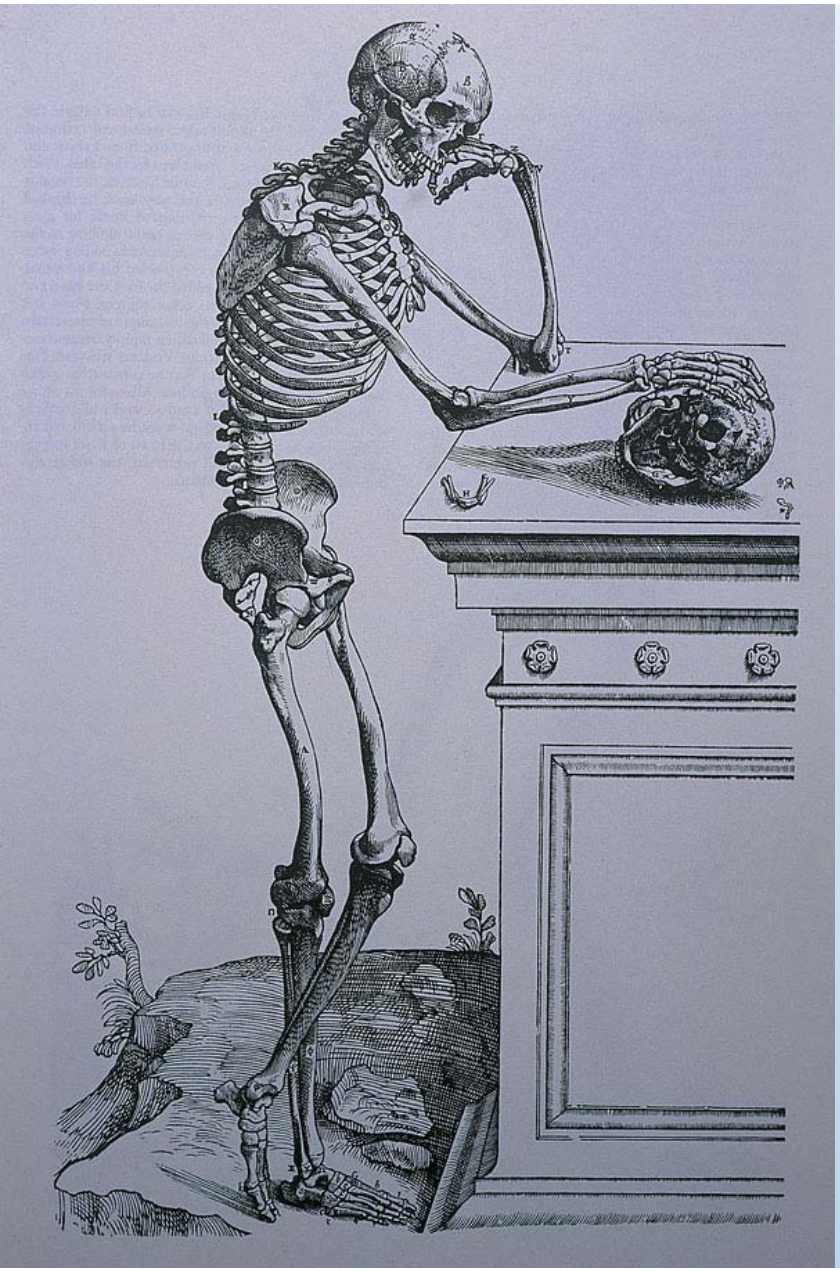
