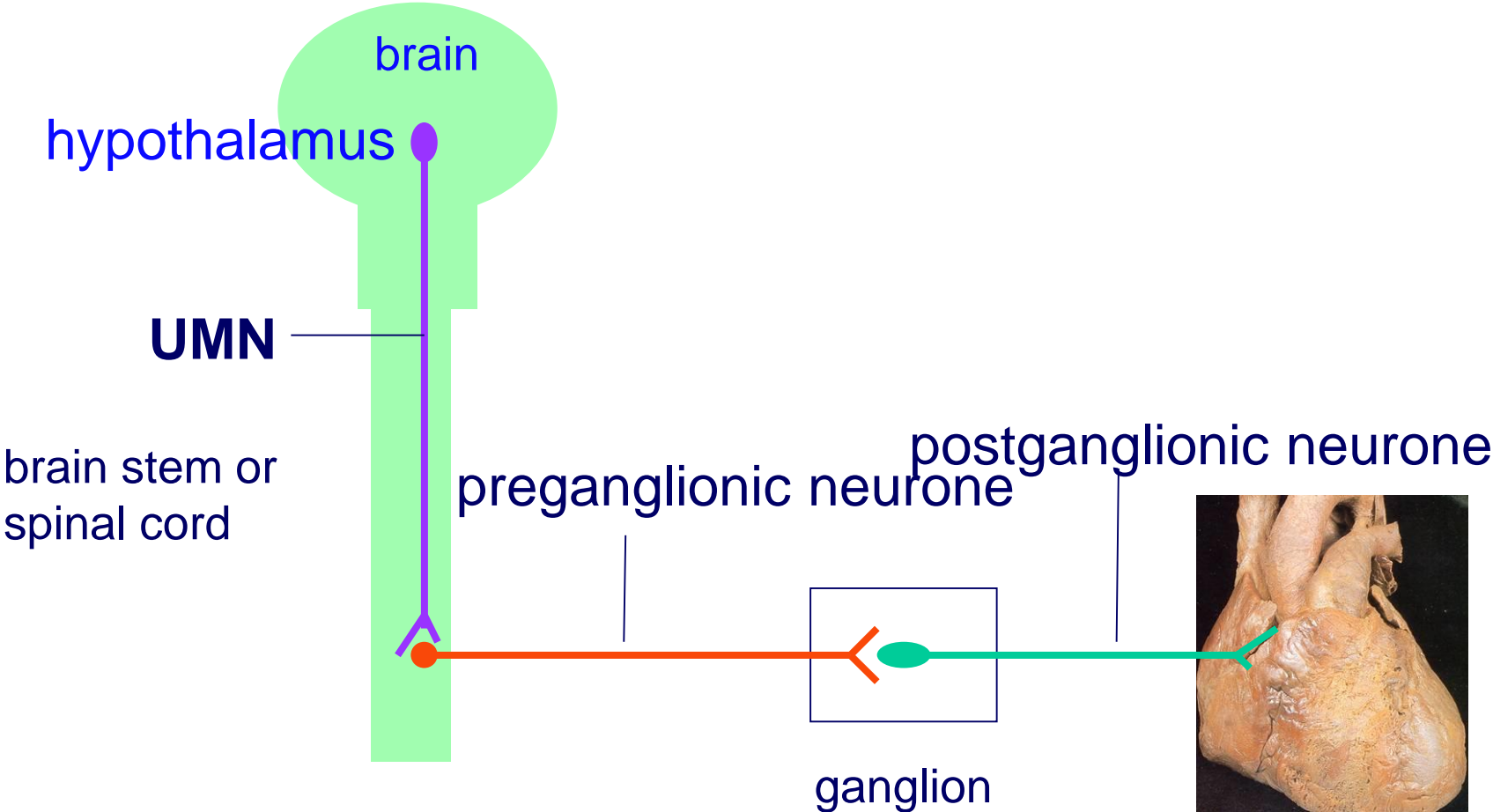
superior part of nucleus is bilaterally innervated

