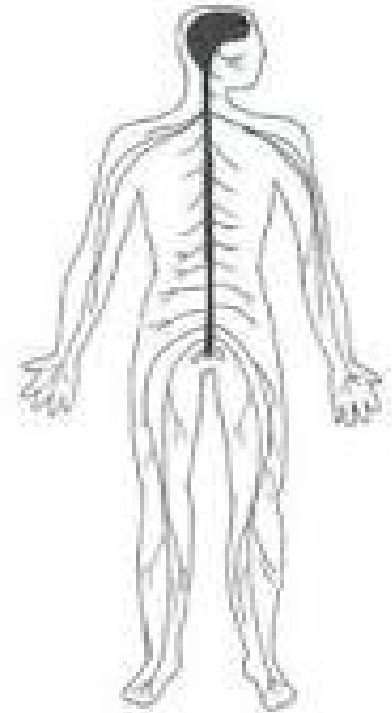


# Locomotion (Movement)

Requires the interaction of 3 human systems:

- **The Skeletal System**
- **The Muscular System**
- **The Nervous System**



# Human Skeletal & Muscle Systems

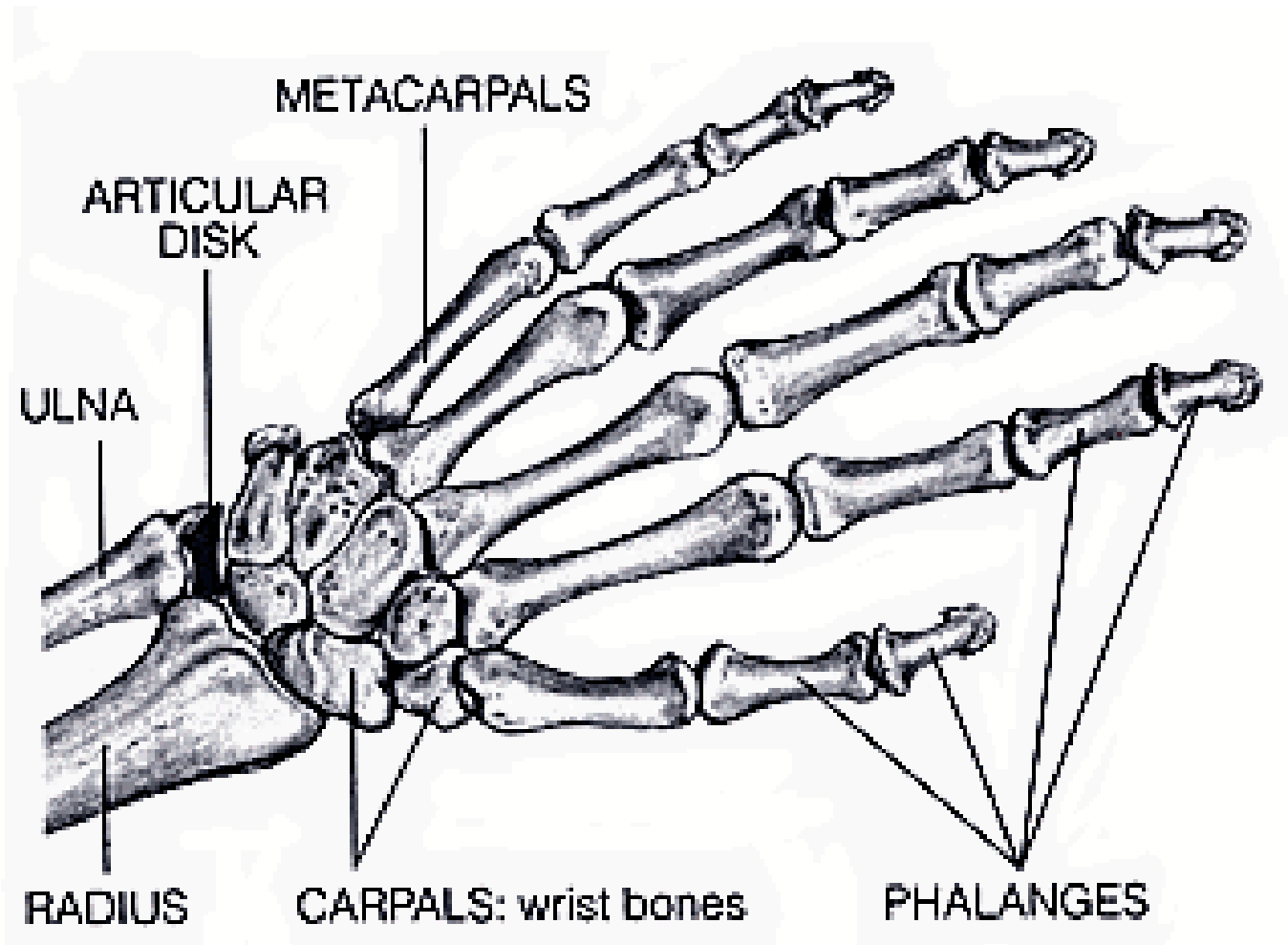
**Skeletal  
system**



**Muscular  
system**



Trace your hand onto your paper. Make observations about your hand and draw the bones as you think they are arranged.

