



# Spinal Cord and Spinal Nerves

- Did you turn in the pre-lab on Canvas?
- Did you submit your post-lab from last week?

# Spinal Cord and Spinal Nerves

- Case Study: “Pain in the Back” **(in pairs)**
- Activity 1: The Structure of the Spinal Cord **(in pairs)**
- Activity 2: Histology of the Spinal Cord **(individually)**
- Activity 3: Spinal Nerve Structure and Function **(in pairs)**
- Activity 4: Identification of the Major Spinal Nerves and Their Motor Functions **(in pairs)**
- Activity 5: Somatic and Autonomic Reflex Arcs **(in pairs)**
- Activity 6: Spinal Nerve Pathway **(in pairs)**

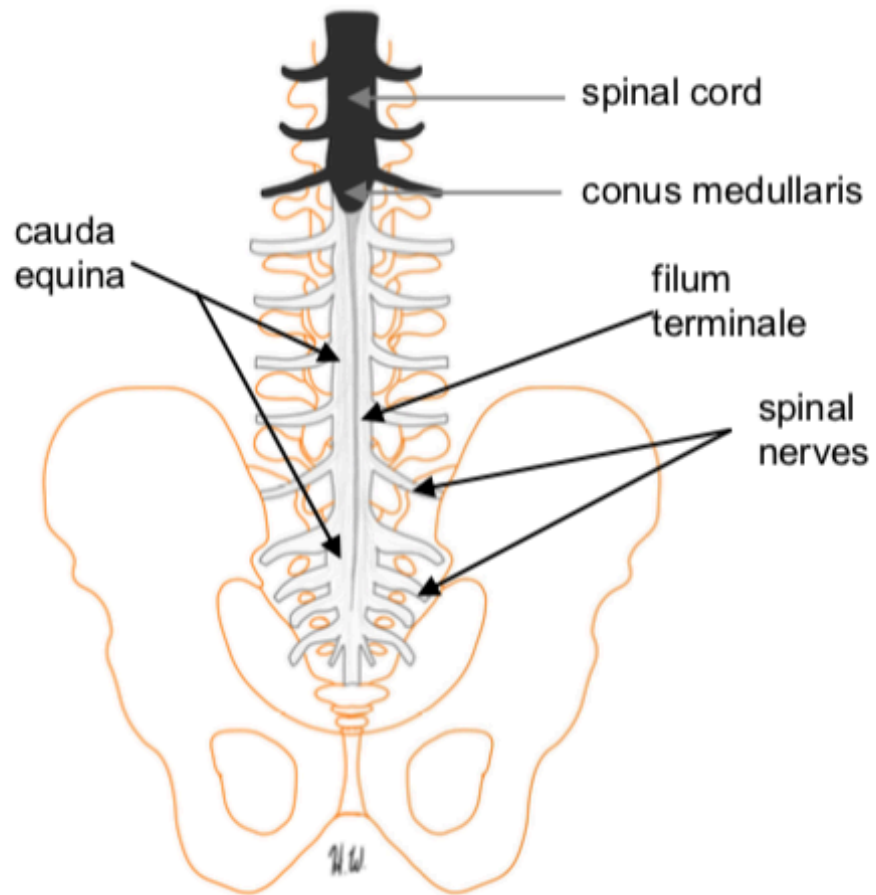
# Case Study “Pain in the Back”

## Case Study: “The Pain in the Back”

You are a nurse practitioner working in a family practice. One of your patients, Adele, a young woman in her 20's, comes in with pain in her lower back and pain down the anterior and posterior of her leg. She remarks that the pain began shortly after she began a weightlifting regimen. The pain is quite severe, preventing her from lying down at night and disrupting her sleep. She has been struggling to walk upstairs and a number of times her leg has buckled (given out) from under her. She asks for medication for pain relief that will allow her to sleep. You suspect a herniated disc in which the intervertebral disc, the pad of fibrocartilage between the vertebrae, has ruptured and is putting pressure on the several spinal nerves. You write a referral for an MRI and schedule an appointment with the radiologist to have her lower back imaged the following day.

1. Using correct anatomical terminology, describe the patient's symptoms and write down one other question you would ask the patient.

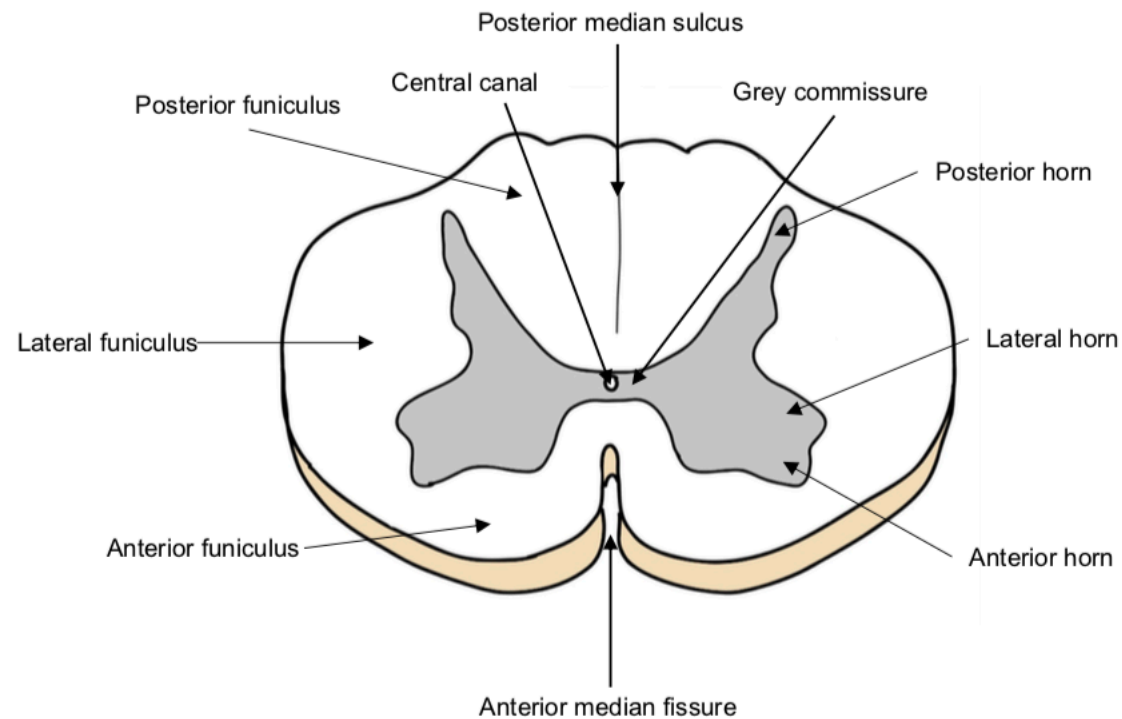
# The Structure of the Spinal Cord



The spinal cord is part of the central nervous system

It carries signals between the peripheral nerves and the brain.

