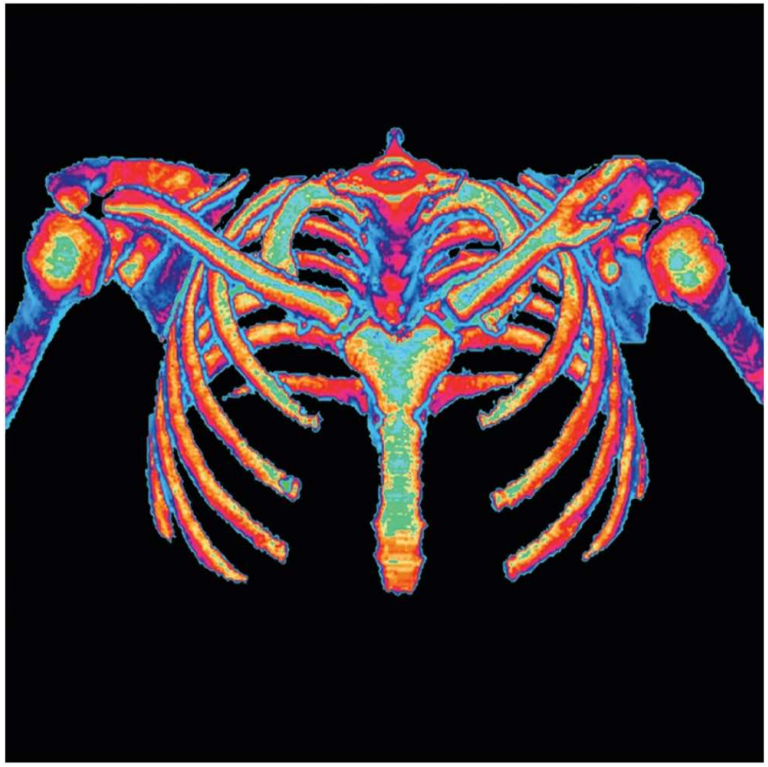
C8 – C9 – C10
Only The Essential Info

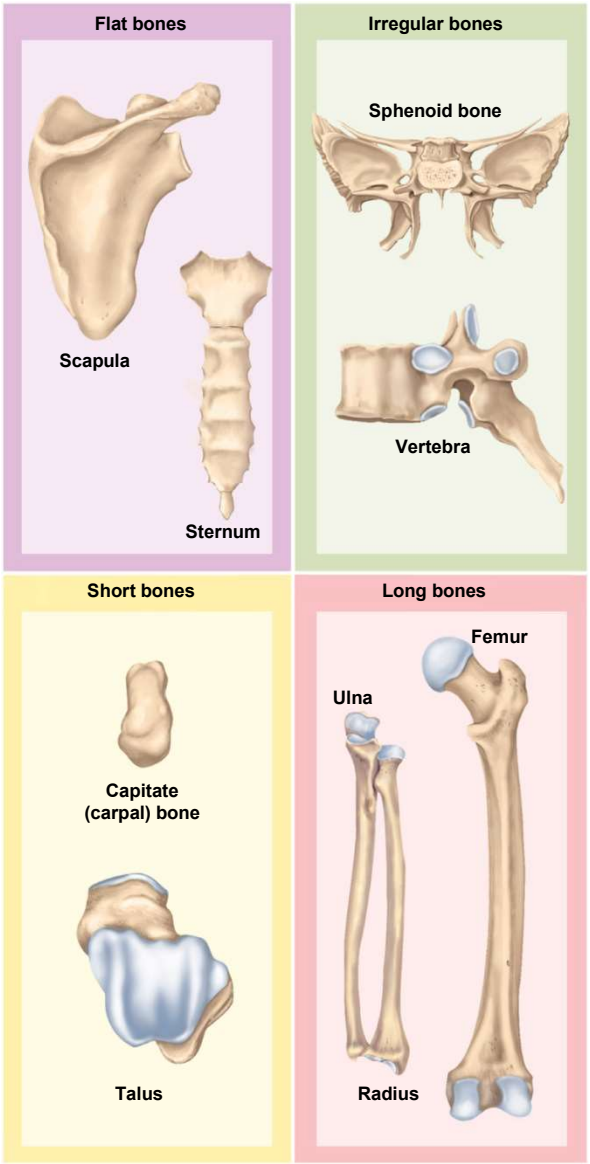
(See Summary Study Guide for this Presentation)



C8

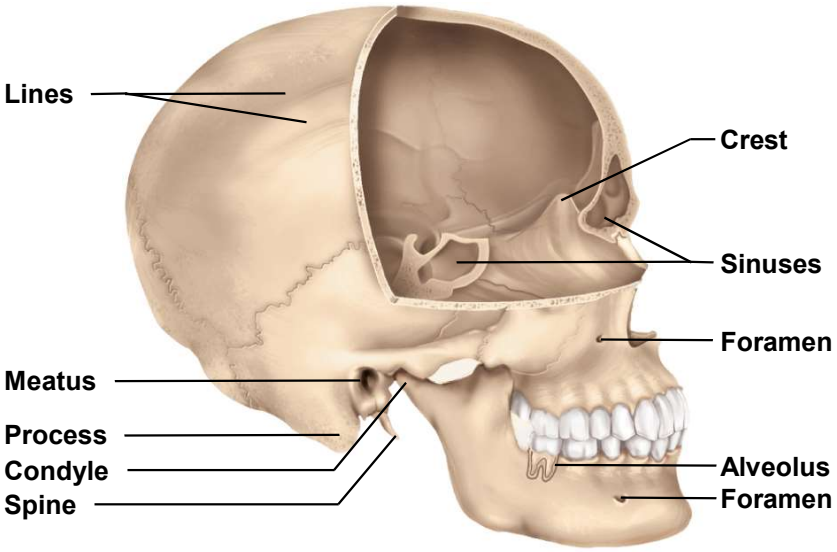
An Introduction to the Skeleton System

Shapes of Bones

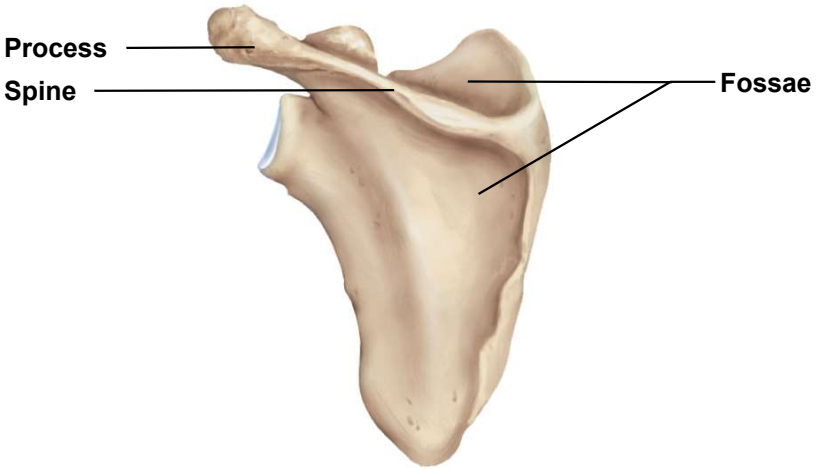


- **long bones**
  - longer than wide
  - rigid levers acted upon by muscles
- **short bones**
  - equal in length and width
  - glide across one another in multiple directions
- **flat bones**
  - protect soft organs
  - curved but wide & thin
- **irregular bones**
  - elaborate shapes that don't fit into the other categories

