

ANATOMY OF THE UPPER LIMBS

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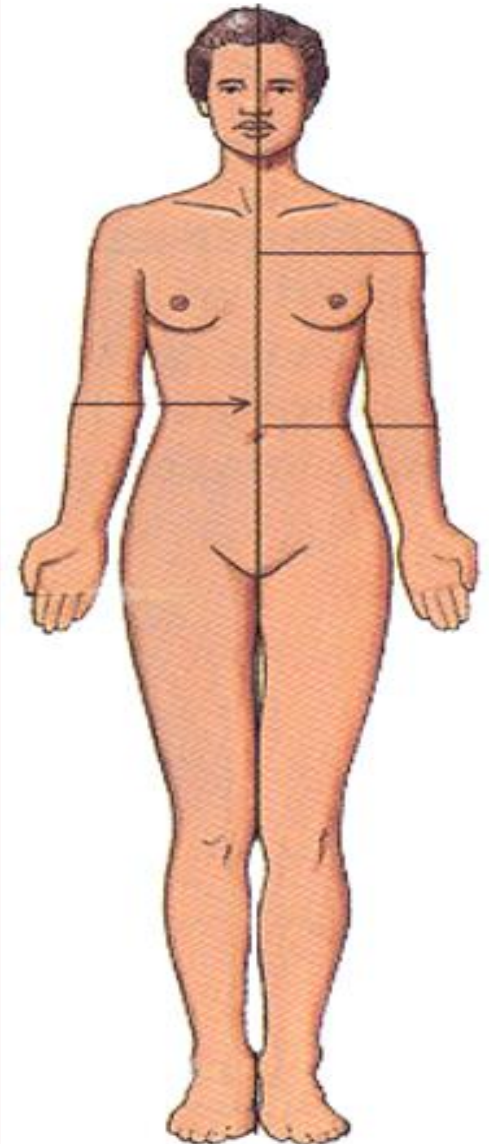
A-ANATOMICAL POSITION AND ANATOMICAL TERMS

ANATOMICAL POSITION

The anatomical position is the standard reference position of the body, used to describe the location of structures.

based on the **assumption**
that the person is:

- 1- Standing erect**
- 2- The upper limbs by the sides**
- 3- The face and palms of the hands directed forward**
- 4- Feet by the sides**



Various parts of the body are described in relation to certain *imaginary planes*

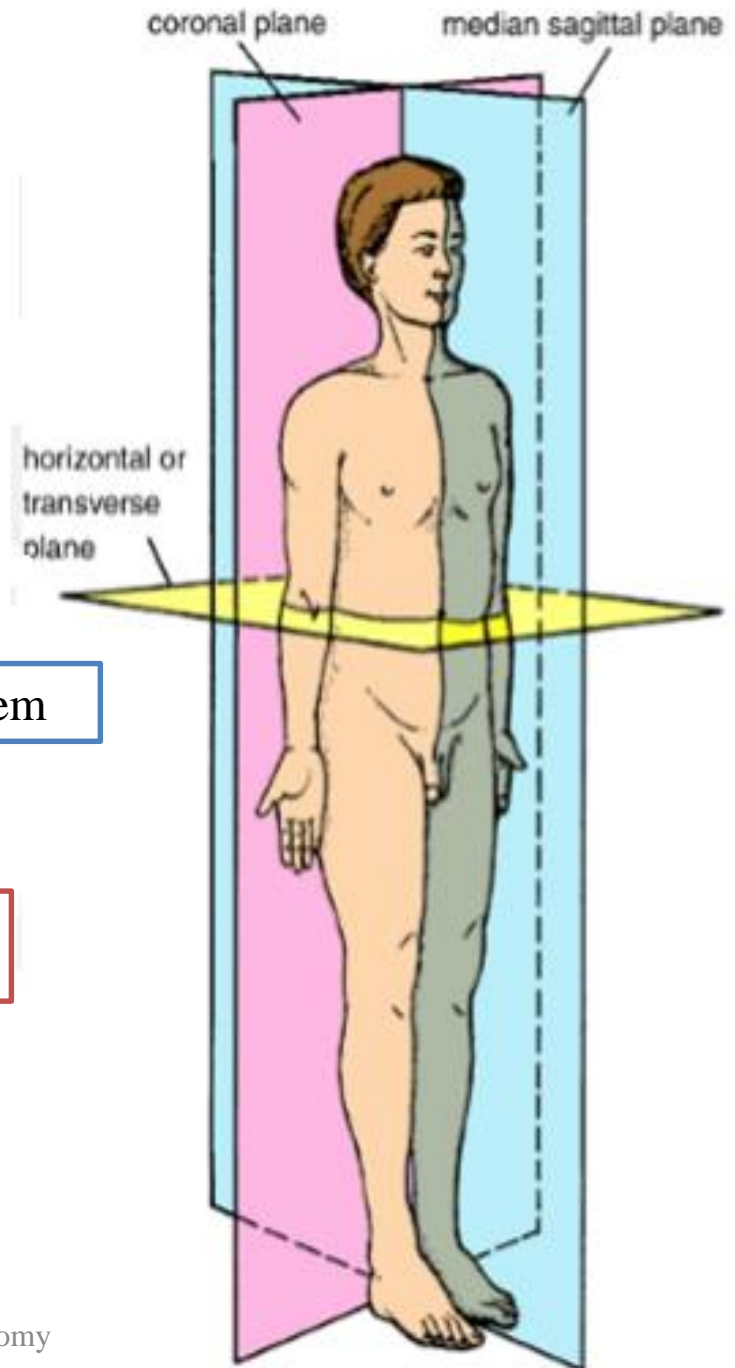
Two Vertical planes

Sagittal

Coronal

This is why we need to know the difference between them

One Horizontal OR Transverse



1-Vertical planes

1-The Sagittal Plane

Passes through the center of the body
Divides the body into right and left halves

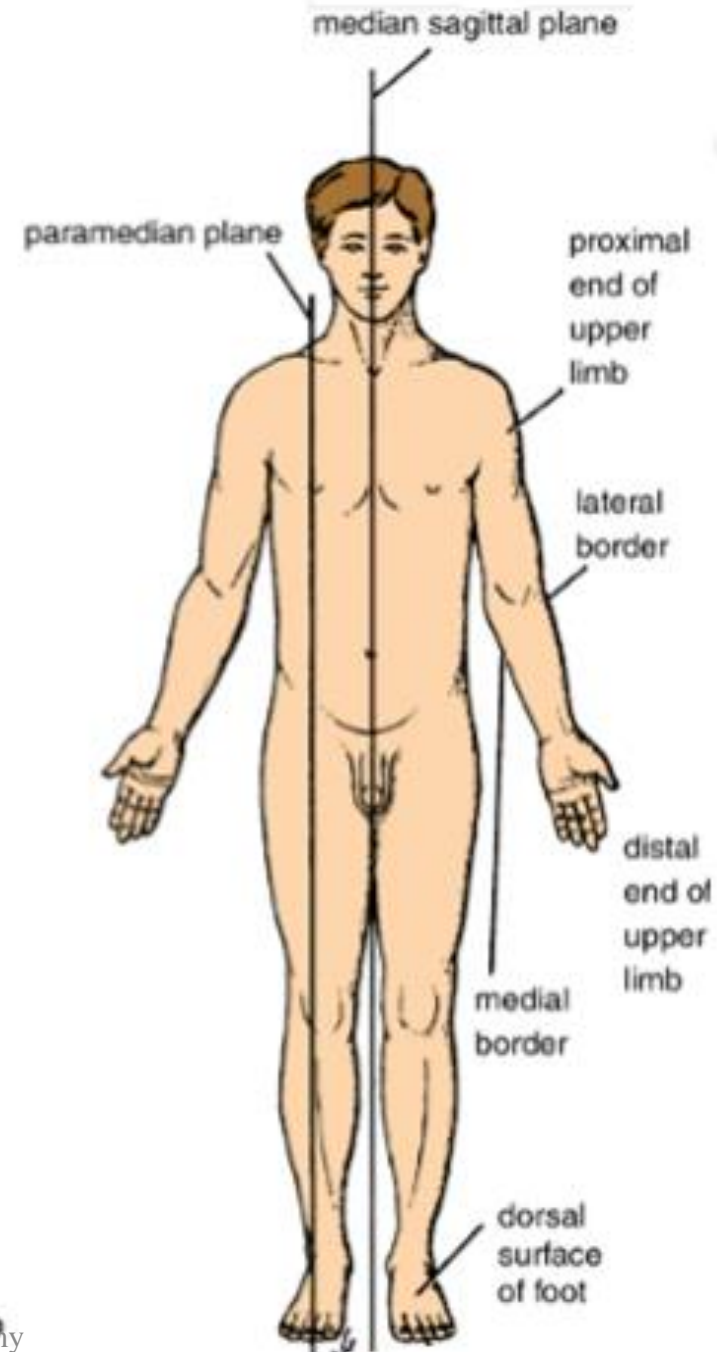
Types:

1- median sagittal plane; Divides the body into equal right and left halves

2-Paramedian plane: Is situated to one or the other side of the median plane and parallel to it.
Divides the body into none equal right and left halves