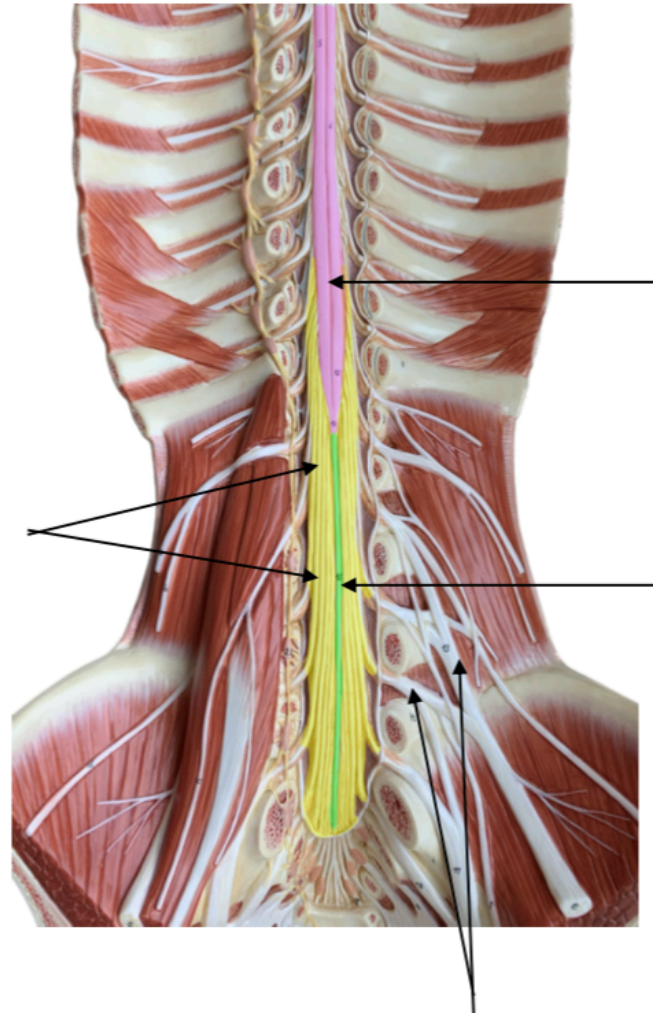
# The Structure of the Spinal Cord



In cross section the location of the grey and white matter is visible. Notice the hole in the center of the grey matter. This contains CSF.

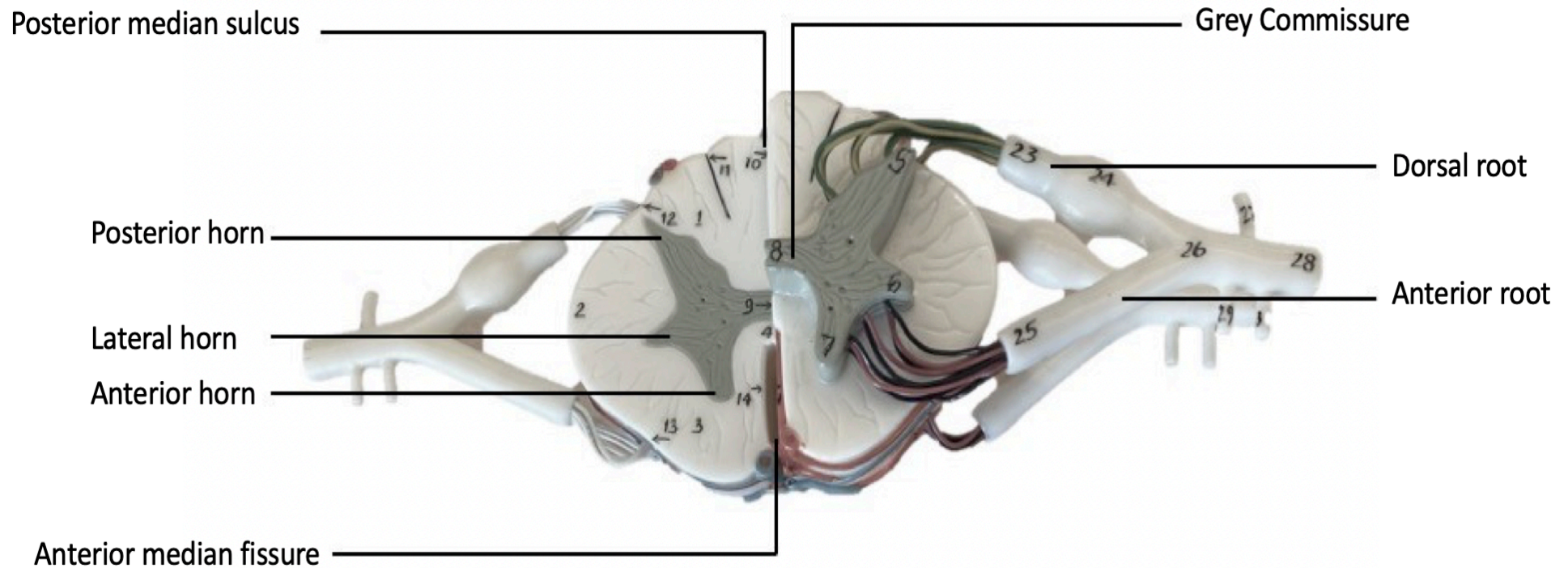
# The Structure of the Spinal Cord

You will label a longitudinal image of the spinal cord on the image in your lab manual.