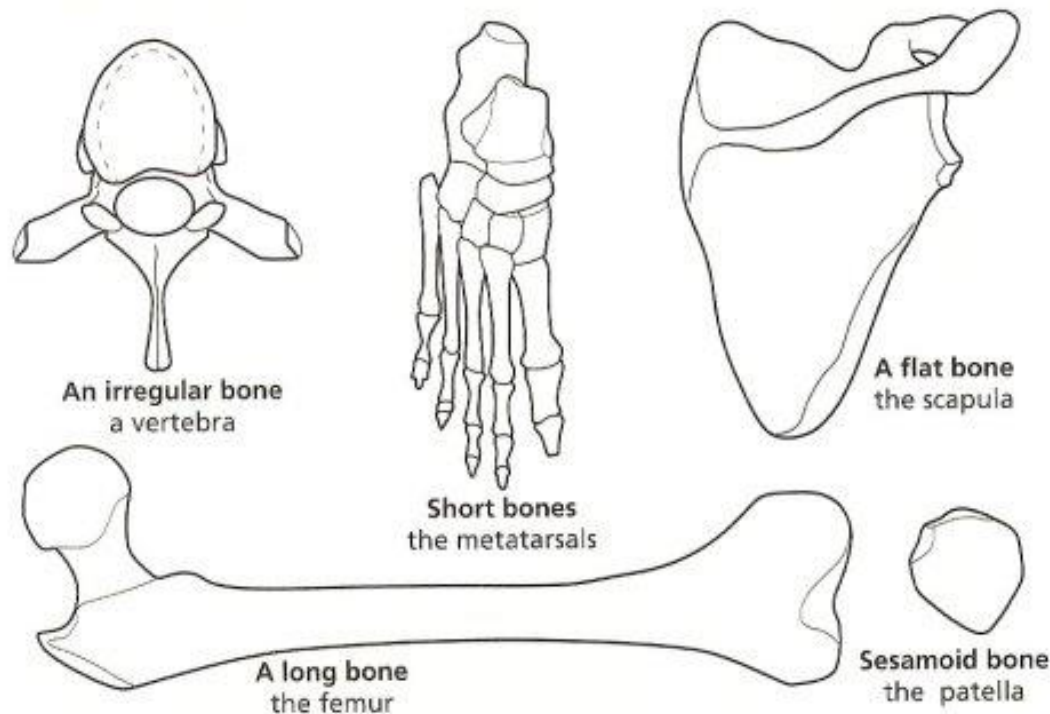


# A. The Skeletal System

## 1. Bones

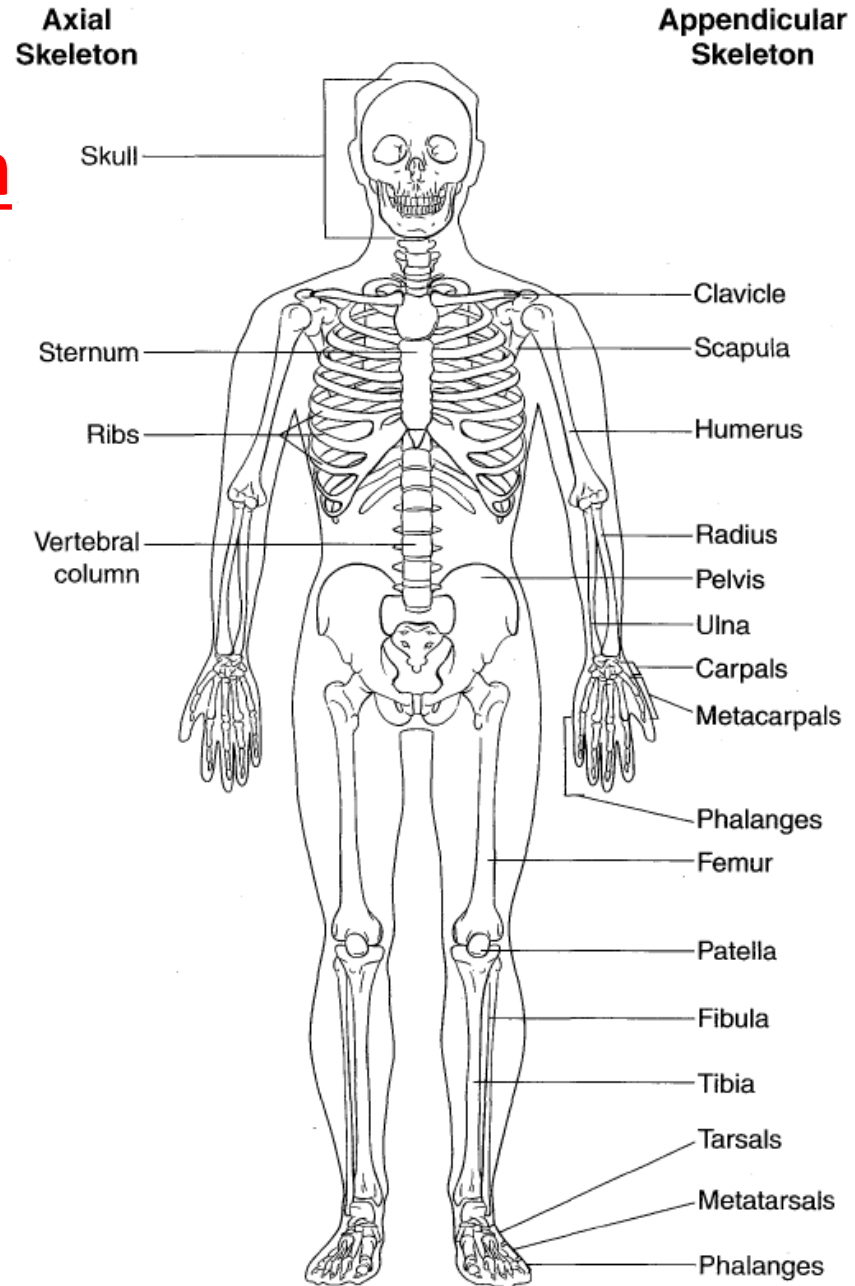
- **206** total bones (adult)
- Come in various shapes and sizes
- Point where 2 bones meet is called a **joint**

Examples of each type of bone are shown in *Figure 1.1*.



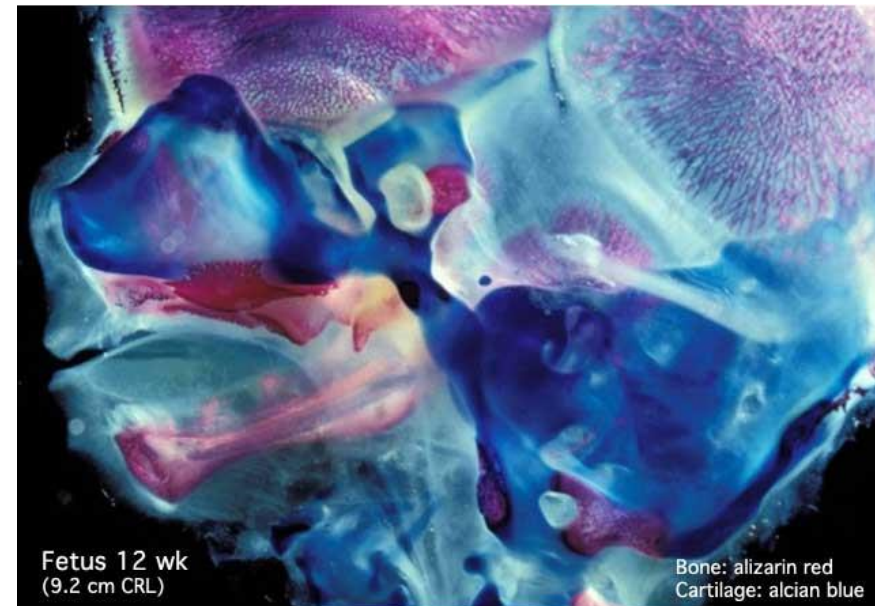
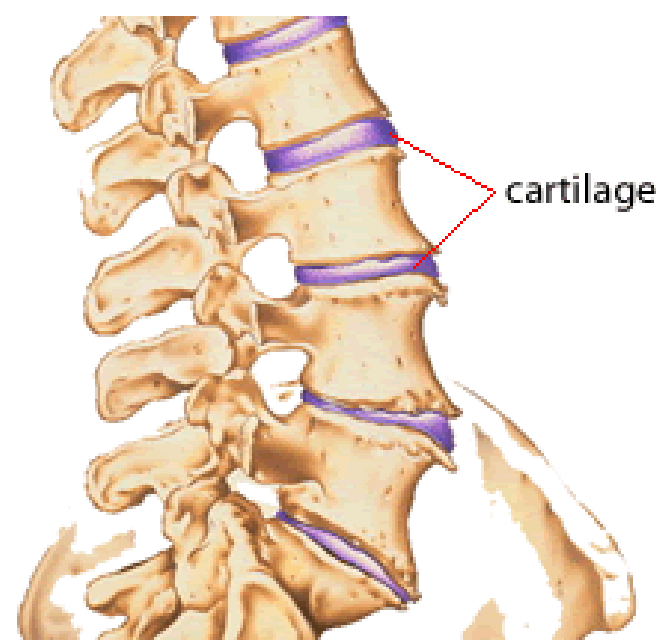
# Functions of Bones:

- Support and **protection of organs**
- Act as attachment point for muscles
- Provide leverage for movement
- Produce blood cells in **bone marrow**



## 2. Cartilage

- Flexible, fibrous & elastic tissue (soft bone)
- Functions:
  - Provide pliable support
  - Allow flexibility at joints
  - Cushions joints
  - Makes up early embryo skeleton

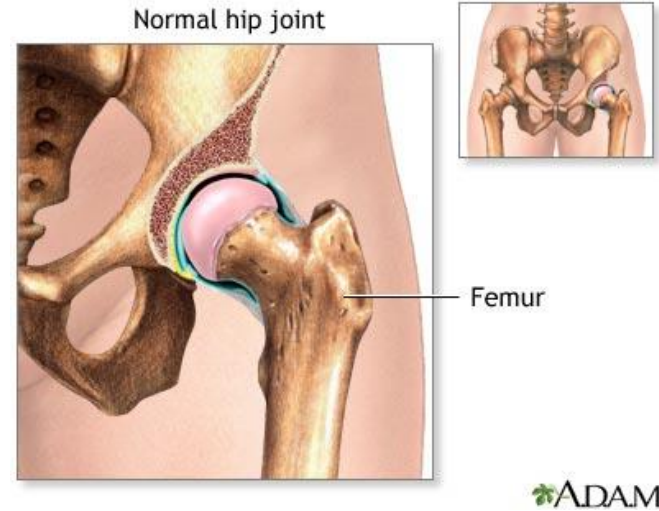


# Examples of Moveable Joints

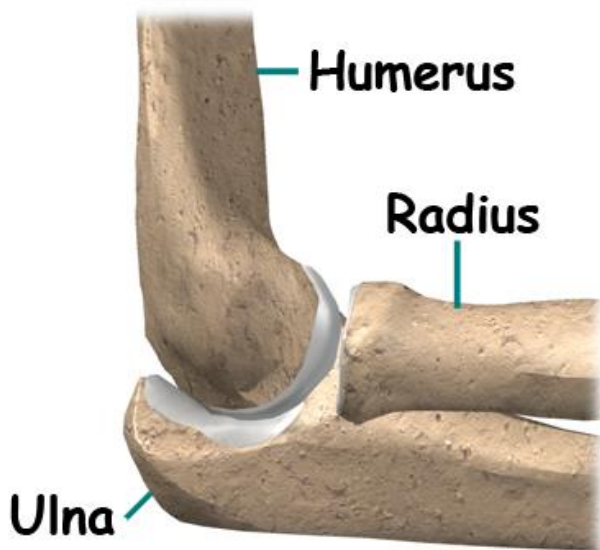
## Saddle Joint



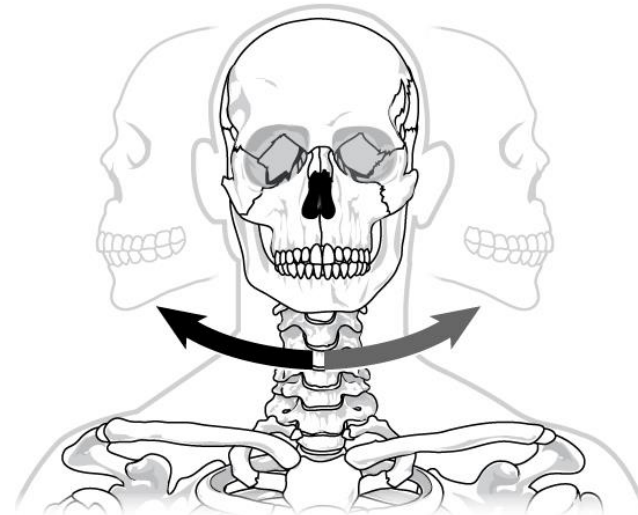
## Ball and Socket Joint



## Hinge Joint



## Pivot Joint



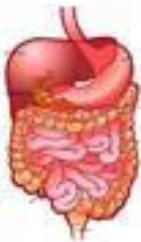
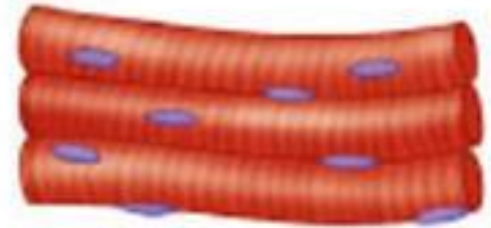
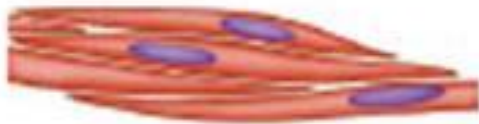
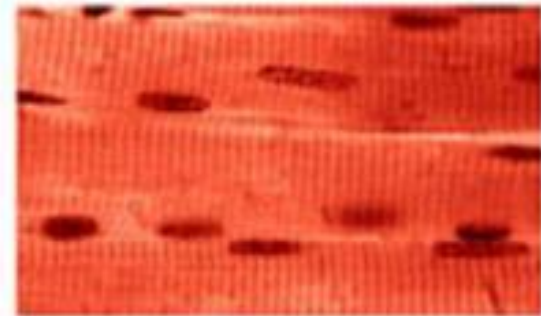
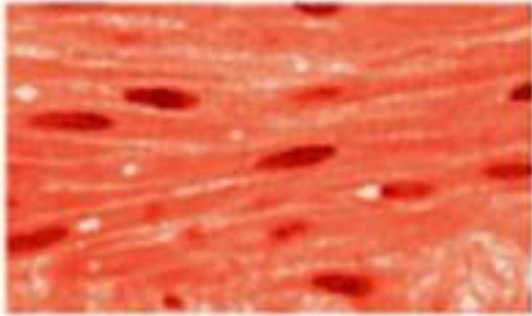
# B. Muscular System

