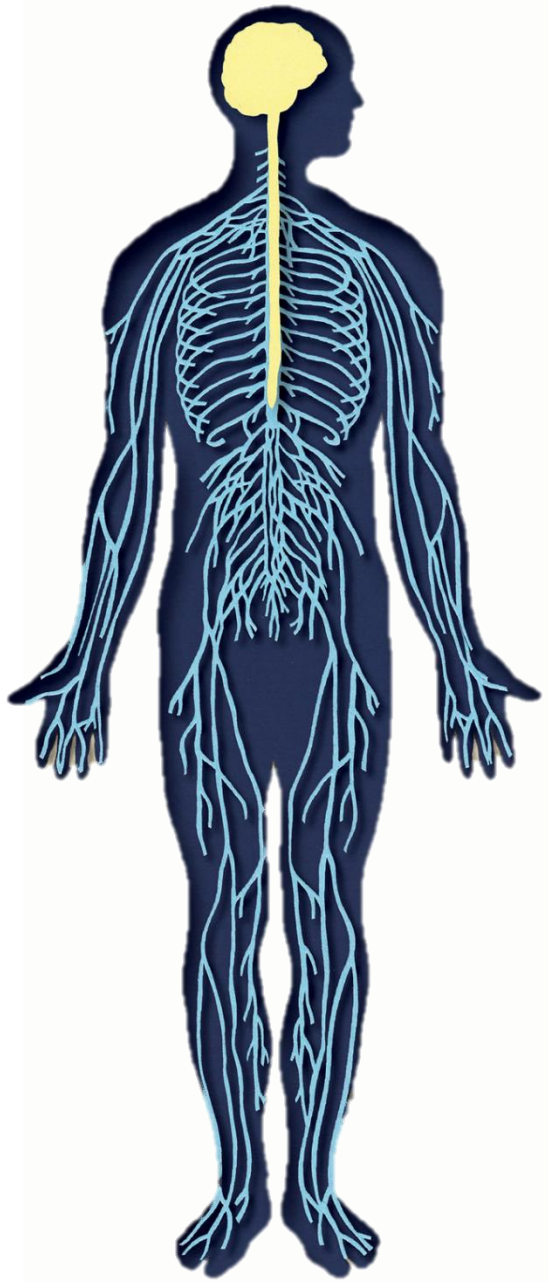
بسم الله الرحمن الرحيم

- Important
- Term
- Female notes
- Male notes
- Extra explanation



Anatomy: Autonomic Nervous System

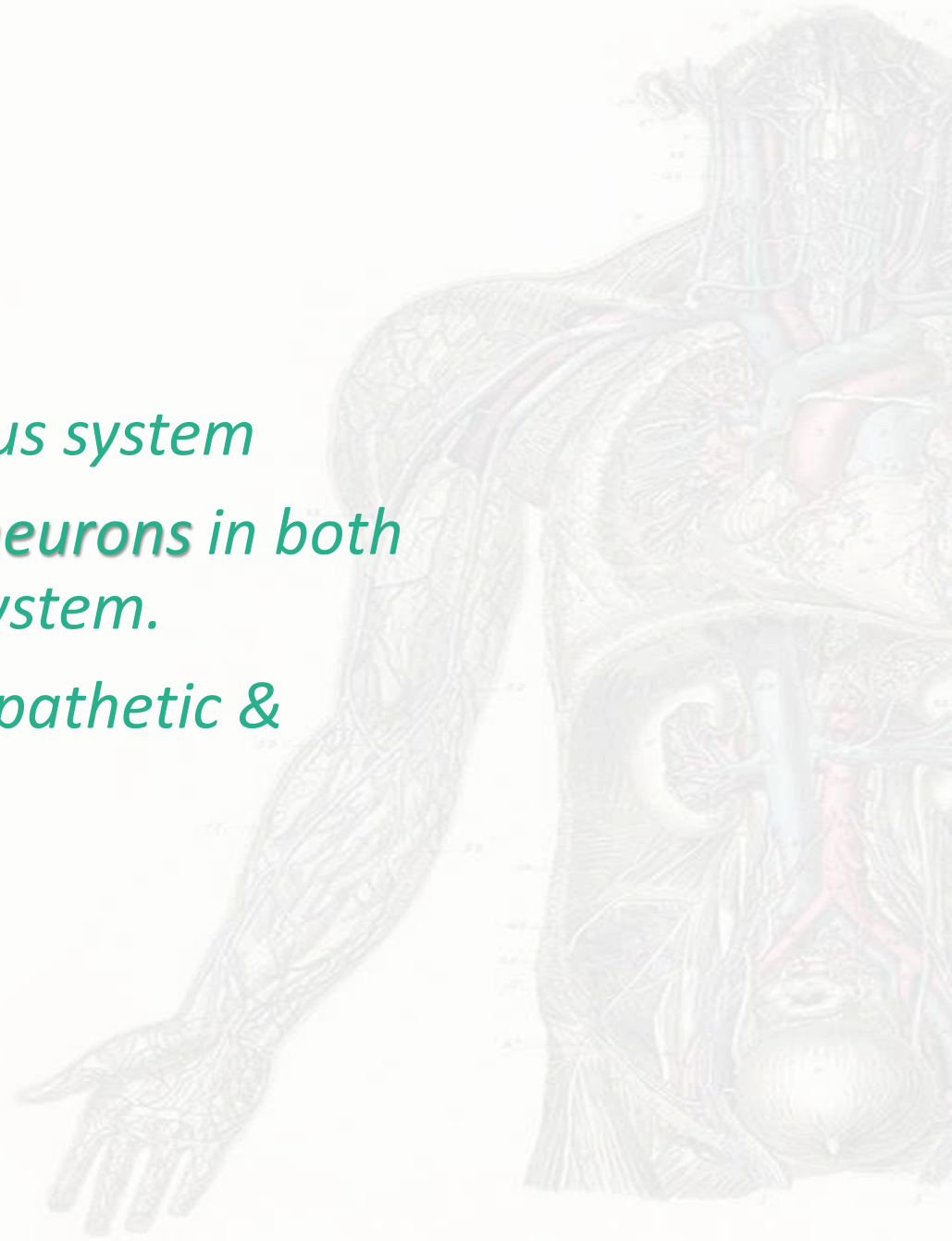
Lecture 4 (Girls) Lecture 5 (Boys)

