

# INTRODUCTION TO ANATOMY



**ACCM** ACCREDITATION COMMISSION  
ON COLLEGES OF MEDICINE 



# **A-ANATOMICAL POSITION AND ANATOMICAL TERMS**

**HEROPHILUS (about 325BC)**

**Father of Anatomy**

**Performed:**

- Vivi-sections (dissections of living humans) and, dissections of human cadavers
- Regarded brain as seat of intelligence
- Described cerebrum, cerebellum, fourth ventricle
- First to identify nerves as sensory or motor.



# Anatomy in the Islamic Culture

Ibn Sina (Avicenna) ابن سينا (980-1037) :

- Described the diaphragm
- Described the lungs
- Stated that there is no connection between heart ventricles

Al Baghdadi عبد اللطيف البغدادي (1162-1231):

- Proved that the ventricle is one bone

Ibn Nafis (1213-1288) ابن النفيس :

- Described pulmonary circulation
- Described coronary arteries and circulation

Ibn Al Qof (1232-1286) ابن القف الكركي :

- Described the pericardium

And many other Scholars and discoveries



يجب التأكد من إتقان الطبيب لعلم  
التشريح قبل أن يبدأ ممارسة الجراحة

أبو القاسم الزهراوي (936-1013)

(Albucasis)

التصريف لمن عجز عن التأليف

# من اشتغل بالتشريح از داد إيماناً بالله

ابن رشد Averroes

1126-1198

عجبي للطبيب يلحد في الخ — الق من بعد درسه التشريحا  
فَطِنُ الْحَاضِرِينَ مَنْ يَفْهَمُ التَّع رِيضَ حَتَّى يَظُنُّهُ تَصْرِيحًا

أبو العلاء المعري

973-1057

**VESALIUS(1514- 1654): Father of Modern Anatomy**

His work *De humani corporis fabrica* written in 7 volumes

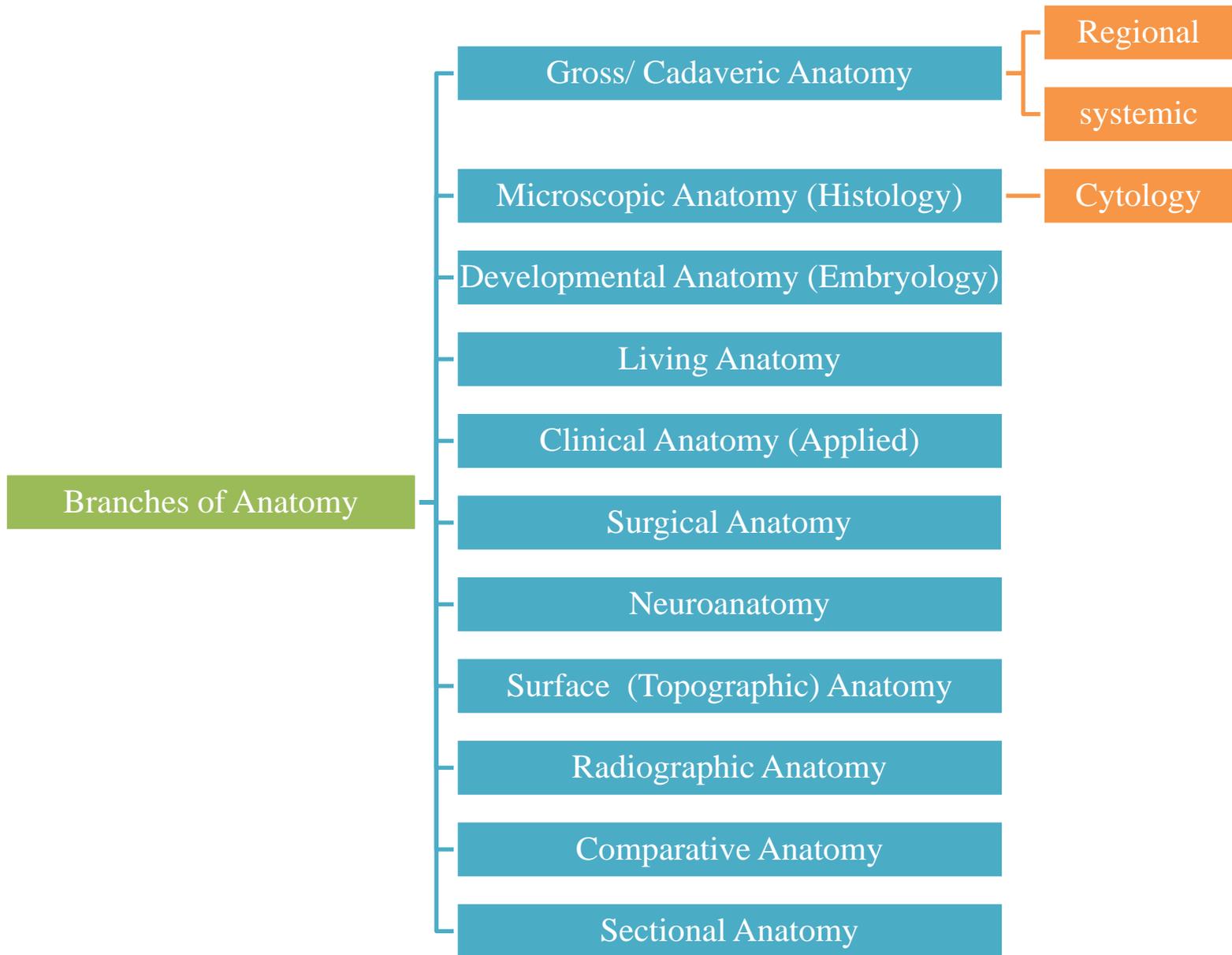
His work revolutionised the teaching of anatomy and ruled for two centuries

Chose not to have his name attached to the parts of body he described unlike anatomists Sylvius, Fallopius, Eustachius.

**‘Reformer of Anatomy’**



**His doctoral thesis**, "Paraphrasis in nonum librum Rhazae medici Arabis clarissimi ad regem Almansorem, de affectuum singularum corporis partium curatione", was a commentary on the ninth book of **Rhazes**.



# ANATOMICAL POSITION

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

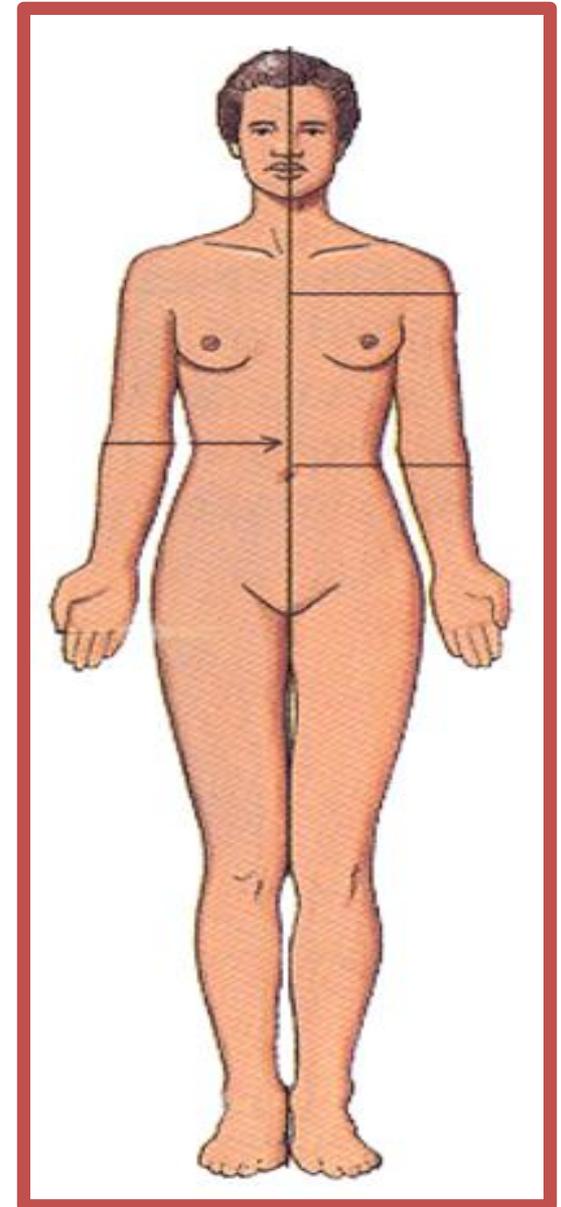
based on the **assumption**  
that the person is:

**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*

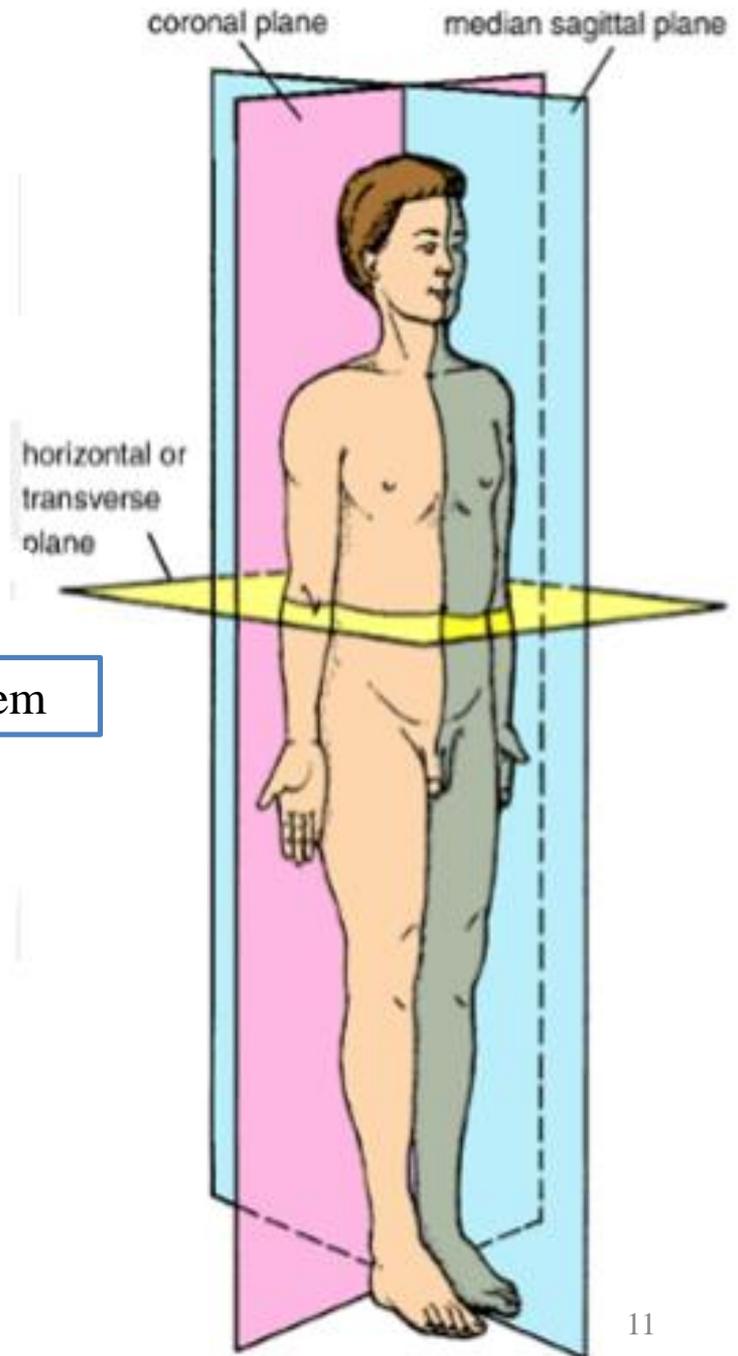
**Two Vertical planes**

**Sagittal**

**Coronal**

This is why we need to know the difference between them

**One Horizontal OR  
Transverse Or Axial**



# 1-Vertical planes

## 1-The Sagittal Plane

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

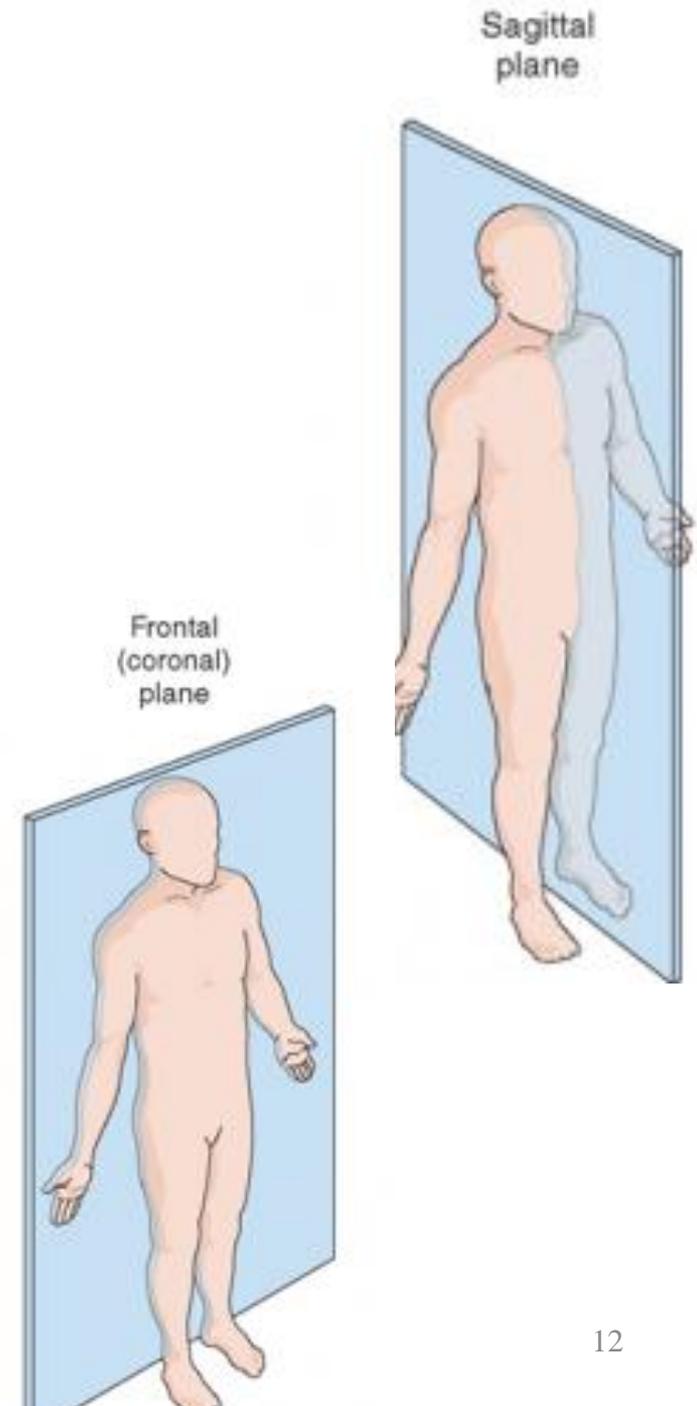
Types:

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

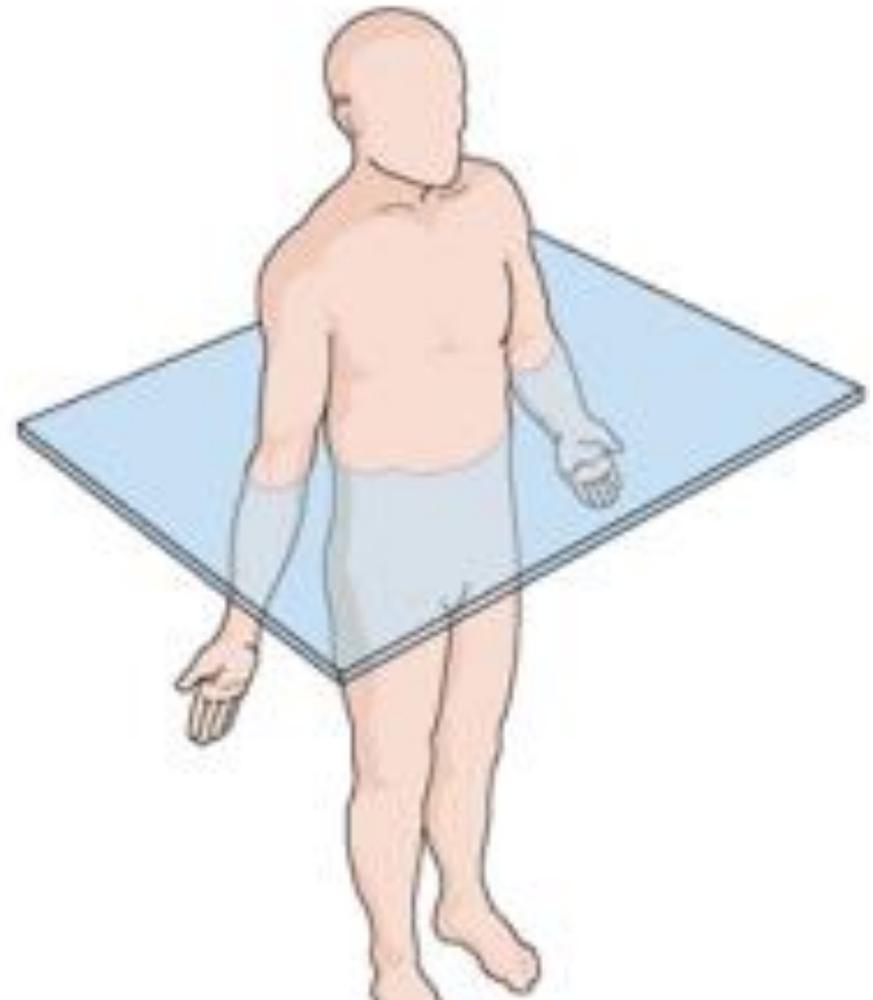
Is an imaginary vertical plane at right angles to the median plane and divides the body into anterior and posterior parts



## 2- Transverse, horizontal,

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

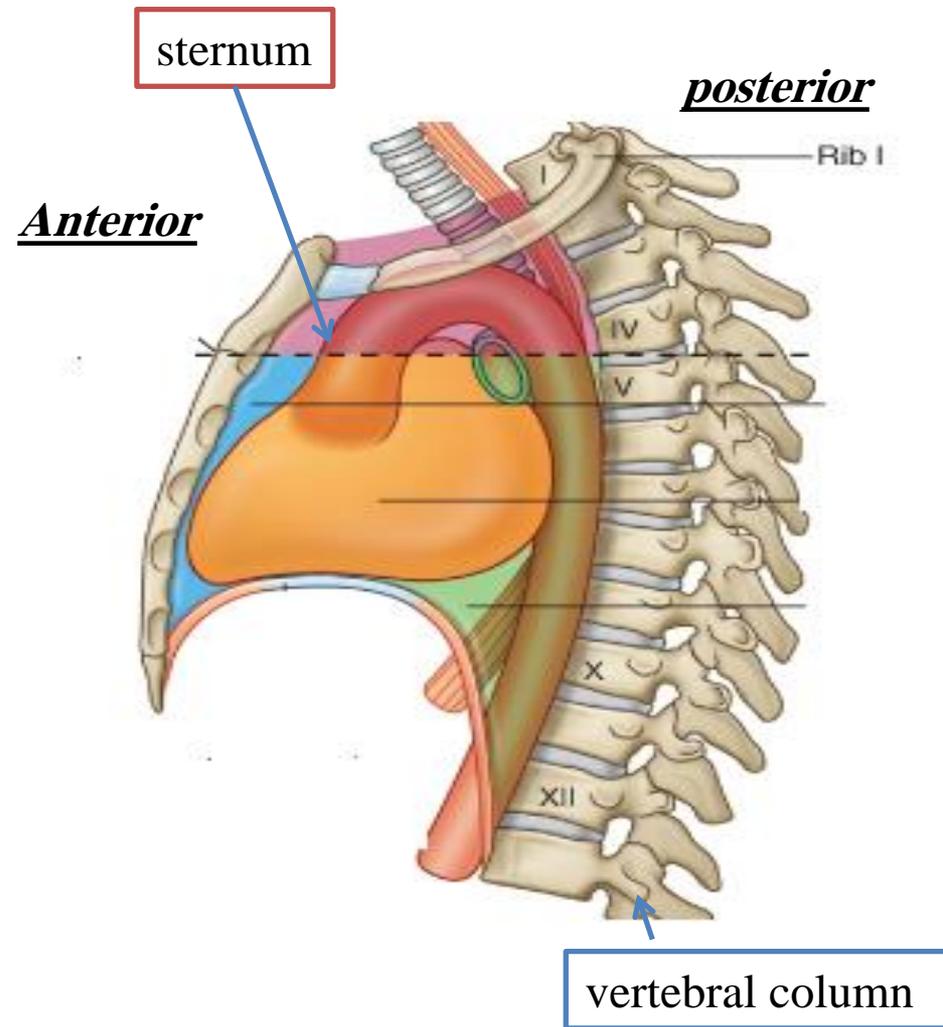
Transverse  
(horizontal)  
plane



## Terms to describe location

### *Anterior (ventral) and posterior (dorsal)*

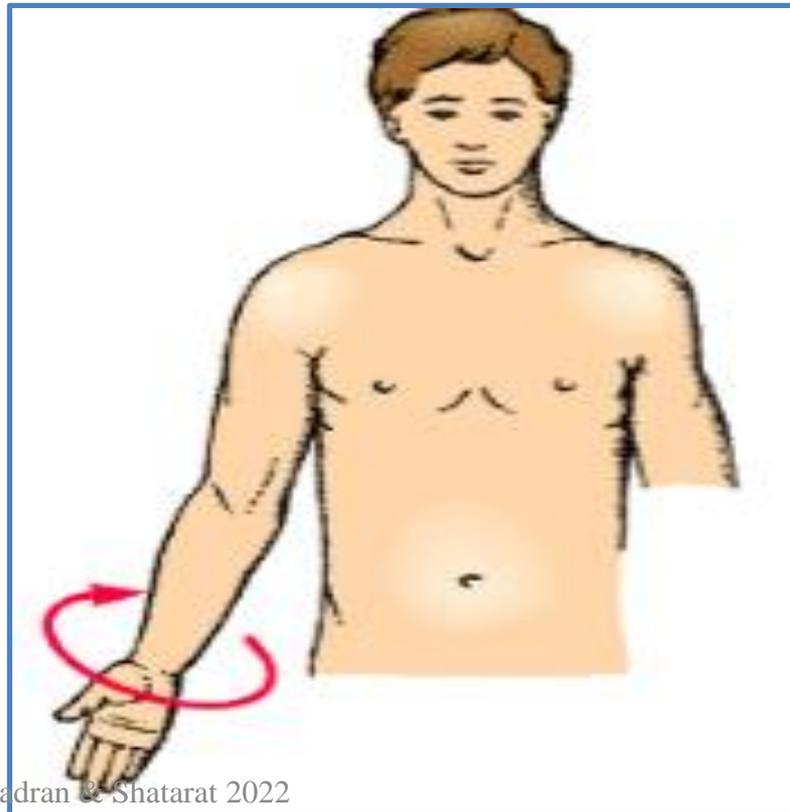
describe the position of structures relative to the 'front' and 'back' of the body.  
For example, the nose is anterior to the ears and the *vertebral column is posterior to the sternum.*