## 1) 3 Types of Muscle Tissue

Muscle Type	Action	Appearance	Location in body
	Involuntary	Not striated (striped)	Lining of digestive system & blood vessels
	Involuntary	Striated (striped)	Heart
	Voluntary	Striated (striped)	Attached to bones



# Types of Muscle



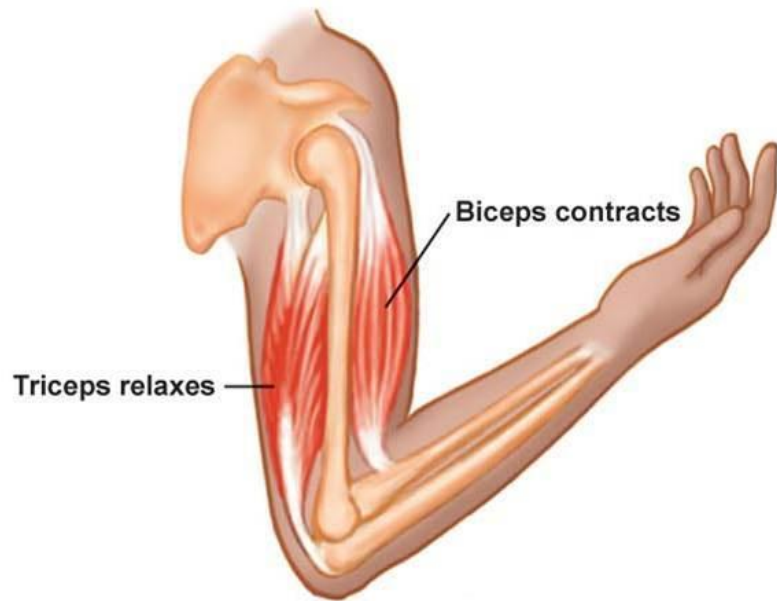
**INTERNAL ORGANS**

**HEART**

**LEG**

## 2) Extensors & Flexors

- Muscles usually work in pairs
- Extensors – muscles that extend limbs, straighten joints
- Flexors – muscles that return limbs, bend joints