تدبّر في خلق الرحمن وردّد سبحان الله

(وَفِي أَنْفُسِكُمْ أَفَلا تُبْصِرُونَ)

Objectives:

- ***Define*** *the autonomic nervous system.*
- *Describe the* ***structure*** *of autonomic nervous system*
- *Trace the* ***preganglionic & postganglionic neurons*** *in both sympathetic & parasympathetic nervous system.*
- *Enumerate in brief* ***the main effects*** *of sympathetic & parasympathetic system*



Autonomic nervous system

Control involuntary structure
(innervation of involuntary structures)

Visceral organ | **Glands** | **Smooth & cardiac muscle**

Visceral(related to viscus): any large interior organ in any of the great body cavities, especially those in the abdomen.

The autonomic nervous system regulates certain body processes, such as blood pressure and the rate of breathing. This system works automatically (autonomously), without a person's conscious effort.

Function

(along with endocrine system)

- **Maintains Homeostasis of internal environment**

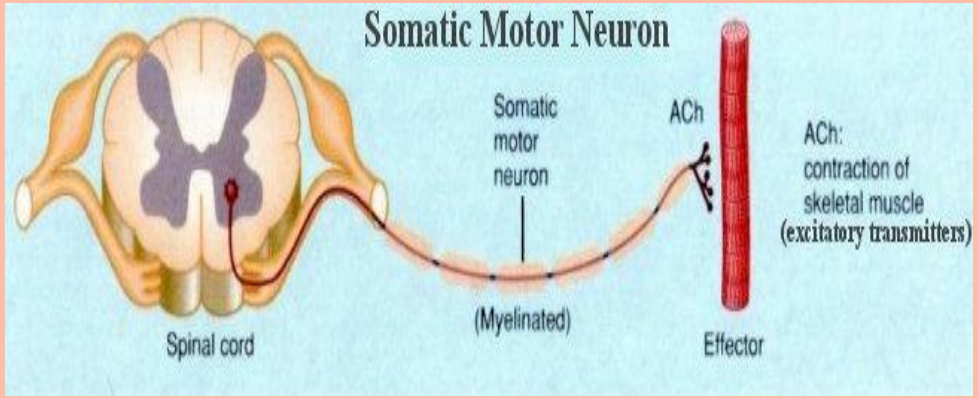
Location

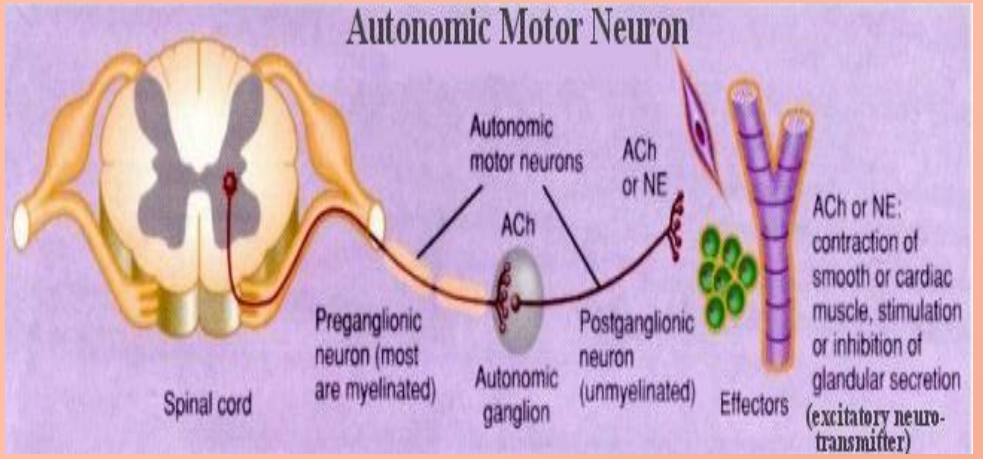
- **CNS** (central nervous system)
- **PNS** (peripheral nervous system)

Regulation

(controlled)

- **Hypothalamus: (Hypothalamus is portion of the brain that maintains the body's internal balance and responsible for the production of many of the body's essential hormones).**