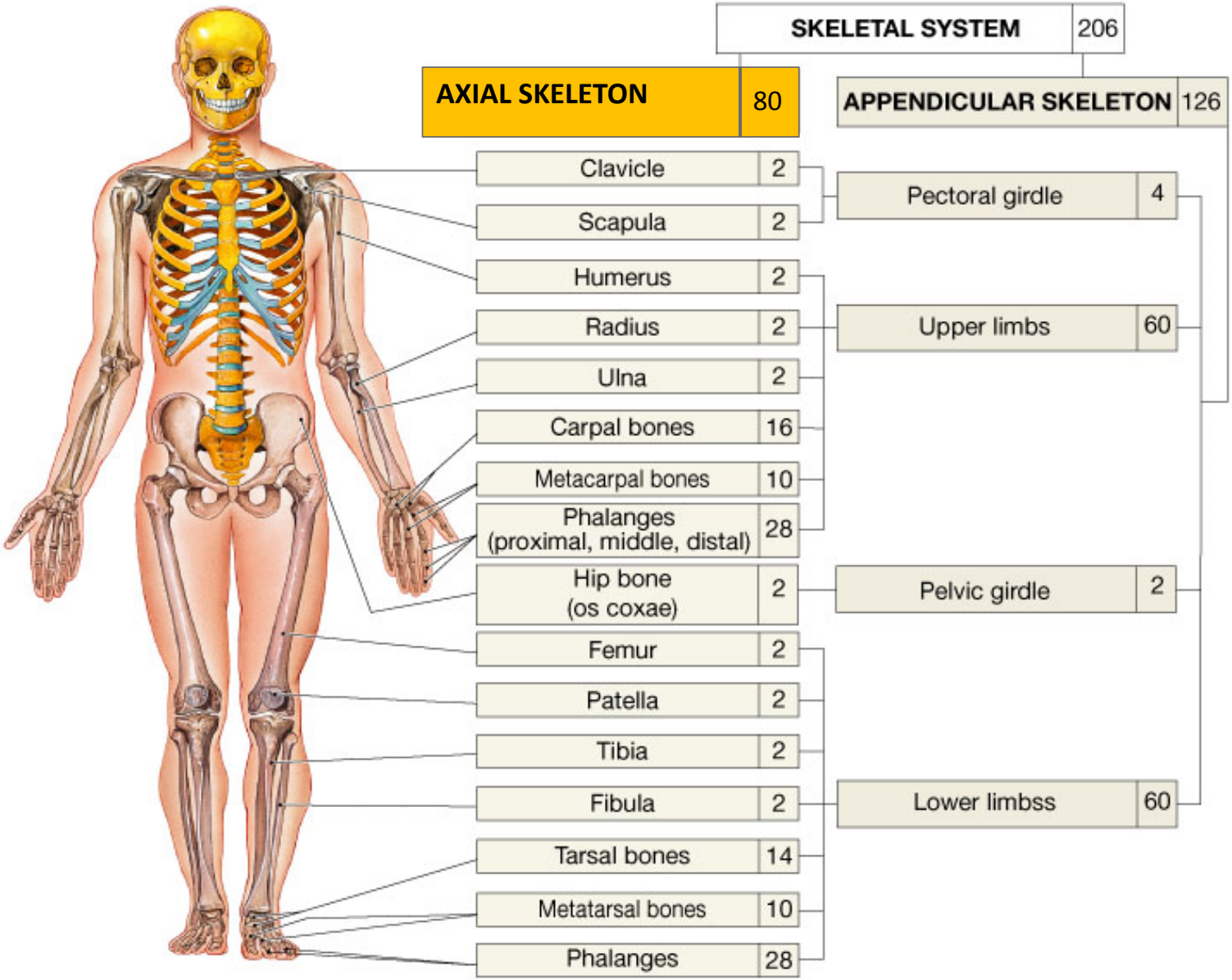