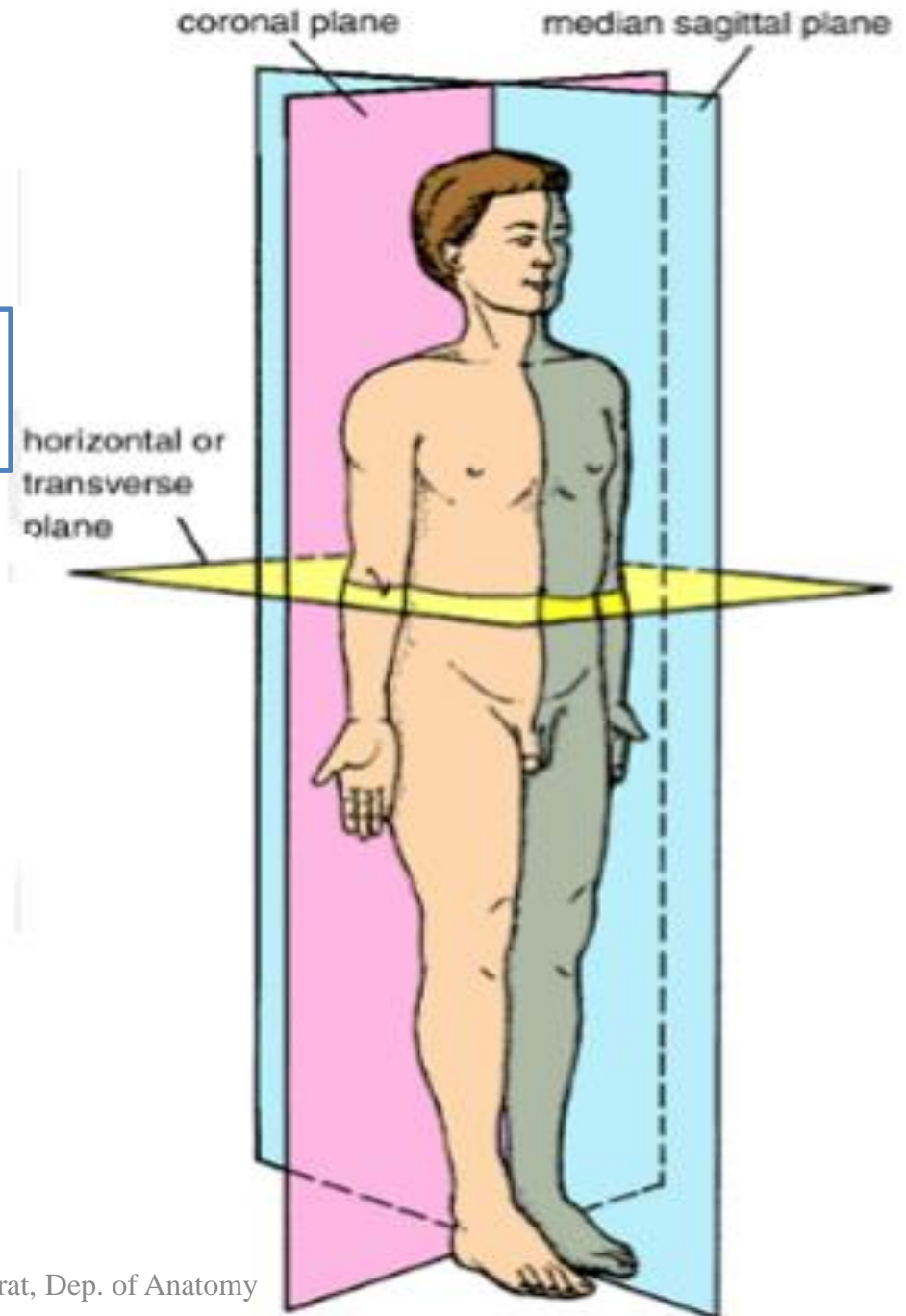
2-Coronal Plane

Is an imaginary vertical plane at right angles to the median plane and divides the body into **anterior and posterior parts**



2- Transverse, horizontal,

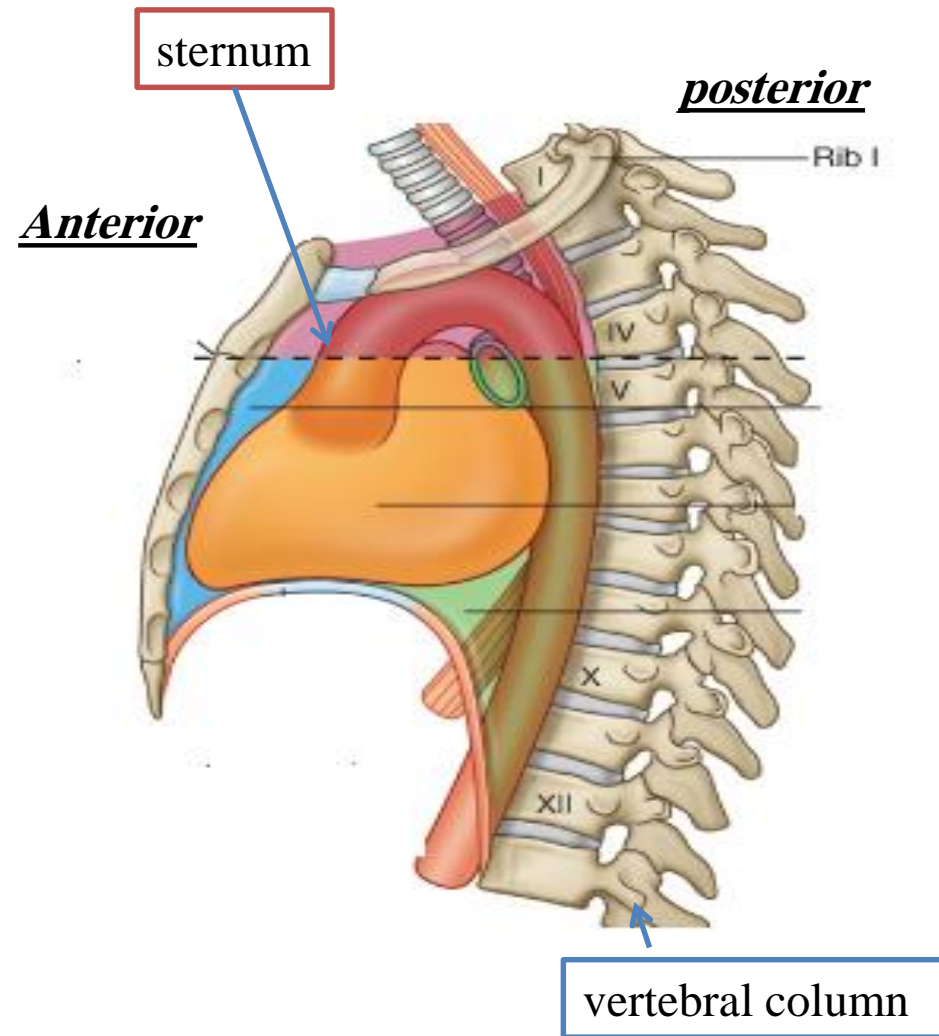
**divide the body into
superior and inferior parts**



Terms to describe location

Anterior (ventral) and posterior (dorsal)

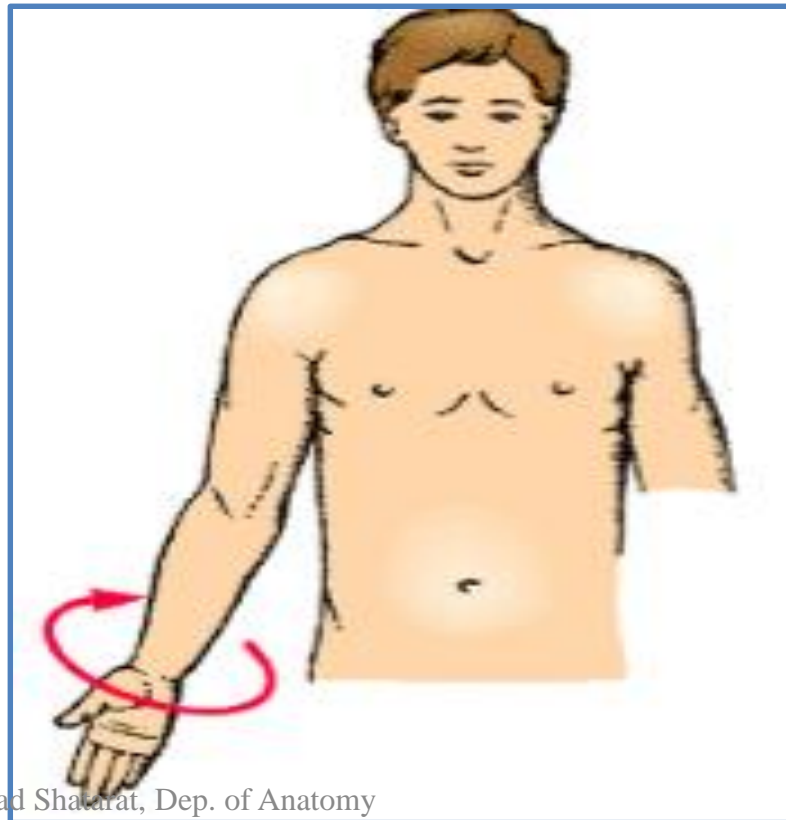
describe the position of structures relative to the 'front' and 'back' of the body.
For example, the nose is anterior to the ears and the *vertebral column is posterior to the sternum.*



Medial and lateral

Medial and lateral describe the position of structures relative to the median sagittal plane and the sides of the body . Any structure situated ***nearer*** to **the median plane** of the body ***than another*** is said to be ***medial to the other***. Similarly, a structure that lies ***farther away from the median plane*** than another is said to be ***lateral to the other***

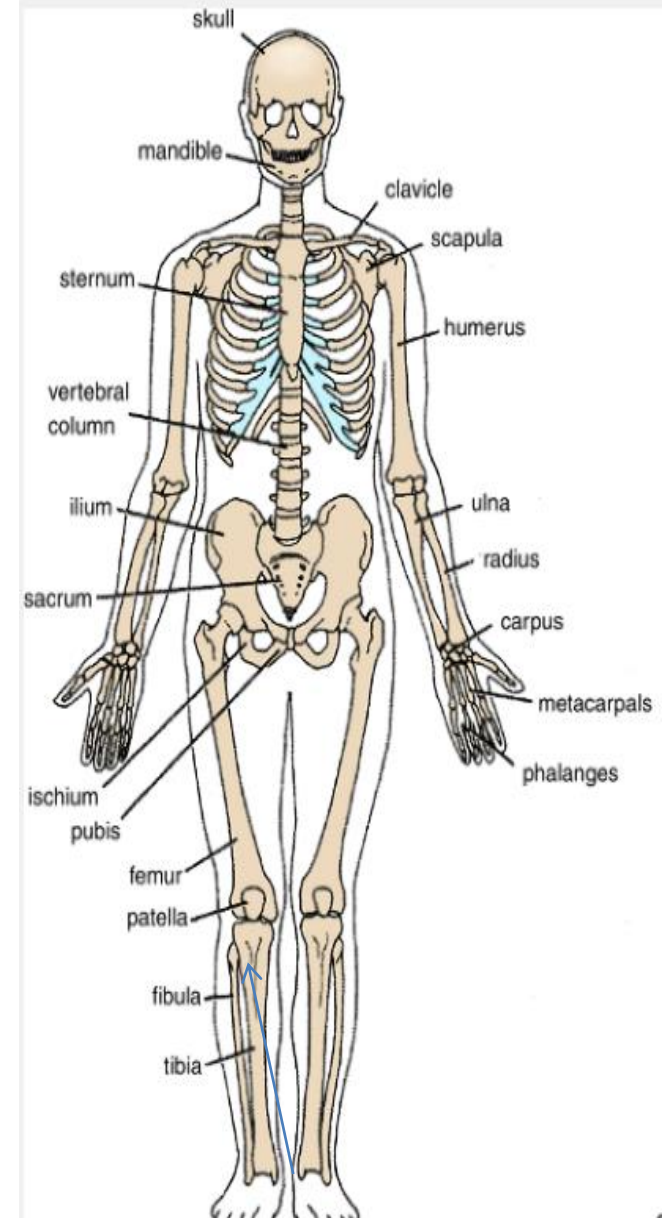
For example, **the thumb** is lateral to **the little finger**.



Superior and inferior

Superior and inferior describe structures in reference to the vertical axis of the body.

For example, the head is superior to the shoulders and the knee joint is inferior to the hip joint.