## ***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***

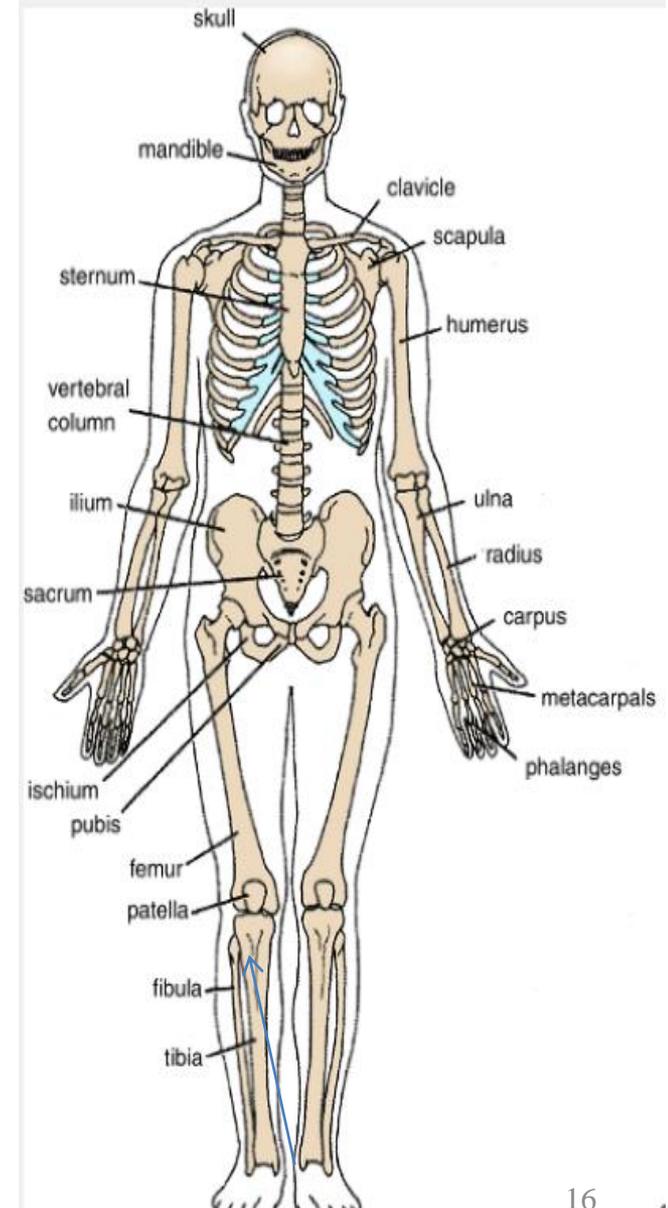
For example, **the thumb** is lateral to **the little finger**.



# *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.



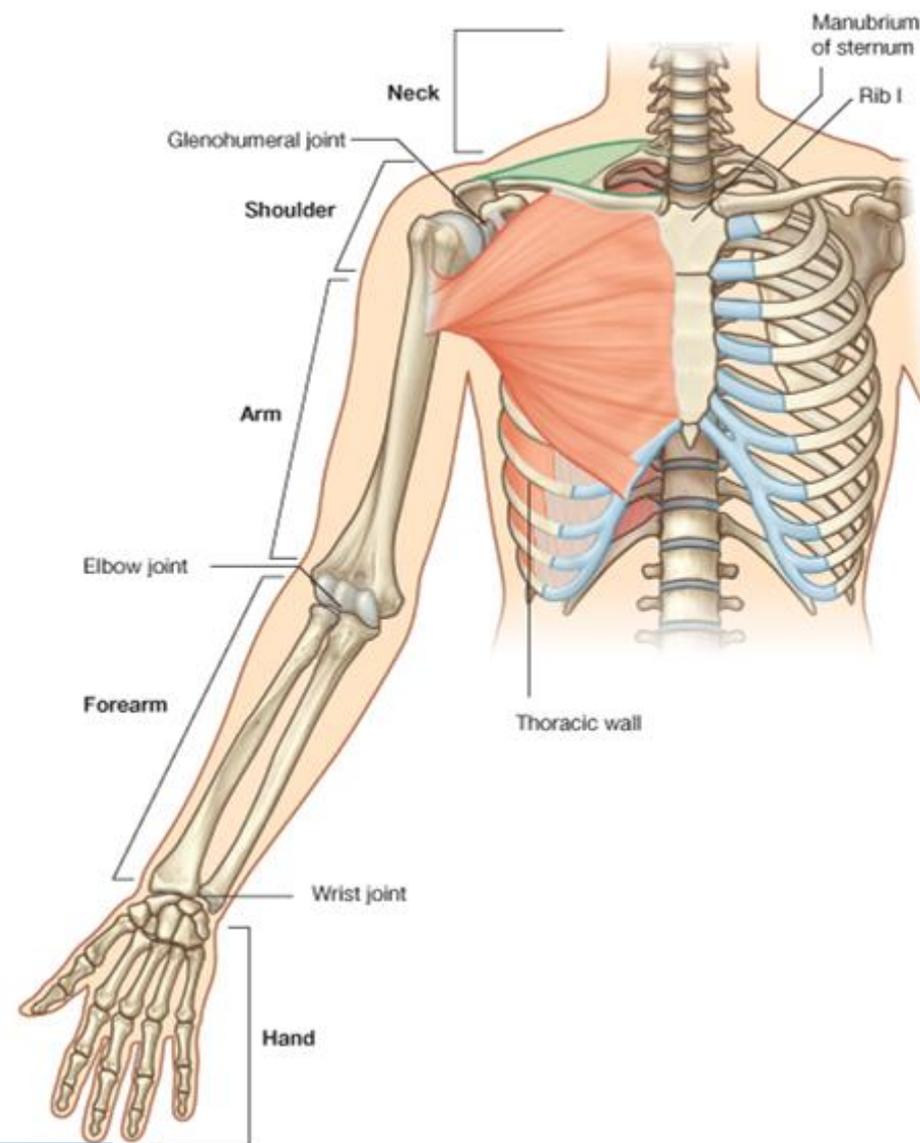
## Proximal and distal

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

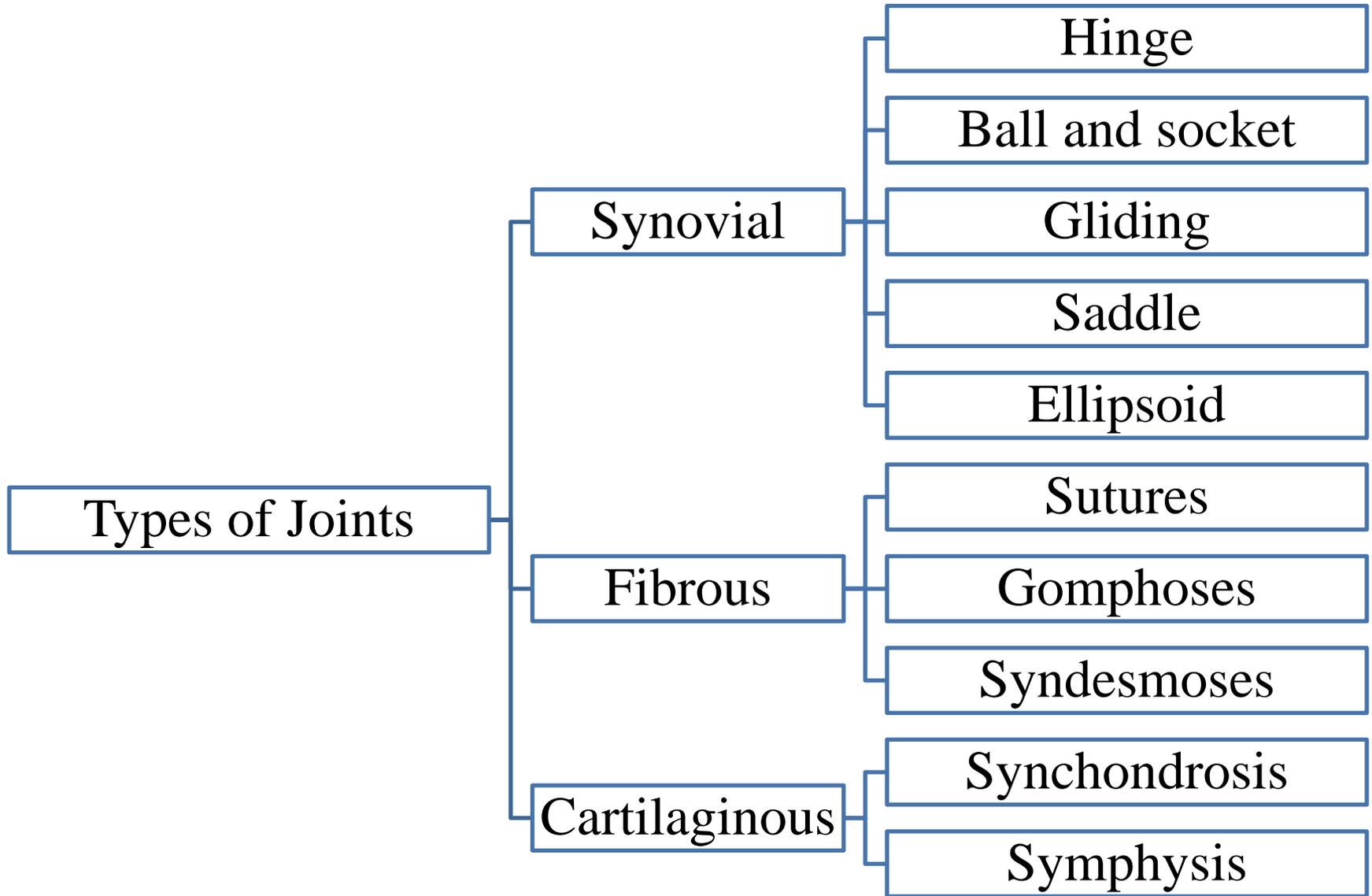
For example, the hand is distal to the elbow joint.

**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

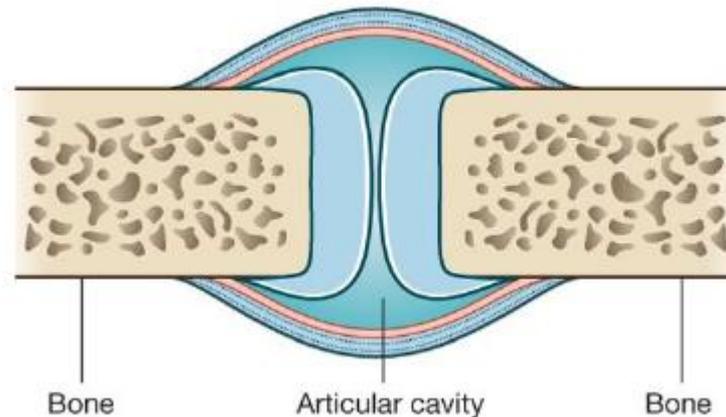
When two bones or more come together wither there is movement between them or not.