The skeleton

The muscles

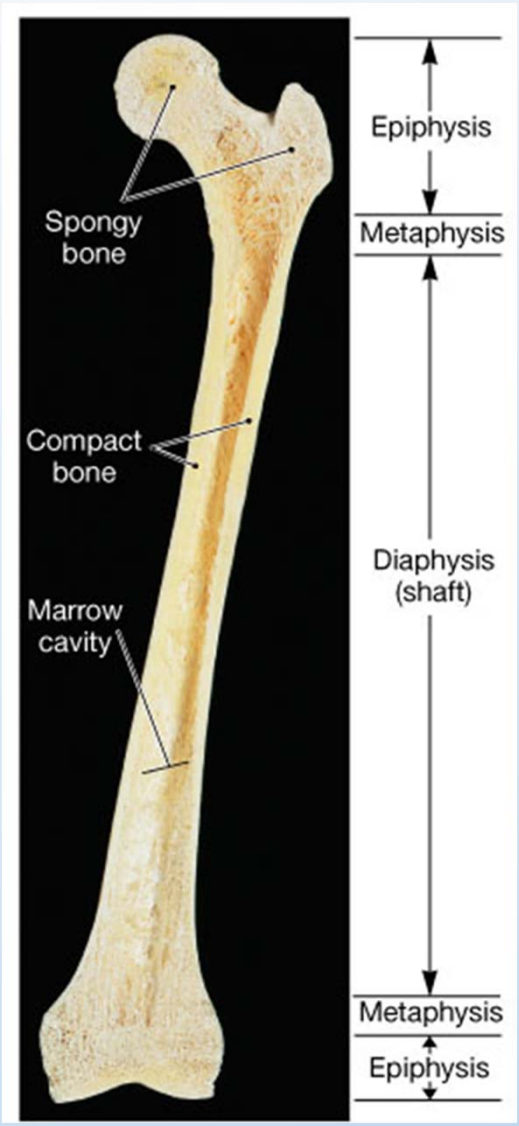
The BONES of the SKELETON

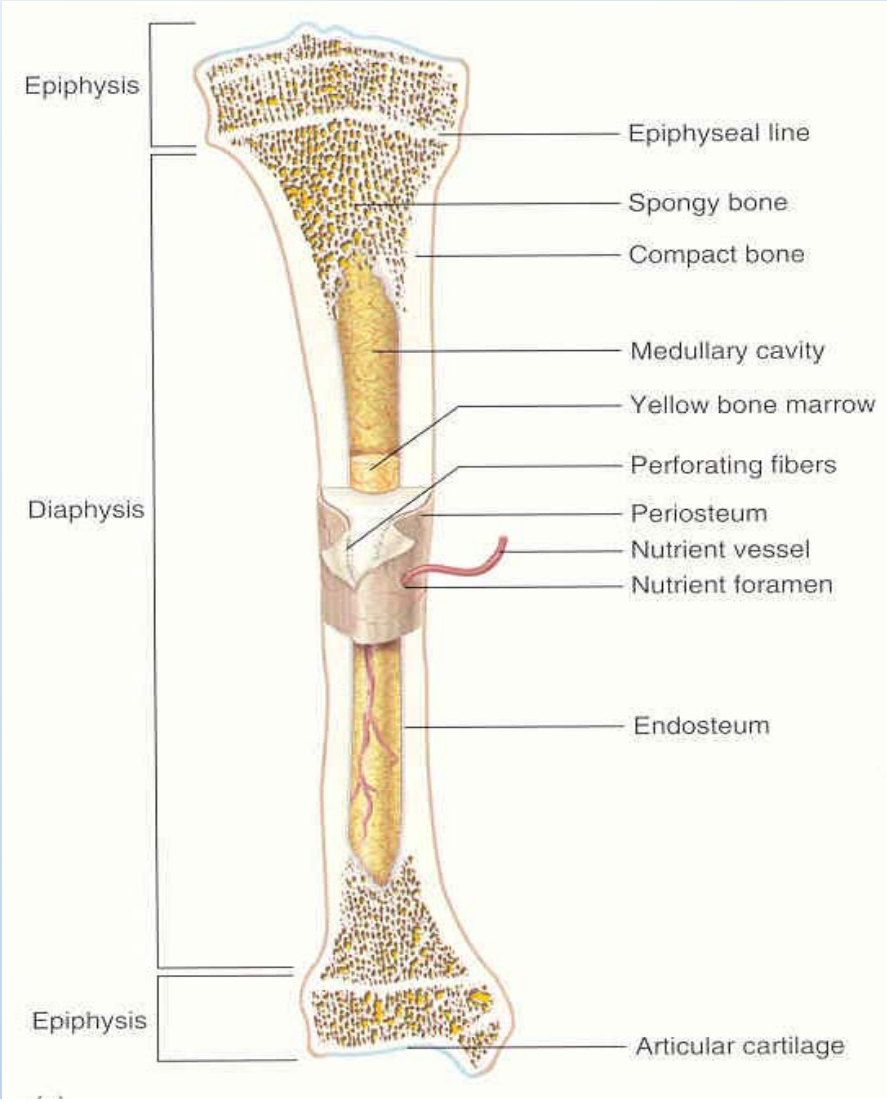


Functions of Bone (Osseous Tissue)

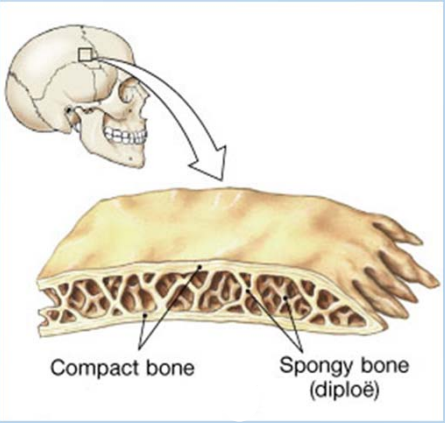
- Structural Support:
- Protection:
- Storage: **1)** minerals and **2)** lipids
- Blood Cell Production:
- Body Movement:
- Detoxification:

Anatomy of a Long Bone





Anatomy of a Flat Bone



Constituents of Bone

Organic (~1/3)	Inorganic (~2/3)
Collagen (and some other proteins)	80% Calcium Hydroxyapatite $Ca_3(PO_4)_2 \cdot (OH)_2$
Specialized Bone Cells (4)	15% Calcium Carbonate $CaCO_3$
Glycosaminoglycans (GAGs)	5% Other Minerals: Mg, SO_4, Na, K
Gives Bone Flexibility!	**Gives Bone Rigidity!**