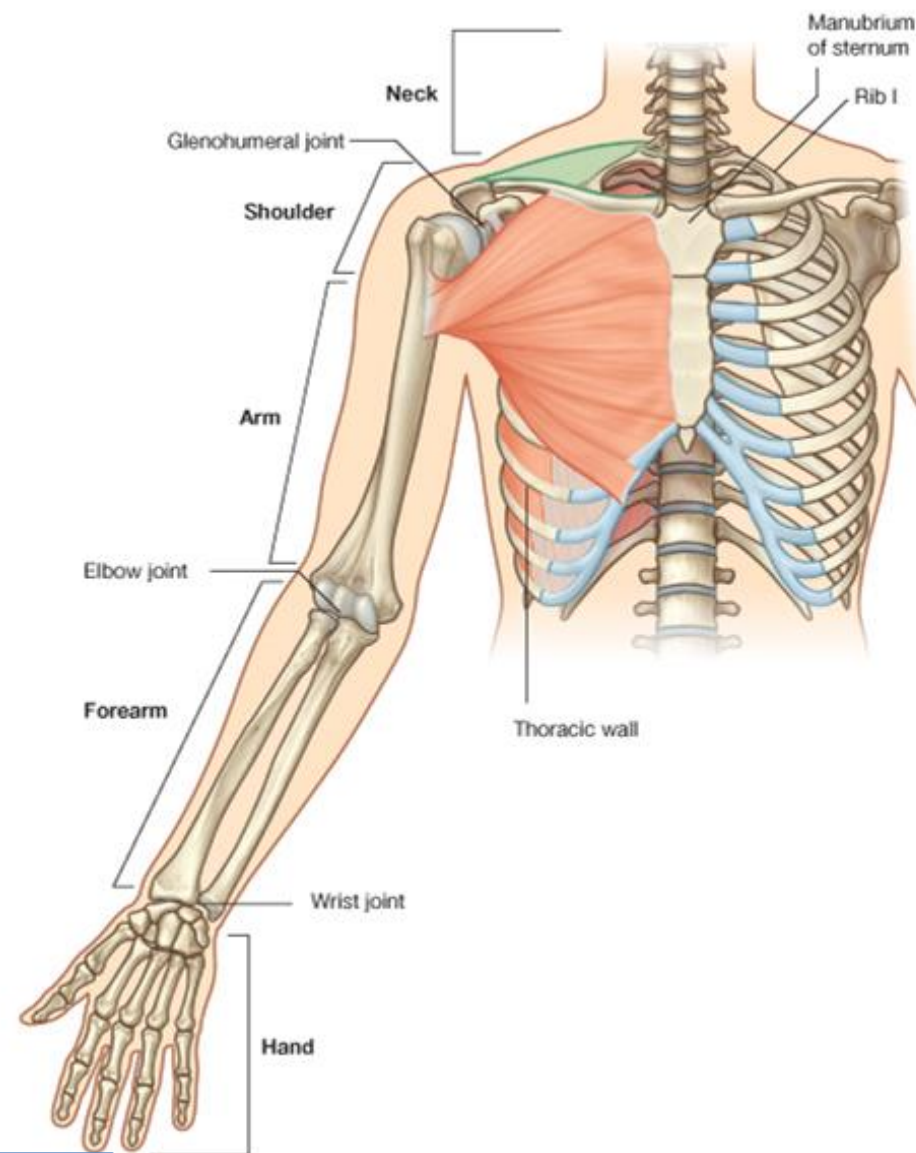
Proximal and distal

are used with reference to being closer or farther from a structure's origin, particularly in the limbs.

For example, the hand is distal to the elbow joint.

Cranial (towards the head) and **caudal** (towards the tail) are sometimes used instead of superior and inferior respectively

Superficial.....Nearer to body surface
Deep..... Away from body surface



B-THE JOINTS

Joints

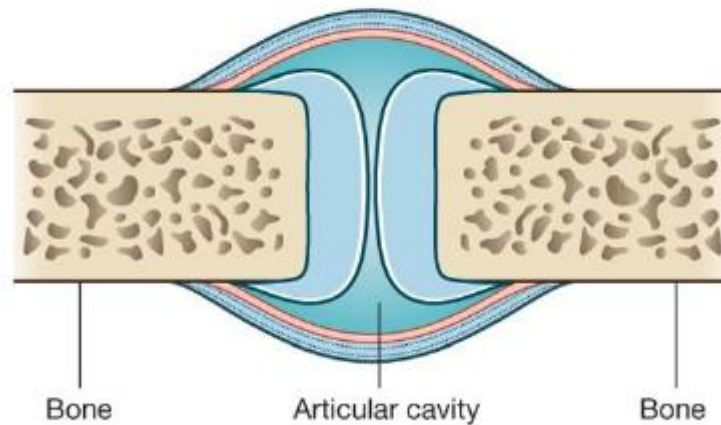
When two bones or more come together wither there is movement between them or not.

According to the tissue laying between the articulating bones ,joints are classified into:

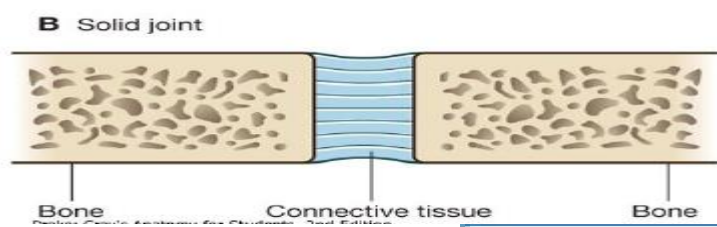
1-Synovial joints

Synovial joints are connections between skeletal components where the elements involved are separated by a narrow articular cavity

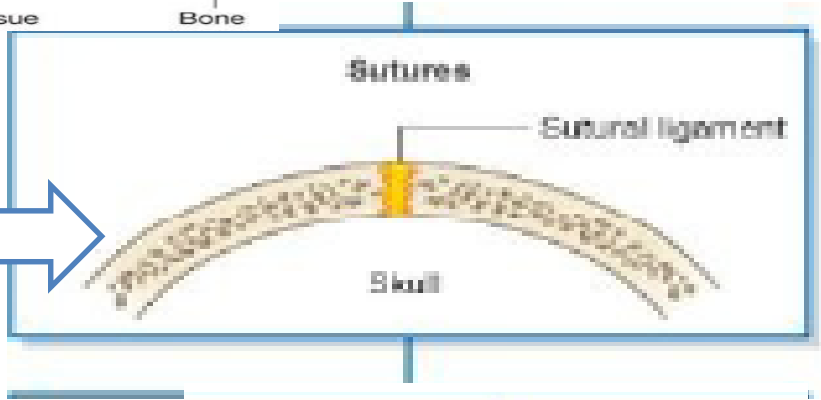
A Synovial joint



2-Fibrous joints

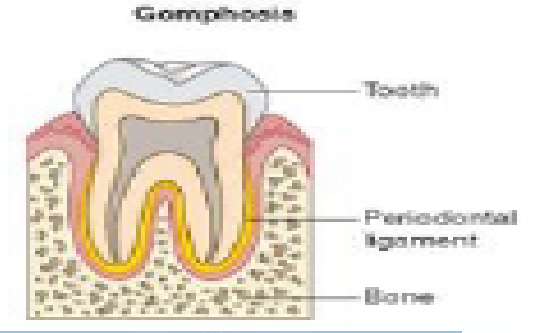


A- Sutures occur only in the skull where adjacent bones are linked by a thin layer of connective tissue termed a *sutural ligament*.



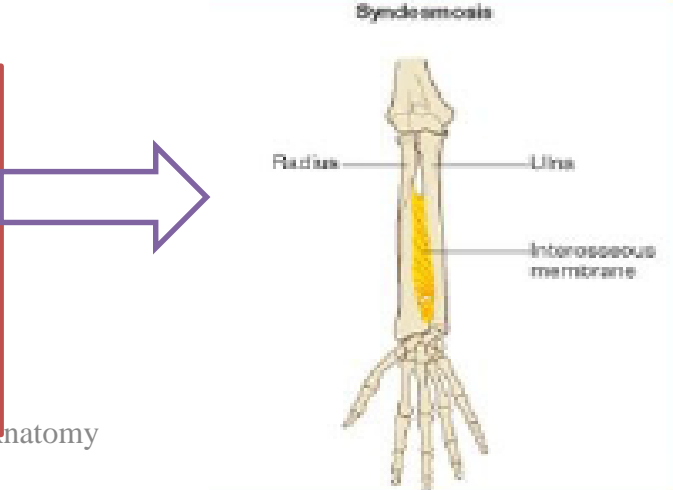
Read only

B-Gomphoses occur only between the **teeth and adjacent bone**. In these joints, short collagen tissue fibers in the periodontal ligament run between the root of the tooth and the bony socket.



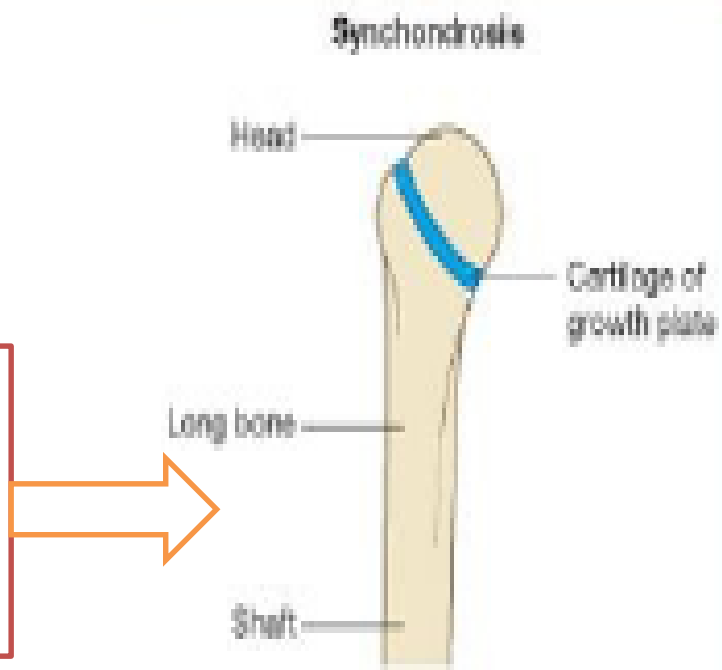
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C-Syndesmoses are joints in which two adjacent bones are linked by a ligament. Examples are the **ligamentum flavum**, which connects adjacent vertebral laminae, and **an interosseous membrane**, which links, for example, the radius and ulna in the forearm.

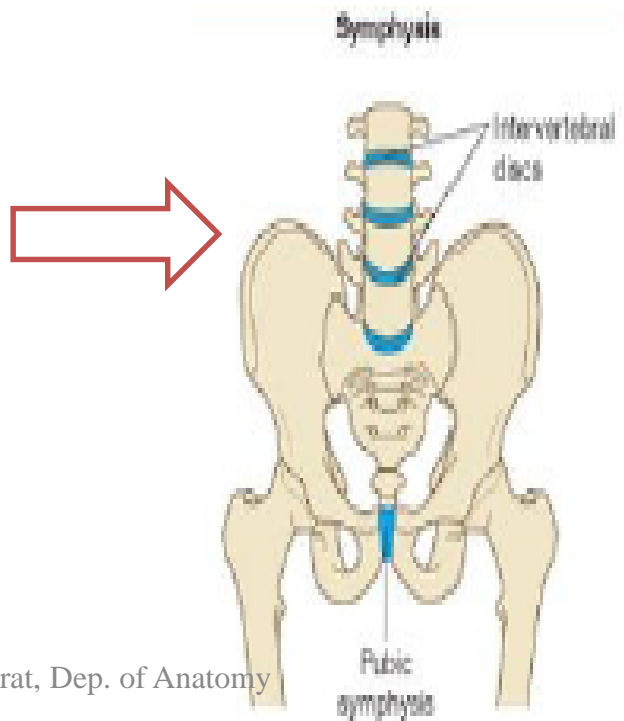


3-Cartilaginous joints

A-Synchondroses occur where two parts in a developing bone remain separated by a layer of cartilage, for example the ***growth plate*** that occurs **between the head and shaft** of developing long bones. These joints allow bone growth and eventually become completely ossified.