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

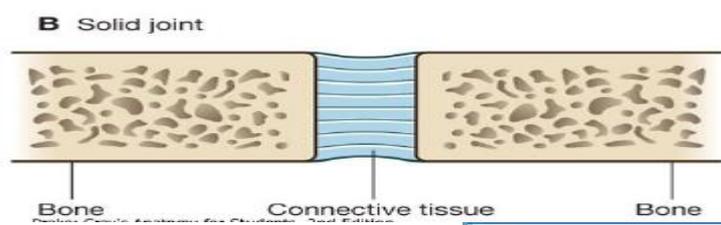
### **1-Synovial joints**

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

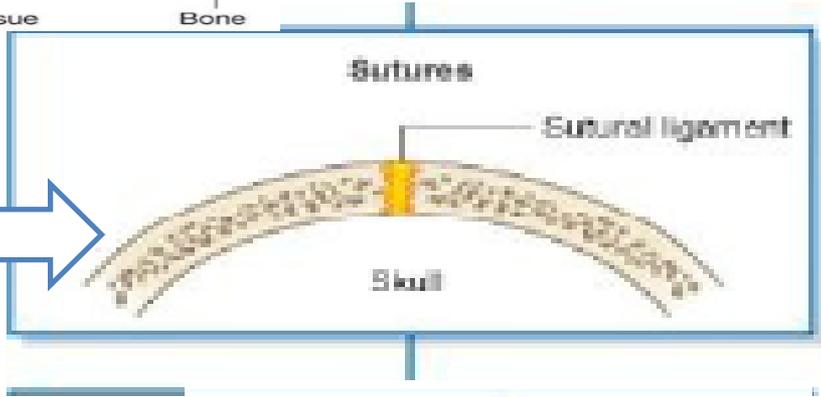
A Synovial joint



# 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*.



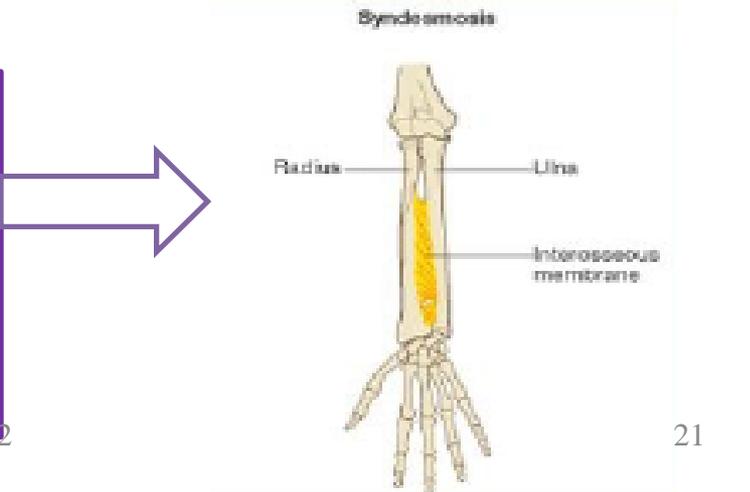
Read only

**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.



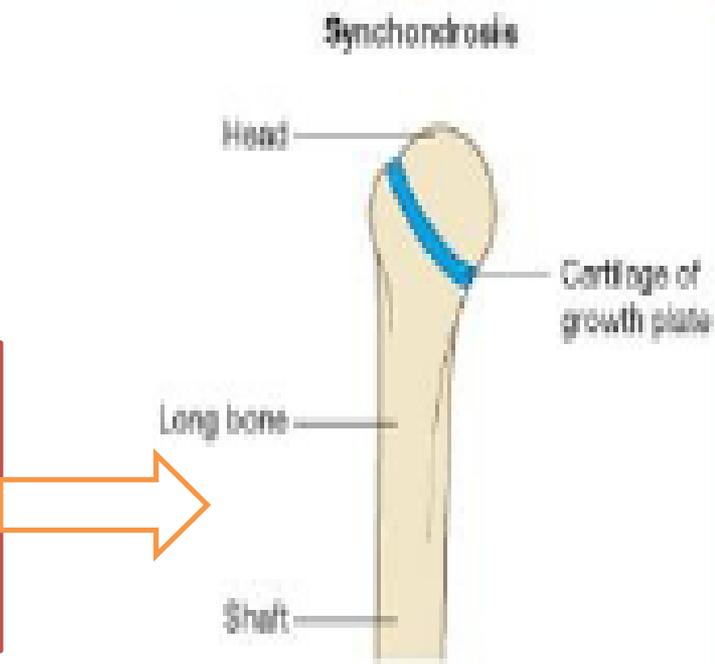
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**C-Syndesmoses** are joints in which two adjacent bones are linked by a ligament. Examples are the **ligamentum flavum**, which connects adjacent vertebral laminae, and **an interosseous membrane**, which links, for example, the radius and ulna in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

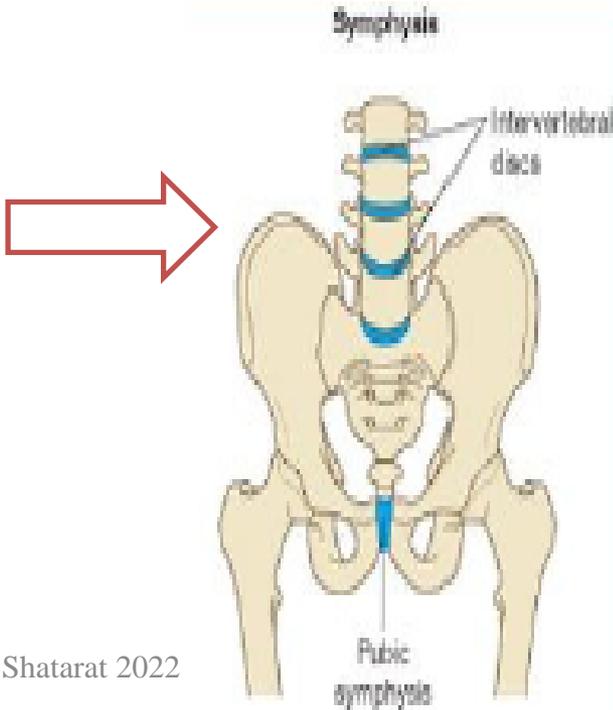


# 3-Cartilaginous joints

**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**

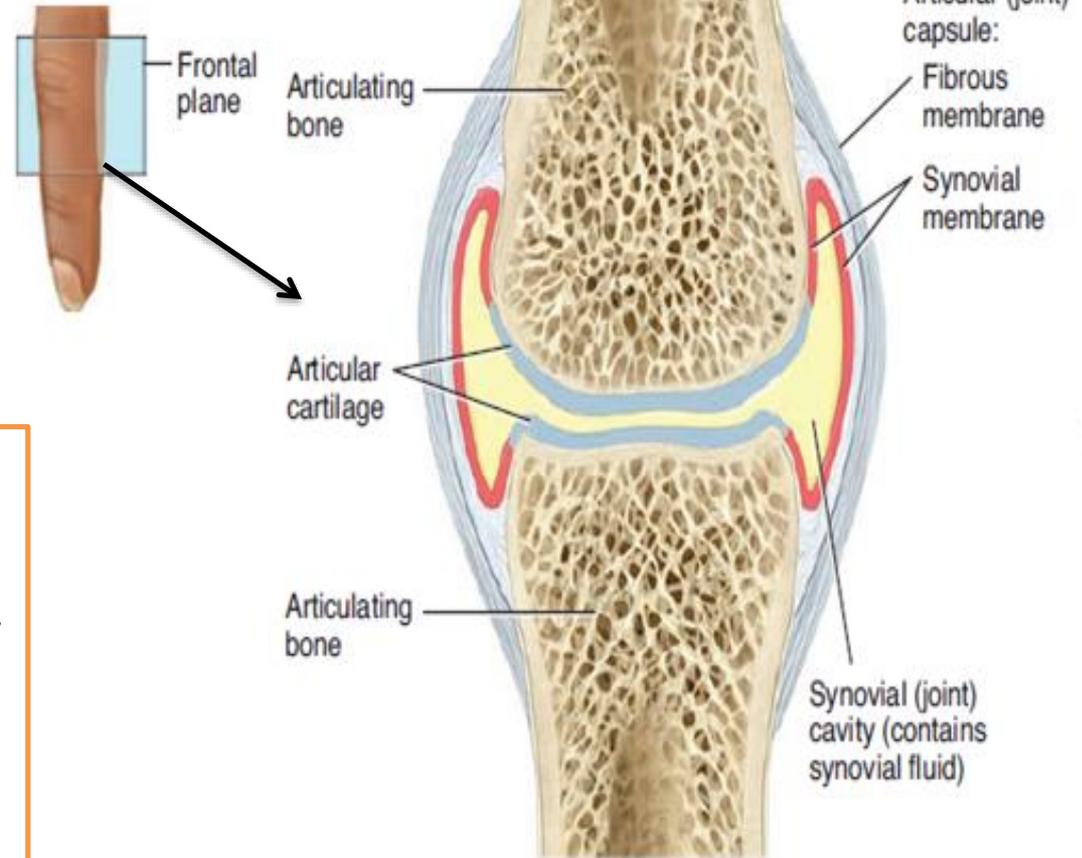
2-The bones are covered by a layer of ***hyaline cartilage*** called **articular cartilage**. **The cartilage covers the articulating surface of the bones with a smooth, slippery surface**

### ***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***

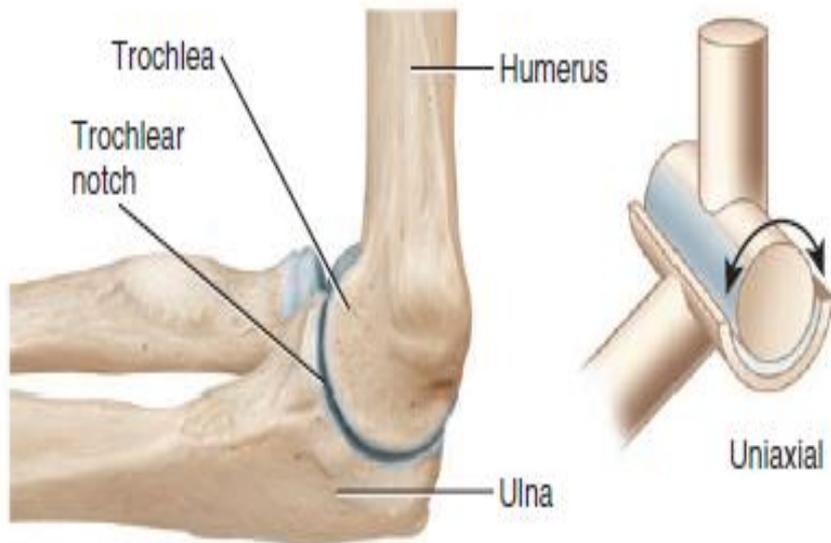
The synovial membrane secretes **synovial fluid** Its functions include reducing friction and supplying oxygen and nutrients to and removing carbon dioxide and metabolic wastes from the chondrocytes within articular cartilage.



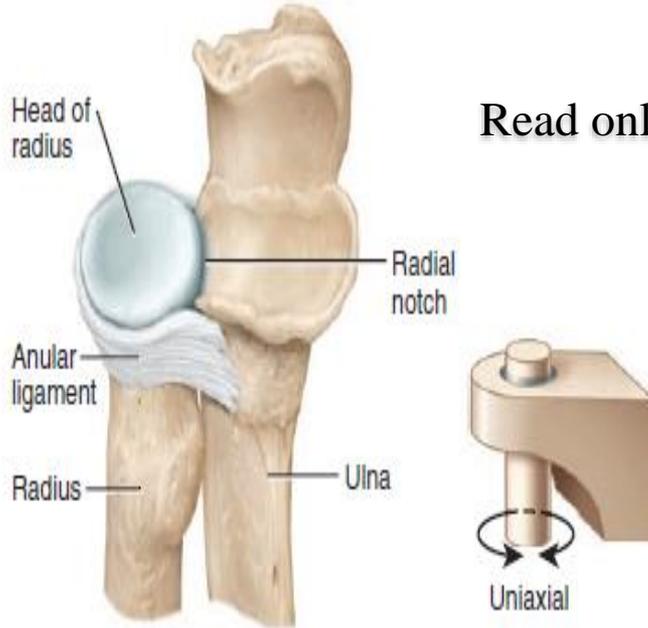
### ***5-Accessory Ligaments, Articular Discs***