inferior part of nucleus is contralaterally innervated

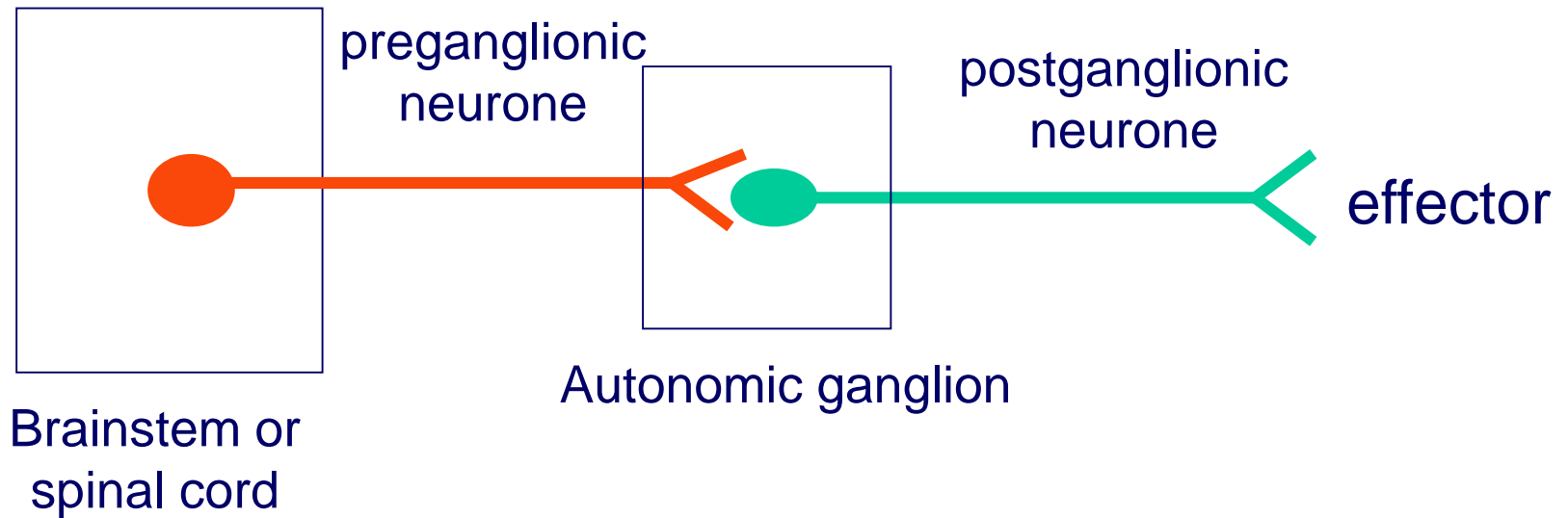


What would be the effect of an upper motor neurone lesion?