B-Symphyses occur where two separate bones are interconnected by cartilage. Most of these types of joints occur in the midline and include **the pubic symphysis** between the two pelvic bones, and **intervertebral discs** between adjacent vertebrae



Features of Synovial Joints

1-The presence of a space called a **synovial (joint) cavity between the articulating bones**

2-The bones are covered by a layer of ***hyaline cartilage*** called **articular cartilage**.

The cartilage covers the articulating surface of the bones with a smooth, slippery surface

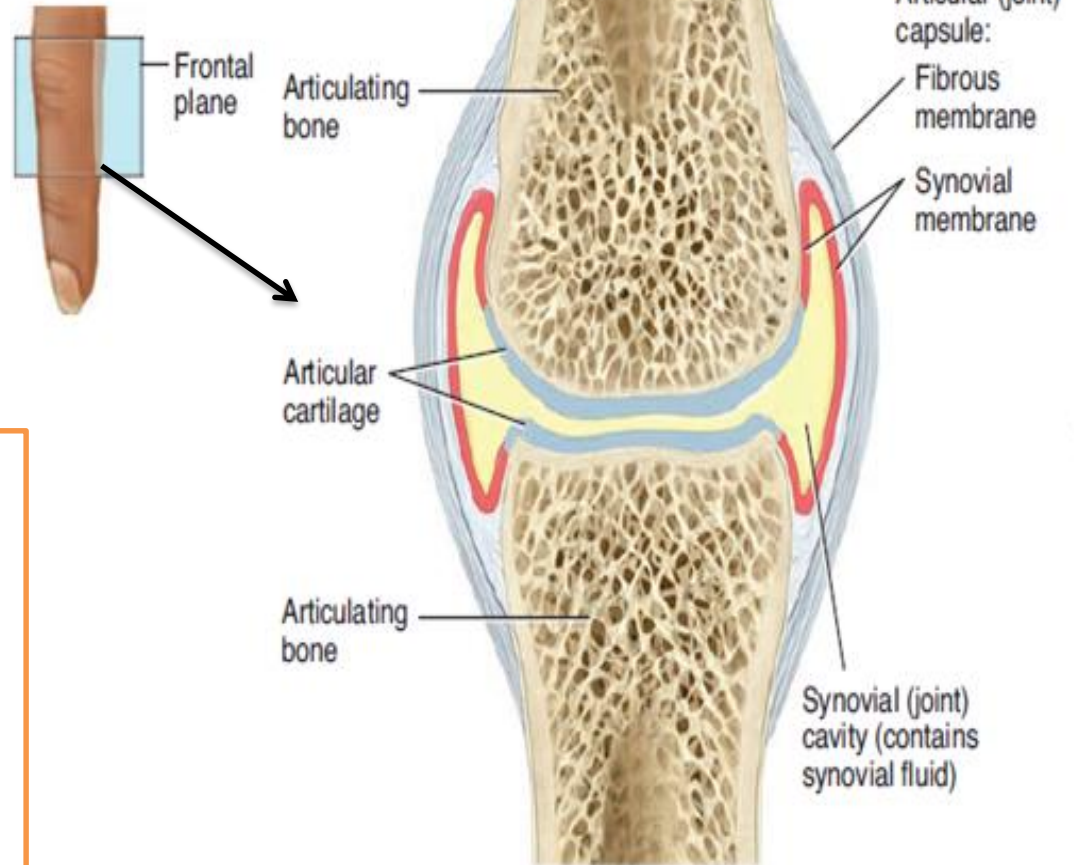
3-Articular Capsule

A sleeve-like **articular (joint) capsule surrounds a synovial joint**,

The articular capsule is composed of two layers, **an outer fibrous membrane and an inner synovial membrane**

4-Synovial Fluid

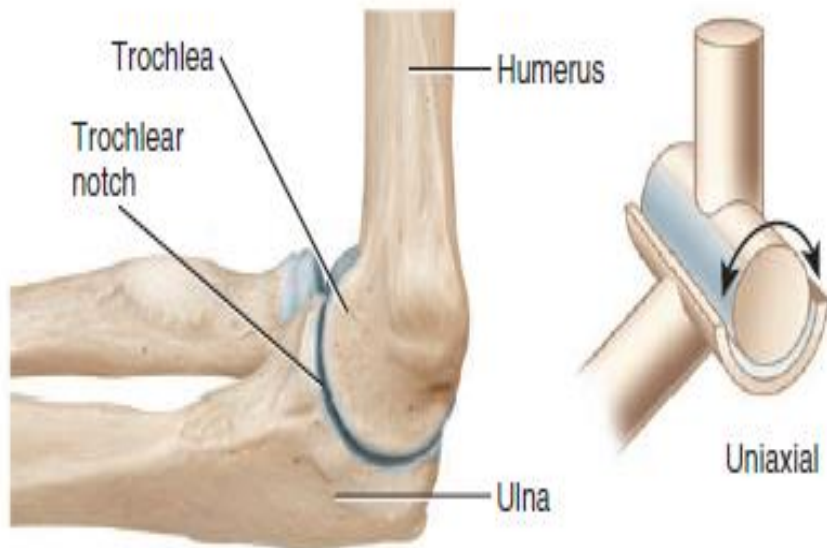
The synovial membrane secretes **synovial fluid**. Its functions include reducing friction and supplying oxygen and nutrients to and removing carbon dioxide and metabolic wastes from the chondrocytes within articular cartilage.



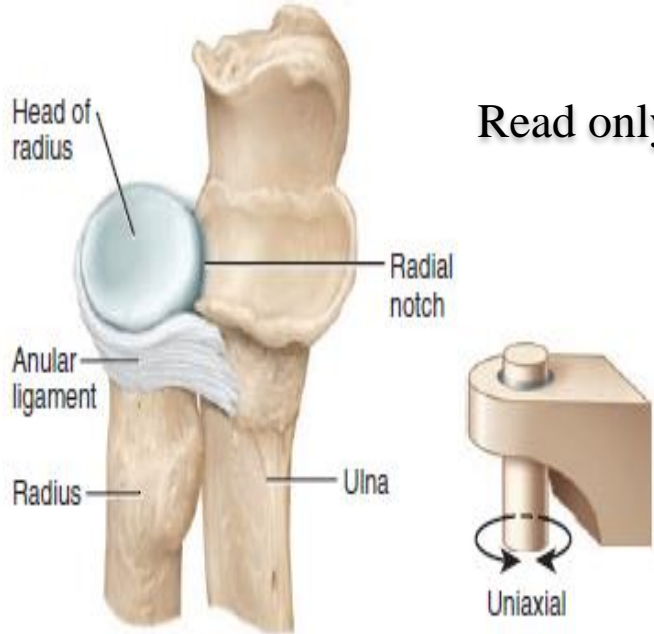
5-Accessory Ligaments, Articular Discs

Many synovial joints also contain **accessory ligaments called extracapsular ligaments and intracapsular ligaments**

Selected Types of synovial joints



(b) Hinge joint between trochlea of humerus and trochlear notch of ulna at the elbow



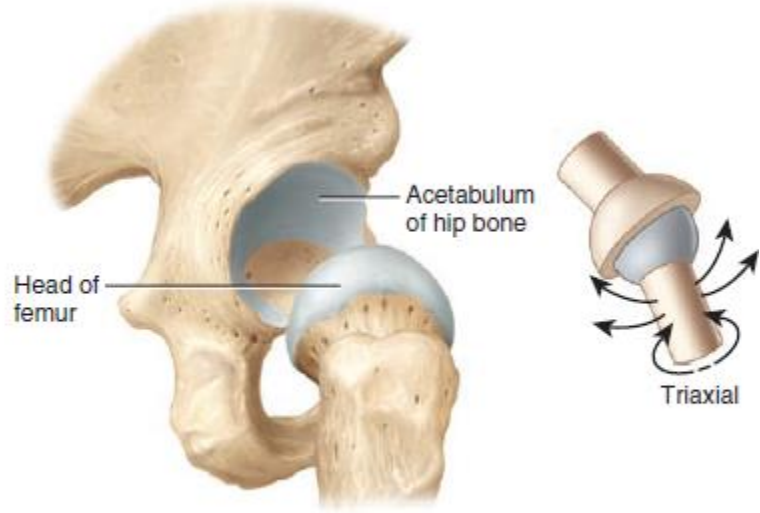
(c) Pivot joint between head of radius and radial notch of ulna

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2-Pivot Joints
 In a **pivot joint**, *the rounded or pointed surface of one bone articulates with a ring formed partly by another bone and partly by a ligament*

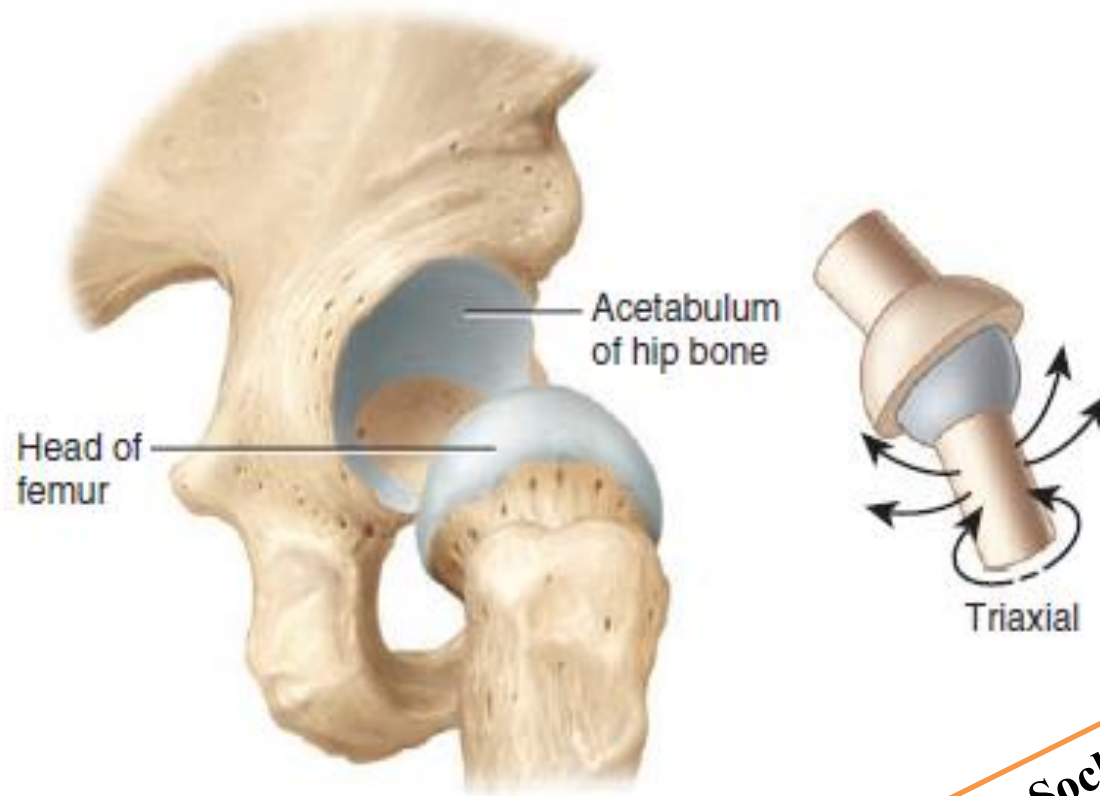
1-Hinge Joints

In a **hinge joint**, *the convex surface of one bone fits into the concave surface of another bone*