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

# Selected Types of synovial joints



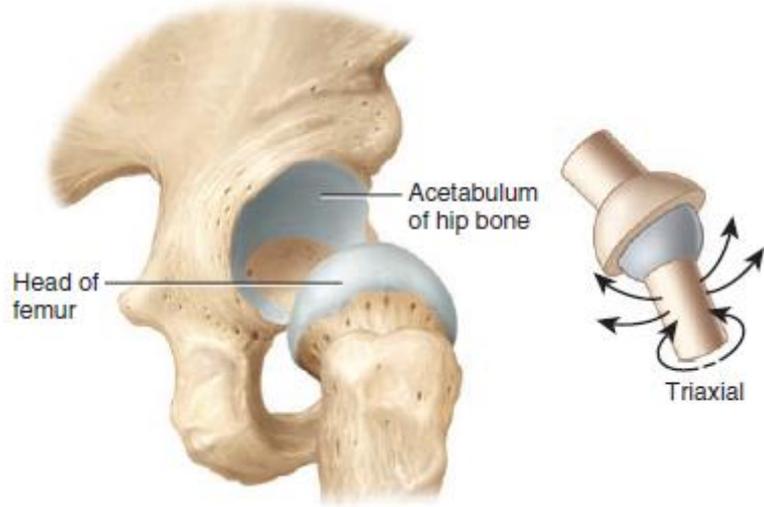
(b) Hinge joint between trochlea of humerus and trochlear notch of ulna at the elbow



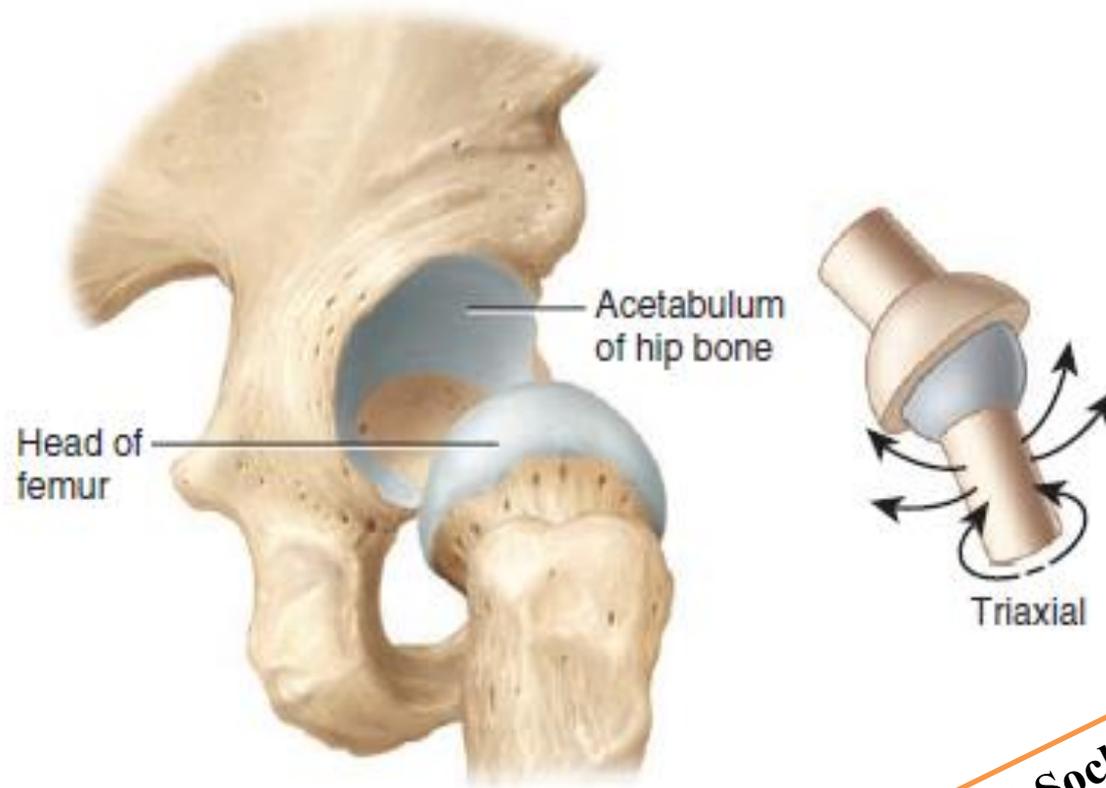
(c) Pivot joint between head of radius and radial notch of ulna

**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*

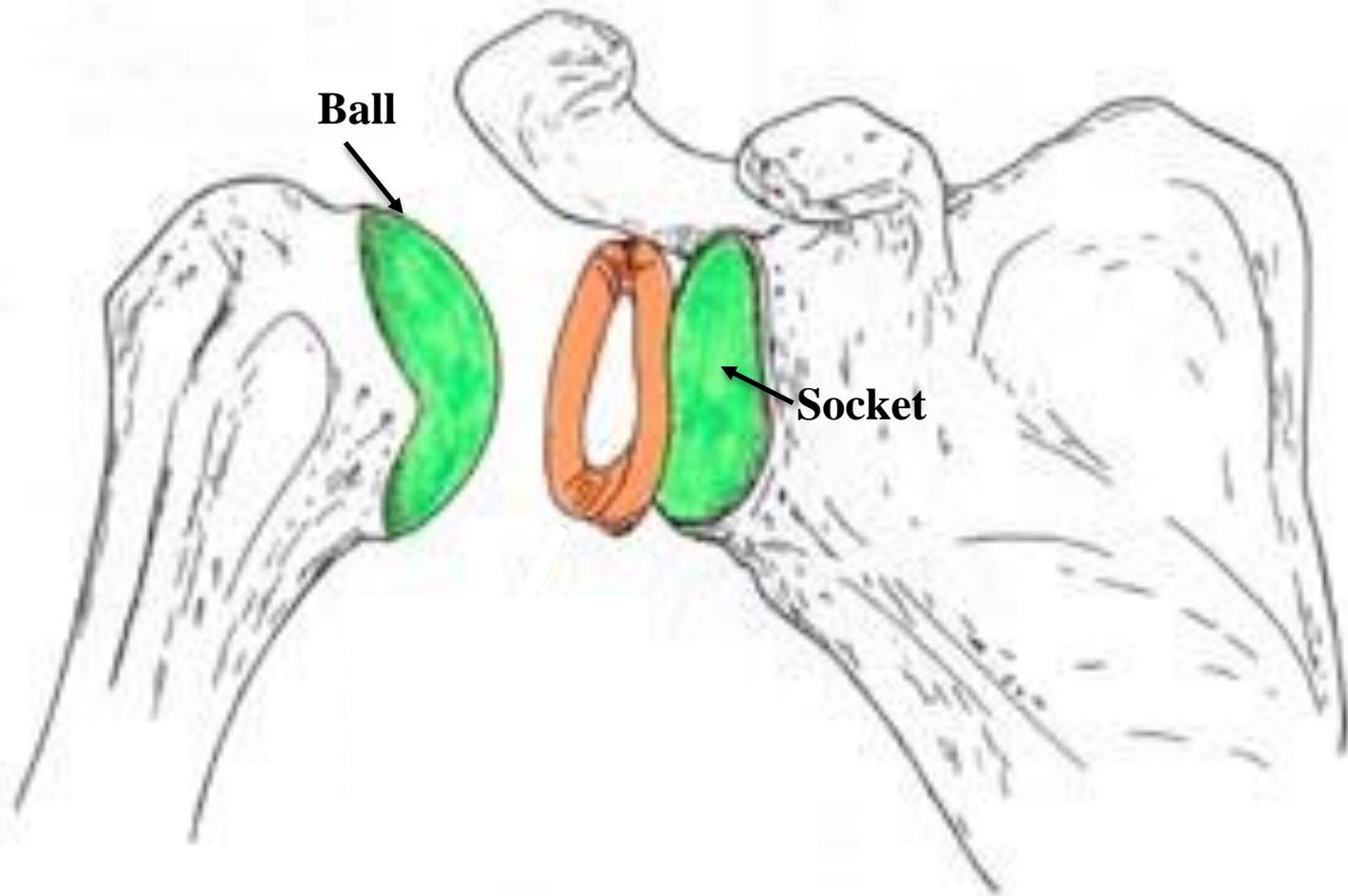


**3-Ball-and-Socket Joints**  
*consists of the ball-like surface of one bone fitting into a cuplike depression of another bone*



(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

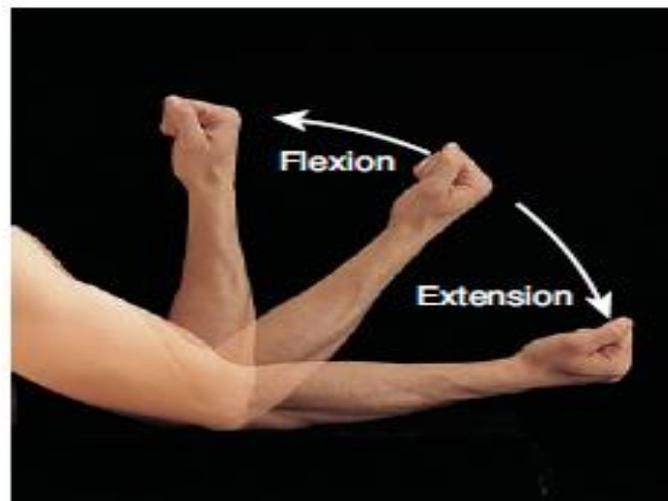
5-CIRCUMDUCTION

## *Flexion, Extension*

Flexion and extension are opposite movements.

