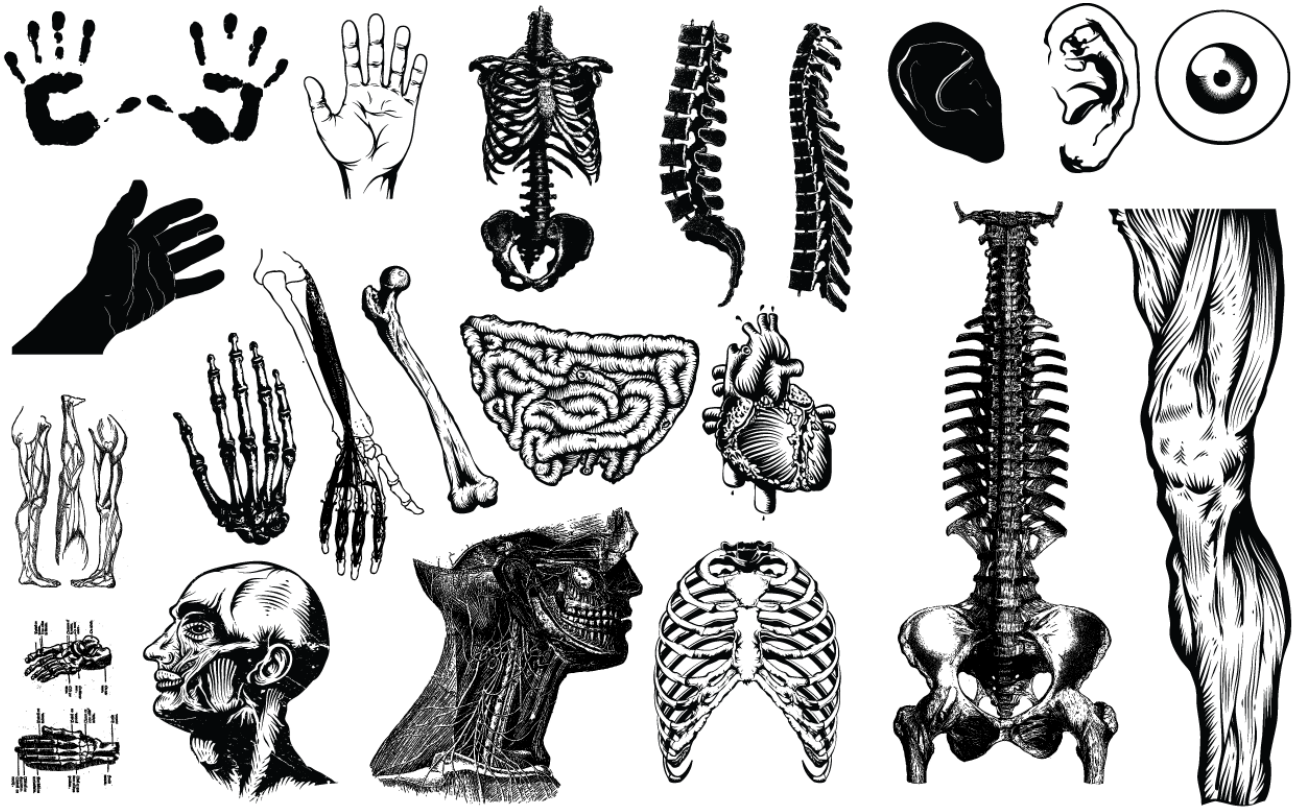
Anatomy for Assistants



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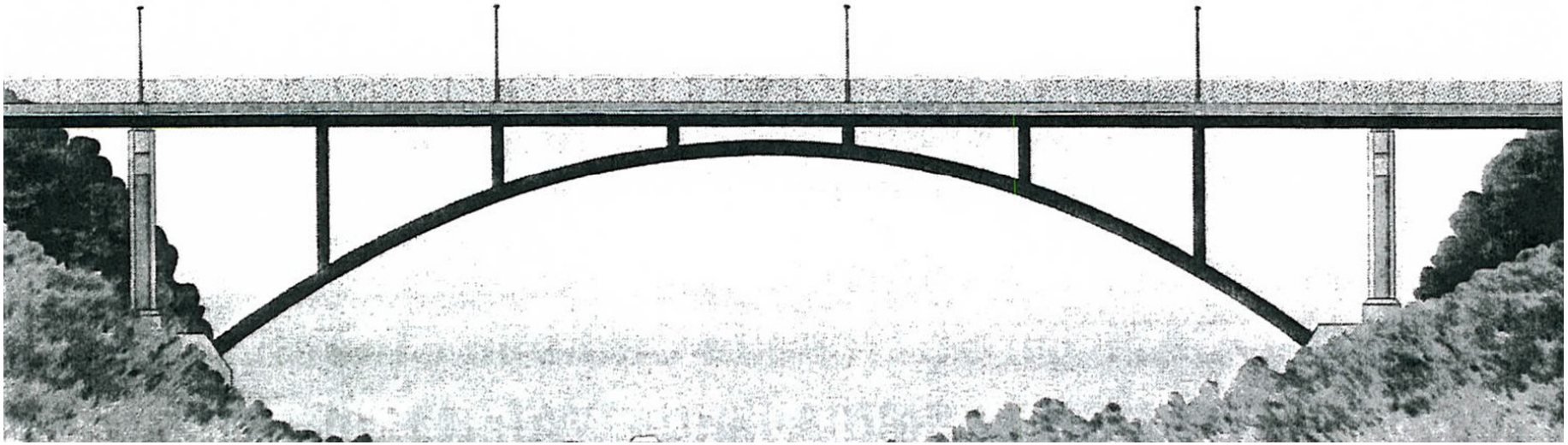
First Things First

Why Bother?

- In today's healthcare environment, expectations are much higher than in the past
  - Everyone already HAS the information
  - Are you by any chance wearing scrubs?
- Patients DEMAND and DESERVE a knowledgeable healthcare team
- When you place your hands on someone, it's essential to know what's underneath the skin
- Your doctor will be able to do their job better. The office will function better when assistants have baseline knowledge

Bridge The Gap



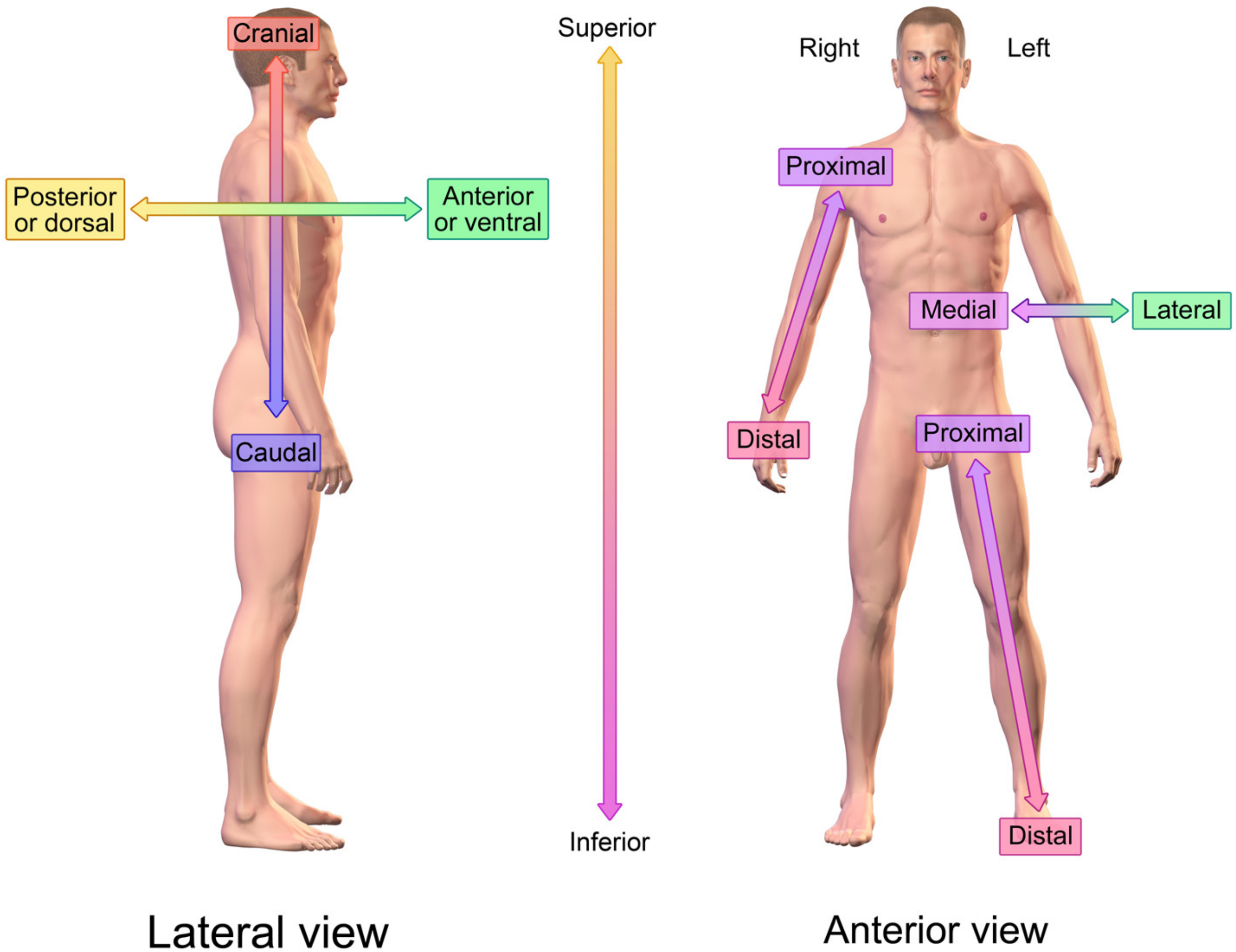
Buckle Up!

Direction and Location

- Anterior - towards the front
- Posterior – towards the rear
- Caudad – towards the tail (feet)
- Cephalad – towards the head
- Contralateral – on the opposite side
- Ipsilateral - on the same side
- Distal – farther from a point of reference or origin
- Proximal – closer to a point of reference or origin

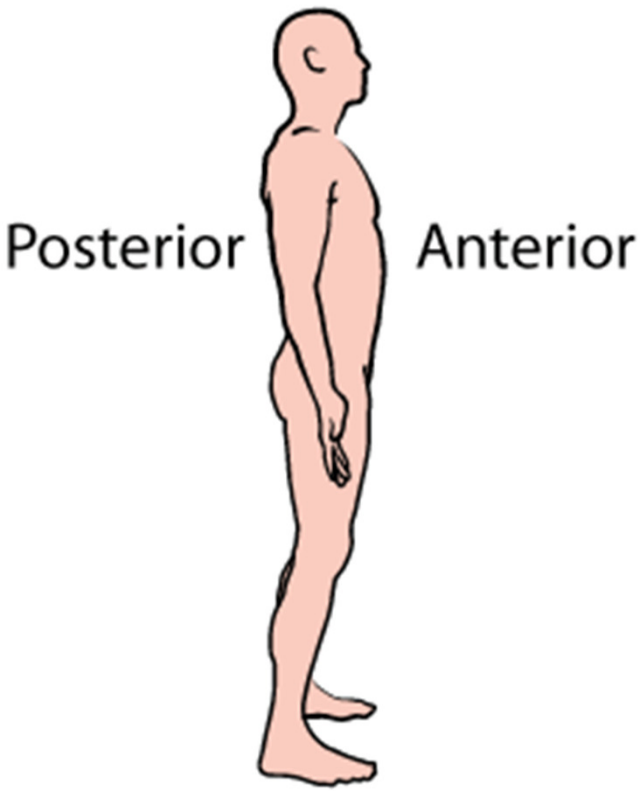
Direction and Location

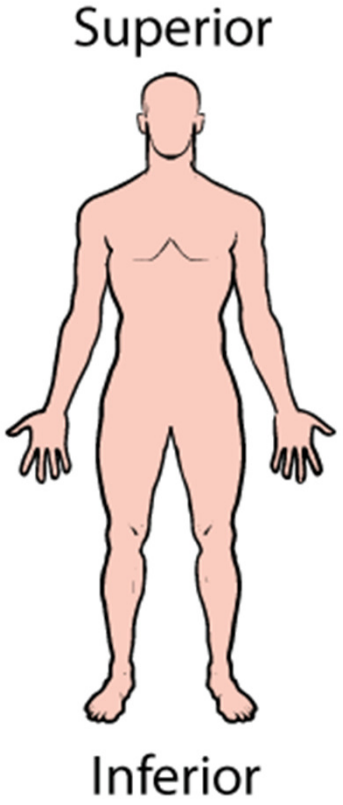
- Lateral – away from the midline of the body or part
- Medial – towards the midline of the body or part
- Superior – situated above
- Inferior – situated below
- Ventral – front surface of the body
- Dorsal – rear surface of the body
- Volar – referring to the inside surface of the wrist
- Palmar – referring to the palm of the hand
- Plantar – referring to the sole of the foot



Directional References

Direction and Location





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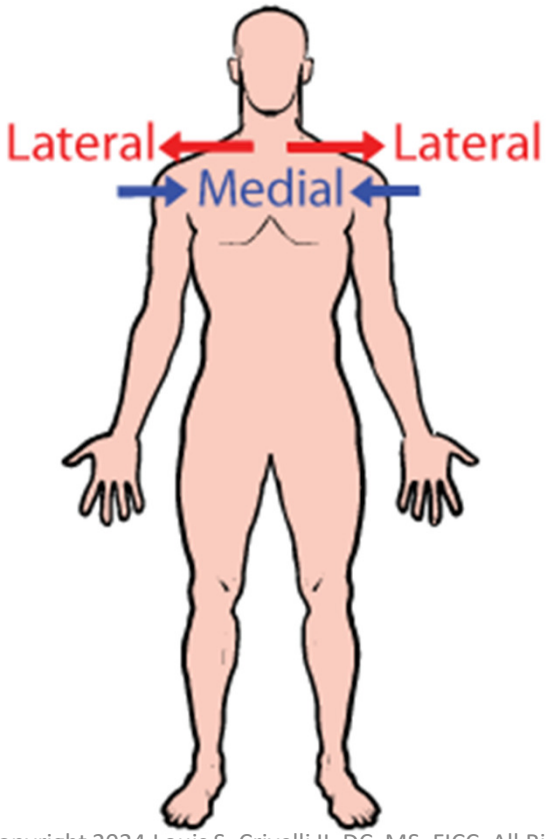
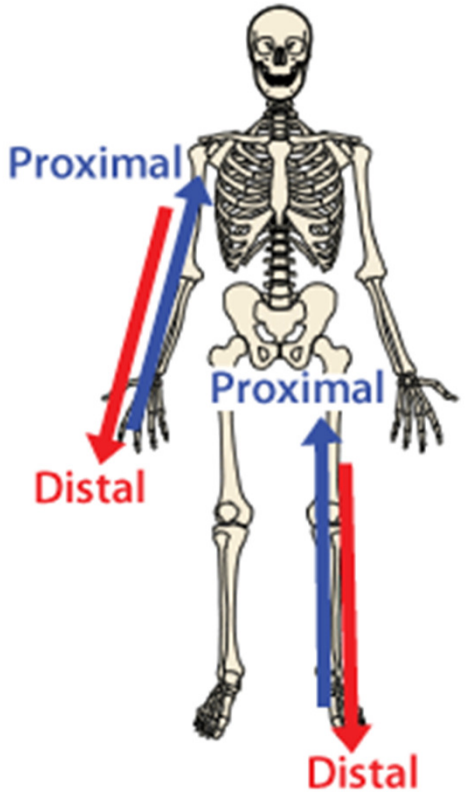
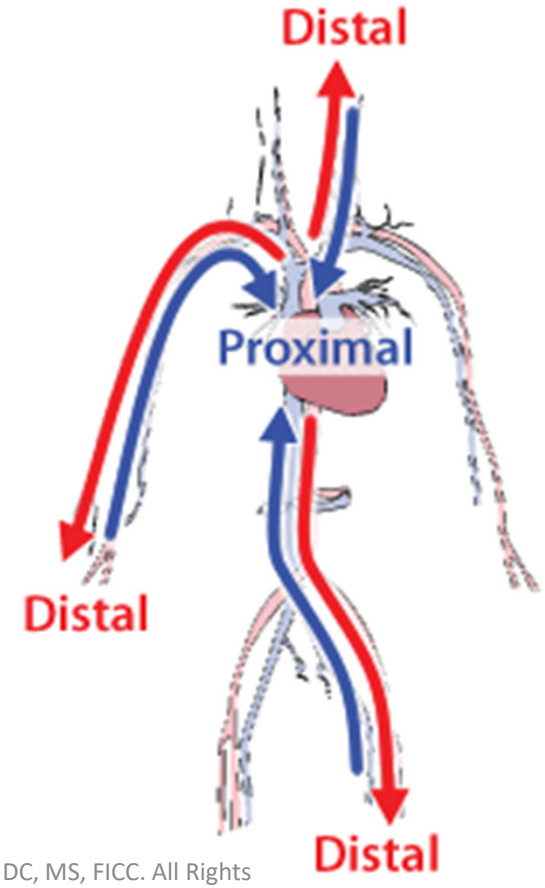


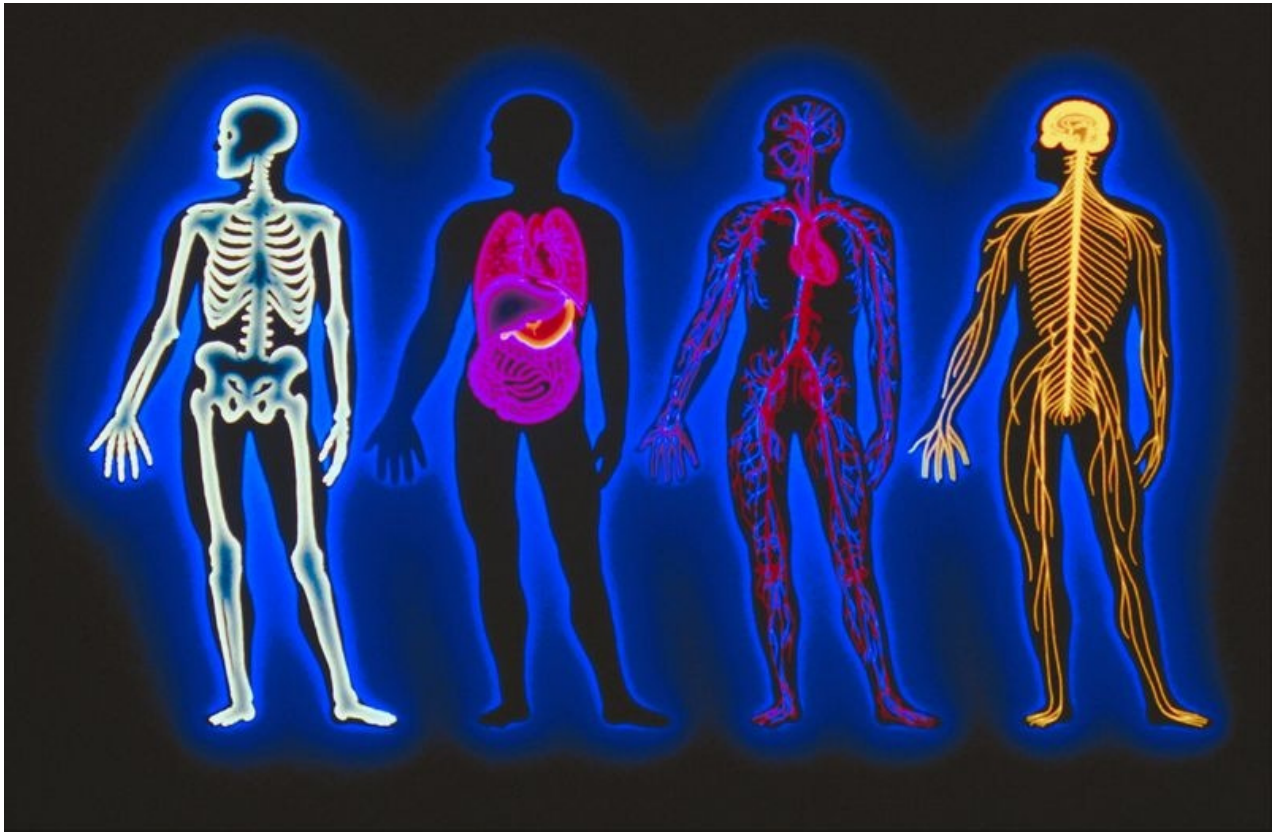
Direction and Location





Direction and Location

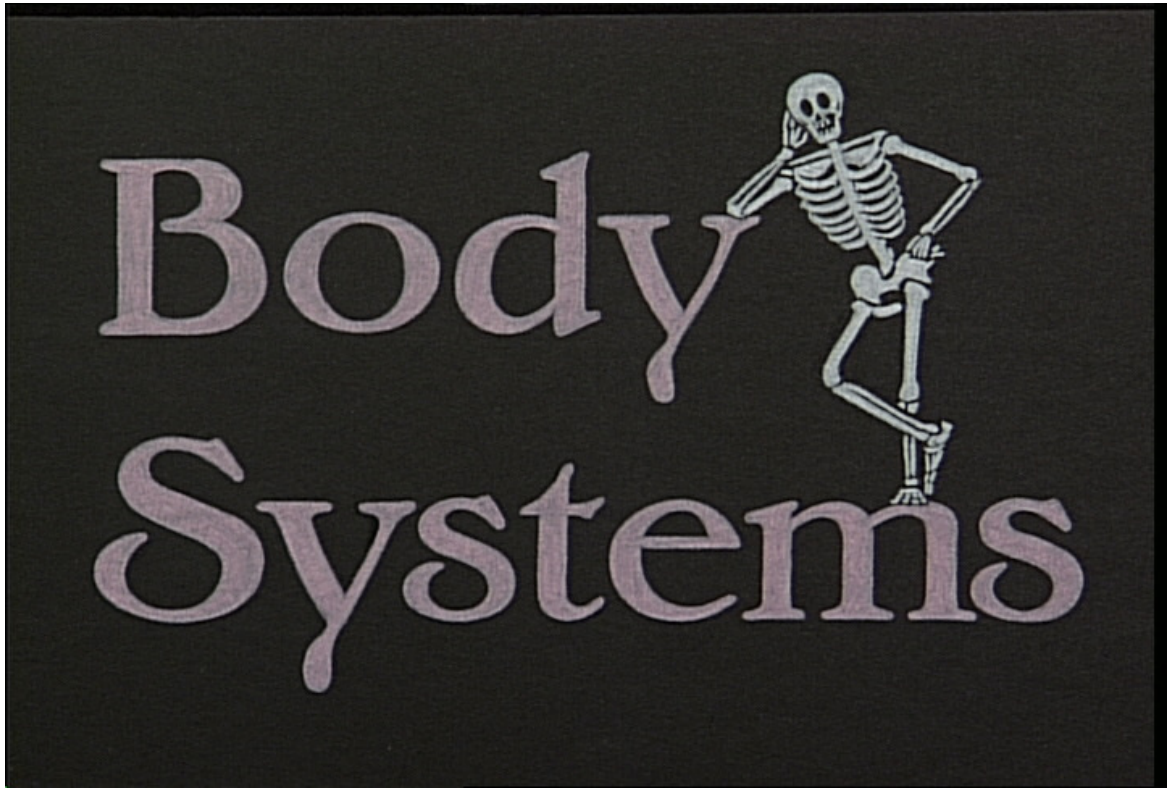
Anatomy and Physiology



Understanding the Human Body

- Anatomy – the study of body structure
- Physiology – the study of the function and activity of the body
- Systemic approach
- 10 Body Systems

10 Body Systems



10 Body Systems

- Skeletal (bones)
- Muscular (muscles)
- Nervous (brain, spinal cord, nerves)
- Circulatory (heart and blood vessels)
- Respiratory (lungs)

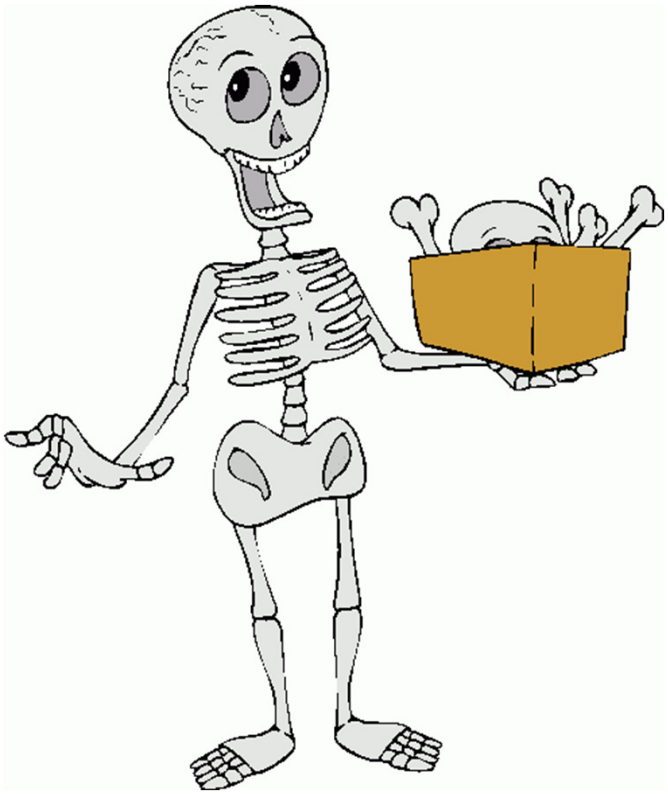
10 Body Systems

- Digestive (stomach and intestines)
- Urinary (kidneys and bladder)
- Endocrine (glands and hormones)
- Reproductive (genitals)
- Integumentary (skin)

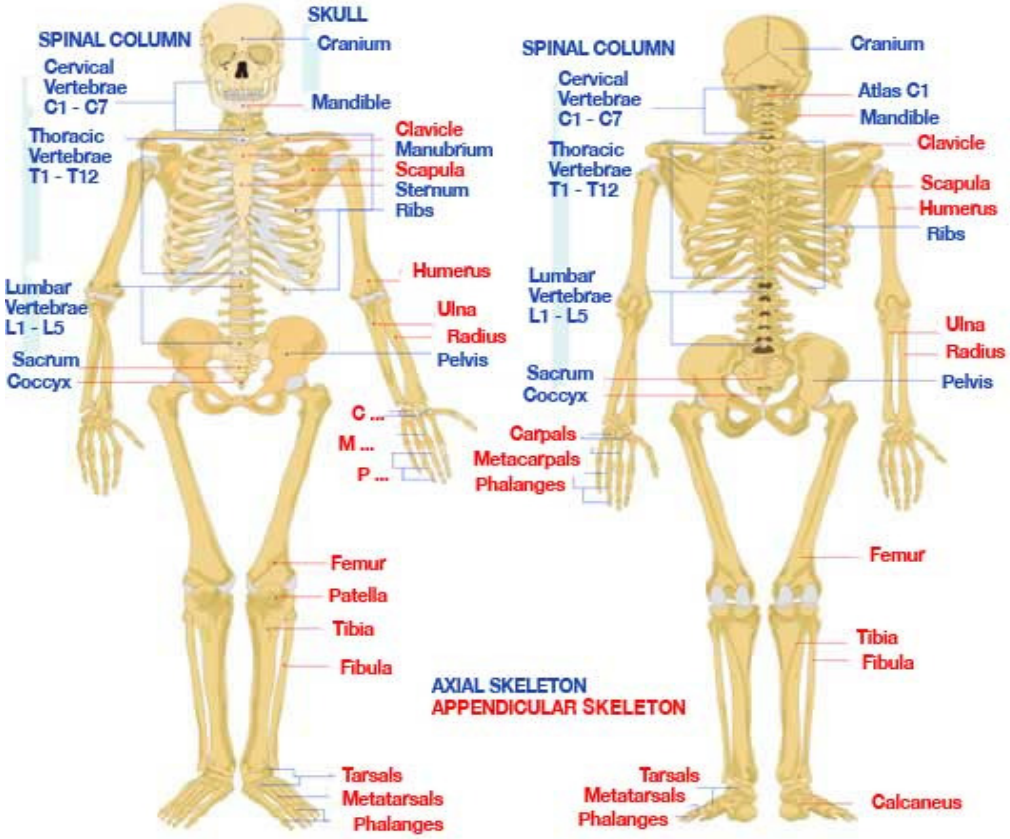
Skeletal System

- Provides framework, support and protection.
- Serves as the attachment point for muscles.
- Major storage dept for Calcium.

Skeletal System

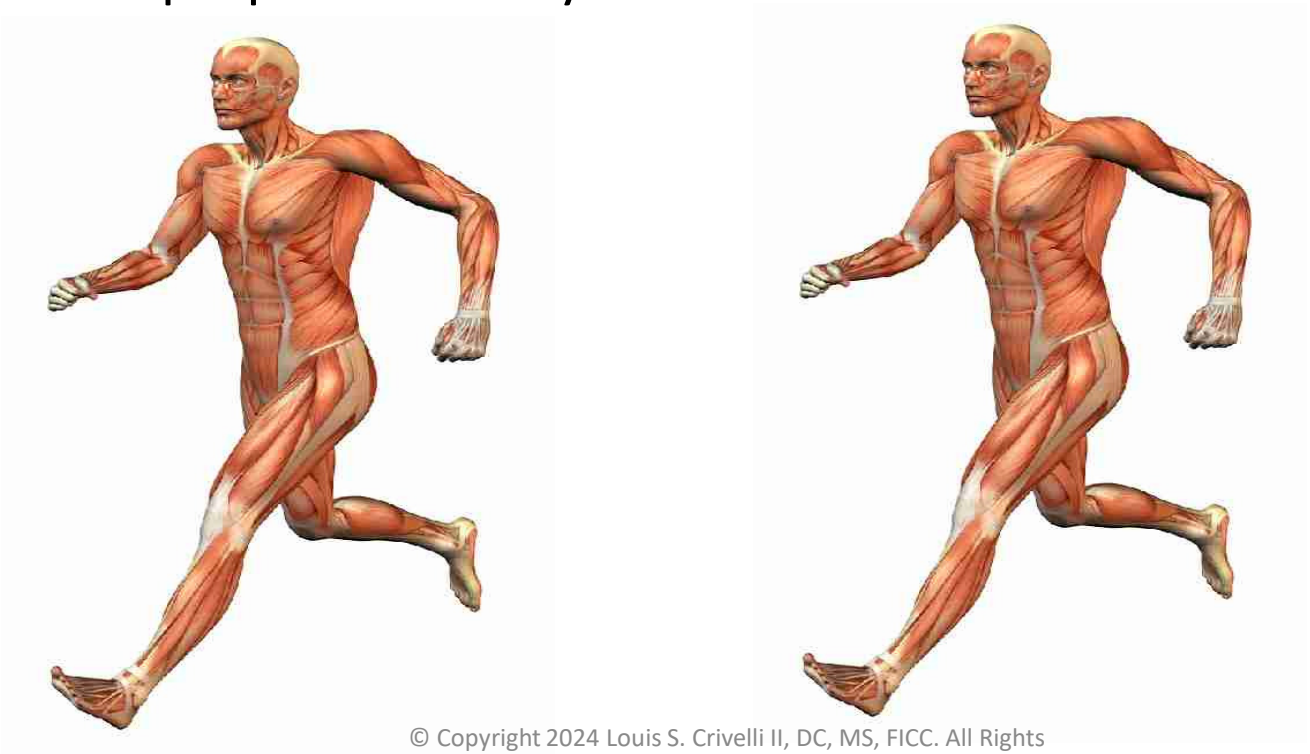


Skeletal System



Muscular System

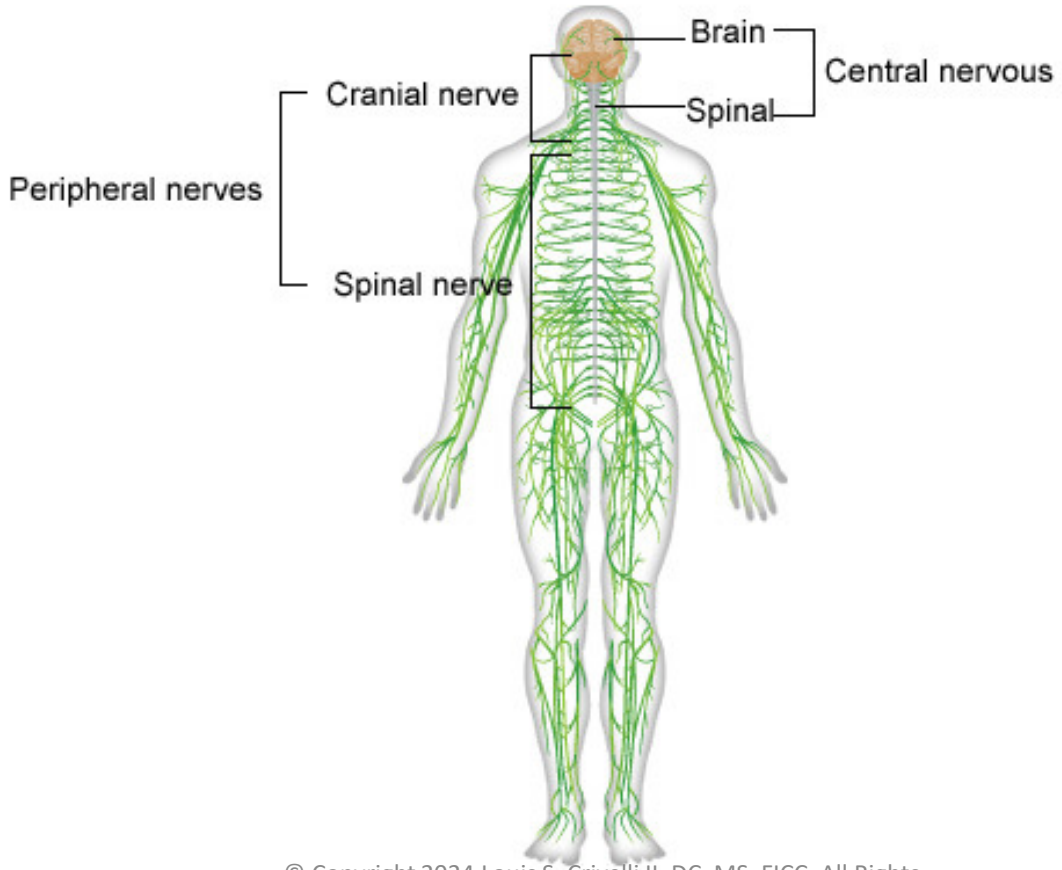
- Moves and propels the body.



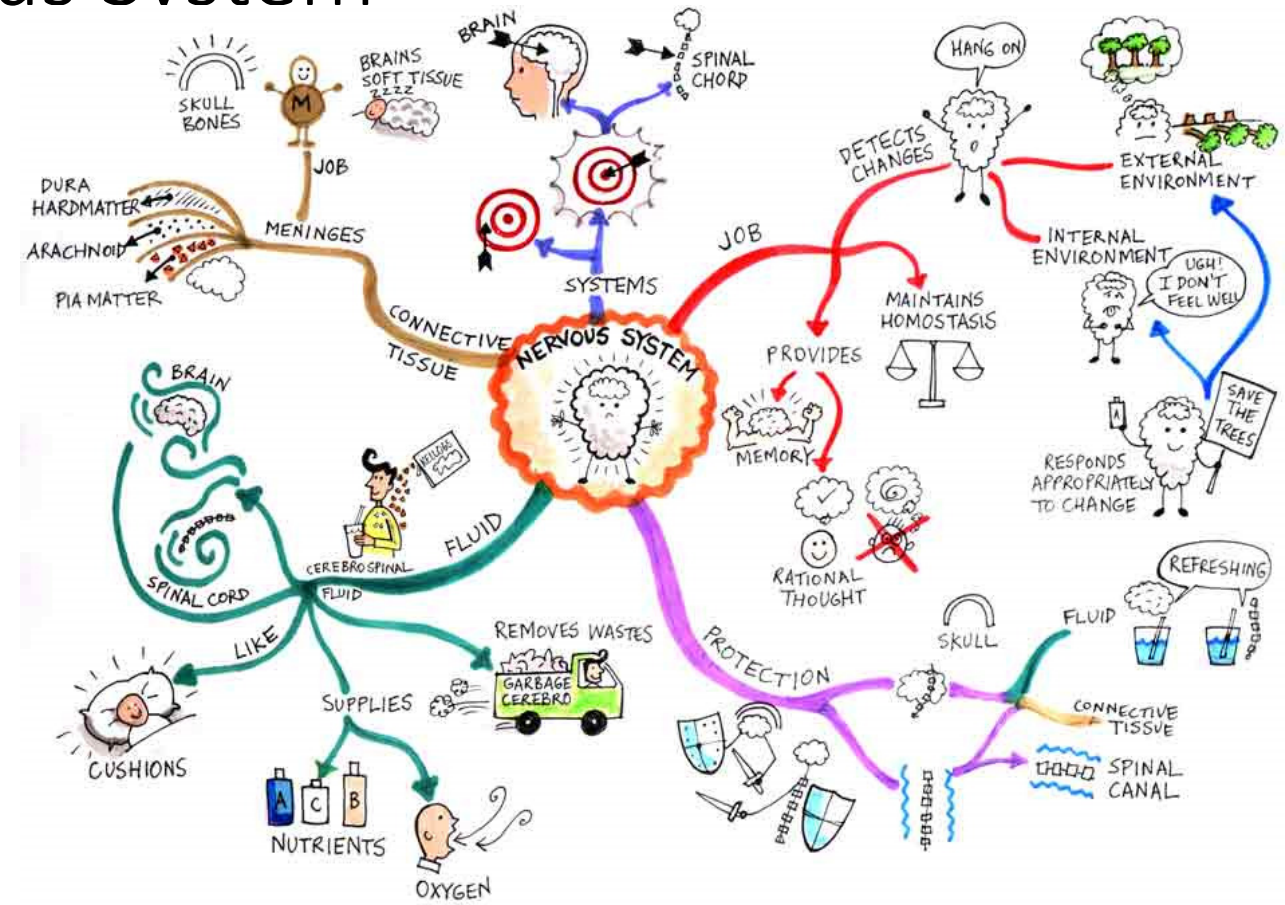
Nervous System

- Gives the body awareness of its environment.
- Enables the body to react to stimuli from the environment.
- Allows the body to work together as a cohesive unit
- Command and Control

Nervous System



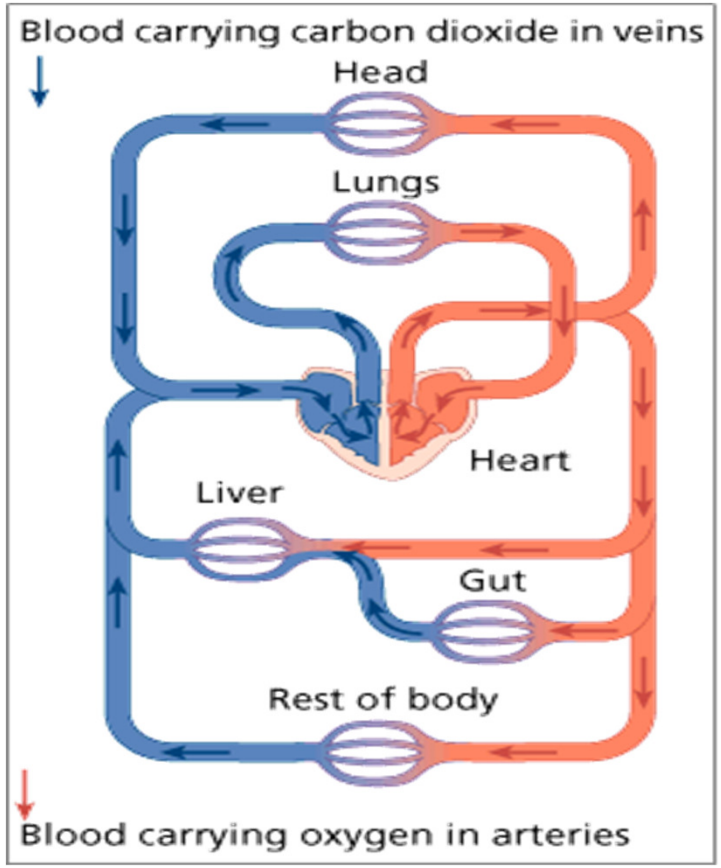
Nervous System



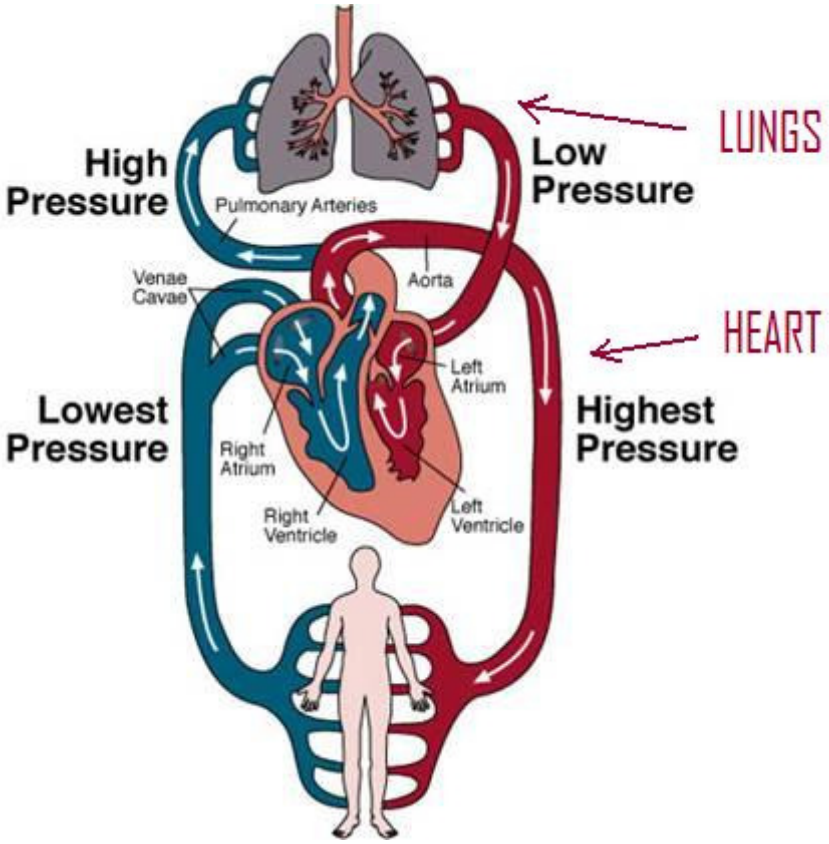
Circulatory System

- Carries oxygen and nutrients in the blood to all parts of the body.
- Carries away waste products from the cells.

Circulatory System



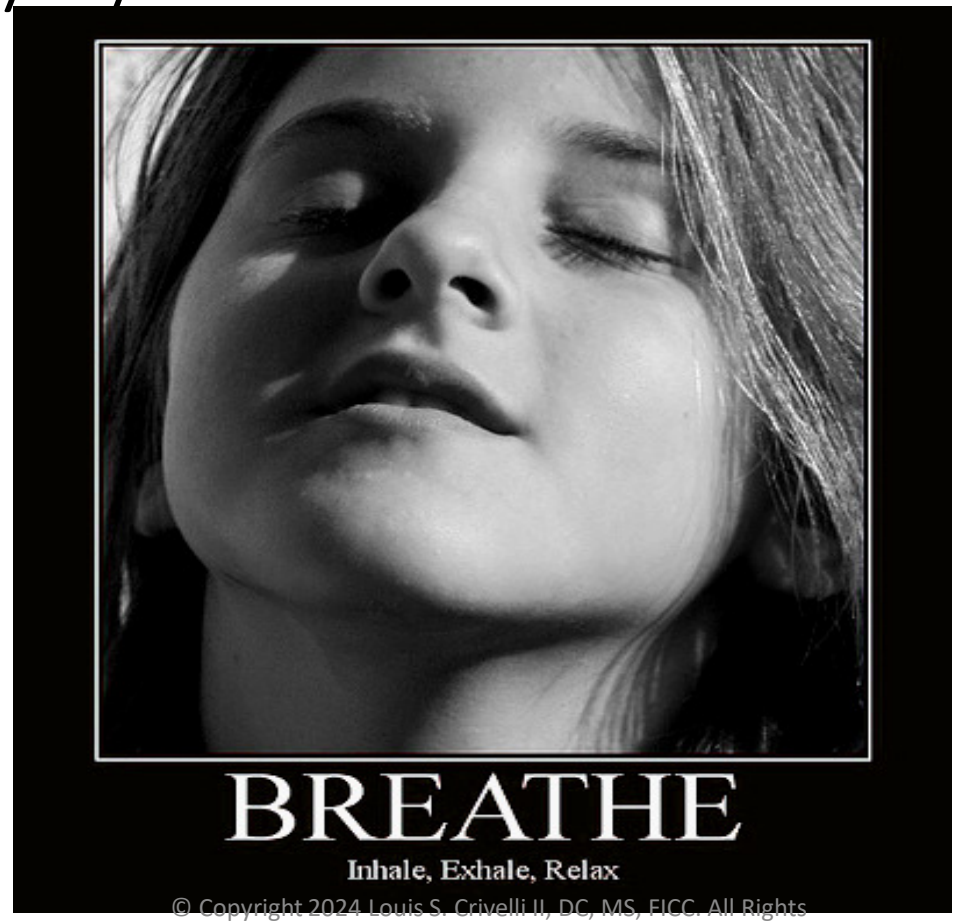
Circulatory System



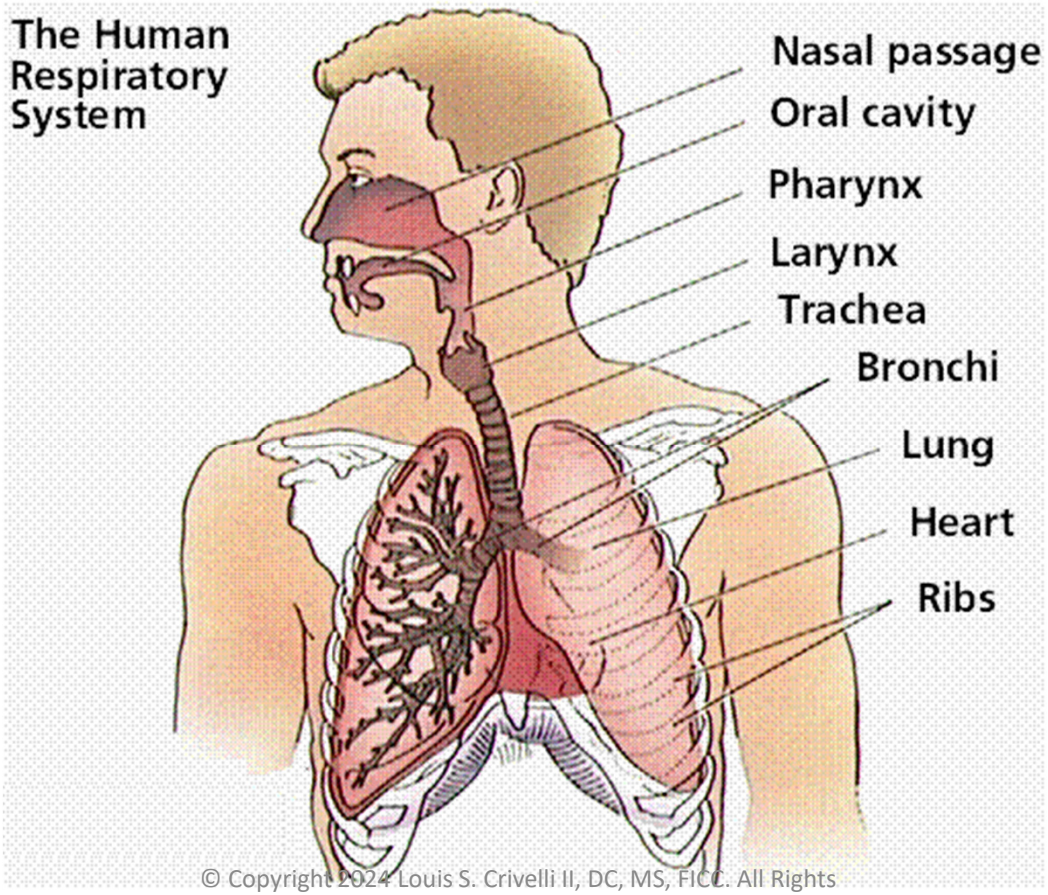
Respiratory System

- Takes oxygen from the atmosphere and puts it into the blood.
- Removes waste from the blood in the form of carbon dioxide.
- Helps to maintain body temperature

Respiratory System



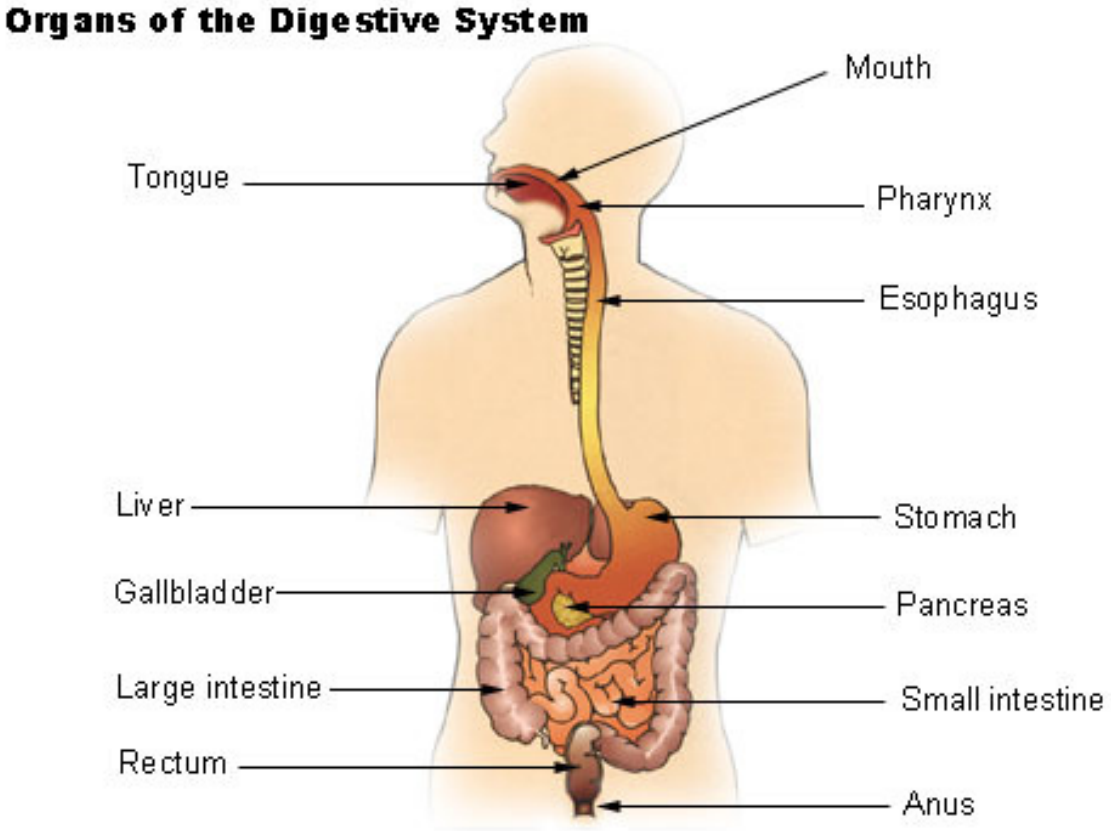
Respiratory System



Digestive System

- Receives, digests, and absorbs food substances.
- Eliminates waste products.

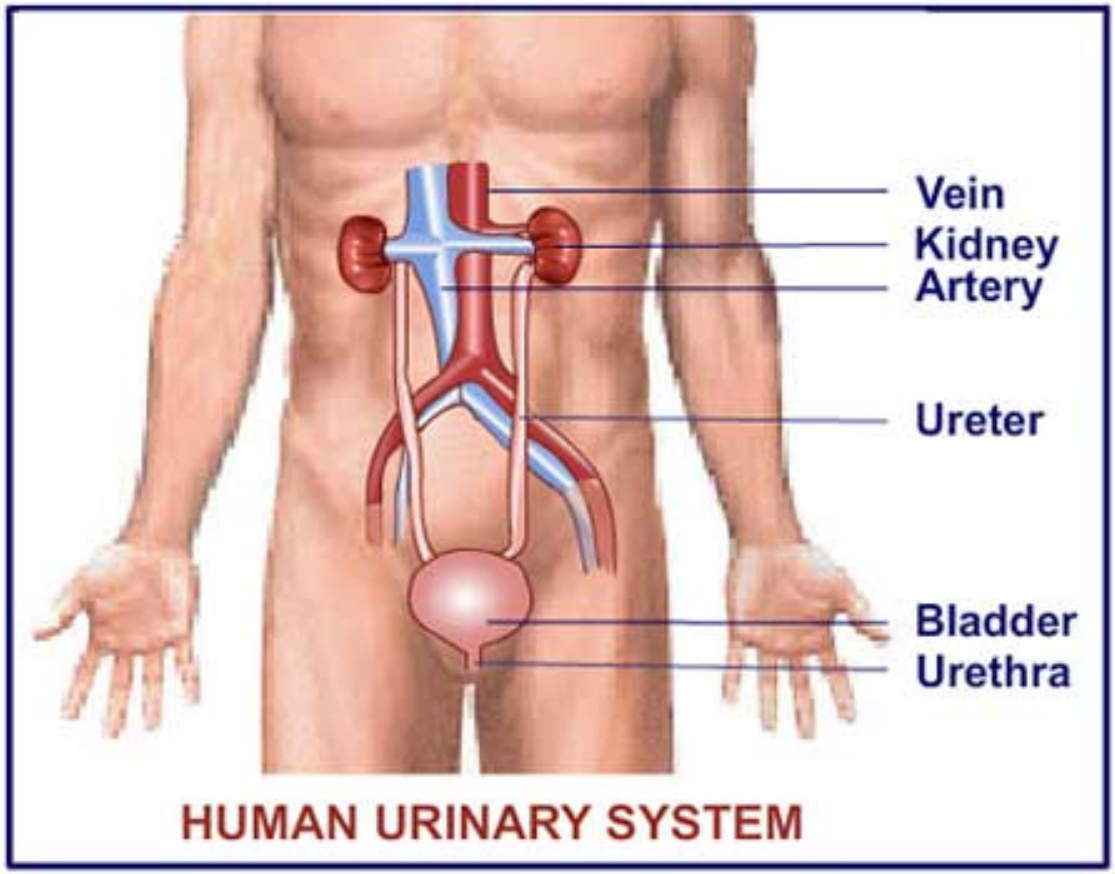
Digestive System



Urinary System

- Filters out waste products from the blood and excretes these products in urine.
- Conservation of water.

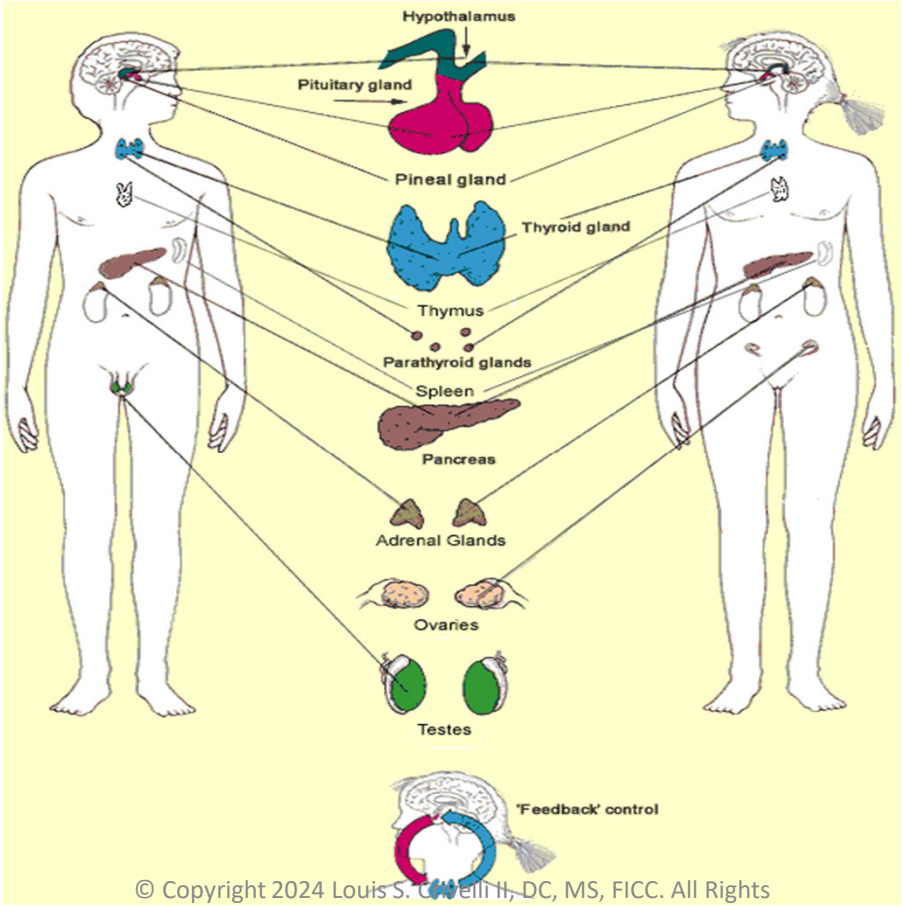
Urinary System



Endocrine System

- Controls many prolonged body functions by the manufacture of hormones that are secreted into the blood.

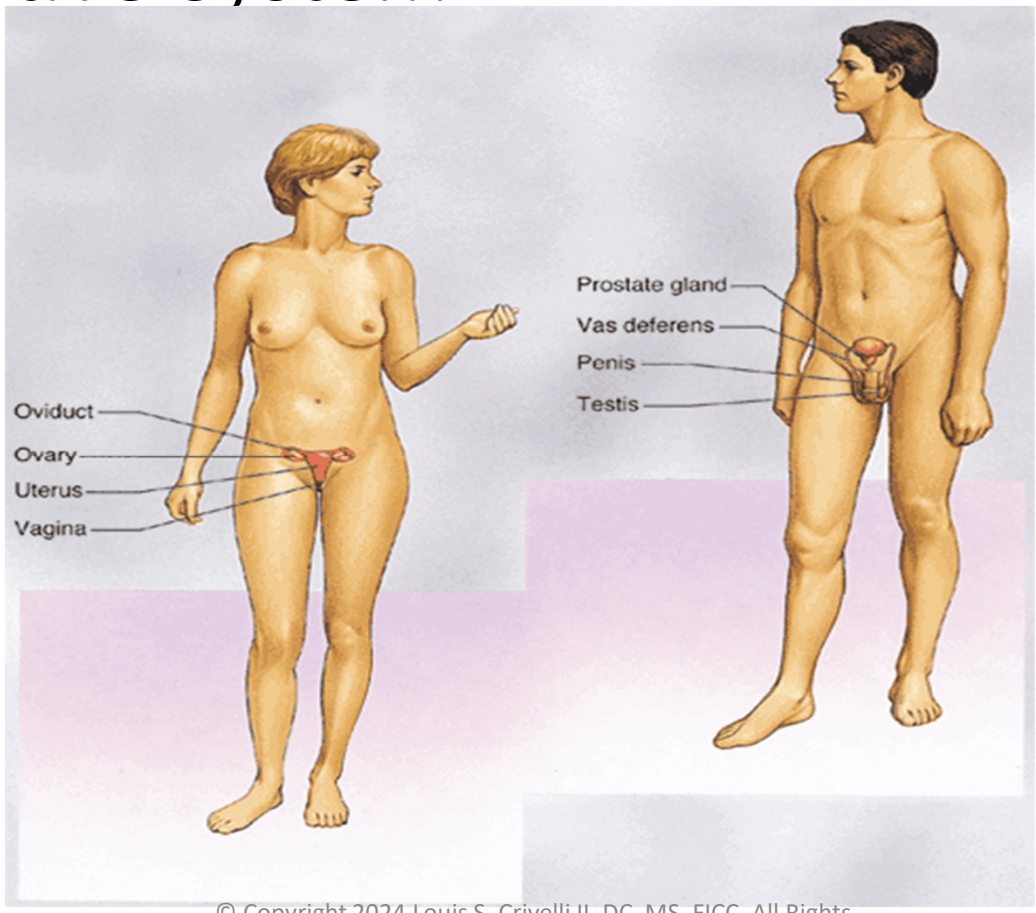
Endocrine System



Reproductive System

- Produces and transports reproductive (sex) cells.