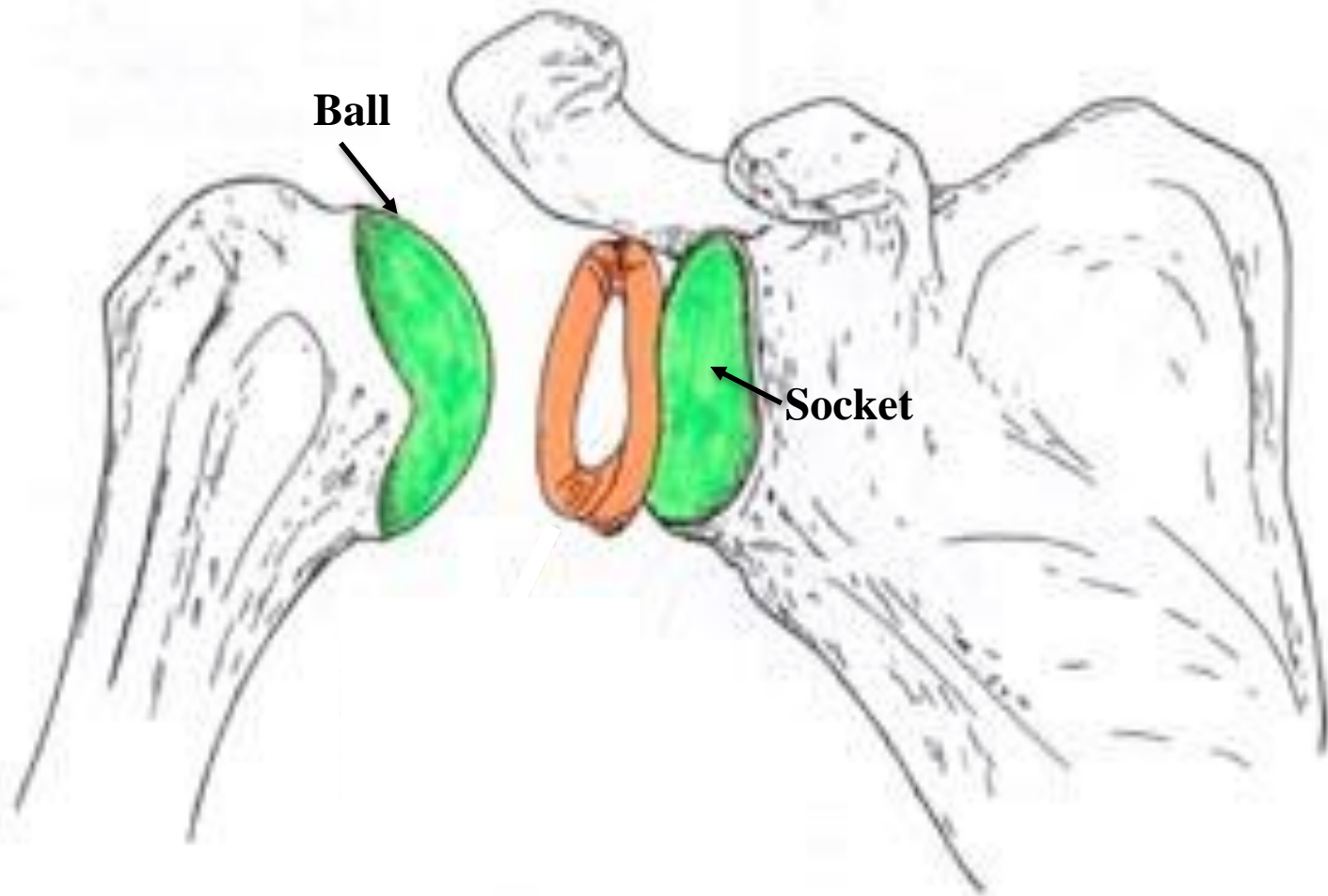
(f) Ball-and-socket joint between head of femur and acetabulum of hip bone

3-Ball-and-Socket Joints
consists of the ball-like surface of one bone fitting into a cuplike depression of another bone



(f) Ball-and-socket joint between head of femur and acetabulum of hip bone

Ball-and-Socket Joints
consists of the ball-like surface of one bone fitting into a cuplike depression of another bone



TYPES OF MOVEMENTS AT SYNOVIAL JOINTS

The major movements are:

1-FLEXION

2-EXTENSION

3-ABDUCTION

4-ADDUCTION

5- MEDIAL AND LATERAL ROTATION

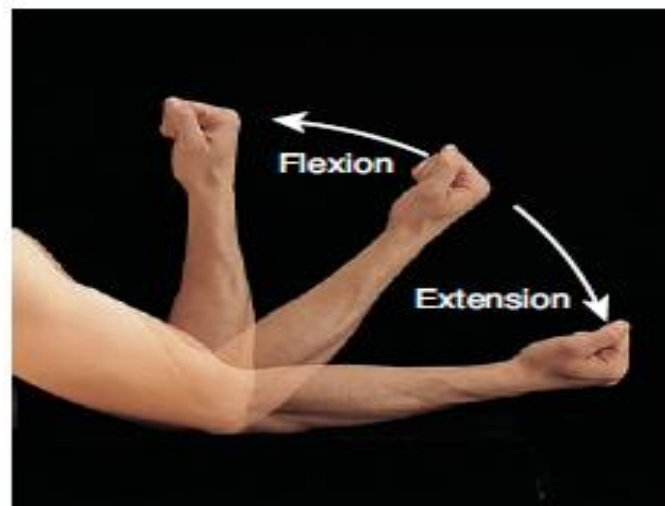
5-CIRCUMDUCTION

Flexion, Extension

Flexion and extension are opposite movements.

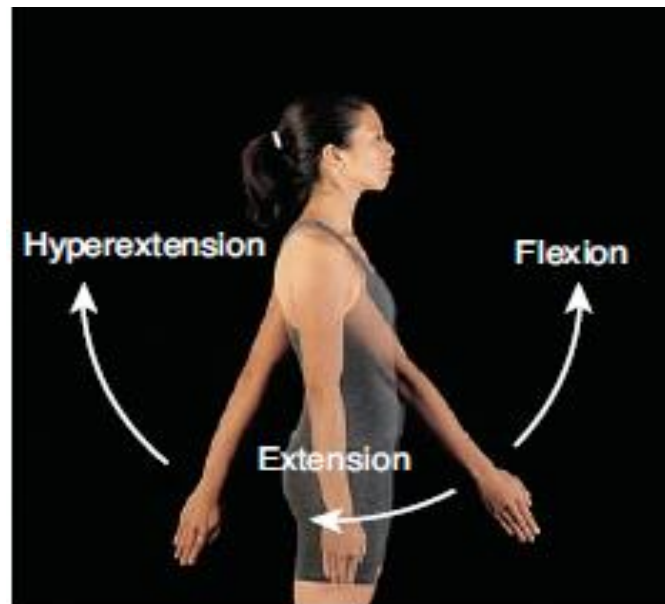
In flexion

there ***is a decrease***
in the angle between
articulating
bones



in extension (to stretch out)
there is

an increase in the
angle between articulating
bones, often to restore a part of the
body to the anatomical position
after it has been flexed