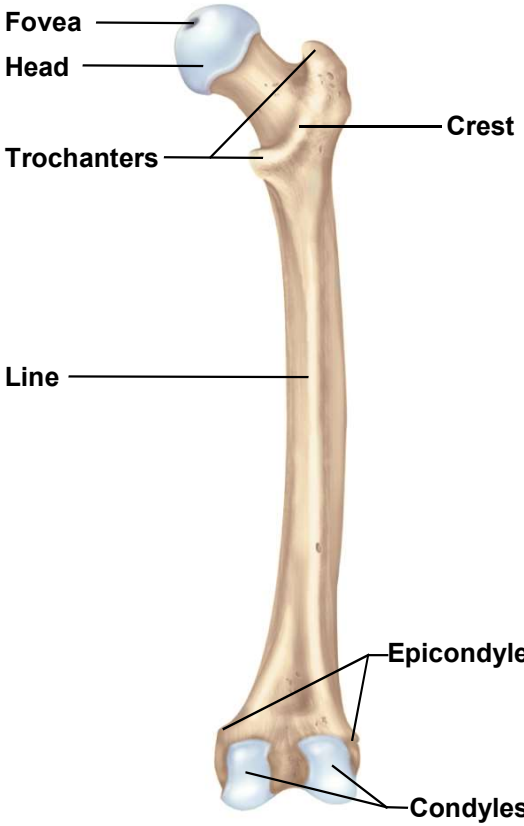
Anatomical Features of Bones



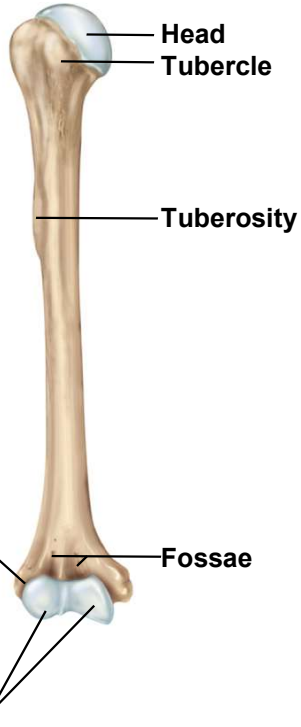
(a) Skull (lateral view)



(b) Scapula (posterior view)

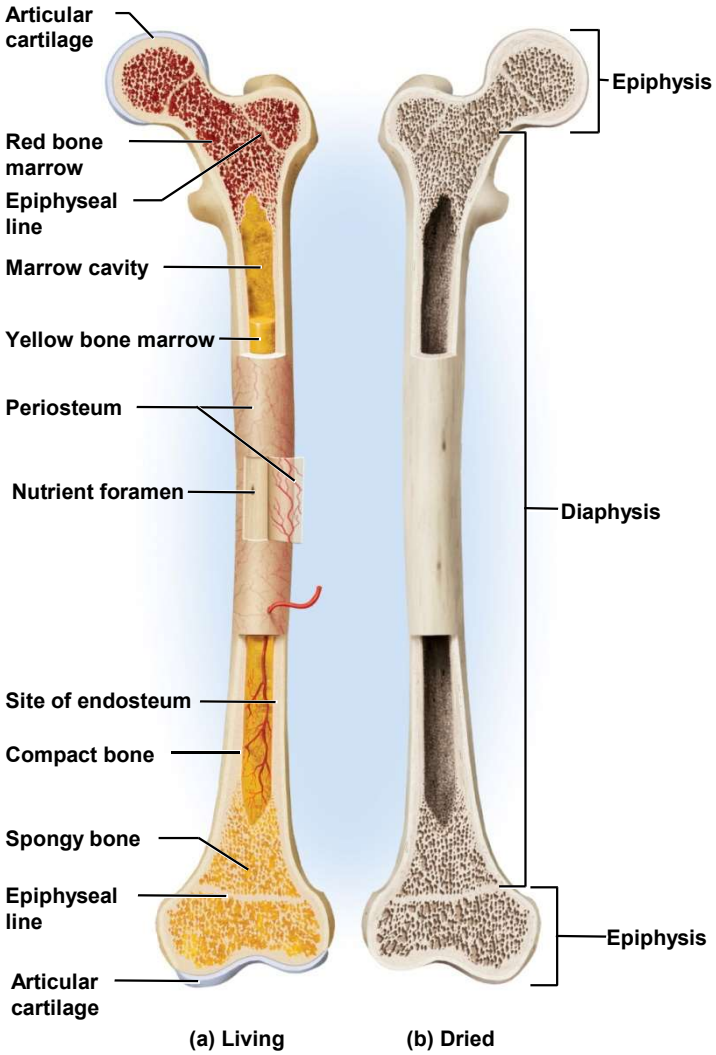


(c) Femur (posterior view)



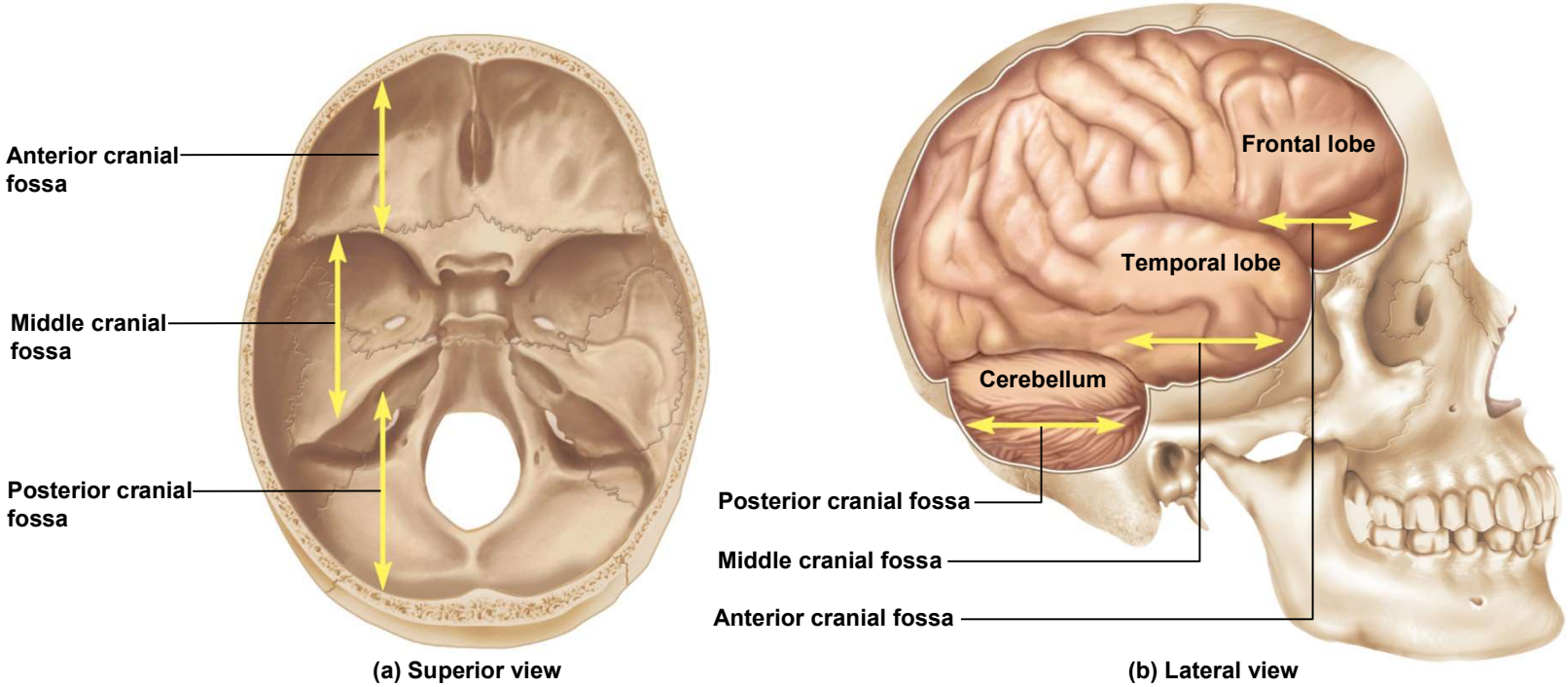
(d) Humerus (anterior view)

Structure of a Long Bone



- epiphyses and diaphysis
- compact and spongy bone
- marrow cavity
- articular cartilage
- periosteum
- endosteum