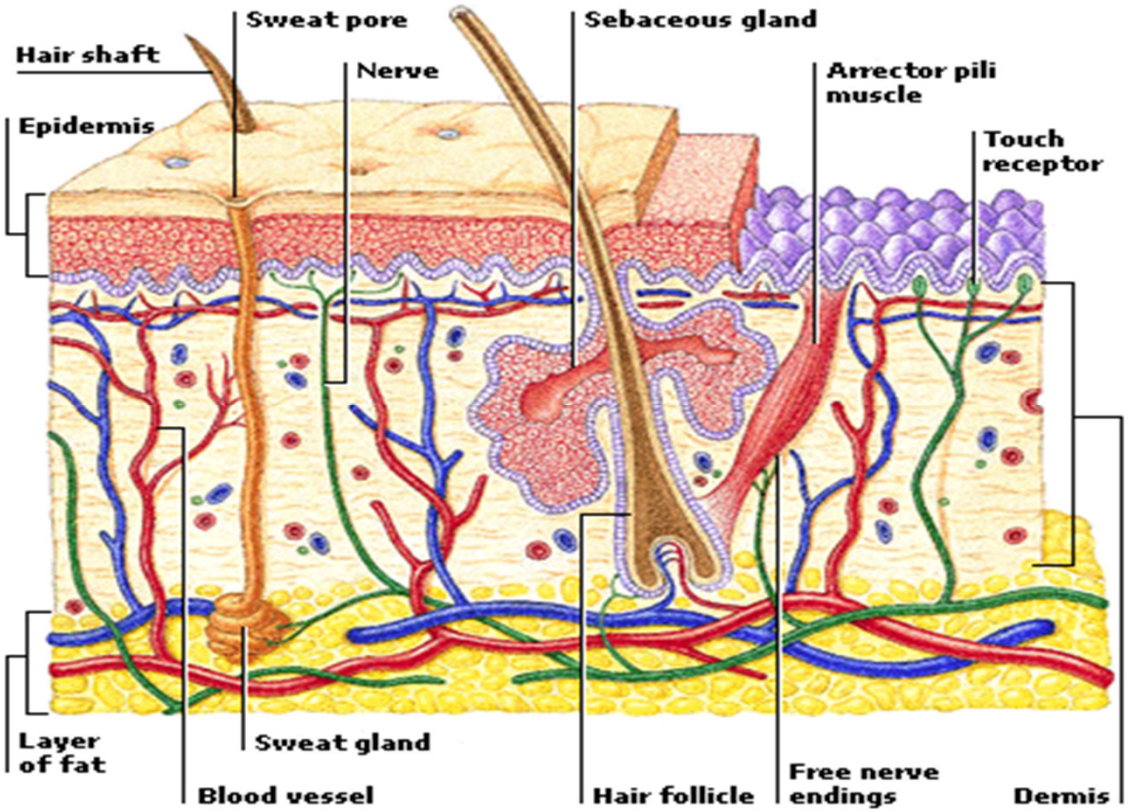
Reproductive System



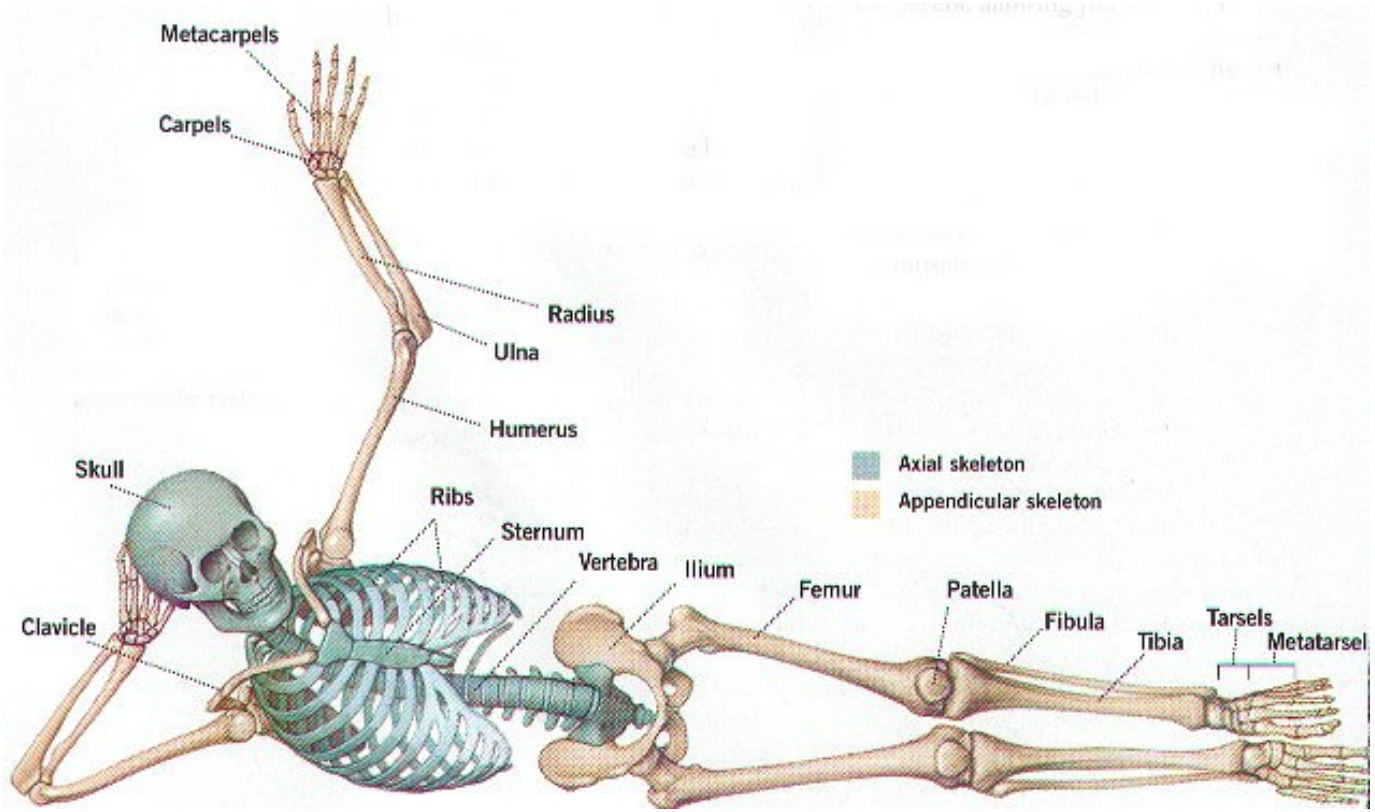
Integumentary System

- Covers and protects the body surface from injury and infection.
- Functions in sensory reception.
- Regulates body temperature.
- Excretes waste products.

Integumentary System



The Skeletal System



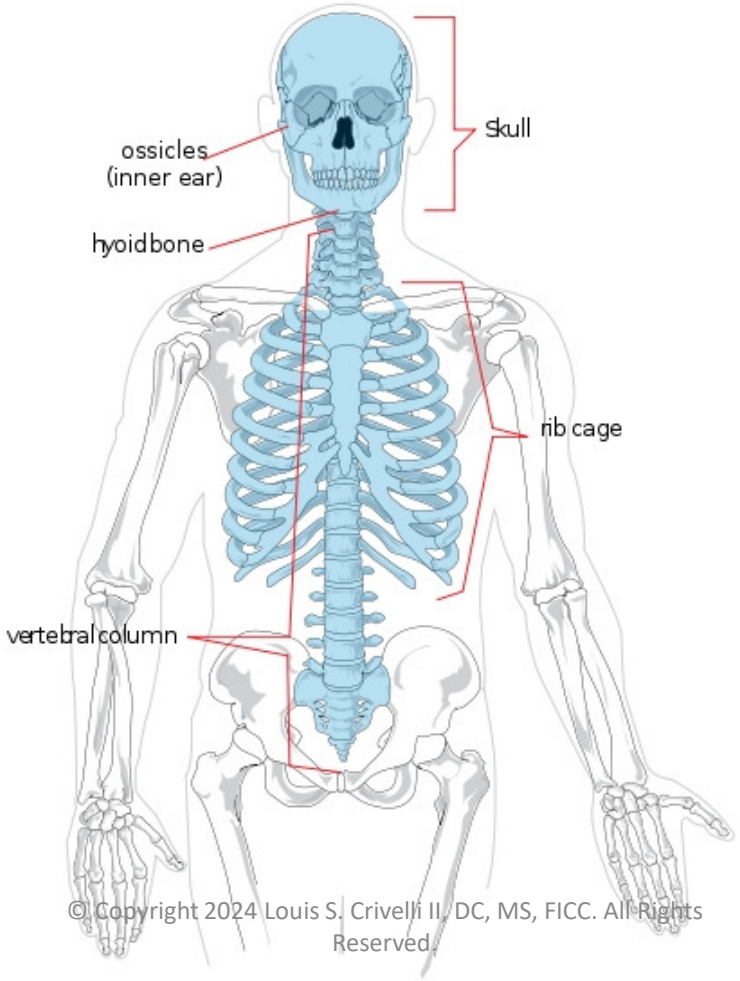
The Skeletal System

- Functions
  - Give support and shape to the body
  - Protect internal organs
  - Provide for movement
  - Manufacture blood cells
  - Store mineral salts

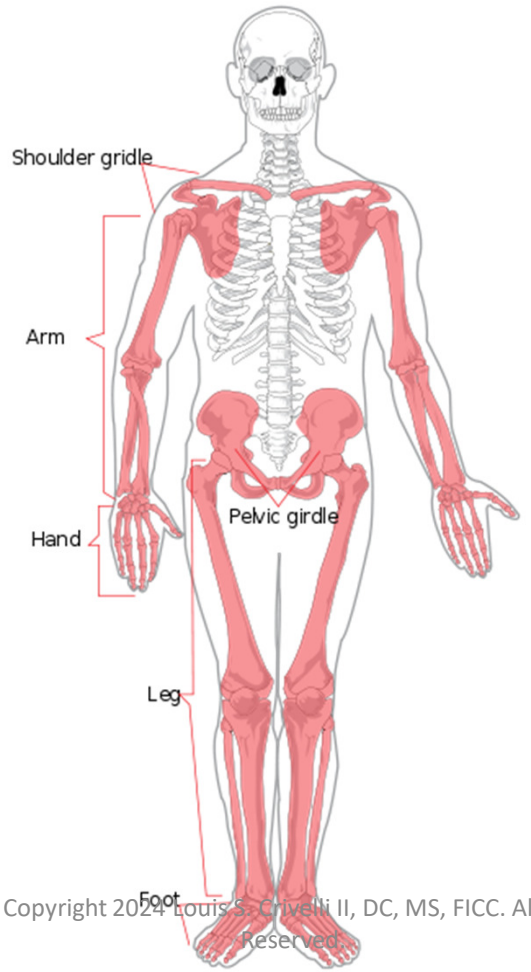
The Skeletal System

- 2 Divisions (206 bones total)
- Axial skeleton
  - 80 bones
  - Skull, vertebral column, ribs, sternum
- Appendicular skeleton
  - 126 bones
  - Shoulder girdle, upper limbs, pelvic girdle, lower limbs

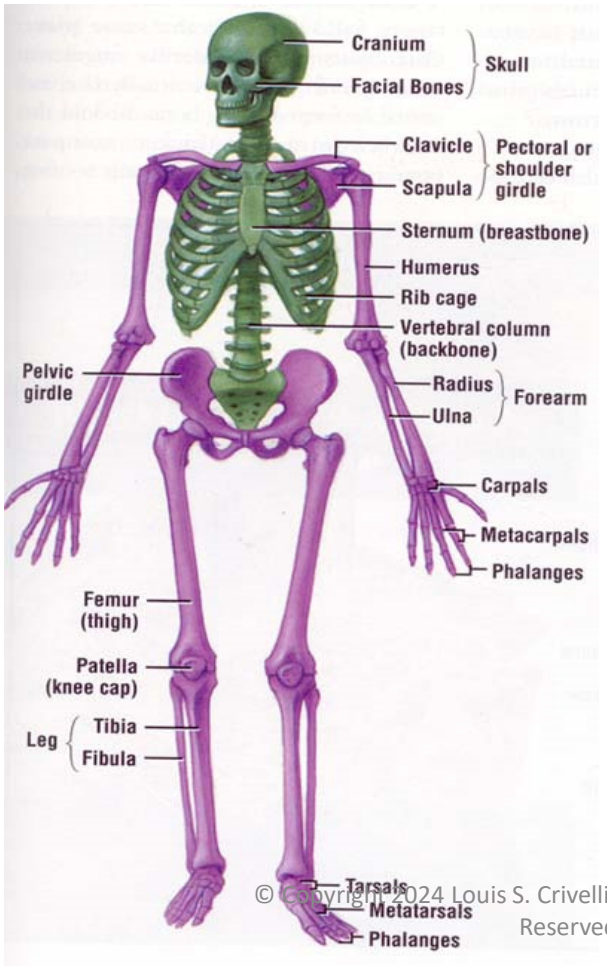
Axial Skeleton

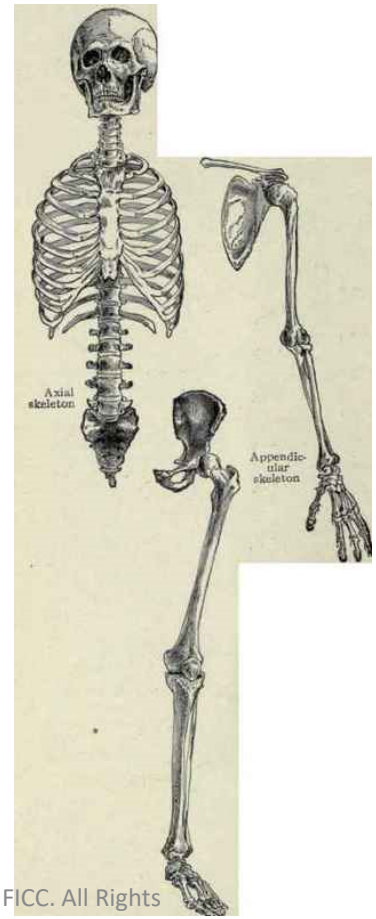


Appendicular Skeleton



Axial vs. Appendicular

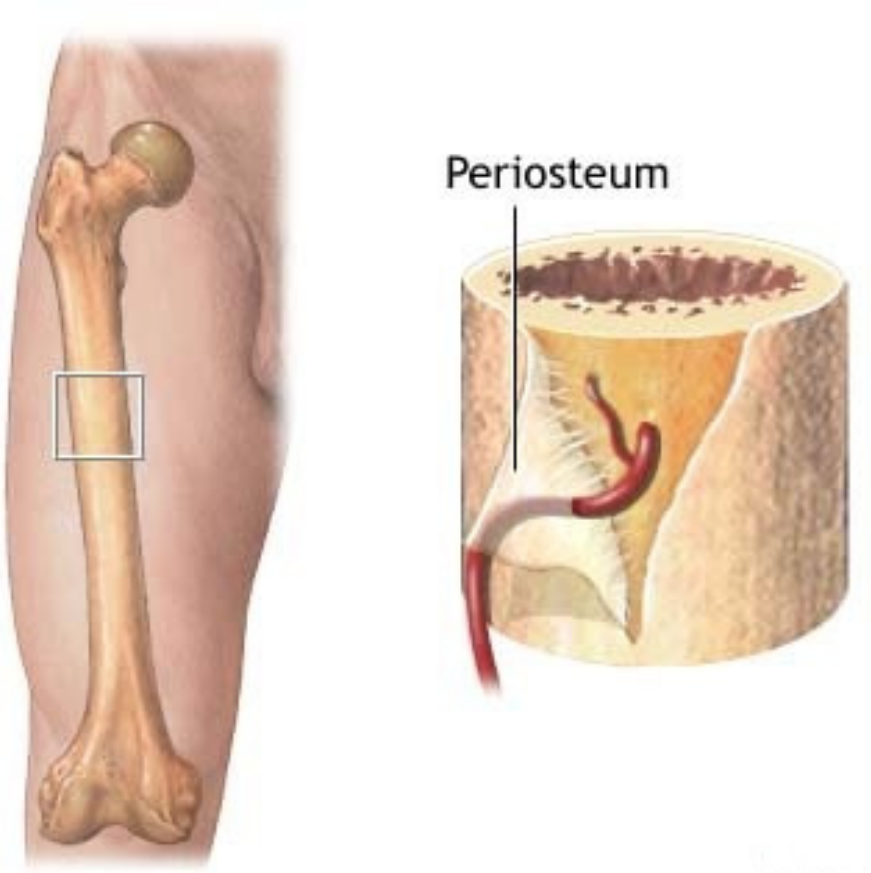




Bone Structure and Classes

- Periosteum
  - Hard membrane covering bone surfaces. This covering carries blood vessels and nerves to the bone cells. Anchored to bone by very strong connective fibers.
  - “Shrink wrap”
  - Due to the presence of nerves, periosteum is pain sensitive.

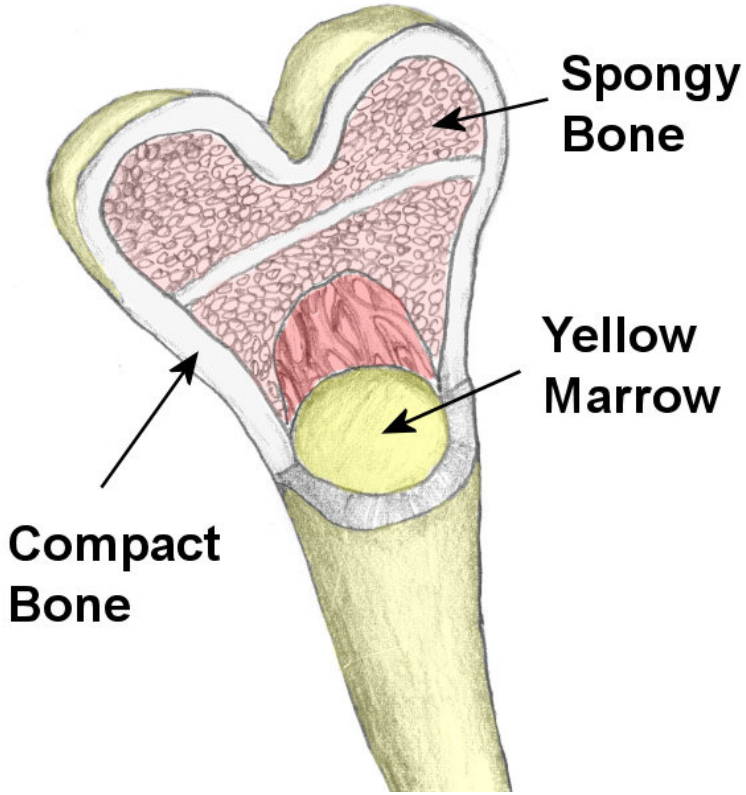
Periosteium



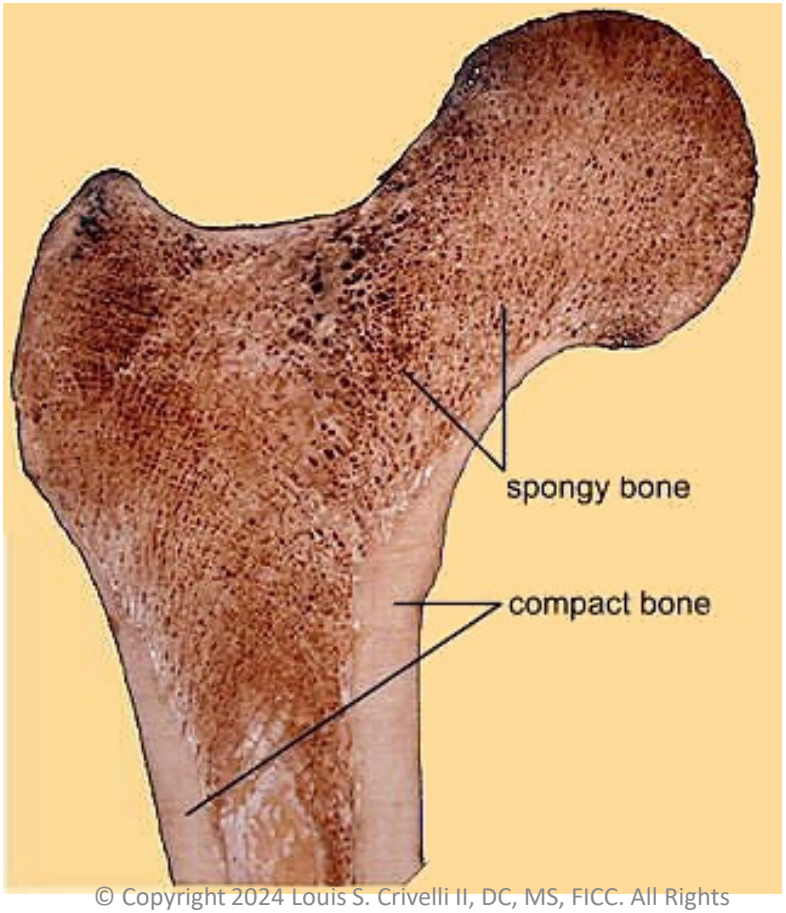
Bone Structure and Classes

- 2 basic types of bone
  - Compact bone
    - Hard and dense structure
  - Cancellous (spongy) bone
    - Porous structure
- The combination of the 2 types of bone gives the skeletal system maximum strength with minimum weight.

Compact/Cancellous bone



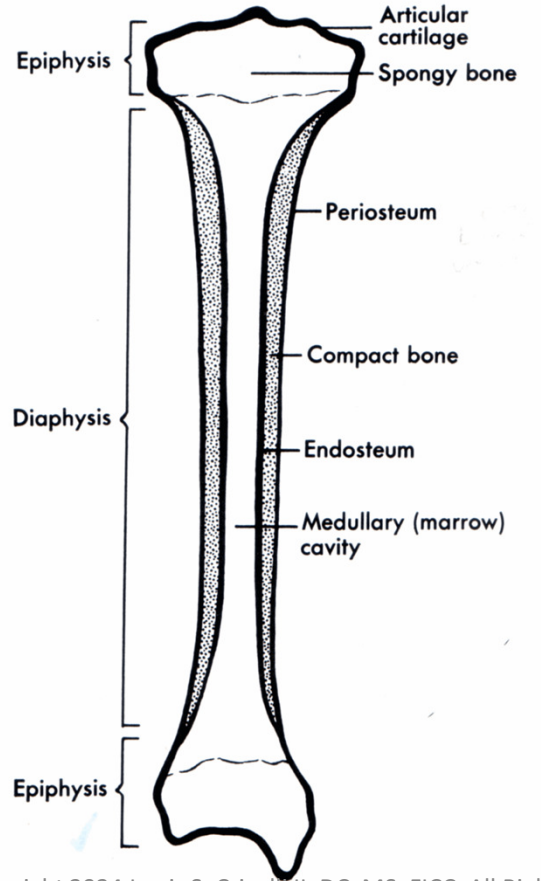
Compact/Cancellous bone



Bone Classification

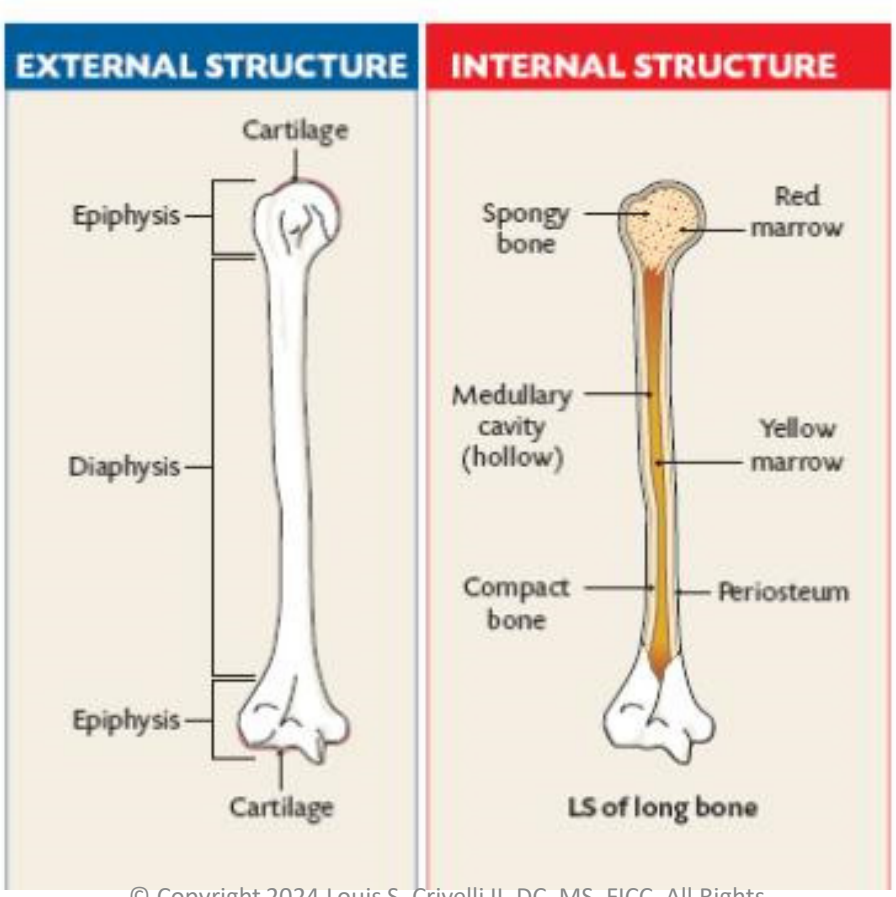
- Long bones
  - Mostly found in extremities, they act as levers to produce motion.
- Short bones
  - Mini long bones, they are strong and compact.
- Flat bones
  - Serve as protective plates and provide a broad surface for muscle attachment.
- Irregular bones

Long Bone

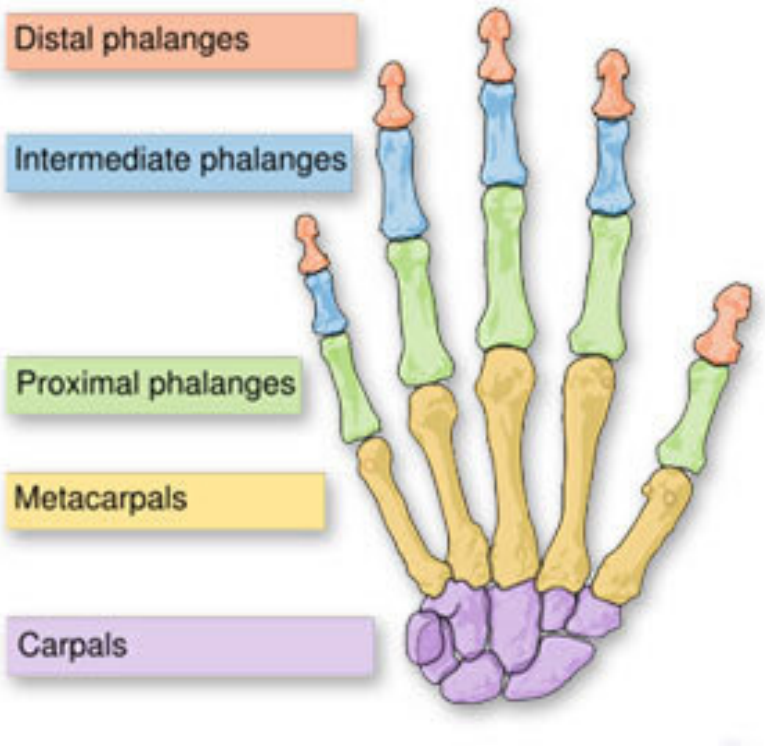


Structure of a long bone as seen in longitudinal section

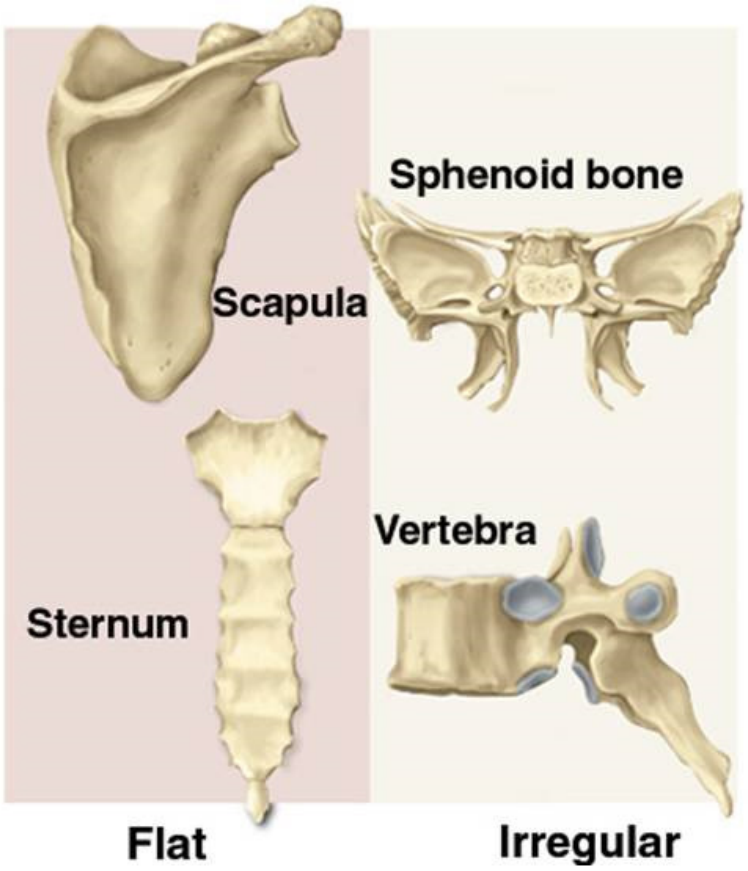
Long Bone



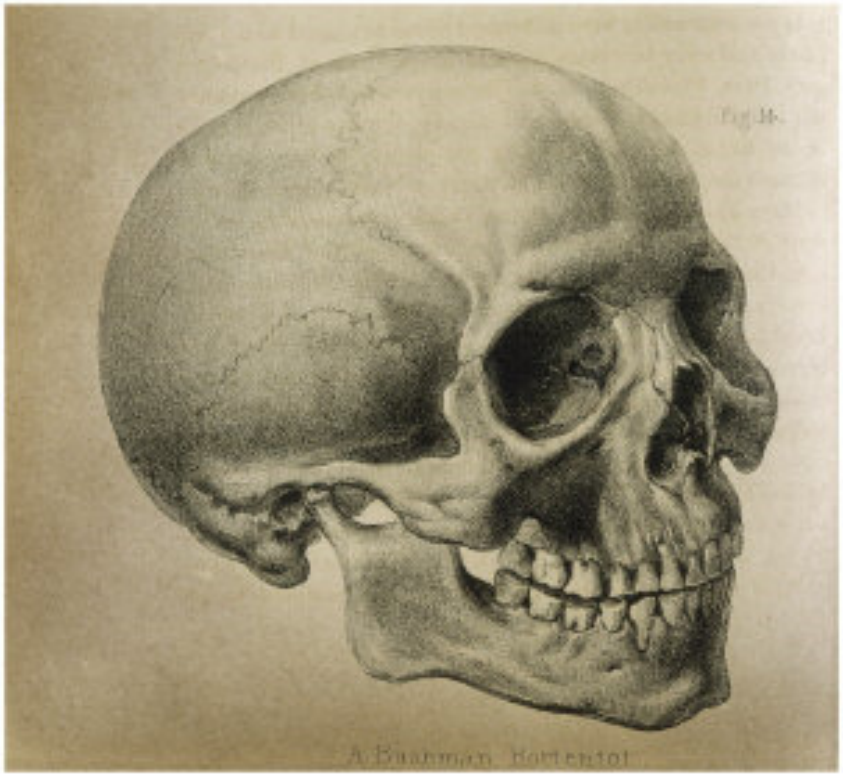
Short Bone



Flat/Irregular Bones



The Skull and Face

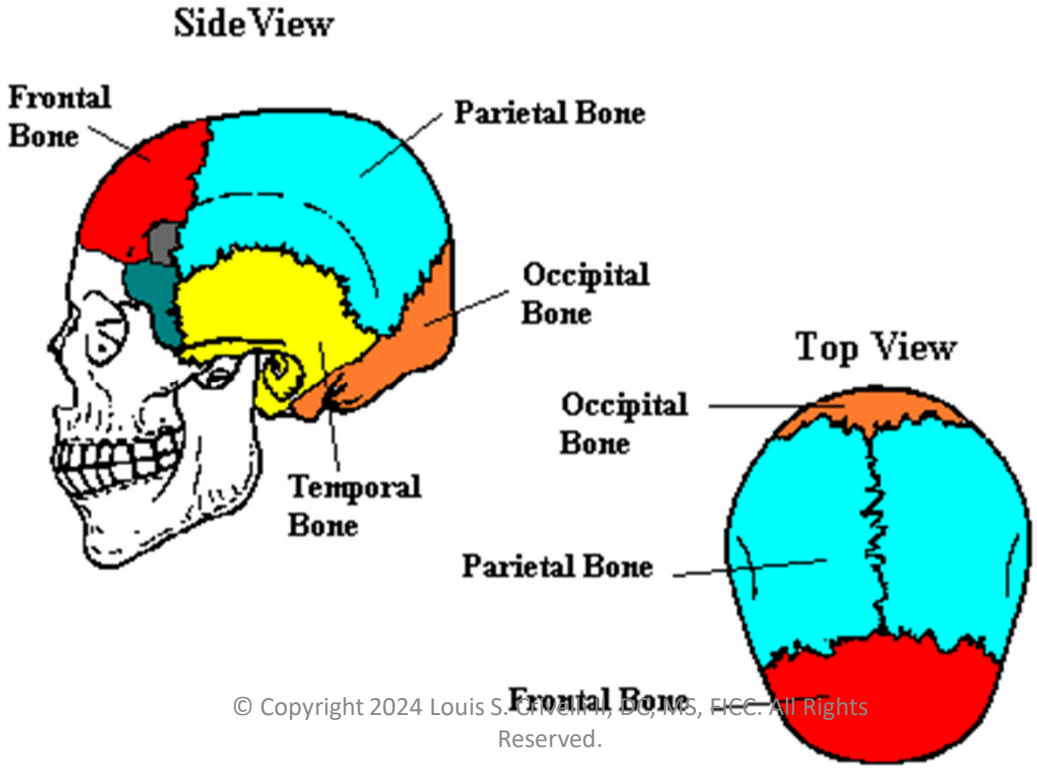


The Skull and Face

- 29 Total bones
- Cranial Bones (8)
- Facial Bones (14)
- Ossicles (6)
- Hyoid bone (1)

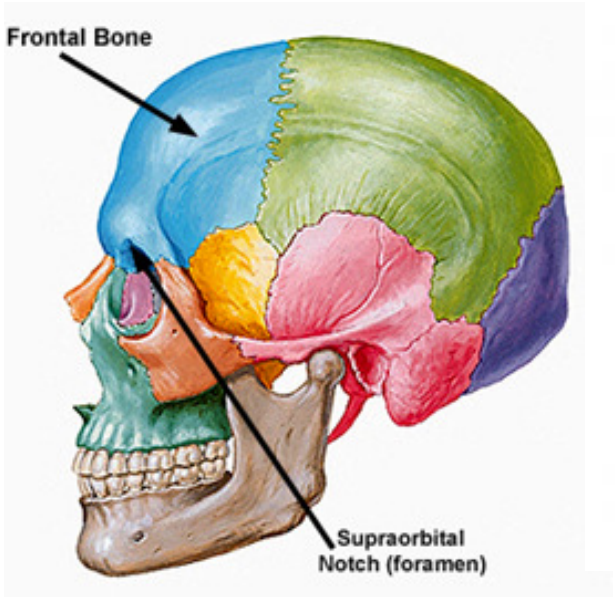
Cranial Bones

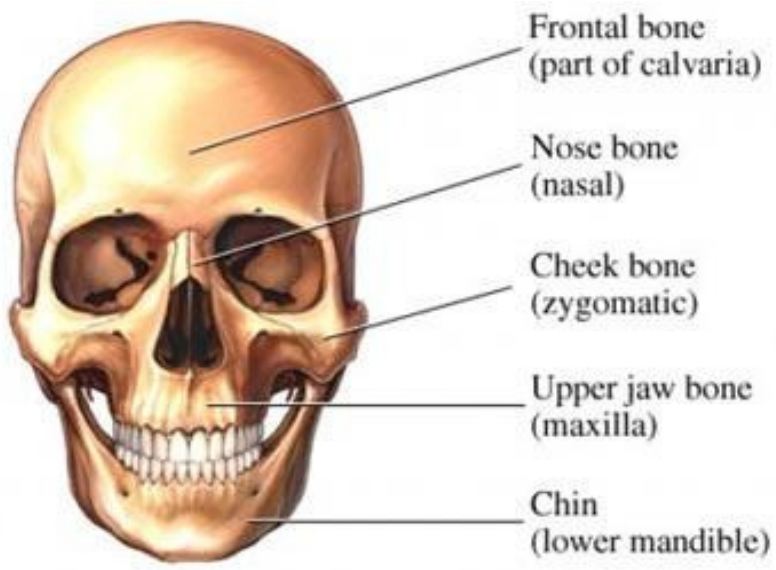
- Purpose – support and protect the brain



Cranial Bones

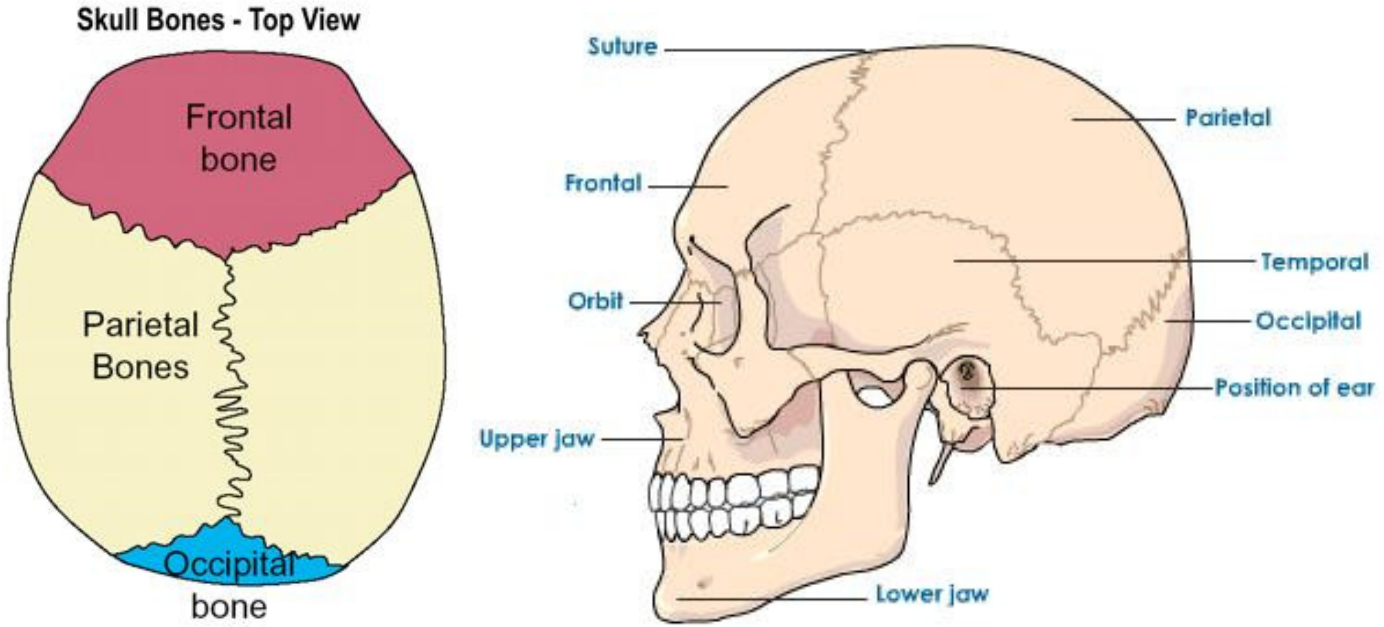
- Frontal bone (1)- Forms the forehead, part of the eye socket and part of the nose.





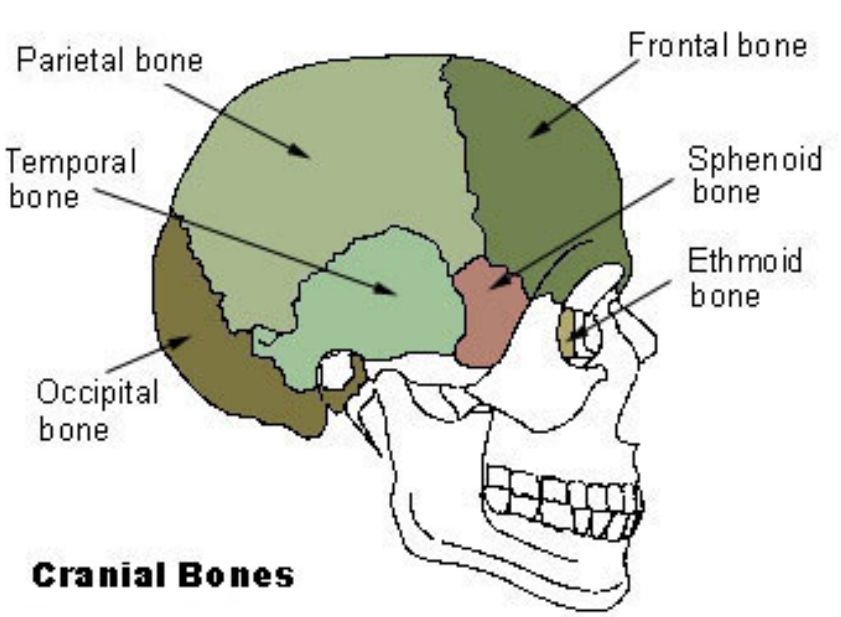
Cranial Bones

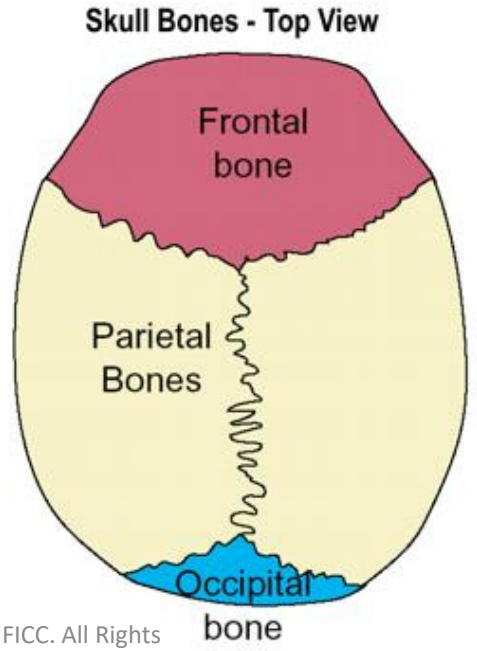
- Parietal Bones (2) – Forms the dome of the skull and upper side walls



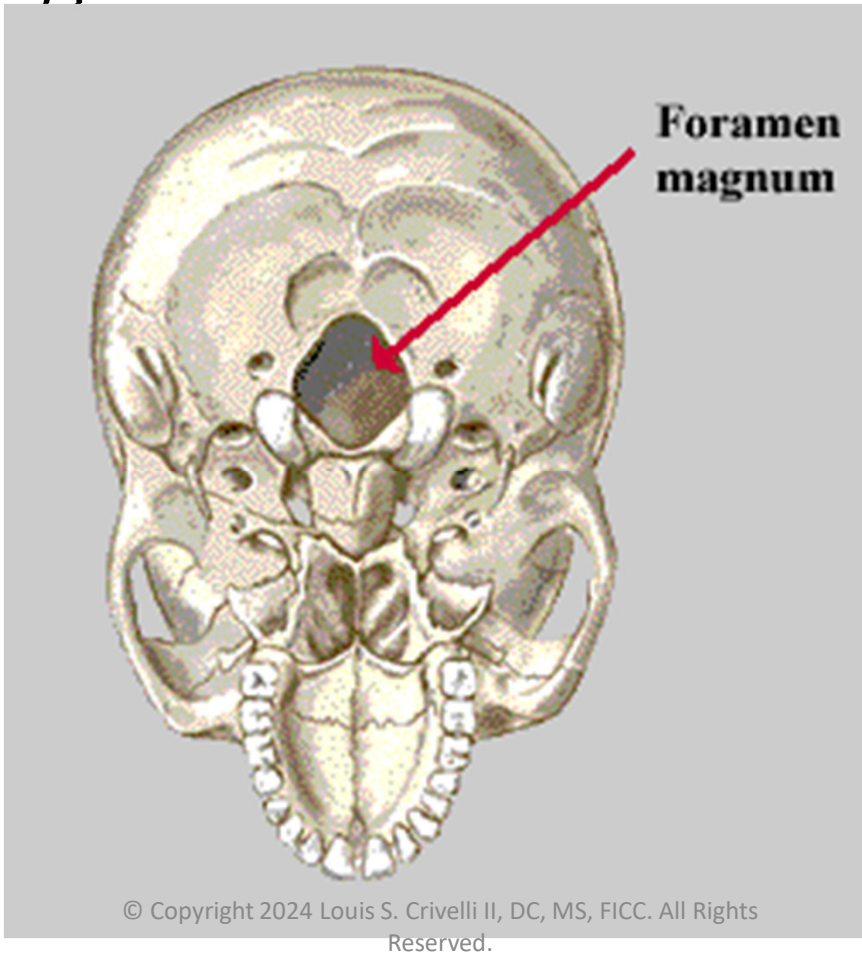
Cranial Bones

- Occipital Bone (1) – Posterior aspect and base of the skull. Contains the Foramen Magnum.



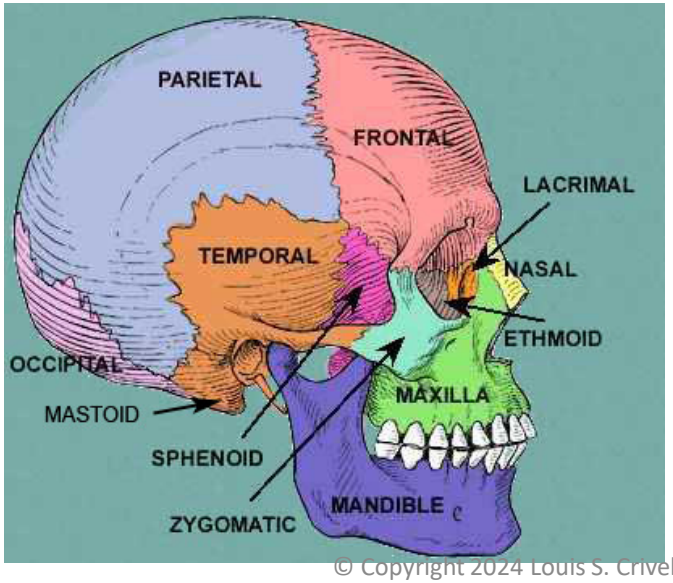


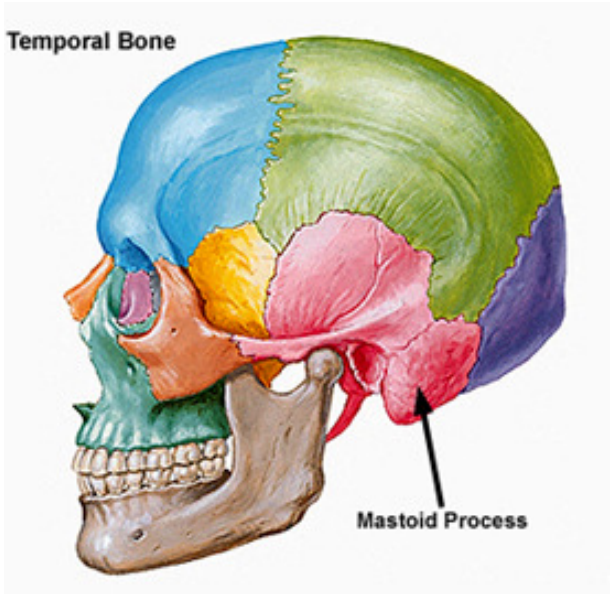
Foramen Magnum



Cranial Bones

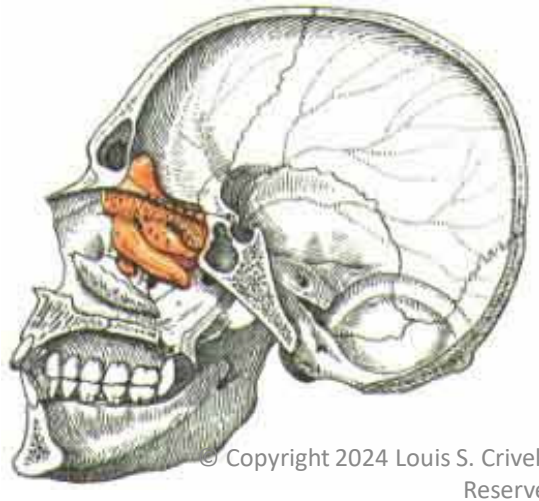
- Temporal Bones (2) – Inferior to the Parietal bones. Contains the organs for hearing and balance.

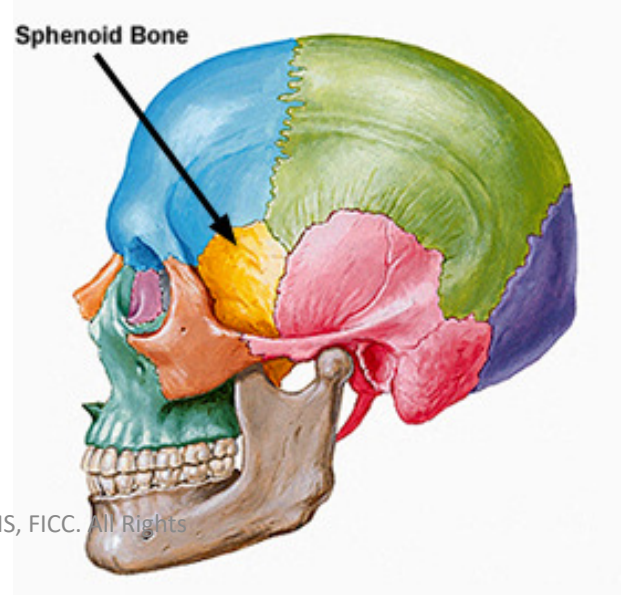




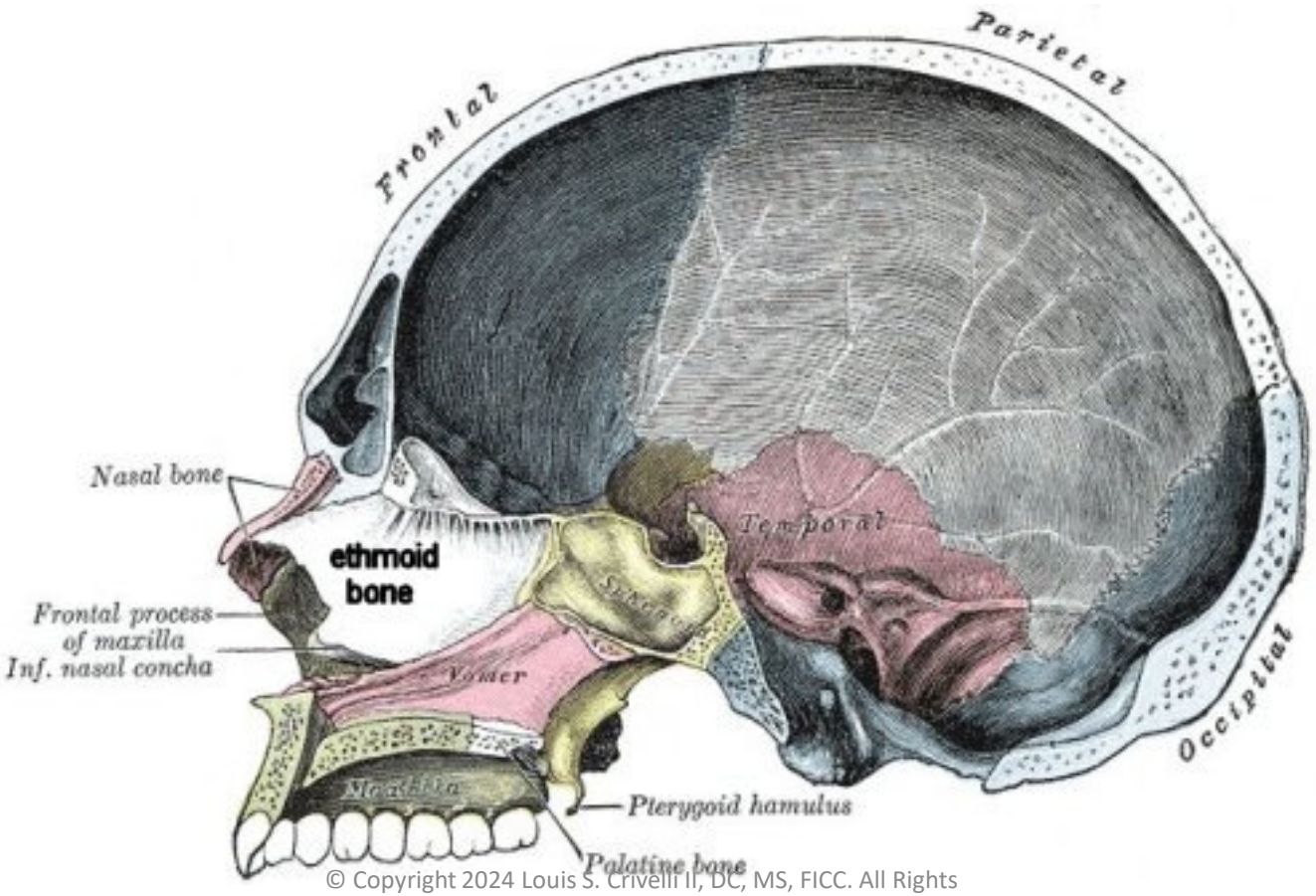
Cranial Bones

- Ethmoid Bone (1)
- Sphenoid Bone (1)
- Collectively, these bones complete the floor of the cranium.



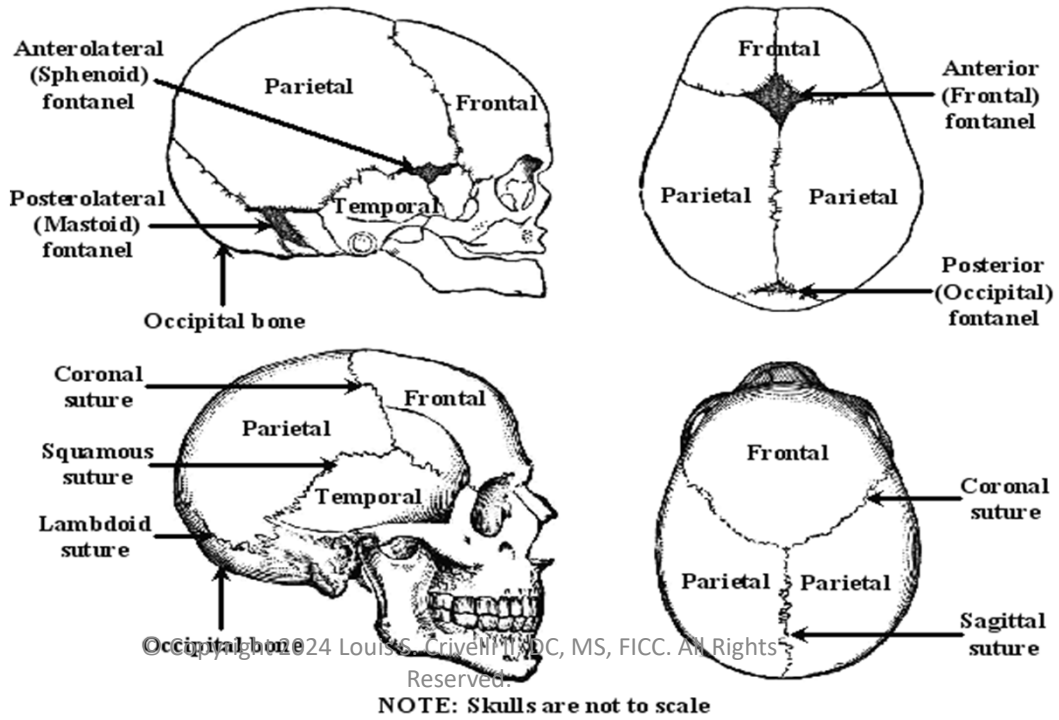


Ethmoid/Sphenoid Bones



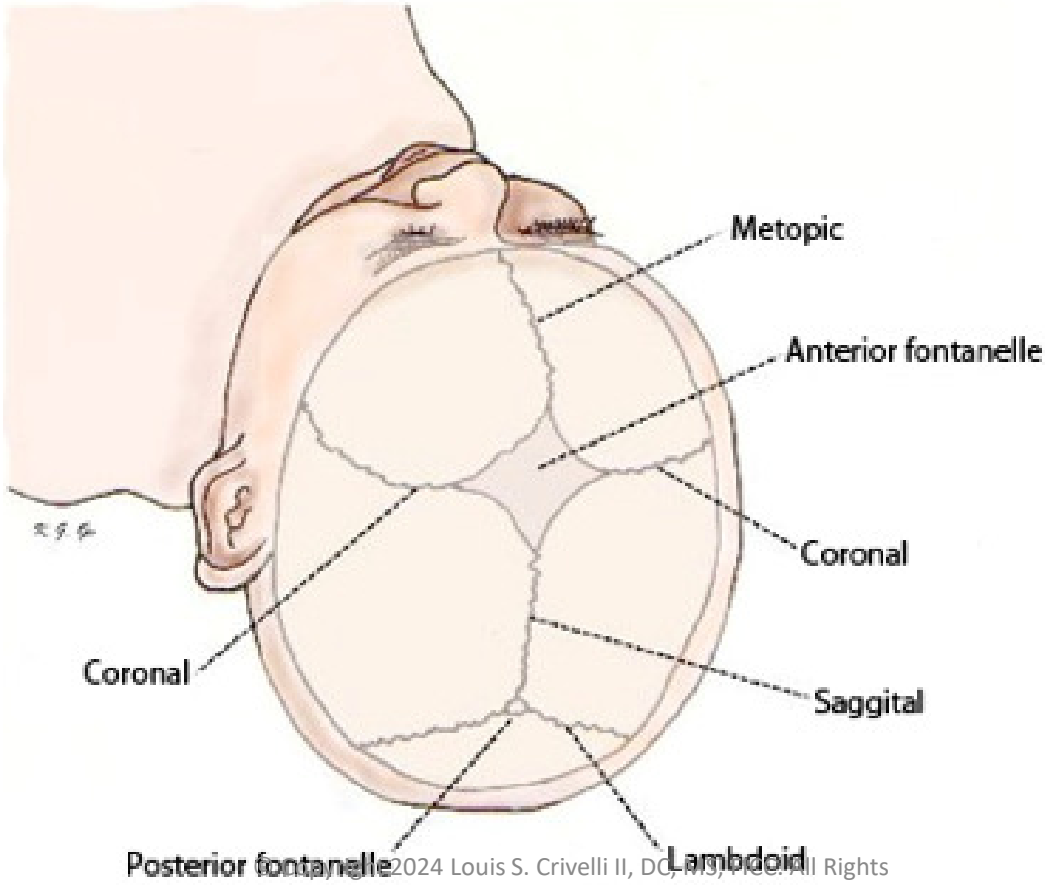
Cranial Bones

- Sutures – Joints in the skull. Fused shortly after birth.



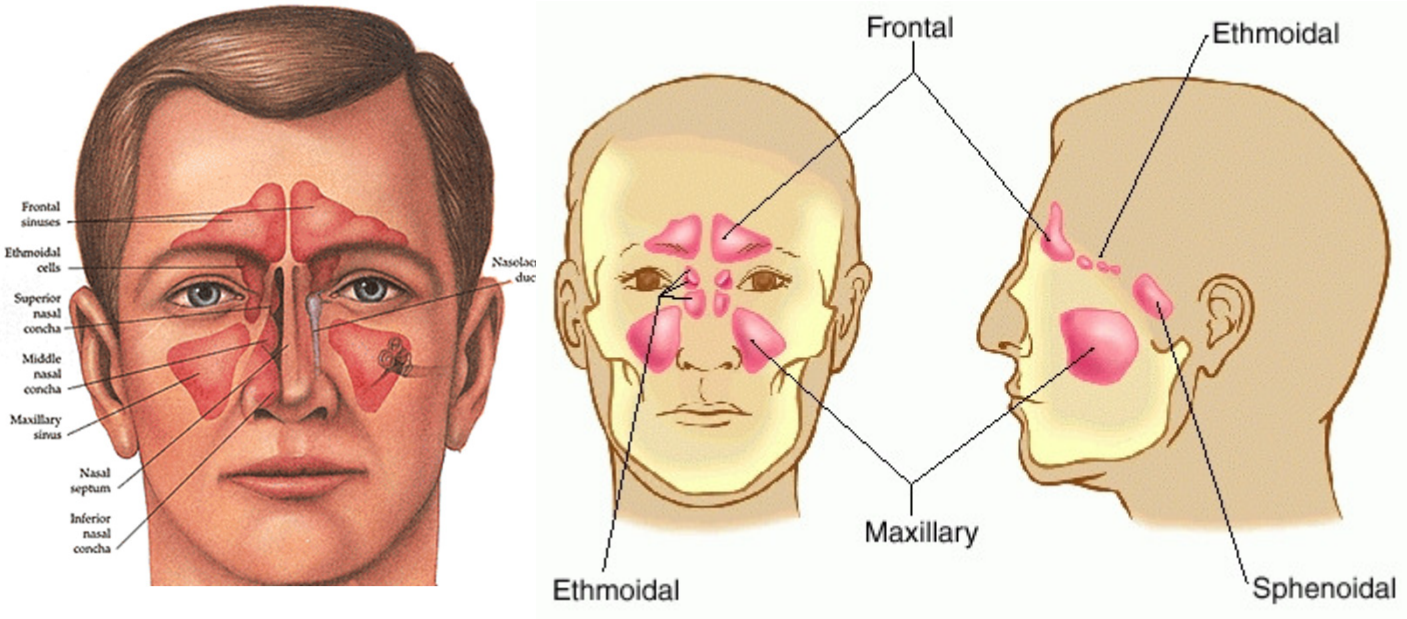
Cranial Sutures

View from top of head



Cranial Bones

- Sinuses – Air spaces located in the frontal, ethmoid, and sphenoid bones.