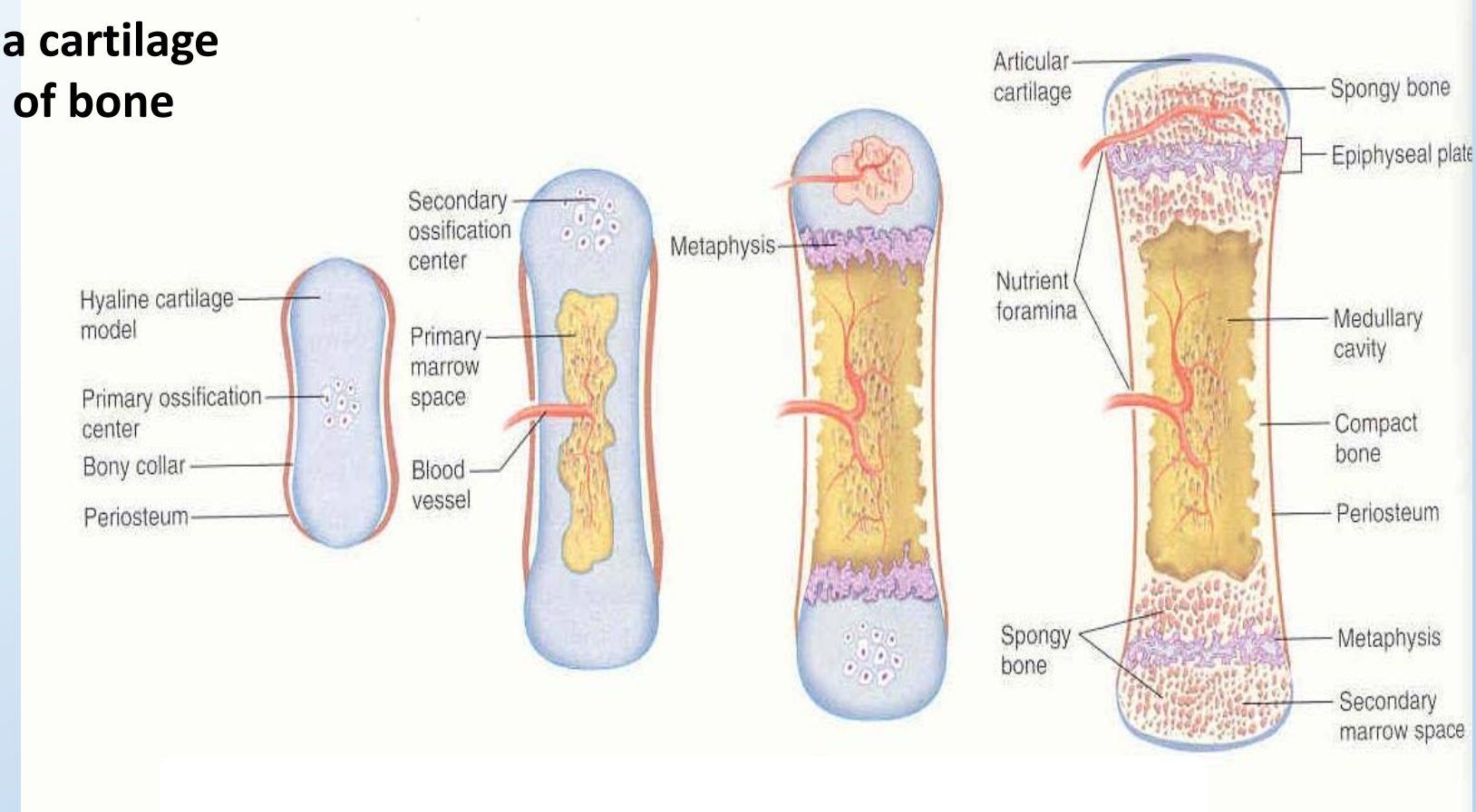
Bone soaked in acetic acid to de-mineralize it…