Abduction, Adduction

Abduction *is the* movement of ***a bone away from the midline***

adduction *is the movement of a* ***bone toward the midline***

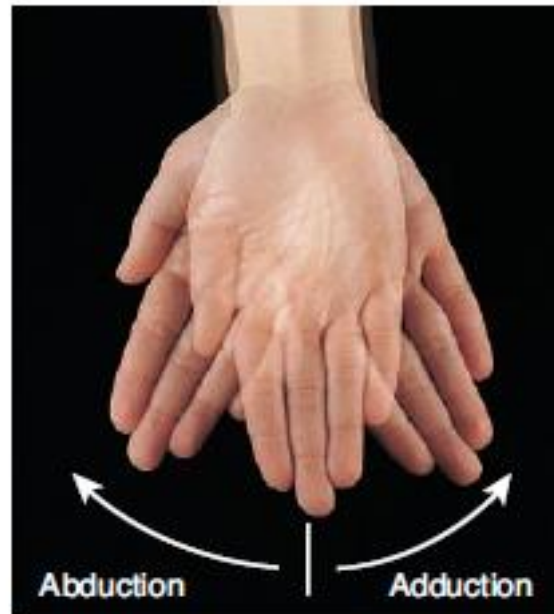
Examples of abduction include

moving the humerus
laterally at
the shoulder joint



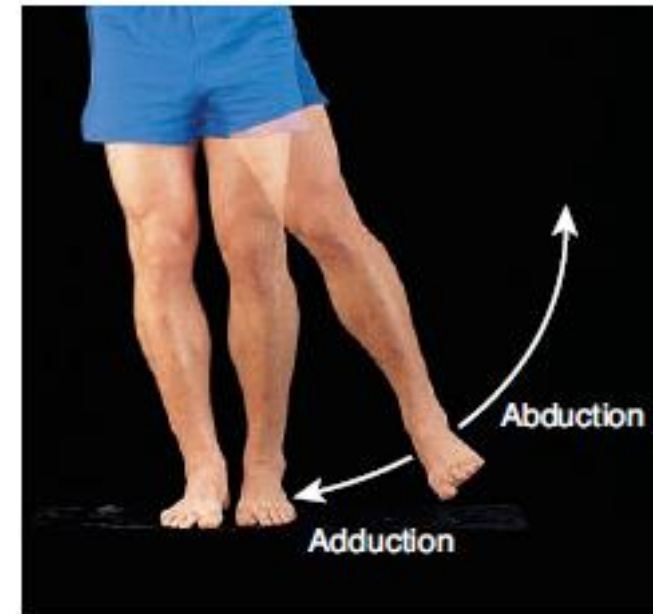
(a) Shoulder joint

moving the palm laterally
at the wrist joint



(b) Wrist joint

moving the femur laterally
at the hip joint



(c) Hip joint

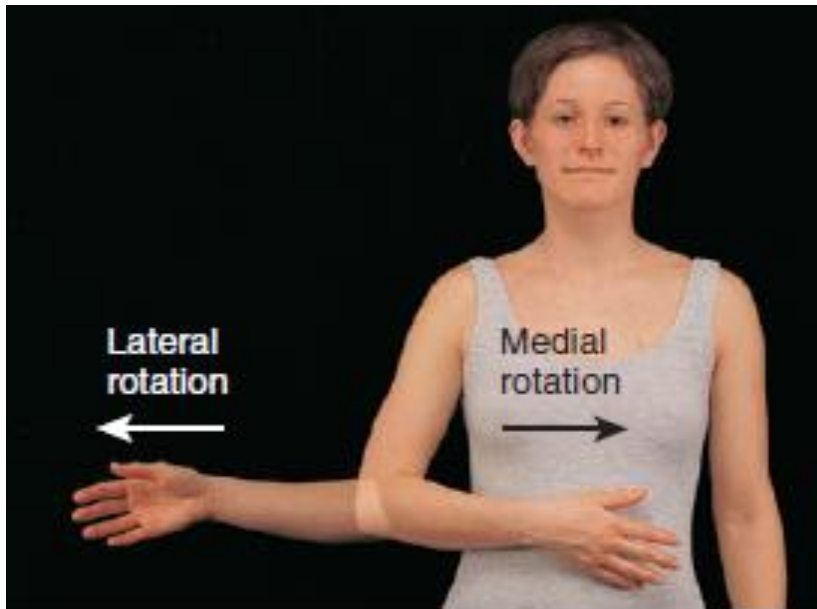
The movement that returns each of these body parts to the anatomical position is adduction

Rotation

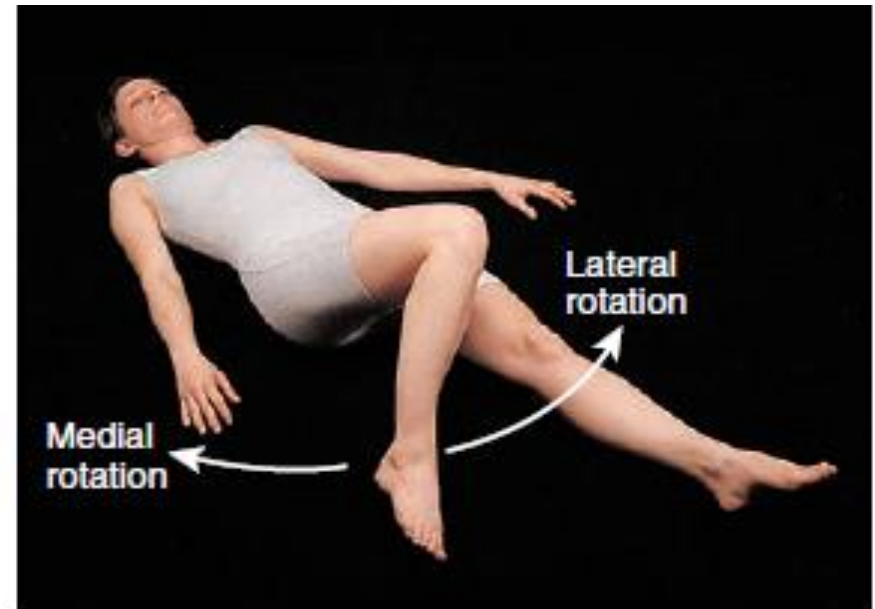
In **rotation** *a bone revolves* around its own longitudinal axis

If the anterior surface of a bone of the limb is turned toward the midline, the movement is called *medial (internal)*

If the anterior surface of the bone of a limb is turned away from the midline, the movement is called *lateral (external) rotation*



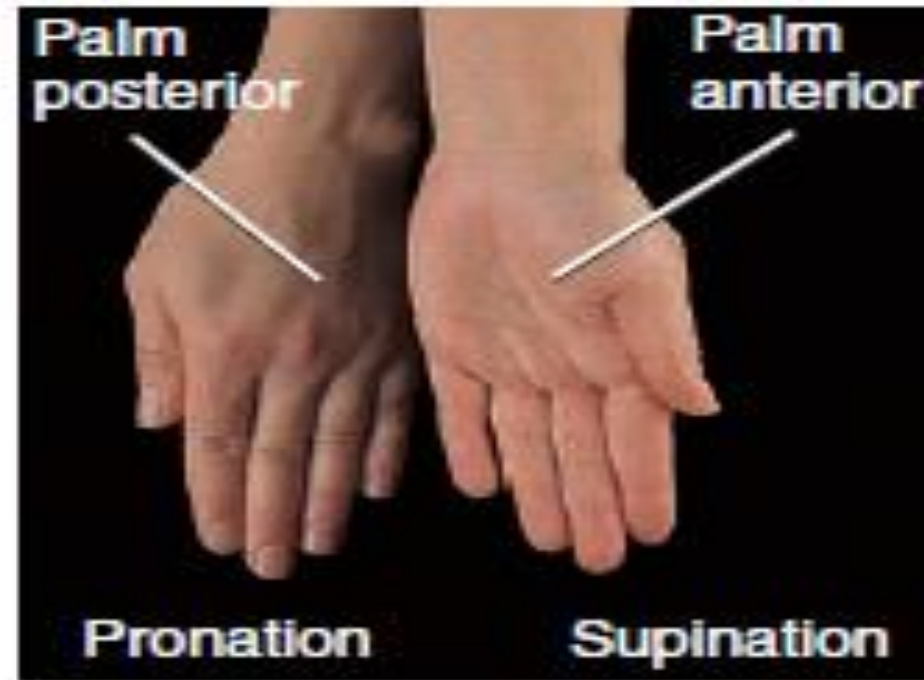
(b) Shoulder joint



(c) Hip joint

Supination is a movement of the forearm at the proximal and distal radioulnar joints in which the palm is turned anteriorly

Pronation is a movement of the forearm at the proximal and distal radioulnar joints in which the palm is turned posteriorly



(h) Radioulnar joint

Major concepts of muscle's actions

1- Each muscle has to be supplied by a nerve

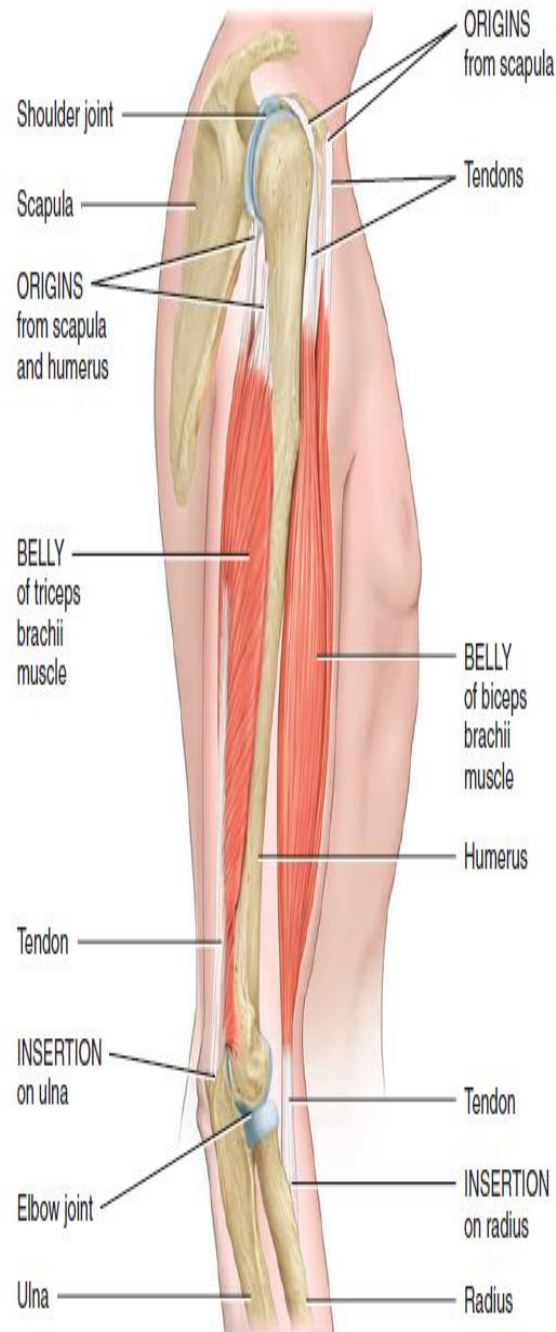
2- For a muscle to produce a movement it has to cross over a joint

3- Muscles are attached to bones through points of attachments called

origin and insertion

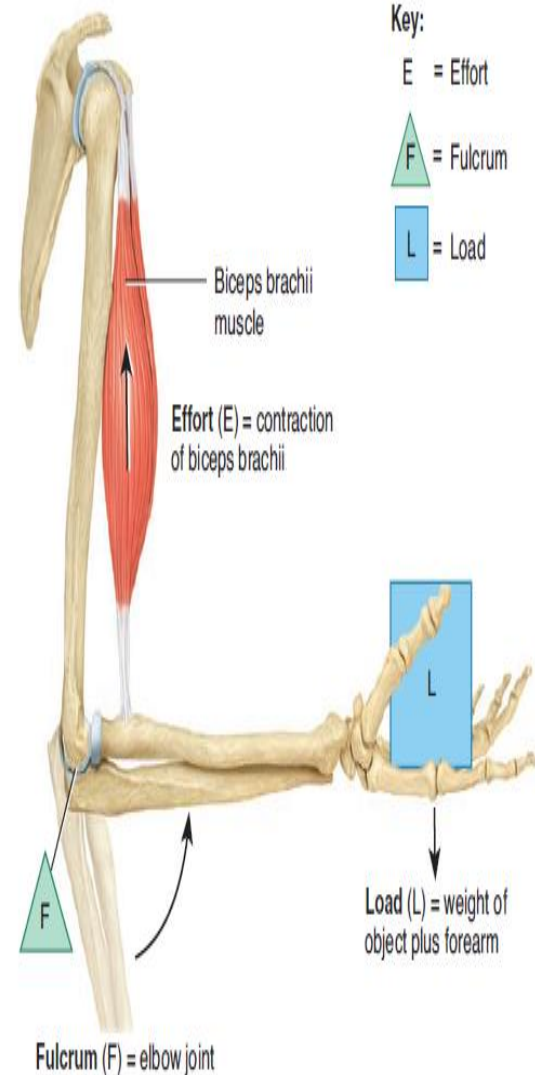
4- Usually the (insertion) moves towards the origin during contraction of the muscle

5- During contraction usually the muscle fibers shorten and this results in pulling the insertion towards the origin over a joint