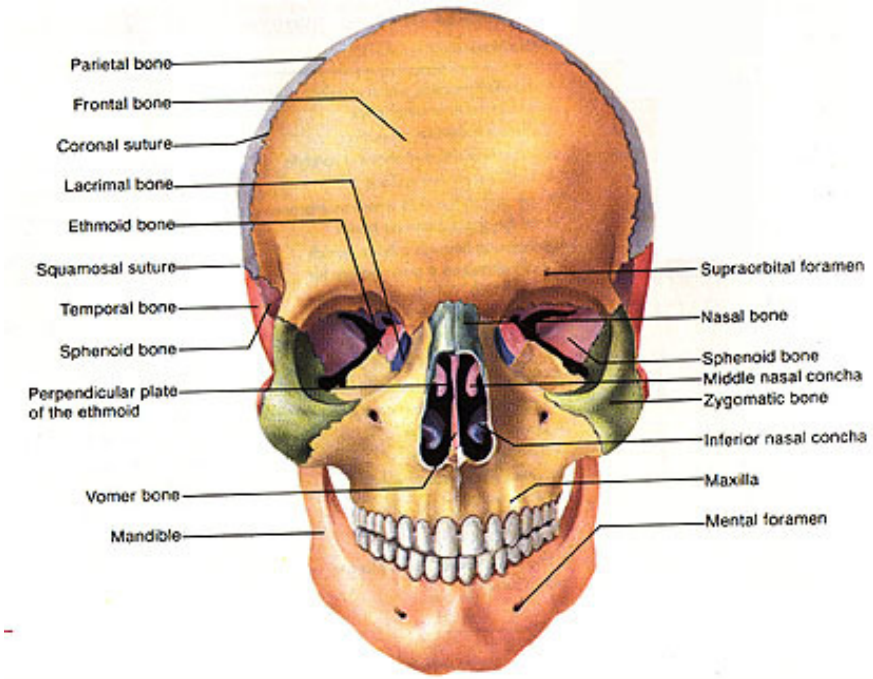


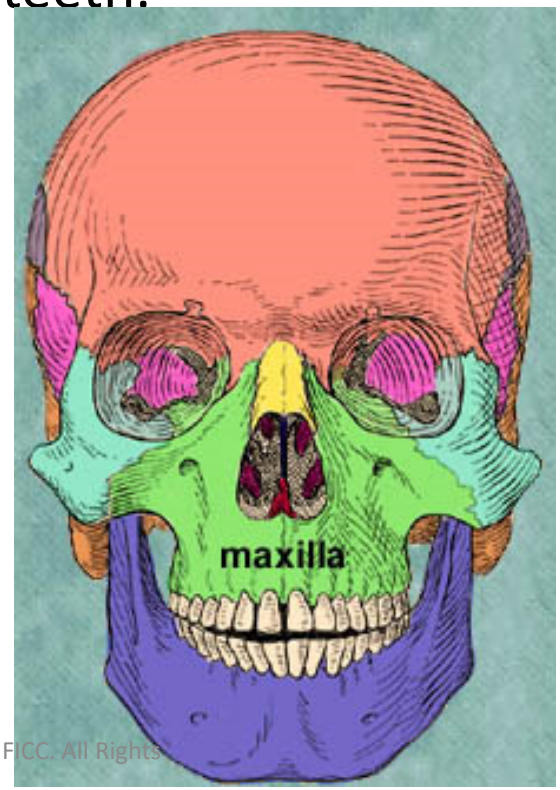
Facial Bones

- 14 Total Bones that fit together like a jigsaw puzzle.
- The eye socket is formed from 7 different bones.
- Maxillary Bones (2)
- Mandible (1)
- Zygomatic Bones (2)
- Small bones of the nose and roof of mouth (9)

Facial Bones

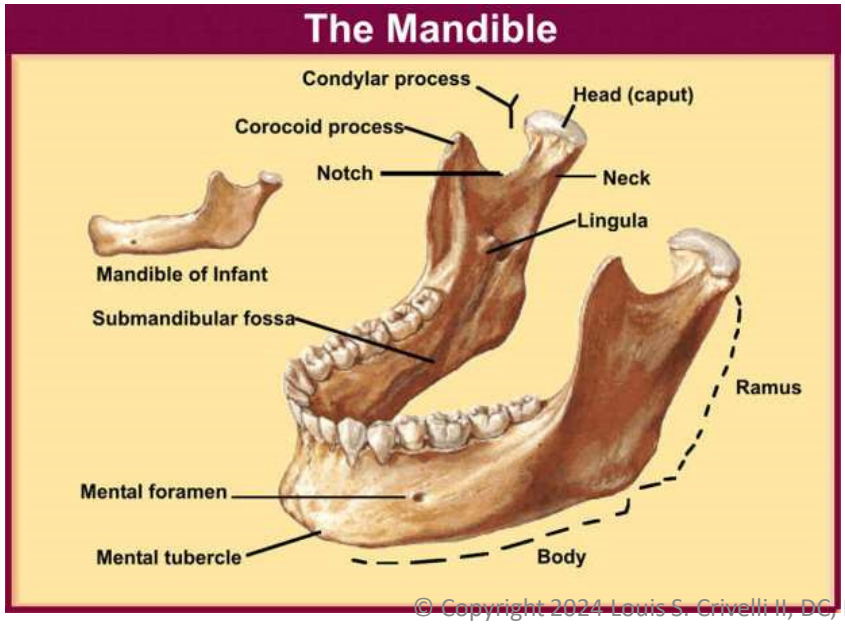
- Maxillary Bones (2) – Support the upper teeth.

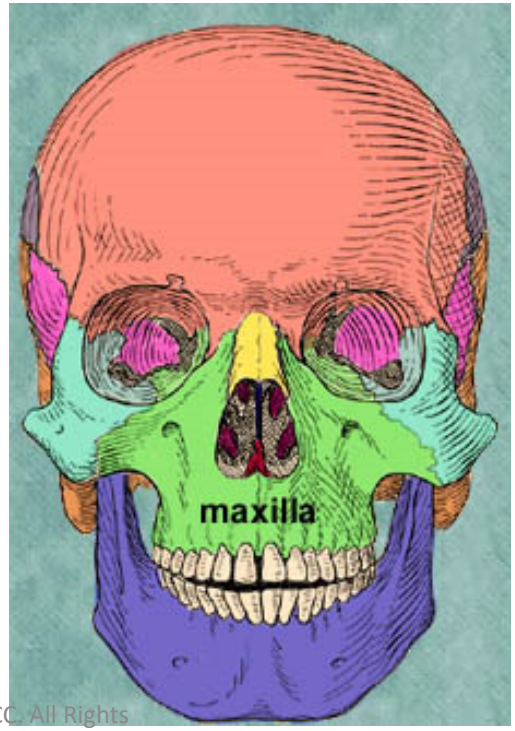




Facial Bones

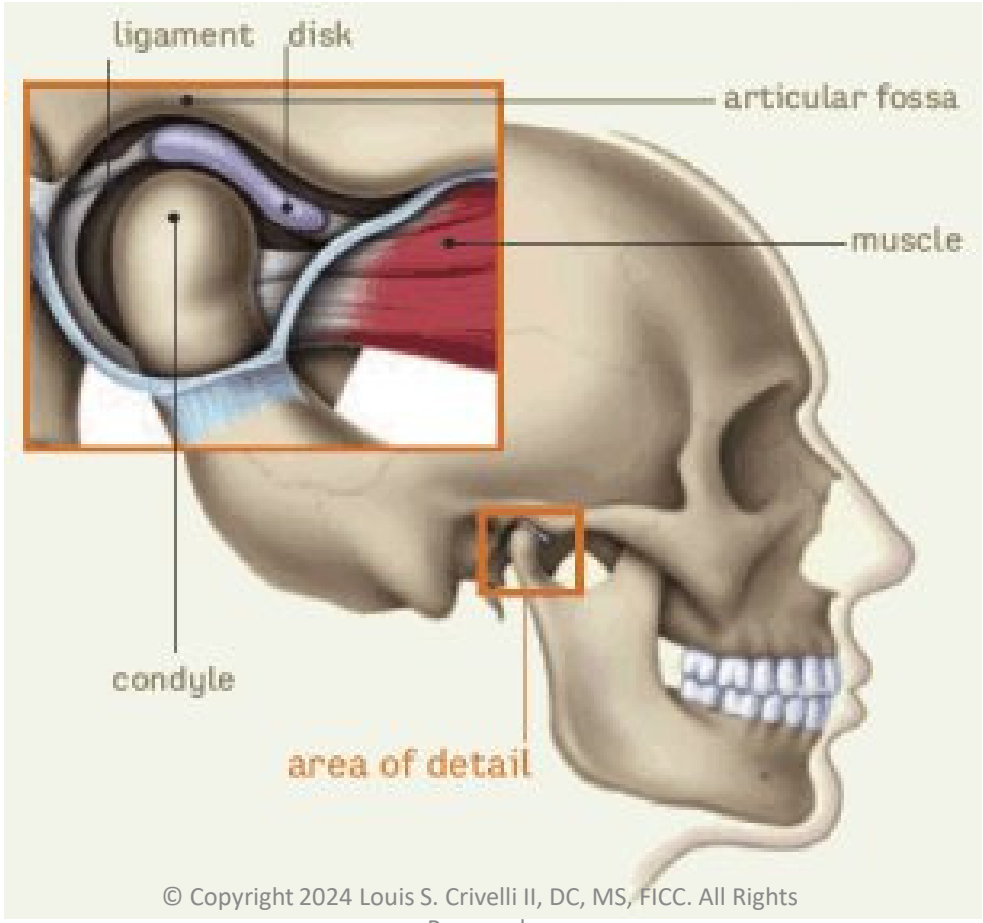
- Mandible (Jawbone) – supports the lower teeth.





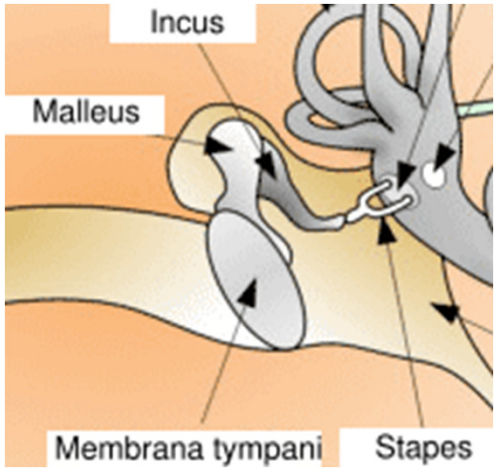
Mandible

Temporomandibular Joint (TMJ)



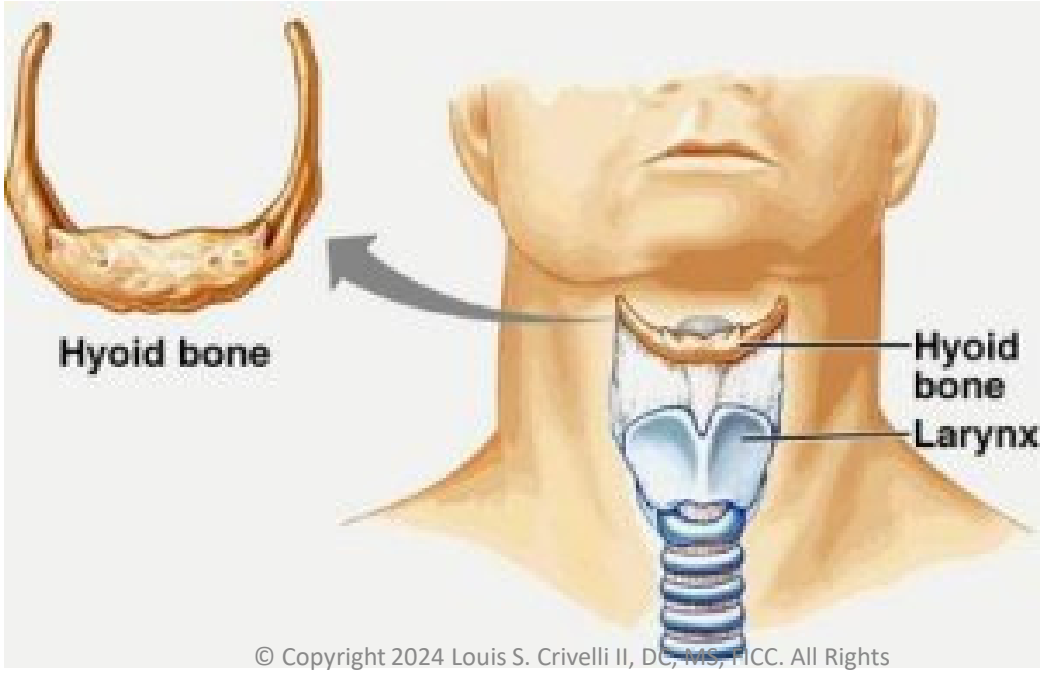
Ossicles

- 3 tiny bones in each ear
- Allow for sound amplification and transformation



Hyoid Bone

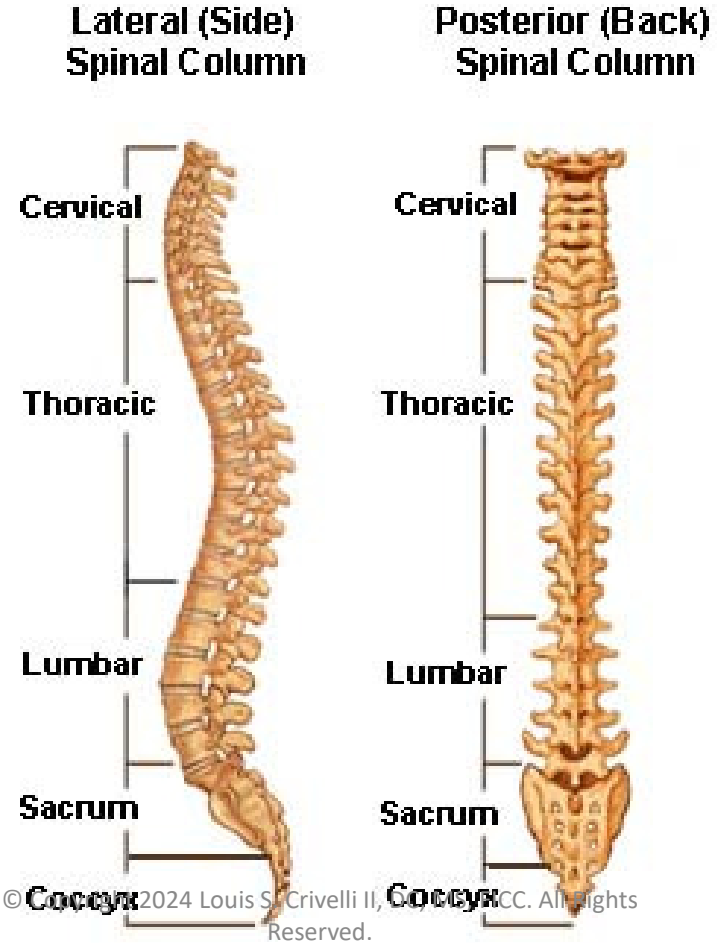
- The primary function of the hyoid bone is to serve as an anchoring structure for the tongue



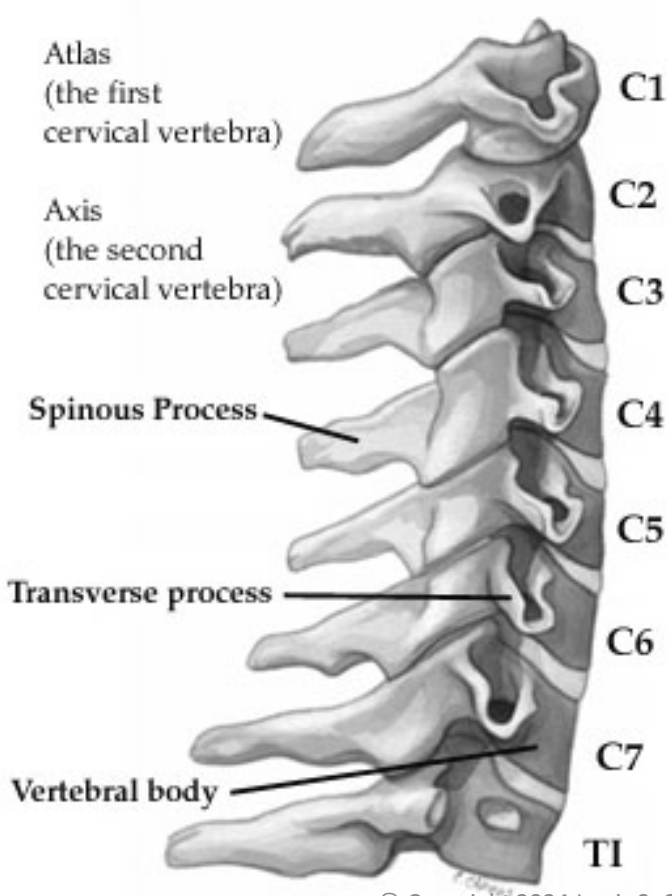
Vertebral Column

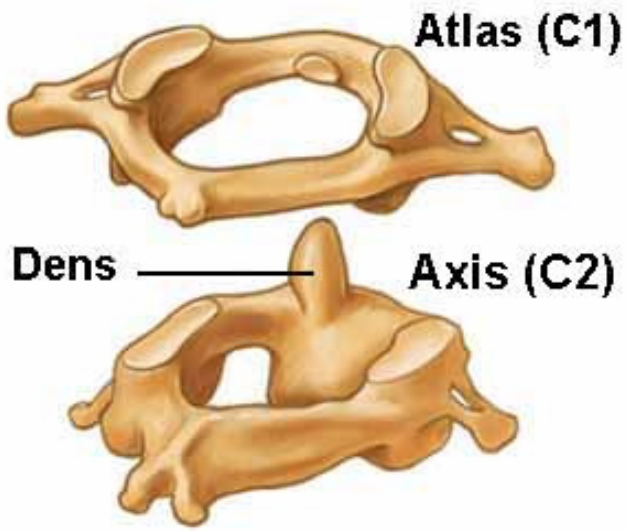
- 26 Bones
  - 7 cervical
  - 12 thoracic
  - 5 lumbar
  - 1 sacrum
  - 1 coccyx
- Forms a flexible structure, supports the head, thorax, abdomen, and upper extremities.
- Protection of the spinal cord

Vertebral Column

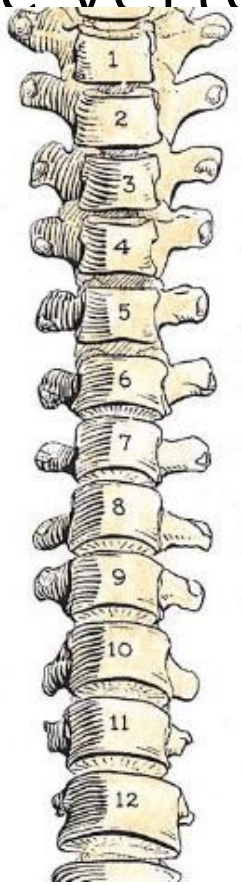


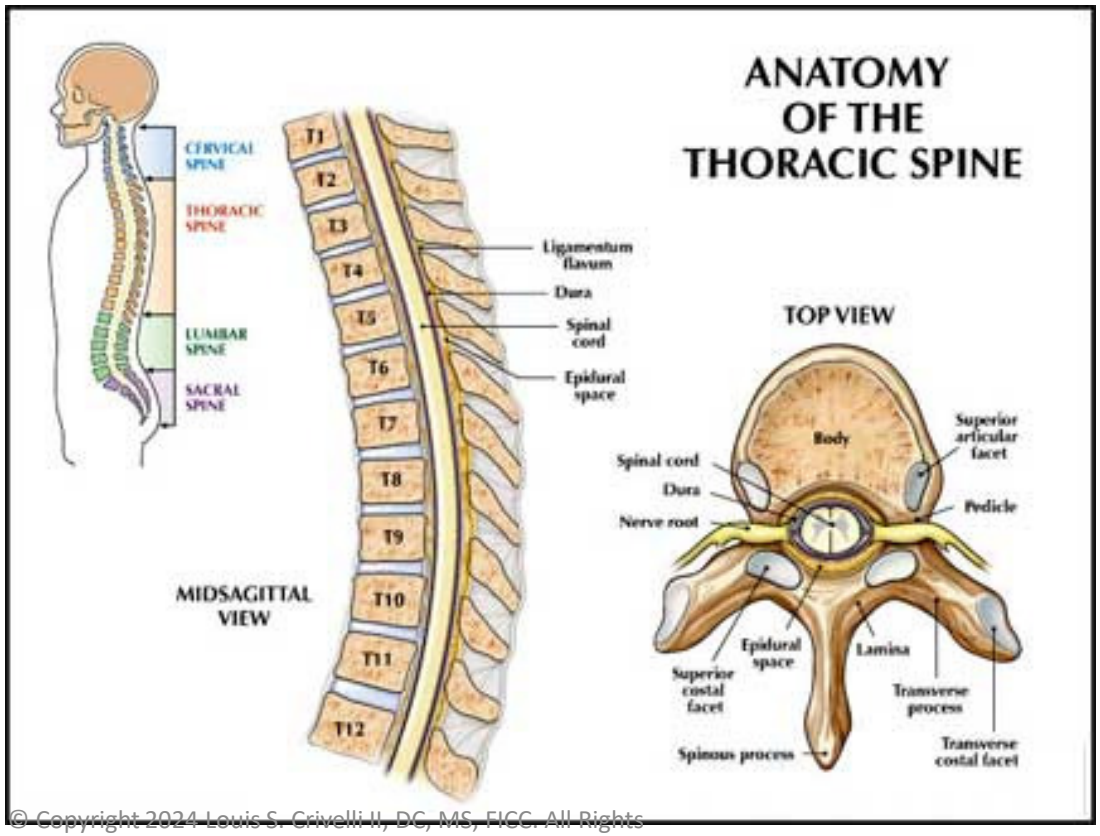
Cervical Vertebrae





Thoracic Vertebrae

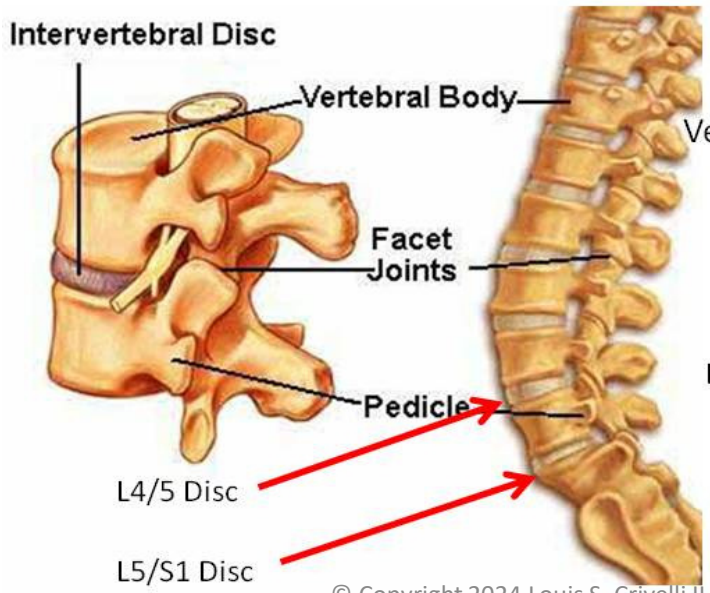




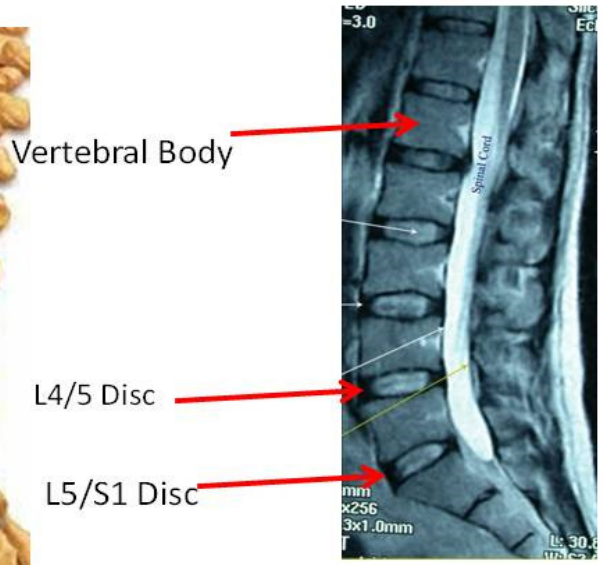
Lumbar Vertebrae

Basics of the Lumbar Spine

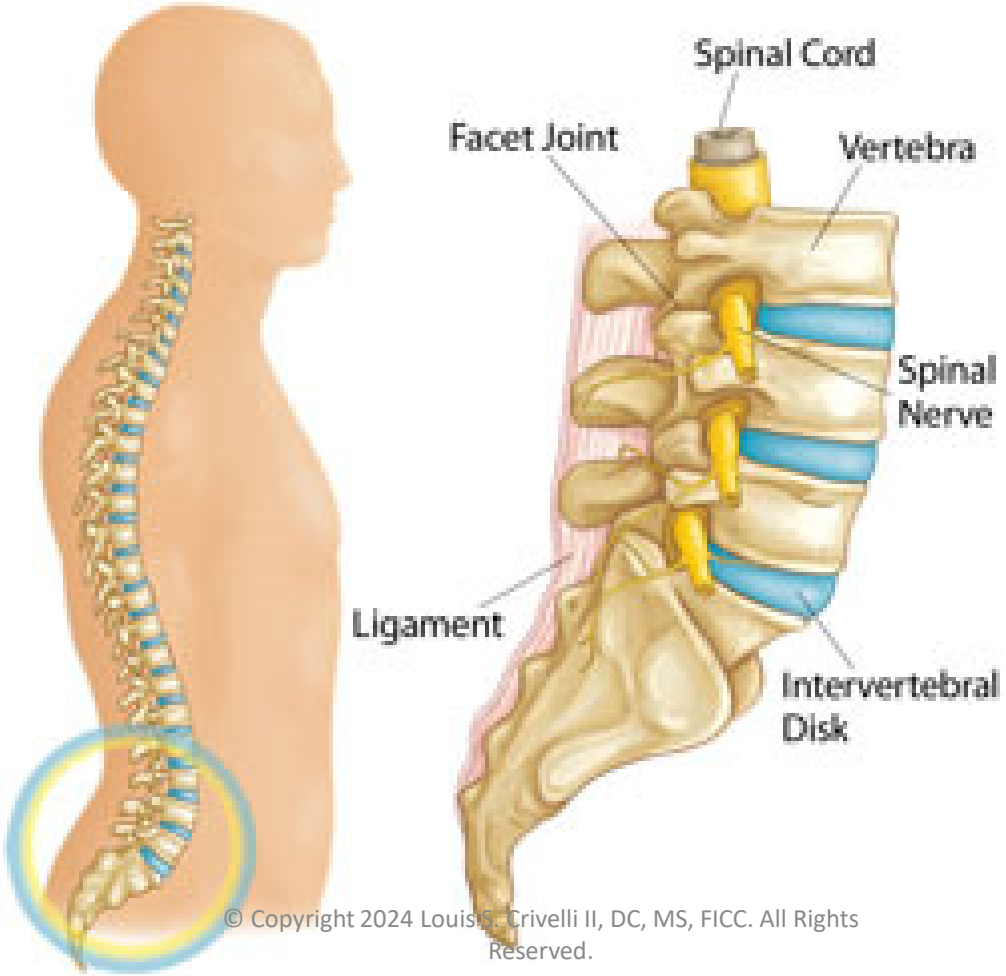
Lumbar Spine



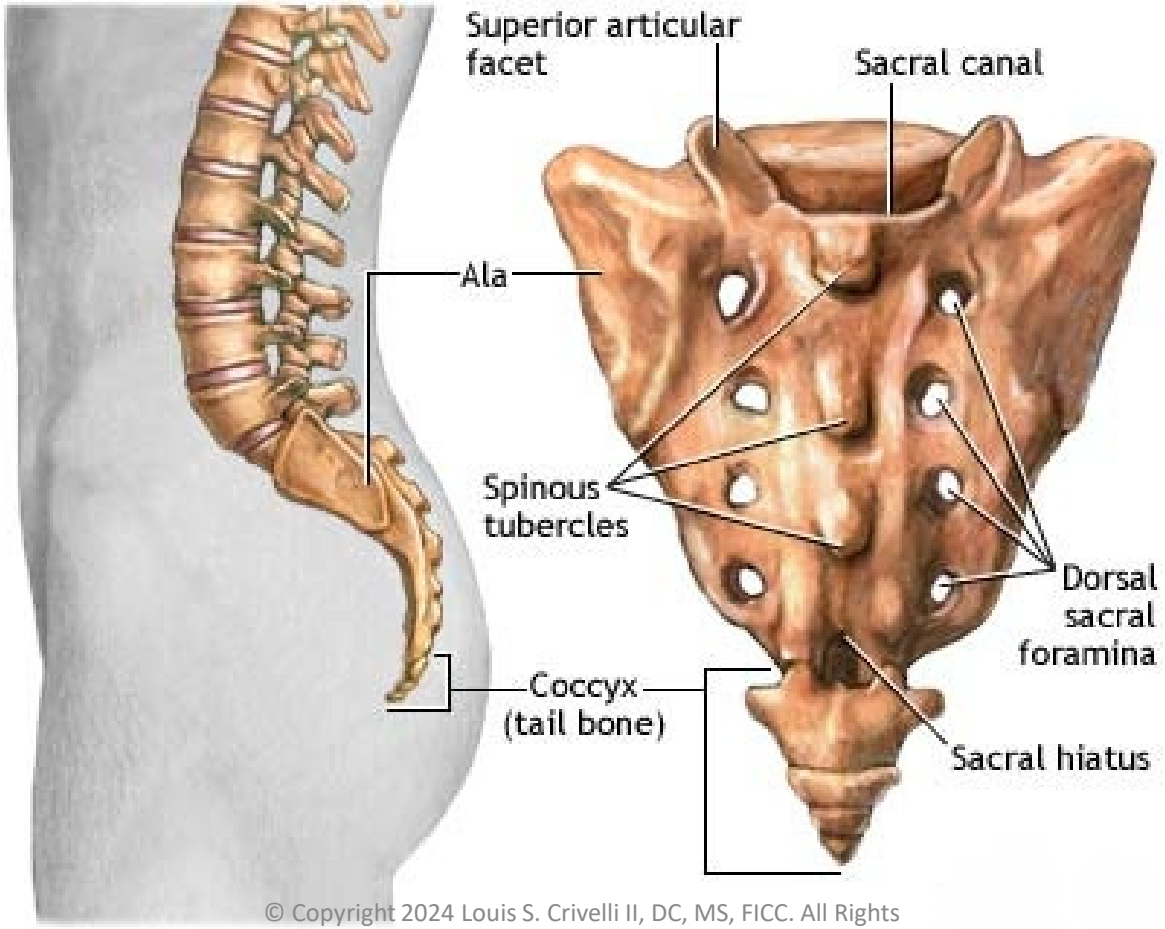
MRI of Normal Spine



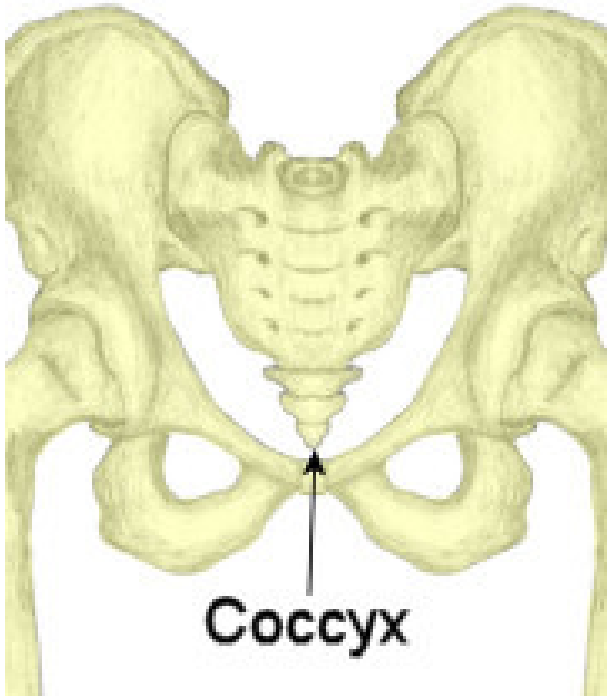
Lumbar Vertebrae



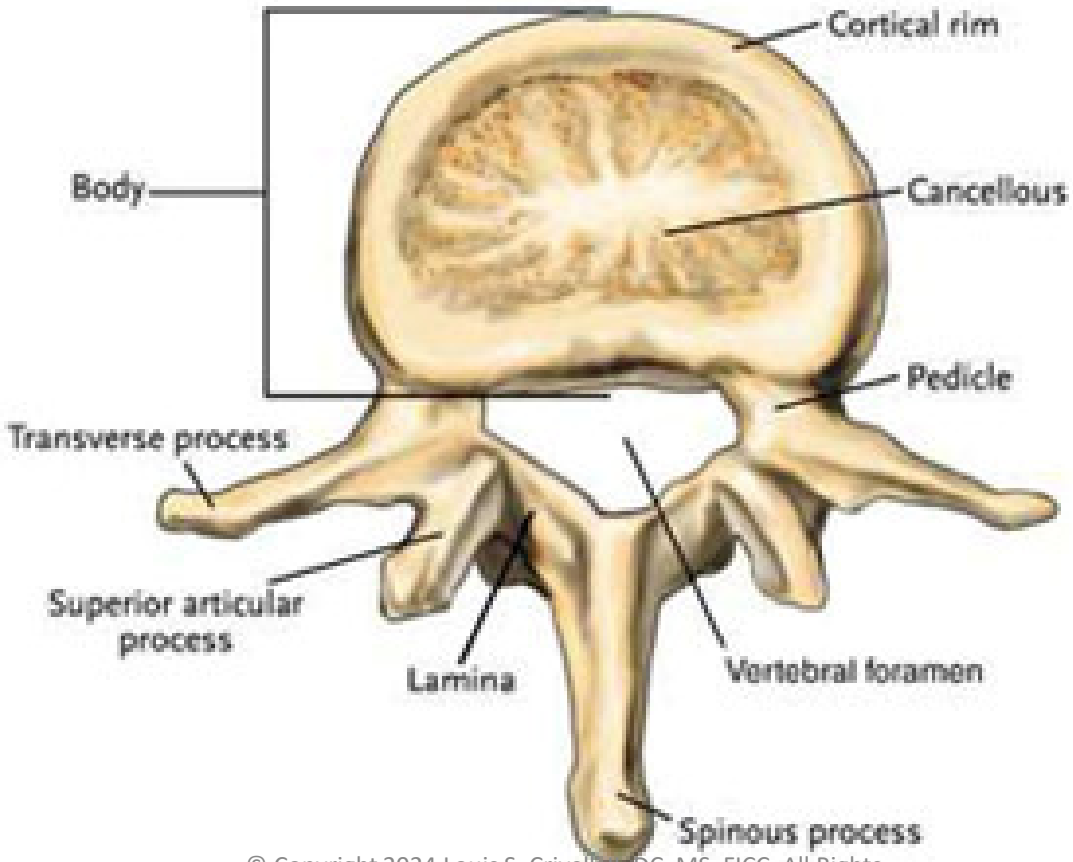
Sacrum



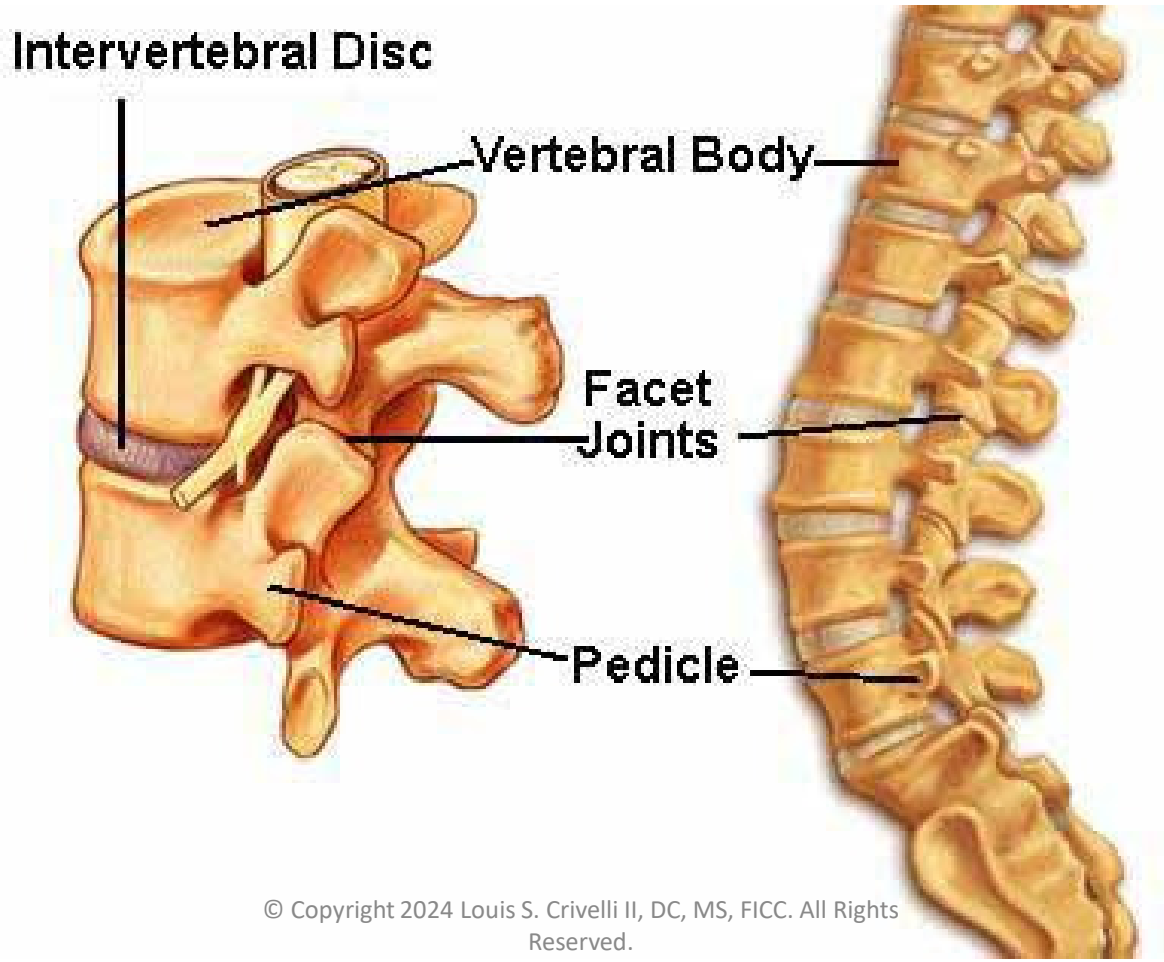
Coccvx



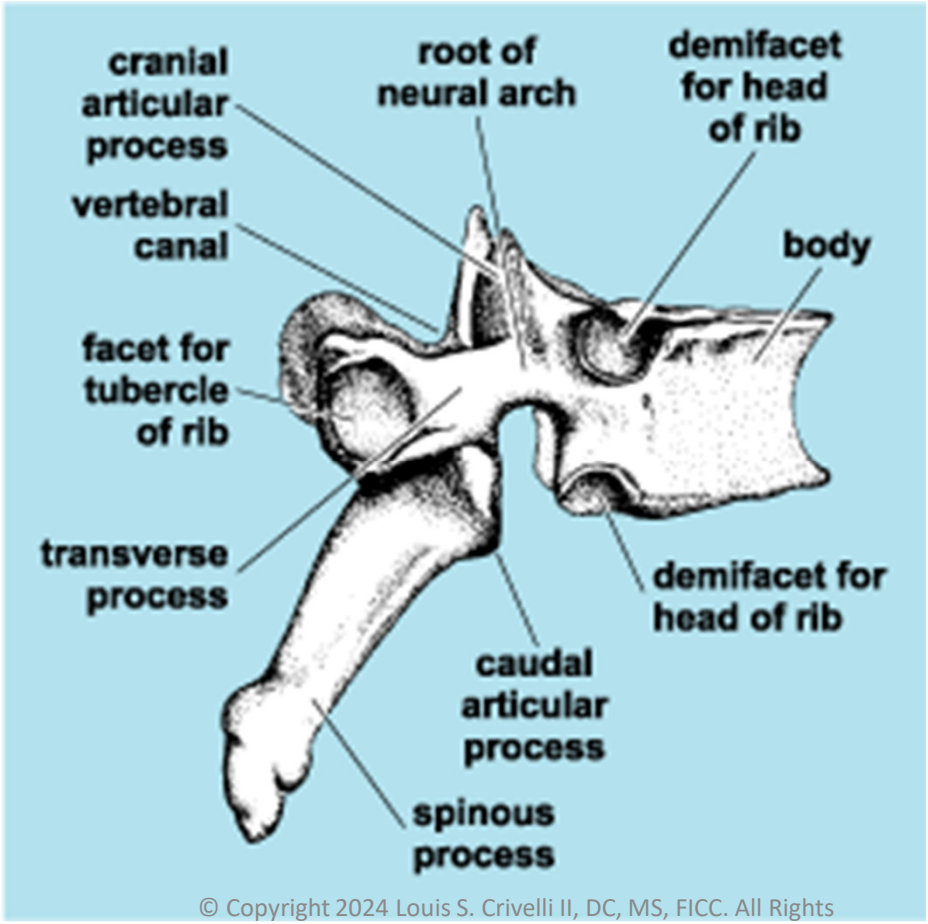
Vertebral Structure



Vertebral Structure

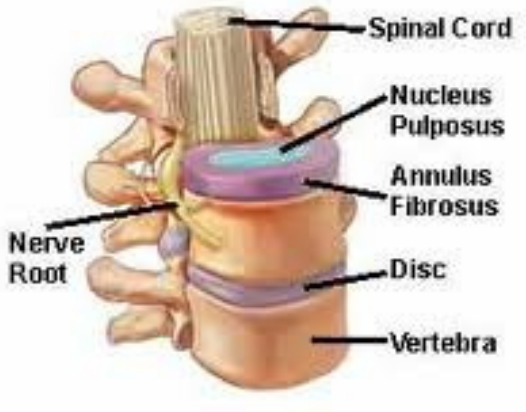


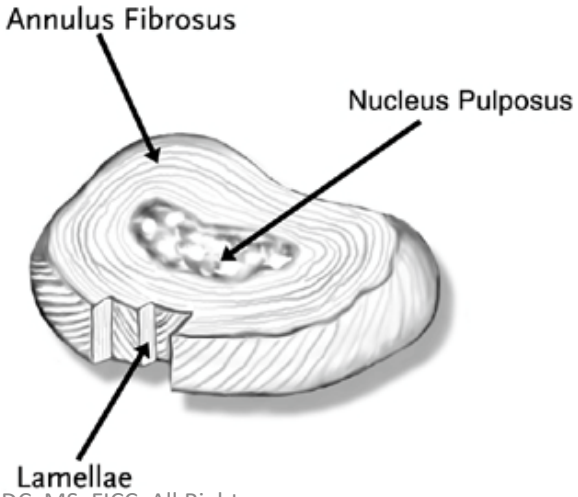
Vertebral Structure



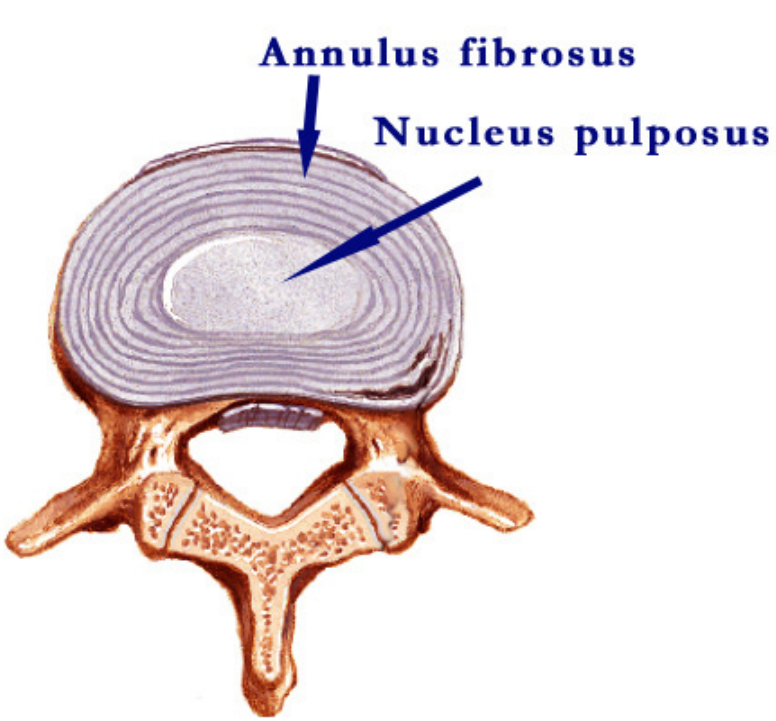
Intervertebral Disc (IVD)

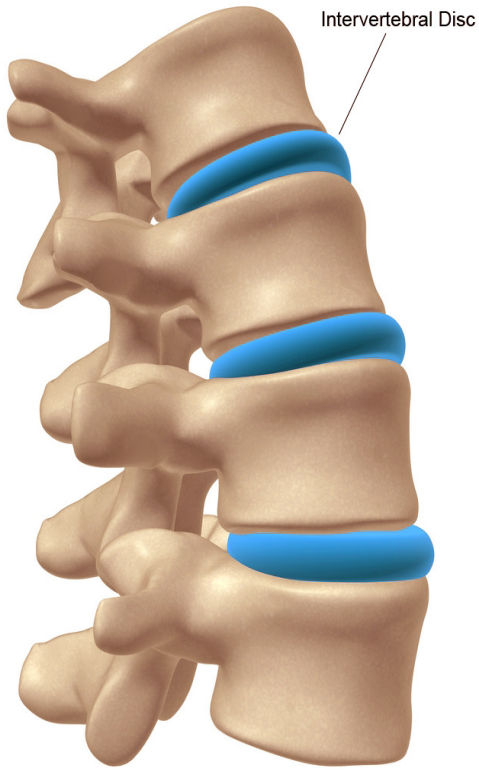
- Located between vertebral bodies.
- Composed of Fibrocartiliage
- Functions as a “shock absorber”



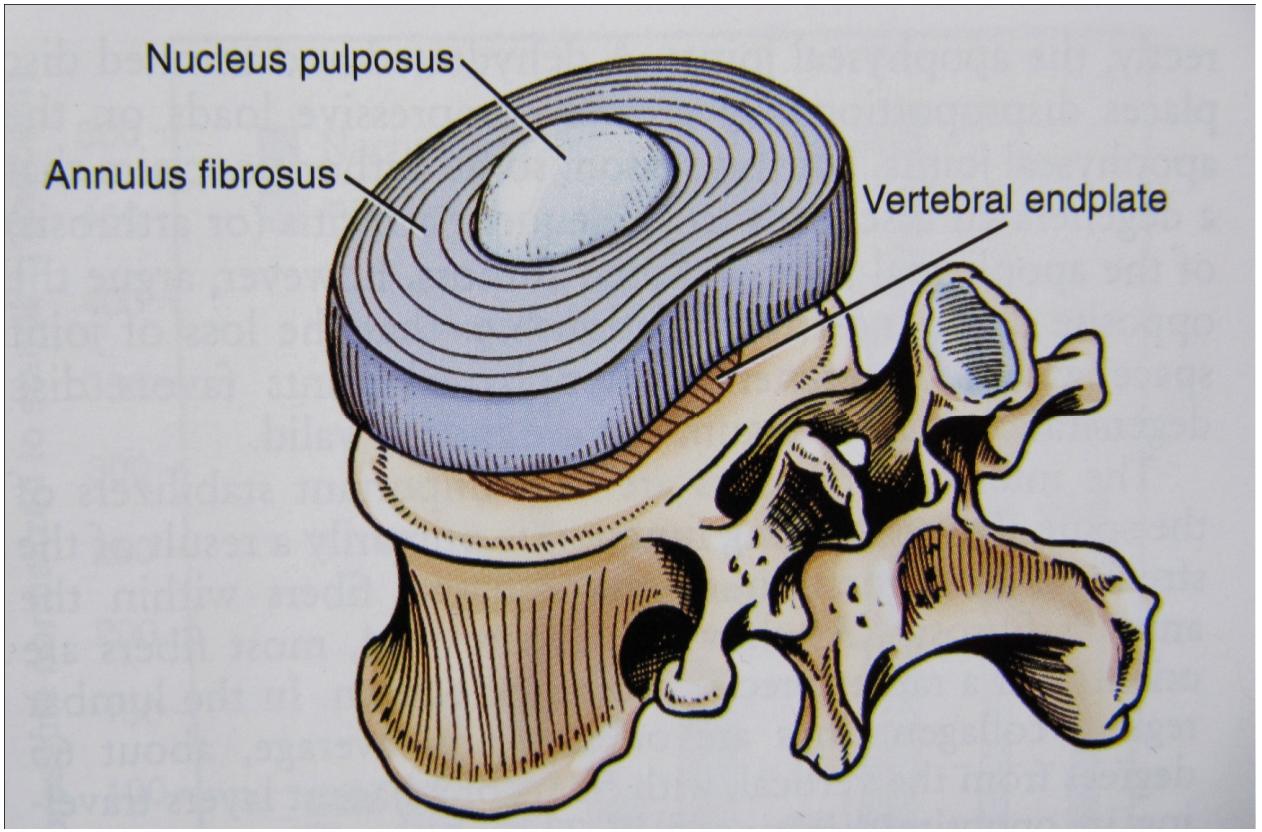


Intervertebral Disc

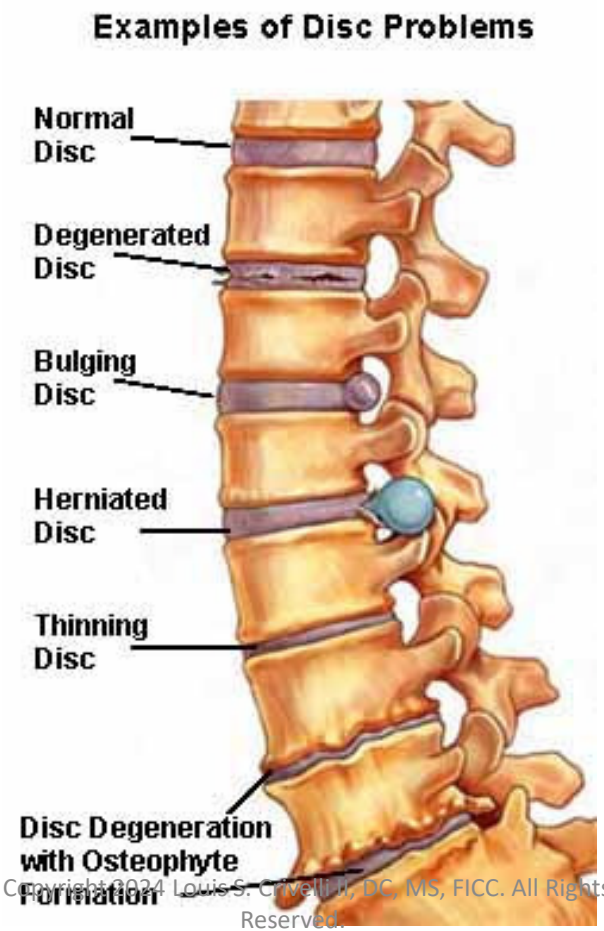




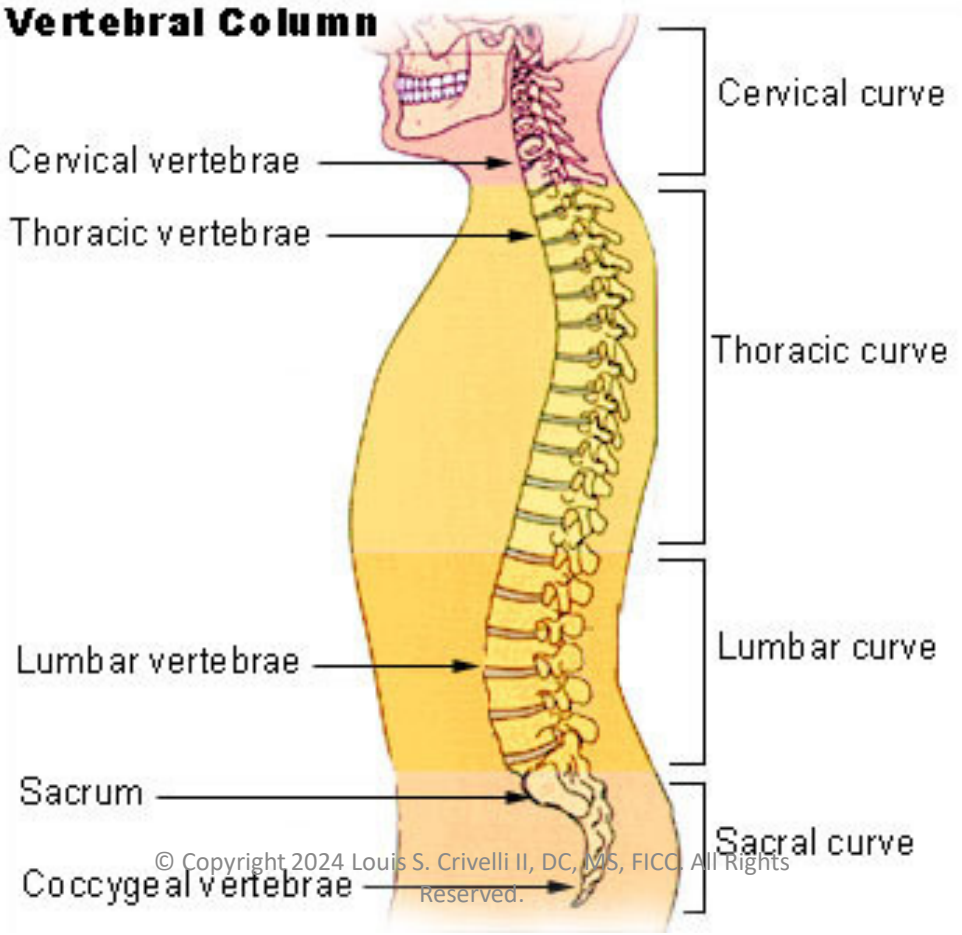
Intervertebral Disc

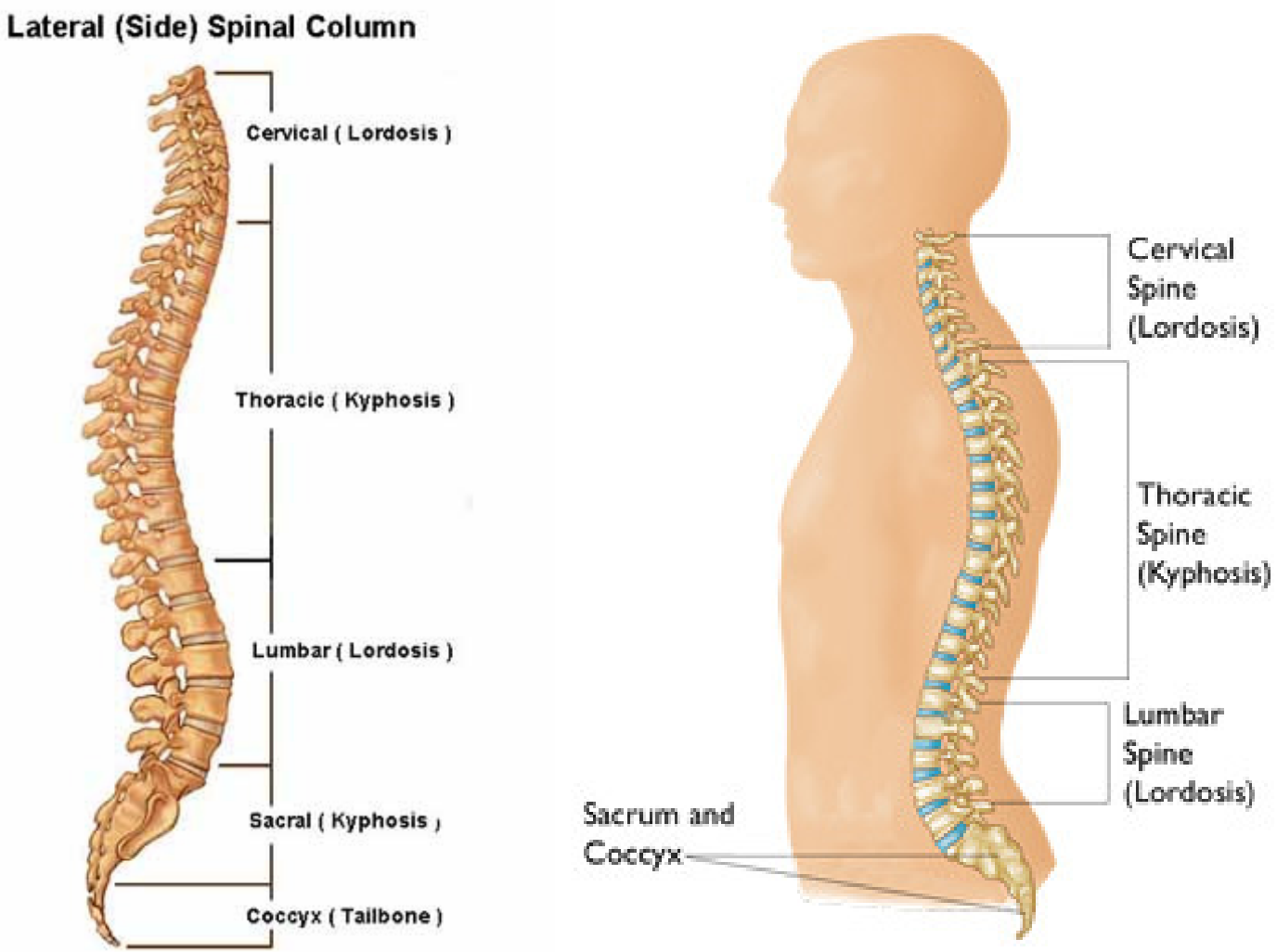


Intervertebral Disc



Spinal Curves



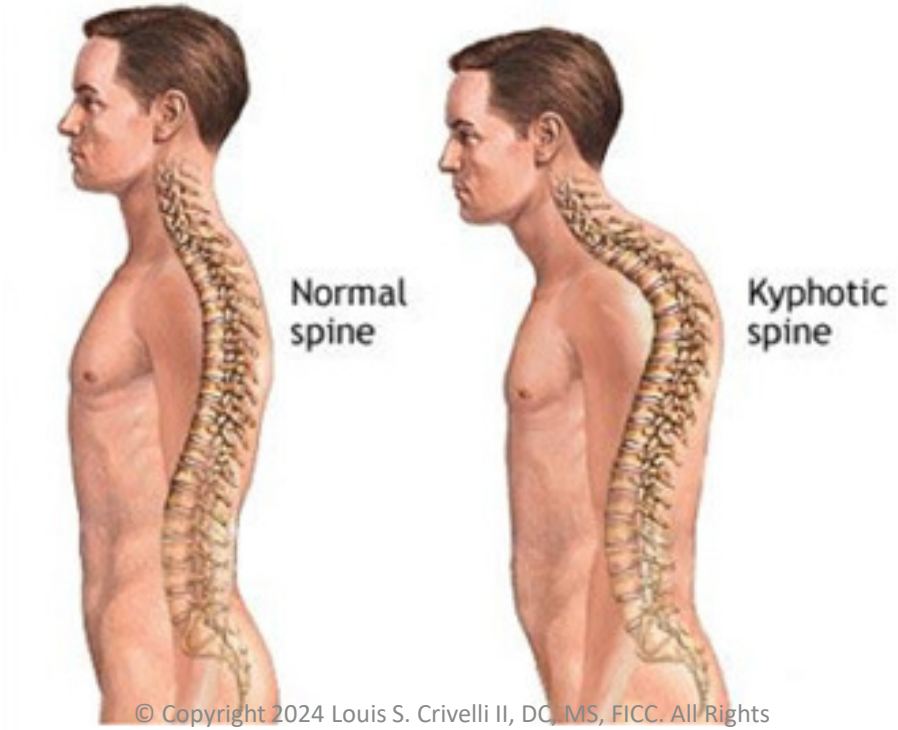


Abnormal Curves

- Exaggerated lumbar lordosis (hyperlordosis)

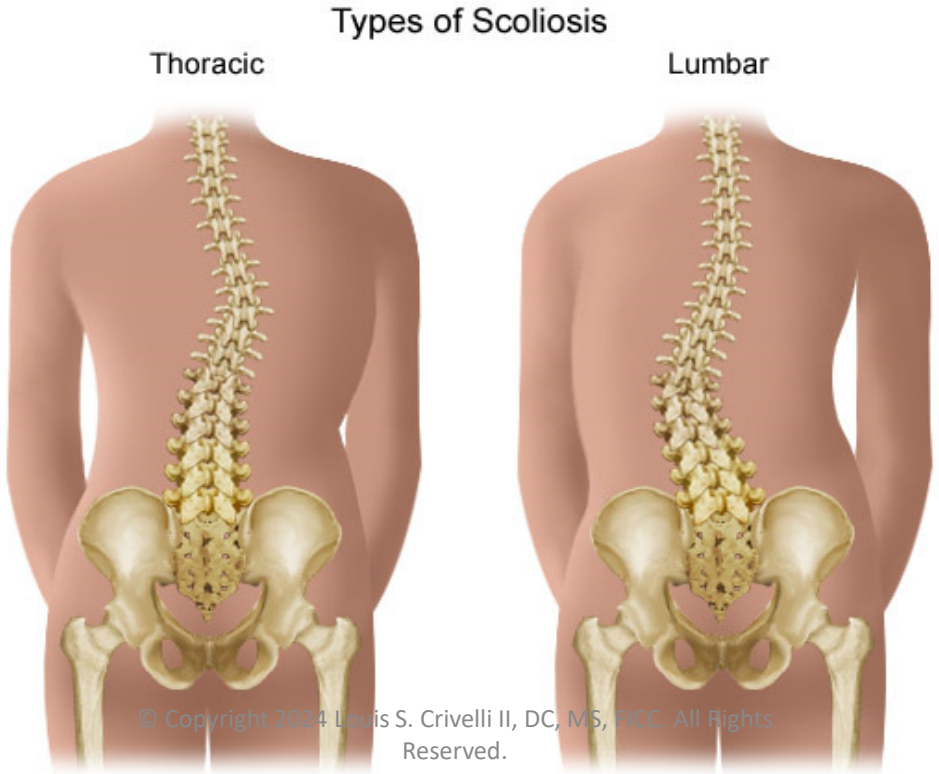
Abnormal Curves

- Exaggerated thoracic kyphosis (hyperkyphosis)