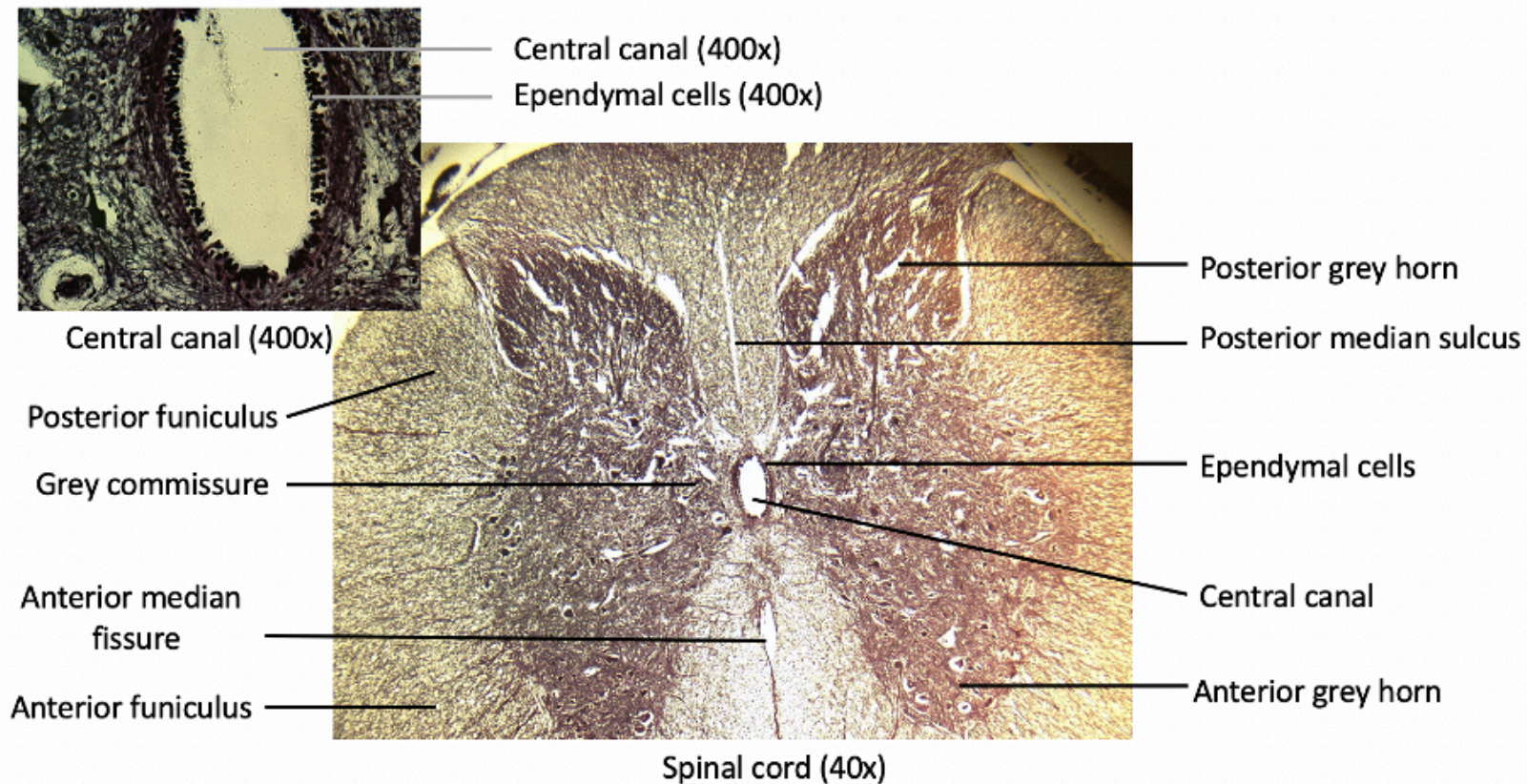
# The Structure of the Spinal Cord

You will use the terminology labels to label the cross section model of the spinal cord.



# The Structure of the Spinal Cord

View and label the slide of the spinal cord in your lab manual. Now using the slide, draw it under high power on the microscope and pay close attention to the cells lining the central canal.





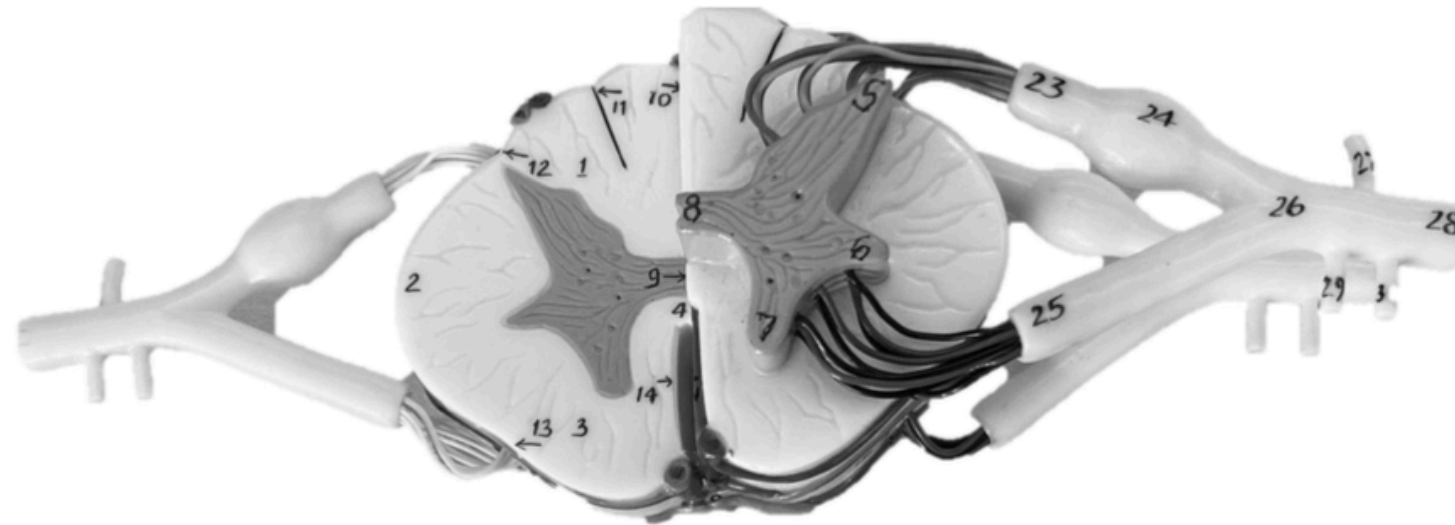
# The Structure of the Spinal Cord

Leaving and entering the spinal cord are the anterior (carries motor neurons) and posterior (carries sensory neurons) roots which fuse to form the spinal nerve. All spinal nerves are mixed nerves. The spinal nerve branches into the posterior ramus (serves the back) and the anterior ramus (serves the anterior of the body and the limbs)



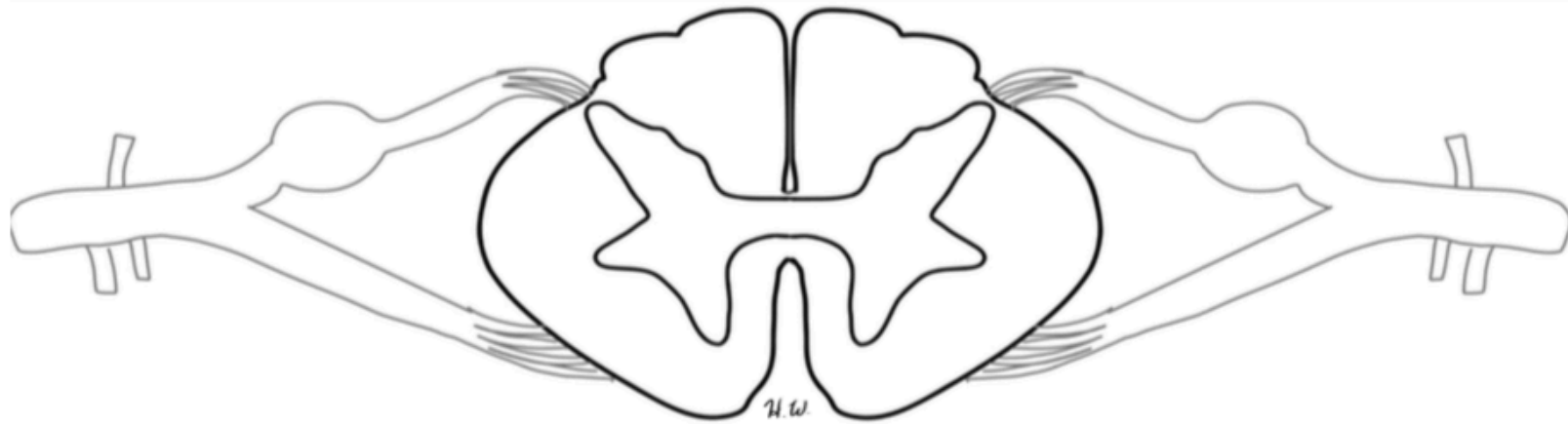
# The Structure of the Spinal Cord

Now label the image in the lab manual



# The Structure of the Spinal Cord

Color the drawing for sensory (blue), motor (red) and mixed (green) parts of the spinal cord and its attachments.



# Identification of the Major Spinal Nerves and Their Motor Functions

The 31 spinal nerves are numbered by the region of the spinal cord they emanate from.