Heating bone
destroys proteins in it…

Makes it very brittle

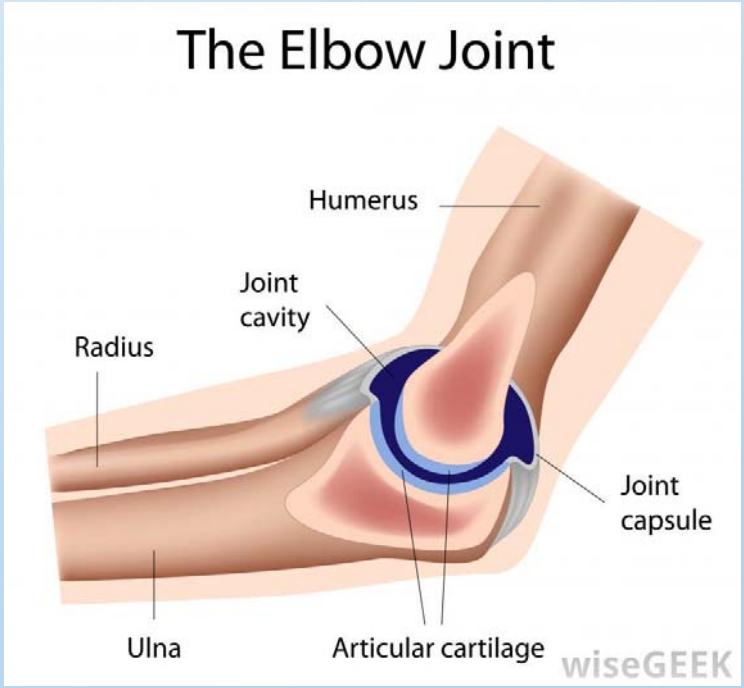
OSSIFICATION

Starts as a cartilage model of bone



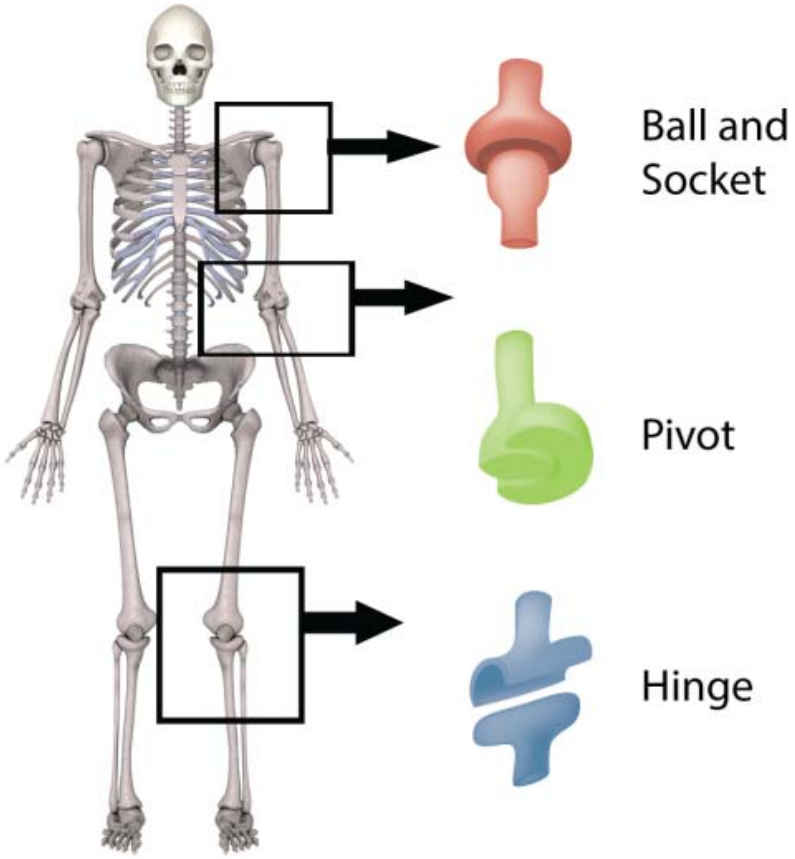
Joints

- Joint: location where two or more bones make contact.
- Joints allow movement and provide mechanical support.
- There is a cartilage cushion in between the bones to keep them from touching directly – which would hurt!