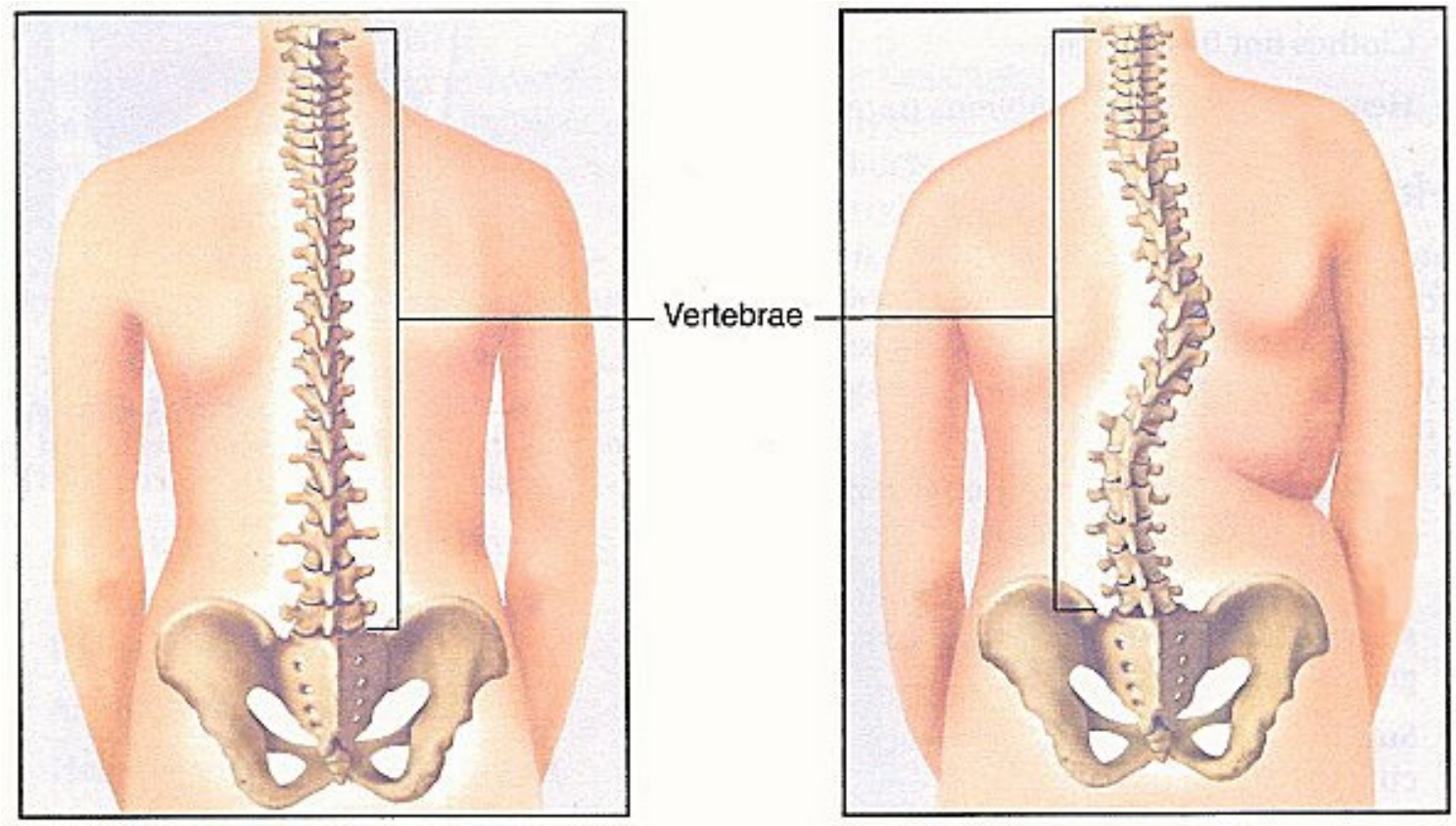


Abnormal Curves

- Scoliosis – Excessive sideways curve

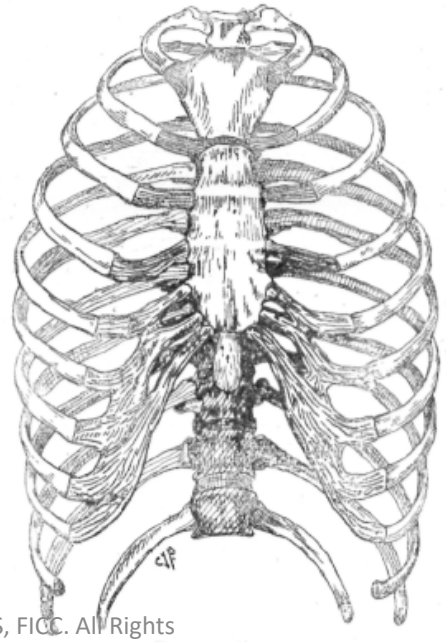


Scoliosis

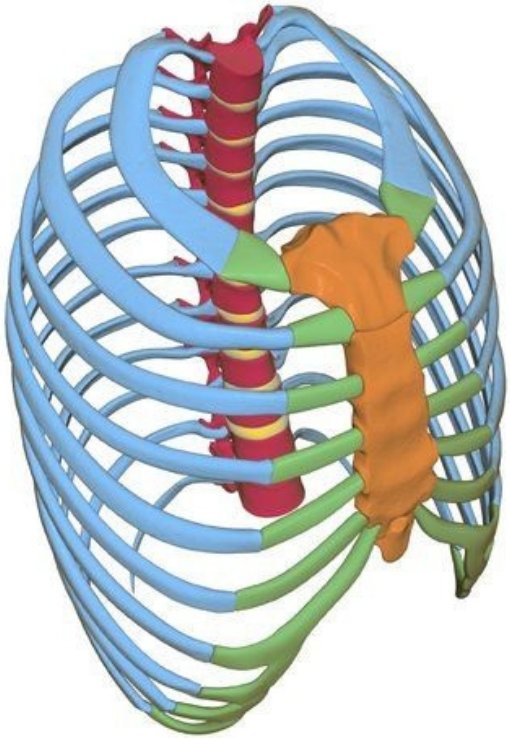


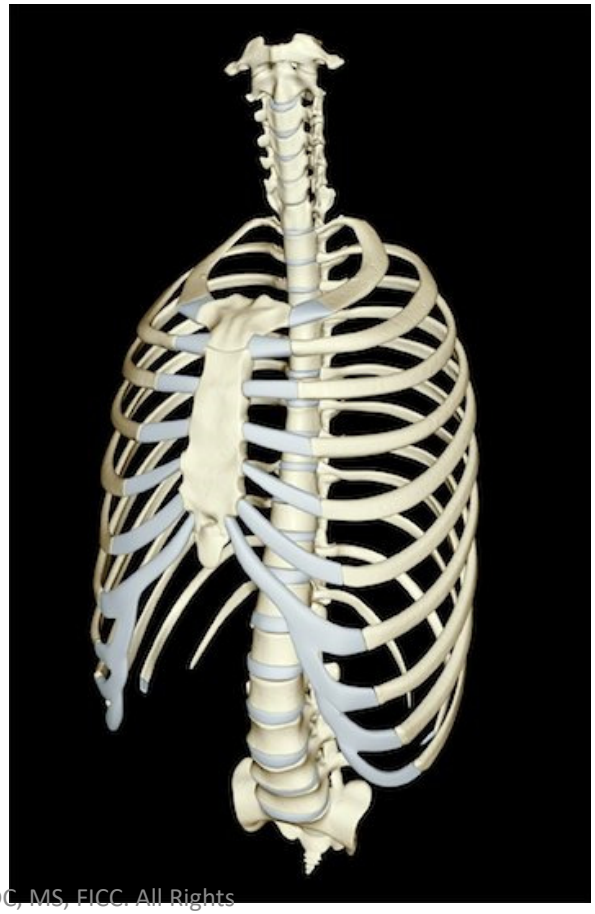
The Thorax

- The chest cage is formed by 25 bones.
- It contains and protects the heart and lungs.
- Contains
  - 12 Thoracic vertebrae
  - 12 pairs of ribs
  - Sternum



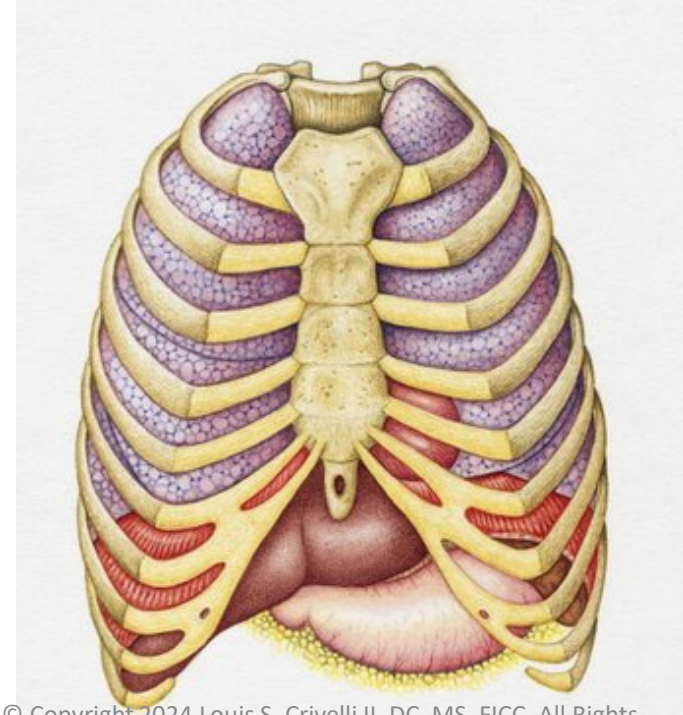
The Thorax



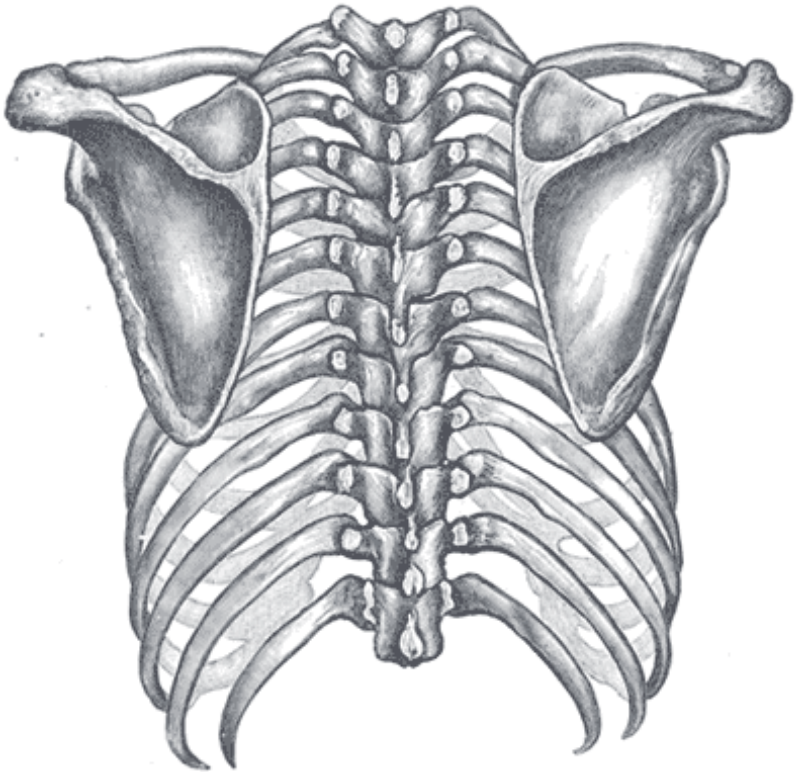


Thoracic Cage

- Protection, protection, protection



12 Thoracic Vertebrae

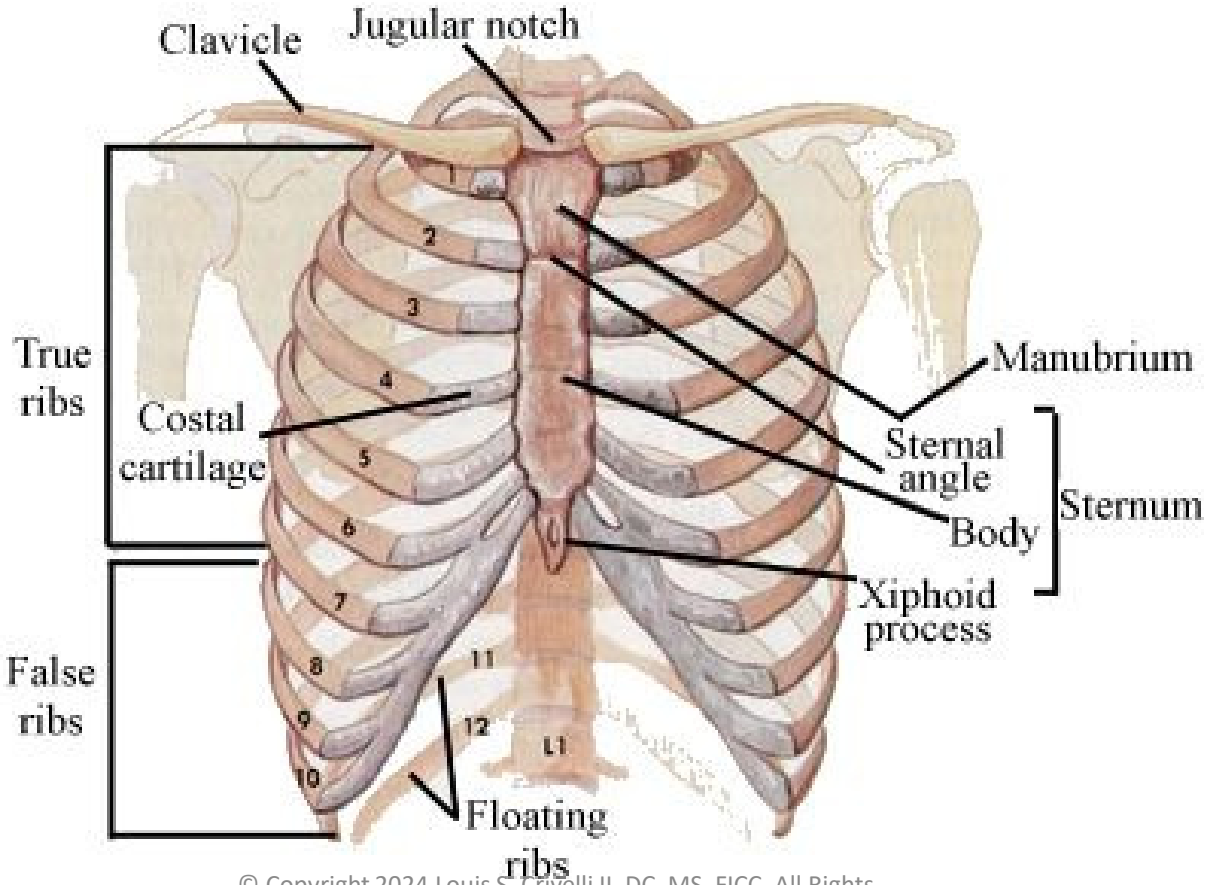


12 Pairs of Ribs

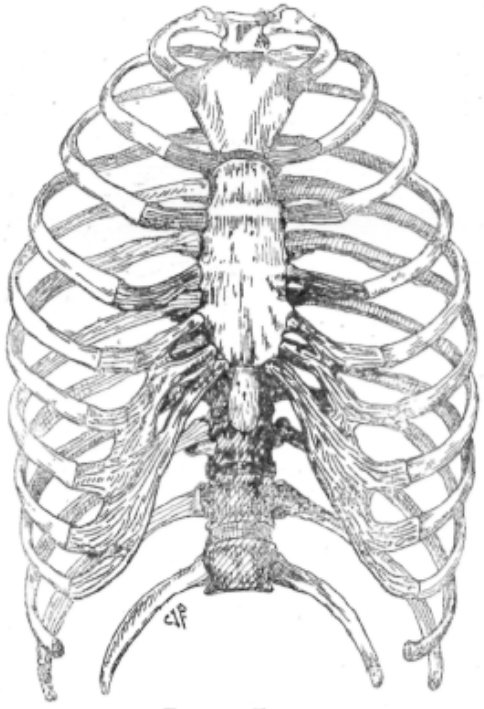
Rib Attachments

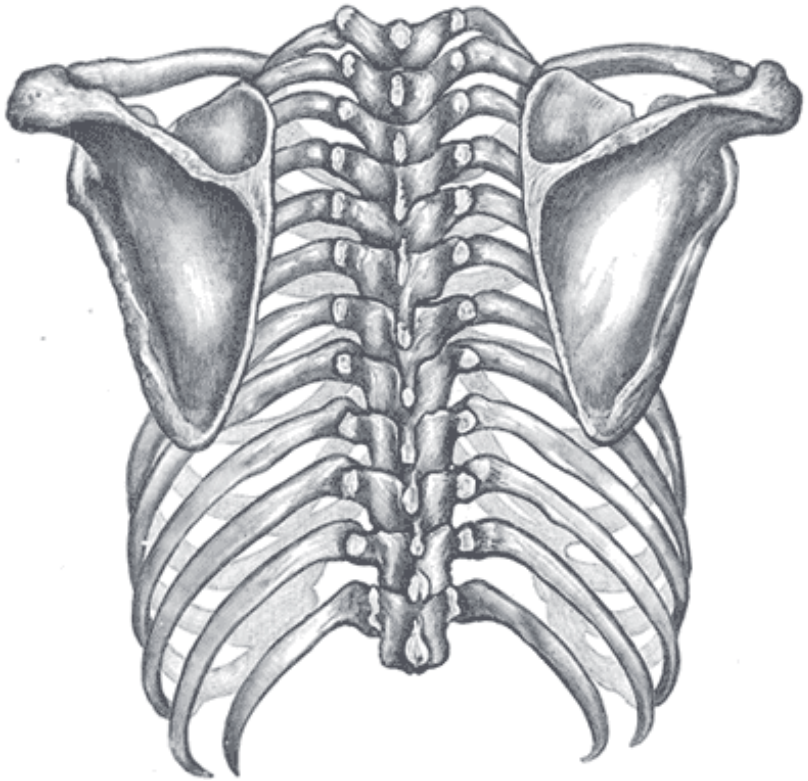
- First seven pairs – attach directly to the sternum by costal cartilage
- Ribs 8-10 – cartilage attaches to the cartilage of the rib above it
- Ribs 11 & 12 – Free floating ribs

Rib Attachments

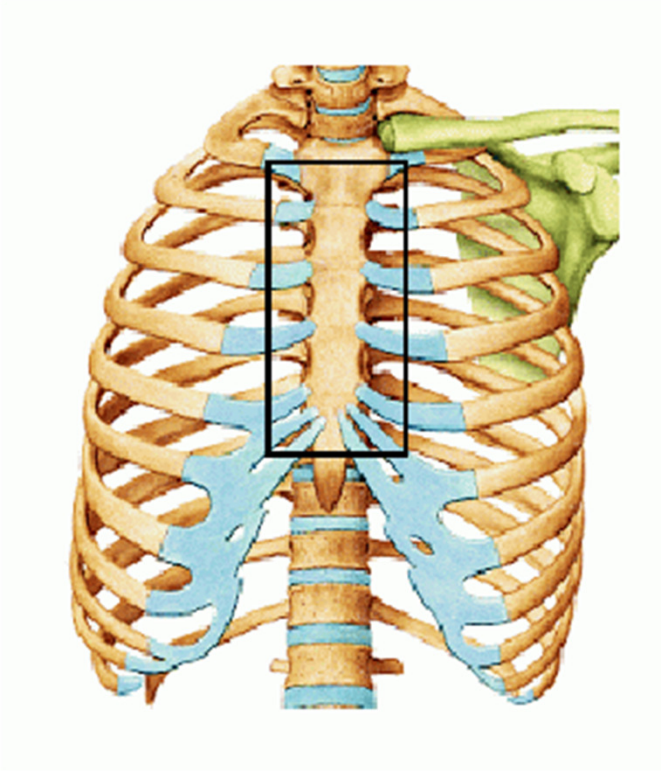


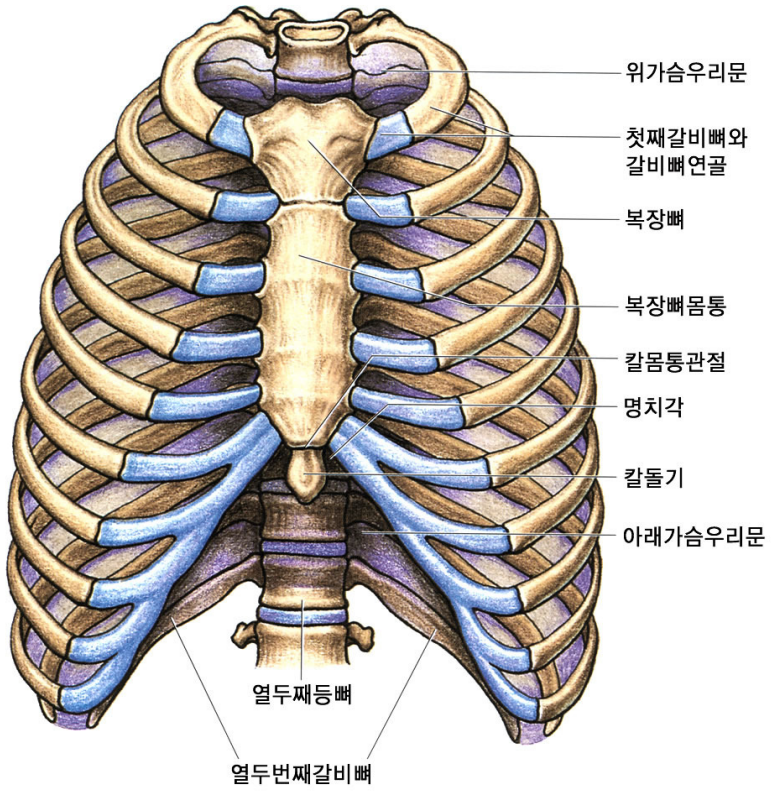
Rib Attachments





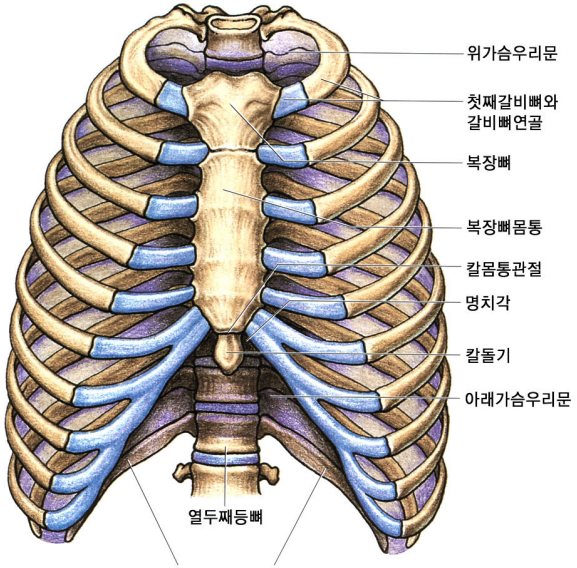
The Sternum



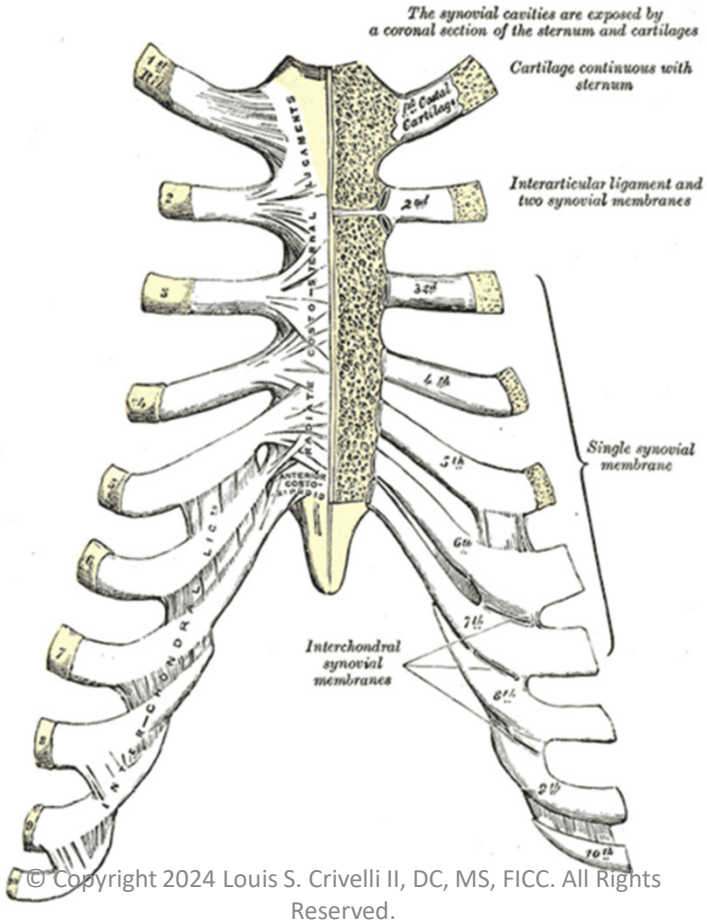


Costal Cartilage

- Bars of hyaline cartilage that serve to let the ribs move forward and contribute to the elasticity of the walls of the thorax.



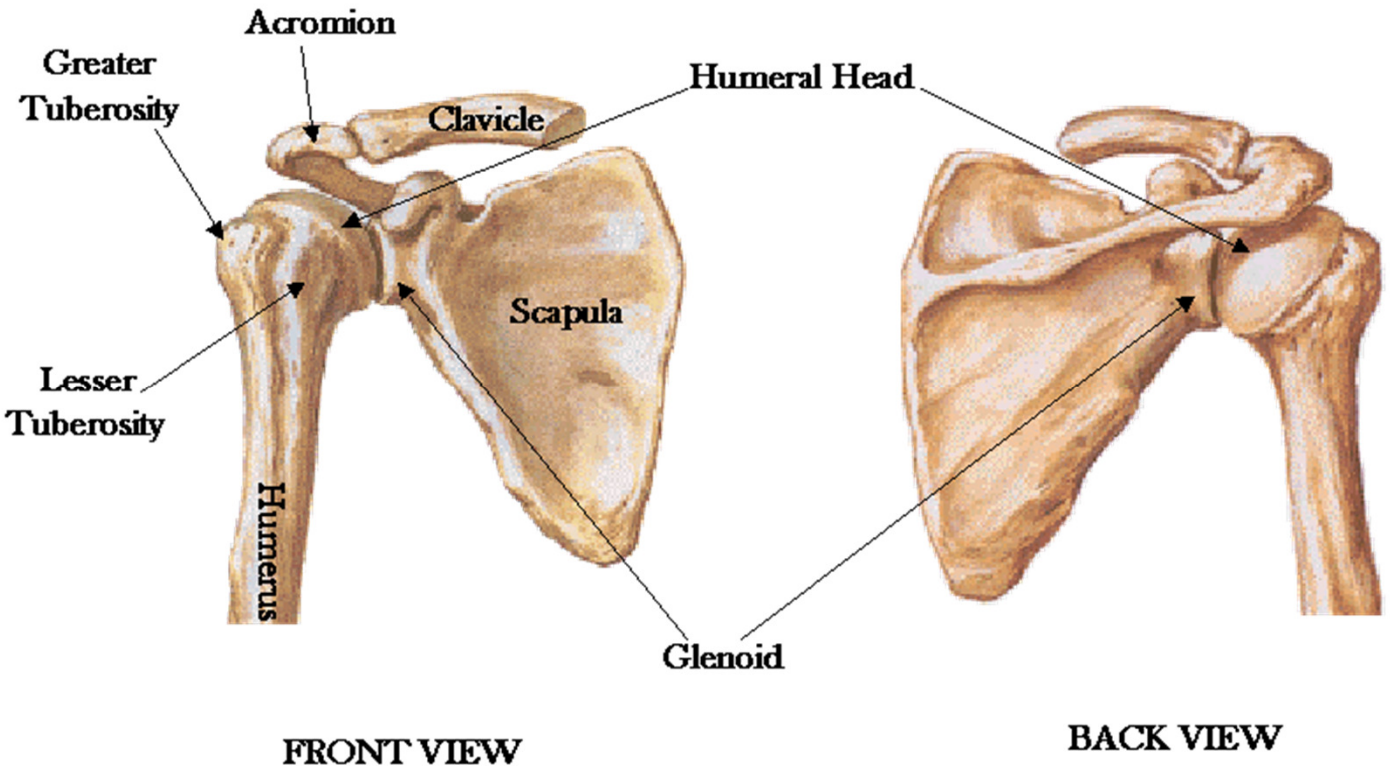
Costal Cartilage



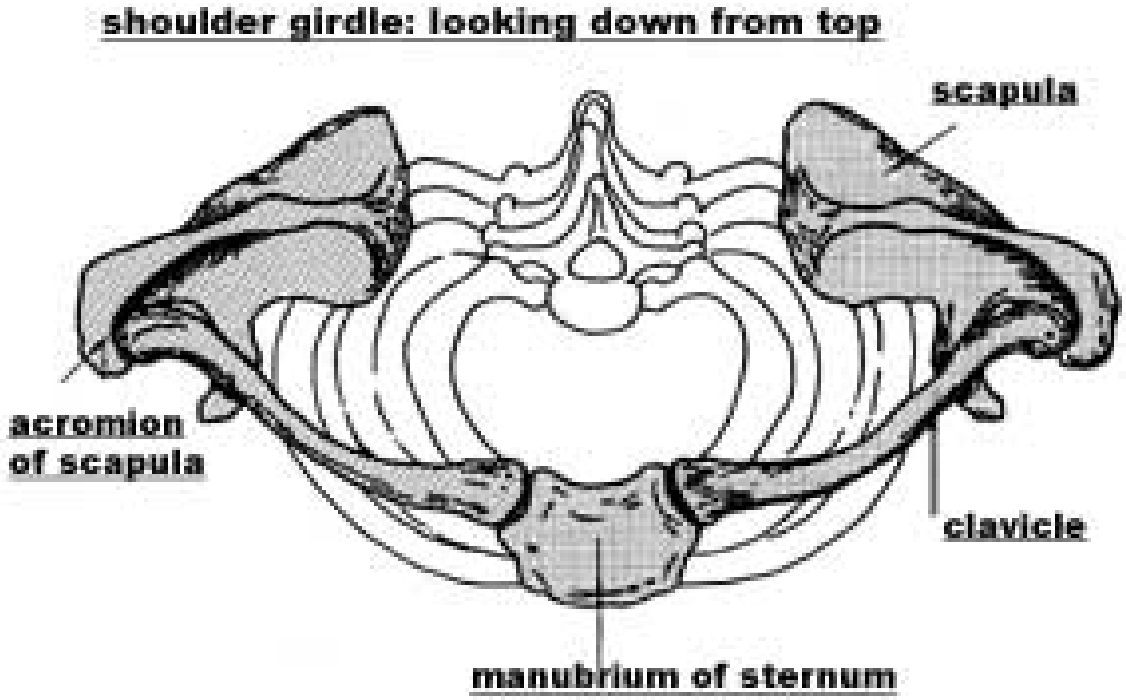
The Shoulder Girdle

- Held to the spine by muscles.
- A free floating yoke that supports and suspends the upper limb.
- The only bone attachment to the axial skeleton is the sternoclavicular (clavicle to the sternum) joint.

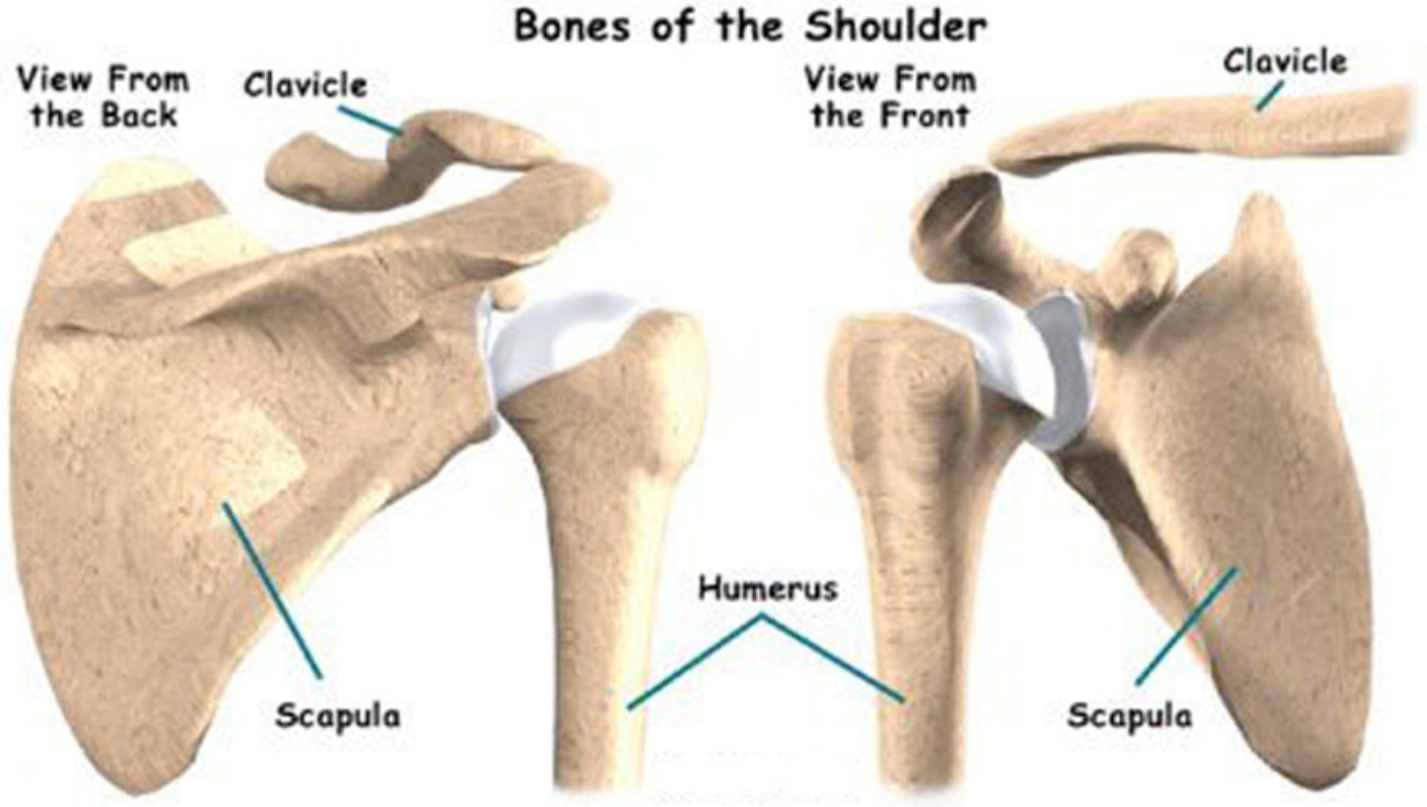
The Shoulder Girdle



The Shoulder Girdle



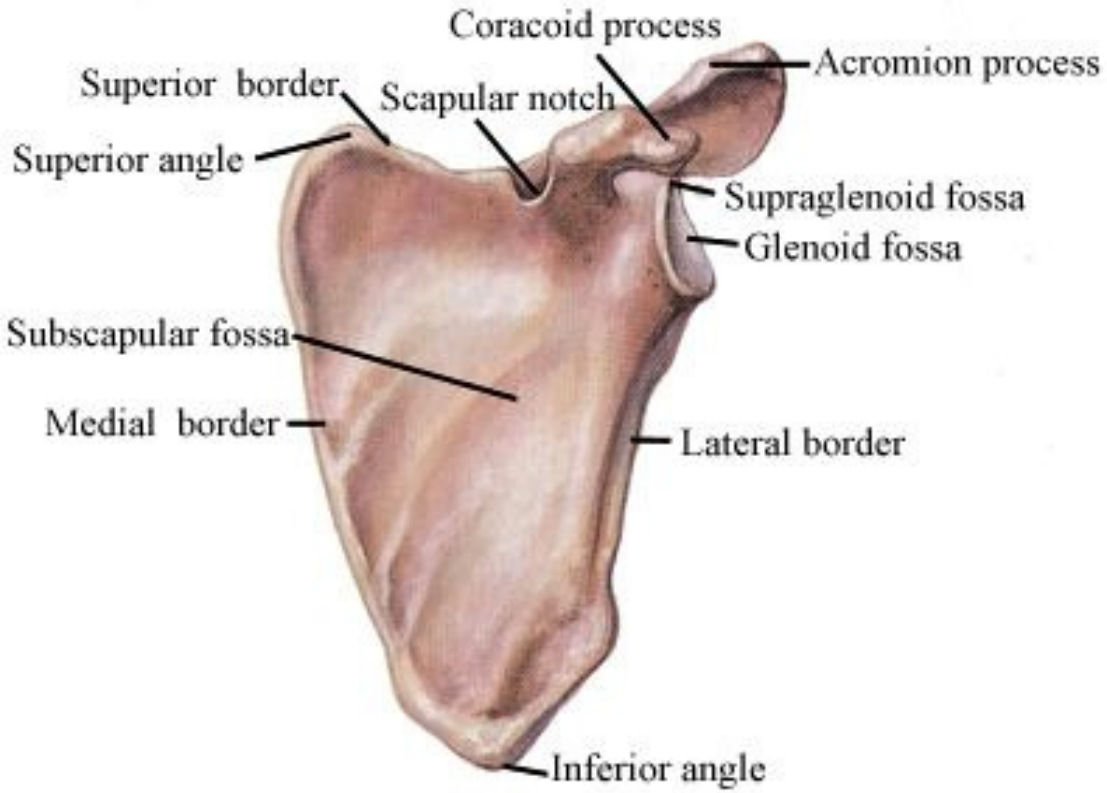
The Shoulder Girdle



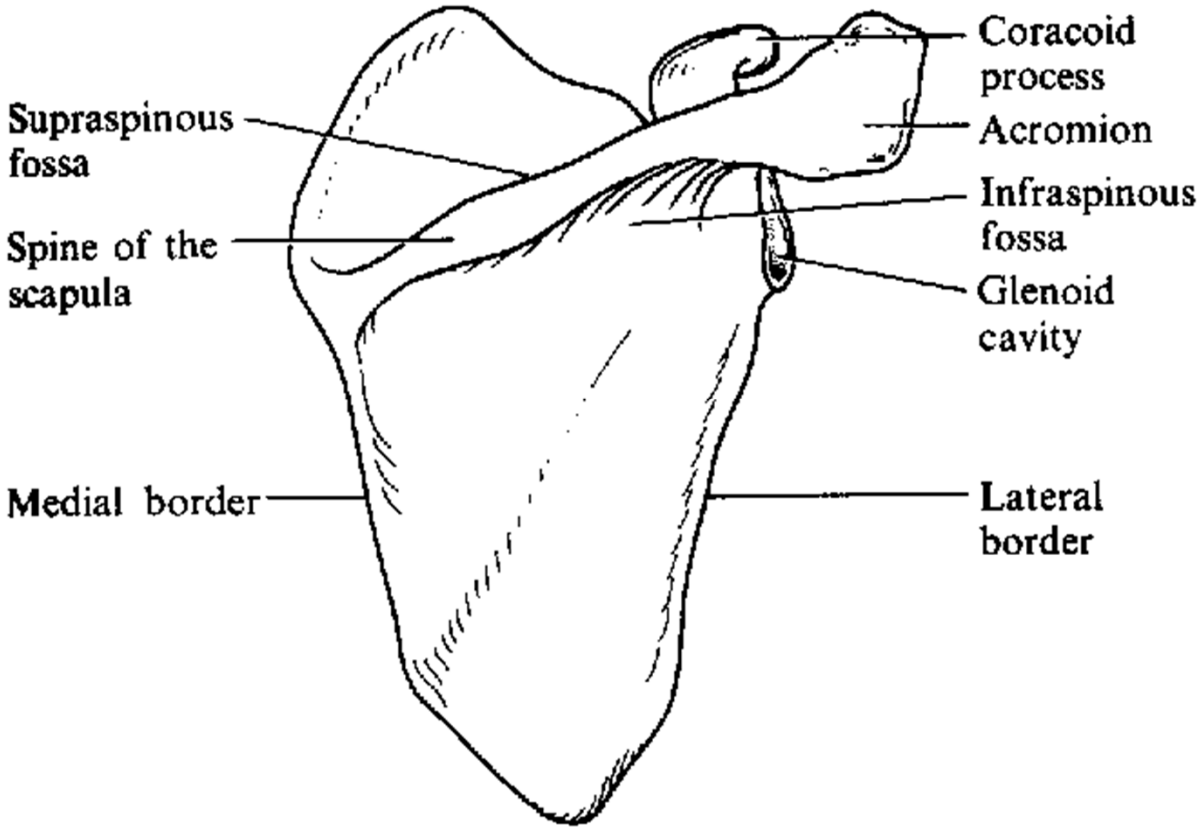
The Scapula

- The Shoulder Blade
- Large triangular flat bone that extends from the 2nd rib to the 7th rib.
- The socket (glenoid fossa) for the humerus is on the lateral end of the scapula.
- Approximately 18 muscles attach to the scapula in some way.

The Scapula



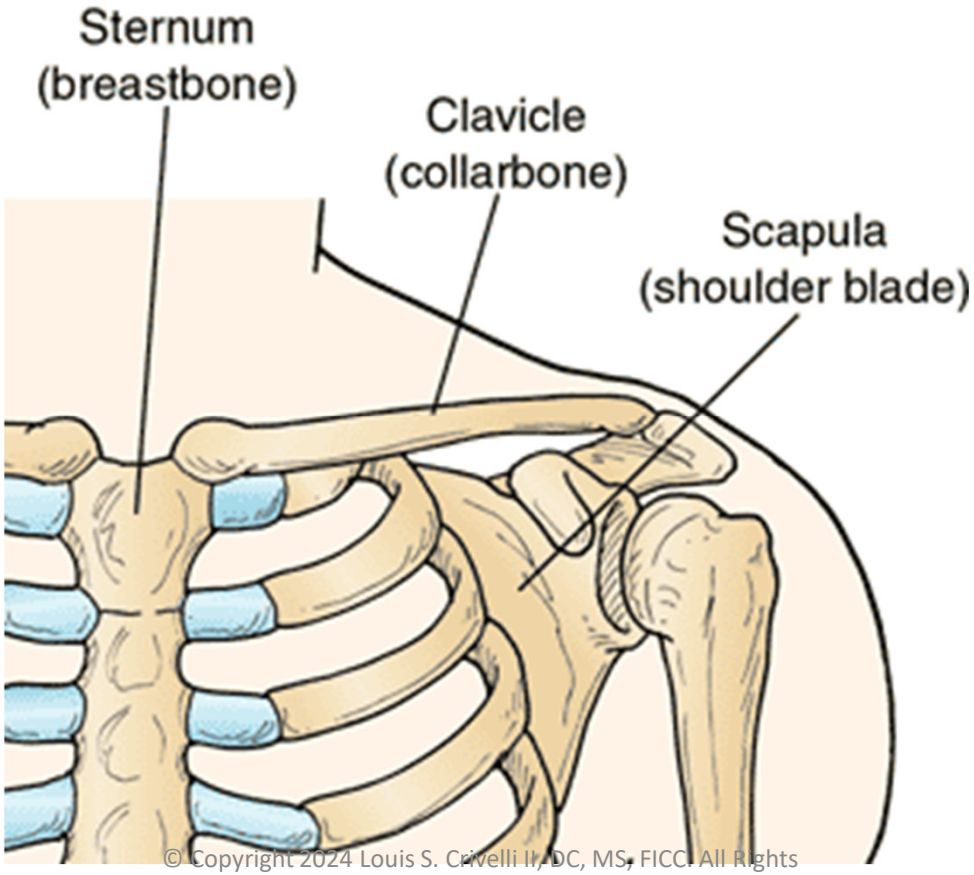
The Scapula



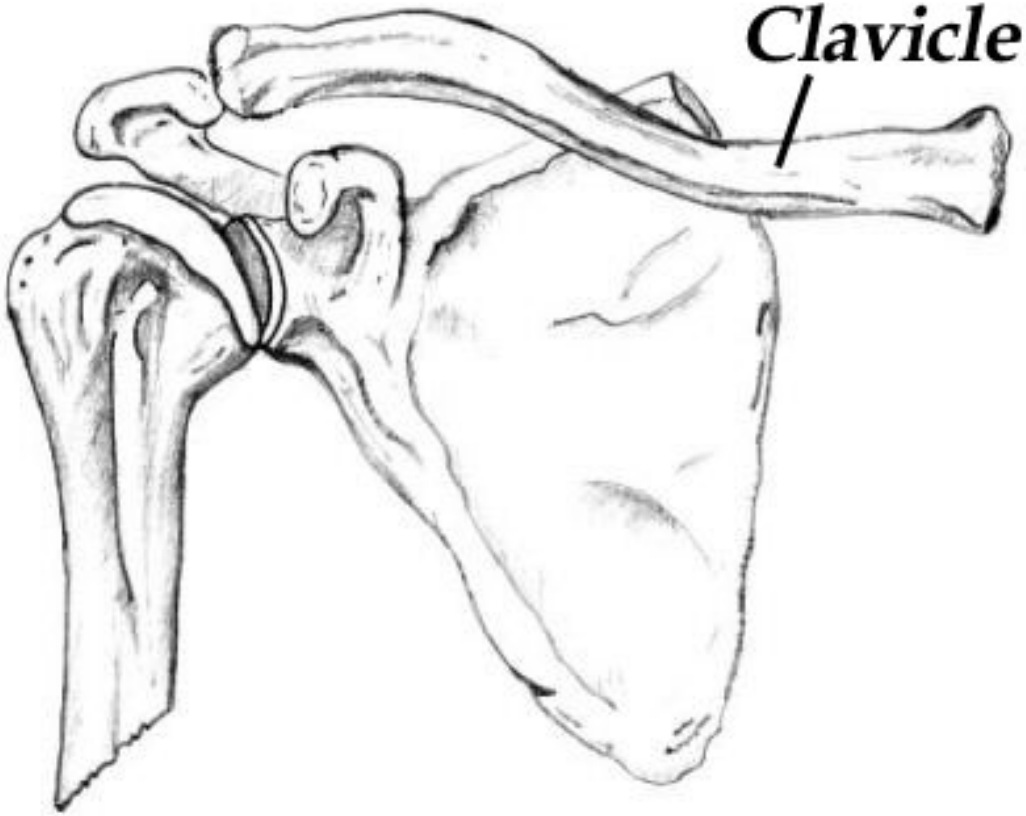
The Clavicle

- The Collar Bone
- S-curved bone over the 1st rib.
- Holds the shoulder up and back.
- Connects to the sternum (sternoclavicular (SC) joint) and to the scapula on the acromion process (acromioclavicular (AC) joint).

The Clavicle



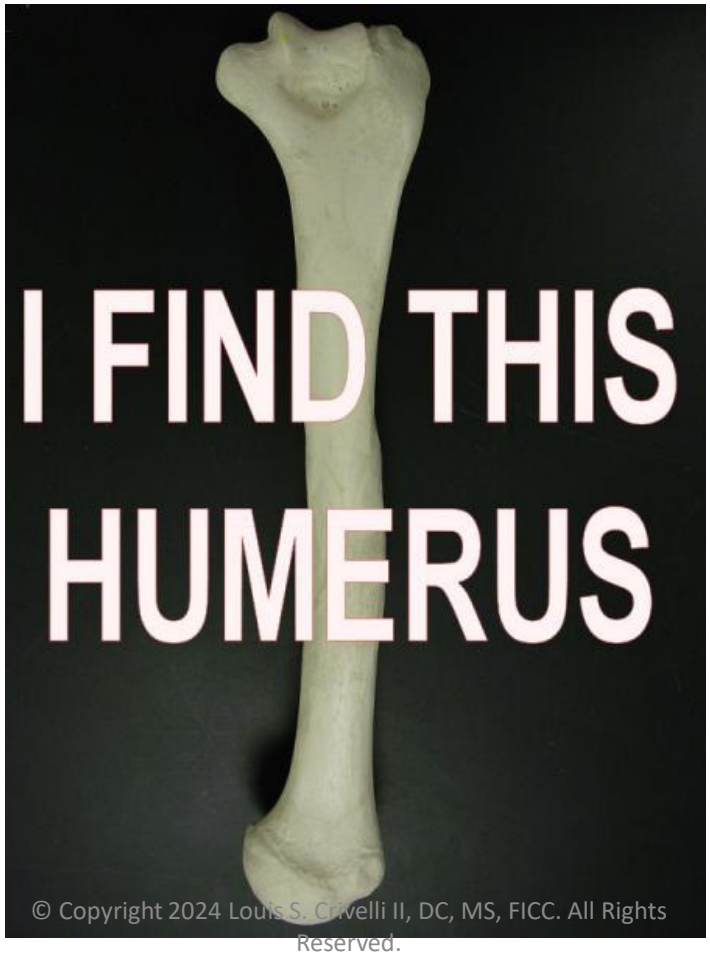
The Clavicle



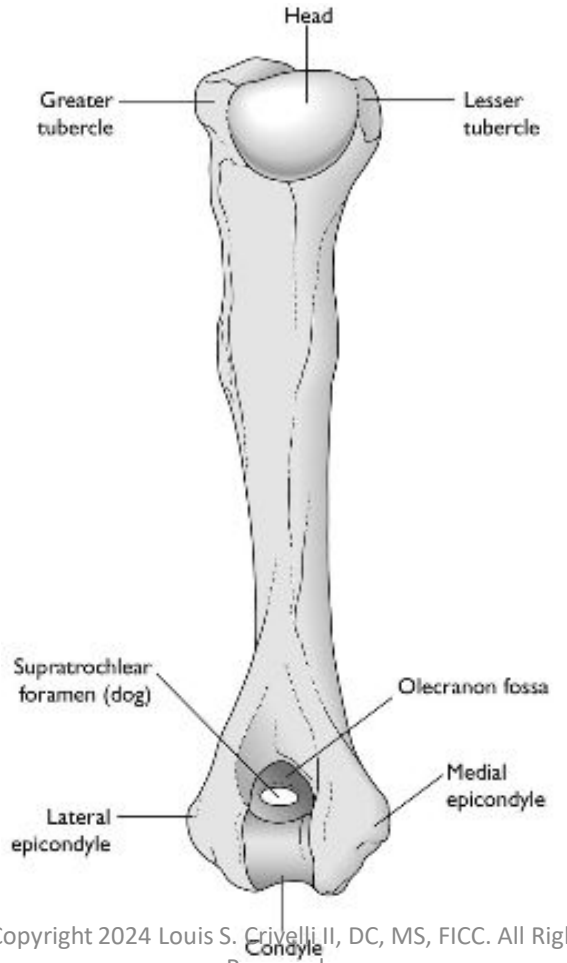
The Humerus

- The upper arm
- Proximal end inserts into the glenoid fossa forming the shoulder joint.
- Distal end inserts into the ulna and radius forming the elbow joint.

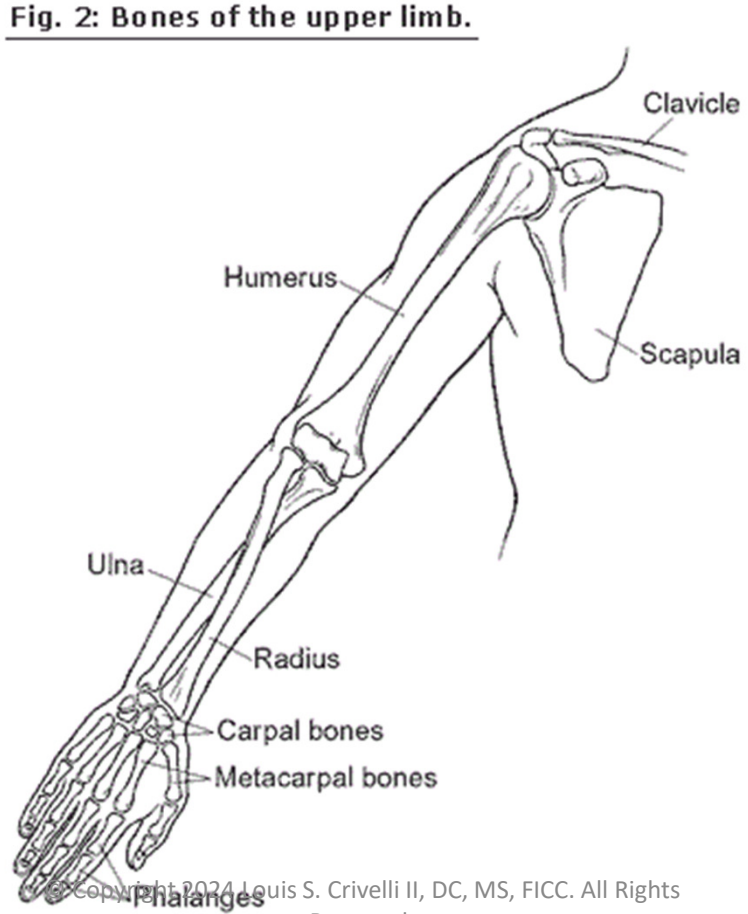
The Humerus



The Humerus



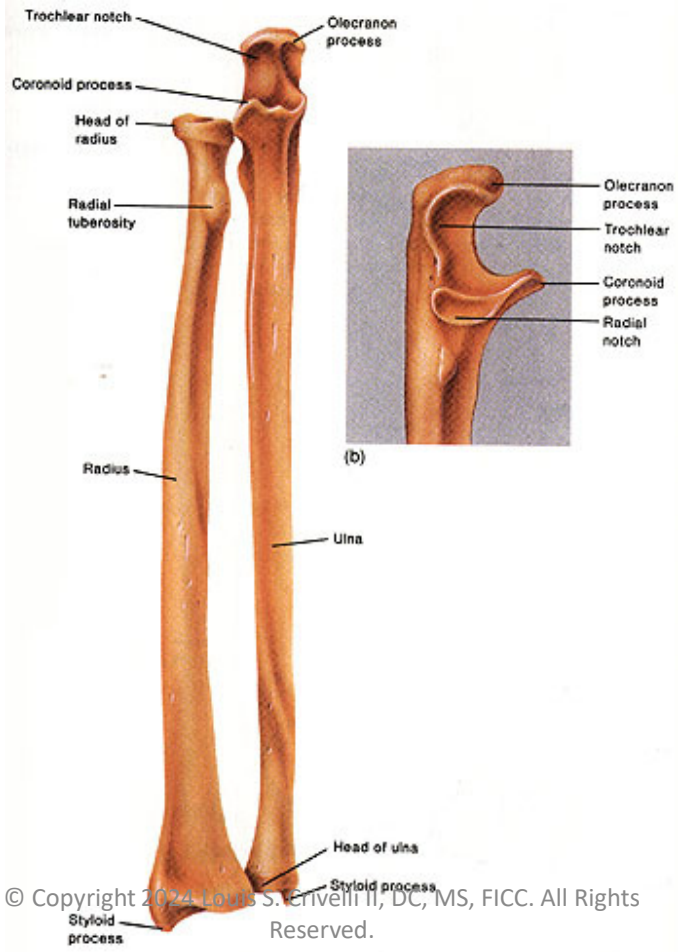
The Humerus



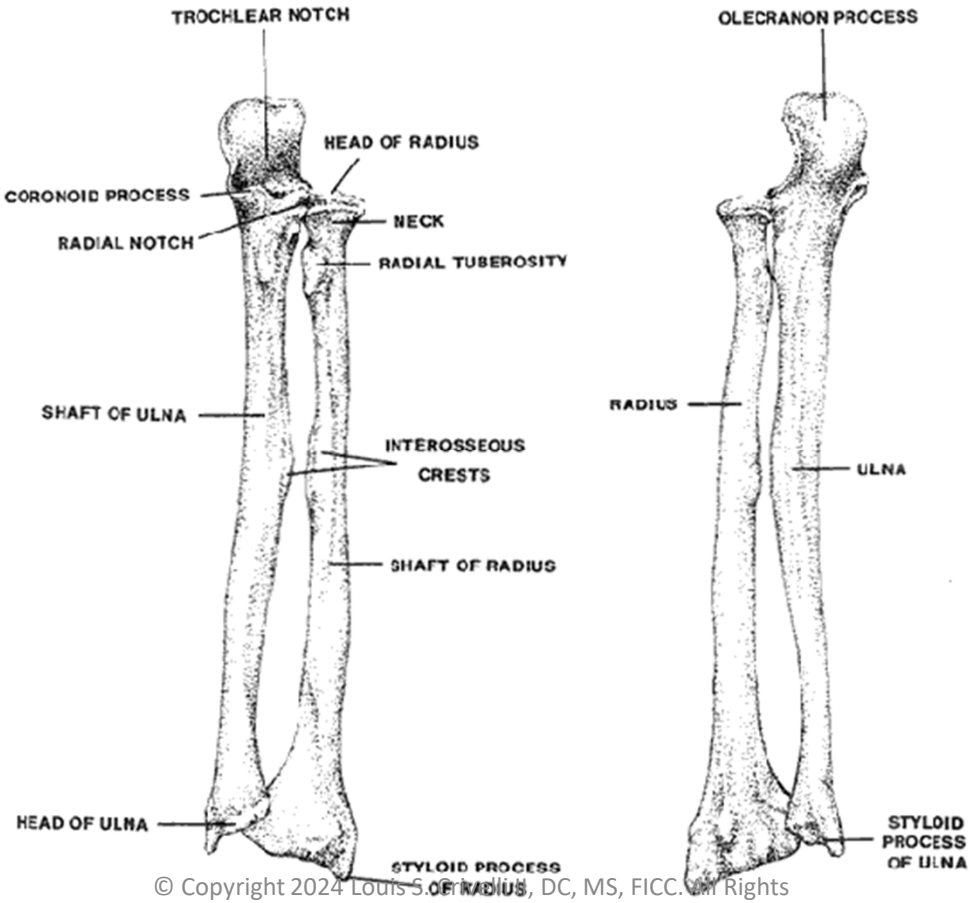
The Radius and Ulna

- The Forearm
- Radius – Thumb side, forms most of the wrist joint
- Ulna – “Pinky” side, forms most of the elbow joint.
- Their combined movement allows rotation of the hand and wrist.

The Radius and Ulna

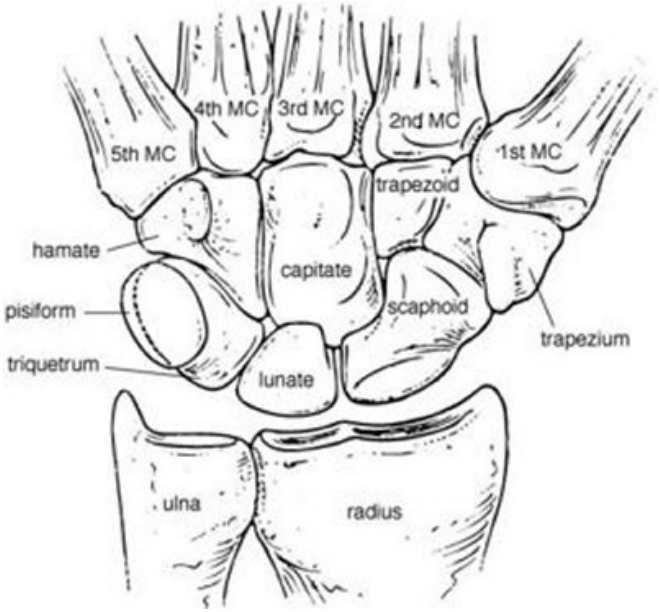


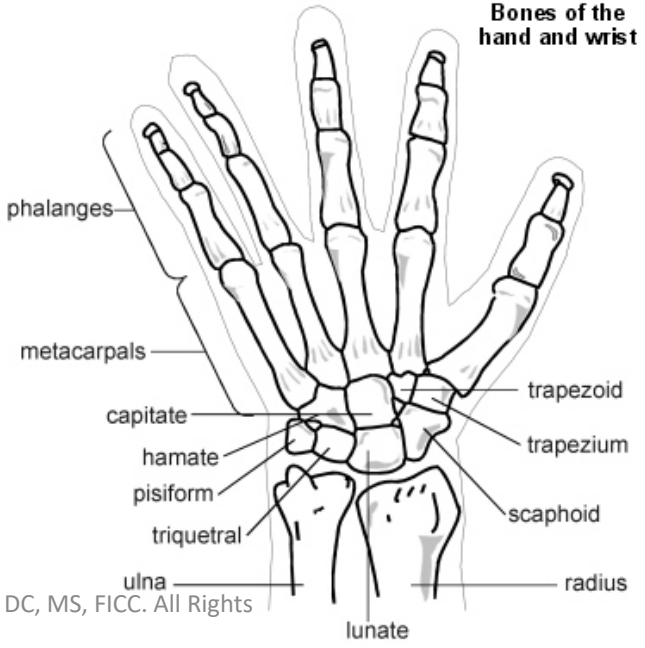
The Radius and Ulna



Carpals

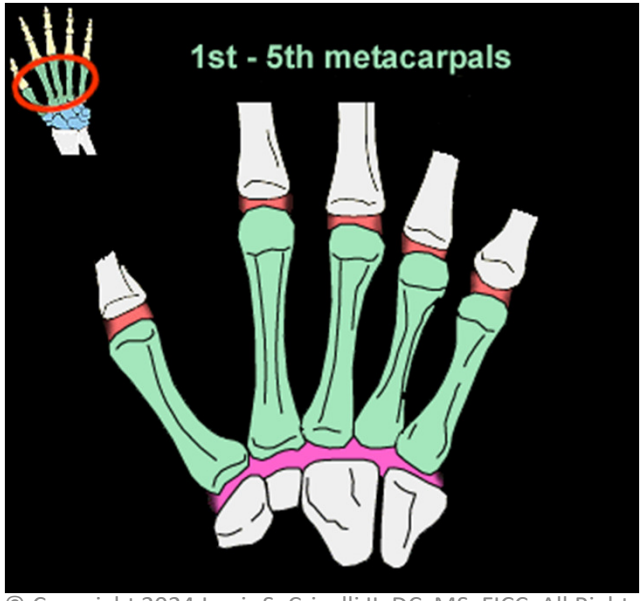
- Wrist bones.
- 8 small bones in 2 rows of 4.