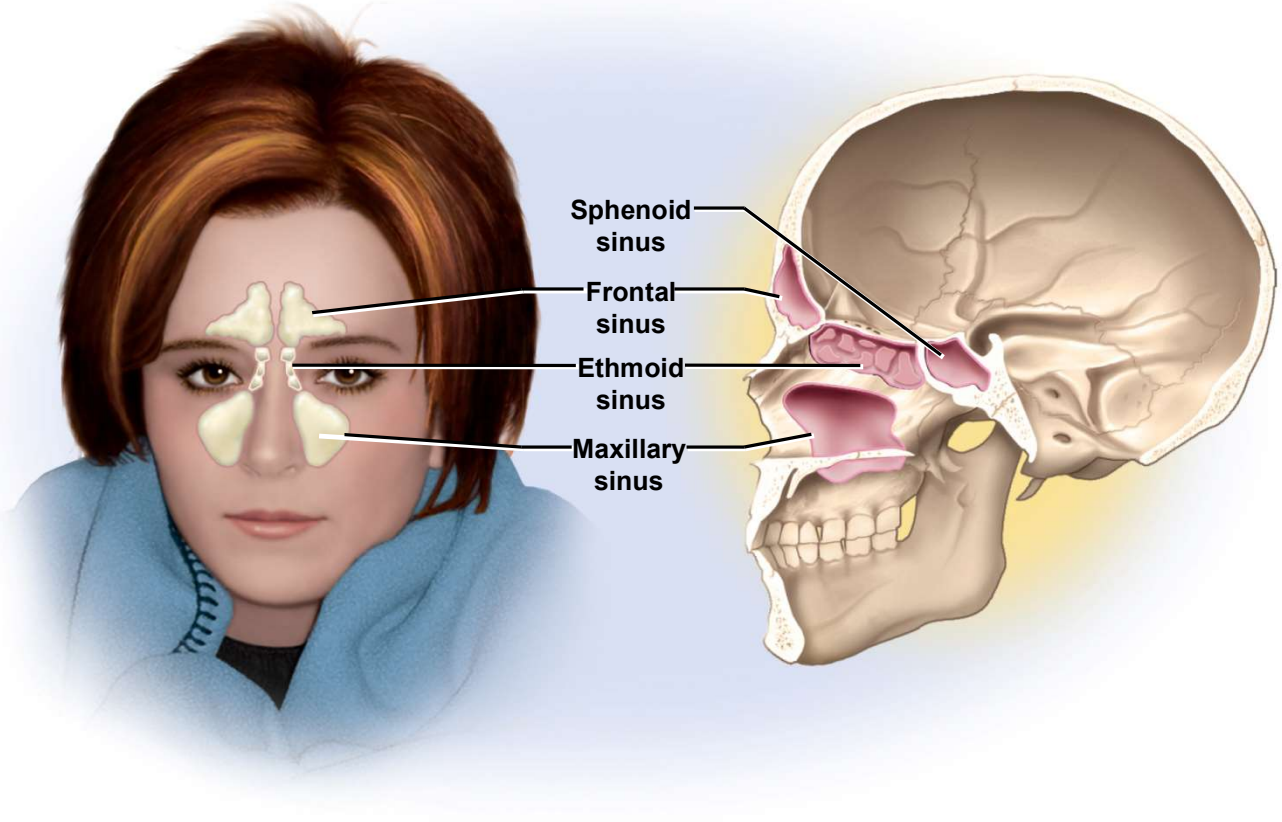
Cranial Base & Fossa



base is divided into three basins that comprise the cranial floor

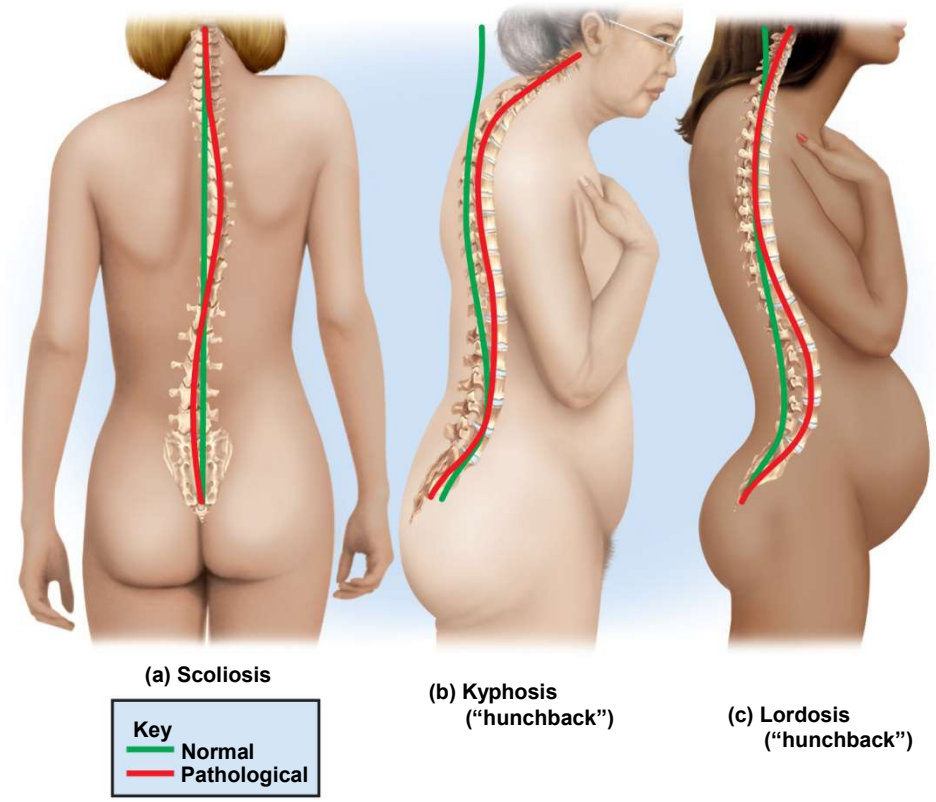
- anterior cranial fossa holds the frontal lobe of the brain
- middle cranial fossa holds the temporal lobes of the brain
- posterior cranial fossa contains the cerebellum

Location of Maxillary Sinus



- **maxillary sinus** fills maxillae bone
  - larger in volume than frontal, sphenoid and ethmoid sinuses

Abnormal Spinal Curvatures



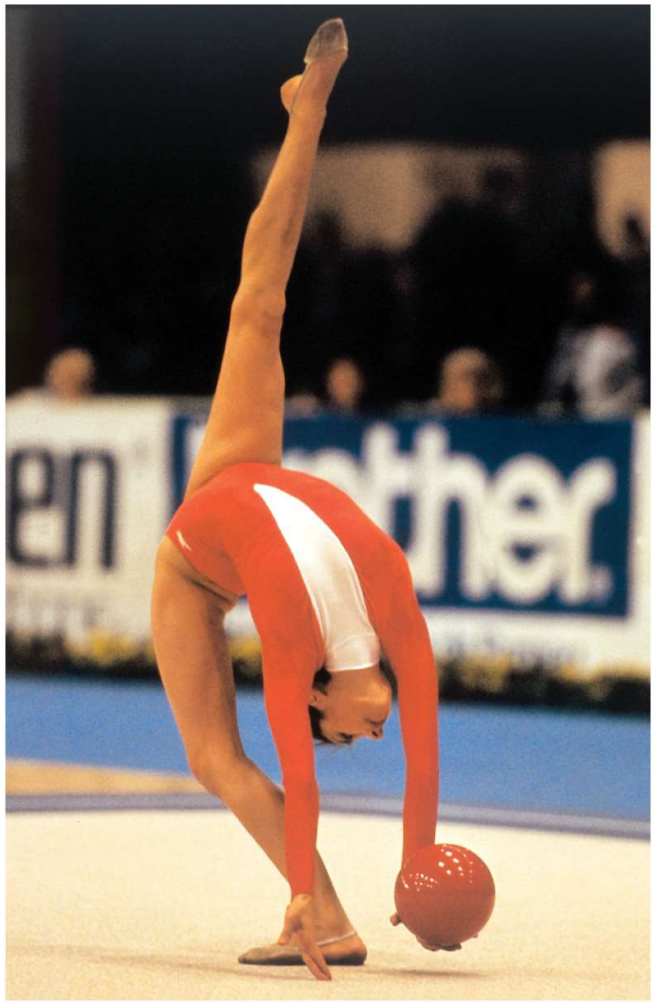
- from disease, paralysis of trunk muscles, poor posture, pregnancy, or congenital defect
- **scoliosis** – abnormal lateral curvature
  - most common
  - usually in thoracic region
  - particularly of adolescent girls
  - developmental abnormality in which the body and arch fail to develop on one side of the vertebrae
- **kyphosis** (hunchback) – exaggerated thoracic curvature
  - usually from osteoporosis, also osteomalacia or spinal tuberculosis, or wrestling or weightlifting in young boys
- **lordosis** (swayback) – exaggerated lumbar curvature
  - is from pregnancy or obesity