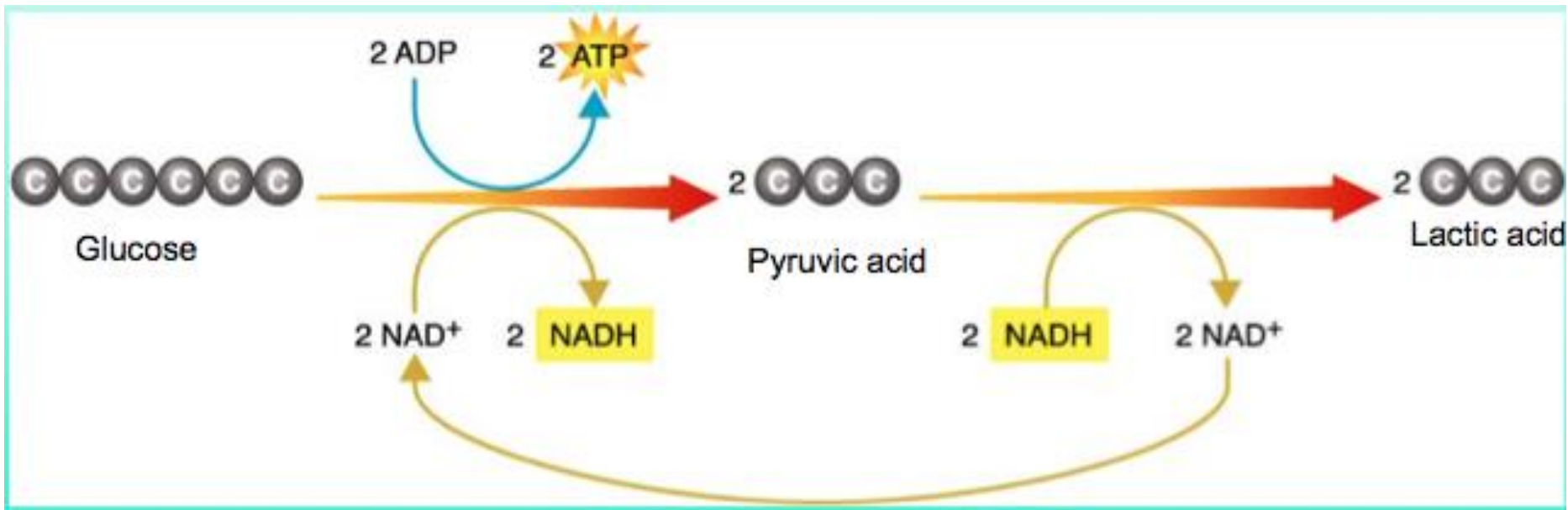
**Flexion**

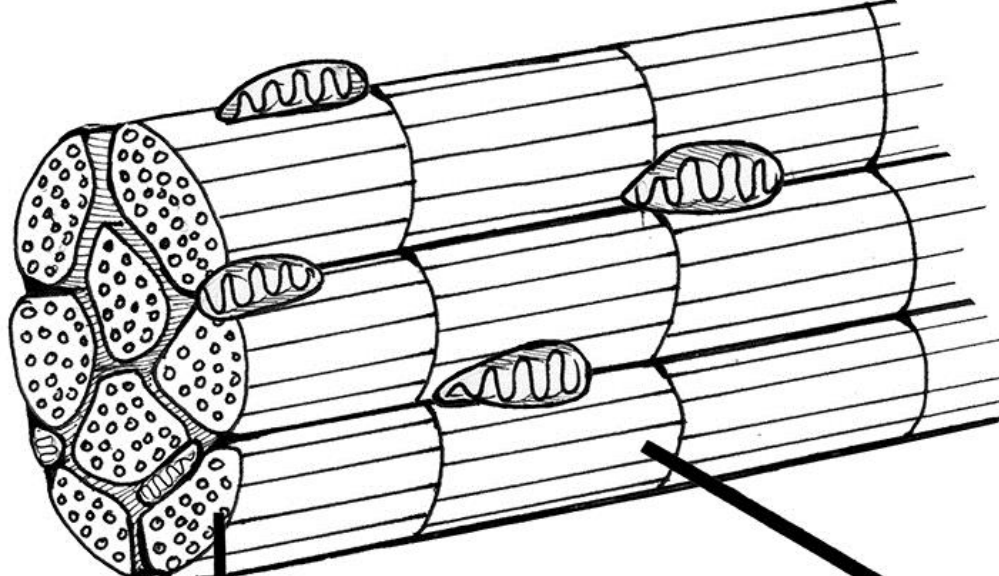


**Extension**

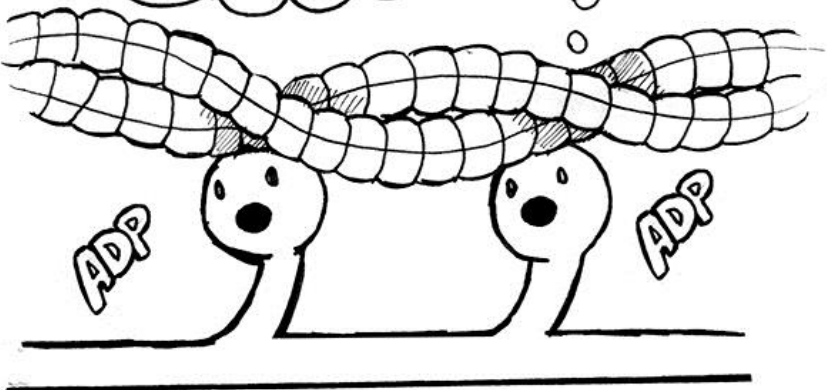
## 2) Muscle Fatigue

- Vigorous activity can lead to an oxygen deficiency
- result in anaerobic respiration & build up of lactic acid
- Lactic acid build up is a painful burning sensation felt in the muscles during this type of activity





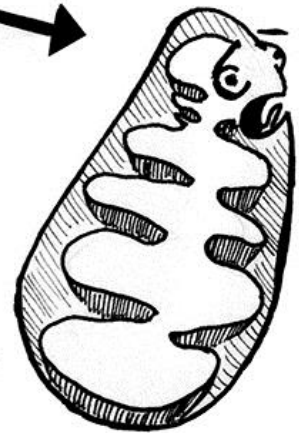
*C'MON MITOCHONDRIA!  
WE NEED MORE ATP!*



**SARCOMERE**

*NOT ENOUGH OXYGEN...  
I CAN'T...*

$O_2$



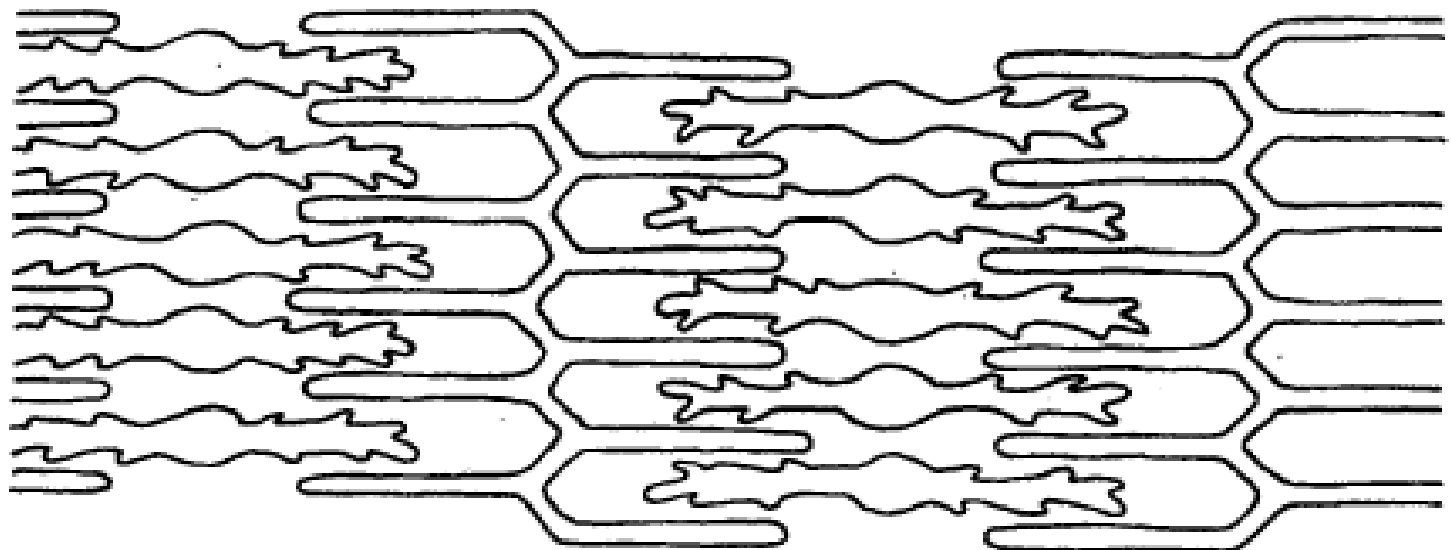
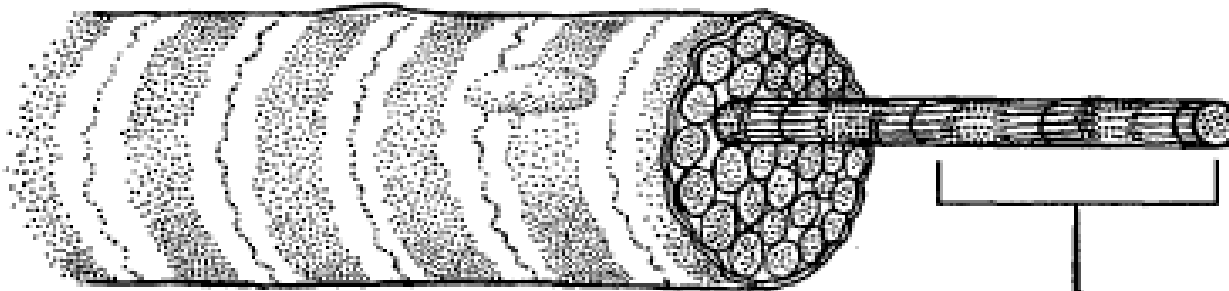
**ATP**