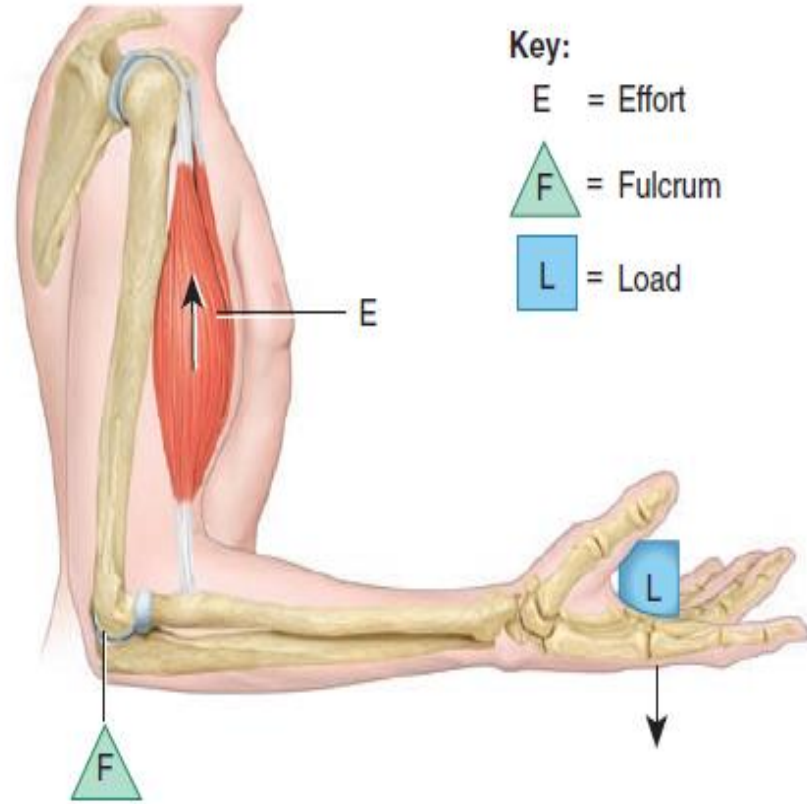
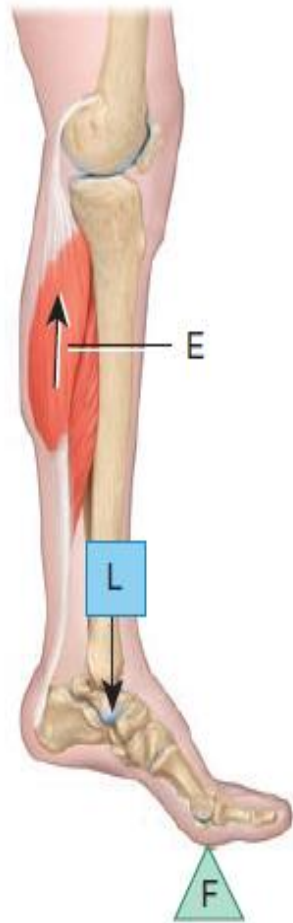
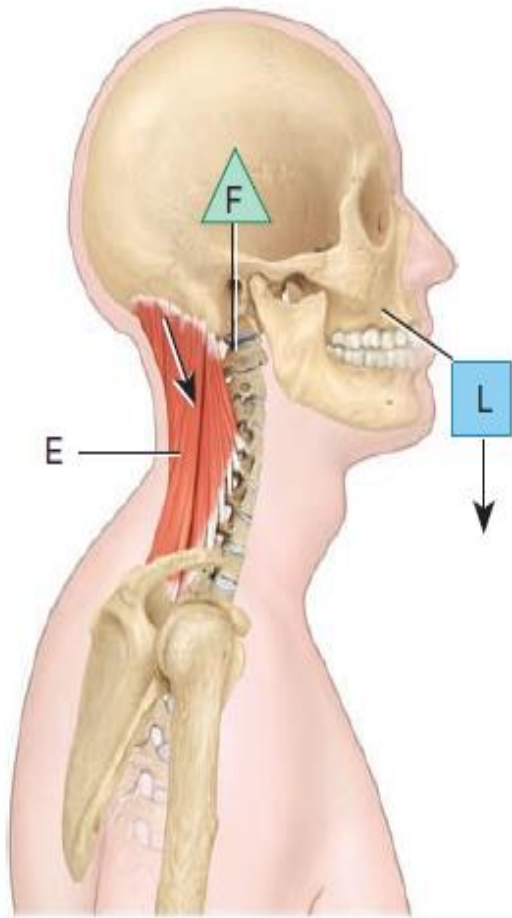


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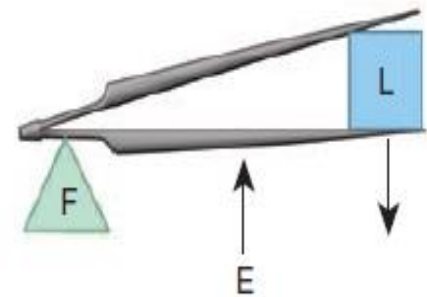
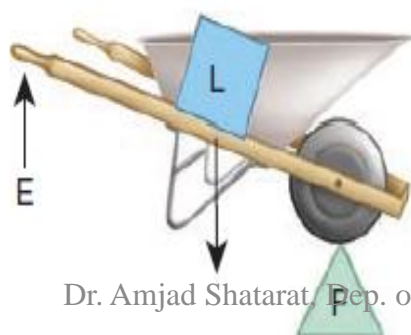
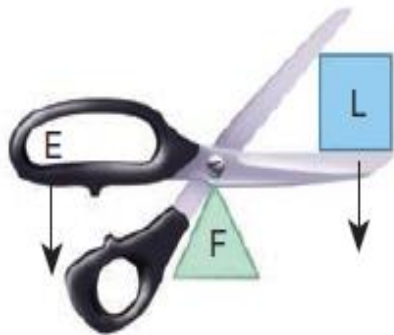
(a) Origin and insertion of a skeletal muscle



(b) Movement of the forearm lifting a weight



Key:
 E = Effort
 F = Fulcrum
 L = Load



C- Nerves

Nervous System

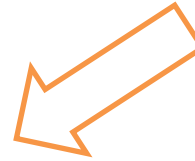
The nervous system is divided into two main parts:



the central nervous system, which consists of the brain and spinal cord



the peripheral nervous system, which consists of 12 pairs of cranial nerves and **31 pairs of spinal** nerves and their associated ganglia



Spinal Nerves

A total of 31 pairs of spinal nerves

The spinal nerves are named according to the region of the vertebral column with which they are associated:

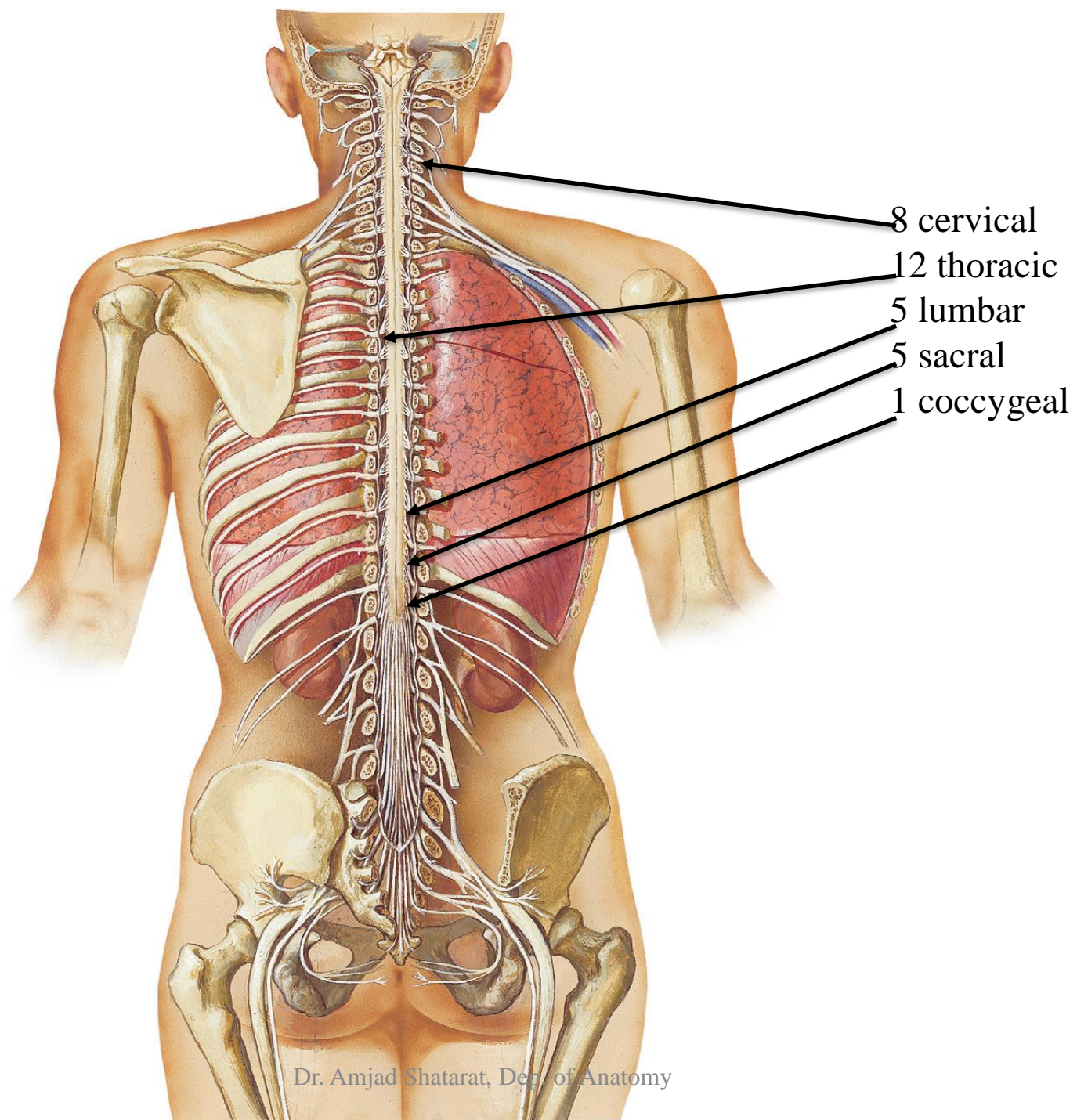
8 cervical

12 thoracic

5 lumbar

5 sacral

1 coccygeal



Each spinal nerve is connected to the spinal cord by two roots:

The anterior root and the posterior root

The anterior (ventral) root

consists of bundles of nerve fibers carrying nerve impulses away **from the central nervous system**

Such nerve fibers are called efferent fibers. Those efferent fibers that go to skeletal muscle and cause them to contract are called **motor fibers**.