# Autonomic Motor Pathway

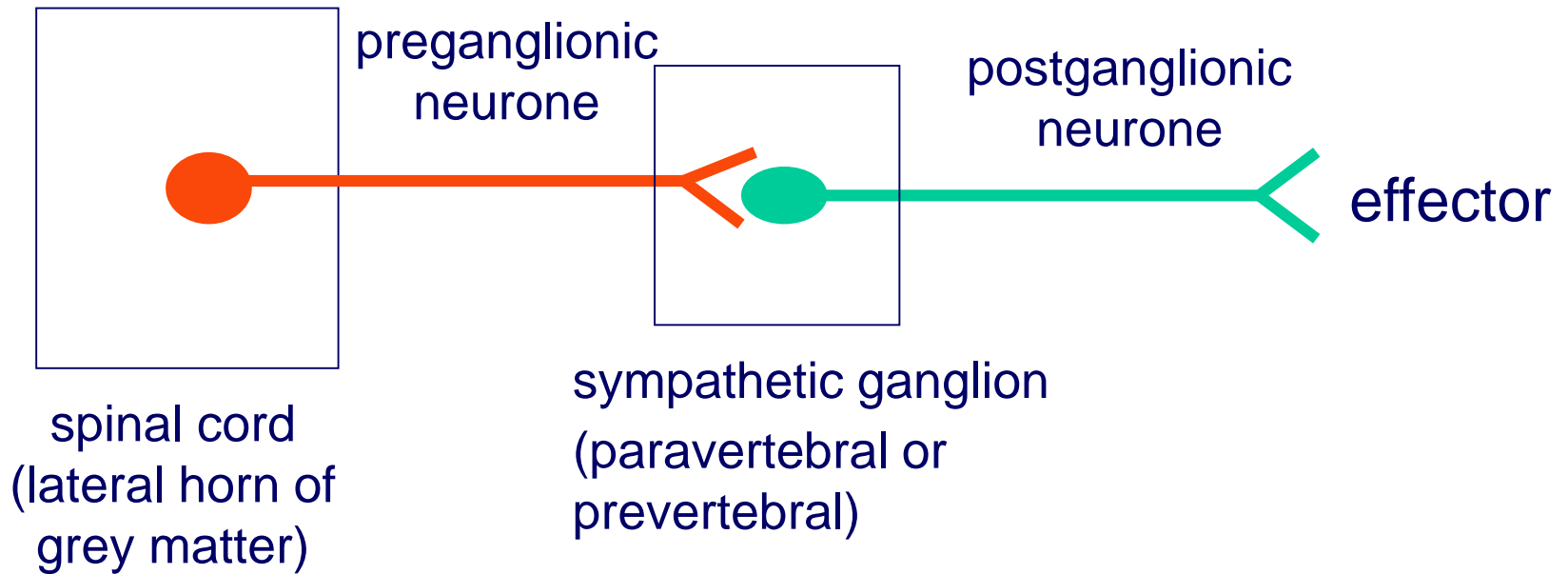


# Autonomic Nervous System



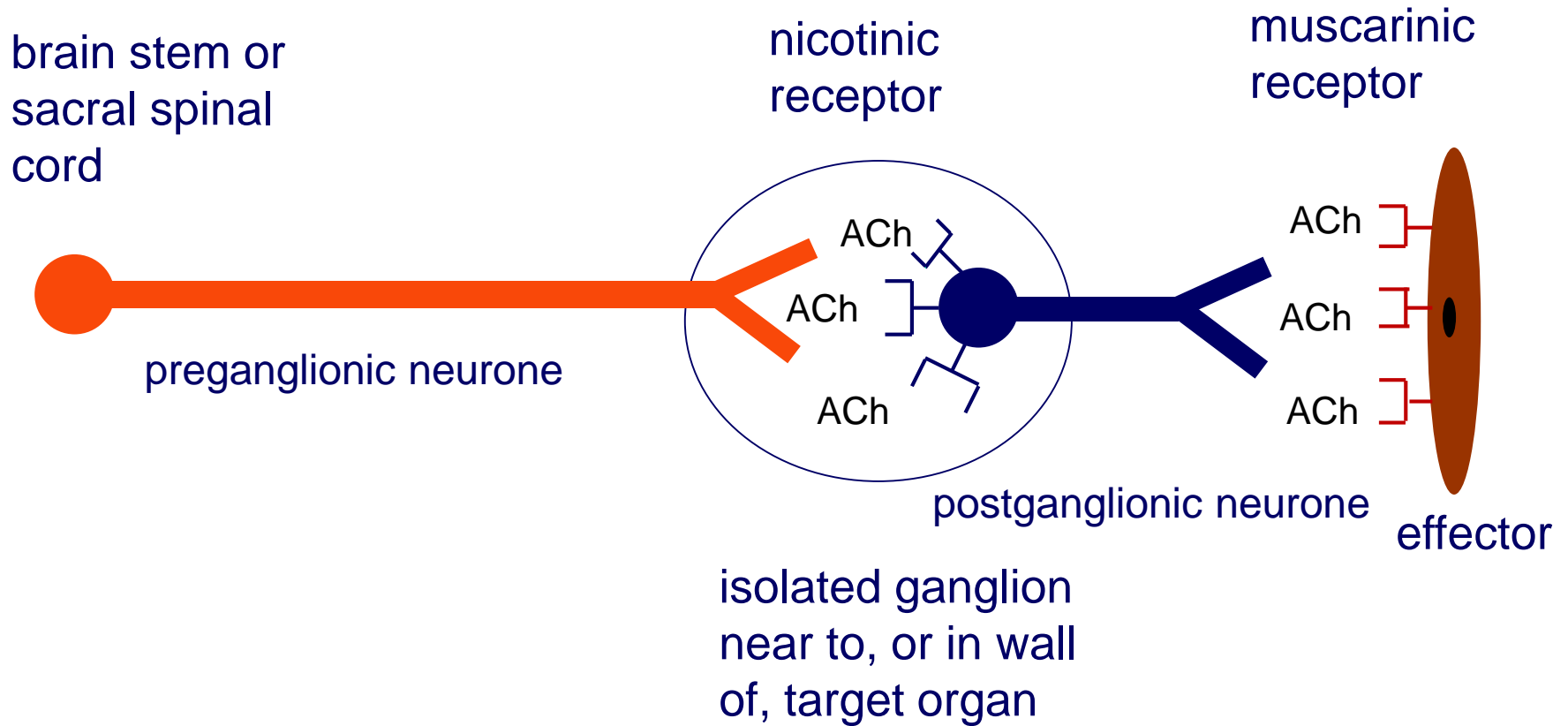
# Sympathetic Nervous System

- 2 lower motor neurones