Efferent pathway motor (ناقل)

- **Somatic nervous system** (1 neurons)
- **Autonomic nervous system** (2 neurons)
  - **Preganglionic** (located in the brain & spinal cord)
  - **Postganglionic** (located in the autonomic ganglia)

Autonomic Nervous System

Sympathetic

Activated during exercise, excitement, and emergencies

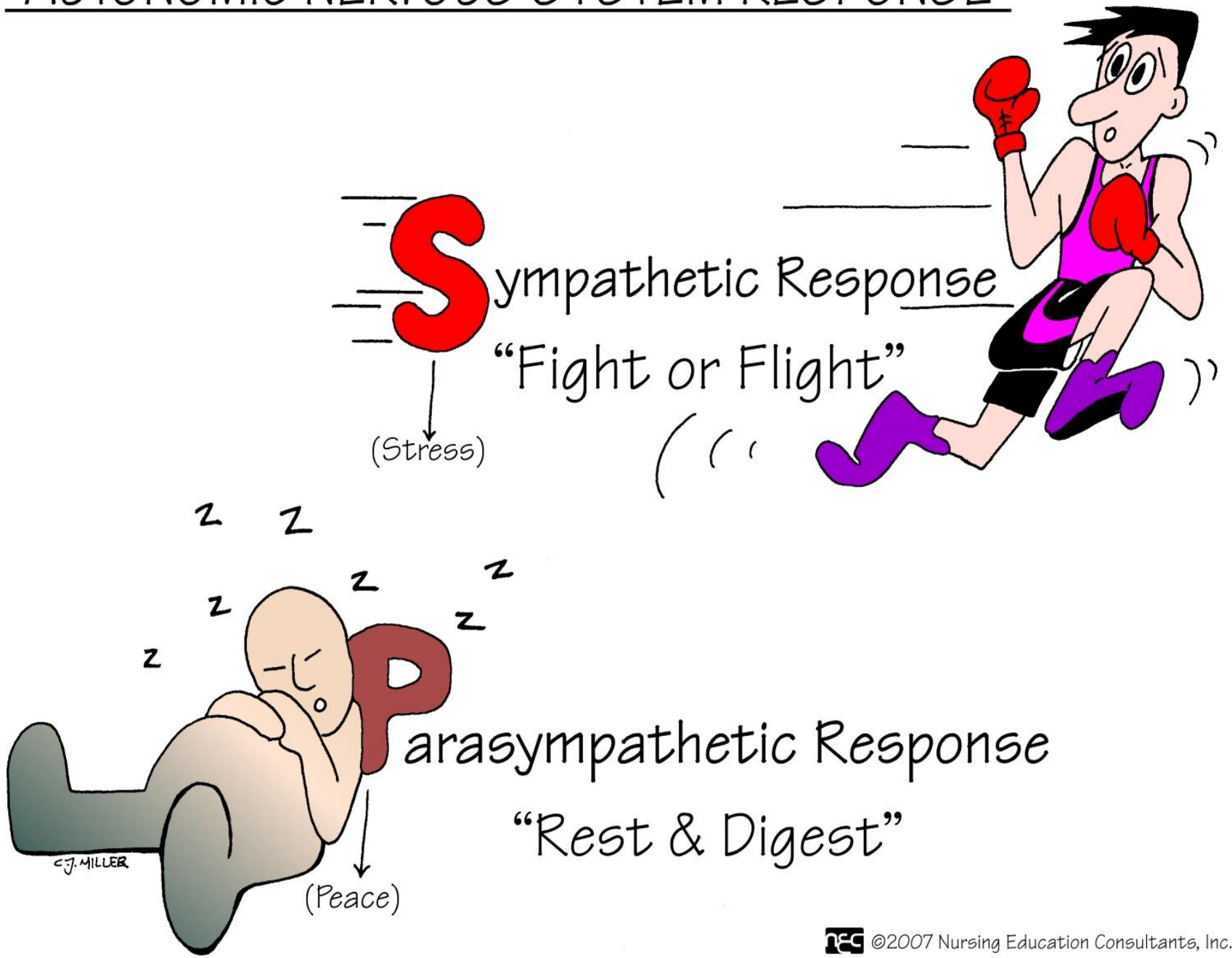
"fight or flight"

Parasympathetic

Concerned with conserving energy

"rest and digest"

"AUTONOMIC NERVOUS SYSTEM RESPONSE"



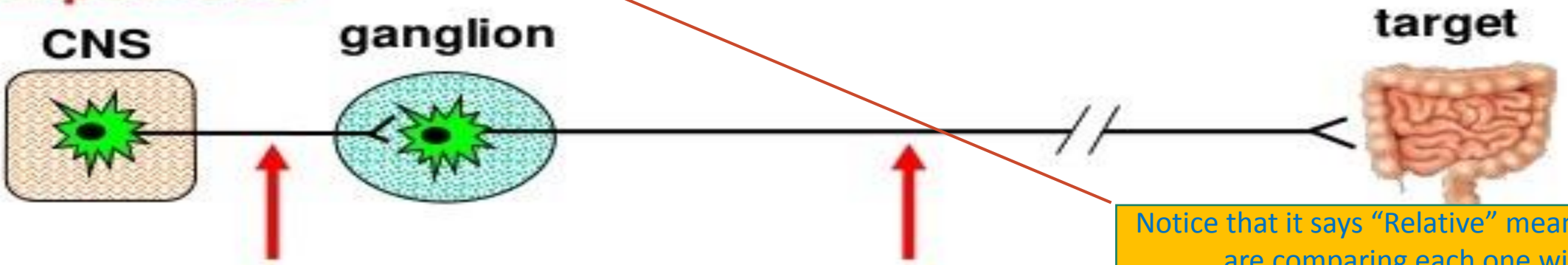
These tow are working together to provide **antagonistic control** over the viscera to maintain a stable internal environment