C9

An Introduction to Articulations

Joints = Articulations

- **Joints = point where two bones meet**
- **It is called a joint *<u>whether or not</u>* the bones are movable**
- **Functions of a joint**
  - **Give skeleton mobility**
  - **Hold skeleton together**



- **Two classification used to describe articulations – based on**
  - **Function = degree of movement**
  - **Structure = type of material between bones or if there is a capsule around the joint**

Functional Classification of Joints

- **Amount of movement = functional classification**

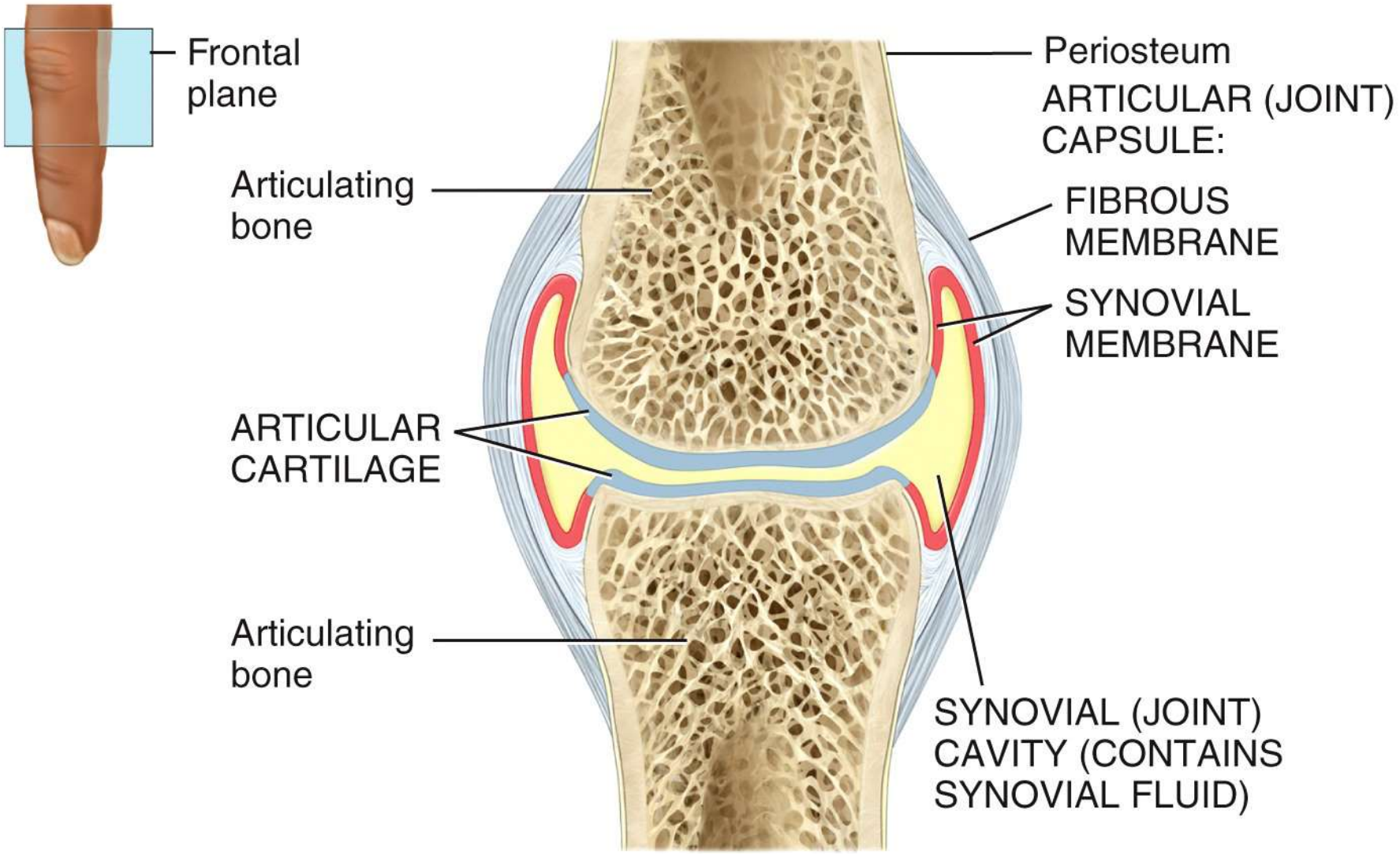
- **Three functional classifications: (know this!)**
  - **Synarthroses—immovable joints**
  - **Amphiarthroses—slightly movable joints**
  - **Diarthroses—freely movable joints**

Structural Classification of Joints

- **Based on material binding bones together "and/or" the presence or absence of a joint cavity**

- **Three structural classifications (know this!)**
  - **Fibrous joints**
  - **Cartilaginous joints**
  - **Synovial joints *(cover this in detail)***

Synovial Joint



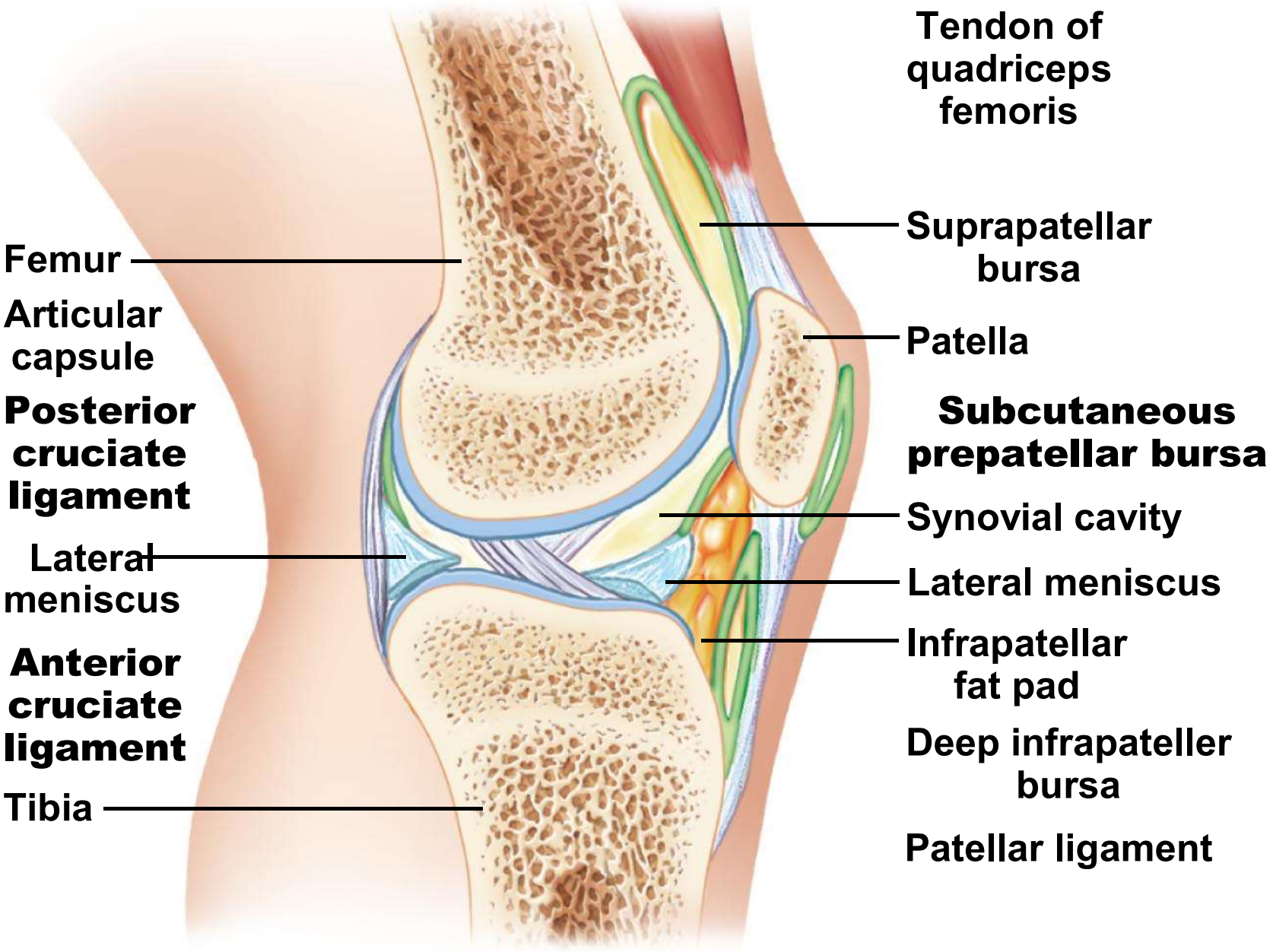
a) Frontal section

Other Features of Some Synovial Joints

- **Fatty pads // For cushioning between fibrous layer and synovial membrane or bone**