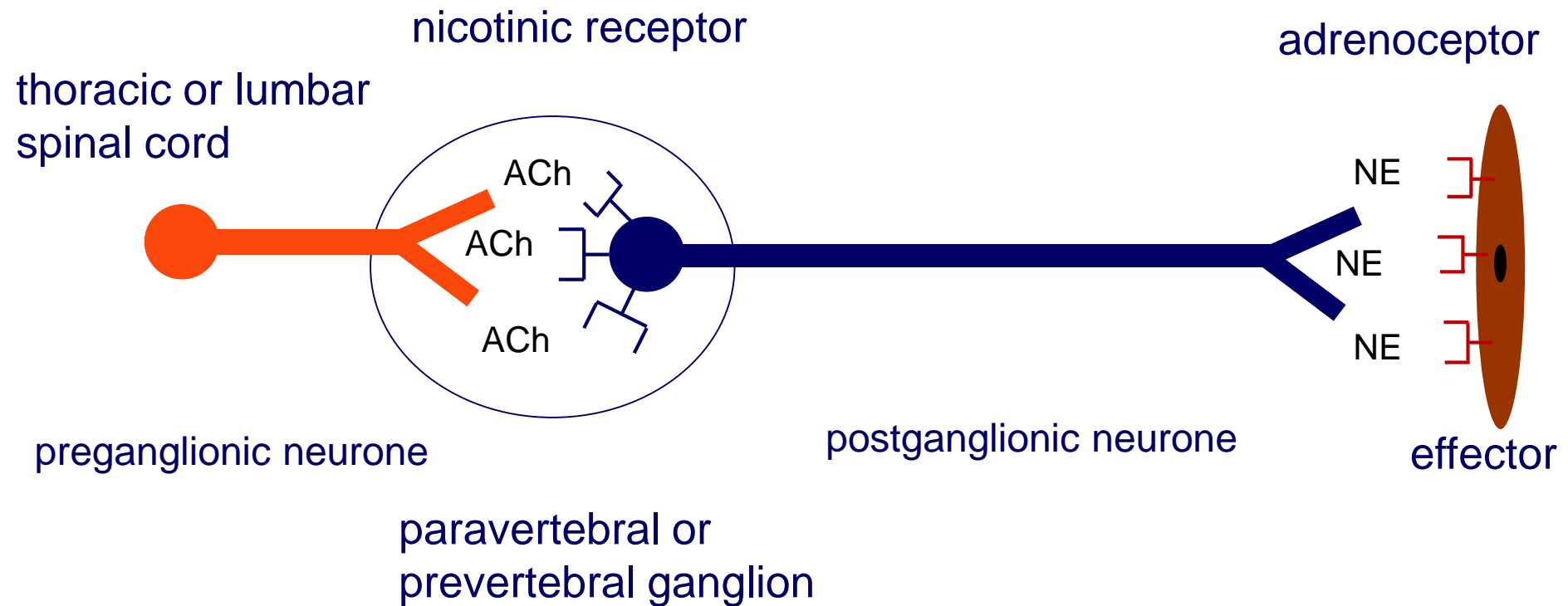




# Parasympathetic



# Sympathetic

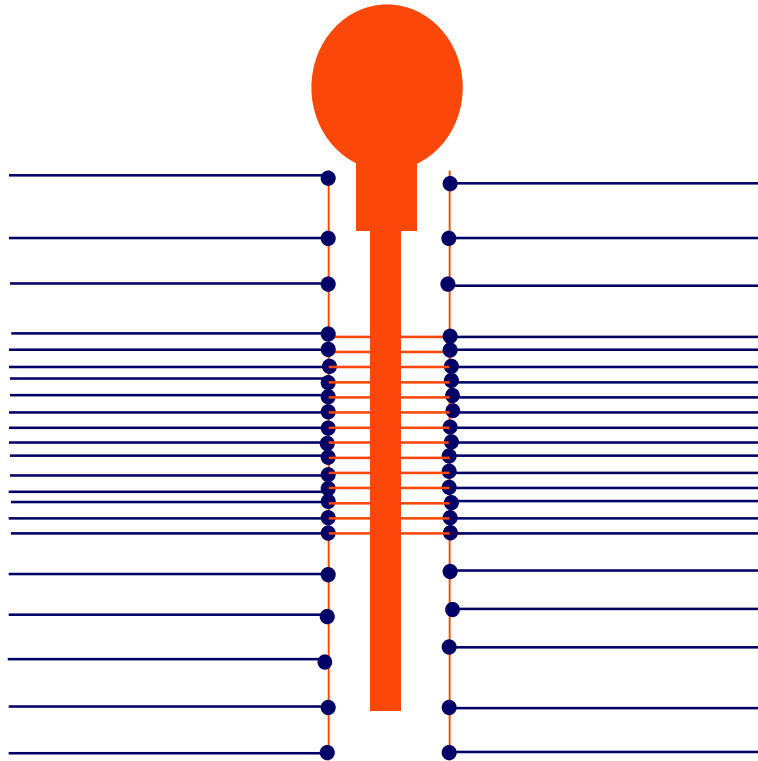


NB postganglionic sympathetic neurones acting on sweat glands release ACh which binds to muscarinic receptors