1-8 Cervical (C1-C8)

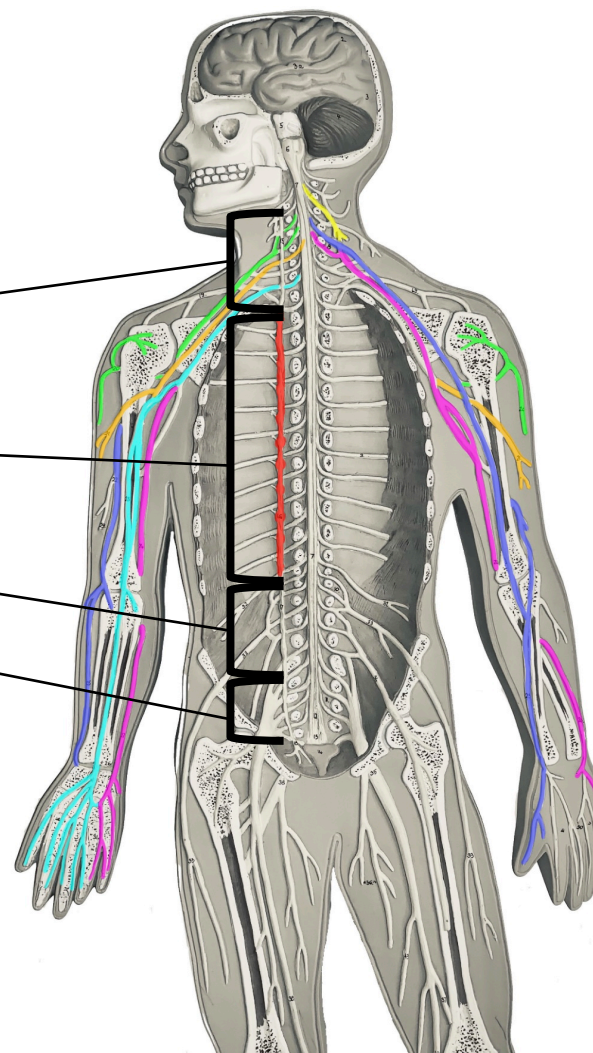
1-12 Thoracic (T1-T12)

1-5 Lumbar (L1-L5)

1-5 Sacral (S1-S5)

1 Coccygeal (Co1)

We will be learning specific nerves from each plexus (specific nerves are color coded on the image).



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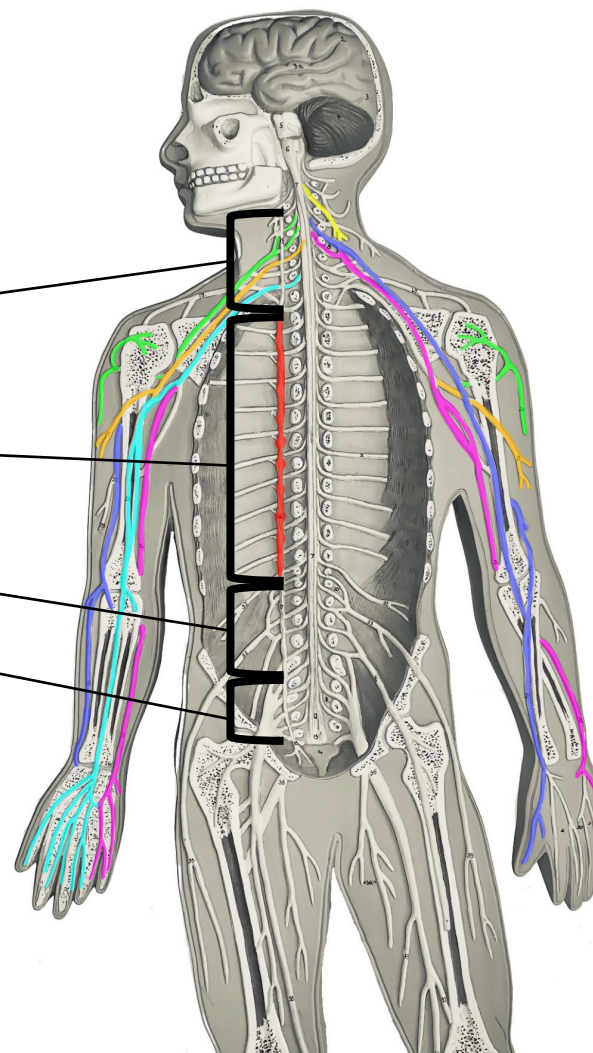
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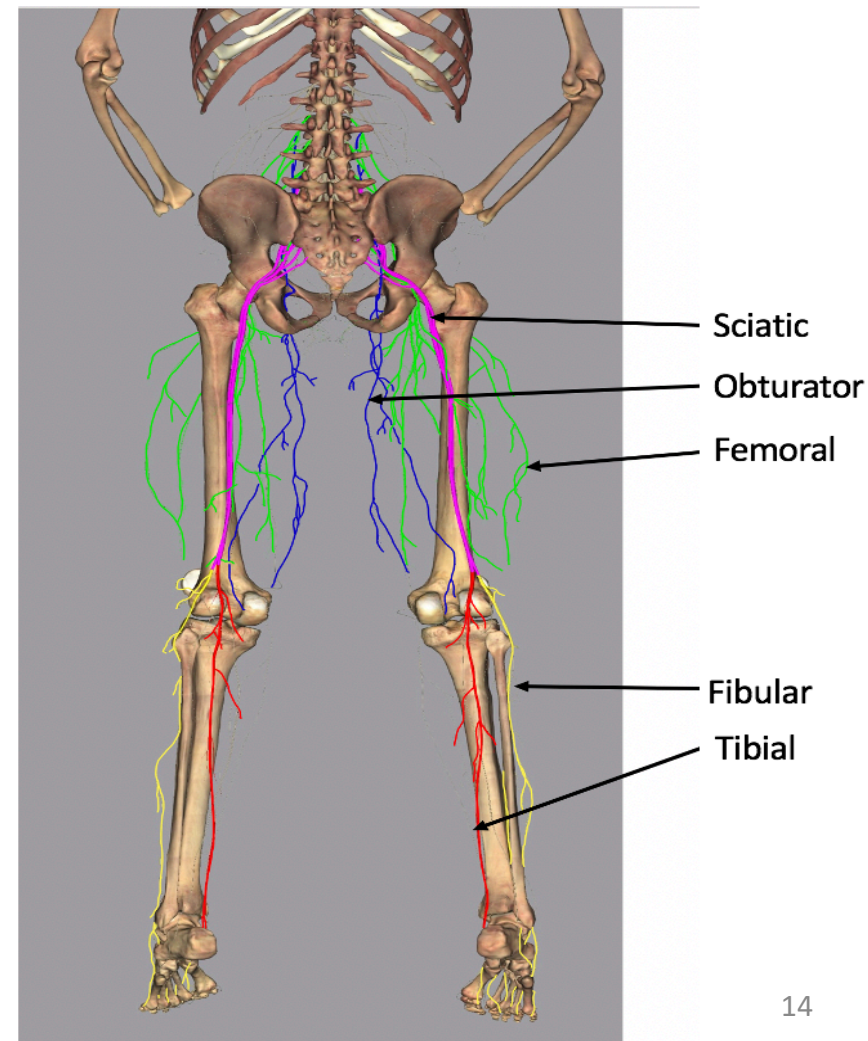
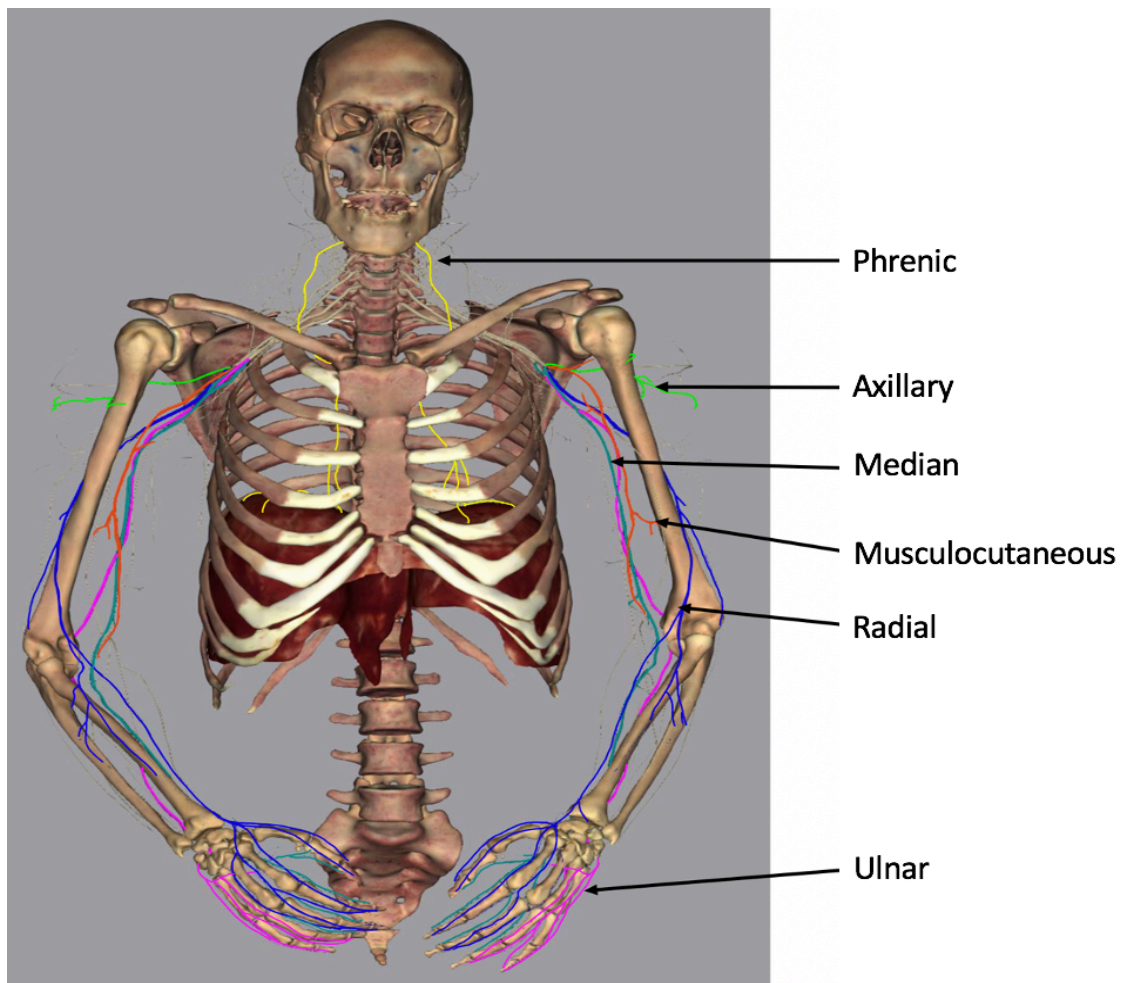
1 Coccygeal (Co1)