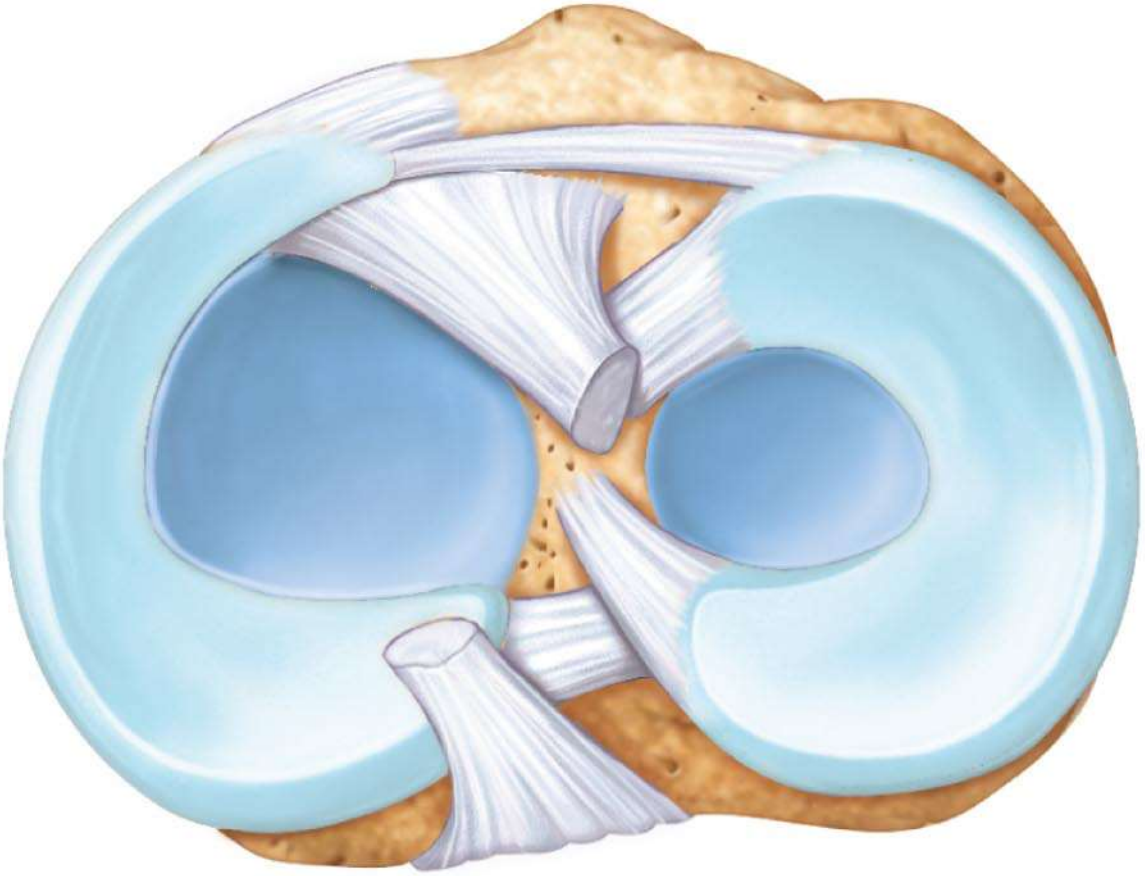
- **Articular discs (menisci) // Fibrocartilage separates articular surfaces**

  - **improve "fit" of bone ends**
  - **stabilize joint**
  - **reduce wear and tear**



Sagittal section through the right knee joint

Anterior



Anterior cruciate ligament

Articular cartilage on medial tibial condyle

Articular cartilage on lateral tibial condyle

Medial meniscus

Lateral meniscus

Posterior cruciate ligament

(b) Superior view of the right tibia in the knee joint, showing the menisci and cruciate ligaments

C10

Intro to the Muscle System

Characteristics of Muscle Tissue

- **responsiveness (excitability)**
  - to chemical signals, stretch and electrical changes across the plasma membrane
- **conductivity**
  - local electrical change triggers a wave of excitation that travels along the muscle fiber
- **contractility**
  - shortens when stimulated
- **extensibility**
  - capable of being stretched between contractions
- **elasticity**
  - returns to its original resting length after being stretched

The Functions of Muscles

- **Movement** // move from place to place, movement of body parts and body contents in breathing, circulation, feeding and digestion, defecation, urination, and childbirth // role in communication – speech, writing, and nonverbal communications

- **Stability** // maintain posture by preventing unwanted movements // antigravity muscles – resist the pull of gravity and prevent us from falling or slumping over // stabilize joints

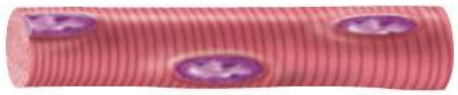
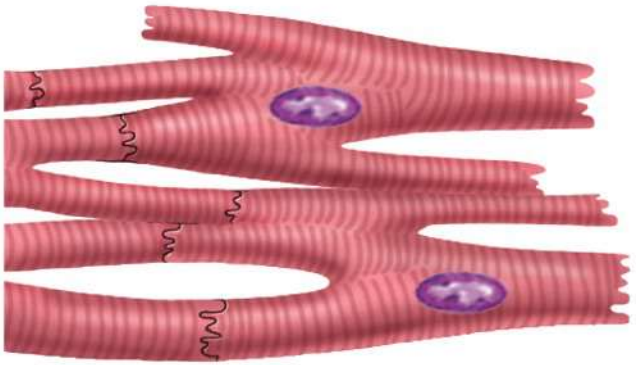
- **Control openings and passageways** // sphincter muscles = internal muscular rings that control the movement of food, bile, blood, and other materials through tubular structures

- **Heat production** by skeletal muscles // 85% of our body heat created by skeletal muscles

Organization of Muscles

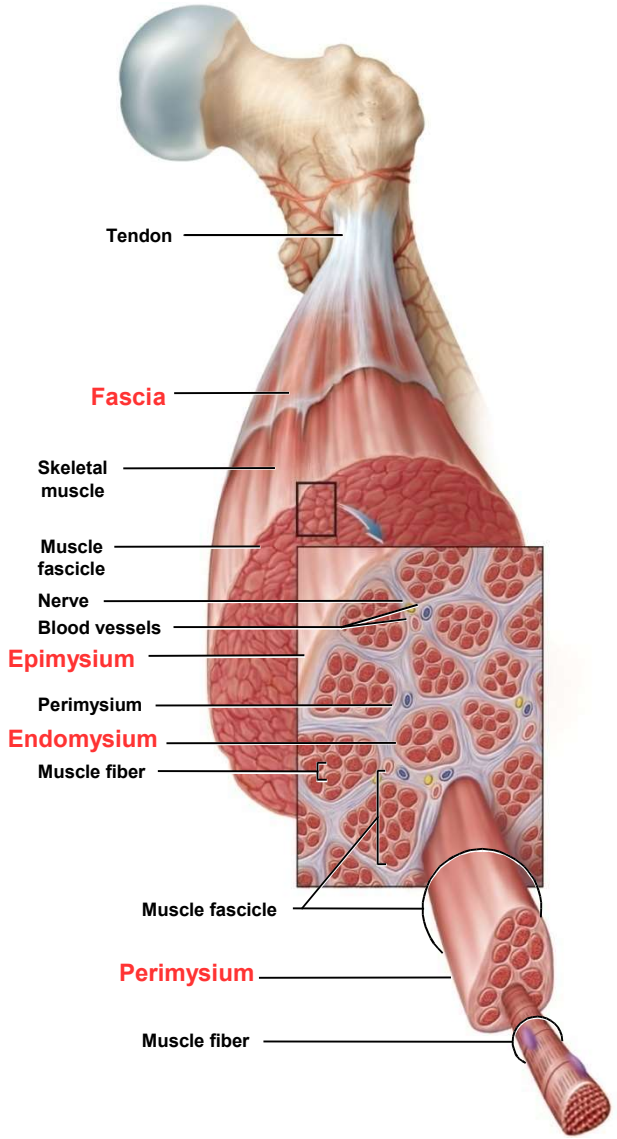
- Constitute about half of our body weight
- Three kinds of muscle tissue
  - skeletal
  - cardiac
  - smooth
- Muscle converts the chemical energy of ATP into the mechanical energy of motion