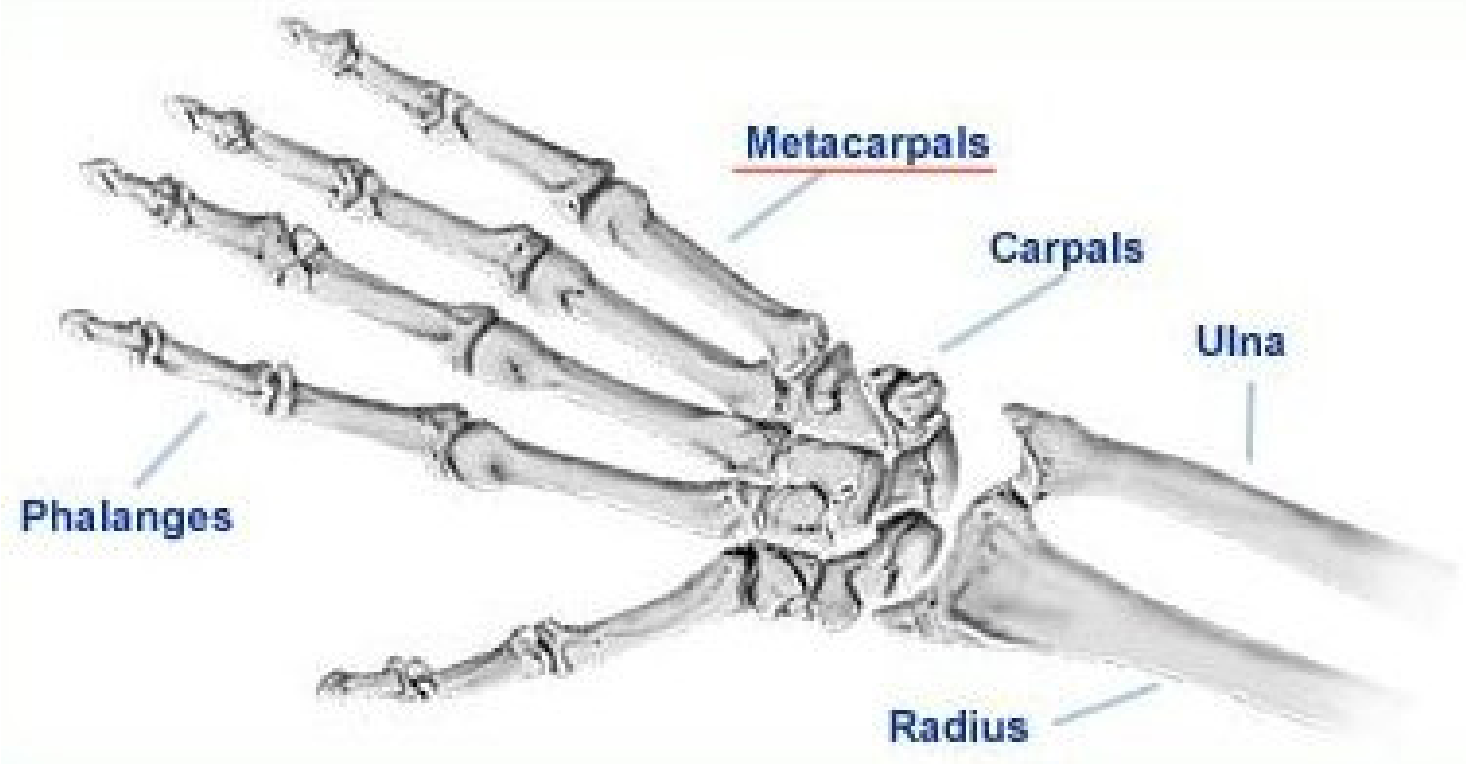


Metacarpals

- Hand bones.
- 5 bones that form the hand.



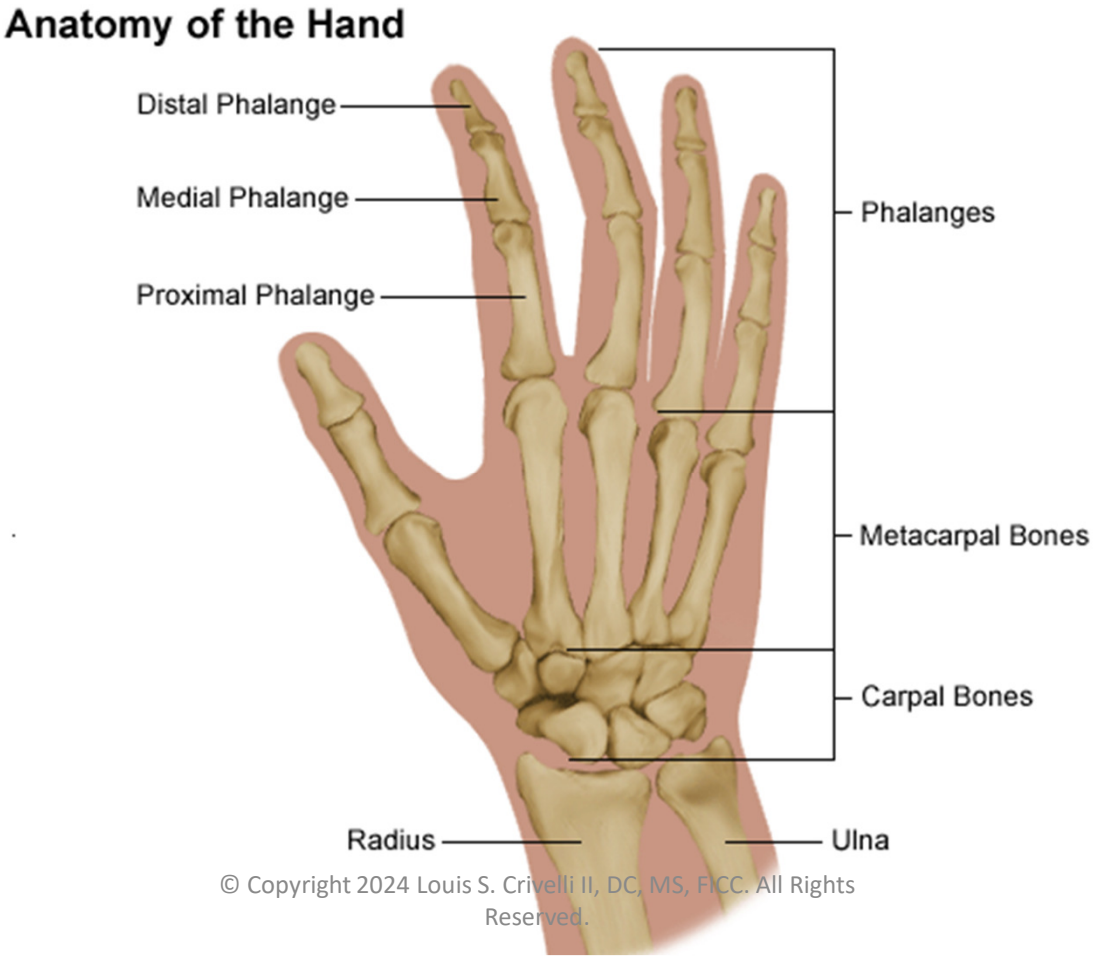
Metacarpals



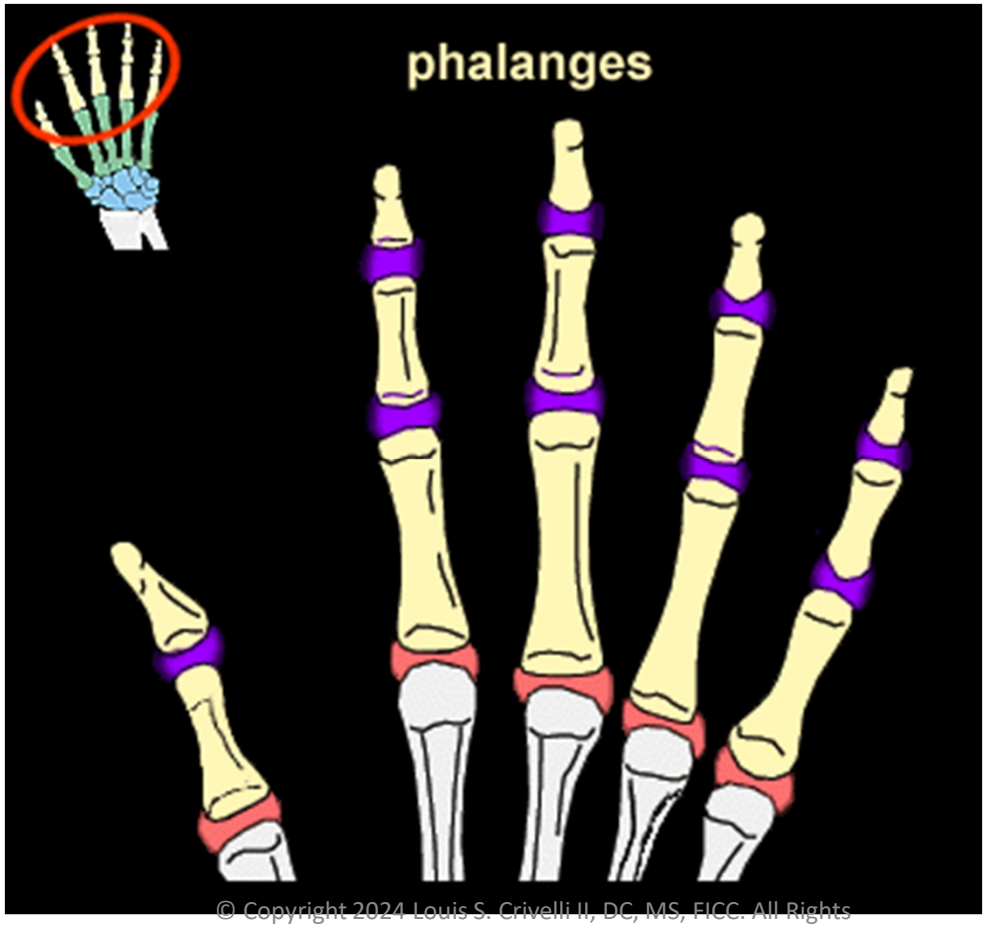
Phalanges

- Finger bones.
- 14 total phalanges in each hand.
- 3 in each finger
- 2 in the thumb

Phalanges



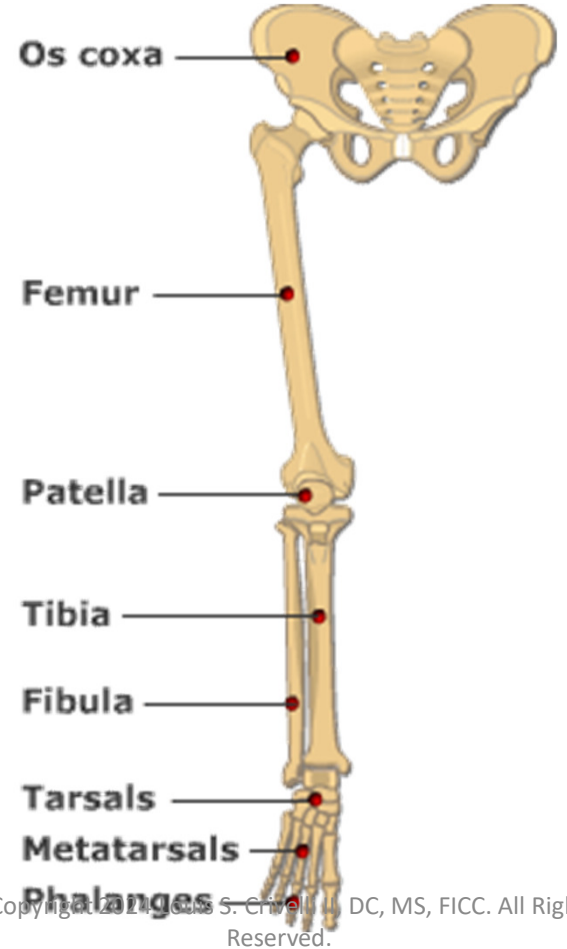
Phalanges



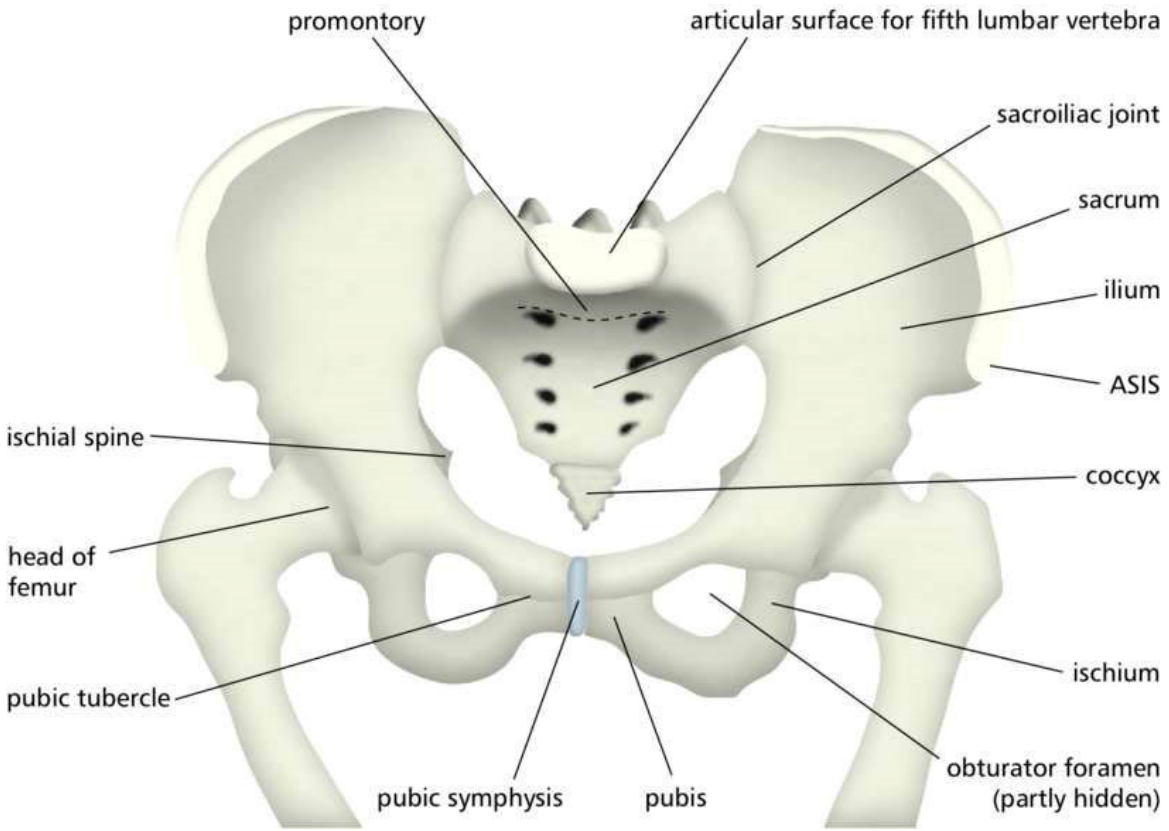
Upper Extremity Bones

- Scapula
- Clavicle
- Humerus
- Radius and Ulna
- Carpals
- Metacarpals
- Phalanges

The Pelvis and Lower Limbs



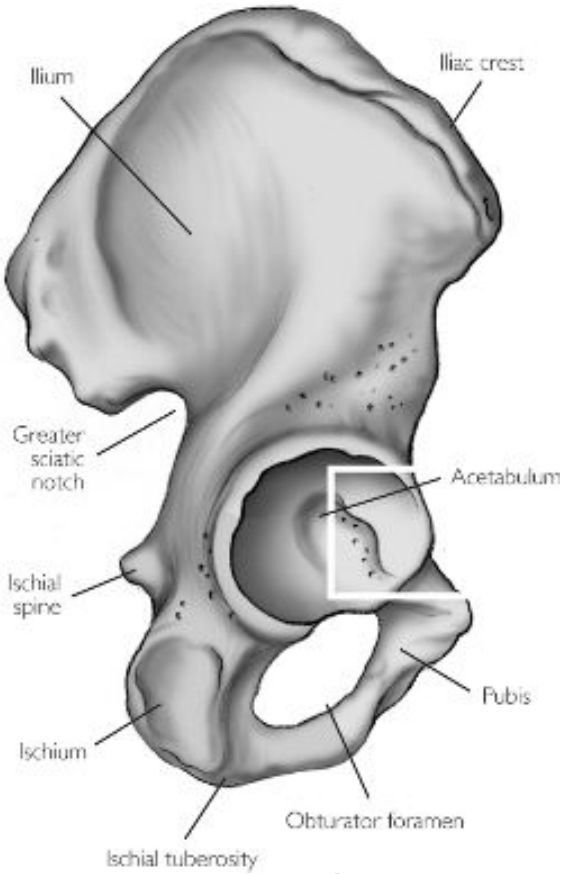
Os Coxa

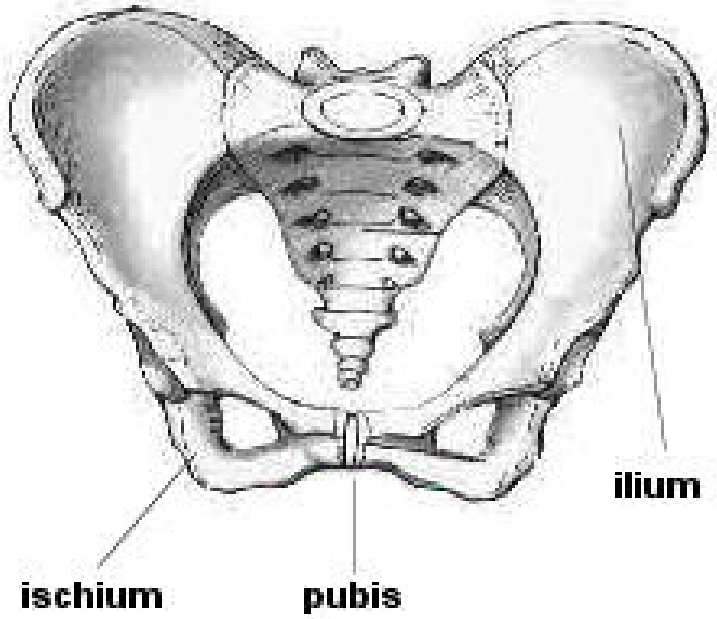


Os Coxa

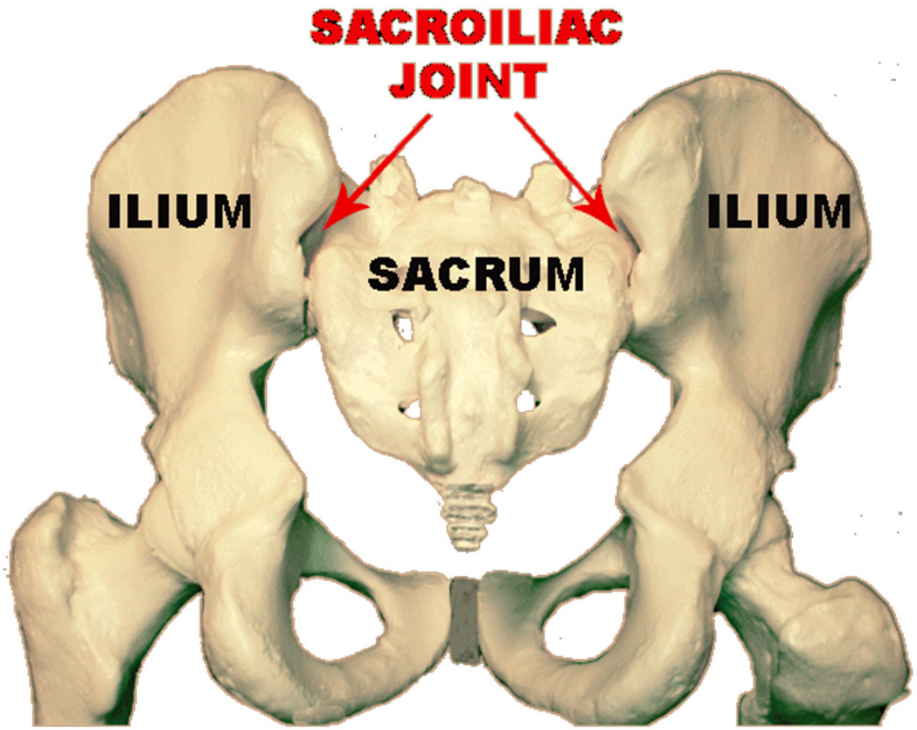
- Distributes weight evenly into the legs.
- Composed of 3 fused bones
  - Ilium (lateral crests)
  - Ishium (posterior)
  - Pubis (anterior)

Os Coxa

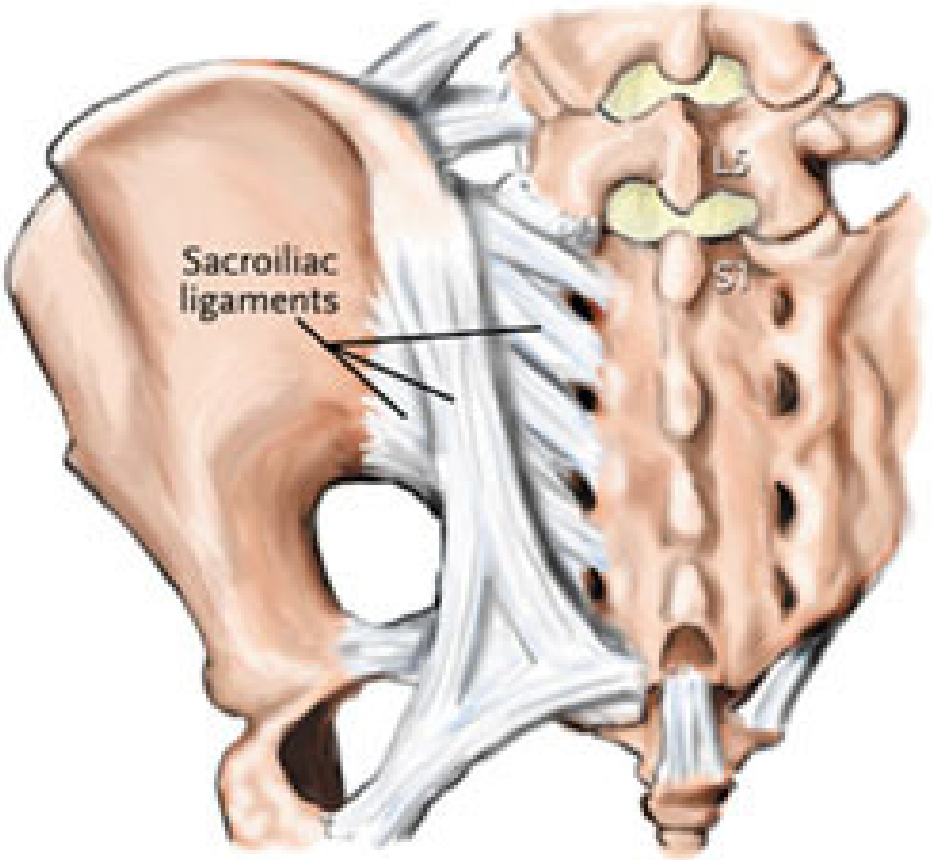




Sacroiliac Joint



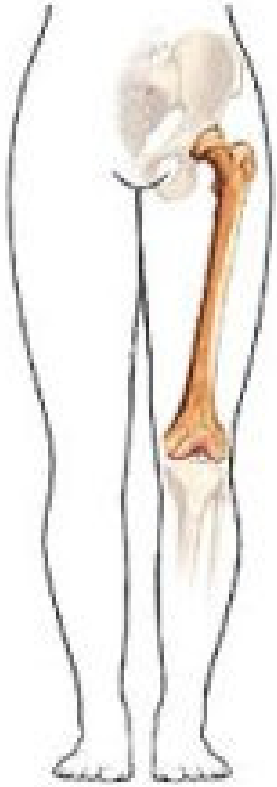
Sacroiliac Joint



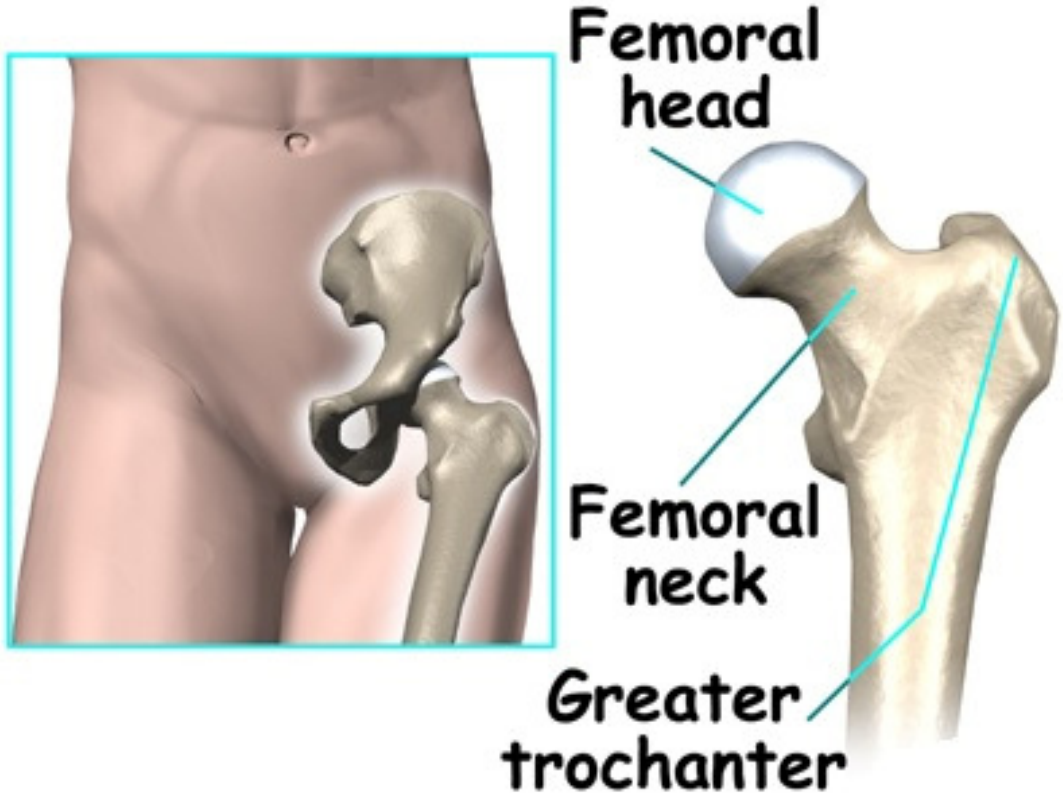
The Femur

- Thigh Bone
- The longest and strongest bone in the body.
- Proximal end inserts into Os Coxa at the acetabular fossa and forms the hip joint.
- Distal end forms the knee joint with the tibia
- The greater trochanter is the originating point for thigh muscles.

The Femur

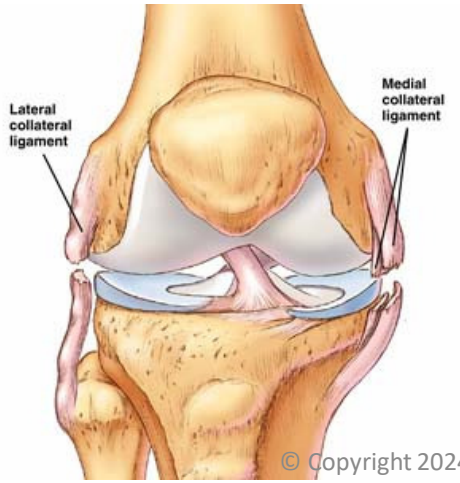


The Femur

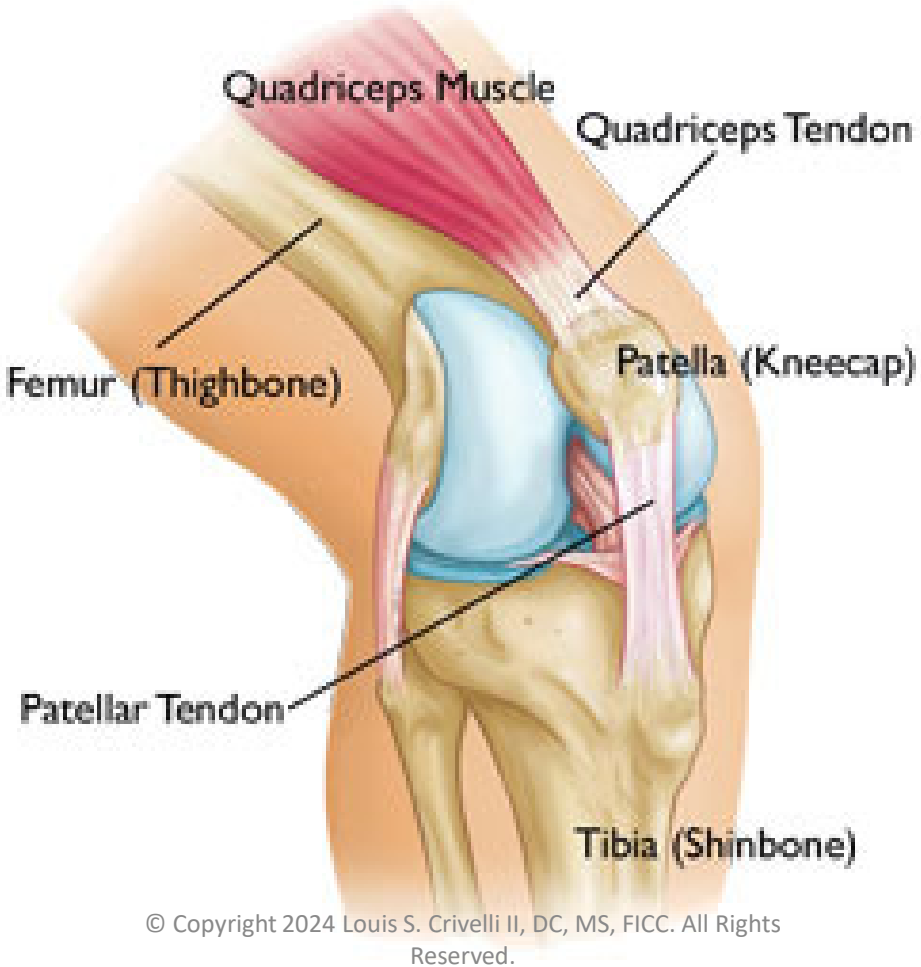


The Patella

- Knee Cap
- Protects the front of the knee joint
- Sesamoid bone (free floating) that provides increased mechanical advantage.

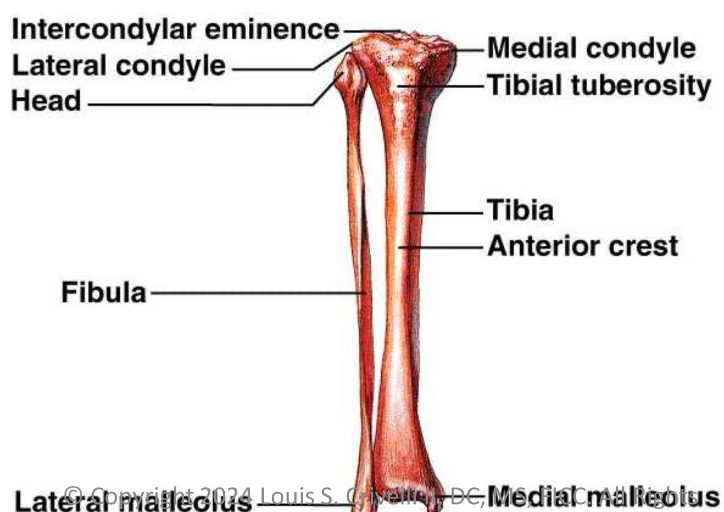


The Patella



The Tibia and Fibula

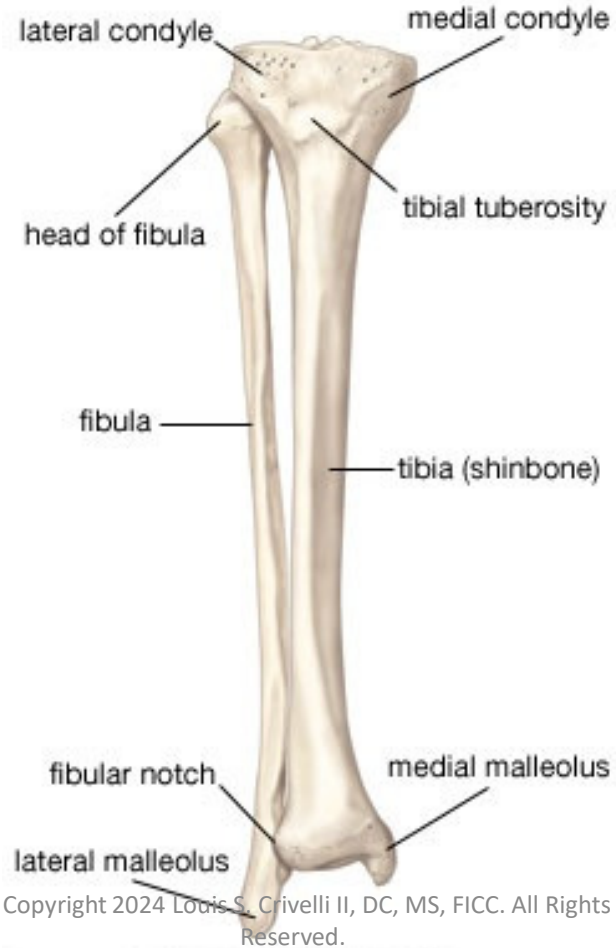
- Shin and lower leg bones
- Forms the knee joint proximally
- Forms the ankle joint distally



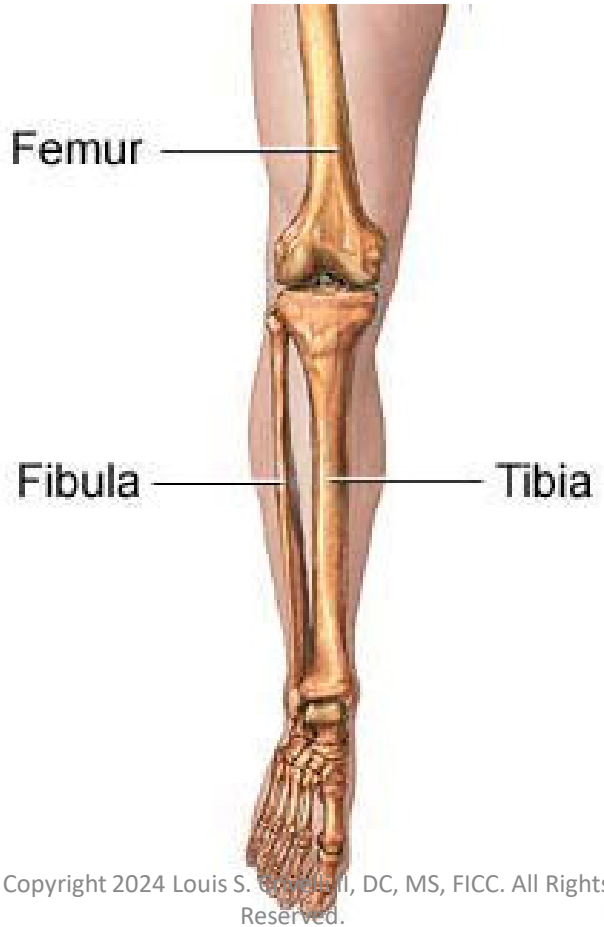
The Tibia

- Shin bone
- Thicker and stronger, it supports our weight.
- Attaches to the femur.
- Distal end is the medial malleolus of the ankle.

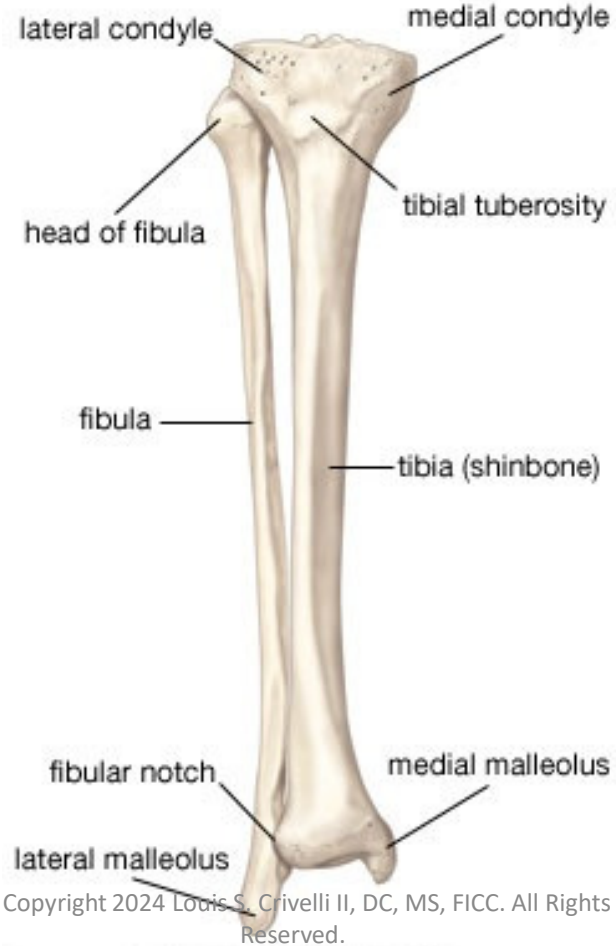
The Tibia



The Fibula

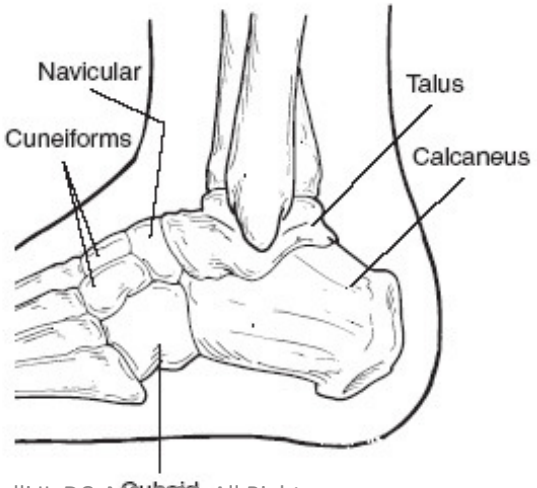


The Fibula

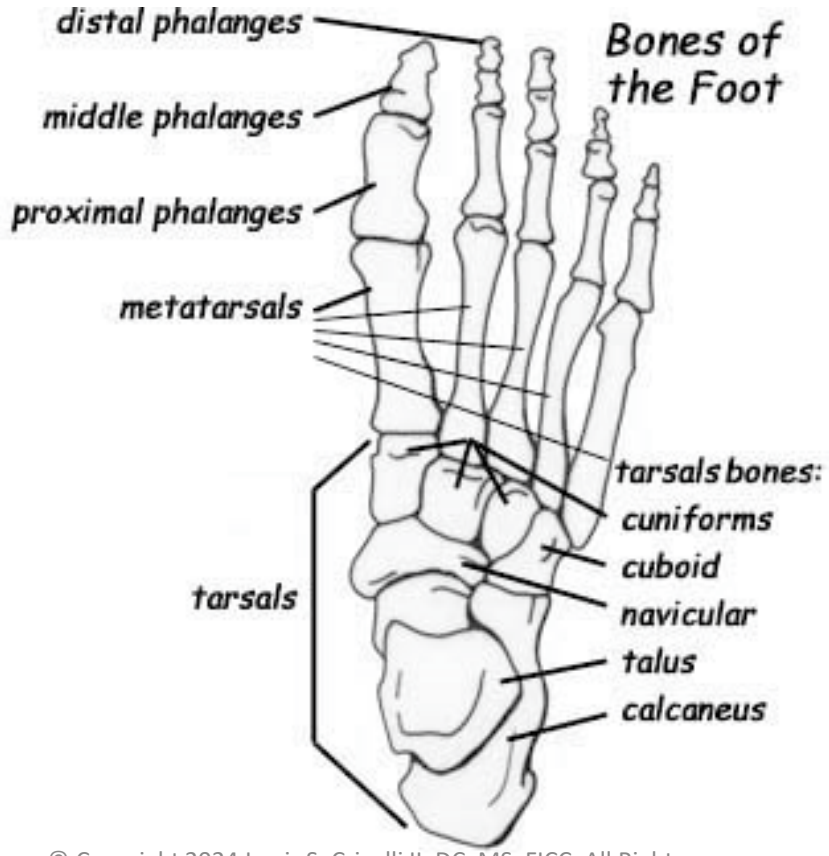


Tarsals

- 7 bones that form the ankle, heel, and posterior part of the instep
- The calcaneus is the largest tarsal bone and forms the heel.

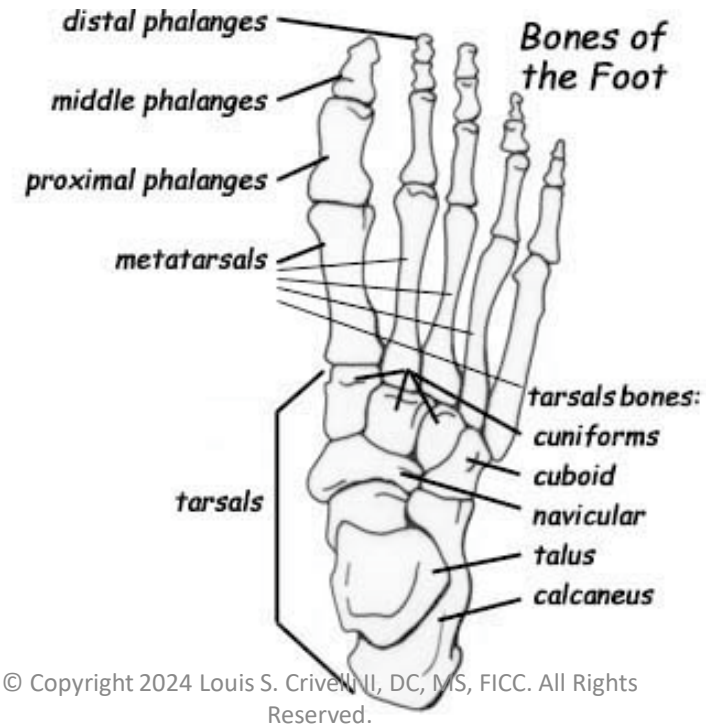


Tarsals

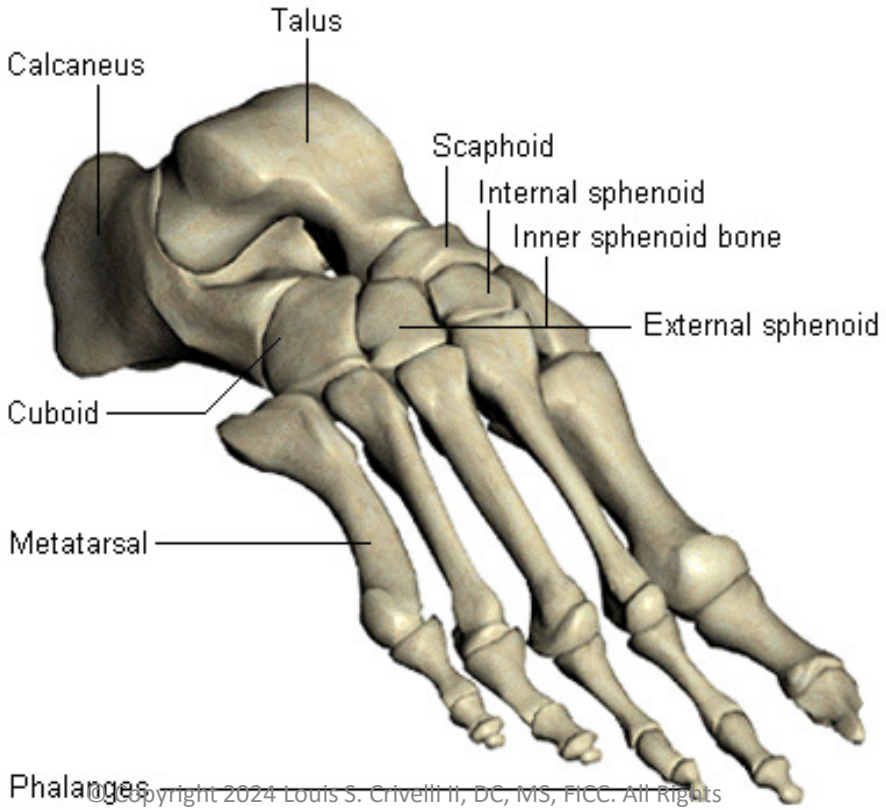


Metatarsals

- 5 bones that form the anterior portion of the instep.



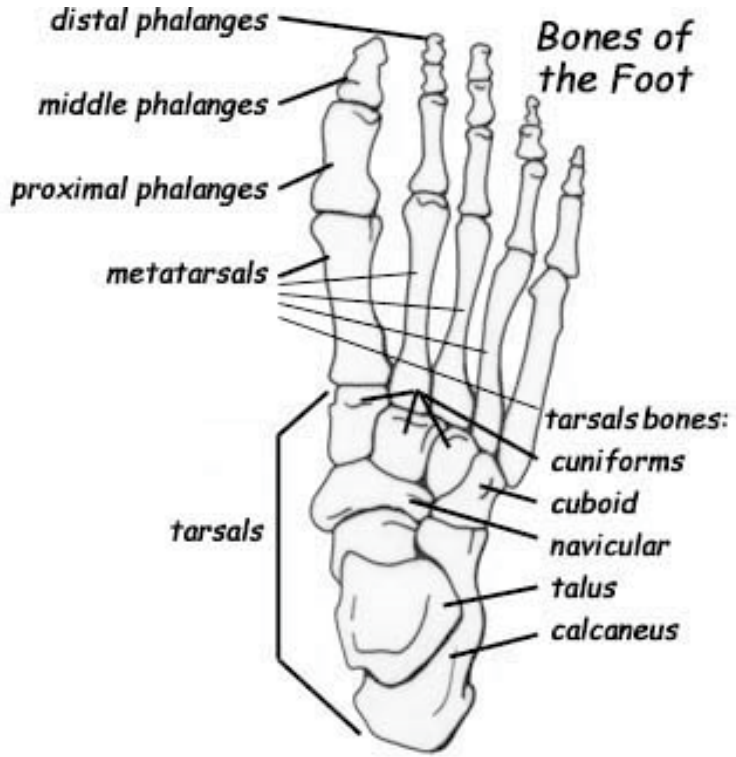
Metatarsals



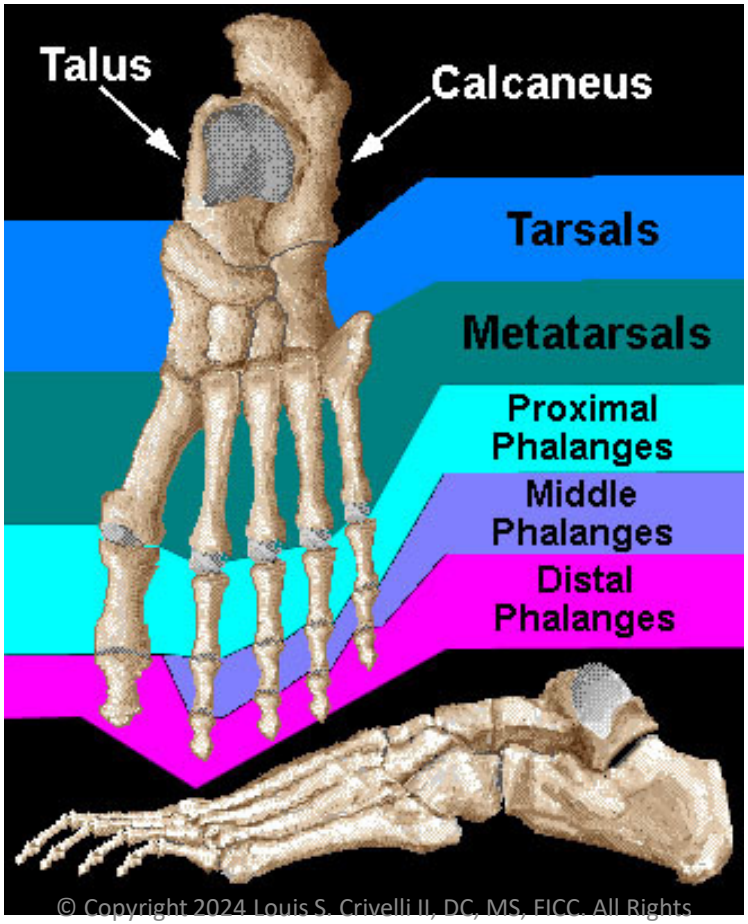
Phalanges

- 14 phalanges make up the each foot.
- Same as the hand.
- 3 in each toe
- 2 in the “big toe” or Hallux

Phalanges



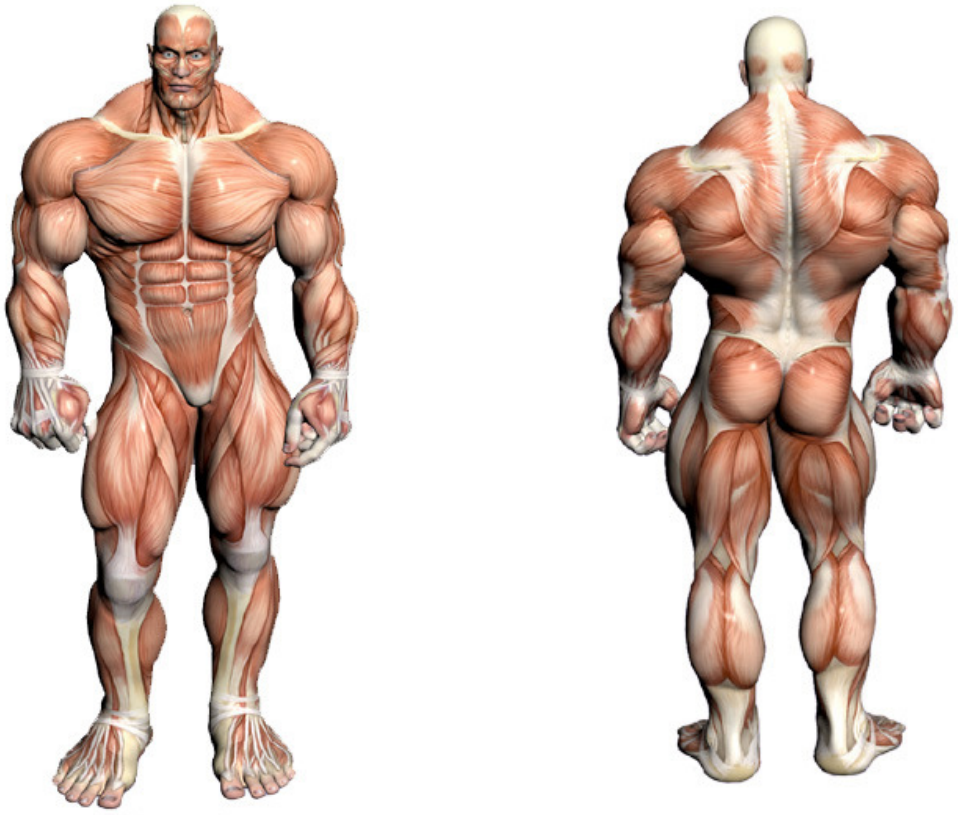
Phalanges



Lower Extremity Bones

- Os Coxa
- Femur
- Patella
- Tibia and Fibula
- Tarsals
- Metatarsals
- Phalanges

The Muscular System



The Muscular System

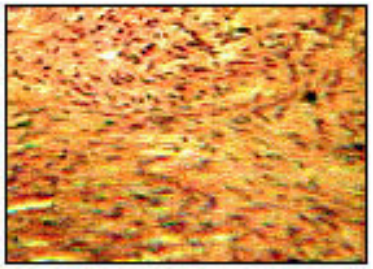
- Functions
  - Moves and propels the body.
  - Major regulator of body heat.

Types of Muscle

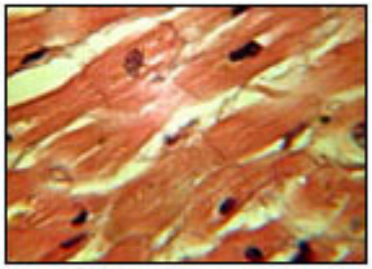
- Smooth muscle
  - INVOLUNTARY
  - Inside the walls of internal organs and blood vessels.
- Skeletal muscle
  - VOLUNTARY
  - Attaches to and causes muscle movement
  - Neuromuscular unit
- Cardiac muscle
  - INVOLUNTARY
  - Located inside the walls of the heart