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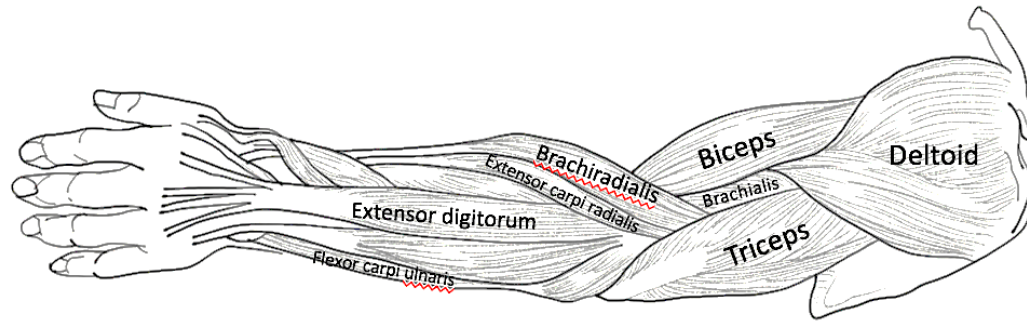


# Identification of the Major Spinal Nerves and Their Motor Functions

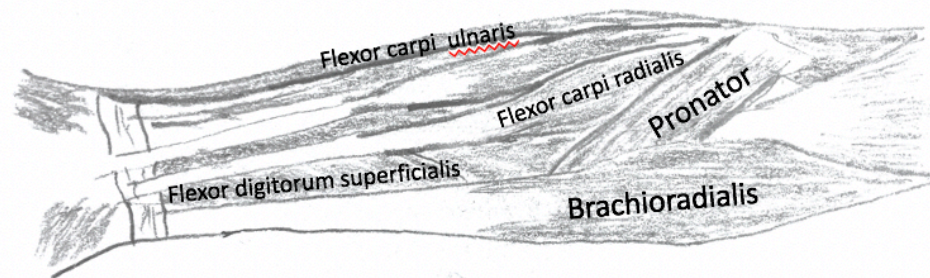
Spinal Cord and Spinal Nerves



# Identification of the Major Spinal Nerves and Their Motor Functions



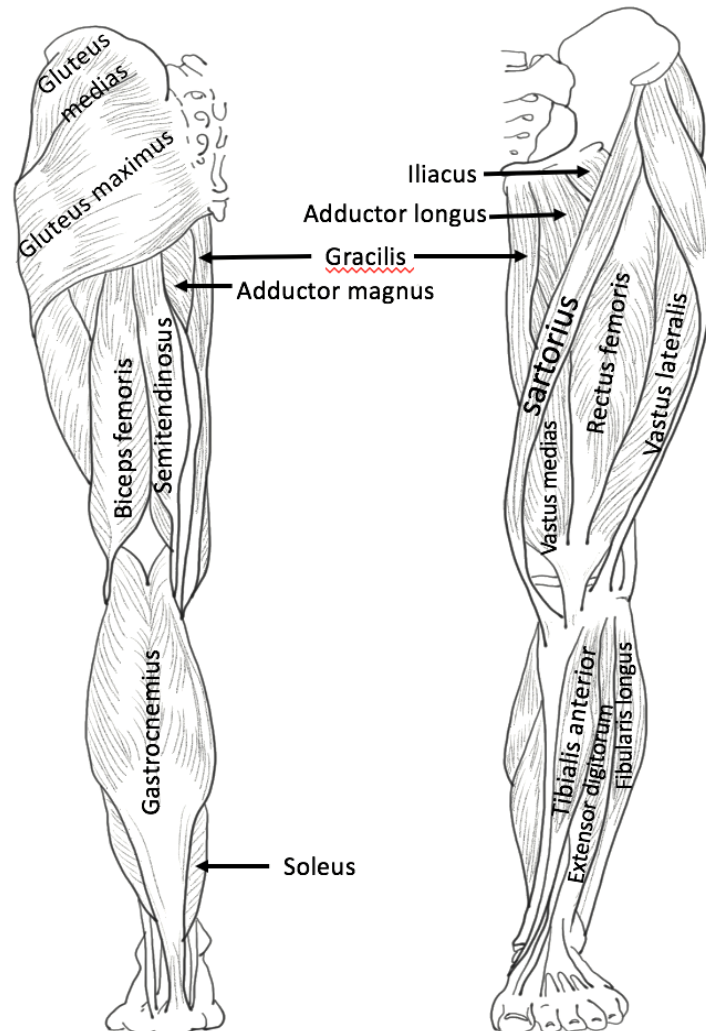
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Use the muscle chart available in the tray and the information in the lab, to color the muscles according to which spinal nerve innervates it. See the color key in your manual.