How to Identify the Three Different Types of Muscle

Skeletal muscle	Cardiac muscle	Smooth muscle
		
Striated	Striated	No striation
Voluntary	Involuntary	Involuntary
Somatic NS	Internal pacemaker and modified by ANS	ANS

Note: This lecture will primarily cover “skeletal muscle”.

Connective Tissues of a Skeletal Muscle



Four Connective Tissues of a Skeletal Muscle

- **1) Endomysium**
  - thin sleeve of loose connective tissue surrounding each **muscle fiber**
  - allows room for capillaries and nerve fibers to reach each muscle fiber
- **2) Perimysium**
  - slightly thicker layer of connective tissue
  - **fascicles** – bundles of muscle fibers wrapped in perimysium
  - carry larger nerves and blood vessels, and stretch receptors

Four Connective Tissues of a Skeletal Muscle

- **3) Epimysium**
  - fibrous sheath surrounding the entire muscle
  - outer surface grades into the fascia
  - inner surface sends projections between fascicles to form perimysium
- **4) Fascia =** sheet of connective tissue that may separate and/or connect neighboring muscles from each other /// also between all other organ systems throughout body

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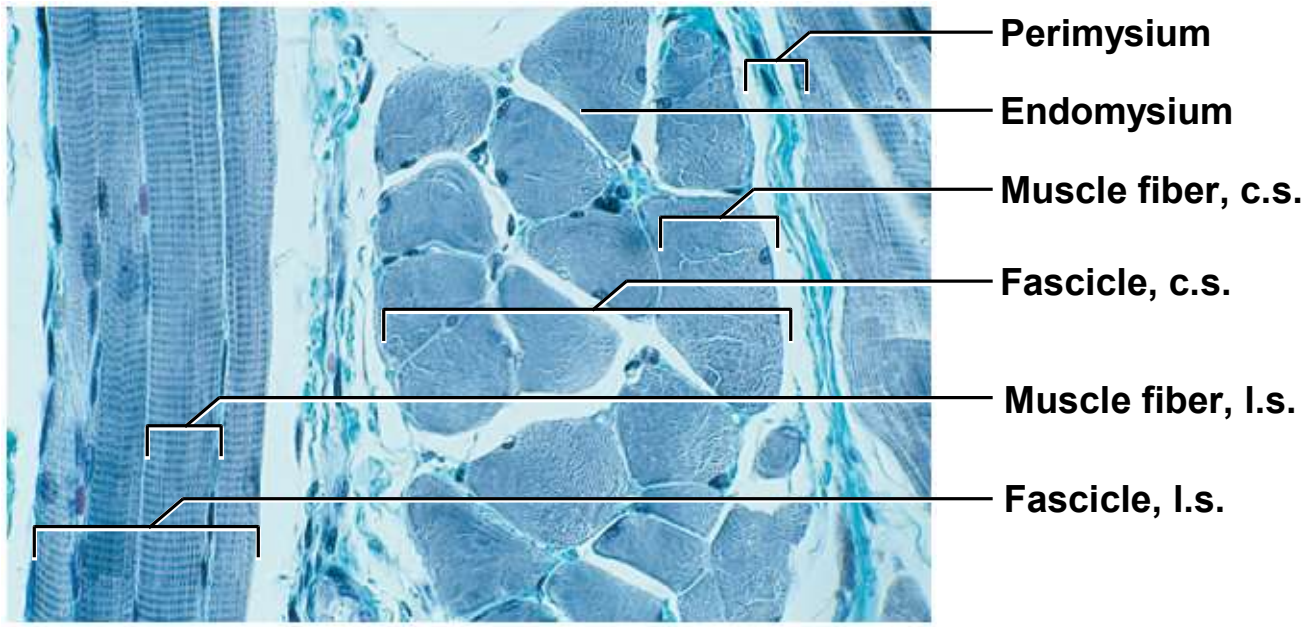
- **Compartment Syndrome** /// CNN science reporter, Miles Obrien had his arm amputated 12 hours after a heavy case “bruised his arm”.
- Why? What happened?

Connective Tissue in a Muscle



(c)

Victor Eroschenko

Muscle Indirect Attachments to Bone

- tendons bridge the gap between muscle fiber's ends and bony attachment

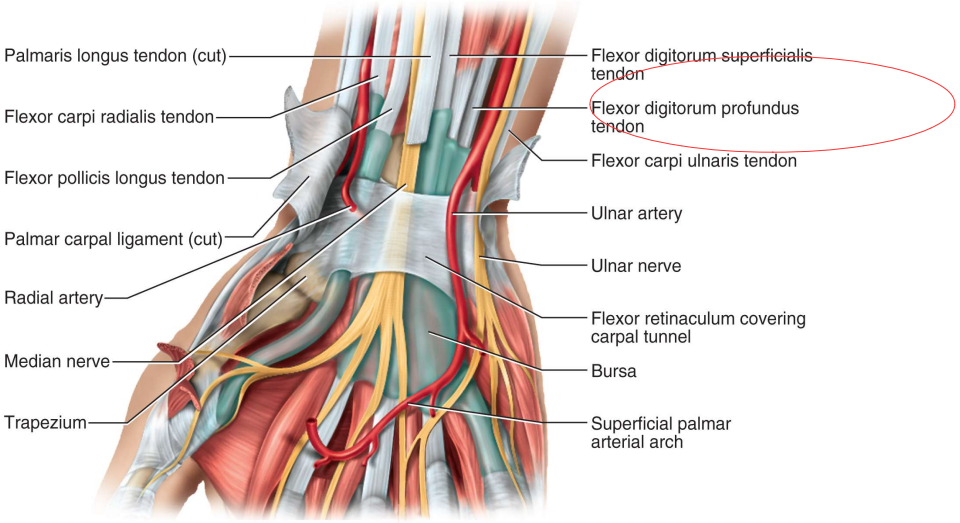
- the collagen fibers of the endomysium, perimysium, and epimysium continue to become the tendon /// these fibers weave themselves into the periosteum and penetrate beyond periosteum into the matrix of bone (weaving into the collagen fibers of the bone matrix

- very strong structural continuity from muscle into bone /// e.g. *biceps brachii, Achilles tendon*

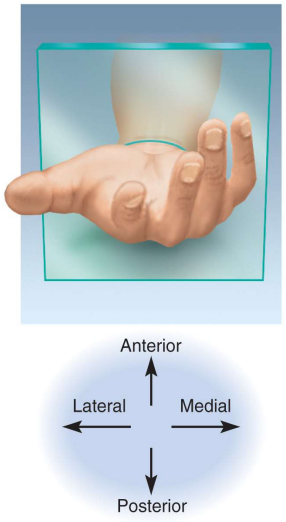
- aponeurosis – tendon is a broad, flat sheet *(palmar aponeurosis)*