Types of Muscle

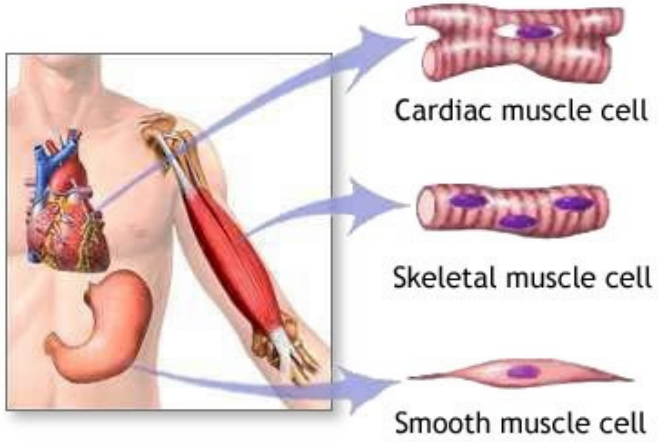
Skeletal muscle



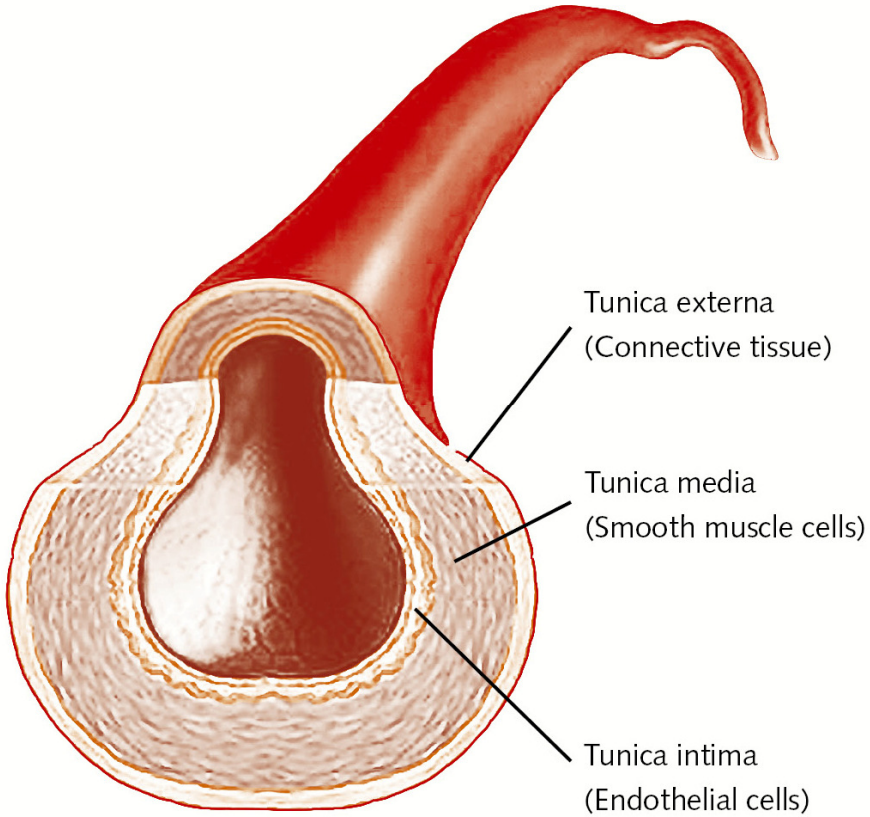
Smooth muscle



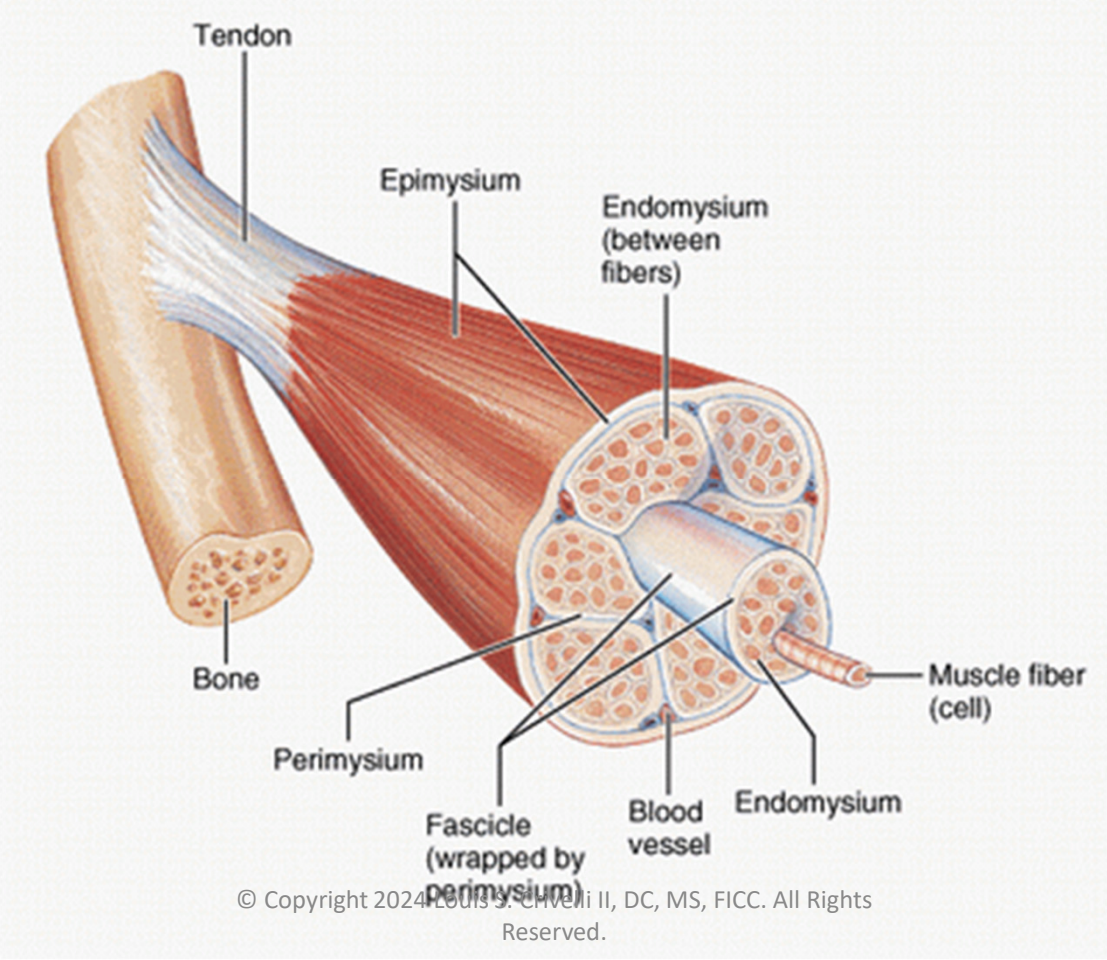
Cardiac muscle

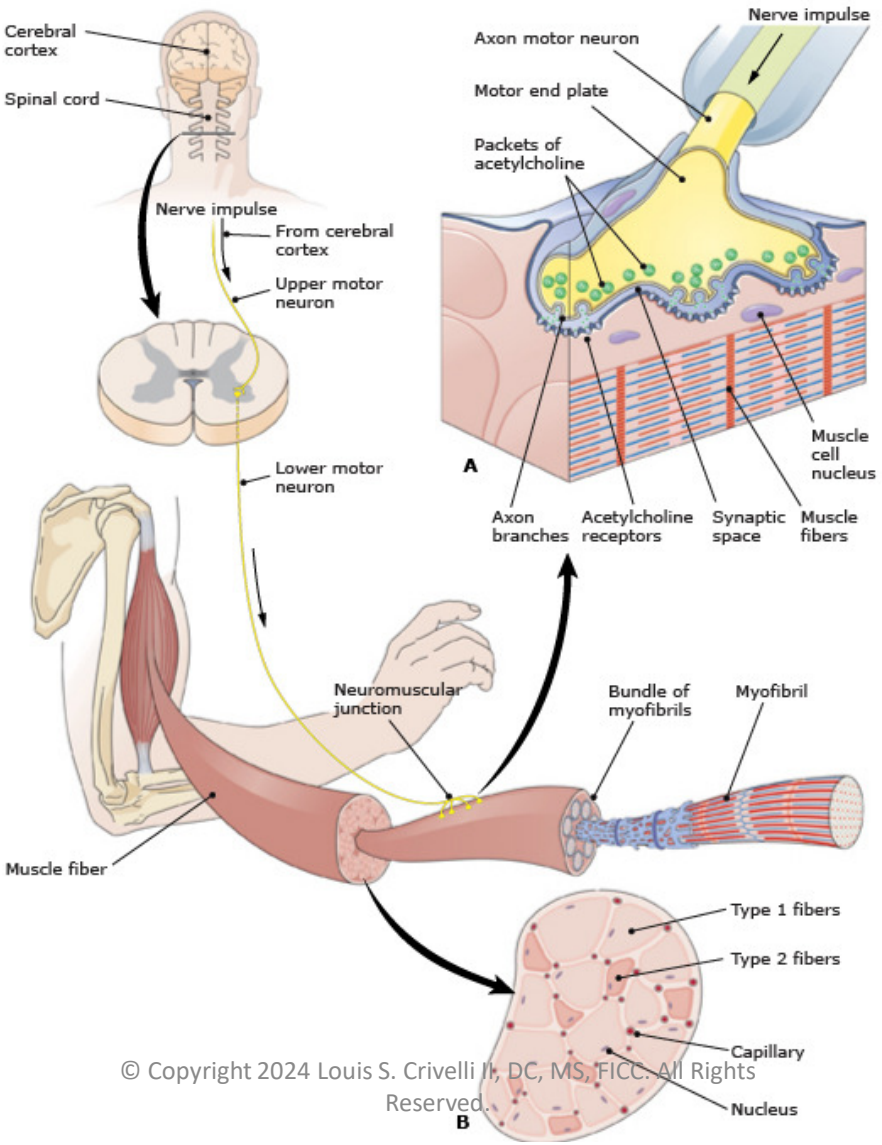


Smooth Muscle

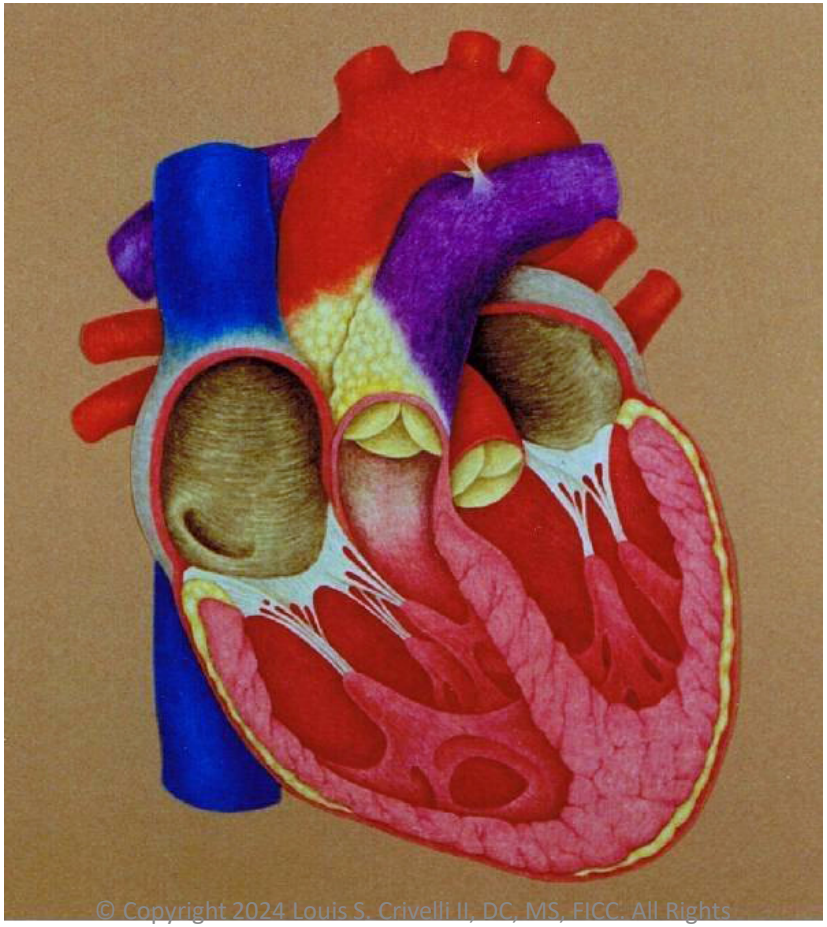


Skeletal Muscle





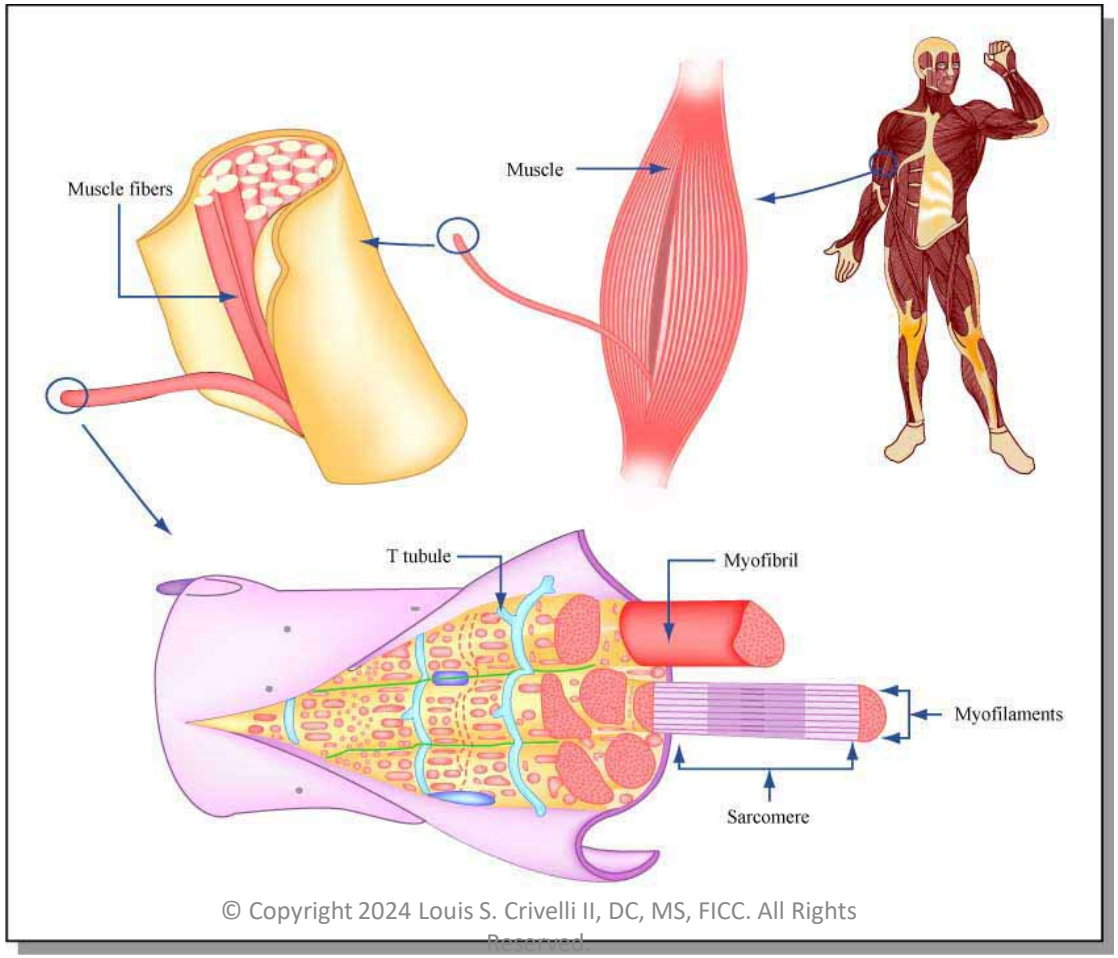
Cardiac Muscle

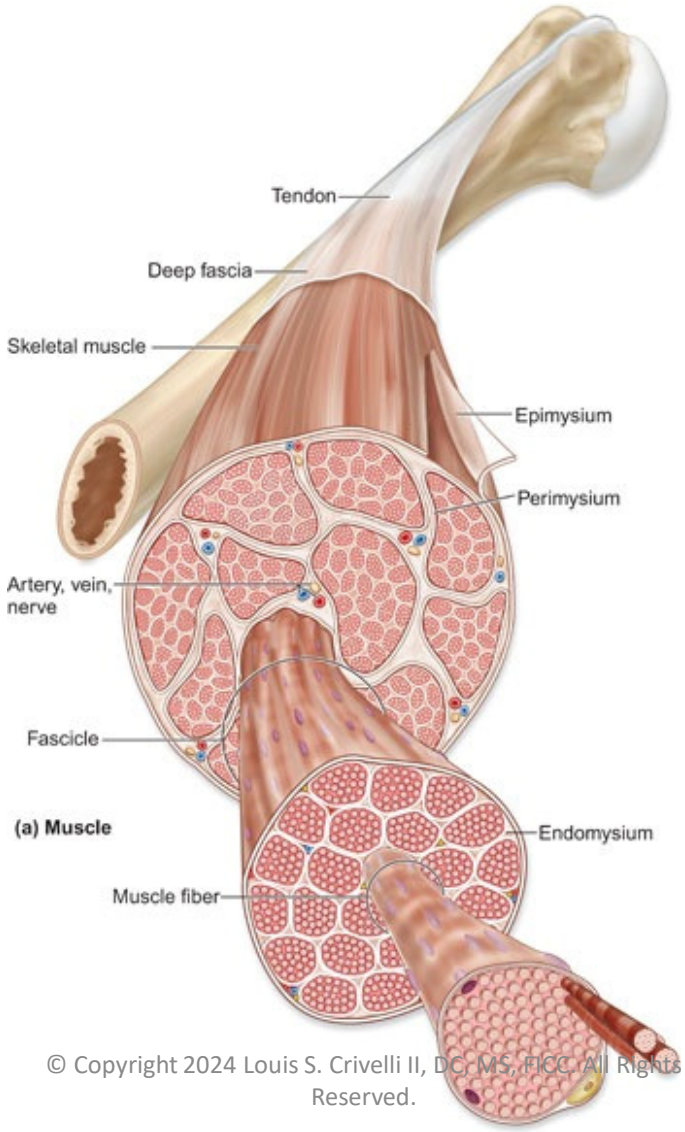


Muscle Structure

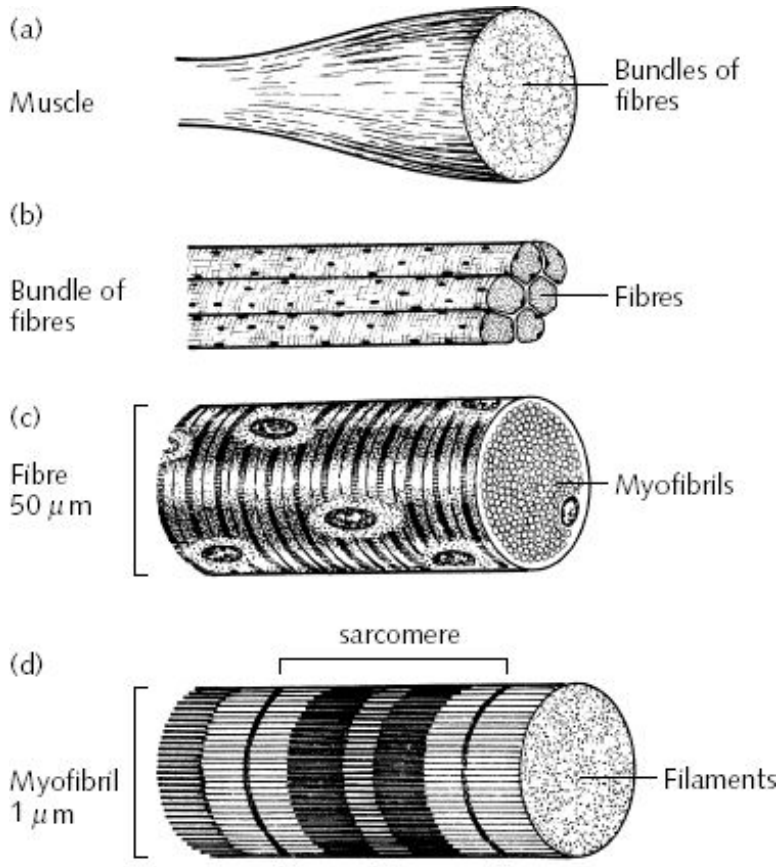
- Due to their structure, muscles have the ability to contract (shorten in length). This causes ALL muscle movement in the body.
- Muscle cells – long, slender cells
- Muscle fibers – group of muscle cells
- Muscle bundles – group of muscle fibers
- Muscle sheath – connective tissue sheath wrapped around muscles. Contains blood vessels and nerves

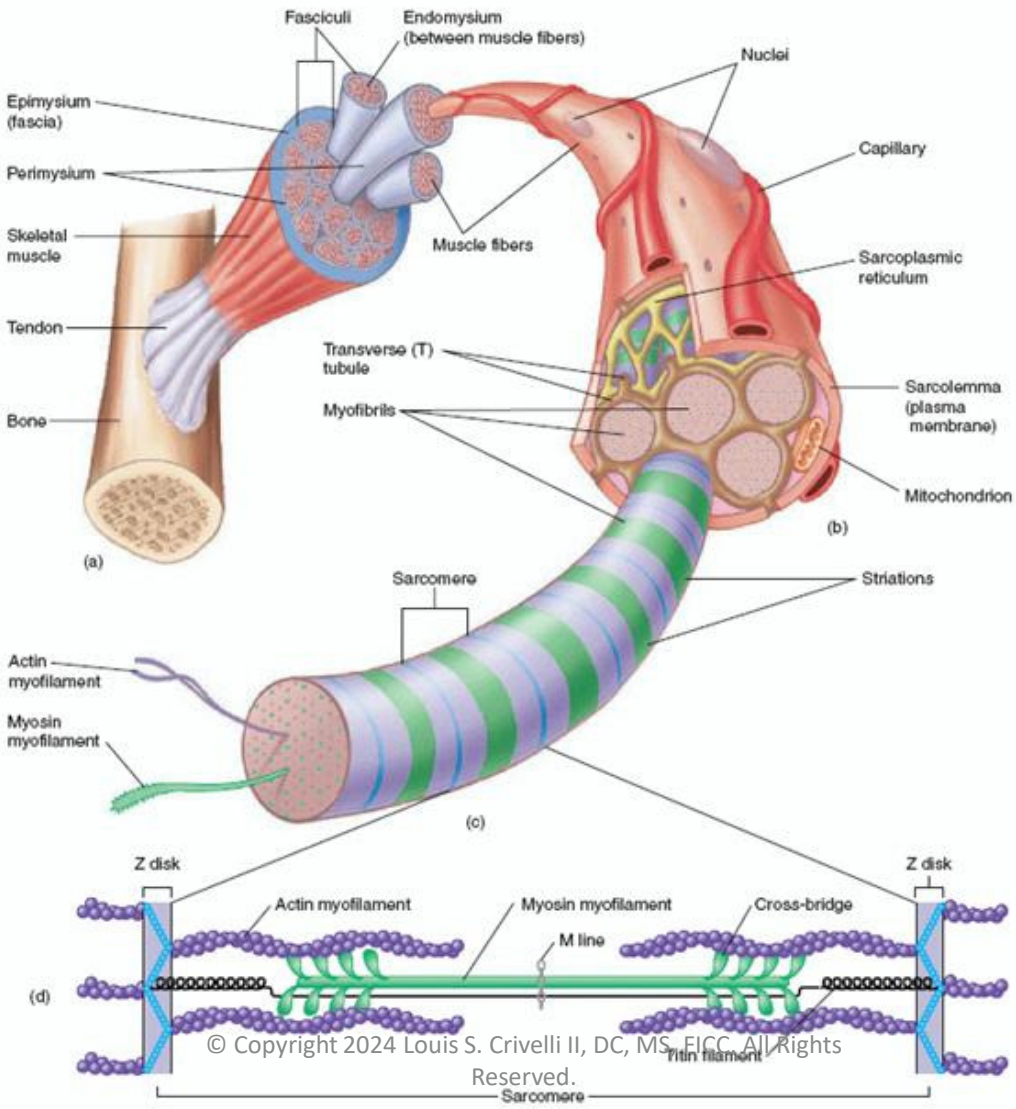
Muscle Structure





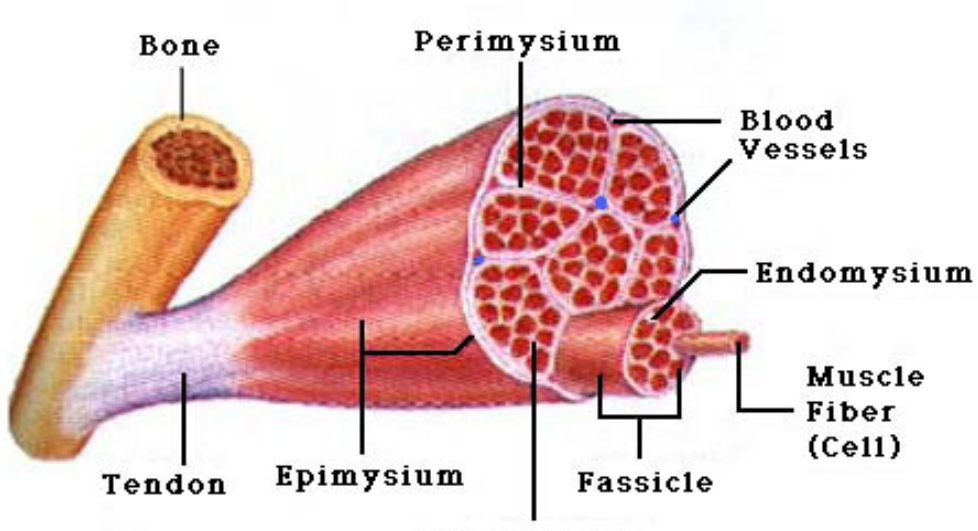
Muscle Structure





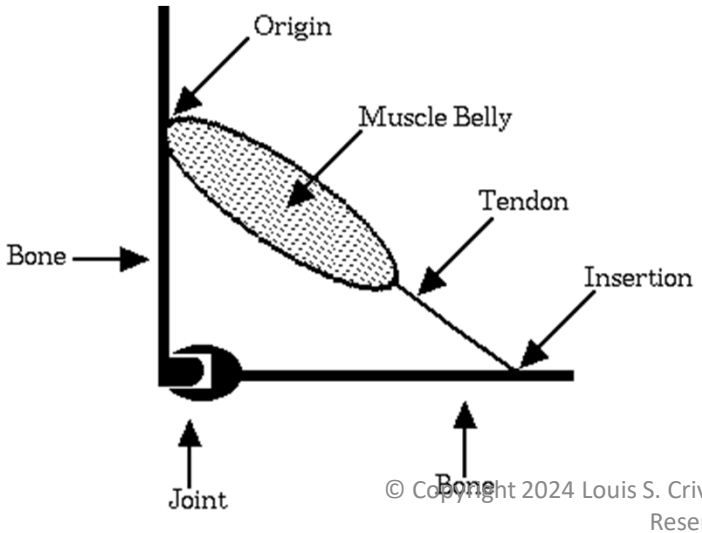
Muscle Attachments

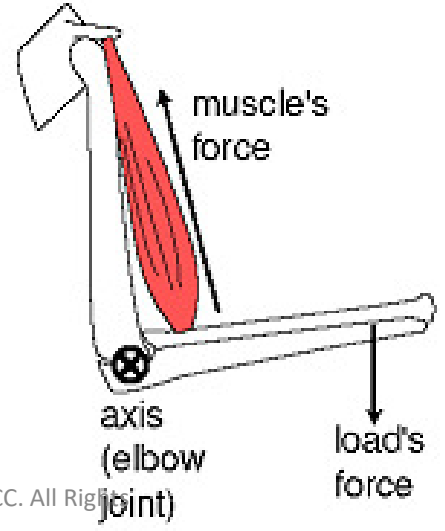
- Extensions of muscle sheaths become connective tissue attachments (tendons) to the bones.



Muscle/Bone Movement

- A muscle is stimulated by a nerve. It then contracts (shortens) and pulls on its connective tissue attachment which pulls on the bone or other muscles.





Muscle Tone

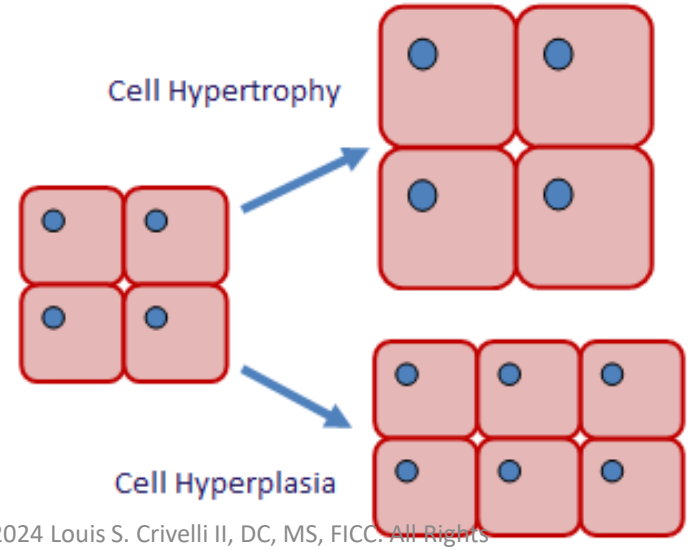
- Muscle tone - the continuous and passive partial contraction of the muscles. A muscle's "readiness to act".
- Hypertonic/hypertonicity – increased muscle tone.
- Hypotonic/hypotonicity – decreased muscle tone.

Muscle Activity

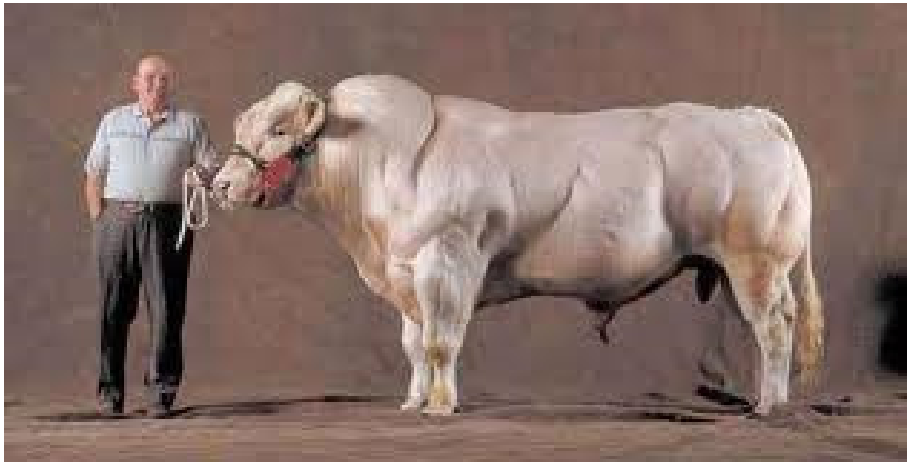
- Contractions consume food and oxygen, particularly postural (spinal) muscles that must be active nearly constantly.
- Contraction produces heat and acid byproducts (lactic acid)
- Acid buildup is a cause of fatigue.
- Contraction is a major source of body heat.

Hypertrophy/Hyperplasia

- Hypertrophy – increase in the SIZE of a muscle cell.
- Hyperplasia – increase in the NUMBER of muscle cells.



Muscle Hypertrophy



Muscle Atrophy

- Atrophy - the partial or complete wasting away of a muscle. Can be caused by long periods of inaction.

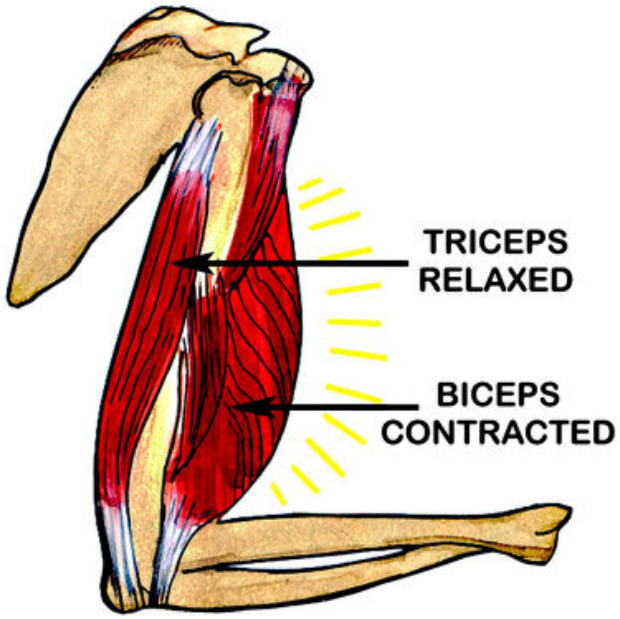
Principles of Skeletal Muscle Action

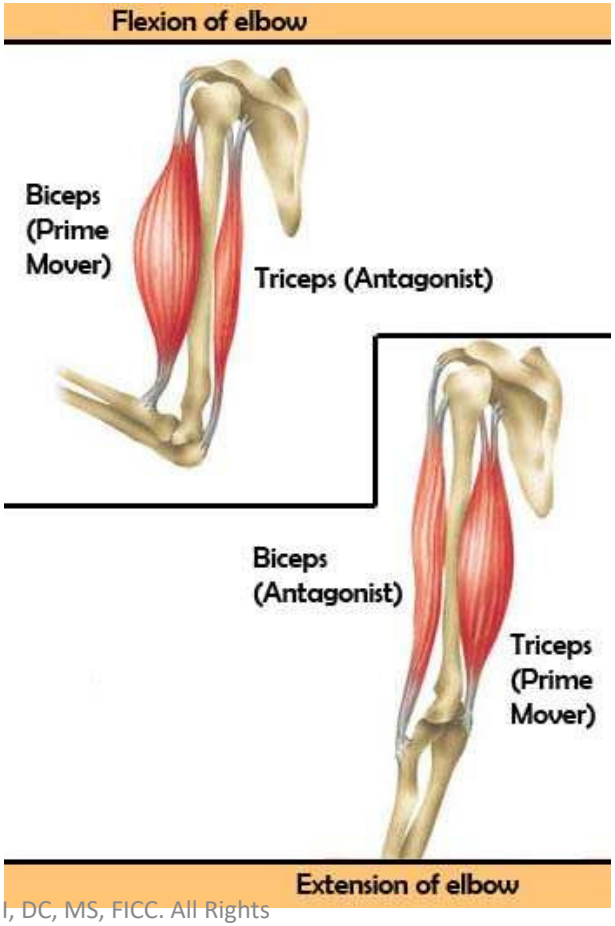
- Pulling and stabilizing – Muscles can only shorten, hence they only pull.
  - Attach to bones above and below the joint. Bone above is stabilized while the bone below is pulled.
- Muscles are usually proximal to the part being moved
- Muscles act in groups for coordination
  - Prime movers
  - Antagonists

Prime Mover/Antagonist

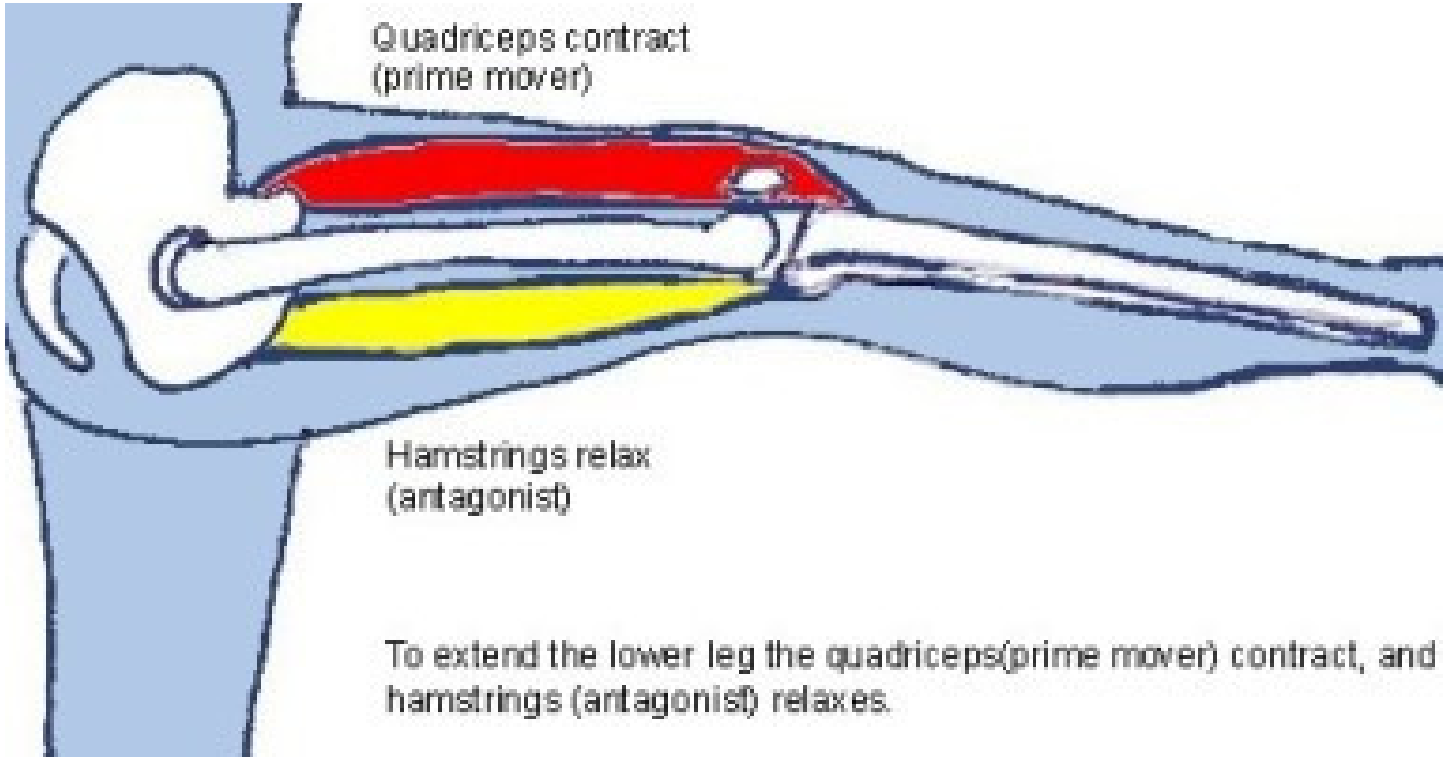
- Muscles act in groups (biceps/triceps) to produce movement.
- During elbow flexion, the biceps muscle is the prime mover (contracting) while the triceps muscle is the antagonist (relaxing) .
- During elbow extension, the jobs are reversed.

Prime Mover/Antagonist





Prime Mover/Antagonist



Principal Groups of Skeletal Muscle

- Head and Face
  - Orbicularis oculi
  - Orbicularis oris
  - Masseters
- Arms
  - Deltoid
  - Biceps
  - Triceps
  - Flexors and Extensors
- Back
  - Erector spinae

Principal Groups of Skeletal Muscle

- Abdomen
  - Rectus abdominis
  - Internal and External obliques
- Neck
  - Posterior cervical muscles
  - Trapezius
  - Levator scapulae
  - Sternocleidomastoid (SCM)
  - Scalenes

Principal Groups of Skeletal Muscle

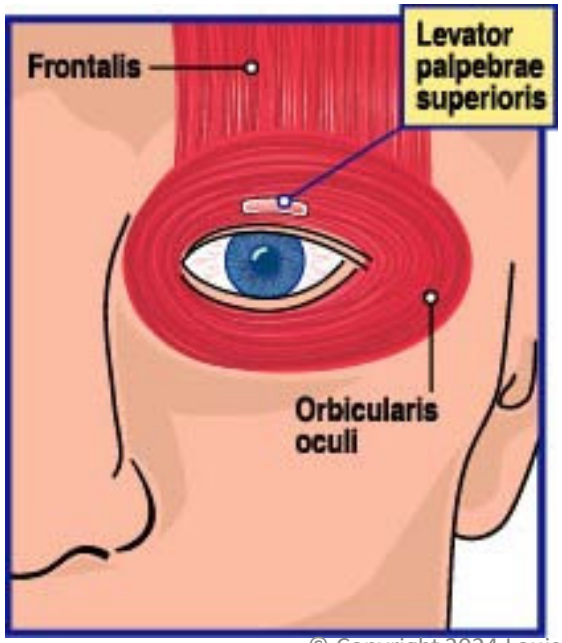
- Chest
  - Diaphragm
  - Pectoralis major and minor
  - Latissimus dorsi
- Perineum
  - Groin muscles
- Buttocks
  - Gluteus maximus
  - Gluteus medius
  - Gluteus minimus

Principal Groups of Skeletal Muscle

- Thighs
  - Quadriceps
  - Hamstrings
- Leg
  - Tibialis anterior
  - Gastrocnemius

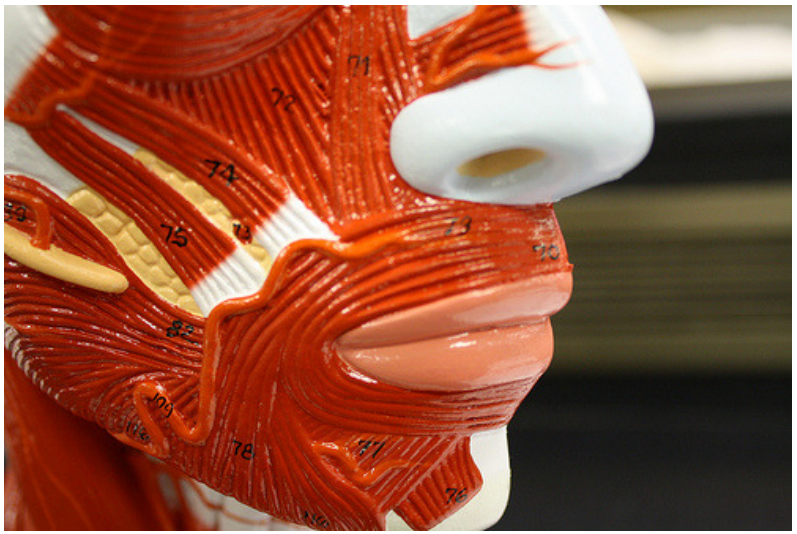
Orbicularis oculi

- Muscle in the front of the face that closes the eye.



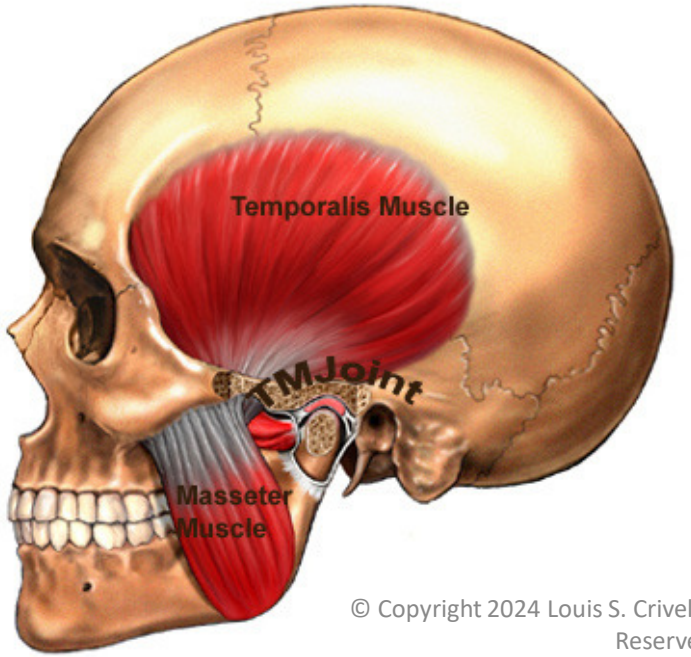
Orbicularis oris

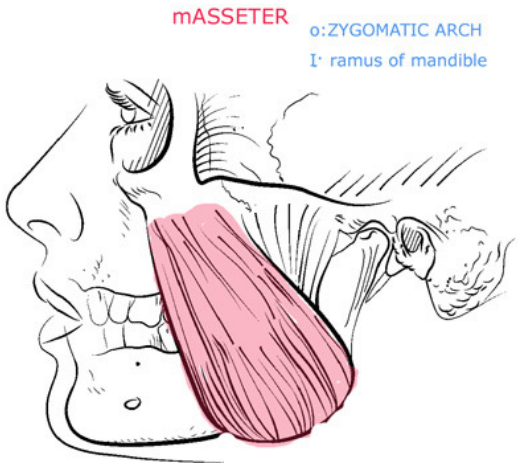
- Muscle in the face that closes the mouth and puckers the lips when it contracts.



Masseter

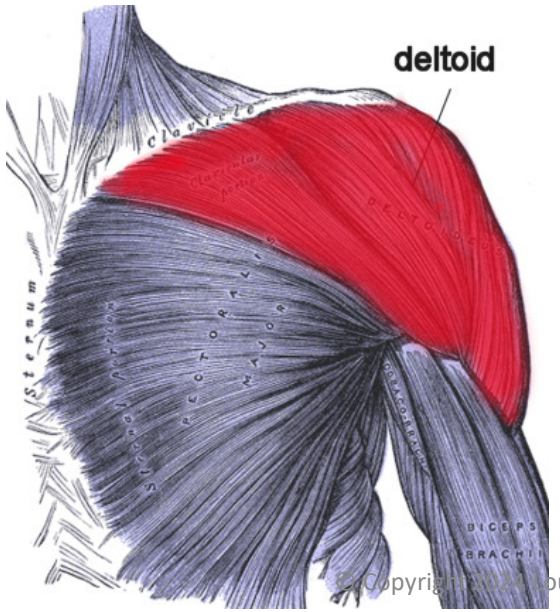
- Muscle of mastication (chewing). Elevates the mandible (closes mouth).

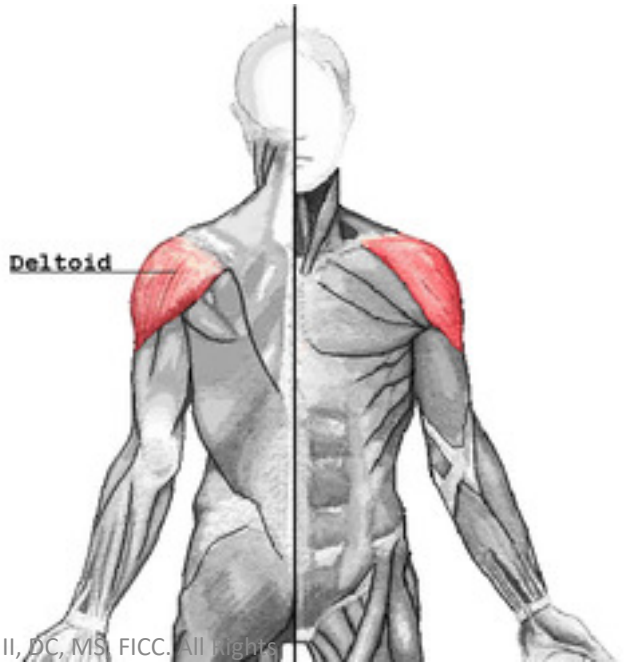




Deltoid

- Provides shoulder abduction, flexion, and extension. Forms the rounded contour of the shoulder.

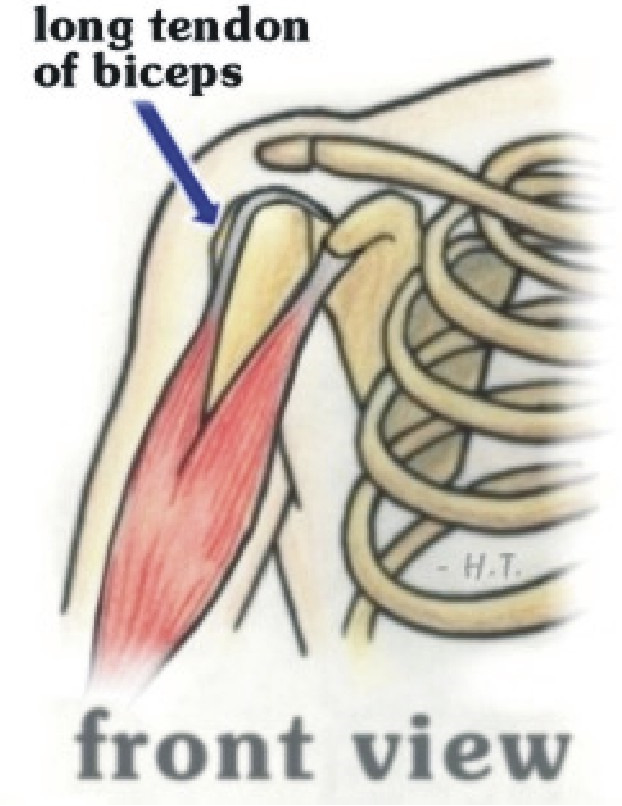


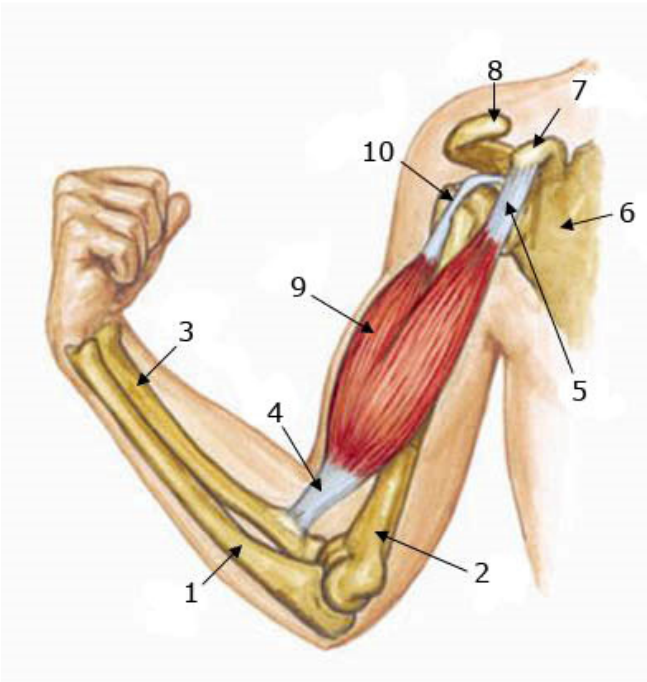


Biceps brachii

- 2 headed muscle in the upper arm. Provides flexion at the elbow and supination of the forearm. Crosses both the shoulder and elbow.

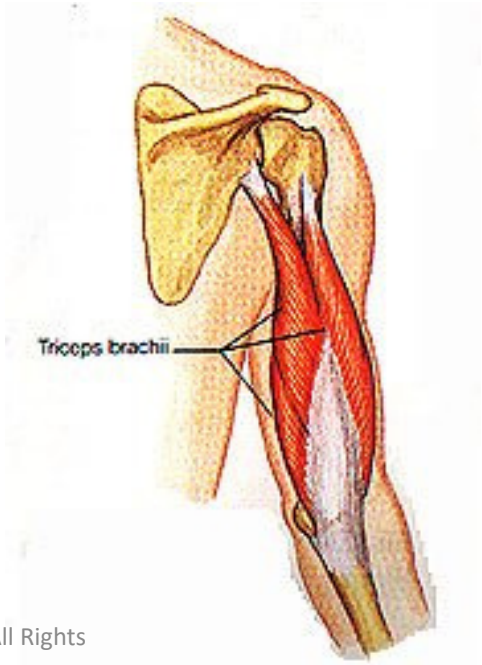
Biceps brachii





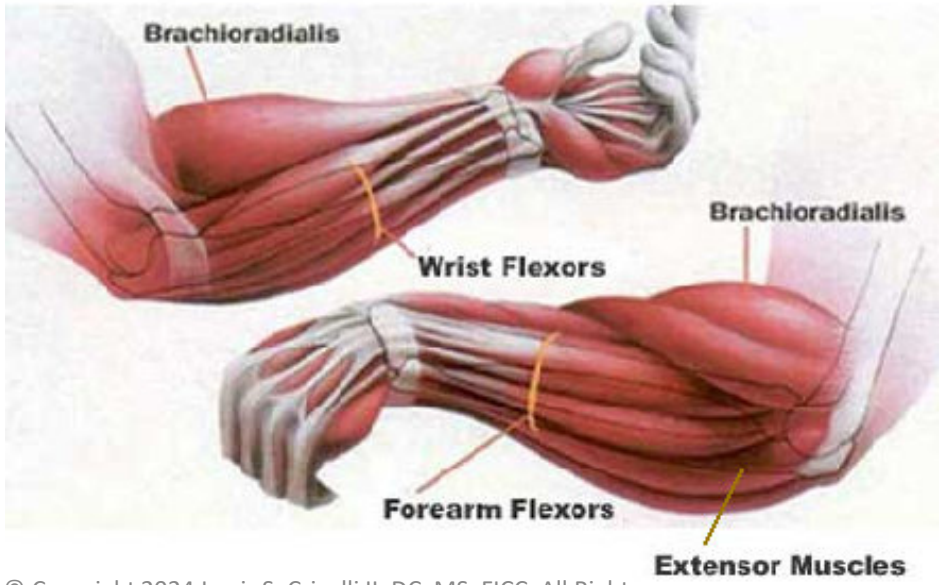
Triceps brachii

- 3 headed muscle in the upper arm. Provides extension at the elbow and adduction of the shoulder.



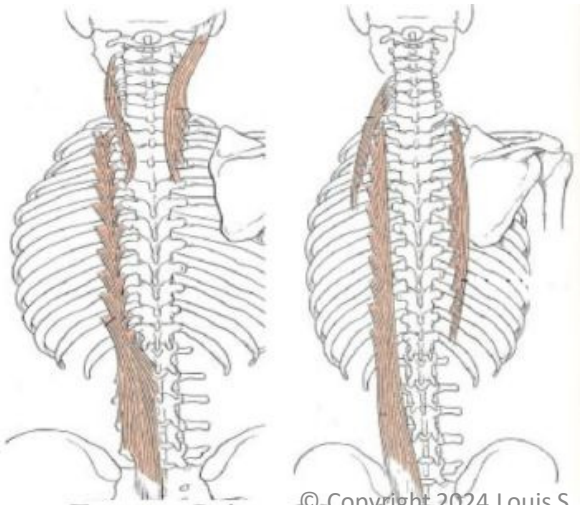
Flexors and Extensors

- Collective name for forearm musculature. Provides flexion and extension of the hand and wrist.

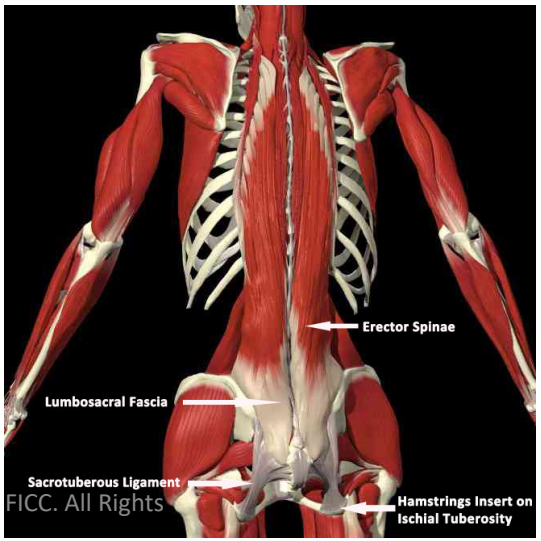


Erector Spinae

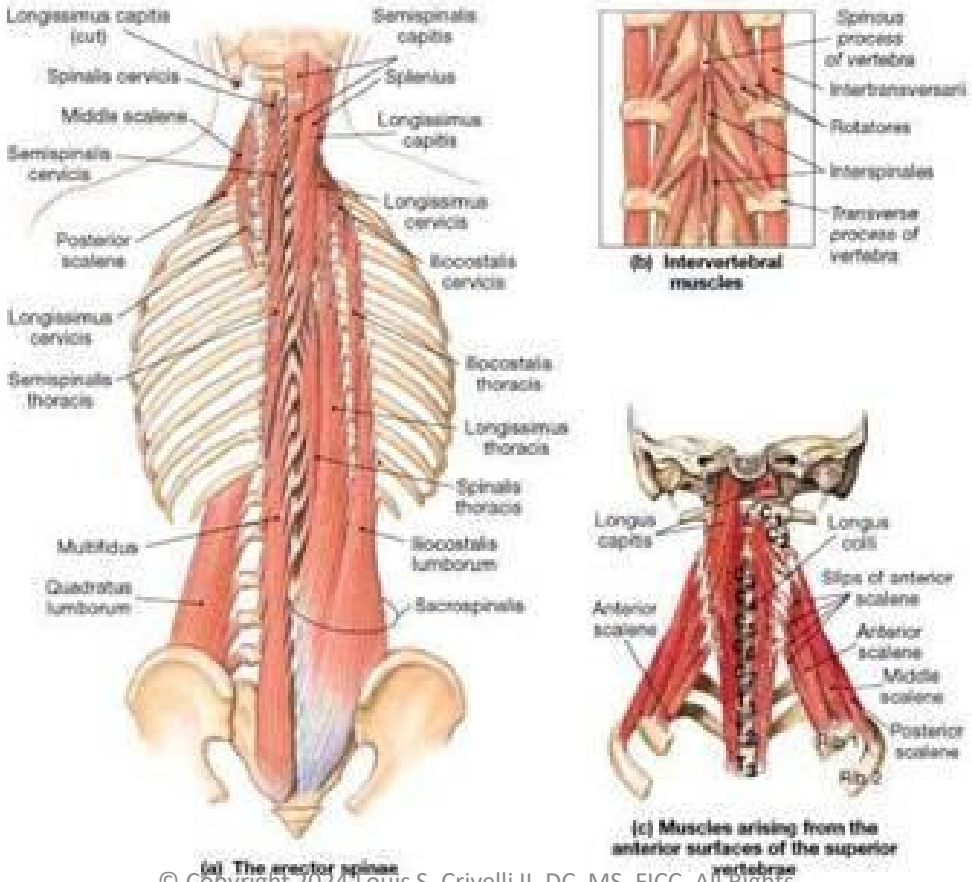
- Collective name for bundles of muscles and tendons that run longitudinally with the vertebral column. Provides extension and postural support for the spine.



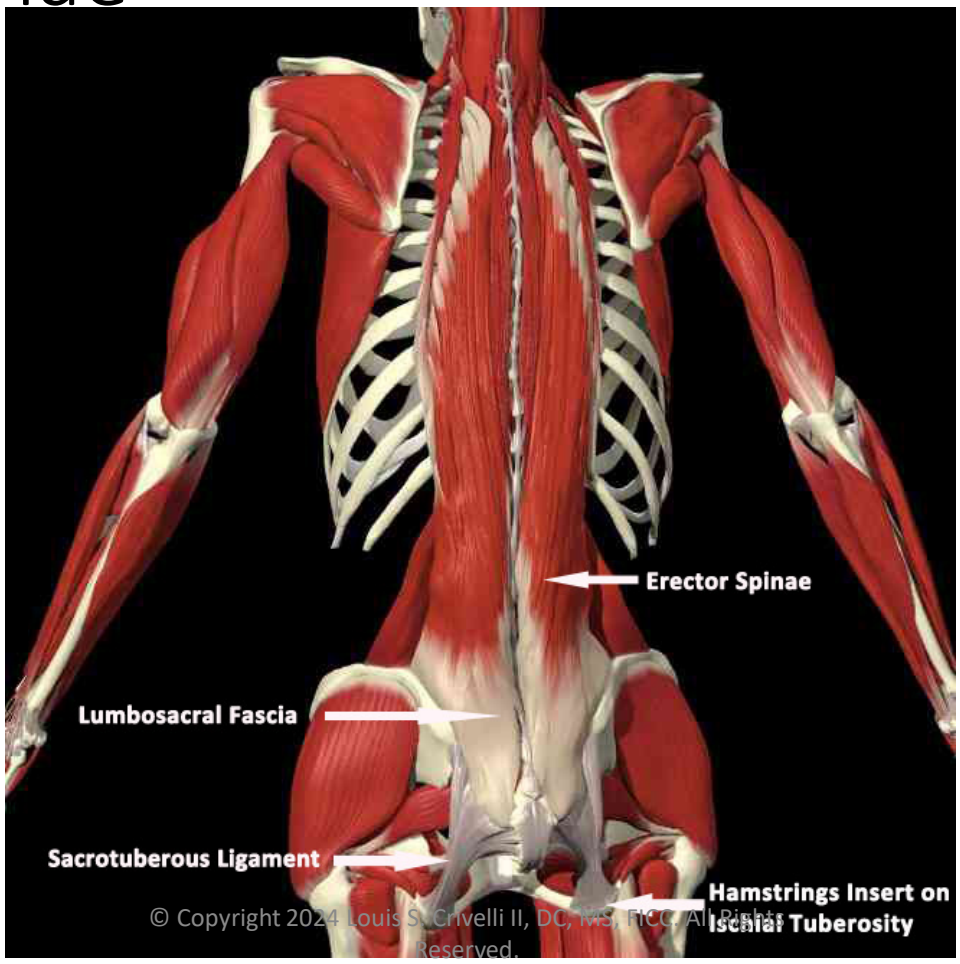
Erector Spinae Muscle Group



Erector Spinae

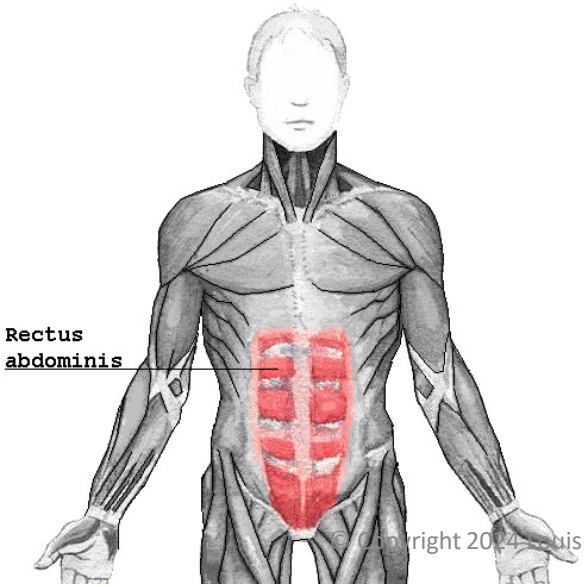


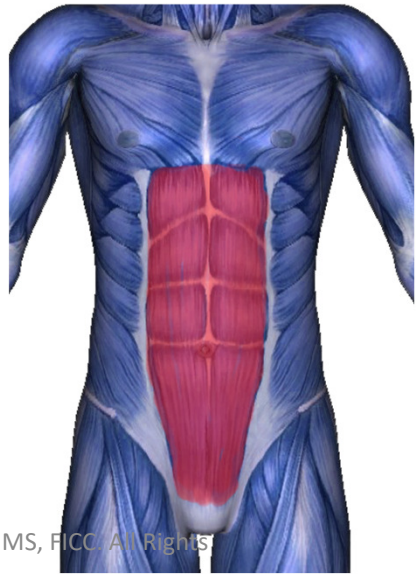
Erector spinae



Rectus abdominis

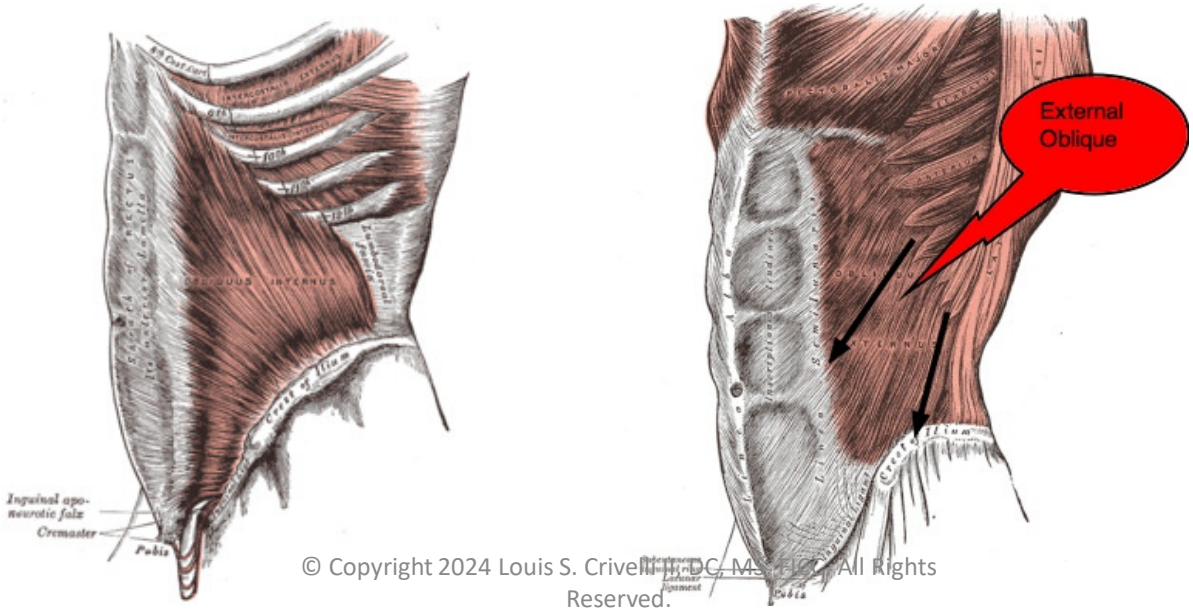
- Paired muscle running vertically on the anterior portion of the abdominal wall. Provides flexion of the lumbar spine.





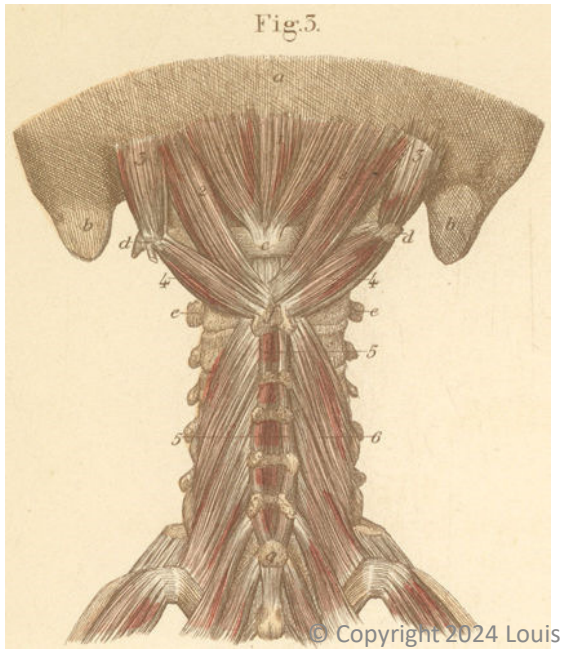
Internal and External Obliques

- Abdominal muscles that compress the abdomen and rotate the vertebral column ipsilaterally. Rotates the torso.



Posterior cervical muscles

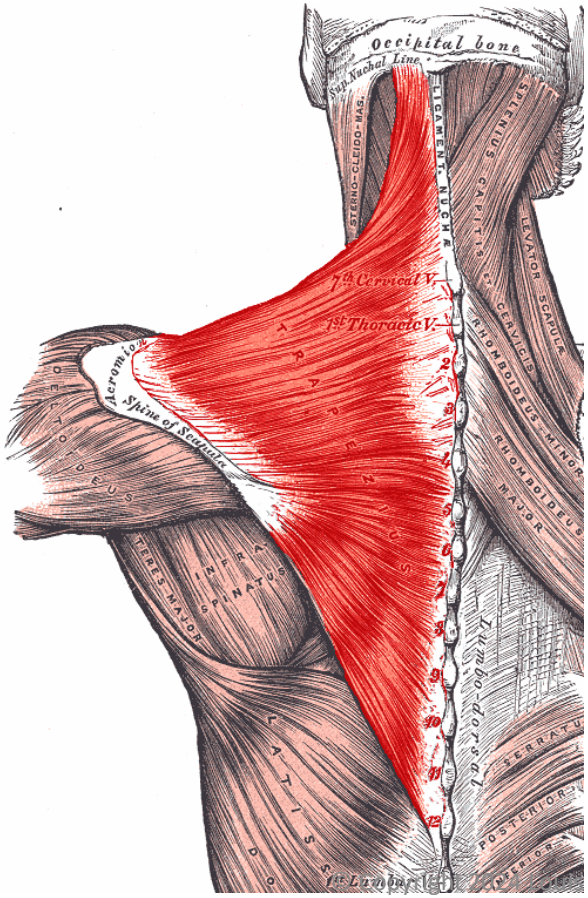
- Collective group of smaller muscles. Provides rotation and extension of the head.

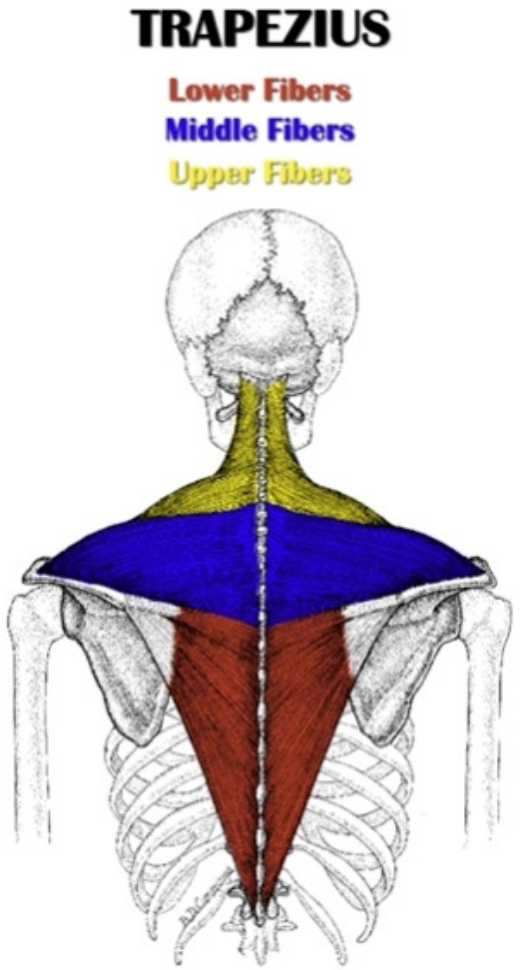


Trapezius

- Large superficial trapezoidal shaped muscle that runs from the occipital bone to the shoulders to the lower thoracic vertebrae. Moves the scapula and supports the arm. Can also move the spine when the scapulae are stabilized.
- 3 functional regions – upper, middle, and lower.