# Sympathetic Chain

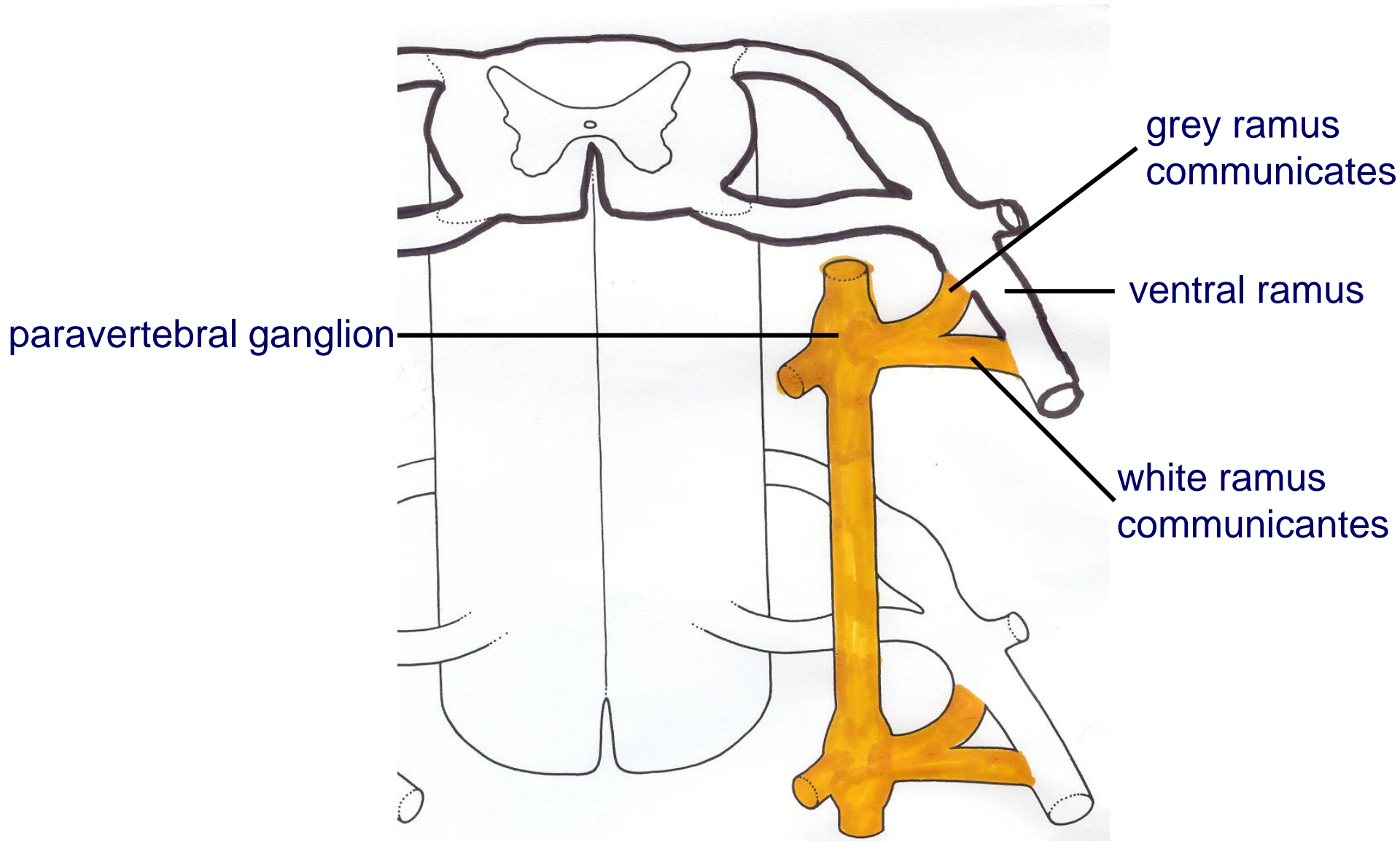
(Paravertebral Ganglion)