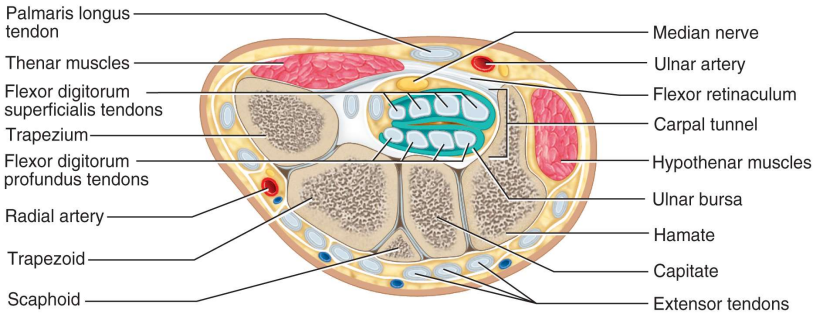
- retinaculum – connective tissue band which tendons from separate muscles pass through

What is a retinaculum? Clinical significance? – connective tissue band /// tendons from separate muscles may pass through the retinaculum /// inflammation swells tissue but retinaculum unable to expand which results in pain (carpal tunnel syndrome)



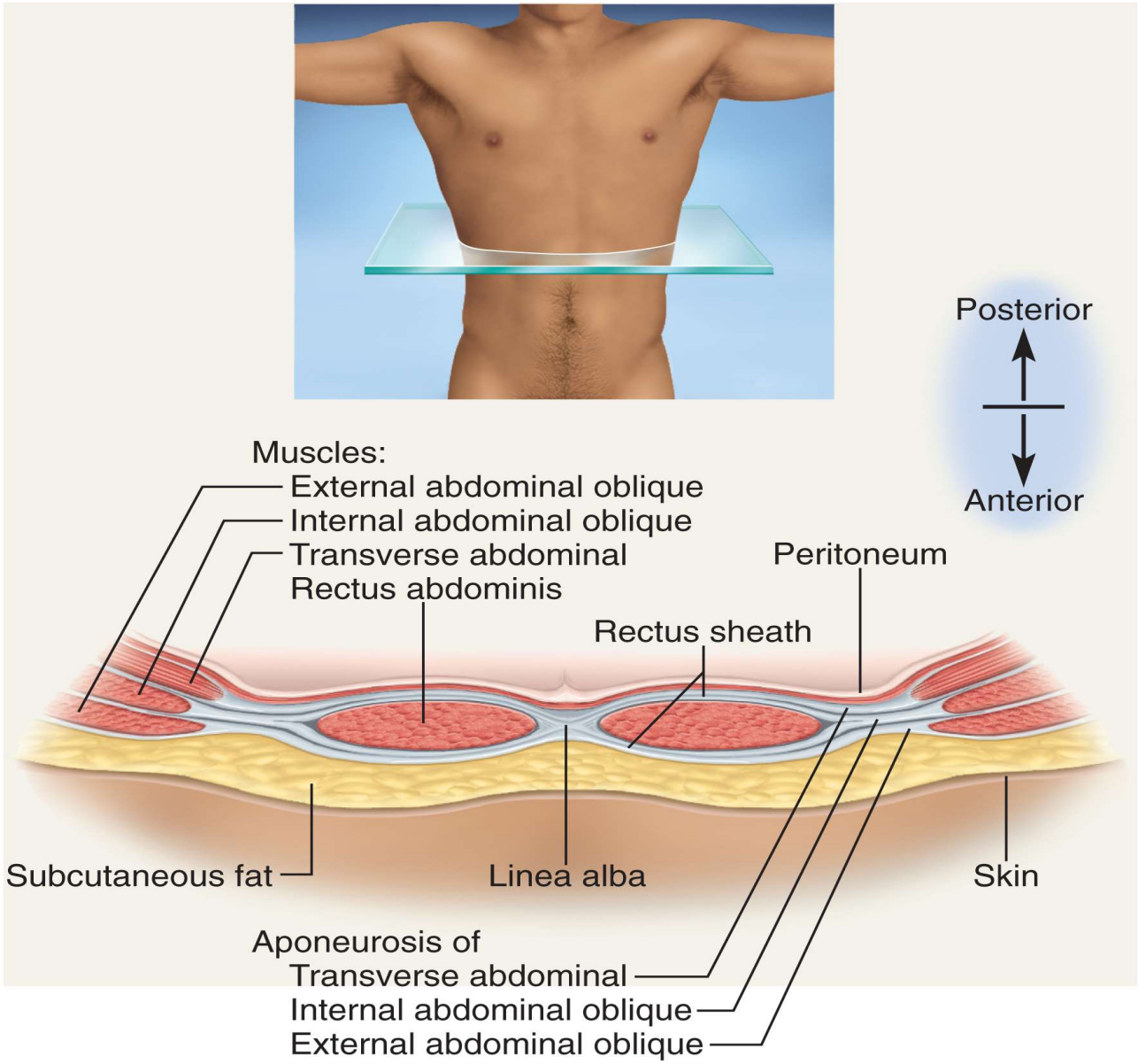
(a) Anterior view



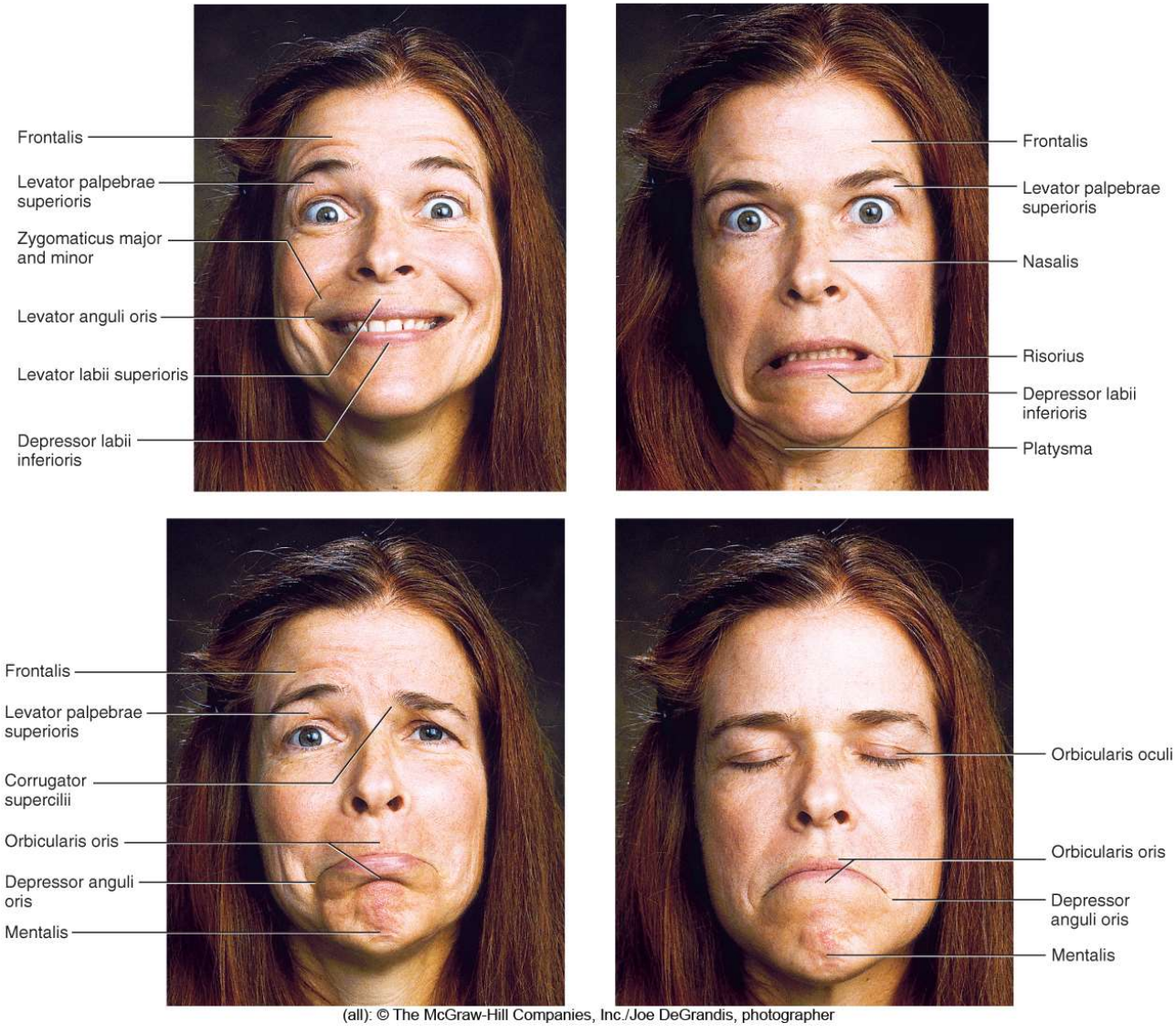


(b) Cross section

Muscles May Also Be Arranged in Layers

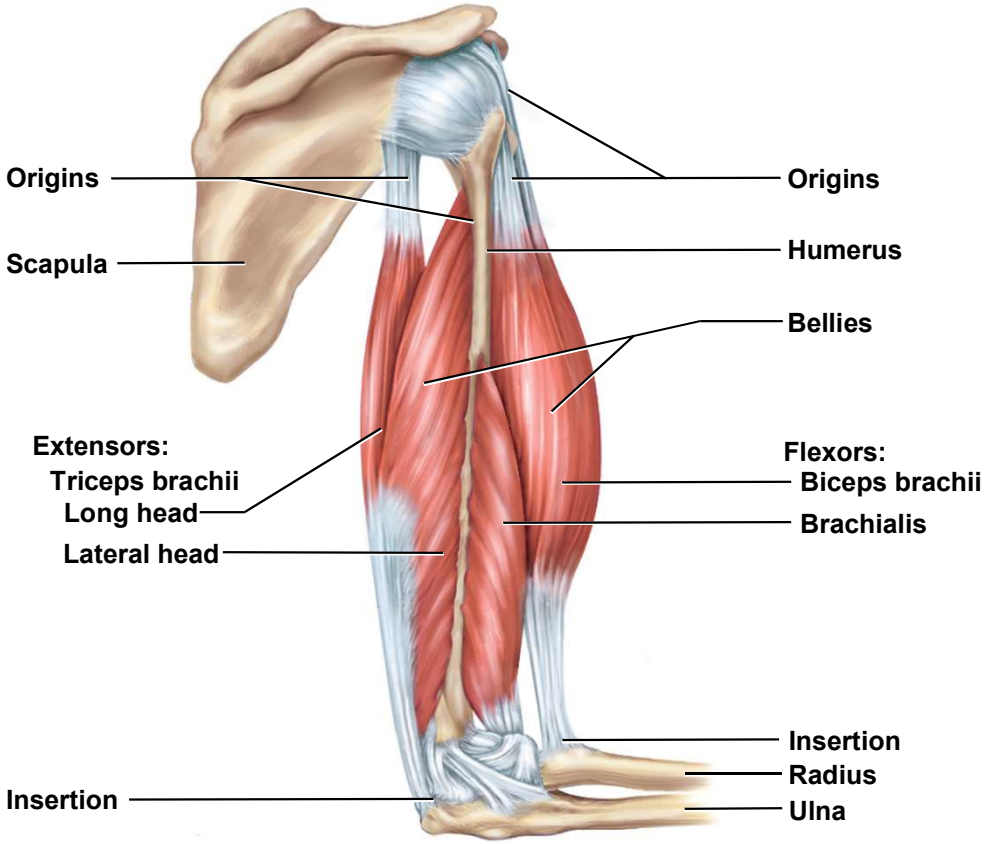


Some skeletal muscles do not insert onto the periosteum/bone but attach to the dermis of the skin or to the tendons of another muscle – e.g. muscles of facial expression (see next slide)



Muscle Origins and Insertions

- **Origin**
  - bony attachment at stationary end of muscle
- **Belly**
  - thicker, middle region of muscle between origin and insertion
- **Insertion**
  - bony attachment to mobile end of muscle



Classify Muslces by Their A Function

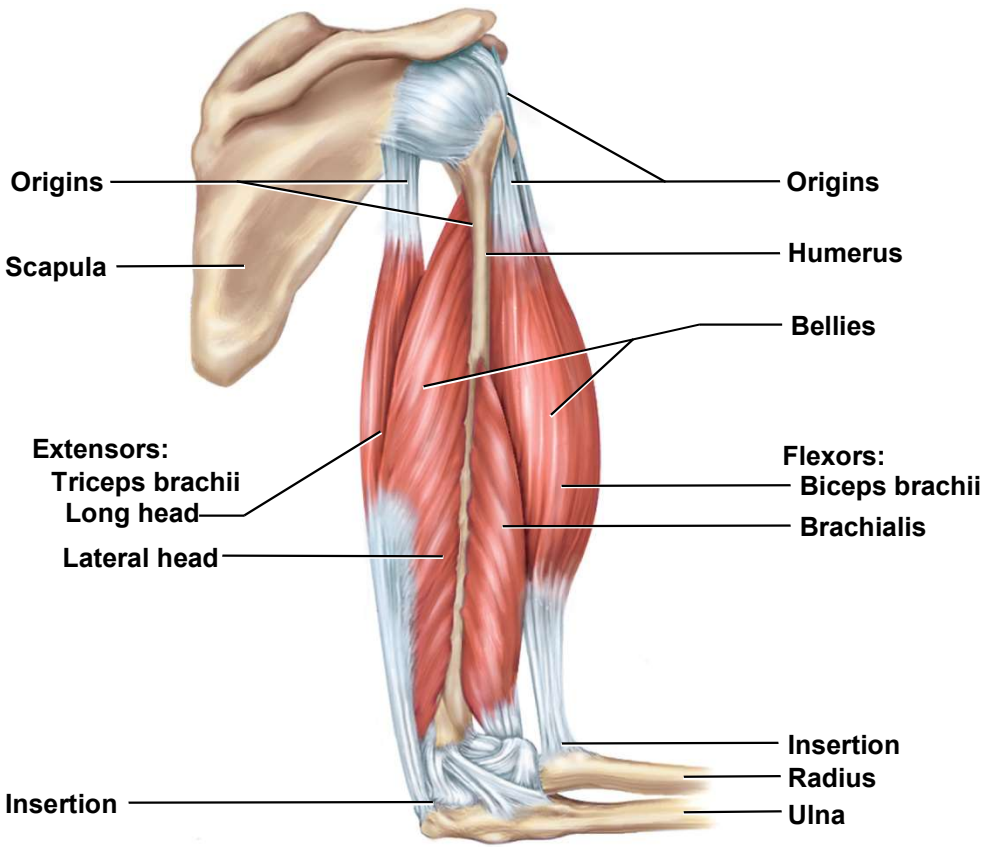
- **Action**
  - the effects produced by a muscle
  - to produce or prevent movement
- **Prime mover (agonist)**
  - muscle that produces most of force during a joint action
- **Synergist**
  - muscle that aids the prime mover
  - stabilizes the nearby joint
  - modifies the direction of movement

Functional Groups of Muscles

- **Antagonist**
  - opposes the prime mover