Overview of the Autonomic Nervous System

Differences between Sympathetic & Parasympathetic

Relative Lengths of Neurons

Sympathetic

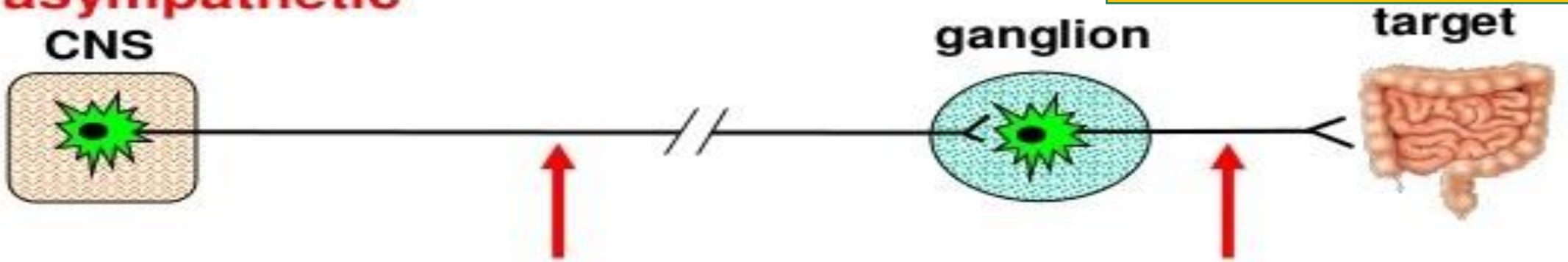


Short Preganglionic Fiber

Long Postganglionic Fiber

Notice that it says "Relative" meaning that we are comparing each one with its complementary.
So in the ***sympathetic*** we may find a **"pre"** fiber that is longer than a **"post". However, they CAN'T be in the same pair.**