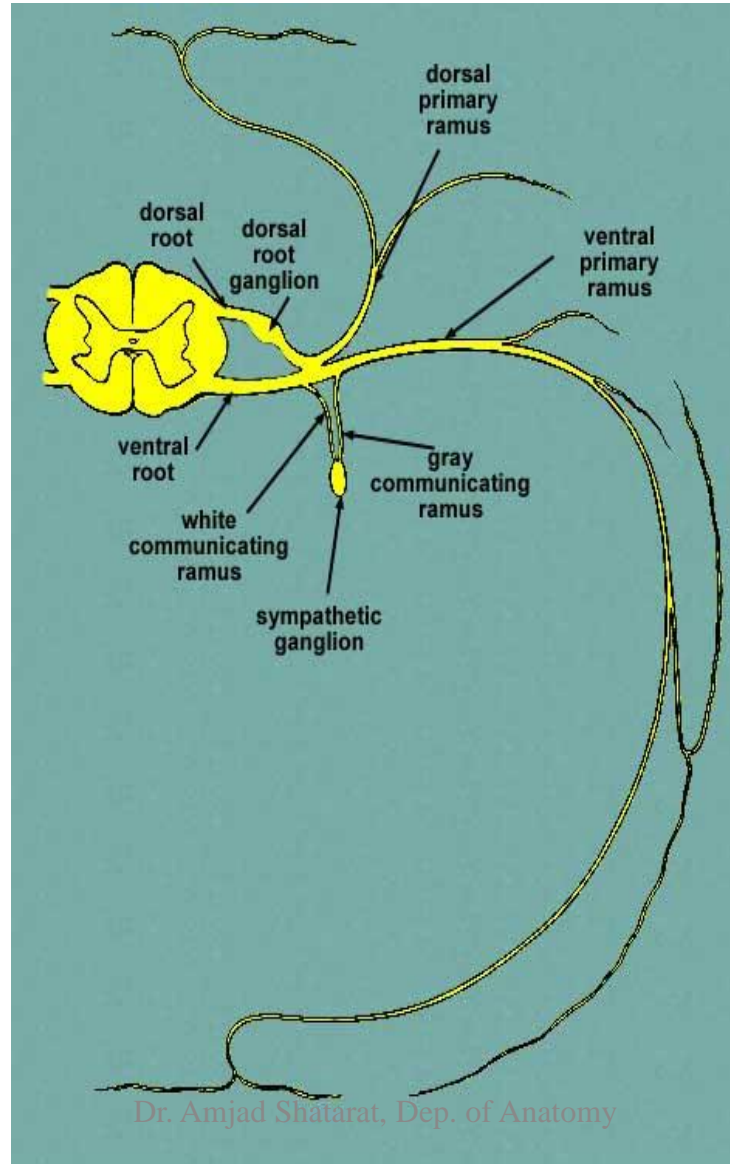
Their cells of origin lie in the anterior gray horn of the spinal cord.

The posterior (dorsal) root

It consists of bundles of nerve fibers that carry impulses **to the central nervous system** and are called **afferent fibers**.

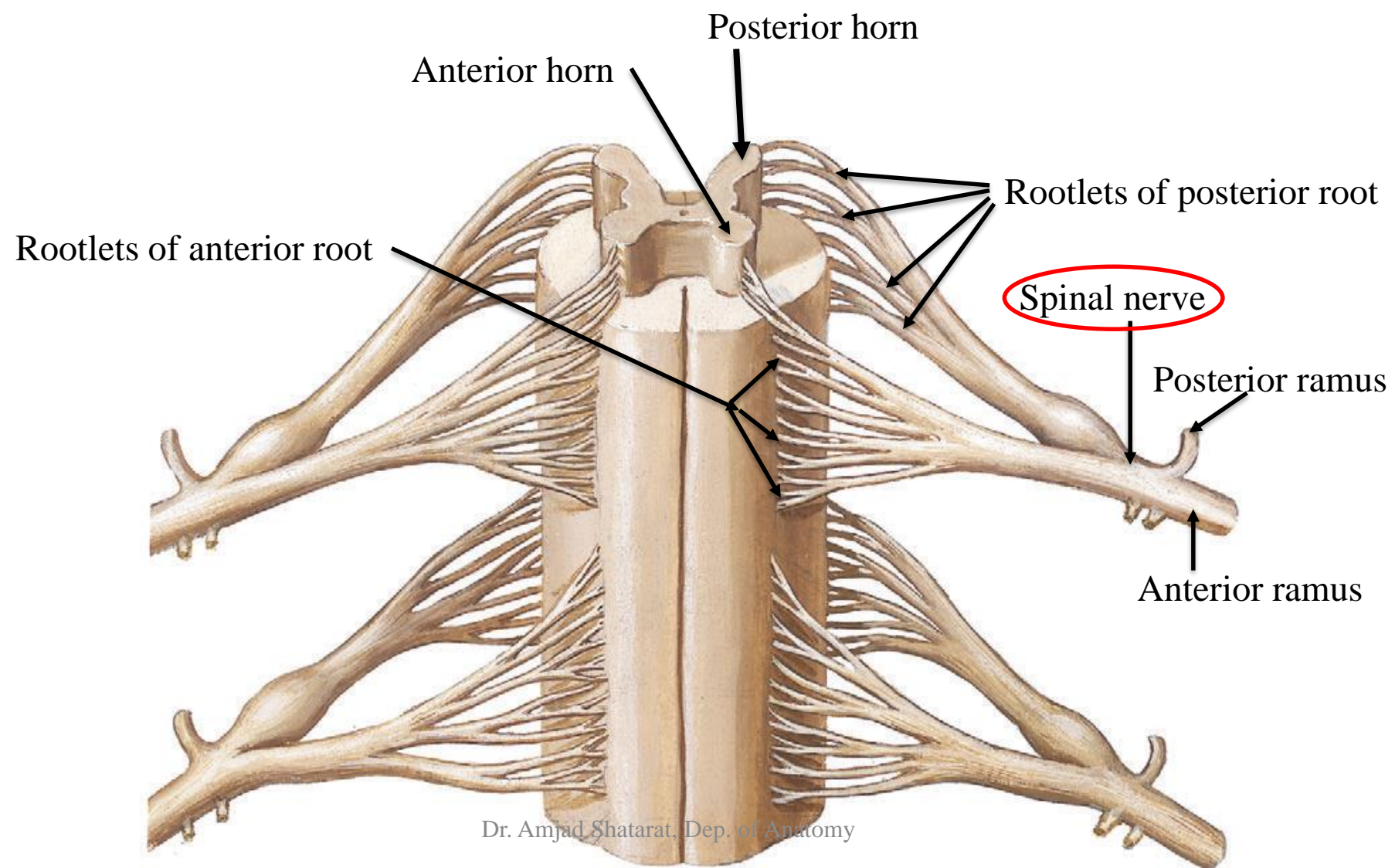
Because these fibers are concerned with conveying information about sensations of touch, pain, temperature, and vibrations, they are called **sensory fibers**.

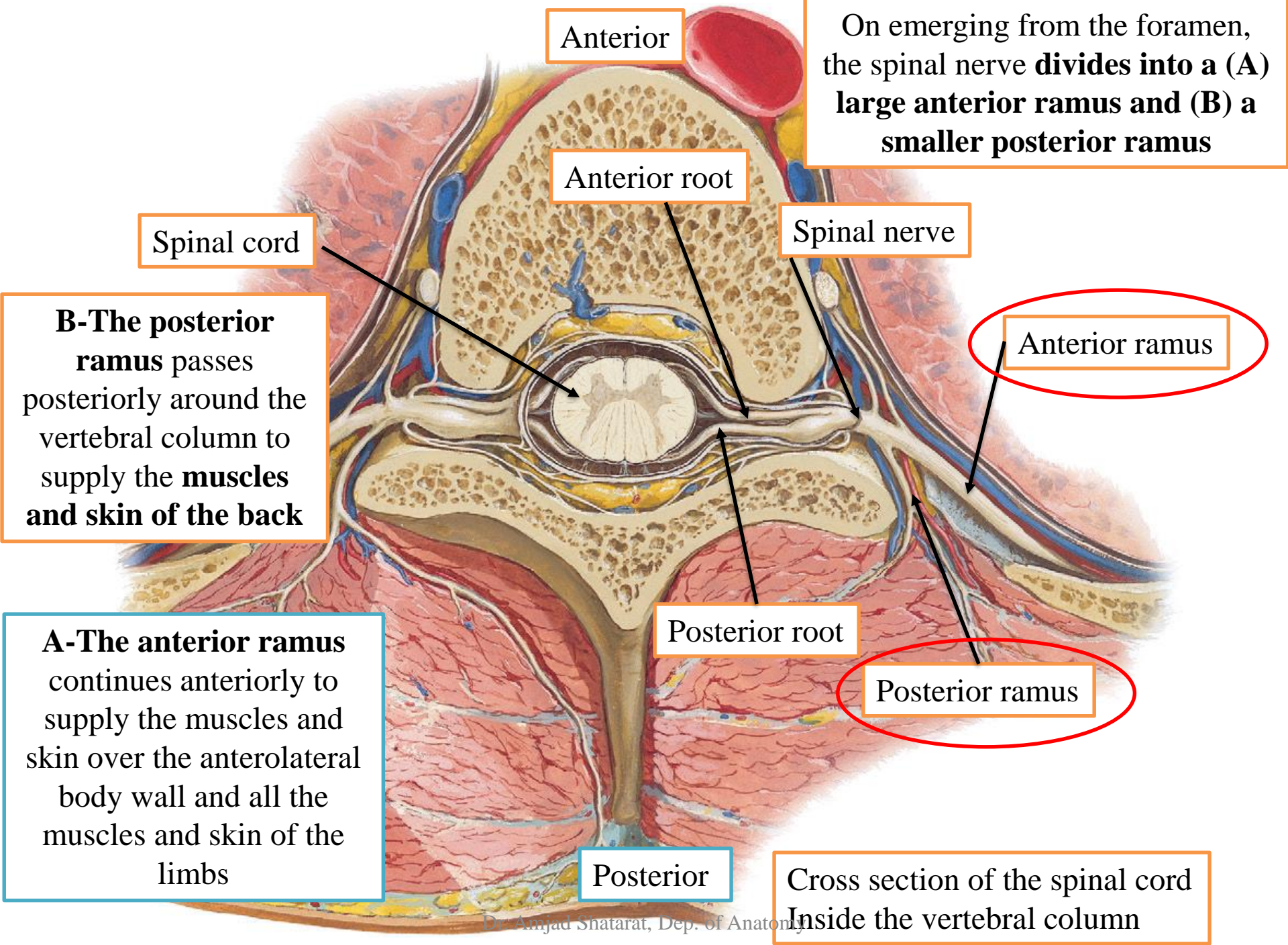
The cell bodies of these nerve fibers are situated in a swelling on the posterior root called the **posterior root ganglion**



At each intervertebral foramen

The anterior and posterior roots unite to form a spinal nerve, here, the motor and sensory fibers become mixed together, so that a spinal nerve is made up of a mixture of motor and sensory fibers





Anterior

On emerging from the foramen, the spinal nerve **divides into a (A) large anterior ramus and (B) a smaller posterior ramus**

Anterior root

Spinal cord

Spinal nerve

B-The posterior ramus passes posteriorly around the vertebral column to supply the **muscles and skin of the back**

Anterior ramus

A-The anterior ramus continues anteriorly to supply the muscles and skin over the anterolateral body wall and all the muscles and skin of the limbs

Posterior root

Posterior ramus

Posterior

Cross section of the spinal cord
Inside the vertebral column