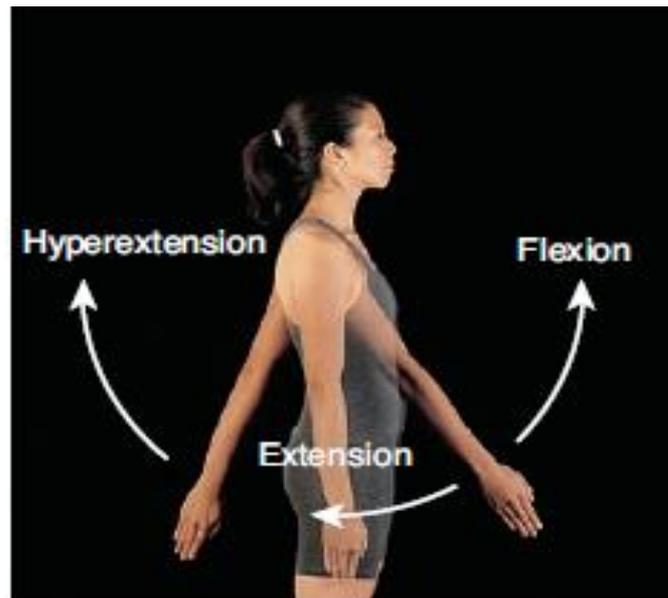
### **In flexion**

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*

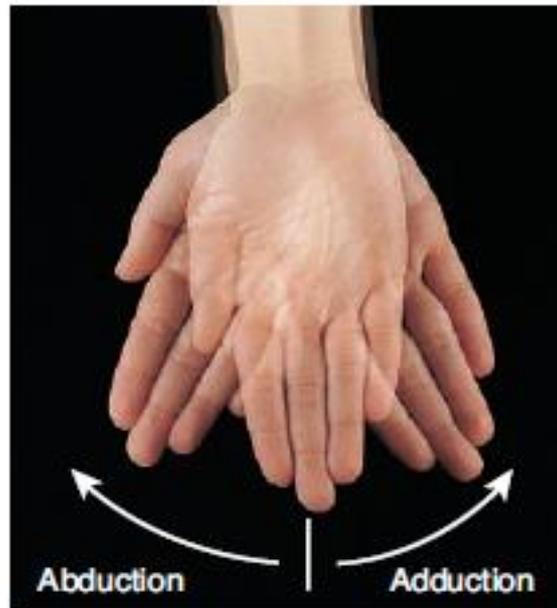
### Examples of abduction include

moving the humerus  
laterally at  
the shoulder joint



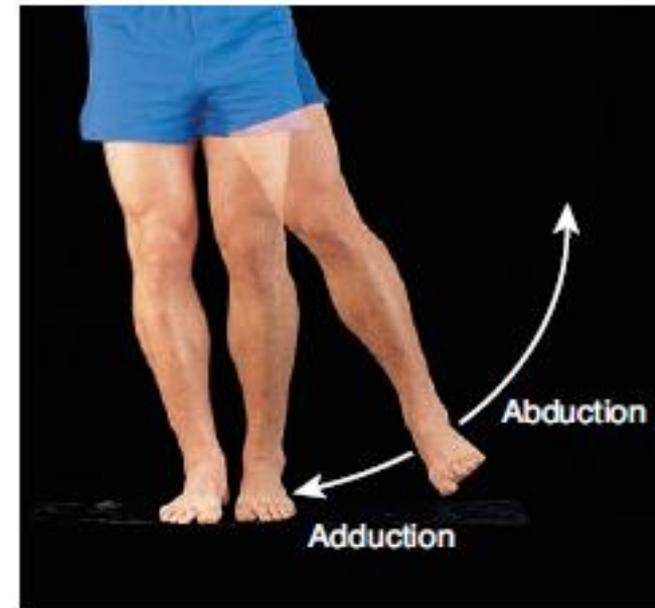
(a) Shoulder joint

moving the palm laterally  
at the wrist joint



(b) Wrist joint

moving the femur laterally  
at the hip joint



(c) Hip joint

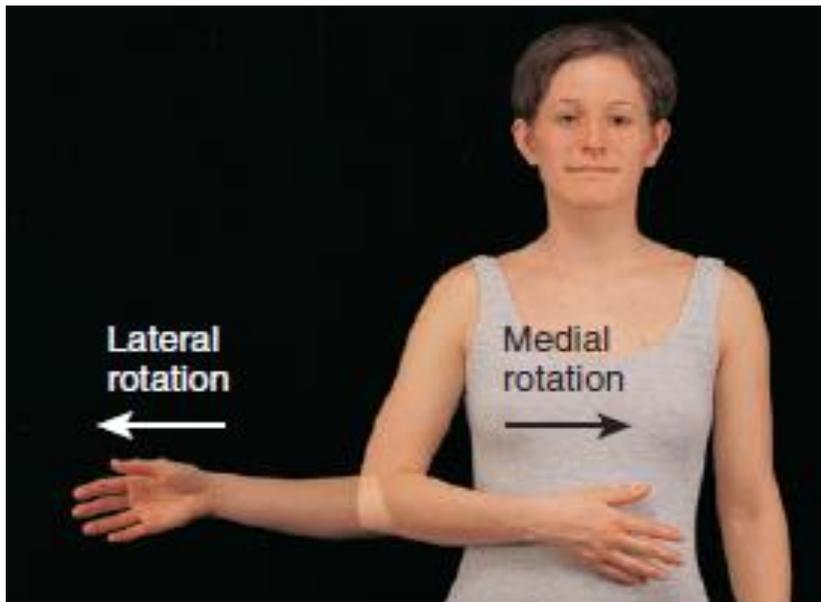
The movement that returns each of these body parts to the anatomical position is **adduction**

## Rotation

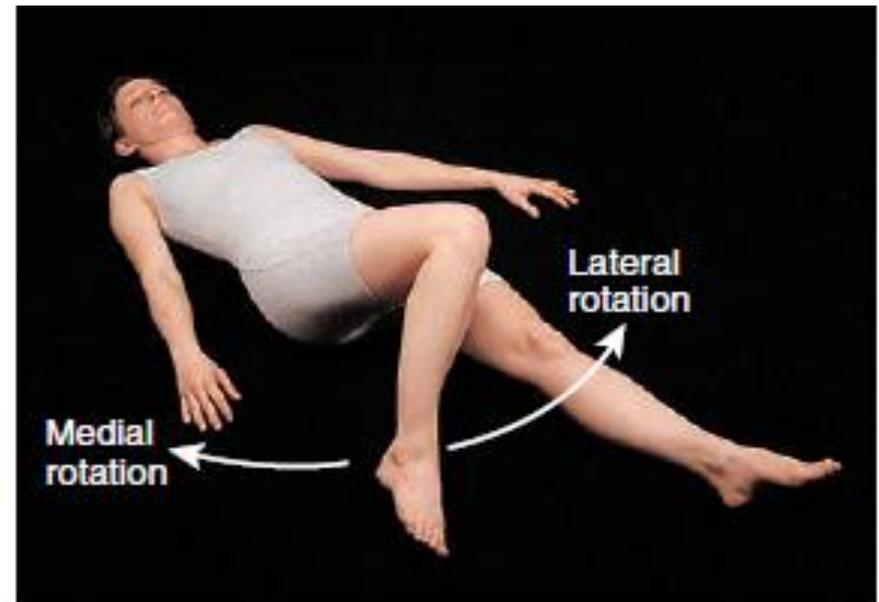
In **rotation** *a bone revolves* around its own longitudinal axis

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*



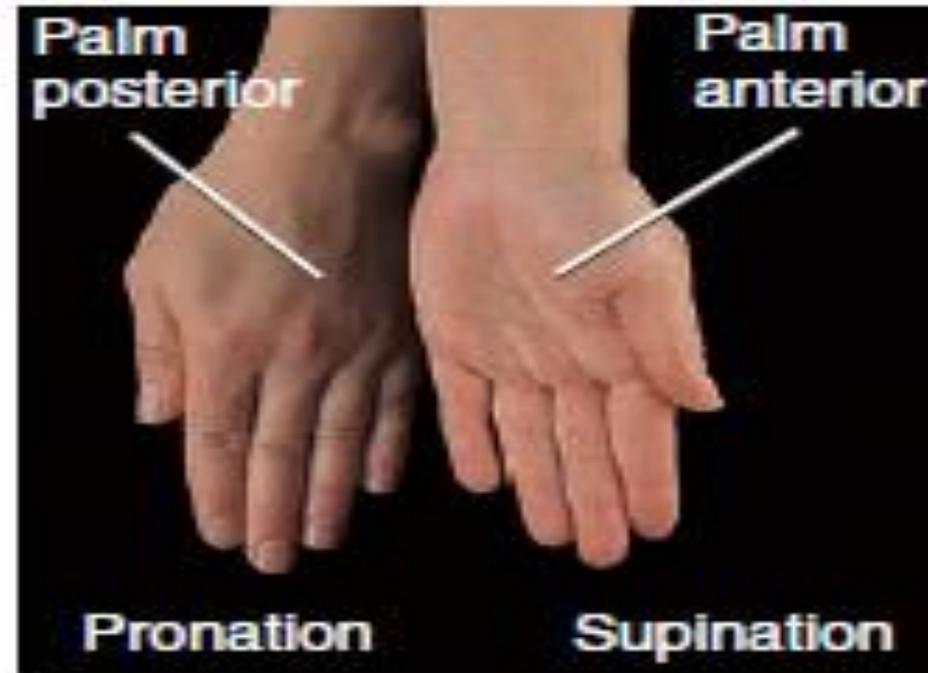
(b) Shoulder joint



(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

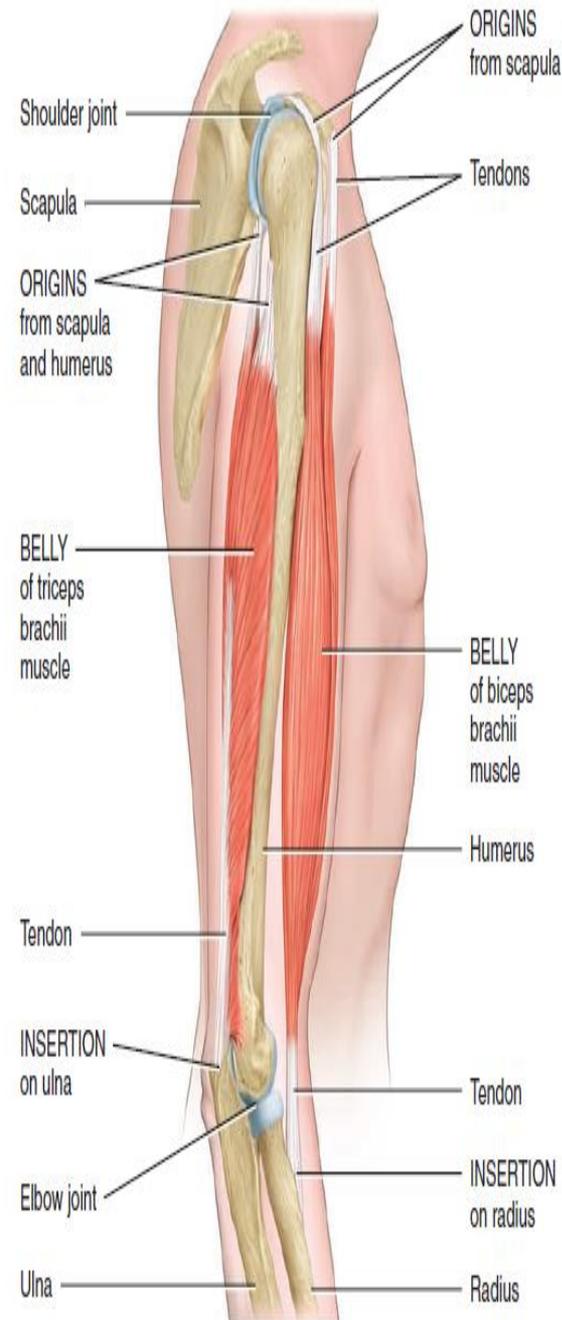
2- For a muscle to produce a movement it has to cross over a joint

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

## origin and insertion

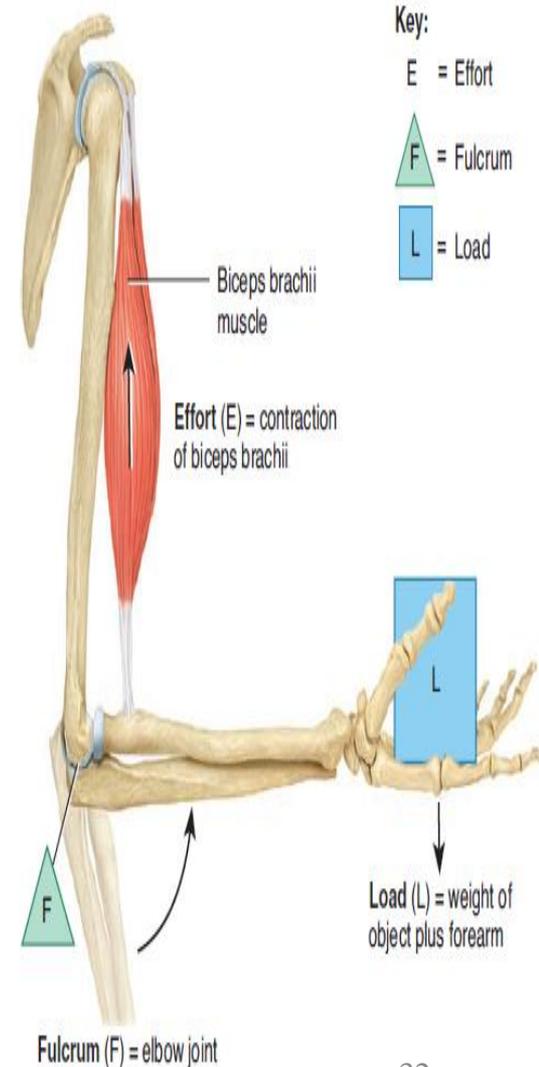
4- Usually the (insertion) moves towards the origin during contraction of the muscle