Parasympathetic

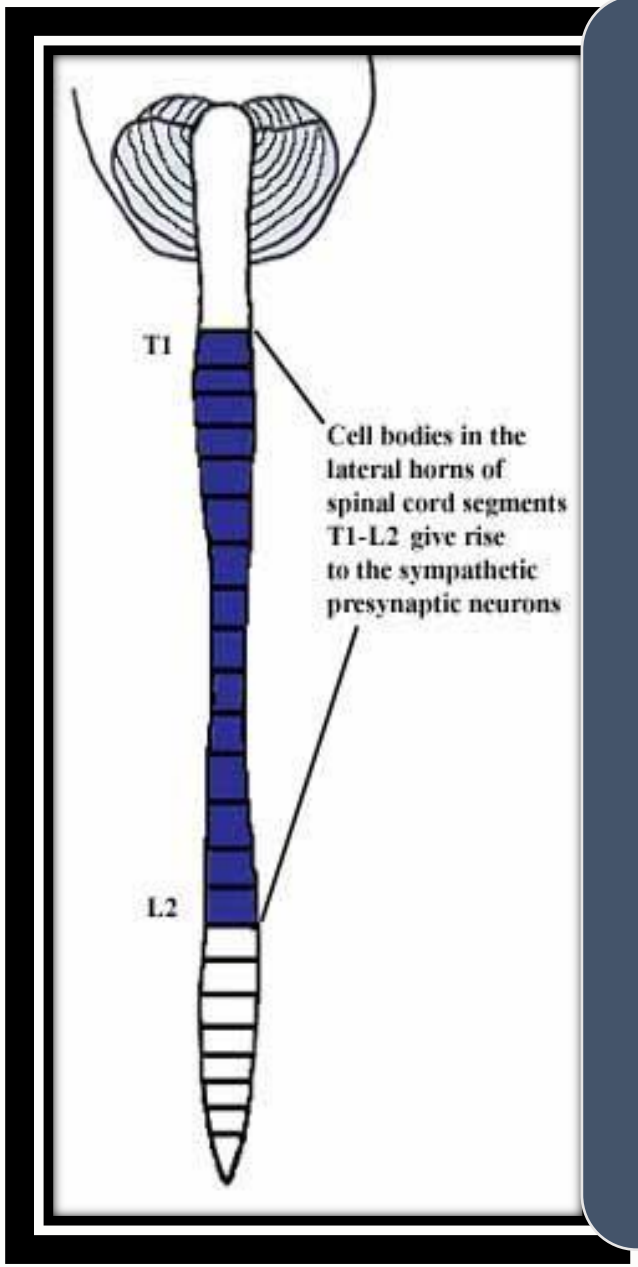


Long Preganglionic Fiber

Short Postganglionic Fiber

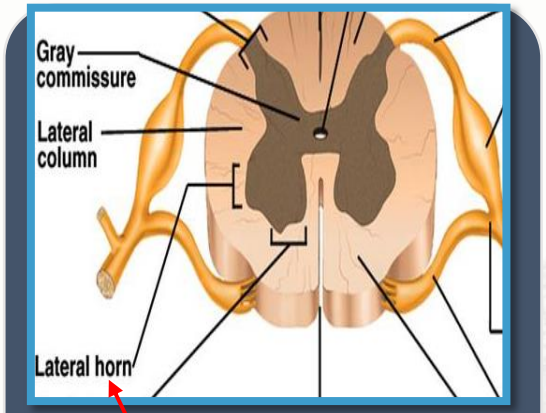
Presynaptic=Preganglionic
Postsynaptic=Postganglionic

Sympathetic Division



Preganglionic neurons

Located in



the lateral gray horn

of

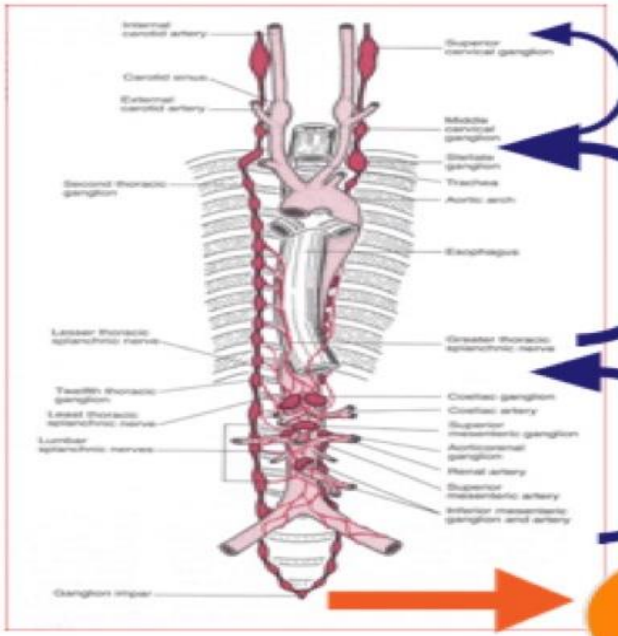
T1-L2 segments of spinal cord
(Thoracolumbar outflow)

Nervous system

- Somatic
- Autonomic
  - Parasympathetic
  - Sympathetic

Sympathetic

As their preganglionic neurons are short, there ganglia are located near the CNS

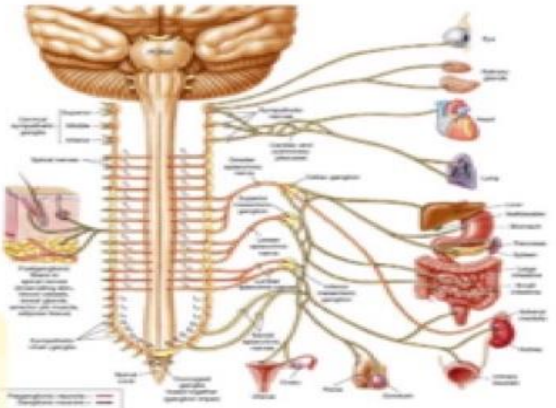


- 3 cervical ganglia
- 11-12 thoracic Ganglia
- 4 lumbosacral Ganglia
- Ganglion impar

- Paravertebral Ganglia

Paravertebral

Forming 2 sympathetic chains, one on each side of the vertebral column.