**MITOCHONDRIA**

# Muscle Structure

○ Myosin

○ Actin filaments



# Muscle Structure & Contraction

## Sliding Filament Theory

[Muscle Contraction Video](#)

- to provide movement muscles must contract/shorten
- organelles called myofibrils (give striated appearance)
- Contain 2 kinds of protein filaments
  - Actin (thin filament)
  - Myosin (thick filament)
- Actin proteins slide over myosin proteins
- Requires a lot of energy (ATP)

# C. Tendons and Ligaments

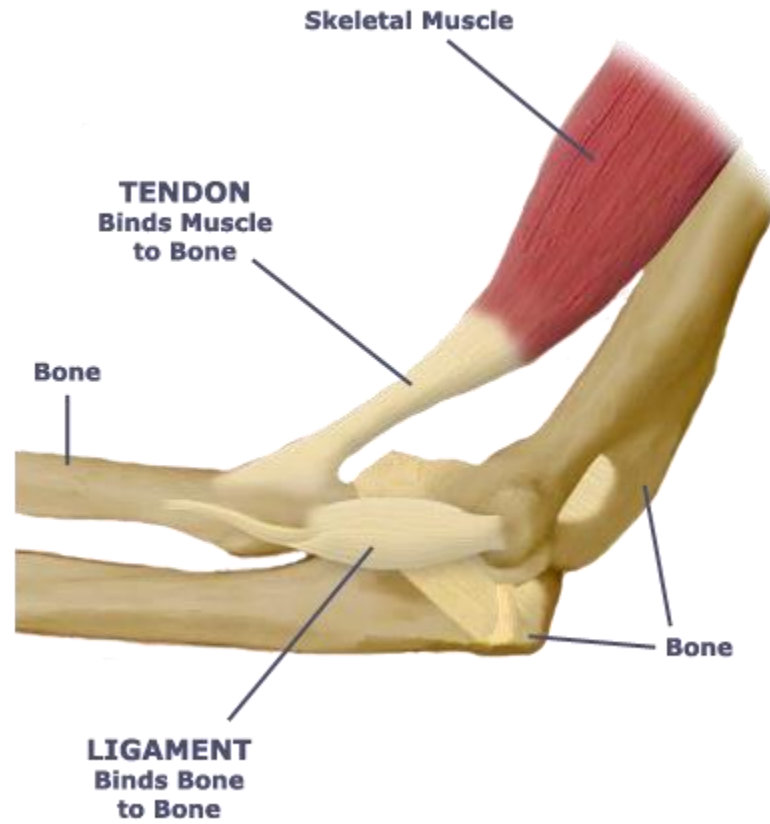
## 1) Tendons (BMT)

- a. Tough, inelastic tissue that connects **muscle to bone**



## 2) Ligaments (BBL)

- a. Tough, elastic tissue which is able to **bend** during joint movement
- b. Connect the ends of bones at moveable joints such as the elbow, fingers, knee