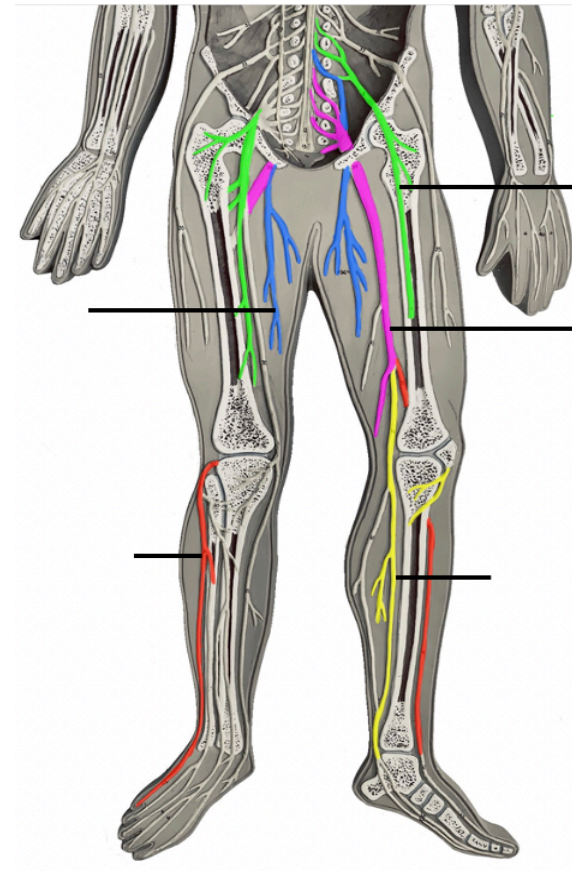
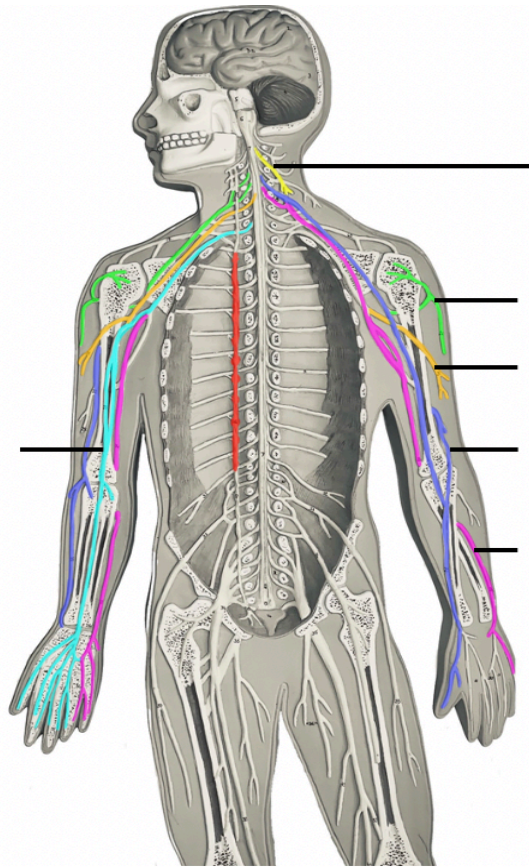
# Identification of the Major Spinal Nerves and Their Motor Functions



Use the muscle chart available in the tray and the information in the lab, to color the muscles according to which spinal nerve innervates it. See the color key in your manual.



# Identification of the Major Spinal Nerves and Their Motor Functions



Now label the spinal nerves in your lab manual or on the model available in lab.

# Identification of the Major Spinal Nerves and Their Motor Functions

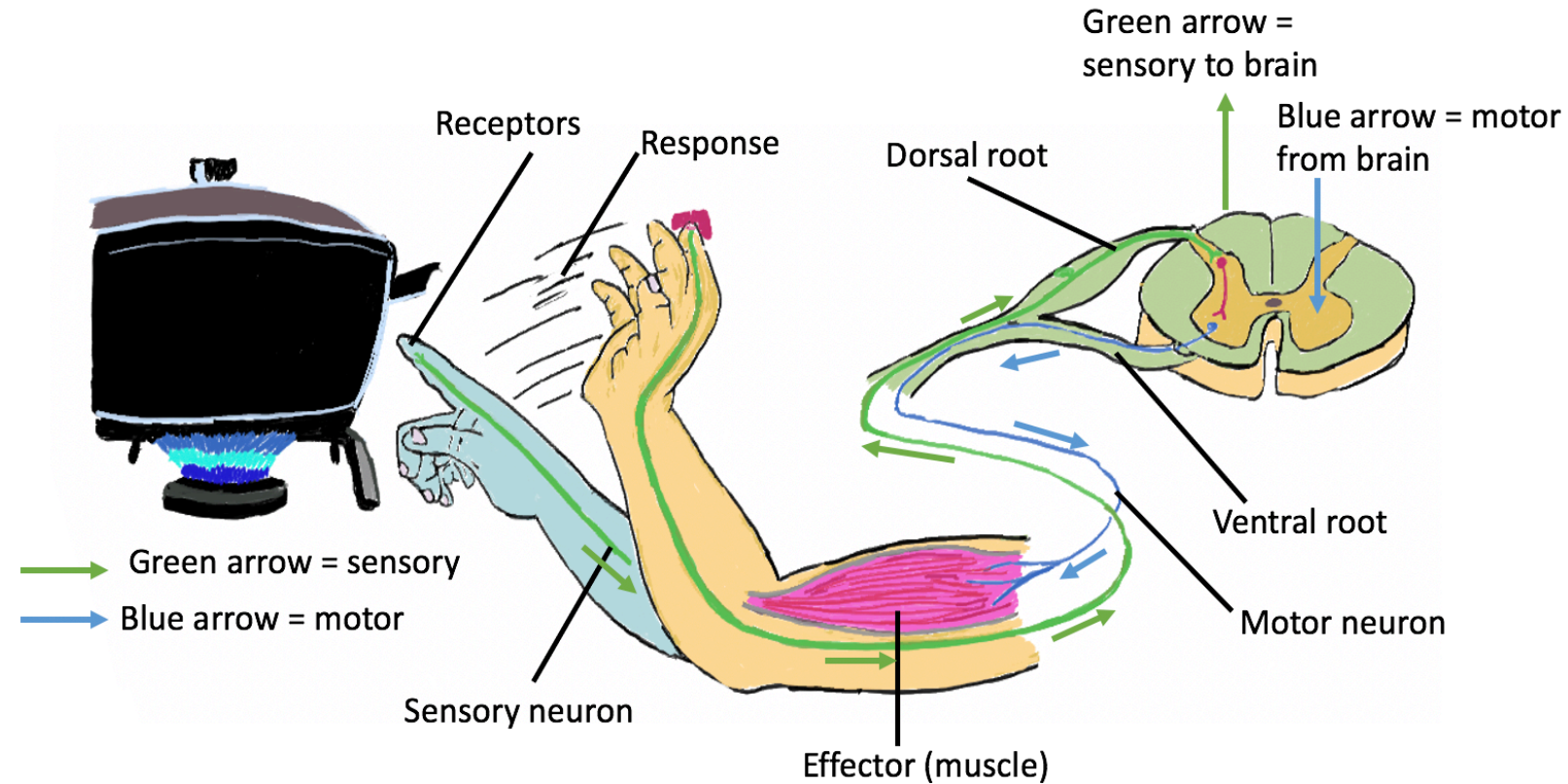
Use what you just learned to analyze the electromyography results of our patient.