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

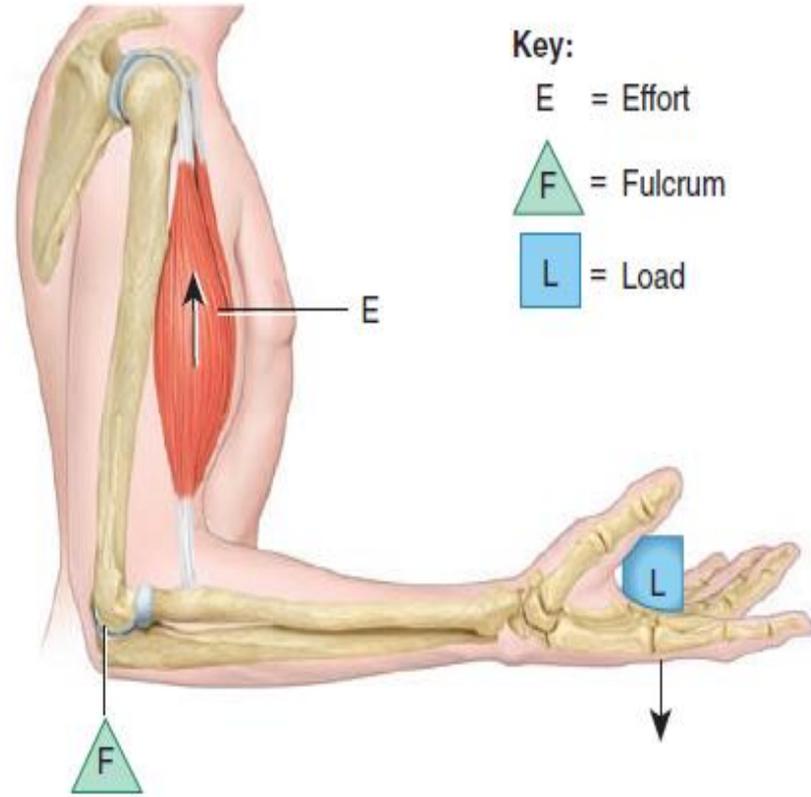
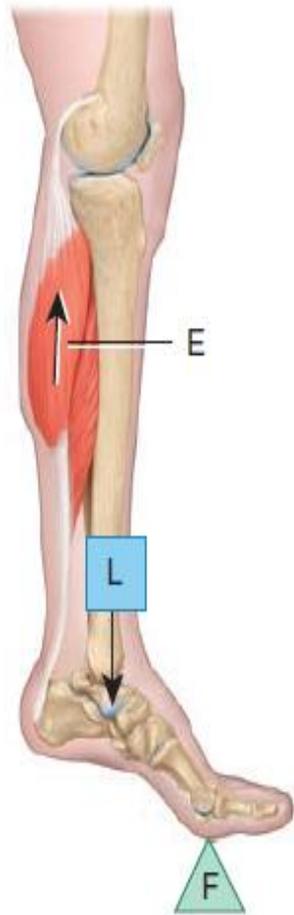
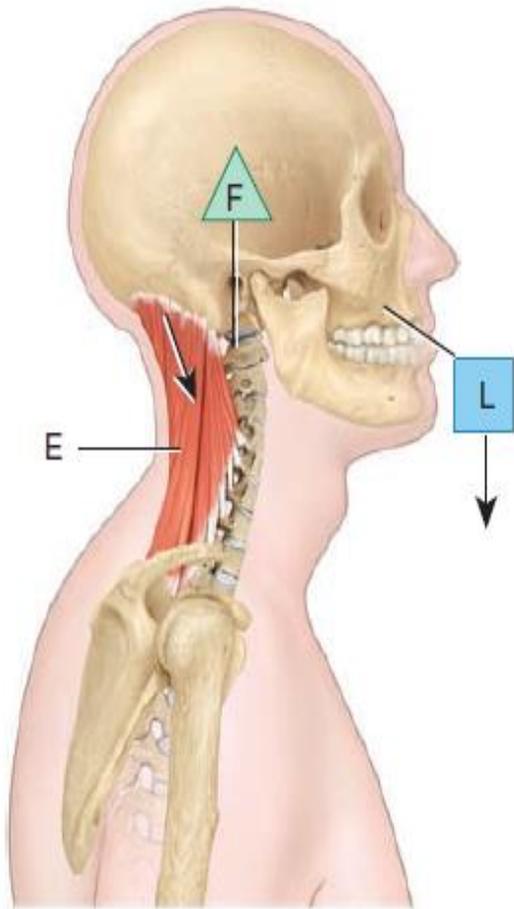


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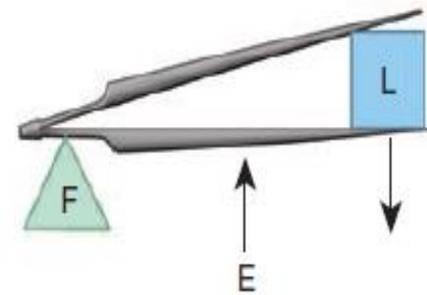
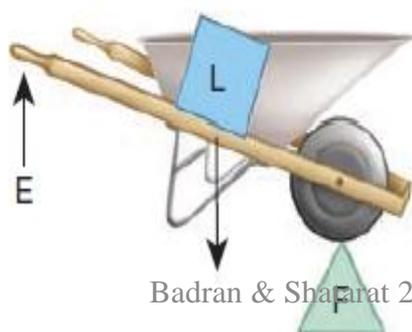
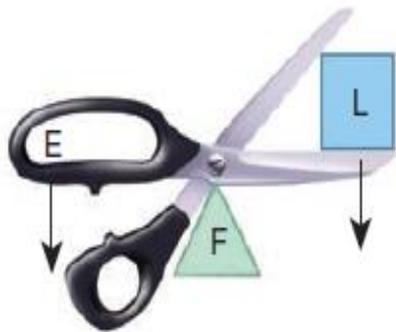
(a) Origin and insertion of a skeletal muscle



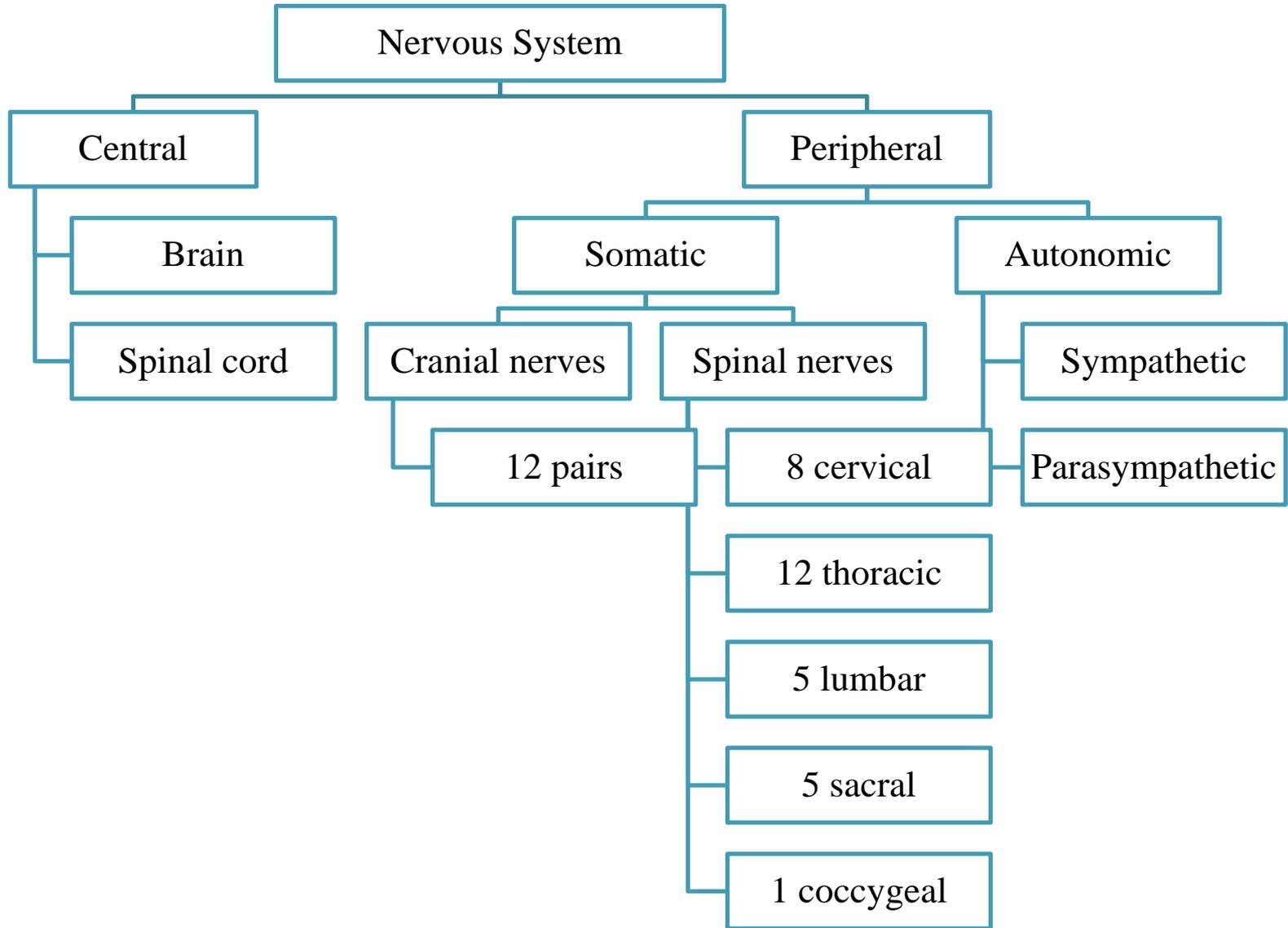
(b) Movement of the forearm lifting a weight

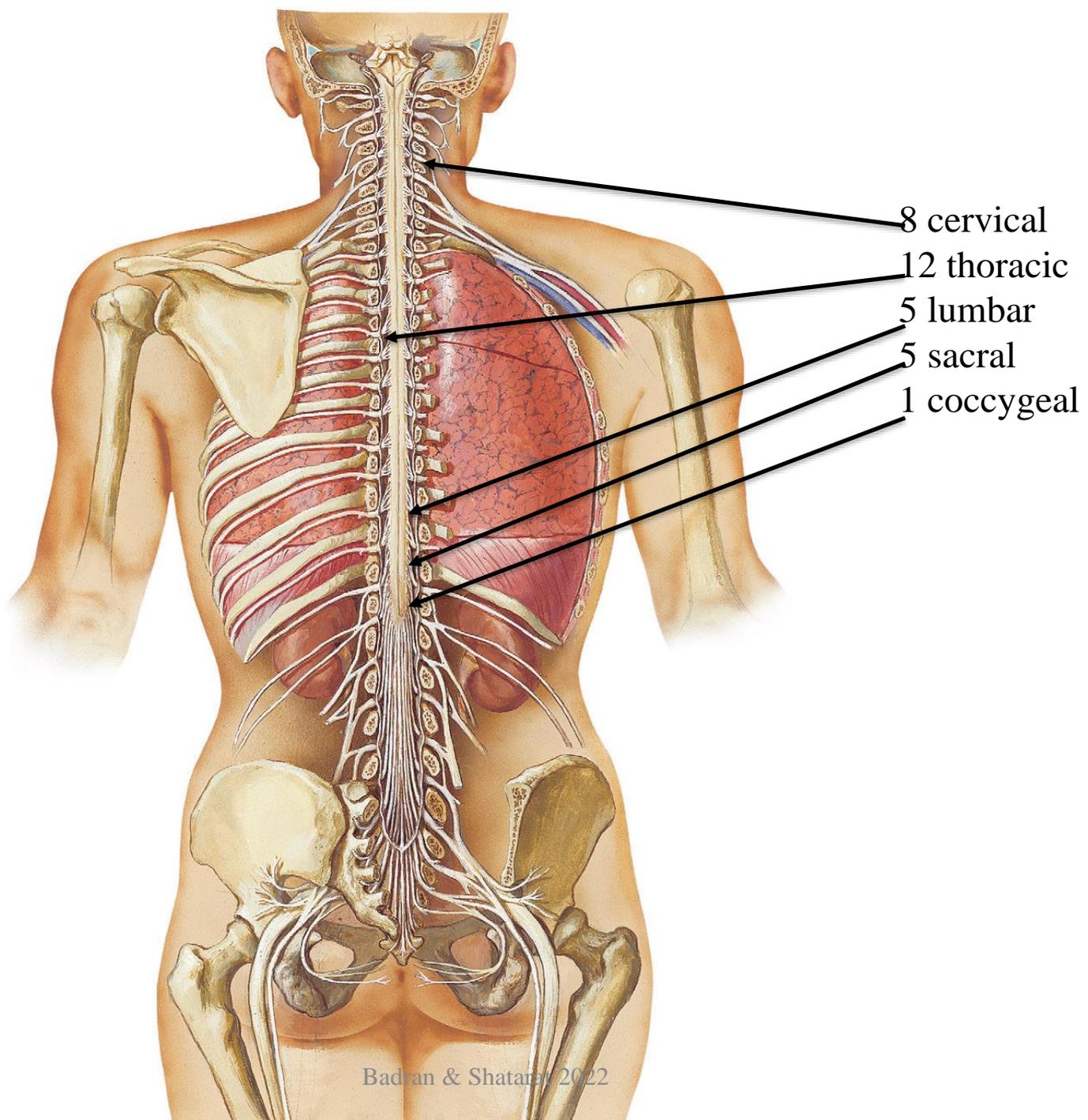


Key:  
 E = Effort  
 F = Fulcrum  
 L = Load



# C- Peripheral Nerves





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**.