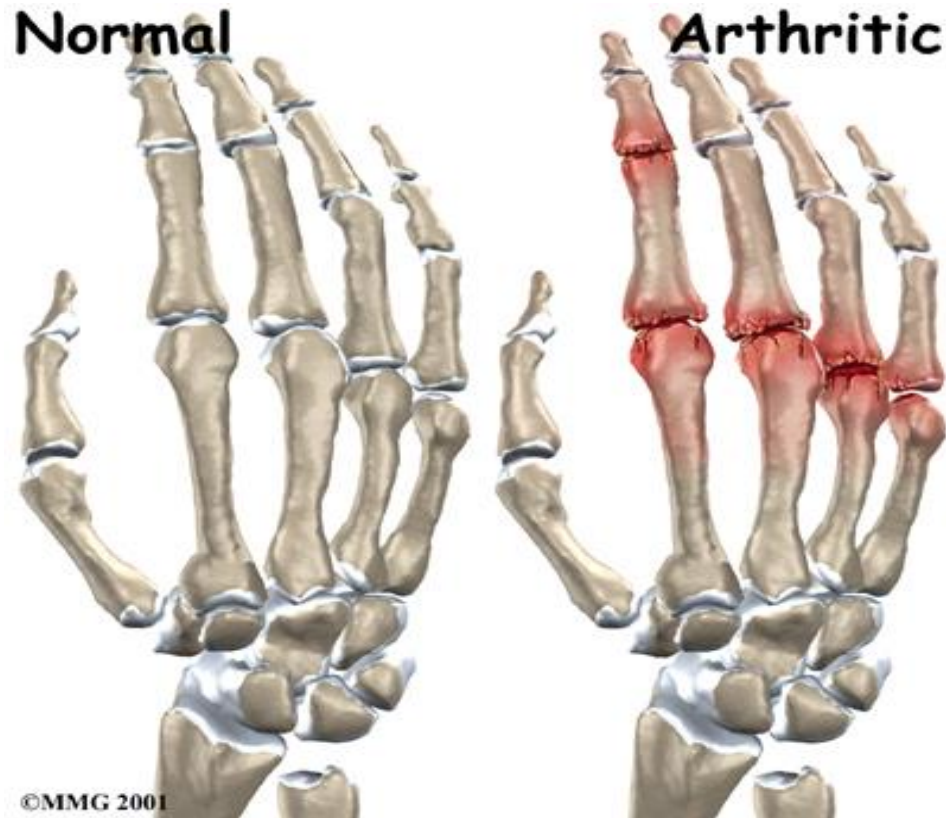




# D. Malfunctions of the Locomotive Systems

## 1) Arthritis

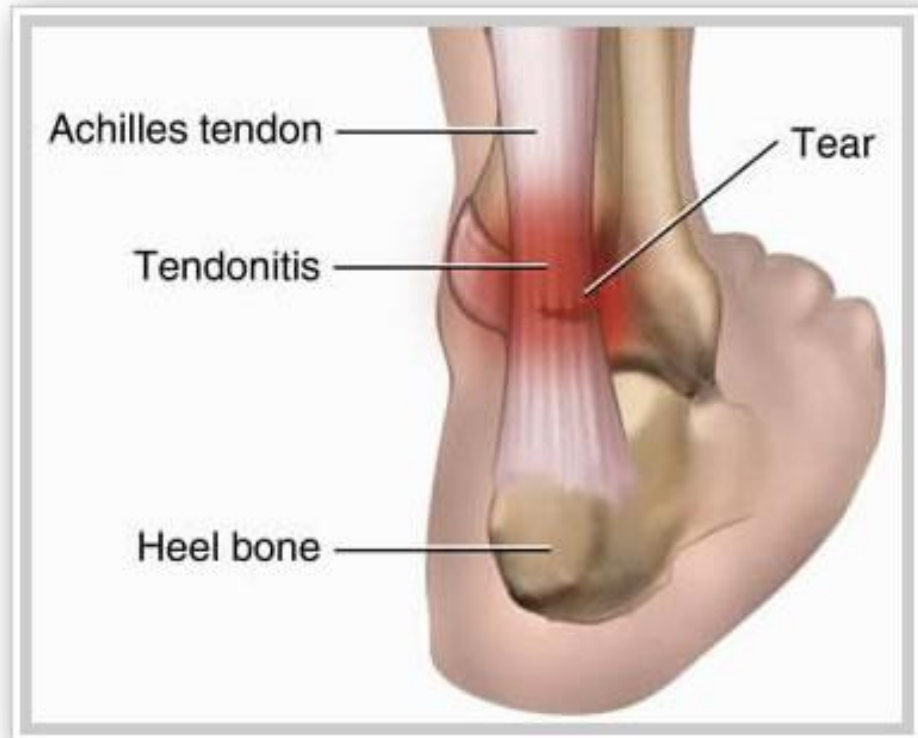
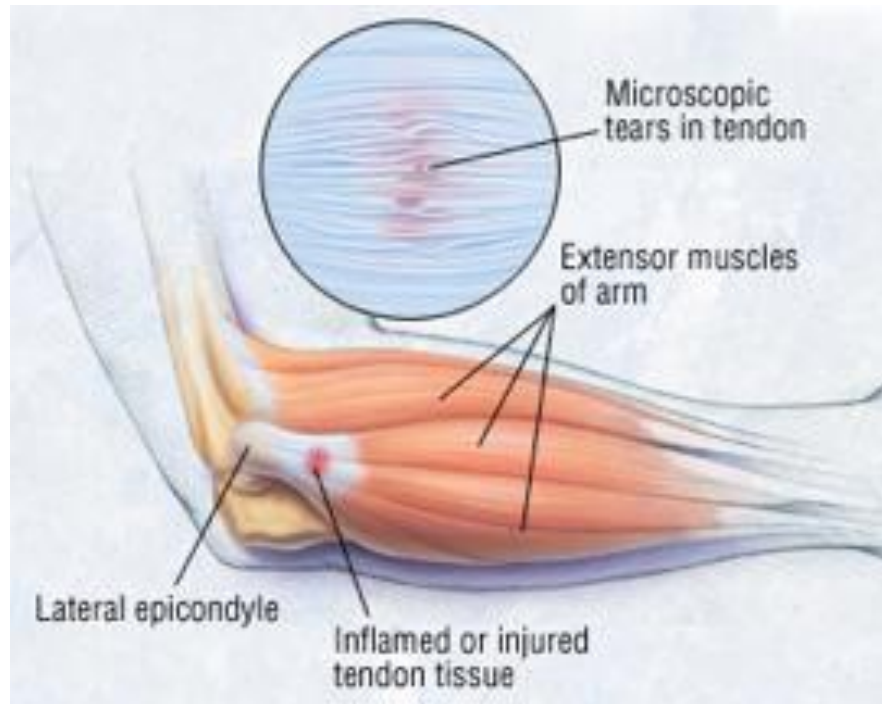
- Inflammation of **joints** causing swelling, pain
- Typically associated with elderly



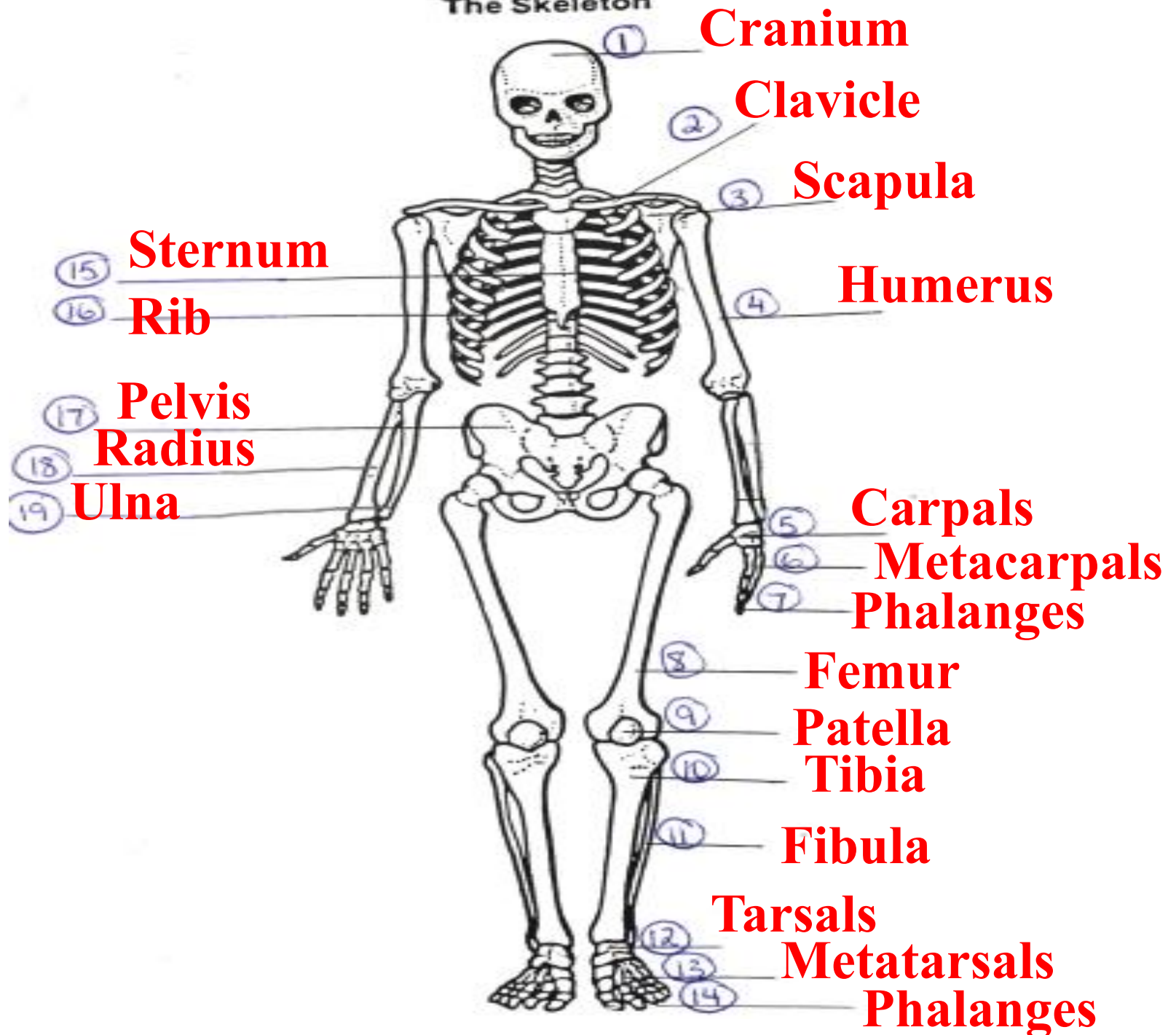
# D. Malfunctions of the Locomotive Systems