lies either side of the vertebral column



Sympathetic  
outflow T1-L2

# Sympathetic Chain



# Sympathetic Chain

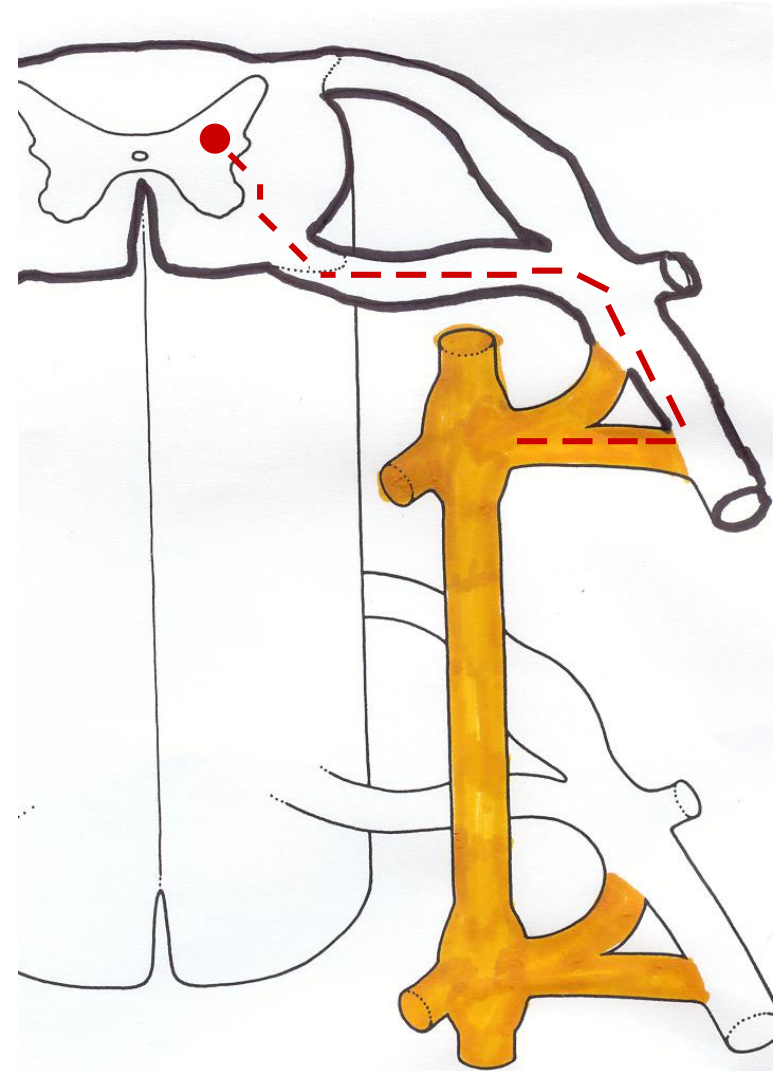
Nerve cell bodies of preganglionic neurones located in lateral horn of grey matter