  - relaxes to give prime mover control over an action
  - preventing excessive movement and injury
  - **antagonistic pairs** – muscles that act on opposite sides of a joint

- **Fixator**
  - muscle that prevents movement of bone
  - allows other muscles to exert force to produce movement.

Muscle Actions Across Elbow



- **Prime mover**
  - brachialis
- **Synergist**
  - biceps brachii
- **Antagonist**
  - triceps brachii
- **Fixator**
  - *Rhomboids* (muscle that holds scapula firmly in place)

Skeletal Muscle Innervation

- **Corticospinal tracts**
  - upper motor neuron
  - Originate in precentral gyrus
  - Transits into spinal cord and synapse on lower motor neuron in the anterior horn
  - Lower motor neurons are common pathway to skeletal muscle below head and neck
- **Corticobulbar**
  - lower motro neuron
  - Originate in precentral gyrus
  - Transits to brainstem and synapse on cranial nerves
  - Cranial are common pathway to skeletal muscles above head and neck

Skeletal Muscle Innervation

- **Spinal nerves (i.e. lower motor neuron)**
  - arise from the spinal cord
  - emerge through intervertebral foramina
  - immediately branch into a posterior and anterior ramus
  - innervate muscles below the neck
  - **plexus** – weblike network of spinal nerves adjacent to the vertebral column
- **Cranial nerves (i.e. lower motor neuron)**
  - arise from the base of the brain
  - emerge through skull foramina
  - innervate the muscles of the head and neck
  - numbered I to XII