## 2) Tendonitis

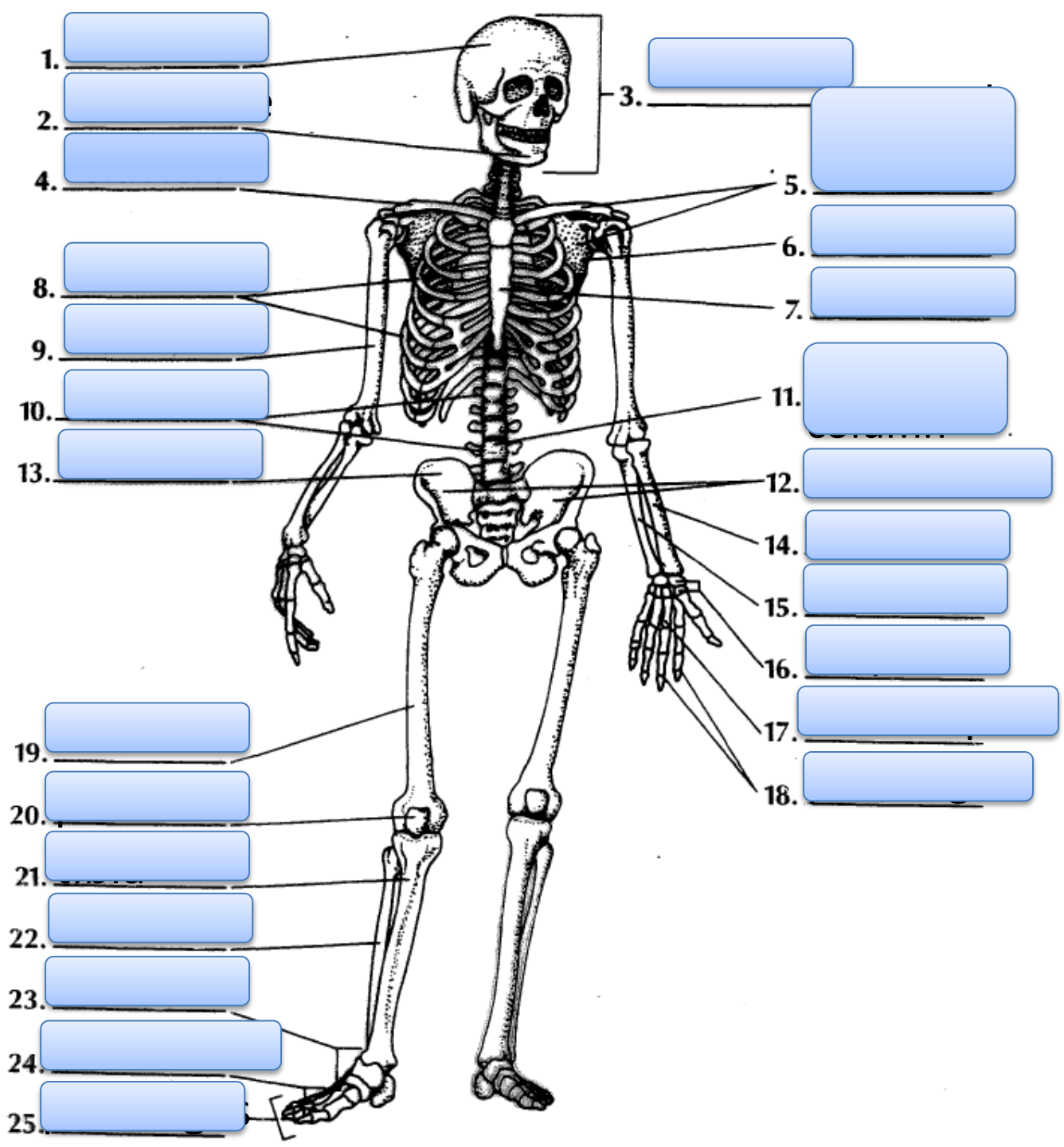
- Inflammation of **tendon** where it attaches to bone
- Caused by physical stress, common in athletes



The Skeleton



# Bones of the Human Skeleton



## The Locomotion ~ Lyrics by Mrs. Marando

Everybody's learning locomotion now,  
(come on baby, do the locomotion)  
Just one human process that we're gonna break down,  
(come on baby, do the locomotion)

Your little baby sister crawls around on her knees,  
But as adults we do it using both of our feet,  
So come on, come on  
Do the locomotion with me

You've gotta move those limbs now  
Come on baby  
Jump up and jump baaaack  
Well I think you've got the knack....ooohhhh

All our bones together total 206,  
(come on baby, do the locomotion)  
Protect internal organs if we get in a fix,  
(come on baby, do the locomotion)  
Bones provide us with our shape and give us support,  
Without them we would be a pile of mush on the floor,  
So come on, come on  
Do the locomotion with me

The locomotion...come on, come on  
The locomotion...come on, come on  
The locomotion...  
Come on, come on, come on, come on, come on, come on...

[The Locomotion \(karaoke\)](#)



Muscles in the human come  
in three different types,  
(come on baby, do the  
locomotion)  
Skeletal, cardiac and one with no stripes [smooth]  
(come on baby, do the locomotion)  
In order to contract our muscles need energy,  
Sometimes they build up lactic acid and get fatigued  
But come on, come on, do the locomotion with me

You've gotta move those limbs now  
Come on baby  
Jump up and jump baaaack  
Well I think you've got the knack....ooohhhh

Bone connects to muscle by a tendon now,  
(come on baby, do the locomotion)  
Its inelastic tissue connects them now,  
(come on baby, do the locomotion)  
Bones connect to other bones by ligaments,  
Their joints are very elastic and that makes sense

So come on, come on  
Do the locomotion....  
Come on, come on  
Do the locomotion....  
Come on, come on  
Do the locomotion with me!