**Table 2: Results from the patient's electromyography.**

Muscle	Notes from physical exam	Electromyography results	Nerve involved
Biceps brachii	Normal forearm flexion	Normal	
Triceps brachii	Normal forearm extension	Normal	
Tibialis anterior	Slapping of foot (weak dorsiflexion)	Abnormal	
Gastrocnemius	Normal plantar flexion	Normal	
Quads	Weak extension of leg at the knee	Abnormal	
Hamstrings	Weak flexion of leg at the knee	Abnormal	

# Somatic and Autonomic Reflexes

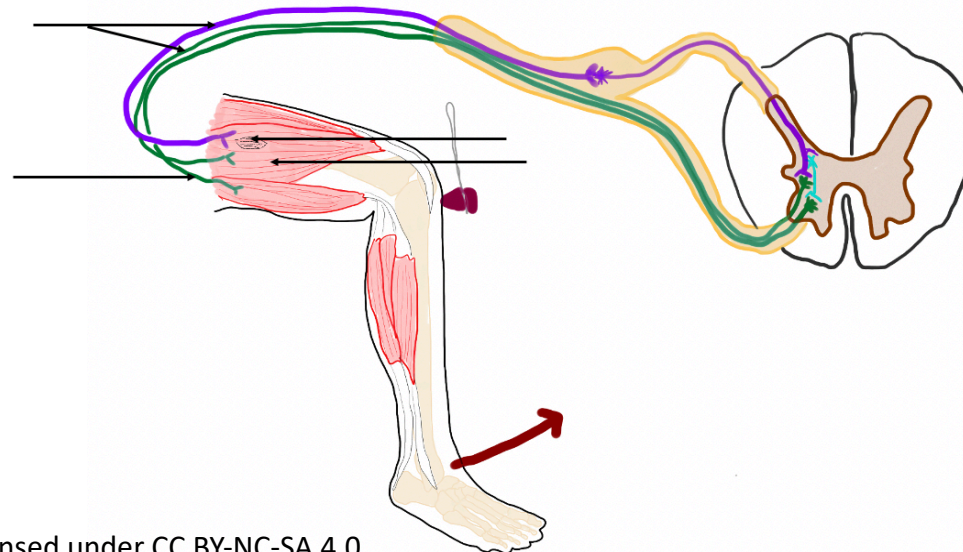
Reflexes are fast, predictable responses to a stimulus. The reflex is not processed consciously – this makes it fast! Find the sensory neuron, integration center, motor neuron and effector below.



# Somatic and Autonomic Reflexes

	Receptor	Sensory neuron	Integration center	Motor neuron	Effector
Patellar reflex	Muscle spindle	Femoral nerve	Spinal cord	Femoral nerve (and Sciatic)	Quad muscles
Pupillary reflex	Retina (photoreceptors)	Optic nerve	Midbrain	Oculomotor	Ciliary muscle

Use the information in the table to label the patellar reflex arc.

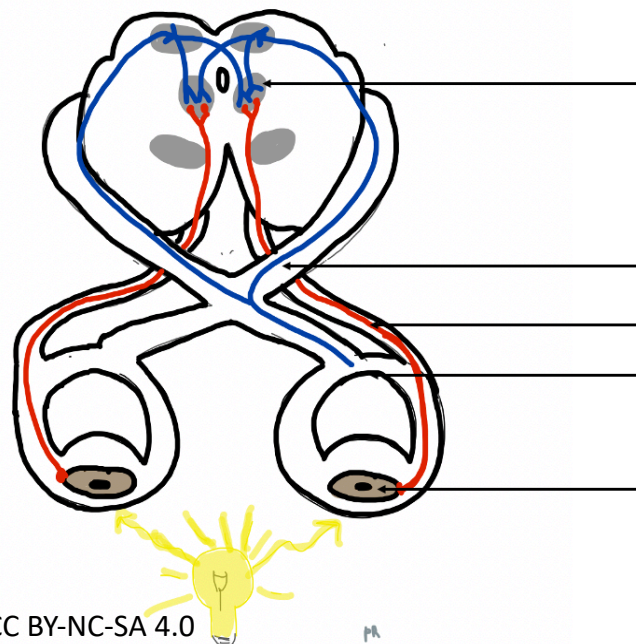


# Somatic and Autonomic Reflexes

Spinal Cord and Spinal Nerves

	Receptor	Sensory neuron	Integration center	Motor neuron	Effector
Patellar reflex	Muscle spindle	Femoral nerve	Spinal cord	Femoral nerve (and Sciatic)	Quad muscles
Pupillary reflex	Retina (photoreceptors)	Optic nerve	Midbrain	Oculomotor	Ciliary muscle

Use the information in the table to label the pupillary reflex arc.



# Somatic and Autonomic Reflexes

Tap Left knee (Jump? No jump?)	Tap Right knee (Jump? No jump?)

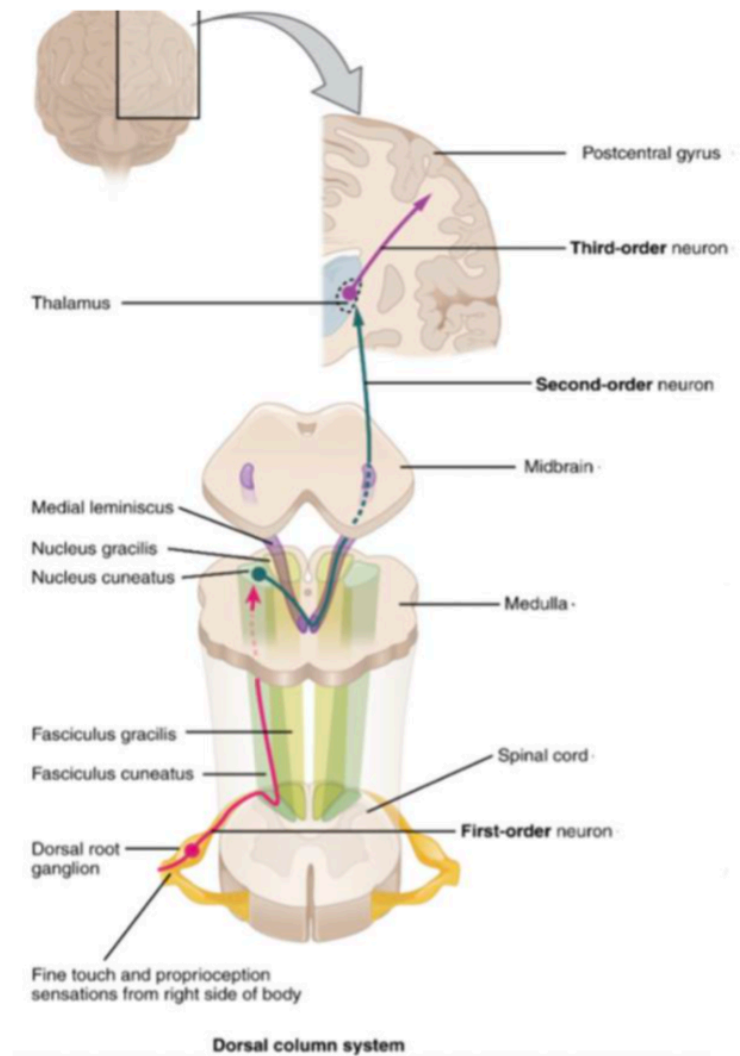
You will now test each reflex using the material available in the tray.