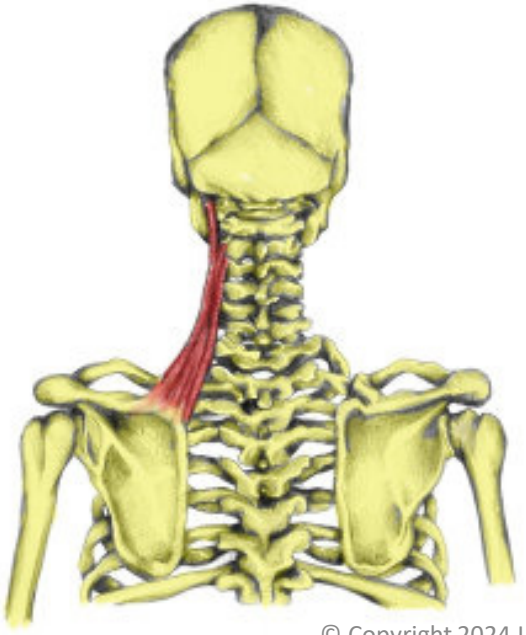
Trapezius

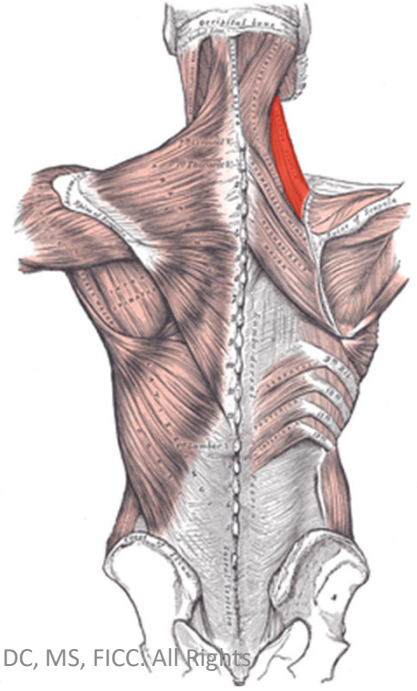




Levator scapulae

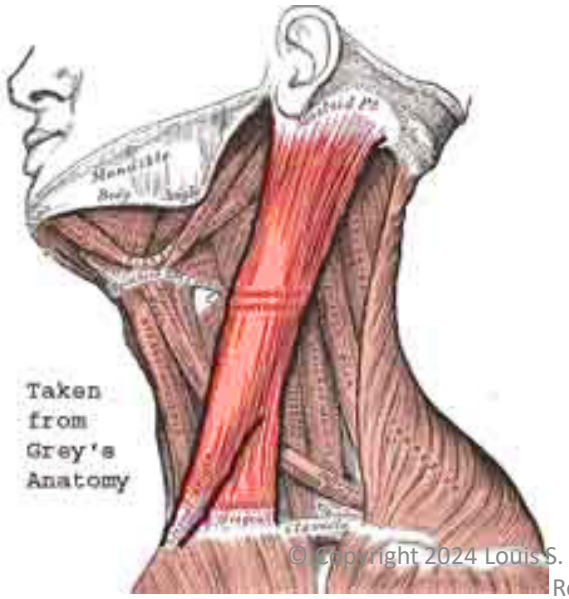
- Runs from the scapula to the occipital bone, its function is to elevate the scapula.





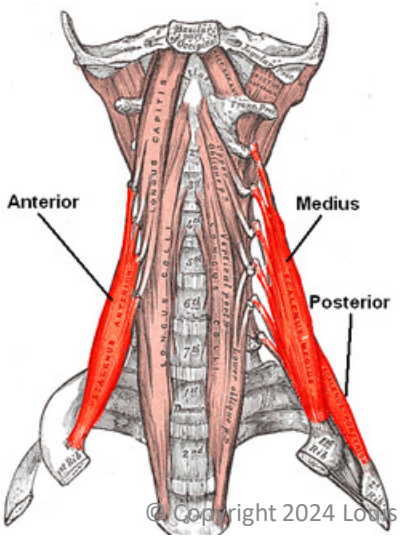
Sternocleidomastoid (SCM)

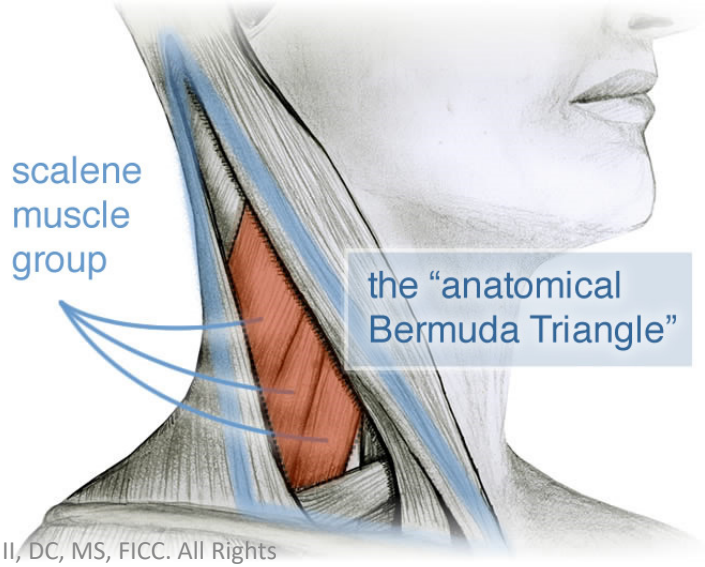
- Anterior neck muscle that joins the mastoid process (behind the ear) with the sternum and clavicle. Acts to flex and rotate the head.



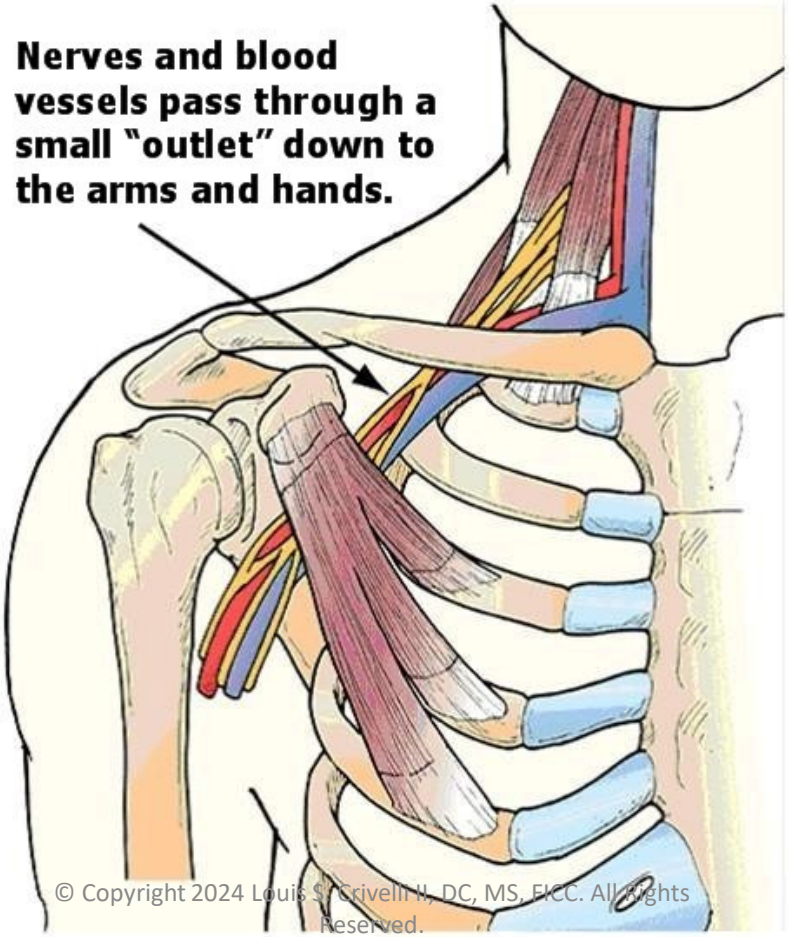
Scalenes

- Group of 3 pairs of muscles that join the cervical vertebrae to the ribs. Act to elevate the ribs. Neurovascular elements run through them.



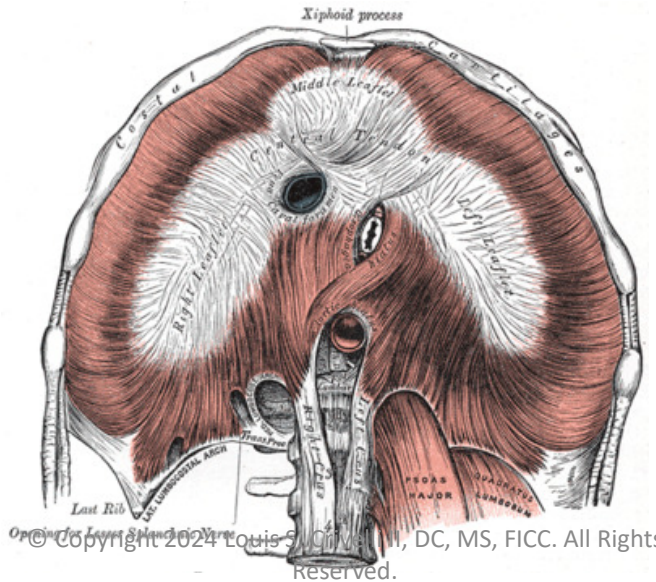


Scalenes

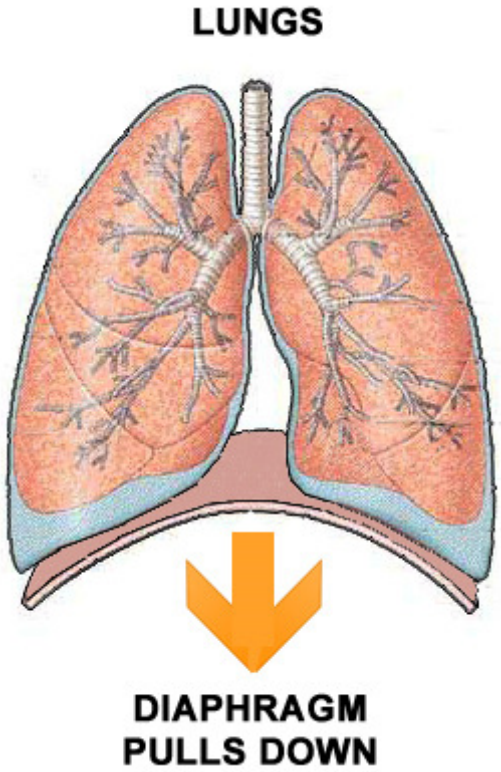


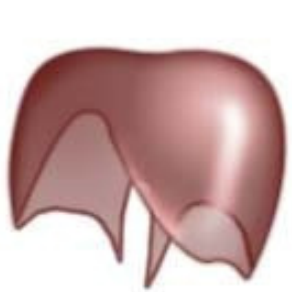
Diaphragm

- Sheet of flat muscle that extends across the bottom of the ribcage. Functions to enlarge the thoracic cavity making inspiration possible.



Diaphragm



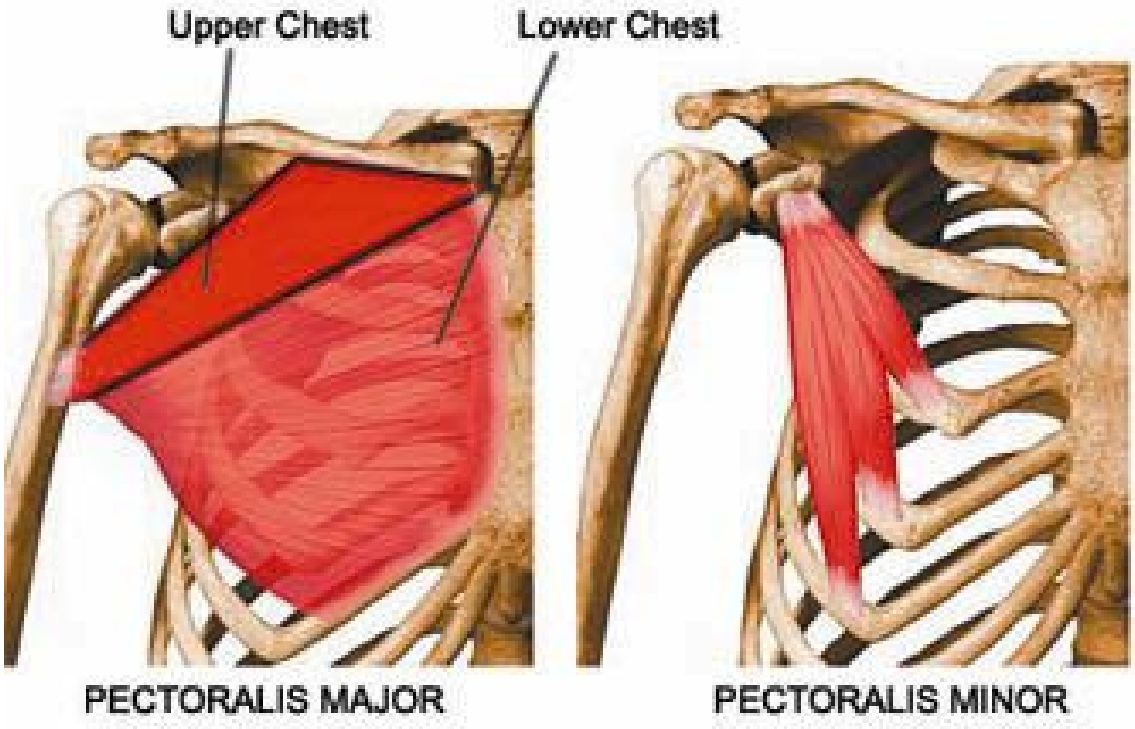


The diaphragm
is shaped
like a parachute

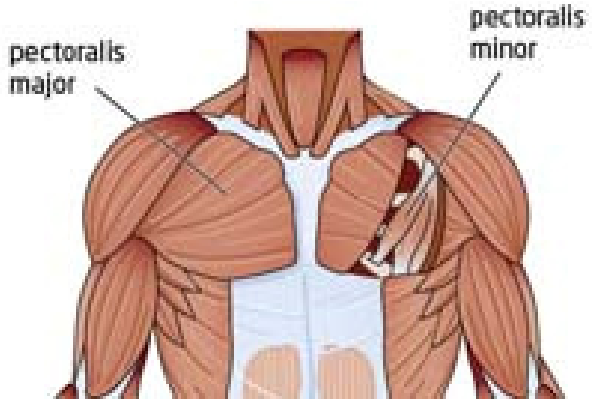
Pectoralis major and minor

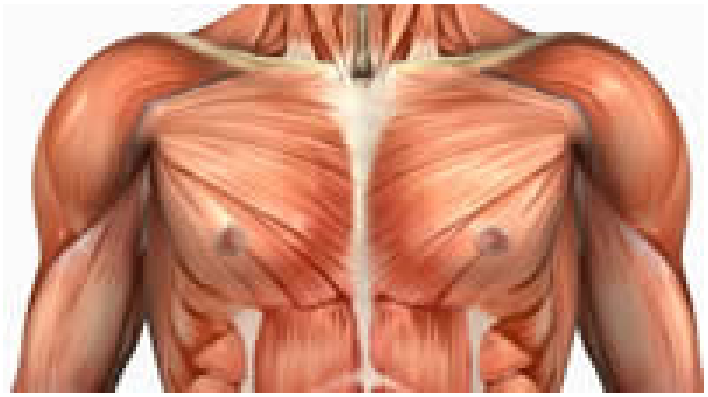
- Muscles of the chest. Pectoralis major functions to move the shoulder joint (flexion, adduction and rotation of the humerus) and secures the arm to the trunk.
- Pectoralis minor is located under the pectoralis major and functions to depress the point of the shoulder, drawing the scapula inferior and medial, towards the thorax.

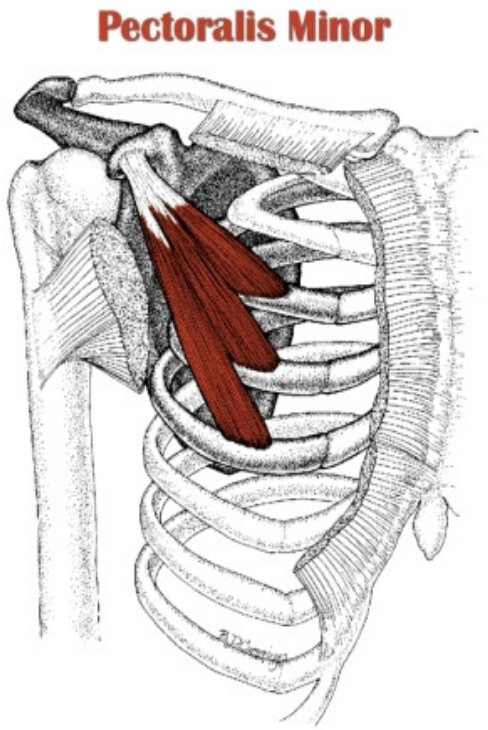
Pectoralis major and minor



Pectoralis major and minor

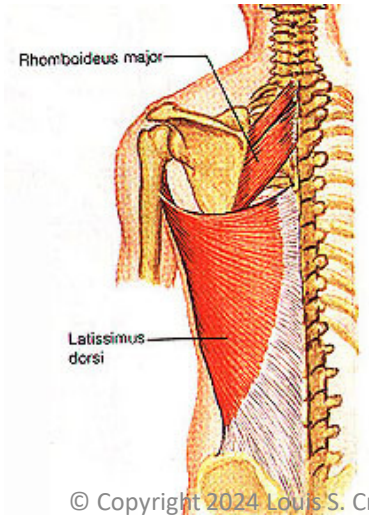


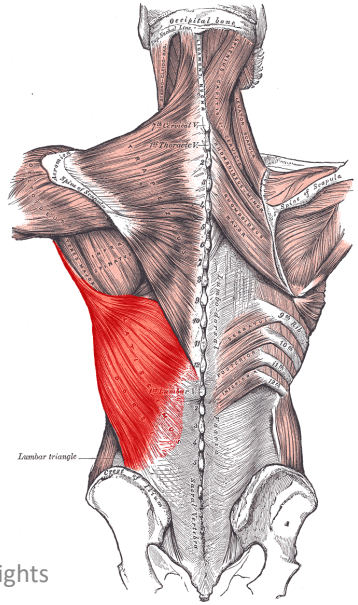




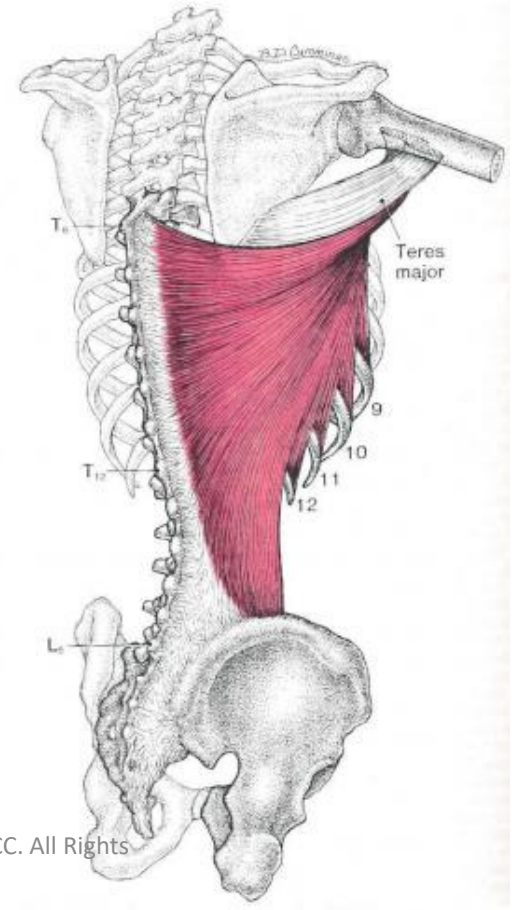
Latissimus dorsi

- Name means “broadest muscle of the back”. Large, flat muscle partially under the trapezius. Acts to adduct, extend, and rotate the arm inwards.



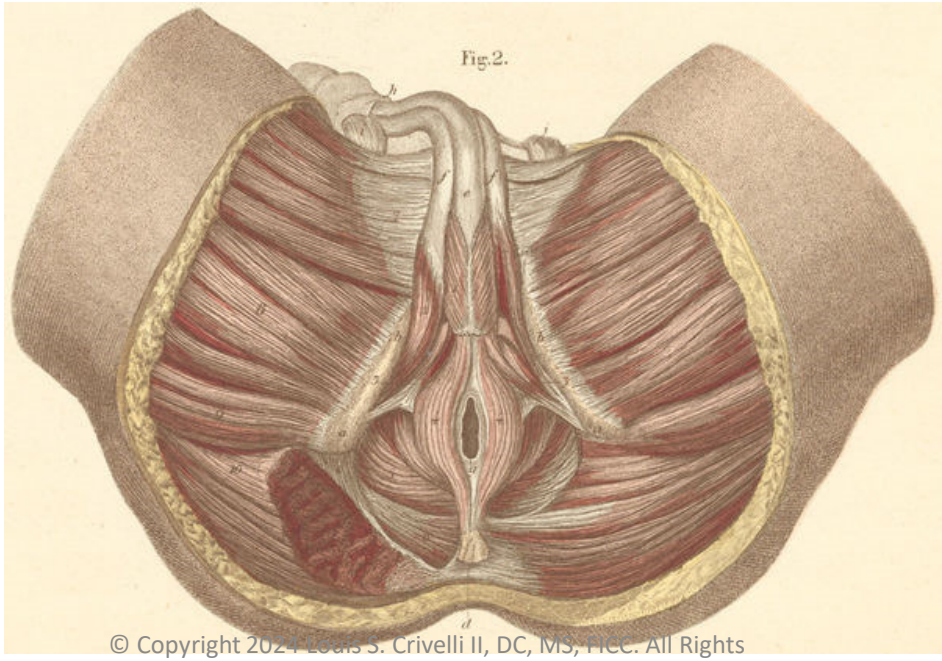


Latissimus dorsi



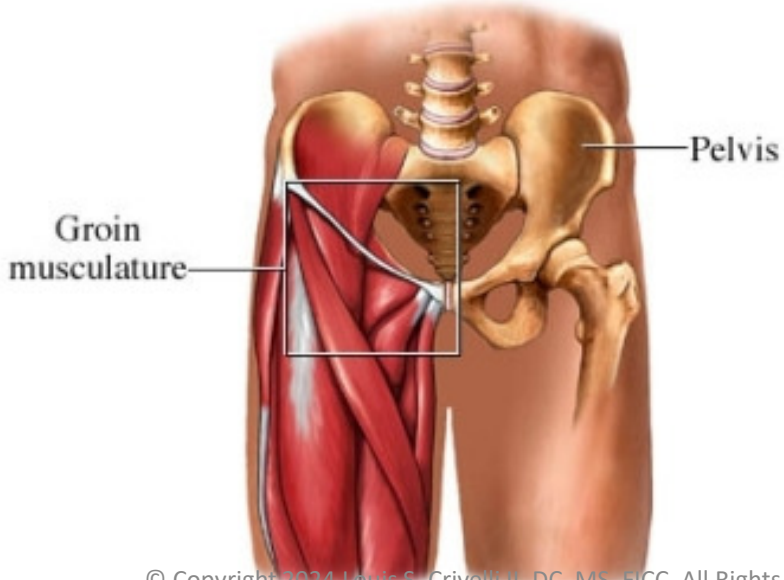
Perineum

- Group of muscles that form the floor of the pelvic cavity.



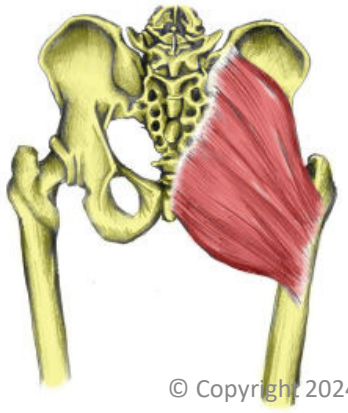
Groin muscles

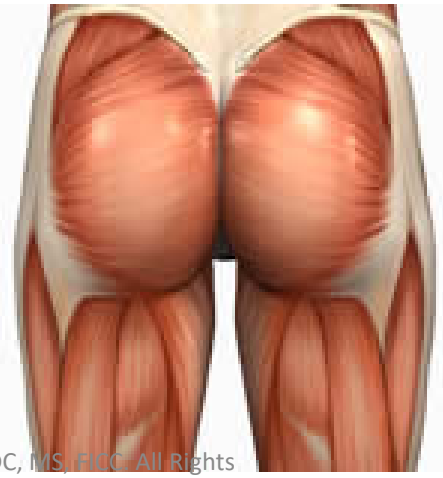
- Primarily composed of hip adductor muscles, the groin area forms the junction of the torso with the legs, on either side of the pubis.



Gluteus maximus

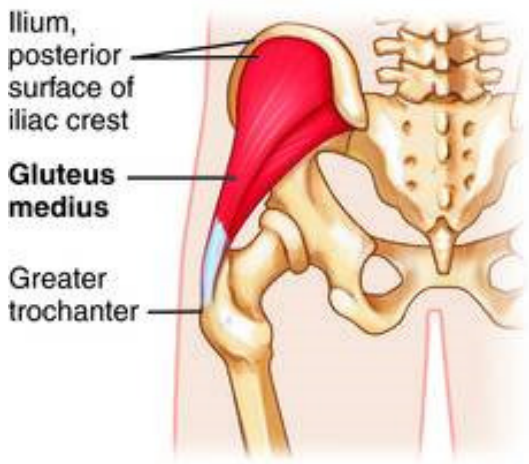
- Largest and most superficial of the gluteal muscles. Forms most of the shape and appearance of the buttocks. Major stabilizer of the lumbar spine. Functions to rotate and extend the hip joint.

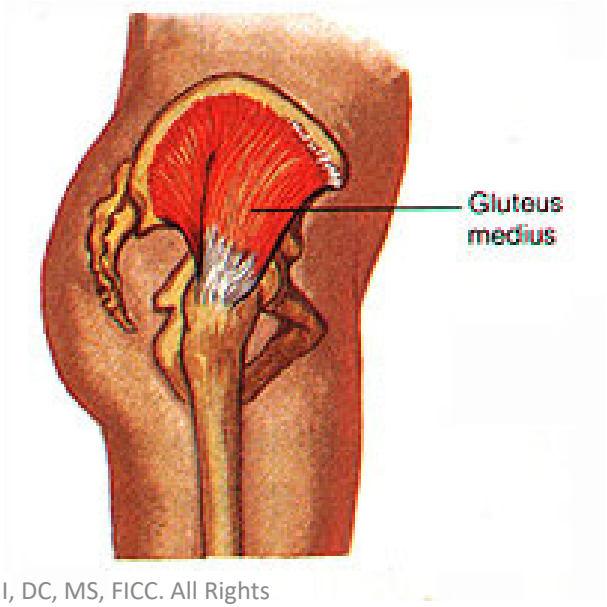




Gluteus medius

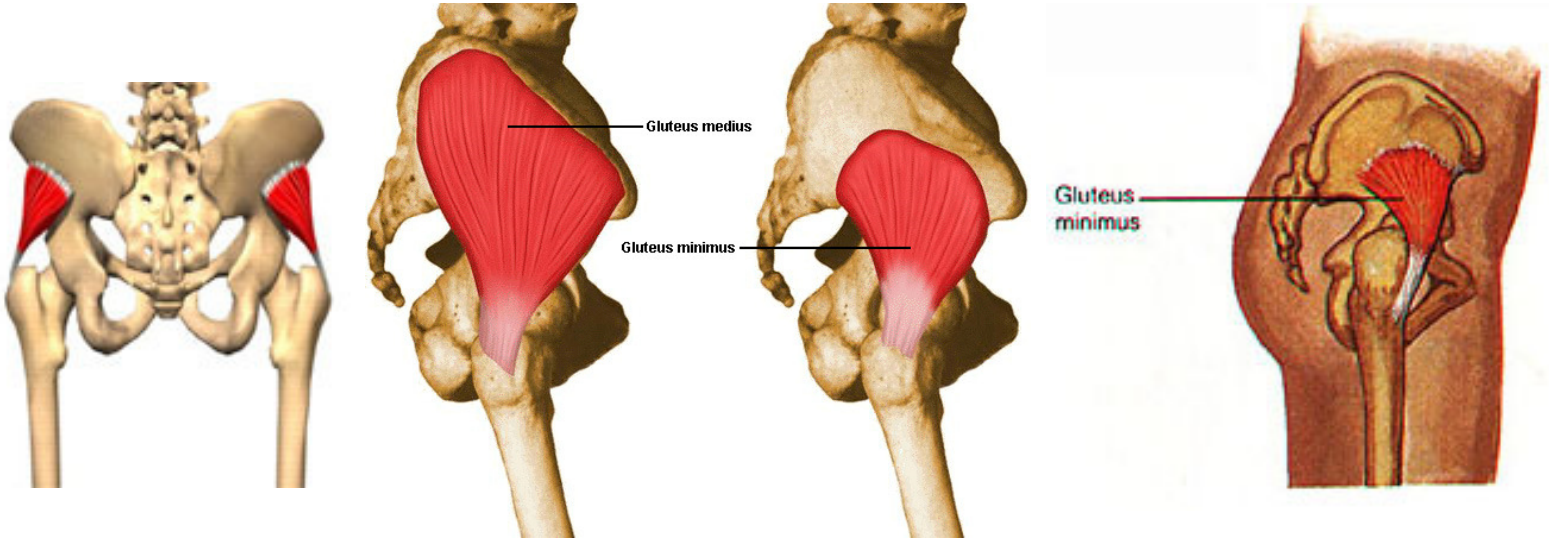
- Middle gluteal muscle. Provides abduction of the hip, stabilization of the hip and rotation of the thigh.





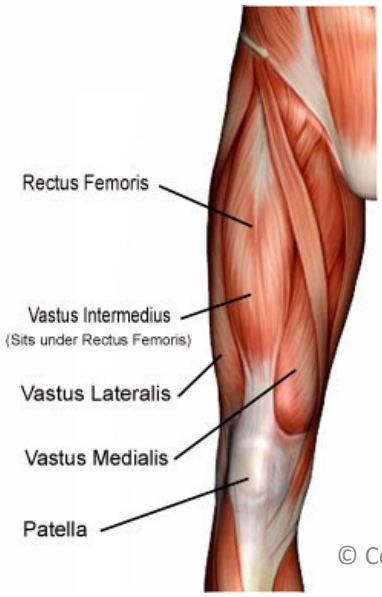
Gluteus minimus

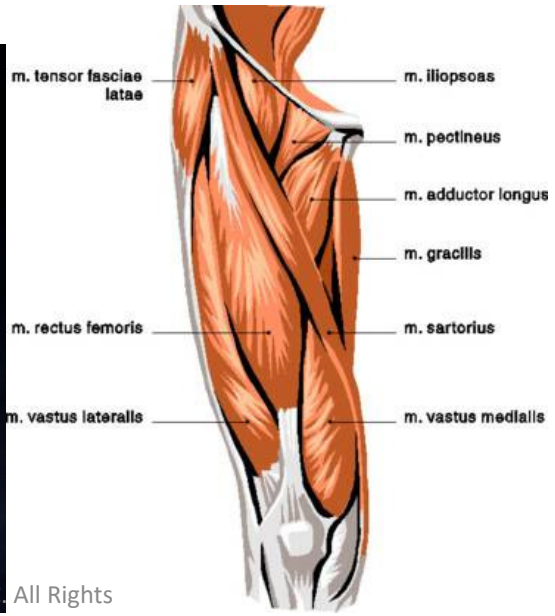
- Inferior to the gluteus medius, it aids the gluteus medius in abduction and stabilization of the hip.



Quadriceps

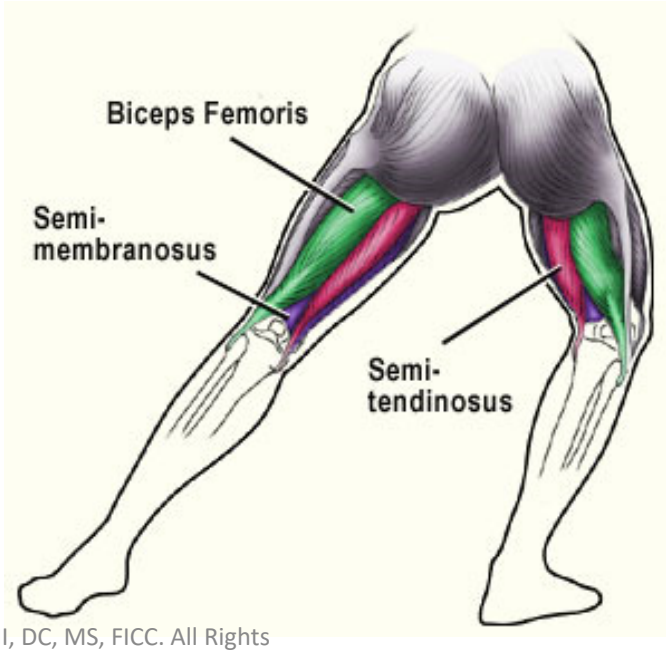
- A group of 4 muscles on the anterior thigh. Functions to extend the knee joint. The strongest muscle in the body.





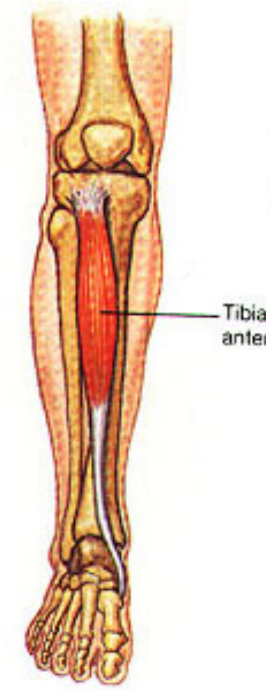
Hamstrings

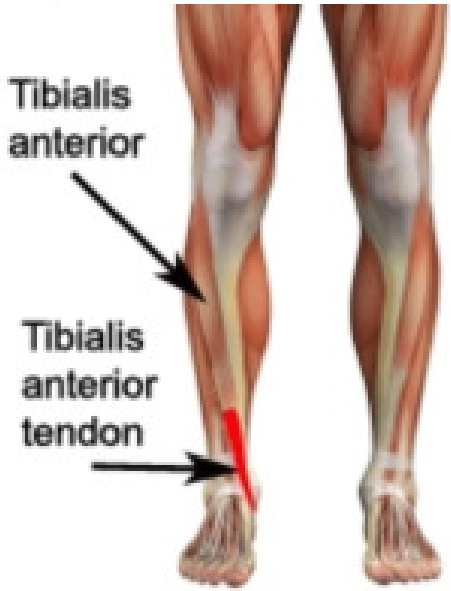
- Group of 3 posterior thigh muscles. Functions to flex the knee. They cross and act upon the hip and the knee joints.

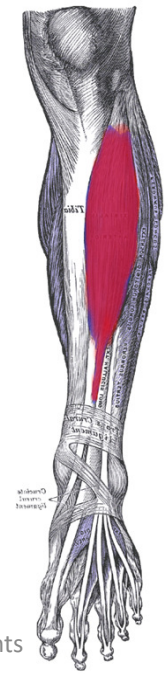


Tibialis anterior

- Muscle on the anterior portion of the lower leg. Functions to dorsiflex and invert the foot.

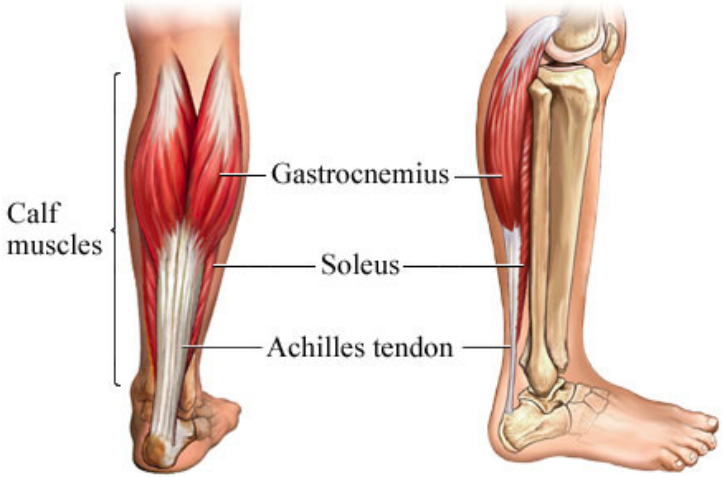




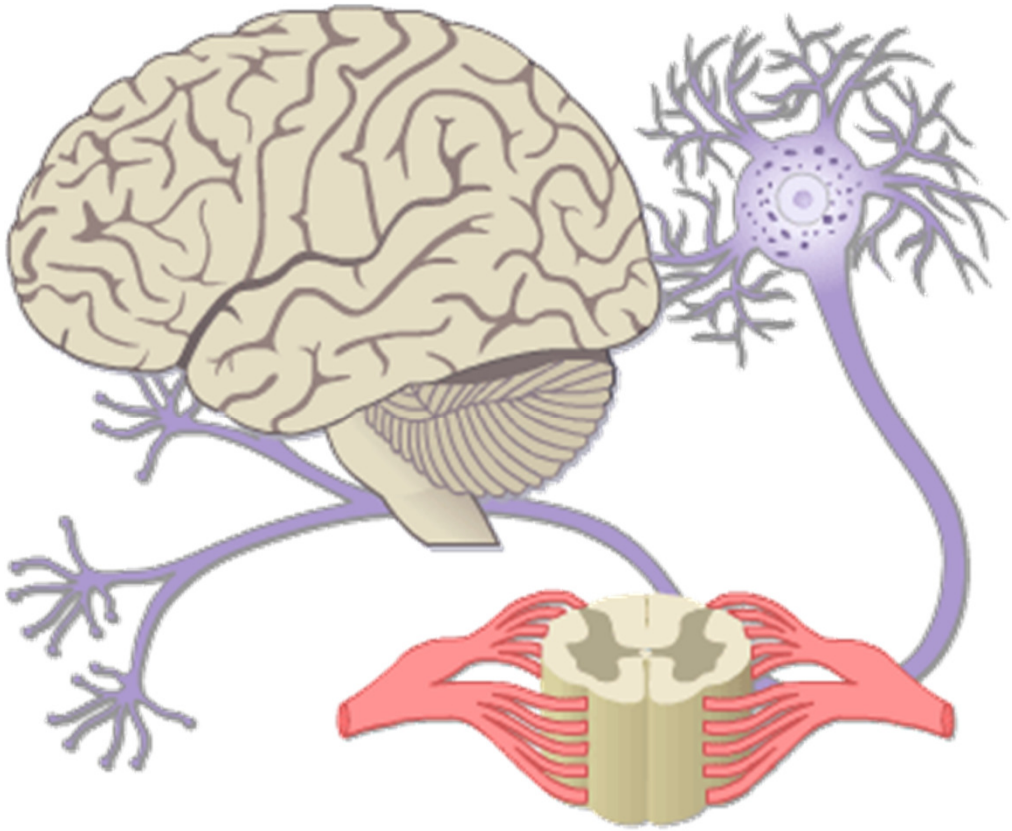


Gastrocnemius

- Posterior muscle of the lower leg. Functions to plantar flex the foot and flex the knee. Calf muscles.



The Nervous System



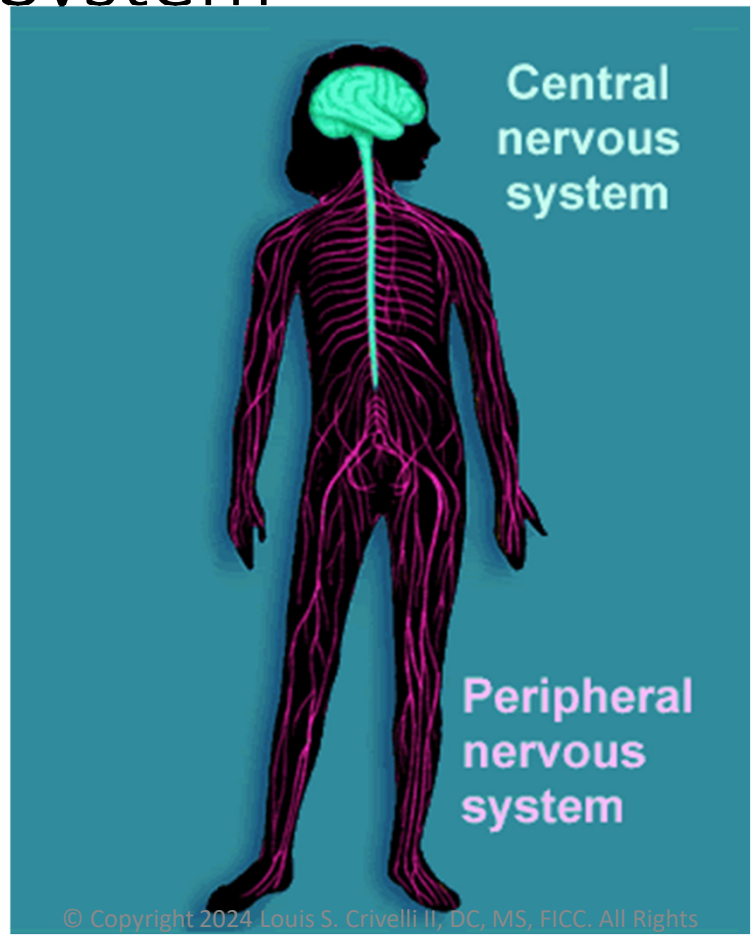
The Nervous System

- Regulates, coordinates, and integrates all body systems.
- Gives the body awareness of it’s environment.
- Communication and Control

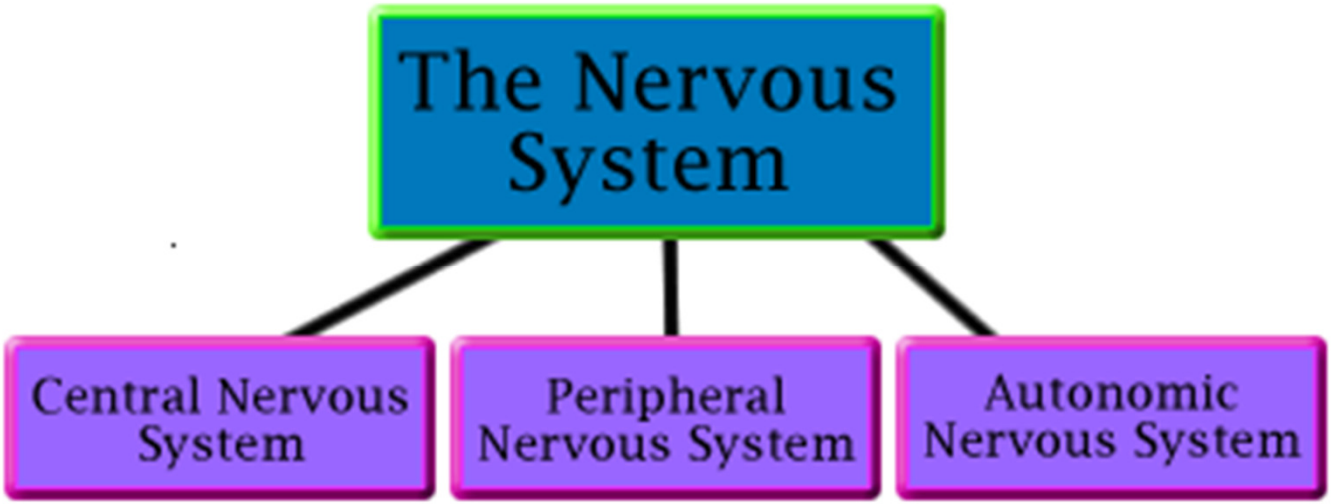
The Nervous System

- Central Nervous System
  - Brain and spinal cord
- Peripheral Nervous System
  - Nerves outside the brain and spinal cord

The Nervous System



The Nervous System



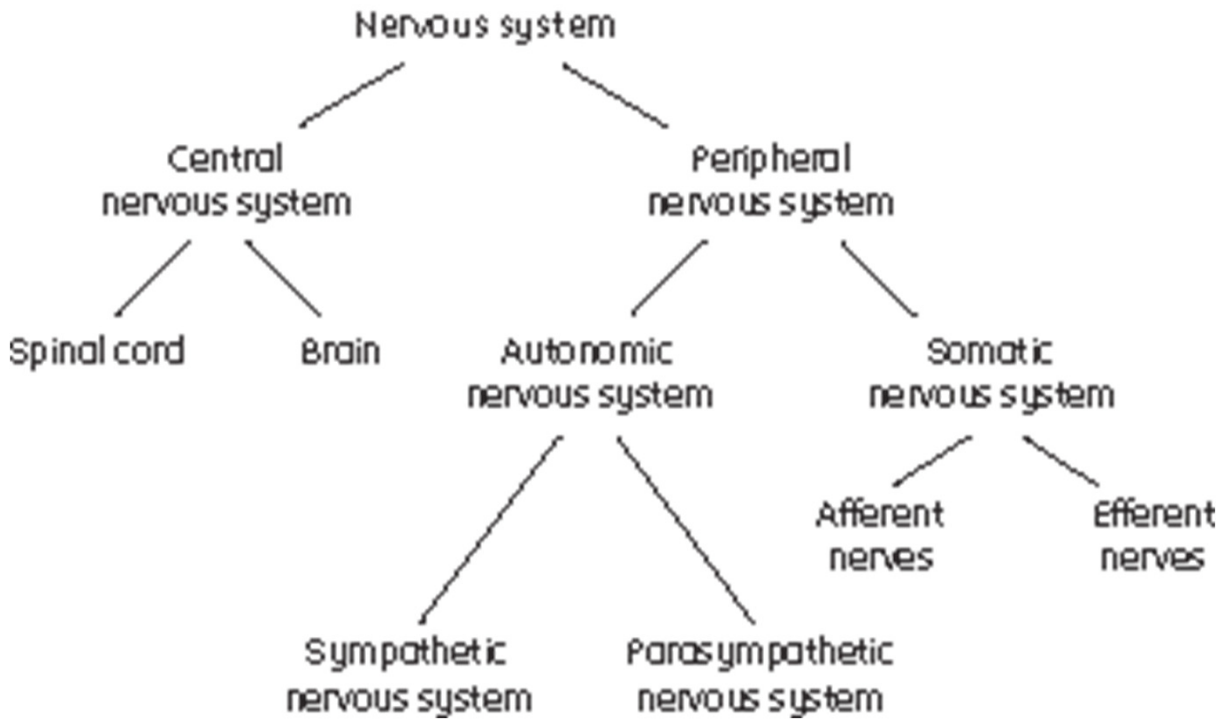
The Nervous System

- Autonomic Nervous System
  - Controls involuntary activity of muscles and glands. Controls prolonged bodily functions.
- Somatic Nervous System
  - Controls voluntary actions of skeletal muscles. Receives information from sensory organs.
    - Afferent nerves – sensory
    - Efferent nerves – motor

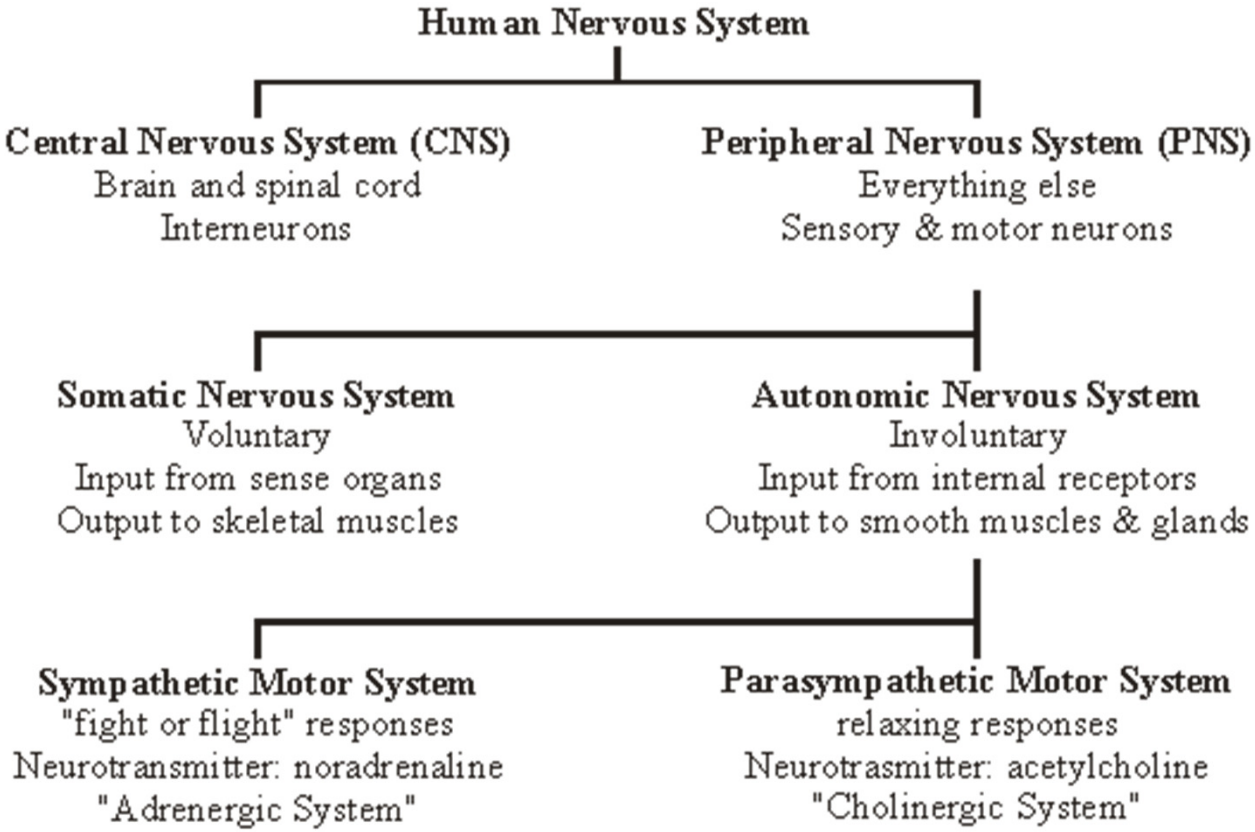
The Nervous System

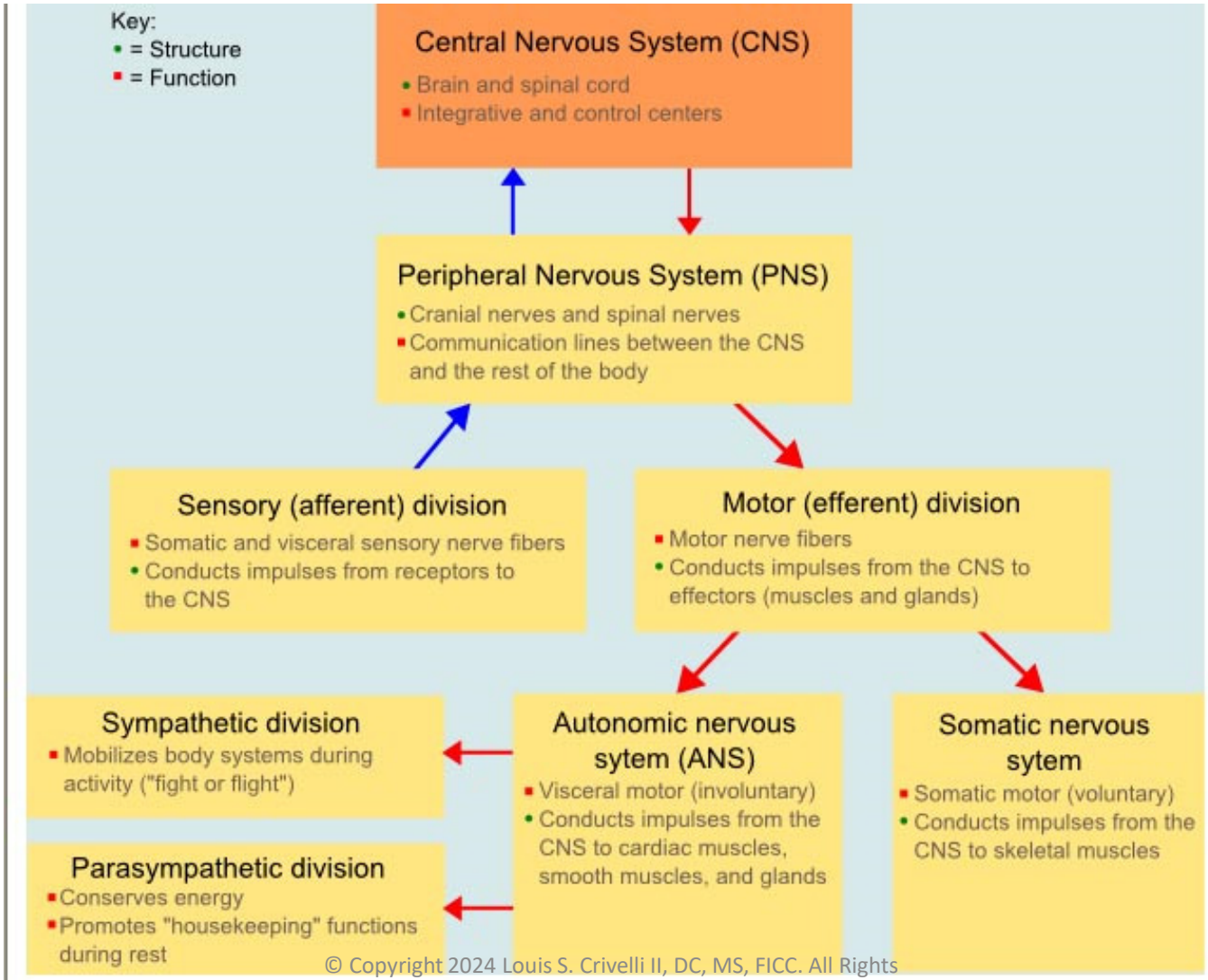
- Sympathetic Nervous System
  - Regulates activities to prepare the body for maximum effort as a response to hazardous conditions. Fight or Flight.
- Parasympathetic Nervous System
  - Regulates activities to conserve energy and to promote digestion and elimination. Rest and Digest

The Nervous System



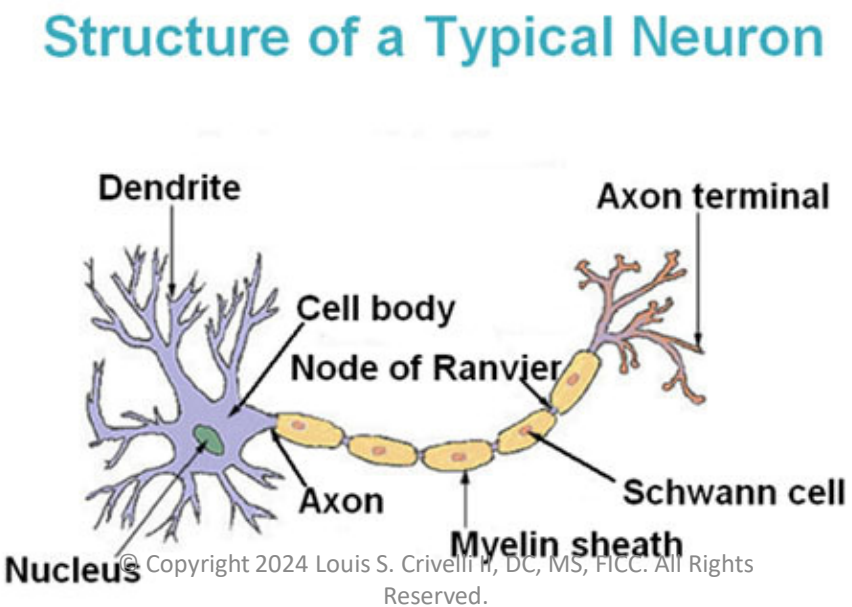
The Nervous System



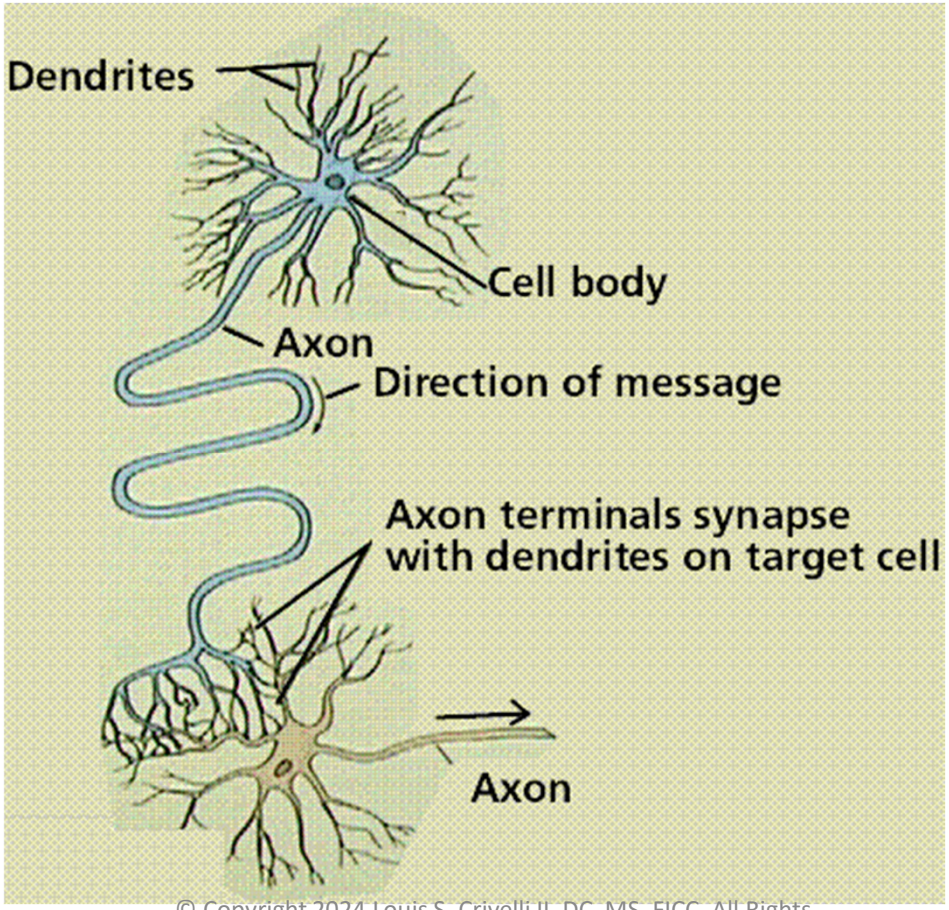


Neuron

- The basic unit of the nervous system. A specialized cell that responds to stimuli and transmits impulses.

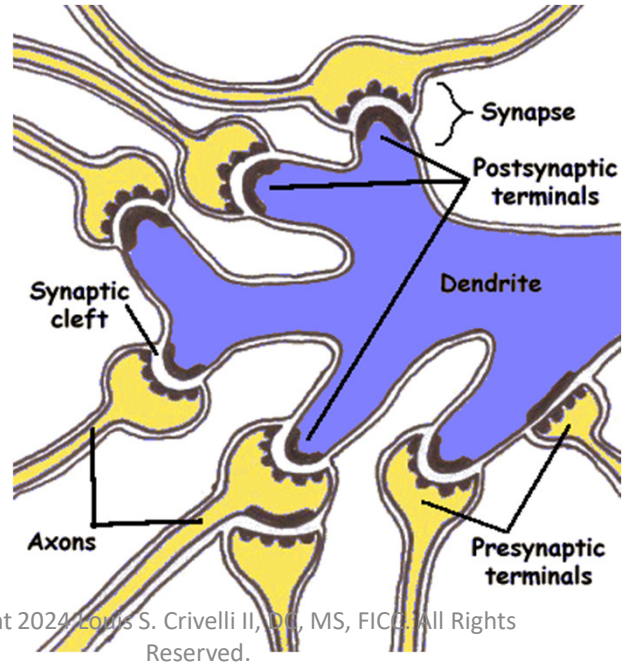


Neuron

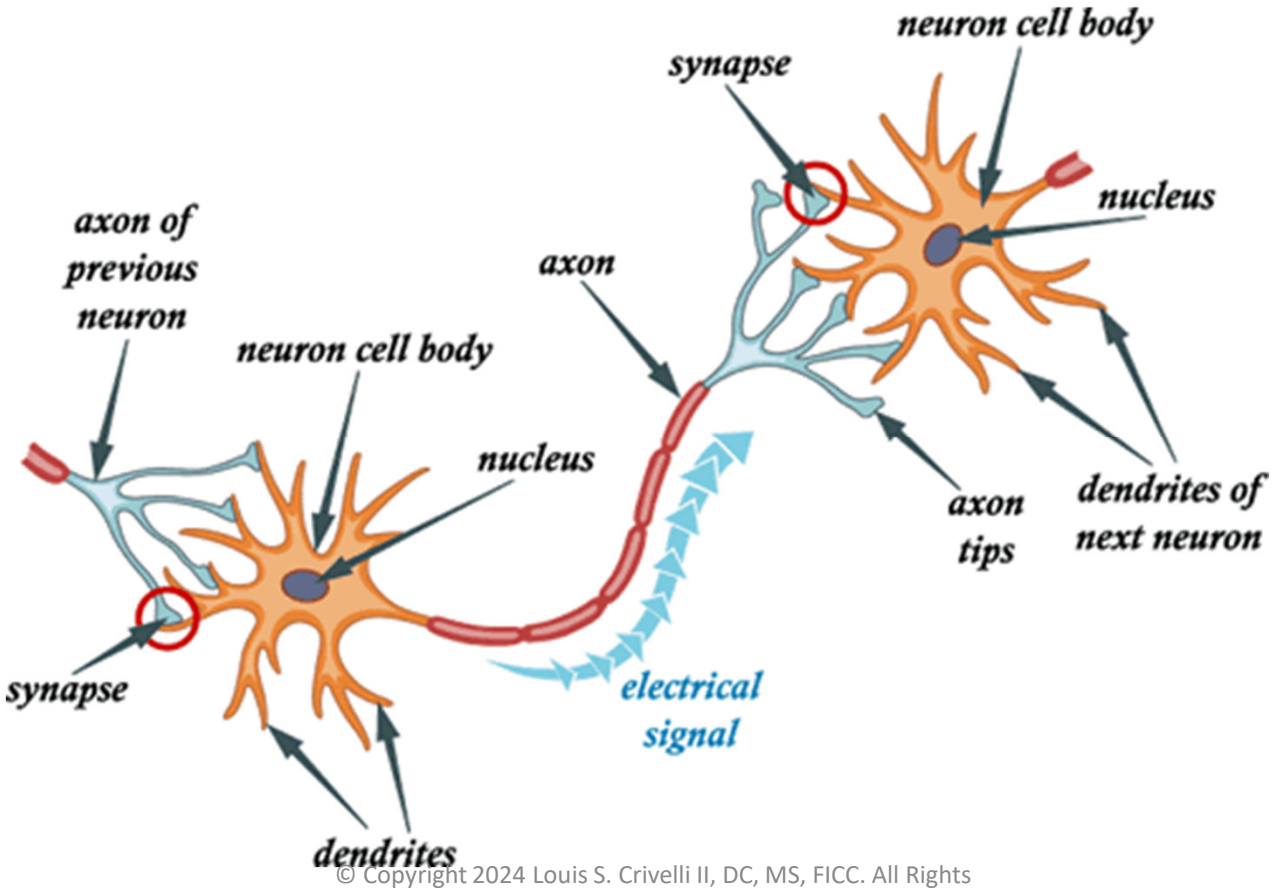


Neuron

- Synapse – the junction that permits a neuron to transmit a signal to another cell. No direct contact.