Axon passes in ventral root

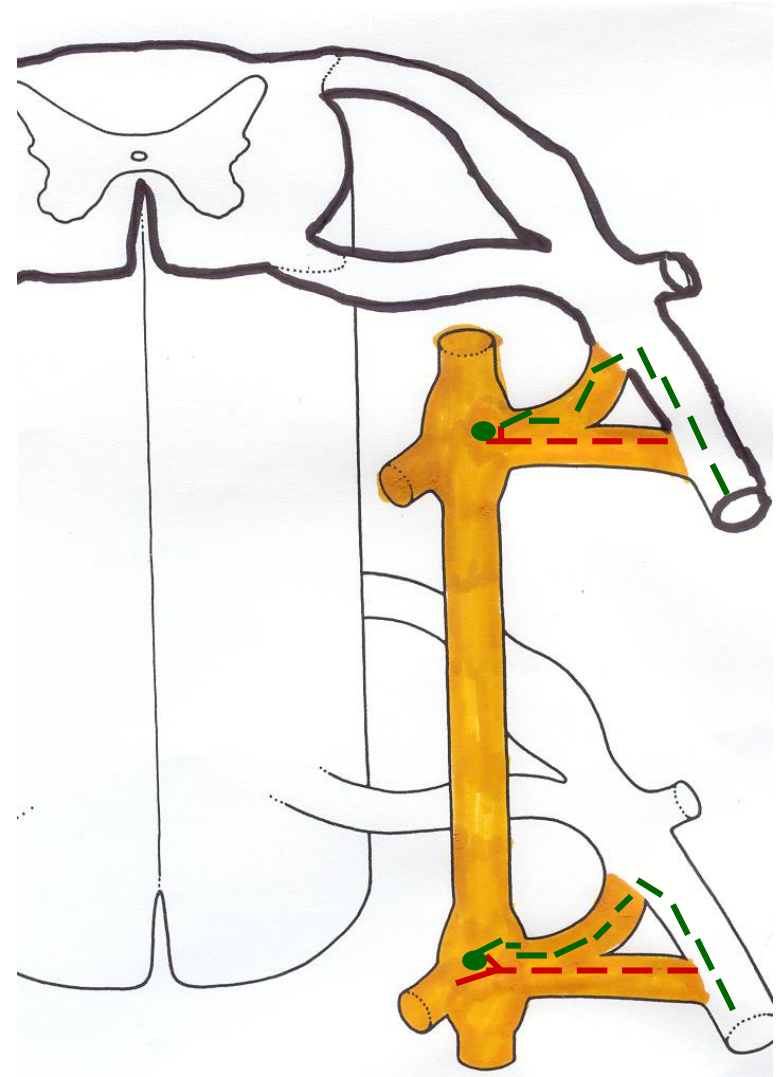
→ spinal nerve → ventral rami

→ white ramus communicantes

Then takes one of 3 options

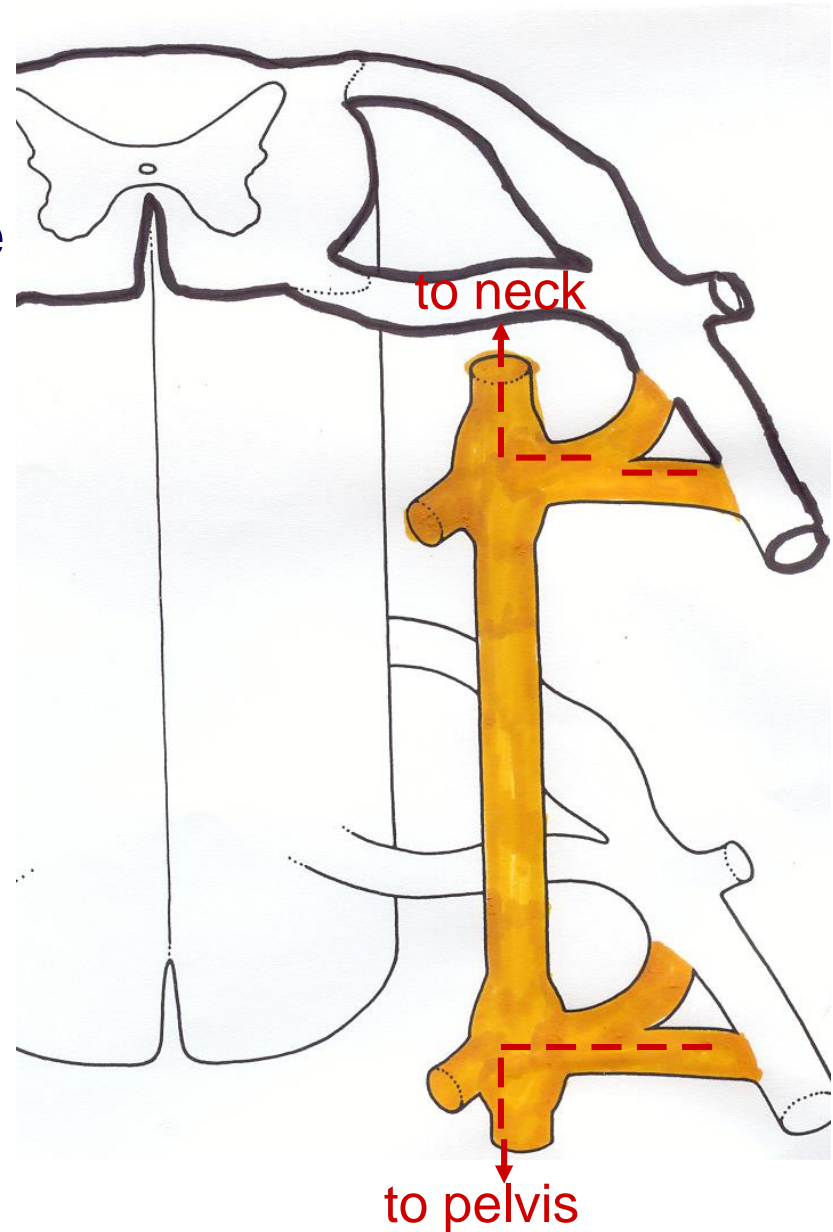


1. Synapses in the paravertebral ganglion. The postganglionic neurone enters the grey ramus communicates and returns to the ventral ramus in order to pass to the periphery.



2. Travels up the chain to synapse in a paravertebral ganglion in the neck or down the chain to synapse in a paravertebral ganglion in the pelvis.

The postganglionic neurone enters the grey ramus communicates at the new level. It passes to the periphery via the adjacent ventral ramus.