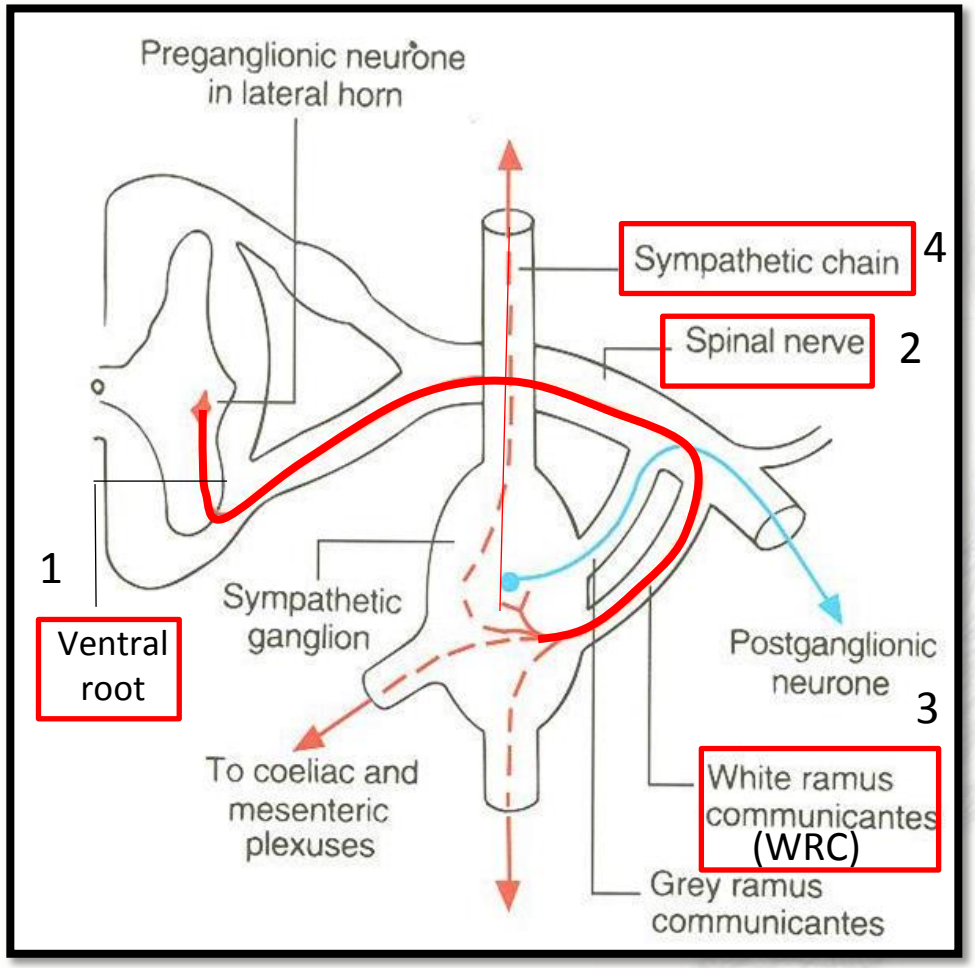
- Prevertebral Ganglia

Prevertebral

Celiac and mescentric

Preganglionic fibers: Movement

- Run in the ventral roots of the spinal nerve
- Travel through the spinal nerve
- Join the sympathetic chain via the white rami communicans. (WRC)

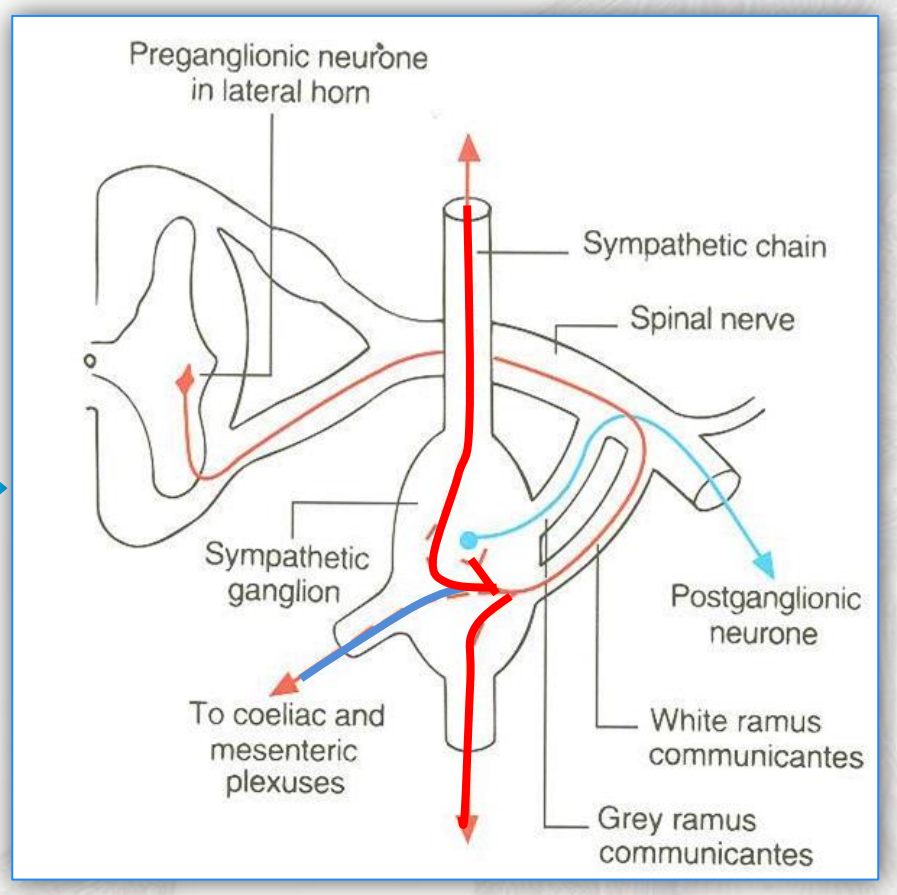


Fibers In Sympathetic Chain

Can Either:

1-Ascend, descend, remain at the same level, they connect with the postganglionic neurons in the sympathetic chain.