Synapse

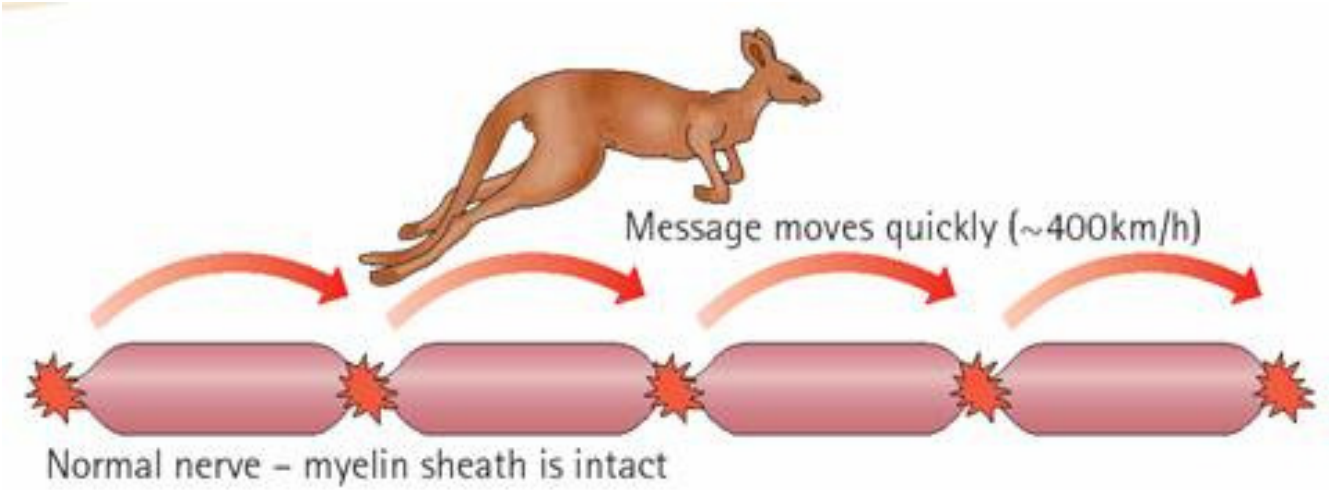


Neuron

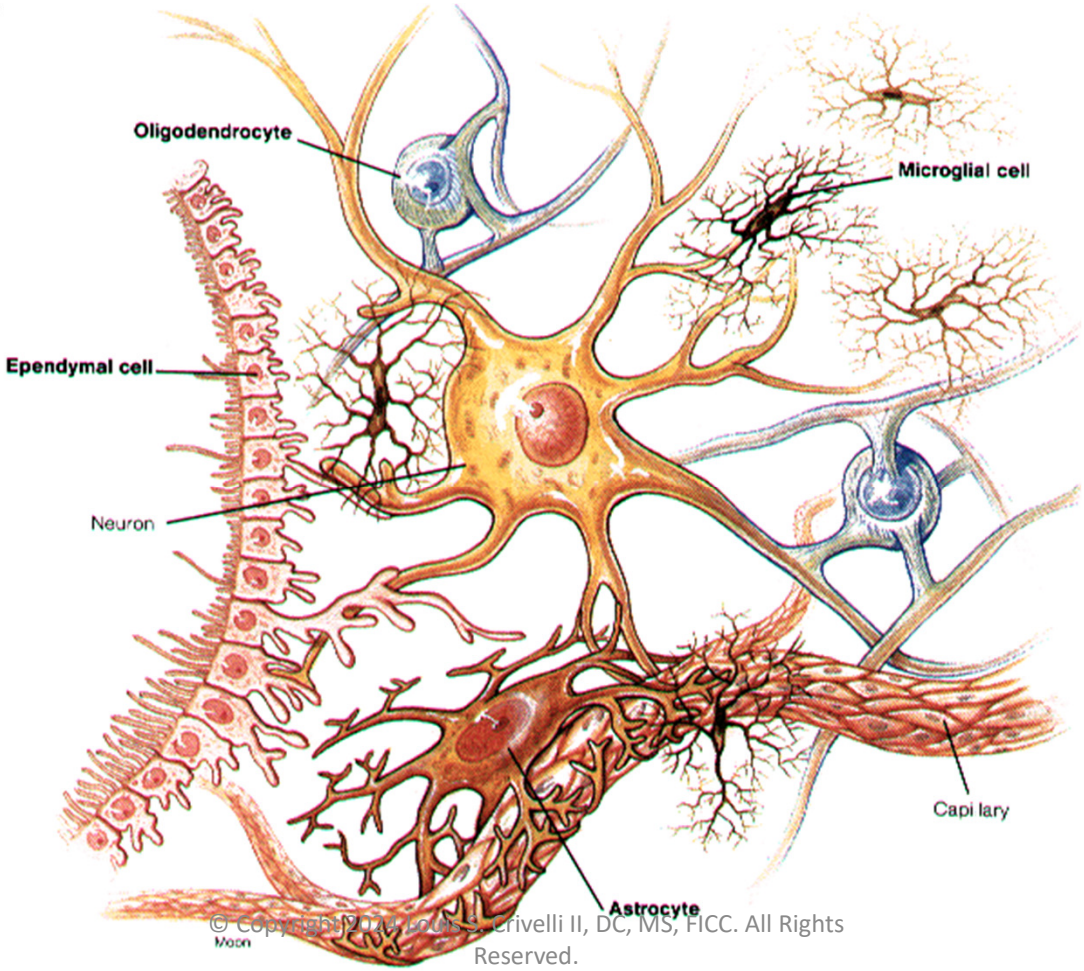
- Myelin Sheath – Insulating material around the axon. Prevents signal loss.
- Neurilemma – Outer membrane around peripheral nerves.
- Neuroglia – Specialized cells that support the neuron. Can provide structure, nutrition, myelin maintenance, and immune function.

Myelin Sheath/Neurilemma

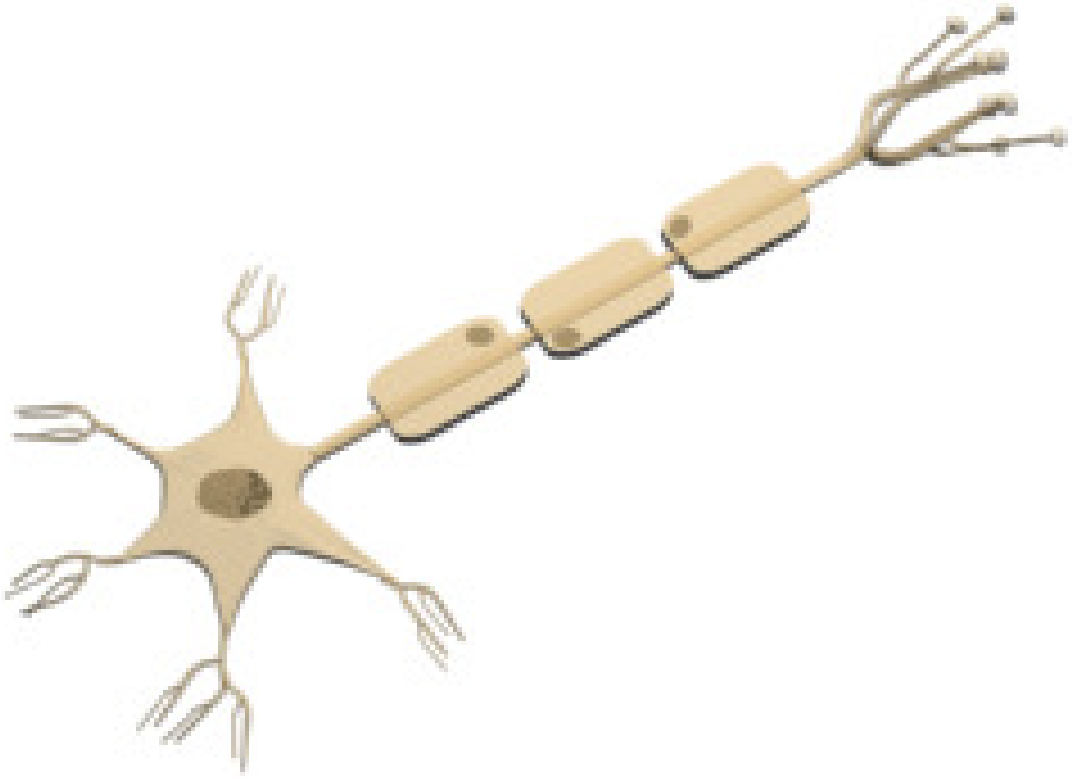
Myelin Sheath



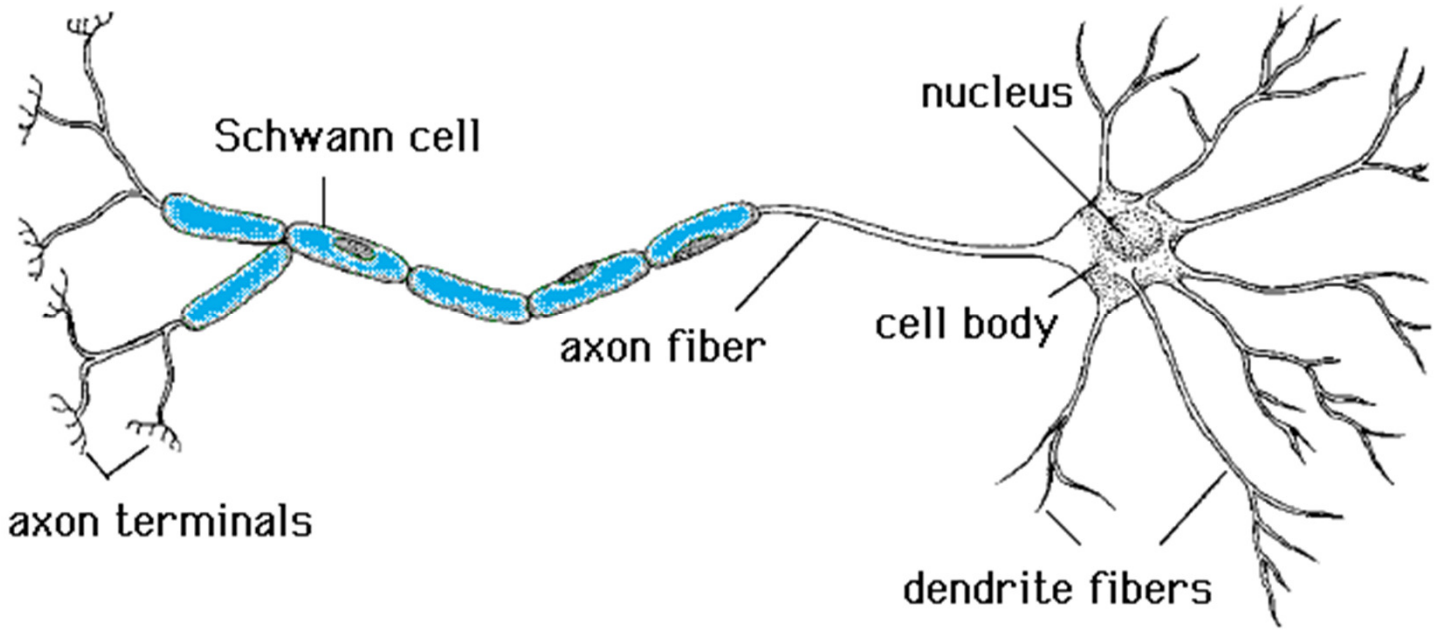
Neuroglia



Neuron



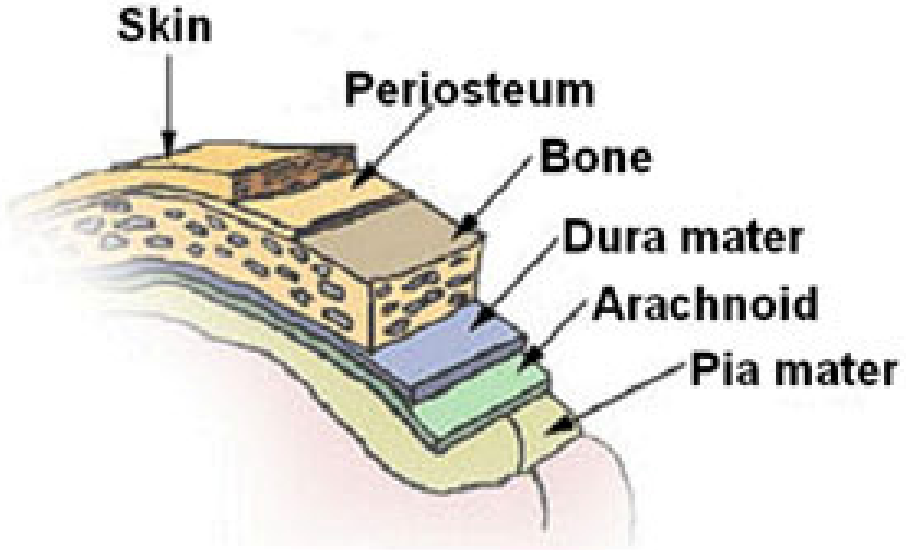
Neuron



Central Nervous System (CNS)

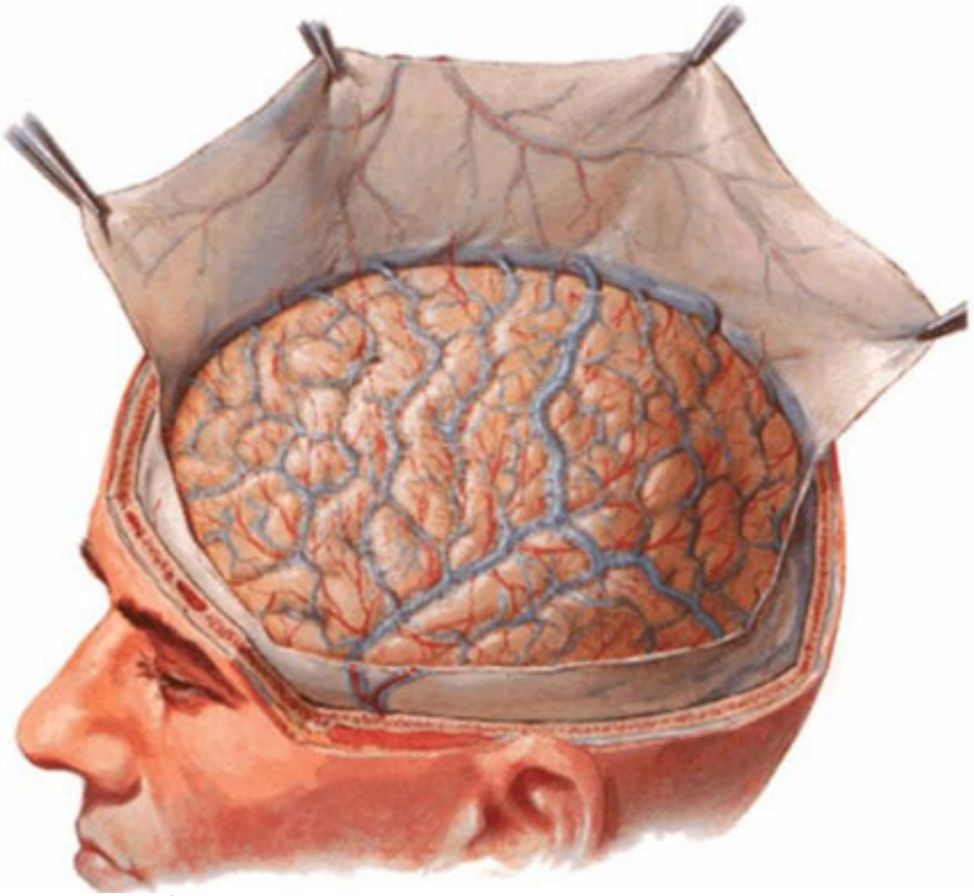
- Protective coverings
  - Skull – protects the brain
  - Vertebrae – protect the spinal cord
  - Meninges – membranes of the nervous system
    - Dura Mater – outermost layer – strong, fibrous tissue
    - Arachnoid Mater – middle layer – delicate, cobweb like tissue
    - Pia Mater – innermost layer – adheres to the outer surface of the spinal cord

Meninges

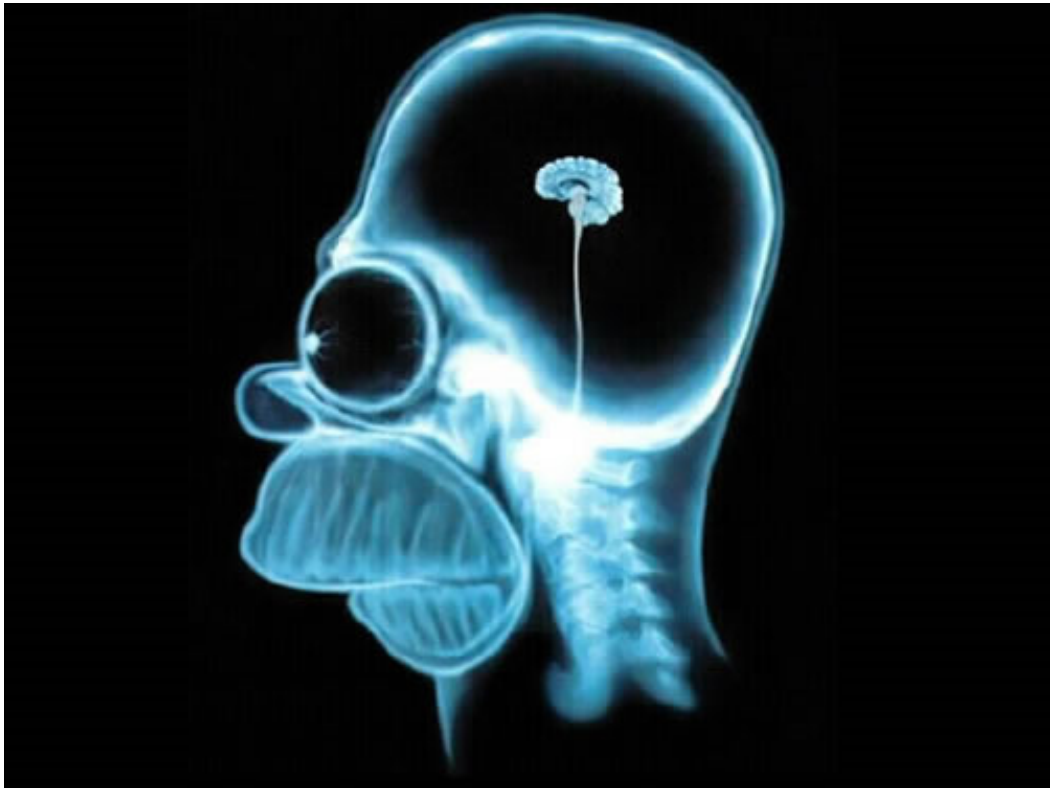


Dura mater -- outer layer lining skull
Arachnoid (mater) -- contains blood vessels
    Subarachnoid space -- filled with CSF
Pia mater -- covers brain

Meninges



The Brain



The Brain

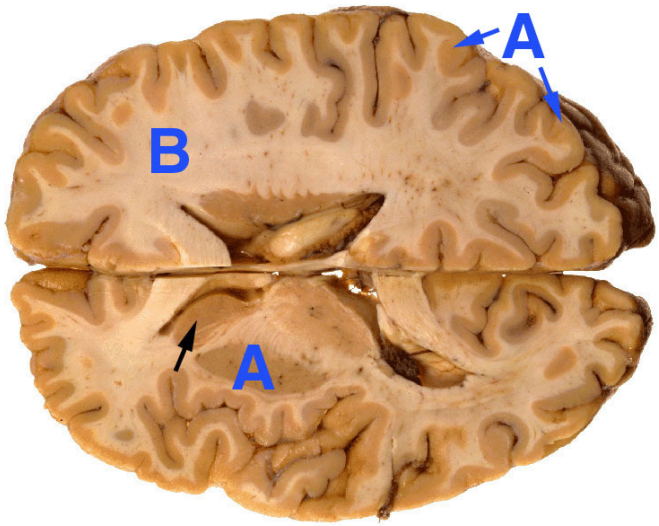
The Brain

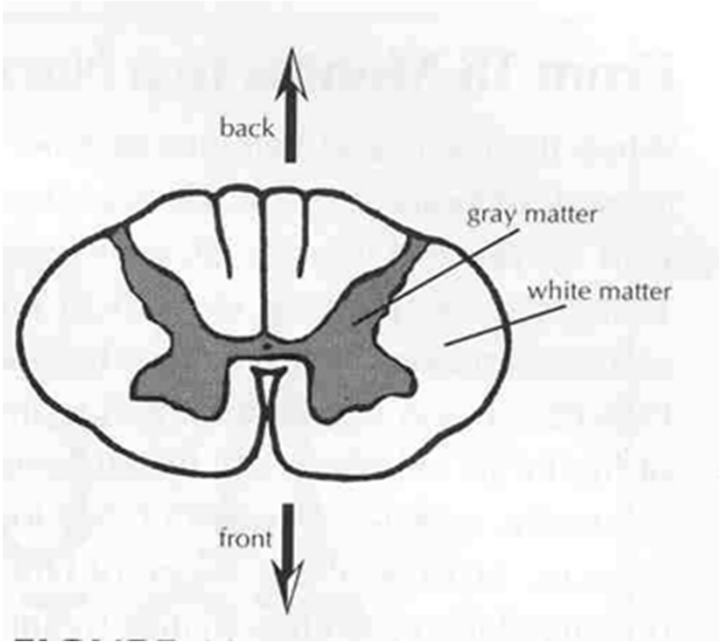
- The human brain represents the highest level of nervous tissue in the animal kingdom.
- The center of the nervous system, the brain has roughly 15-33 BILLION neurons each with up to 10 thousand connections EACH.
- The brain controls the other organ systems of the body and as such allows for rapid and controlled responses to changes in environment.
- Different portions of the brain perform different functions.

The Spinal Cord

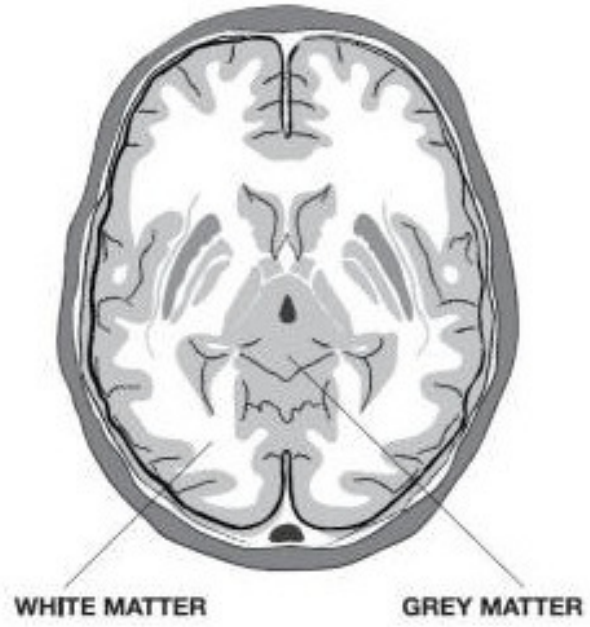
- Approximately 18 inches long starting at the medulla oblongata and terminating between L1 – L2.
- After L2, the physical cord becomes nerve branches that terminate at the coccyx.
- 2 major functions are Conduction and Connection.
- Cell bodies (nerve centers) are on the inside of the cord.
- Axons (nerve fibers) are on the outside of the cord. Known as Tracts

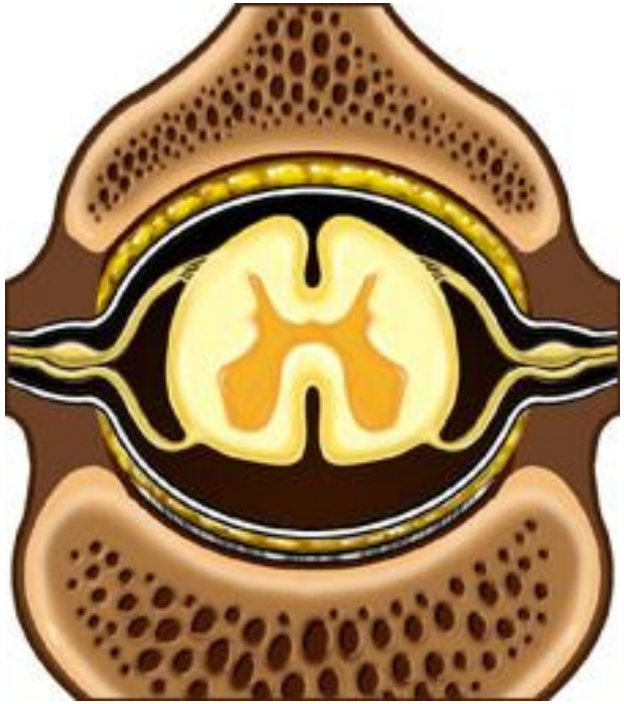
Grey Matter/White Matter





Grey Matter/White Matter

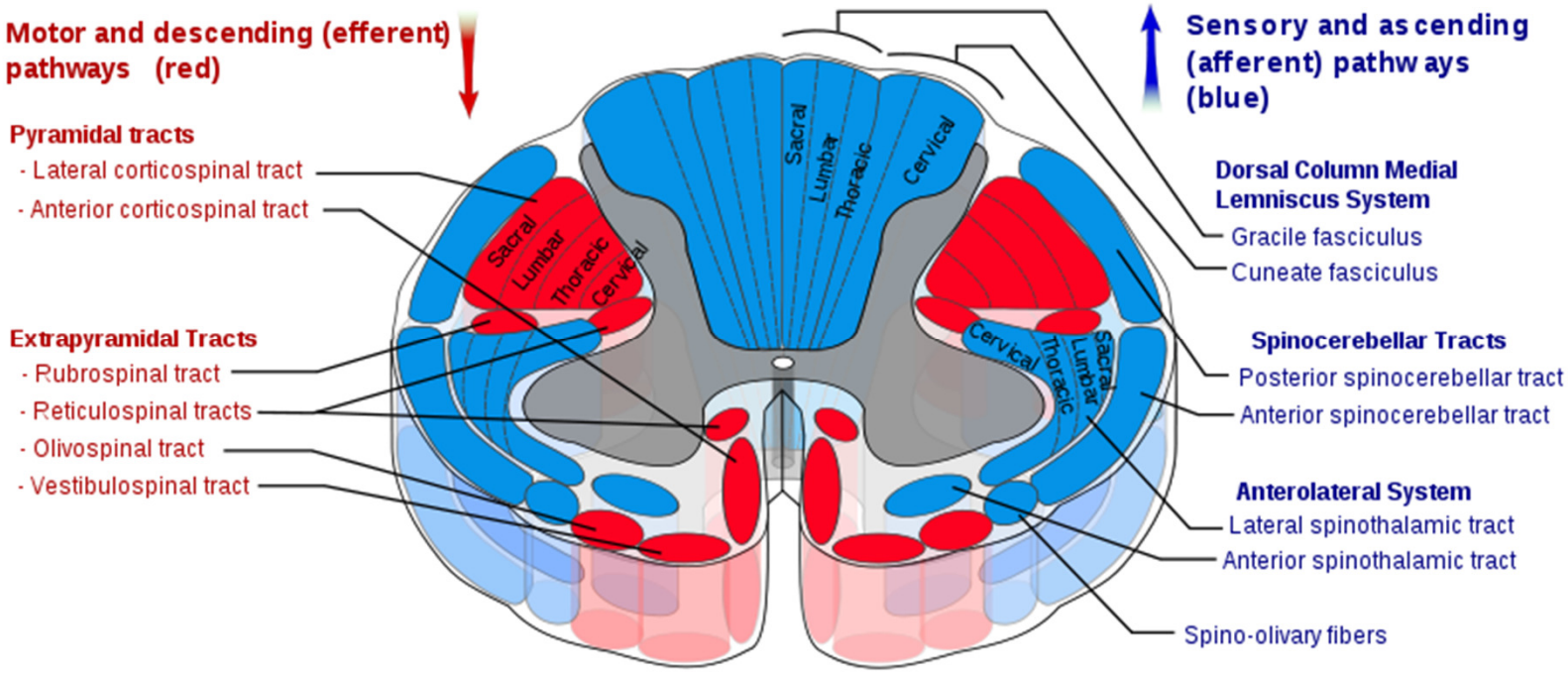




The Spinal Cord

- Ascending tracts are sensory nerve fibers.
  - Messages travel UP to the brain.
- Descending tracts are motor nerve fibers.
  - Messages travel DOWN from the brain to muscles and glands.
  - May control voluntary or involuntary activities.

The Spinal Cord



Spinal Cord Crossection: Detailed Anantomy

1. Fasciculus gracilis
1a. Fasciculus cuneatus
} Dorsal columns

2. Dorsolateral fasciculus or tract of Lissauer

3. Posterior or dorsal spinocerebellar tract

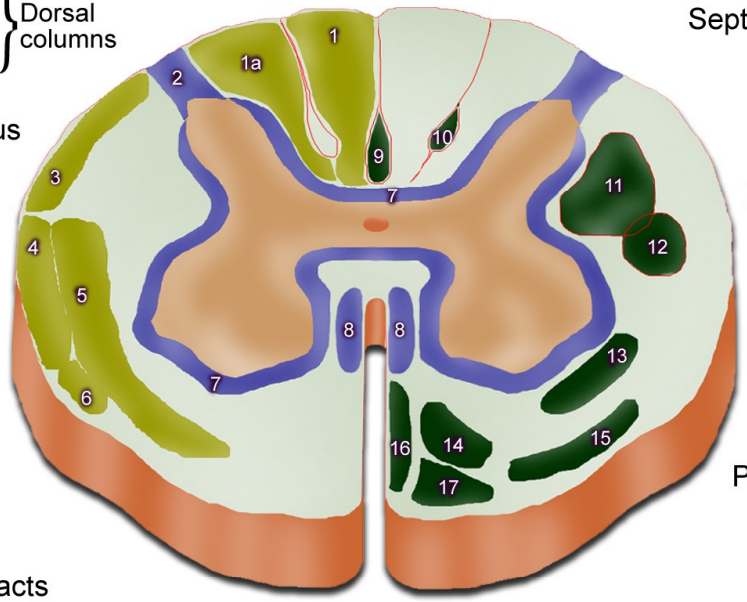
4. Anterior or ventral spinocerebellar tract

5. Spinothalamic, spinoreticular, spinomesencephalic (spinotectal), and spinohypothalamic tracts

6. Spinoolivary tract

7. Fasciculi proprii

8. Medial longtudinal or sulcomarginal fasciculi



Ascending tracts
Decending tracts
Bidirectional tracts

9. Septomarginal fasciculus

10. Interfascicular or semilunar fasciculus

11. Lateral corticospinal or pyramidal

12. Rubrospinal tract

13. Medullary or lateral reticulospinal tract

14. Pontoreticulospinal or medial reticulospinal tract

15. Vestibulospinal tract

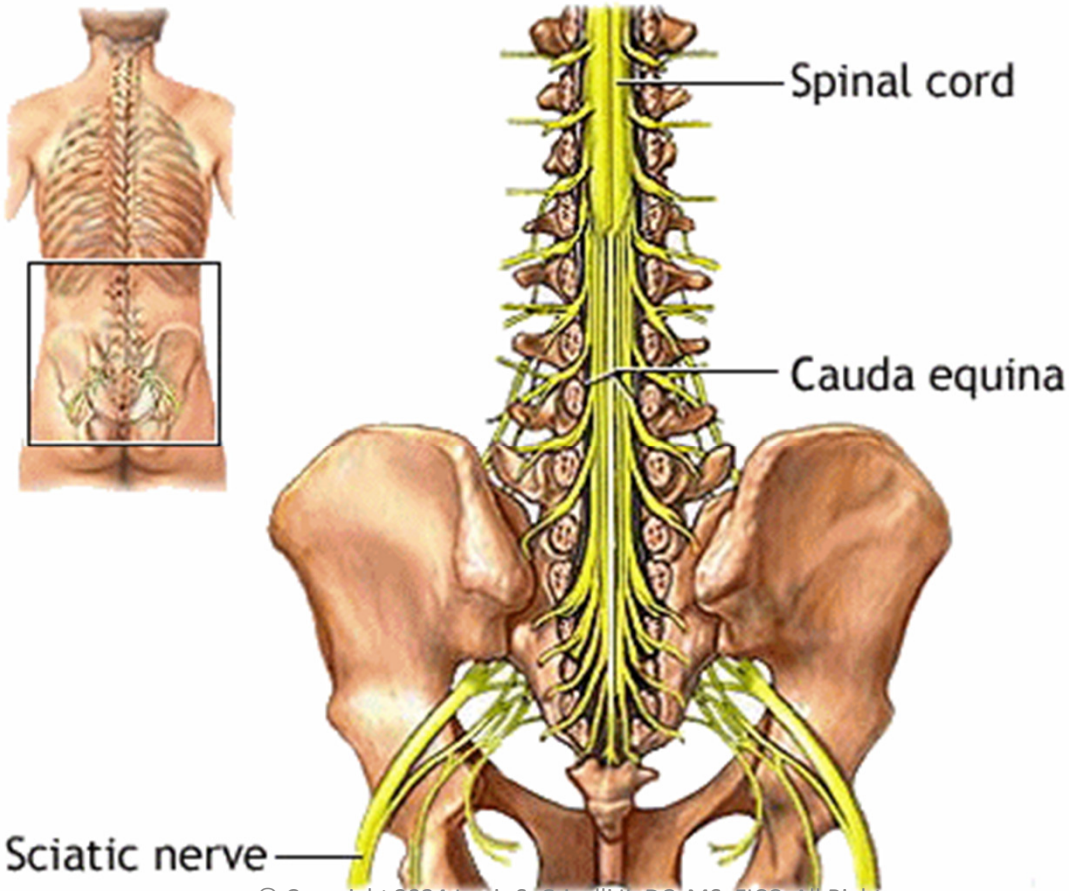
16. Anterior or ventral corticospinal tract

17. Tectospinal tract

Cauda Equina

- Latin for Horse Tail
- Lumbar, sacral, and coccygeal nerves that descend from the terminal end of the spinal cord.
- Lumbar punctures are performed safely because of this structure.

Cauda Equina

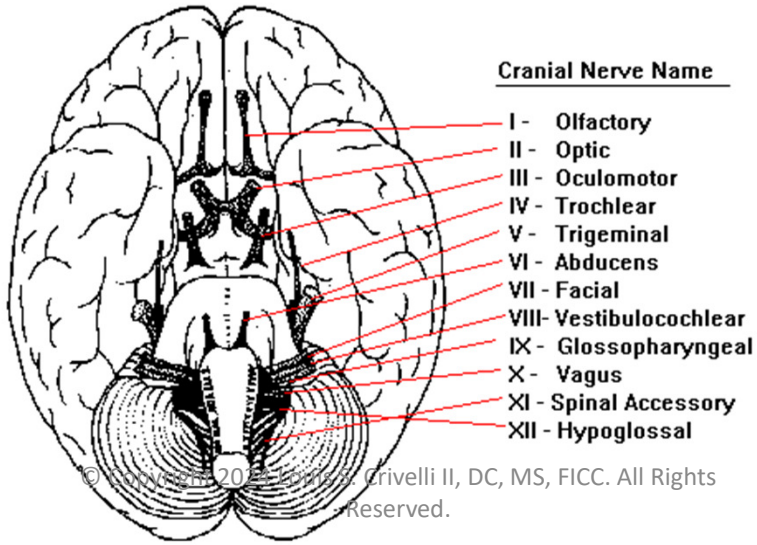


The Peripheral Nervous System (CNS)

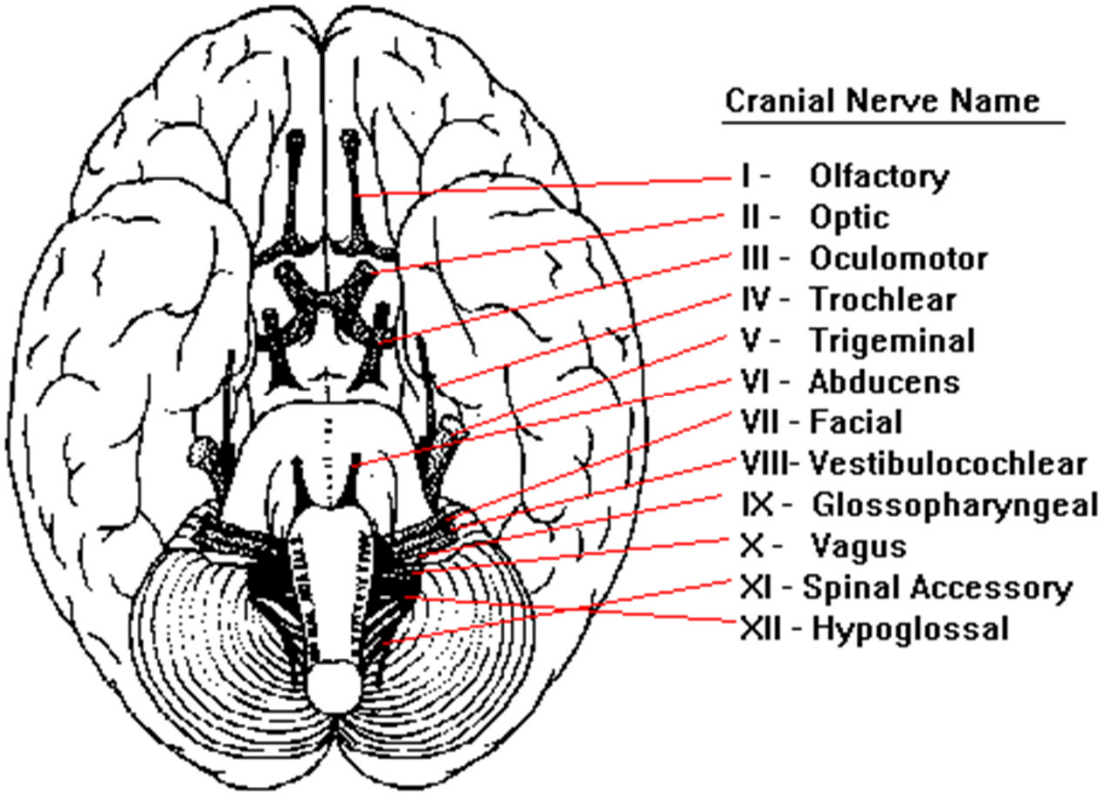
- Composed of the nerves OUTSIDE the brain and spinal cord.
- 3 main sets of nerves
  - Cranial nerves
  - Spinal nerves
  - Nerve Plexuses (plexi)

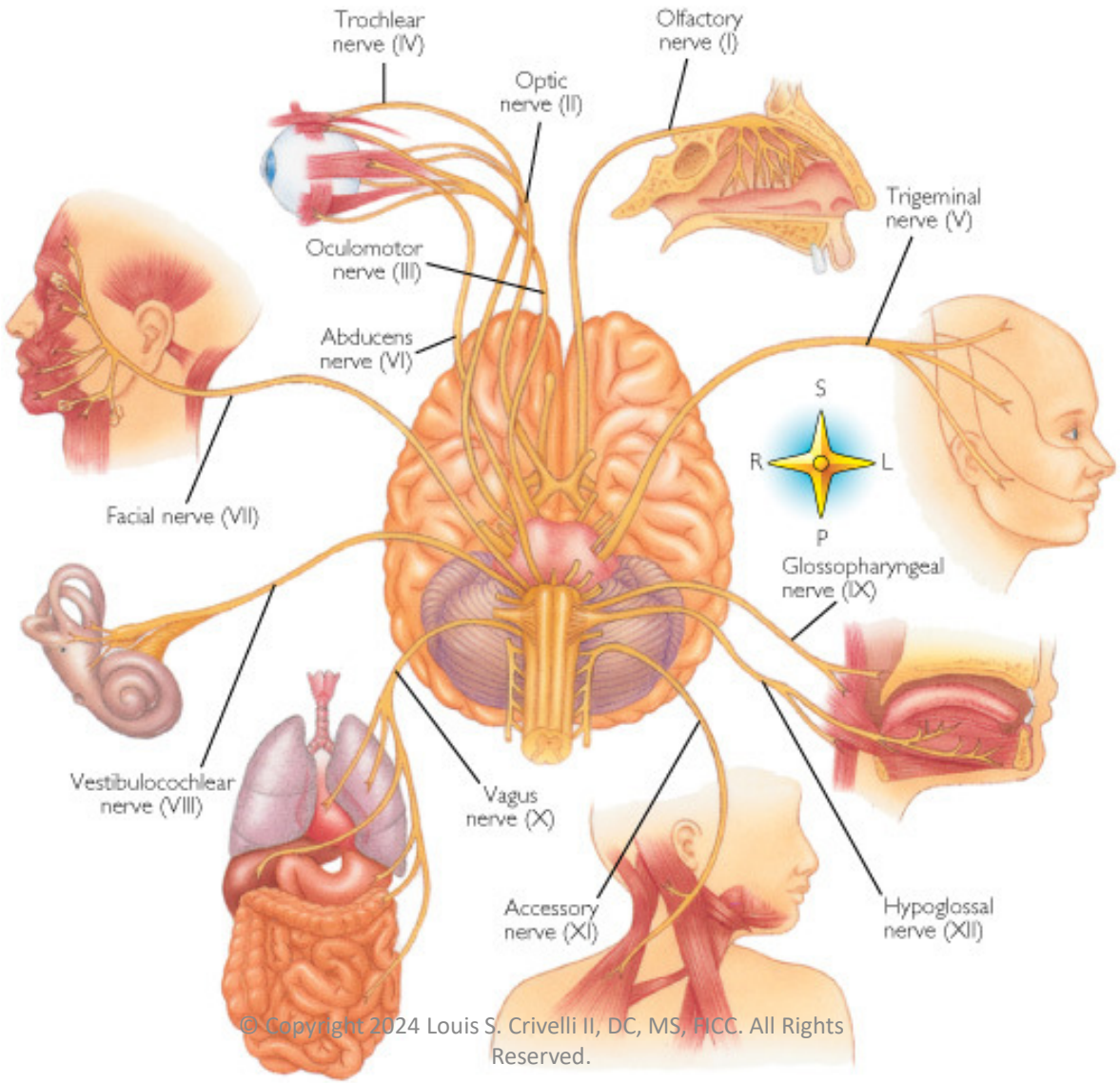
Cranial Nerves

- 12 pairs of nerves that arise from the underside of the brain and pass through openings in the skull.
- Numbered using Roman numerals I – XII



Cranial Nerves

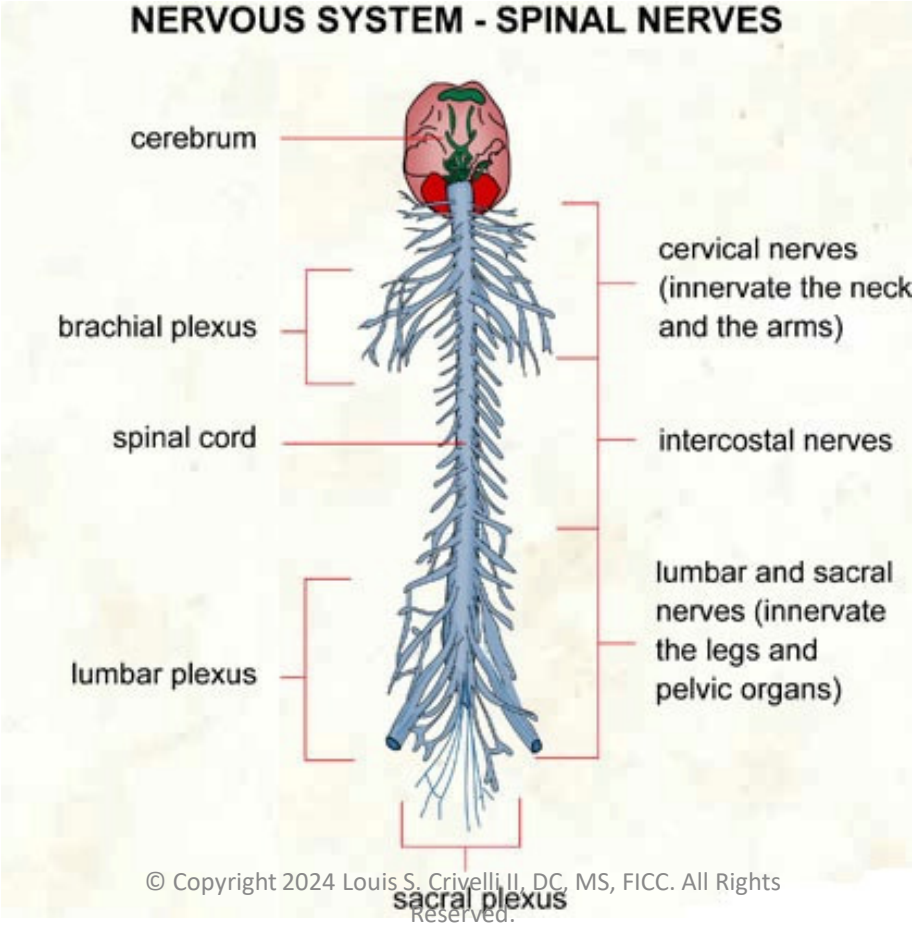




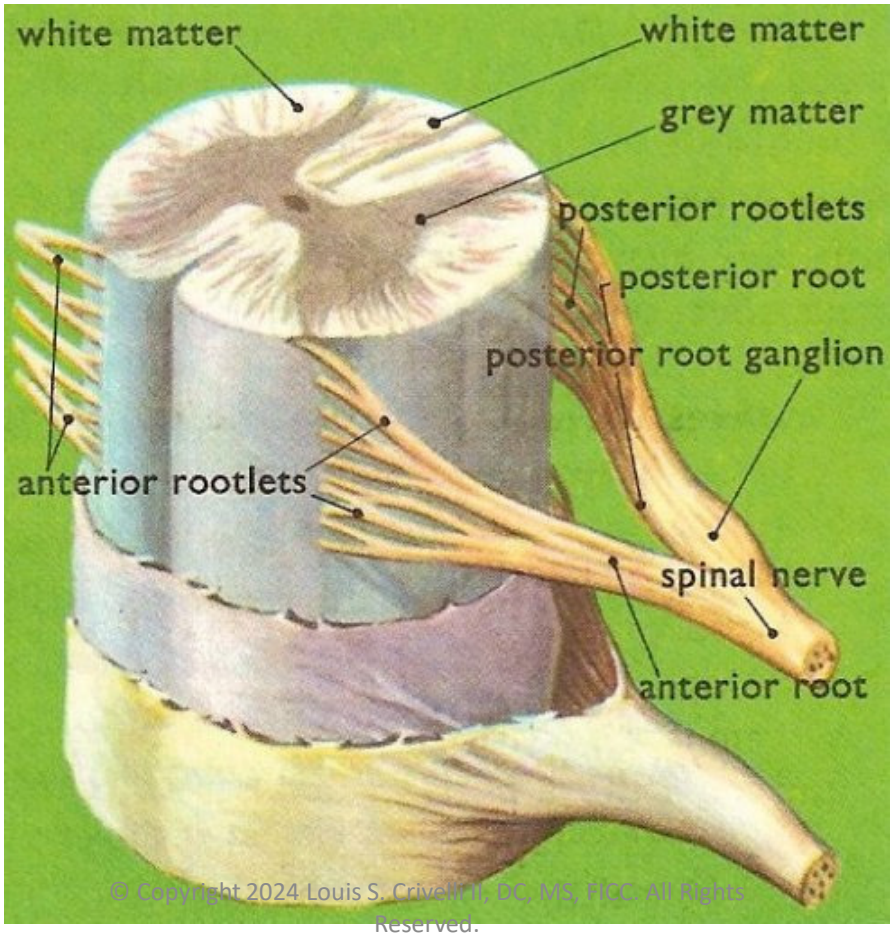
Spinal Nerves

- 31 pairs of nerves that arise from the spinal cord.
- Pas through lateral openings in the spinal column called Intervertebral Foramen (IVF)
- Mixed nerves – carry both sensory and motor fibers.

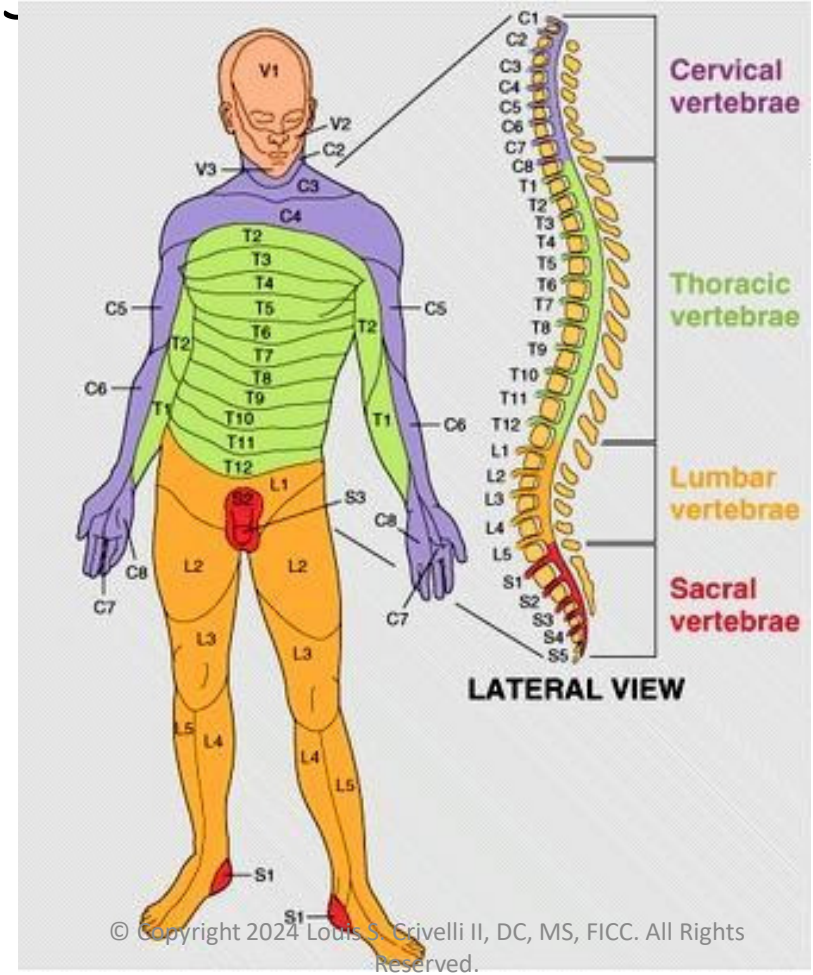
Spinal Nerves

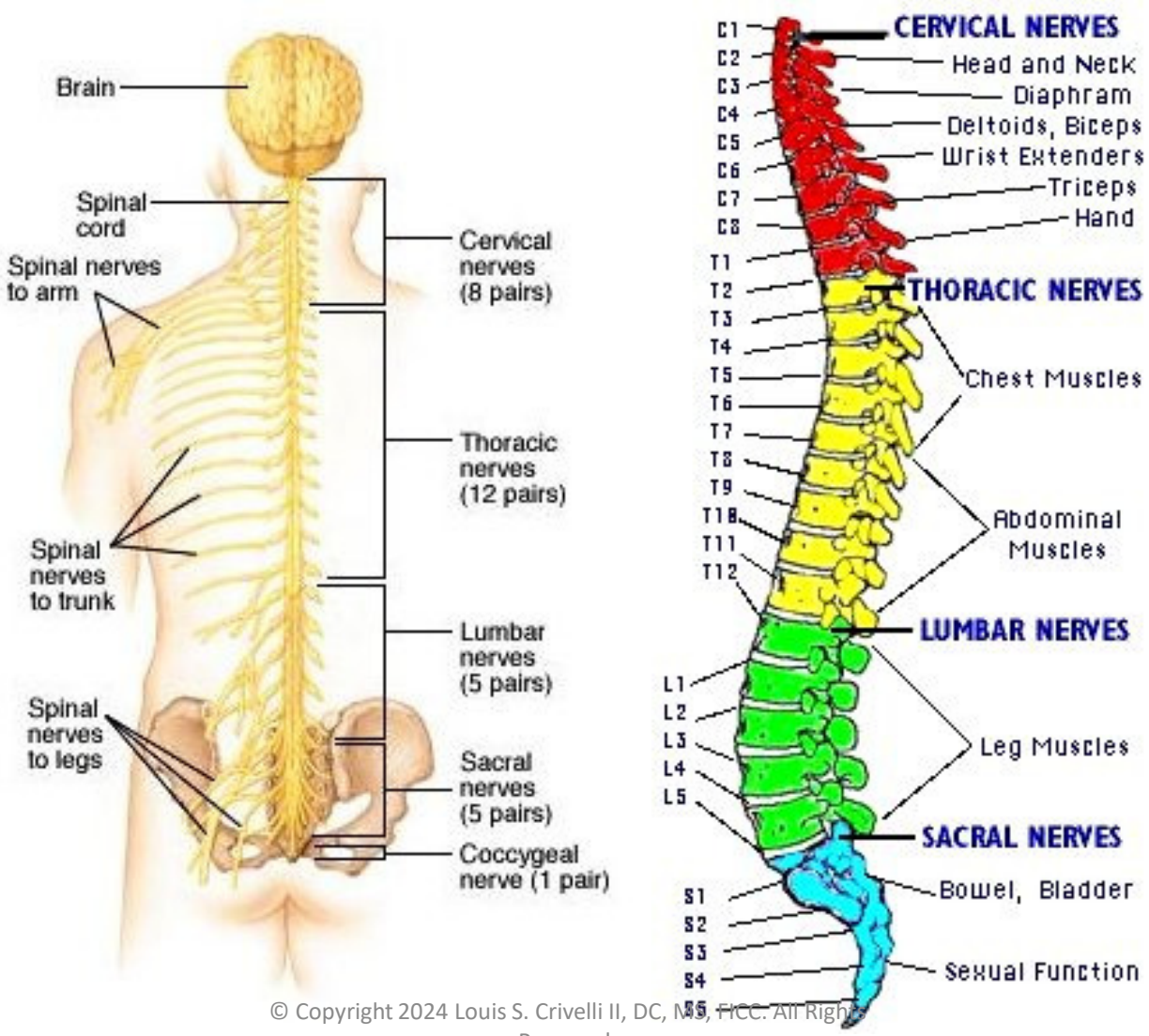


Spinal Nerves



Dermatomes

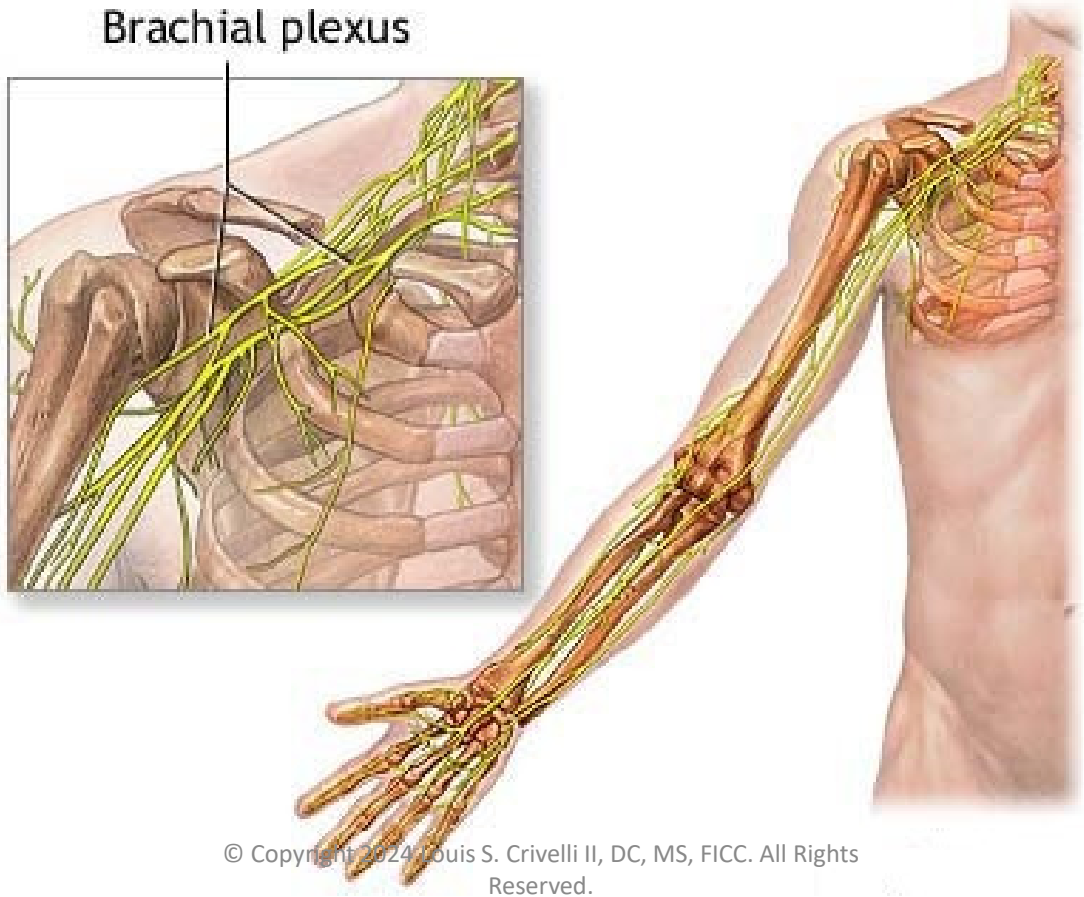




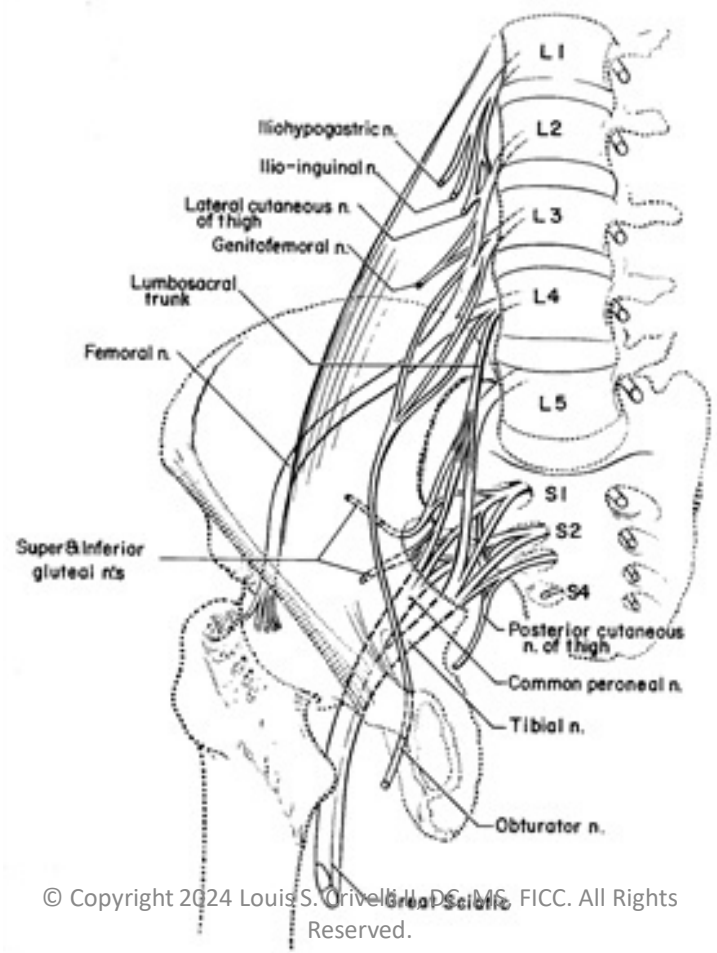
Nerve Plexuses

- Formed by a network of spinal nerves. Highly branched.
- Brachial Plexus – formed from C5 – T1 spinal levels, these nerves control the shoulder and upper extremity
- Lumbosacral Plexus – formed from L1 – S4, these nerves control the pelvis and lower extremity

Brachial Plexus



Lumbosacral Plexus



THANK YOU FOR your ATTENTION! ANY QUESTIONS?

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- Immediate Past Chair – Clinical Compass (Council on Chiropractic Guidelines and Practice Parameters)
- Past President and current Vice President – Maryland Chiropractic Association
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