	Right pupil (dilated or constricted)	Left pupil (dilated or constricted)
Shine Light in Left eye		
Shine Light in Right eye		

# Spinal Nerve Pathways

Ascending pathways travel to the CNS and are made of

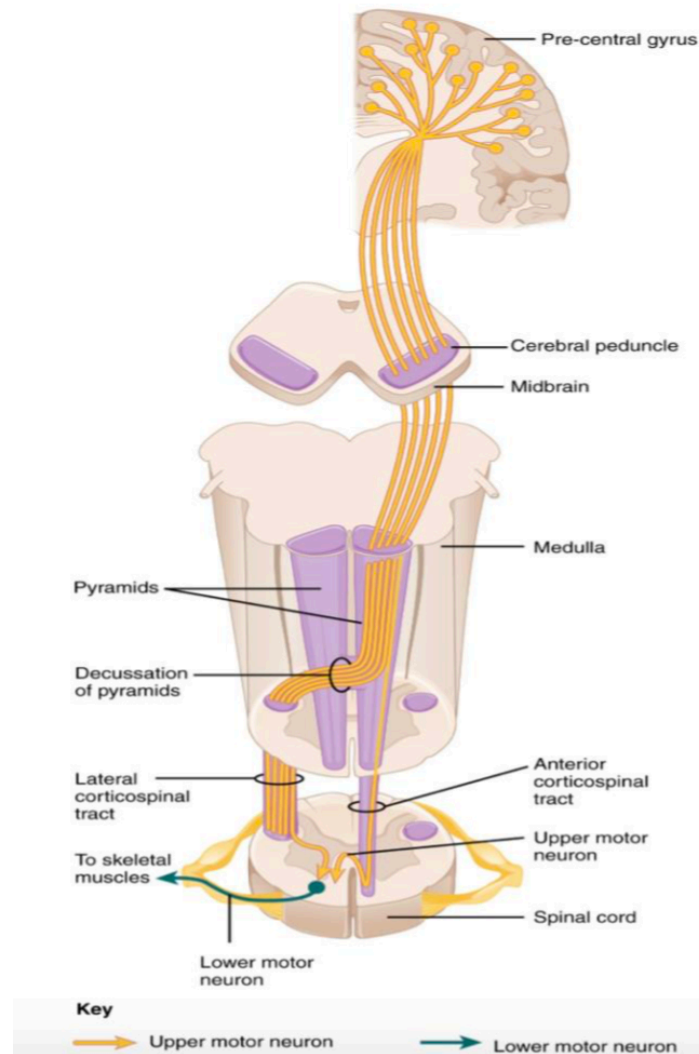
- 1<sup>st</sup> order
- 2<sup>nd</sup> order
- 3<sup>rd</sup> order neurons



# Spinal Nerve Pathways

Descending pathways travel away from the CNS and are made of

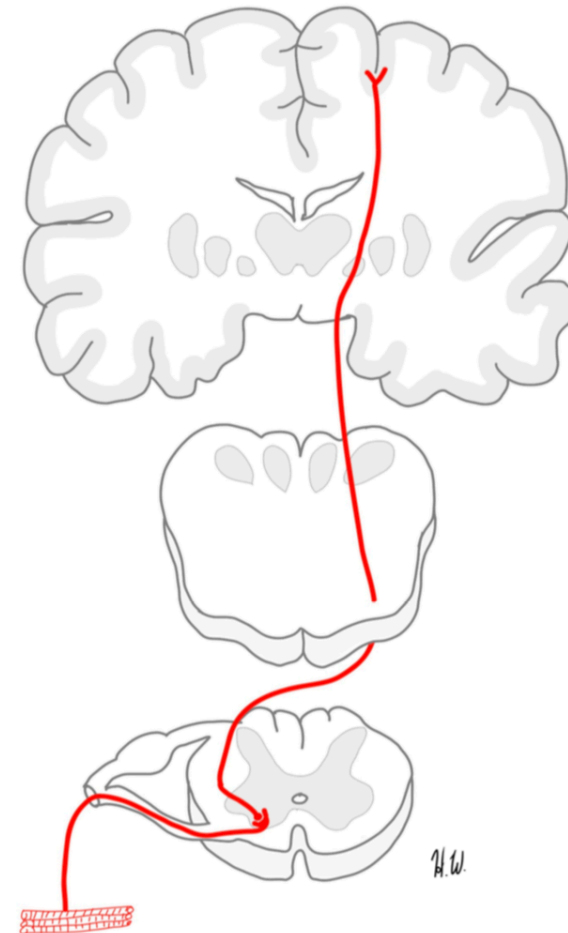
- Upper neurons
- Lower neurons





# Spinal Nerve Pathways

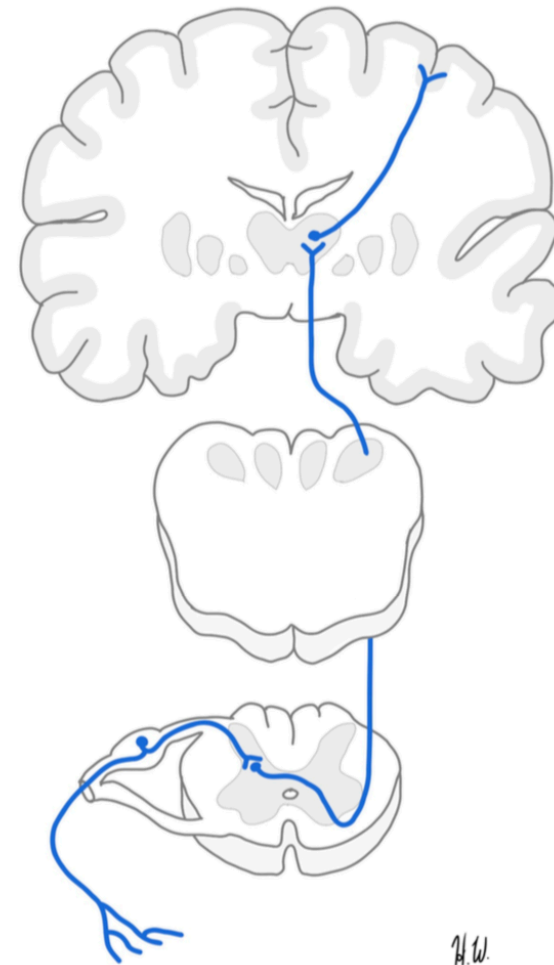
Trace the pathway for the ascending and descending pathways in your lab manual.



**Descending Pathway**

# Spinal Nerve Pathways

Trace the pathway for the ascending and descending pathways in your lab manual.



# Lab Clean-up

- Microscope clean-up:
  - Return all slides to the slide trays.
  - Place the scanning objective in place.
  - Bring the stage down farthest from the objective.
  - Wrap the cord and place the microscope away in the cabinets.
- Return all materials to the side bench.
- Remove all sticky labels from models and place them back on the terminology sheets.