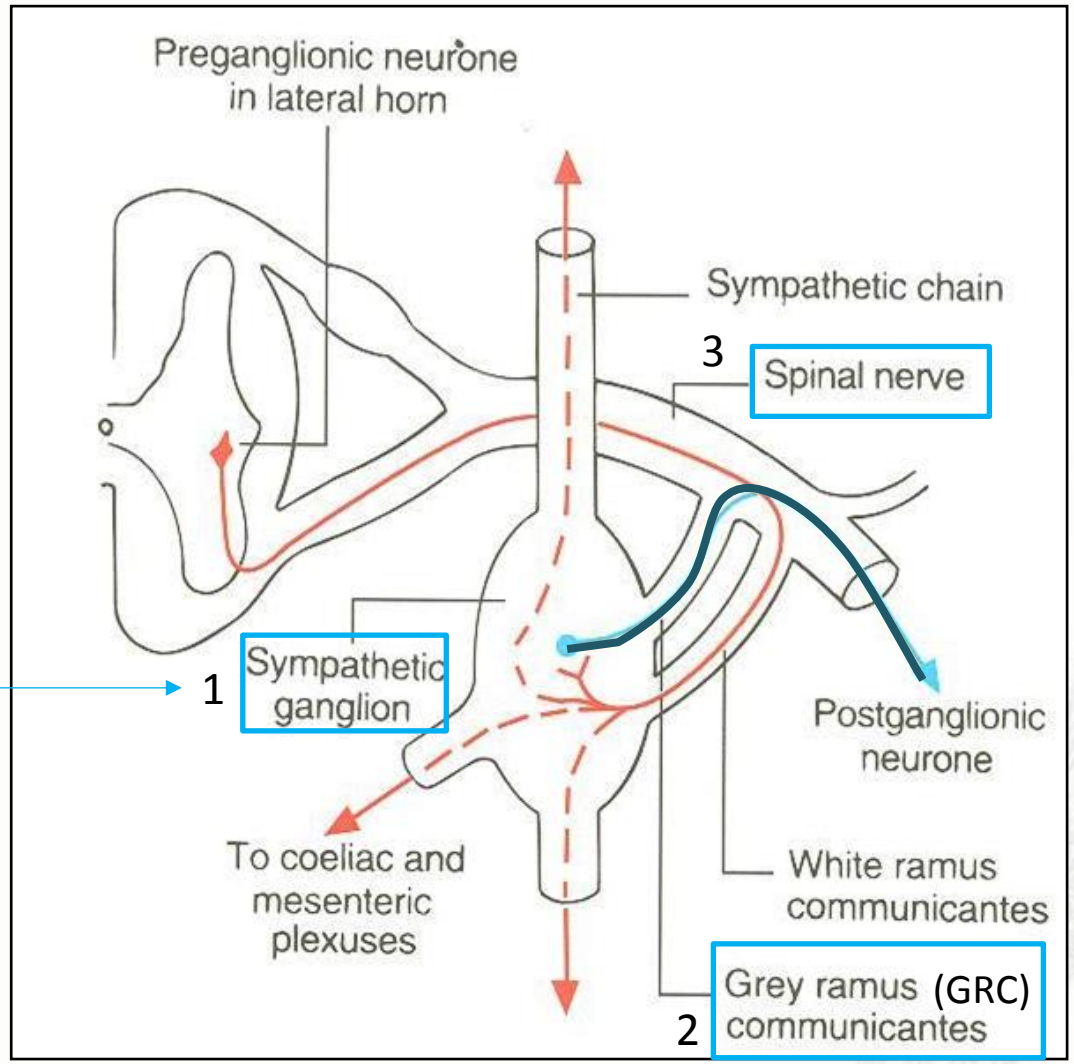
2-Leave the chain without connecting to go to the coeliac and mesenteric ganglia to connect with its postganglionic neurons.



Postganglionic fibers: Its Movement.

- **From:** the sympathetic chain ganglia
- **enter again** into the spinal nerve
- **Via:** **grey** rami communicantes (GRC)

Supply: *structures in head, thorax, blood vessels & sweat glands*



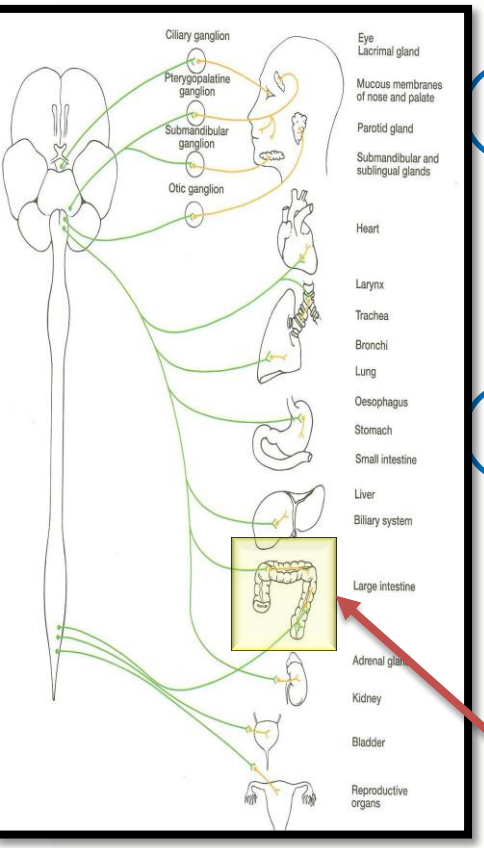
Or **From**: the cells of coeliac & mesenteric ganglia

Supply: *abdominal & pelvic viscera.*

PARASYMPATHETIC NS:

PREGANGLIONIC

Where does it Start?