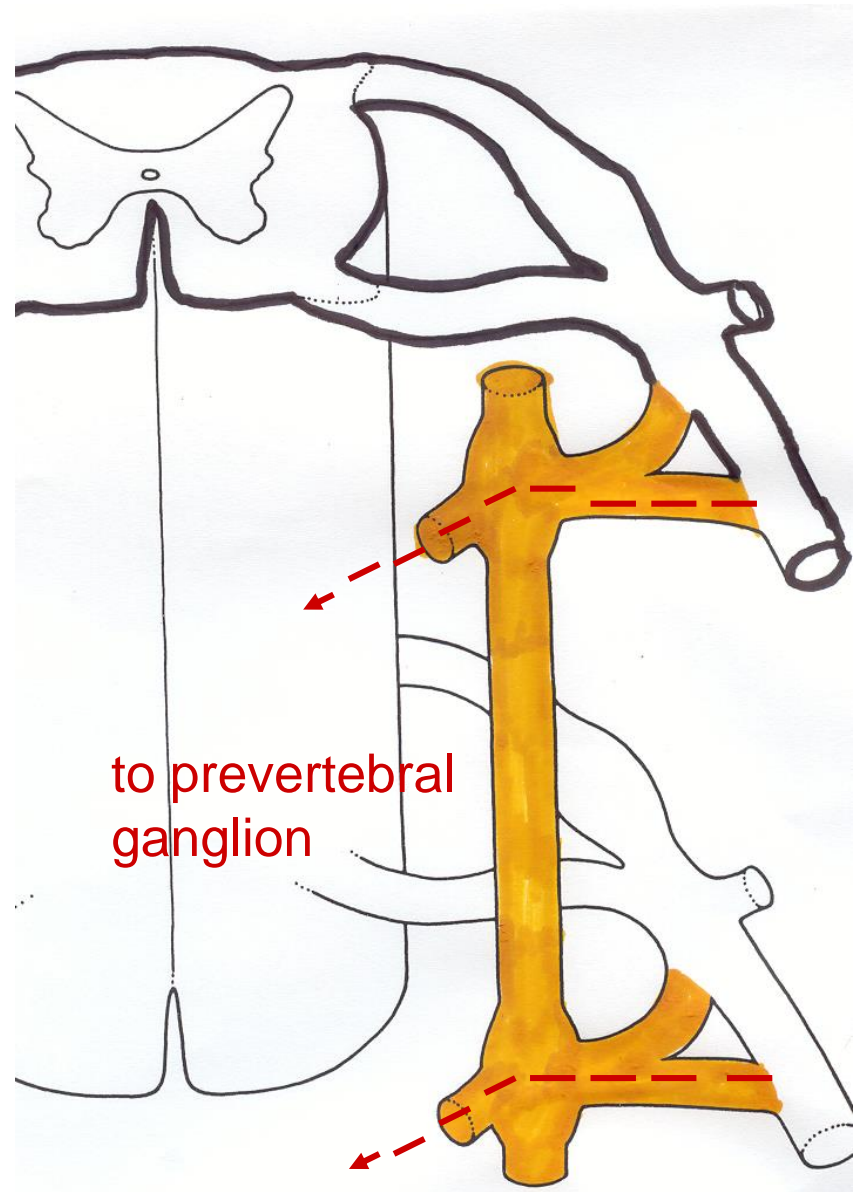




3. Passes straight through the chain to synapse in a prevertebral ganglion (e.g. superior mesenteric ganglion).

The preganglionic neurone is termed a splanchnic nerve.

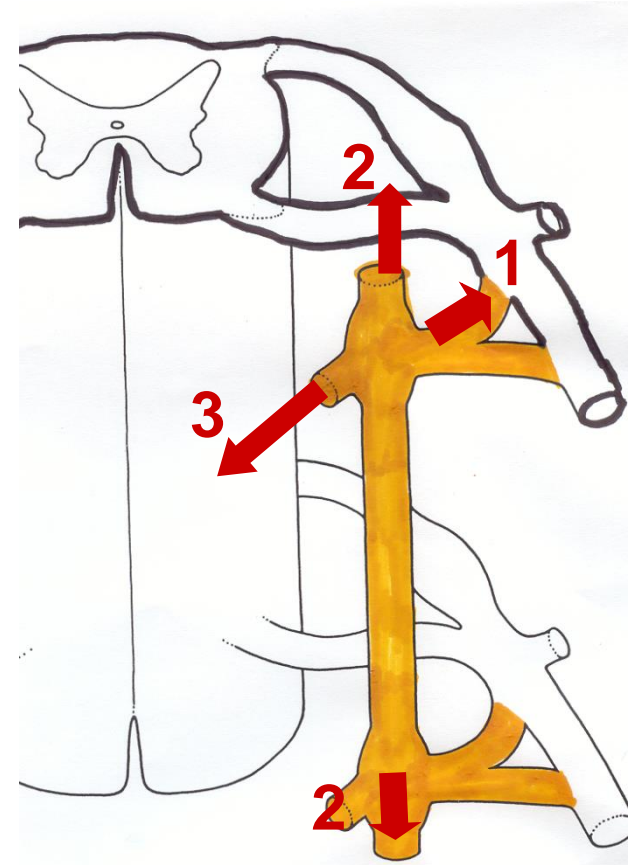
The postganglionic neurone passes directly to the effector organ.





# Summary of fate of sympathetic preganglionic neurones

1. Synapses in paravertebral ganglion at own spinal level
2. Passes up/down the chain to synapse in cervical or pelvic paravertebral ganglion.
3. Passes straight through chain to synapse in prevertebral ganglion.



# Good text book for understanding tracts