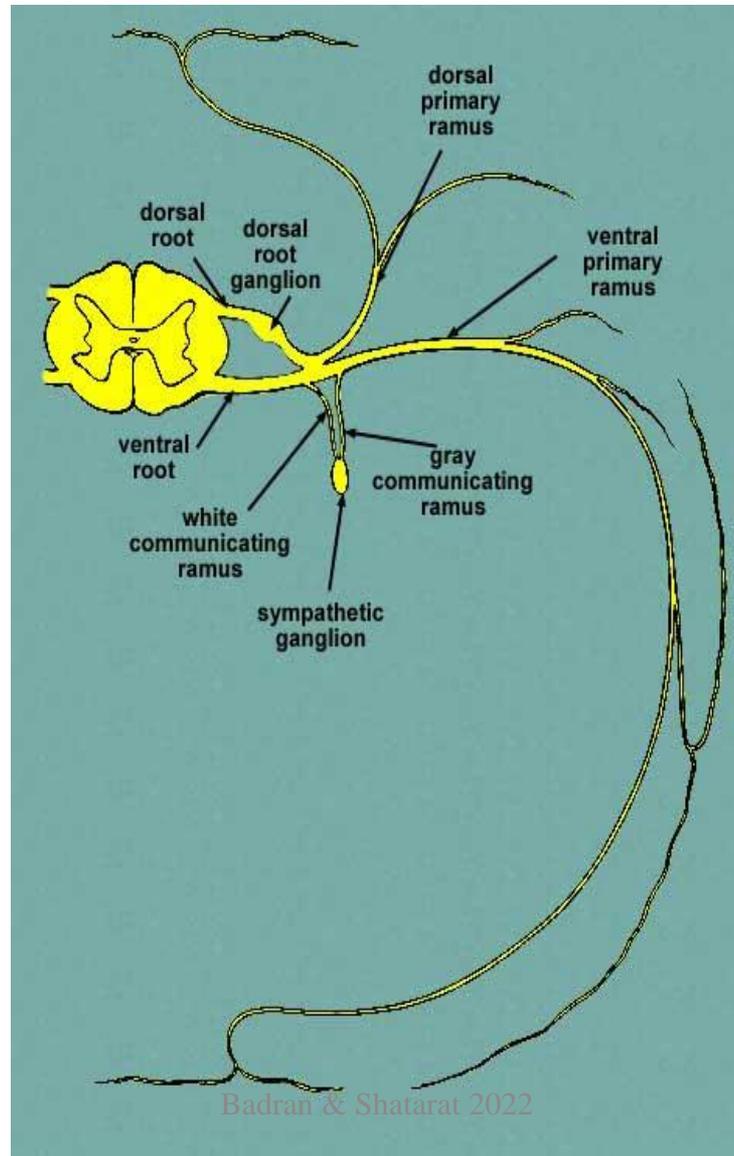
Their cells of origin lie in the anterior gray horn of the spinal cord.

### The posterior (dorsal) root

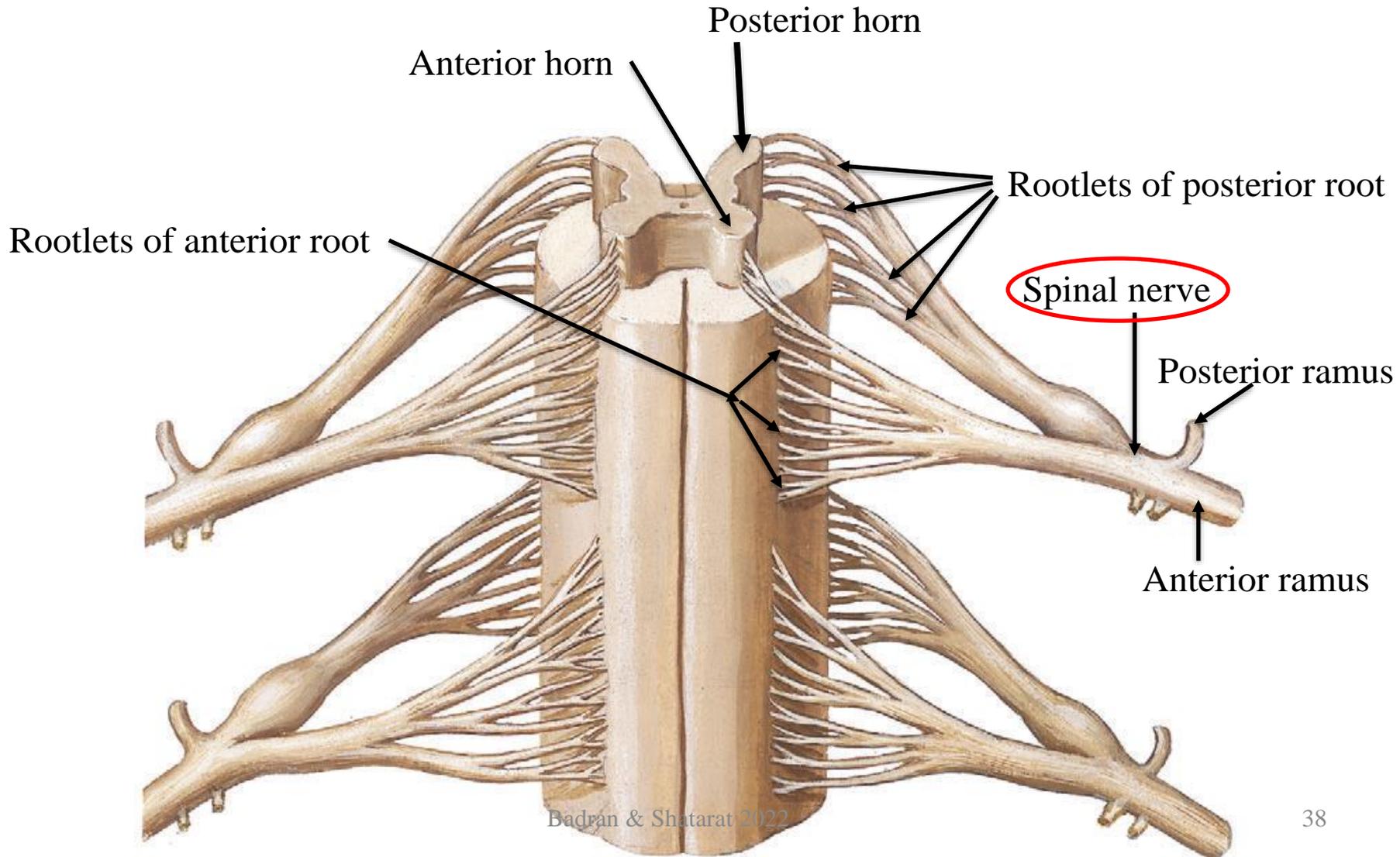
It consists of bundles of nerve fibers that carry impulses **to the central nervous system** and are called **afferent fibers**.

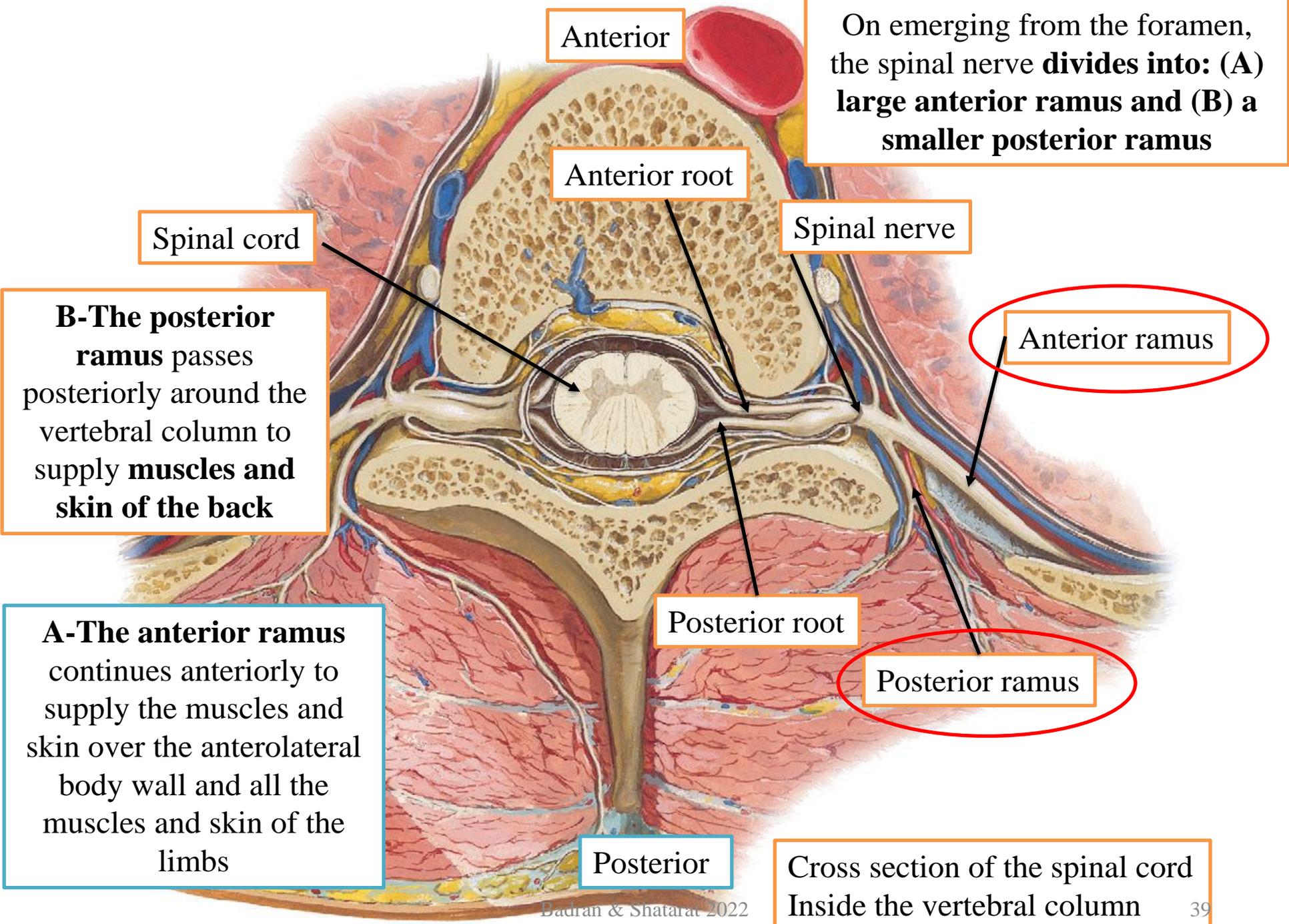
Because these fibers are concerned with conveying information about sensations of touch, pain, temperature, and vibrations, they are called **sensory fibers**.

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) 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 **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