1

From cranial flow
Carried by FOUR nerves:
Oculomotor (3rd)
Facial (7th)
Glossopharyngeal (9th)
Vagus (10th)

- **Ciliary**
- **pterygopalatine**
- **Submandibular**
- **Anything has (otic) as a suffix**
- **Peripheral ganglia**

2

From Sacral flow:
Carried by Pelvic splanchnic nerves

Peripheral ganglia in pelvis where they synapse

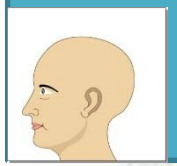
NOTES :
1- The first nerves are located in the nucleus of the four nerves
2- The second nerves located in the lateral horn of the **S2 - S4** segments of the spinal cord
3- Some organs occupy a large area so they're located in both abdominal and pelvic cavities(abdominopelvic cavity), thus they are supplied by cranial and sacral flow.

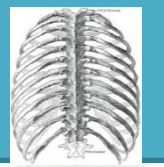
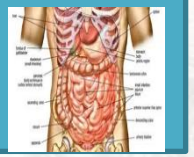
POSTGANGLIONIC

Where does it terminate? (where does the postganglia begin?)

The postganglionic fibers innervate organs of

Head | Neck | thorax | Abdomen



The postganglionic fibers innervate organs of the pelvis and lower abdomen

Parasympathetic
remember (from physiology) that neurotransmitters for:
Pre and postganglionic is Ach

SYMPATHATIC NS **Revision:**

Preganglionic Fibers

1-Run in ventral roots of the spinal nerve

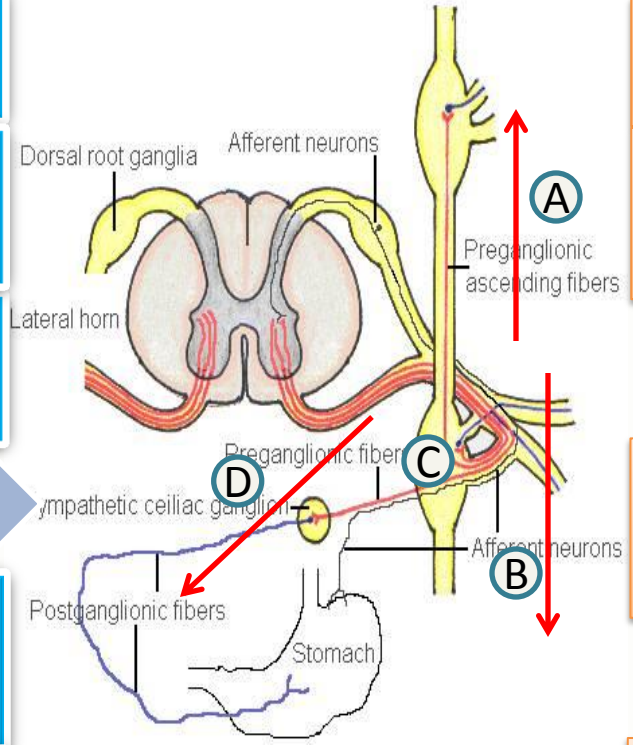
2- Travel through the spinal nerve and join the sympathetic chain via WRC (WHITE RAMI COMMUNICANTS)

Within the sympathetic chain, these fibers may:

A- ascend | B- descend | C- remain

Remain to synapse(يتشابك) with postganglionic neurons of paravertebral ganglia

D- It can simply leaves the sympathetic chain and reach the Coeliac & mesenteric ganglia and synapses with their neurons (postganglionic)



Postganglionic Fibers

1-Run from the sympathetic chain ganglia

2-Enter again into the spinal nerve (**Make a U-turn :p**) through the GRC (GREY RAMI COMMUNICANTS)

SUPPLY structures in head, thorax, blood vessels & sweat glands

Same step

3- It can simply supply abdominal & pelvic viscera from the cells of coeliac & mesenteric ganglia

Remember (from physiology) that neurotransmitters for:
Preganglionic is Ach and
Postganglionic is norepinephrine

*Note: D point doesn't synapse to any other vertebral ganglion

Some effects of the sympathetic and parasympathetic on some structures:

Autonomic nervous system

Structure	Sympathetic effect	Parasympathetic effect
Iris of eye	Dilates pupil	Constricts pupil
Ciliary muscle of eye	Relaxes	Contracts
Salivary glands	Reduces secretion	Increases secretion
Lacrimal gland	Reduces secretion	Increases secretion
Heart	Increases rate and force of contraction	Decreases rate and force of contraction
Bronchi	Dilates	Constricts
Gastrointestinal tract	Decreases motility	Increases motility
Sweat glands	Increases secretion	
Erector pili muscles	Contracts	

Important Links:

Some **websites** that can help you with **Anatomy** :

www.Innerbody.com
https://www.biodigitalhuman.com/default.html
http://www.medicalmnemonics.com/cgi-bin/browse.cfm
http://www.getbodysmart.com/index.htm

Websites from YouTube to help you memorize the Anatomic nervous system :

Autonomic Nervous System: Crash Course A&P #13 ↓
http://www.doctorshangout.com/page/anatomy-mnemonics
Autonomic Nervous System Introduction ↓
https://youtu.be/eeQ6c5nu-ck
Automatic nervous system ↓
https://youtu.be/jA1NyCE4M2g

Apps that you can download :

Anatomy Star - CNS (the Brain)

Anatomy Learning 3D Atlas

Contact us at:

anatomy435@gmail.com

QUIZ

https://www.onlineexambuilder.com/autonomic-nervous-system/exam-36200

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