Joints

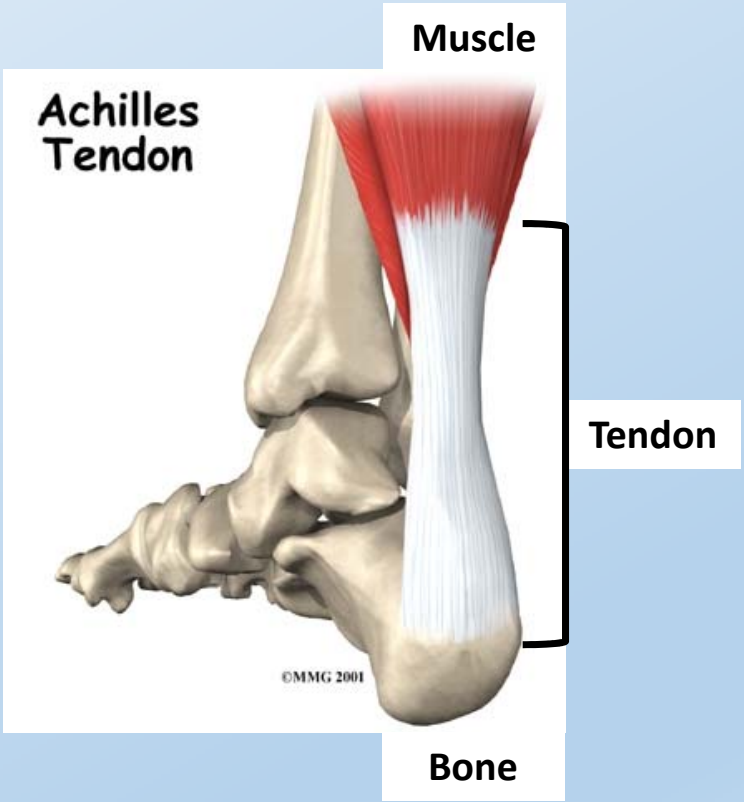
Examples of Joints

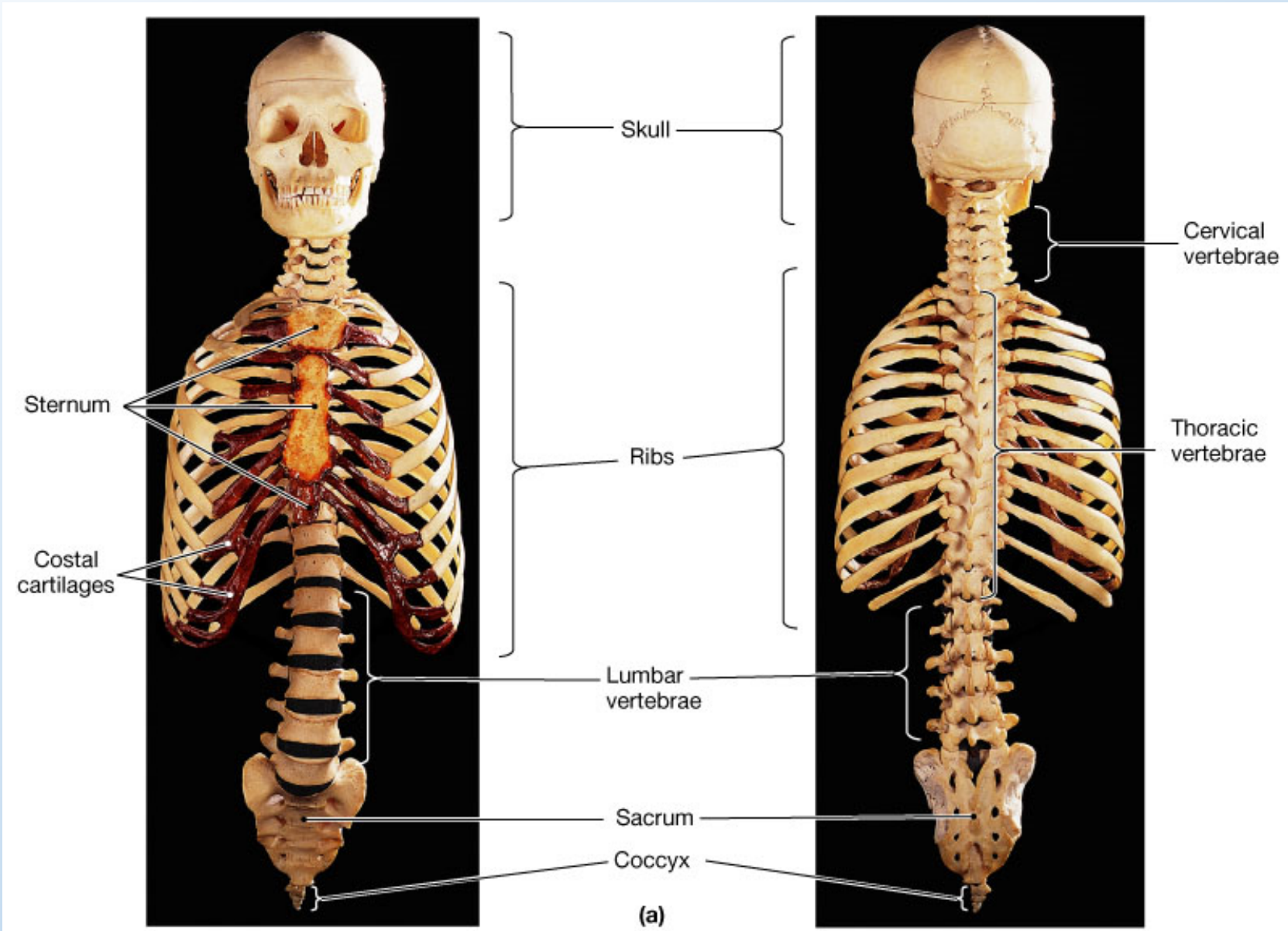


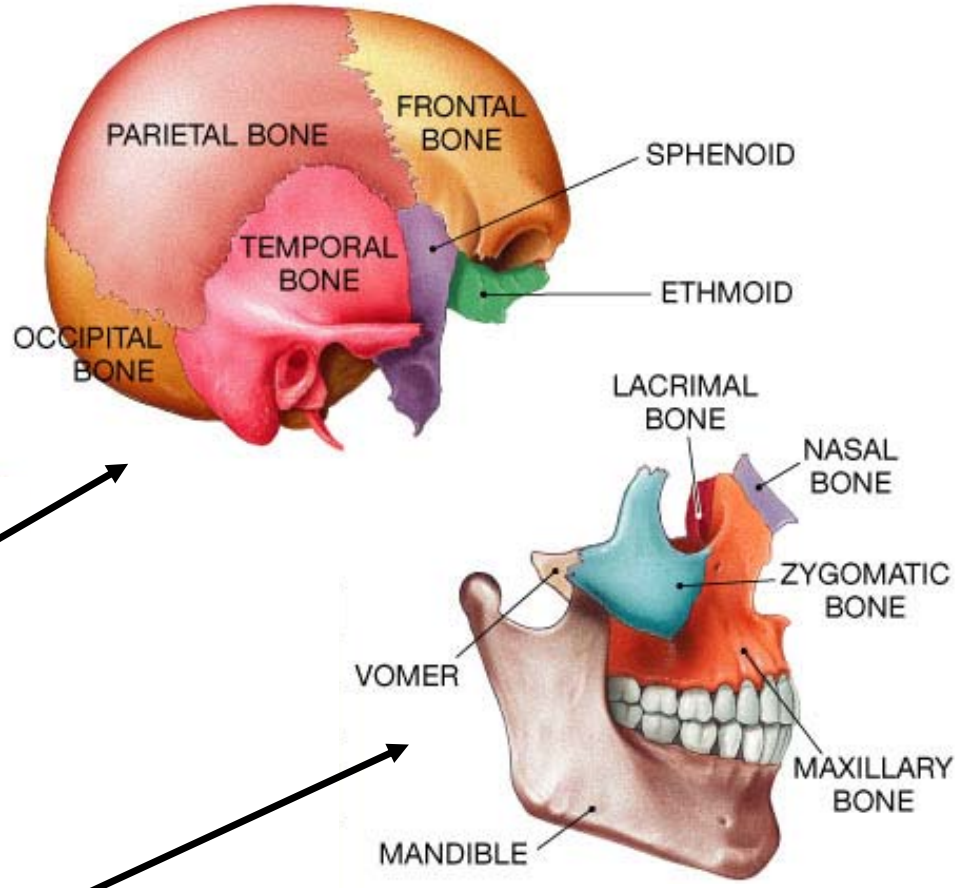
Tendons

Tendons: attach muscles to bone.

They are made out of a tough connective tissue and are capable of stretching to allow for movement.







Cranial Bones

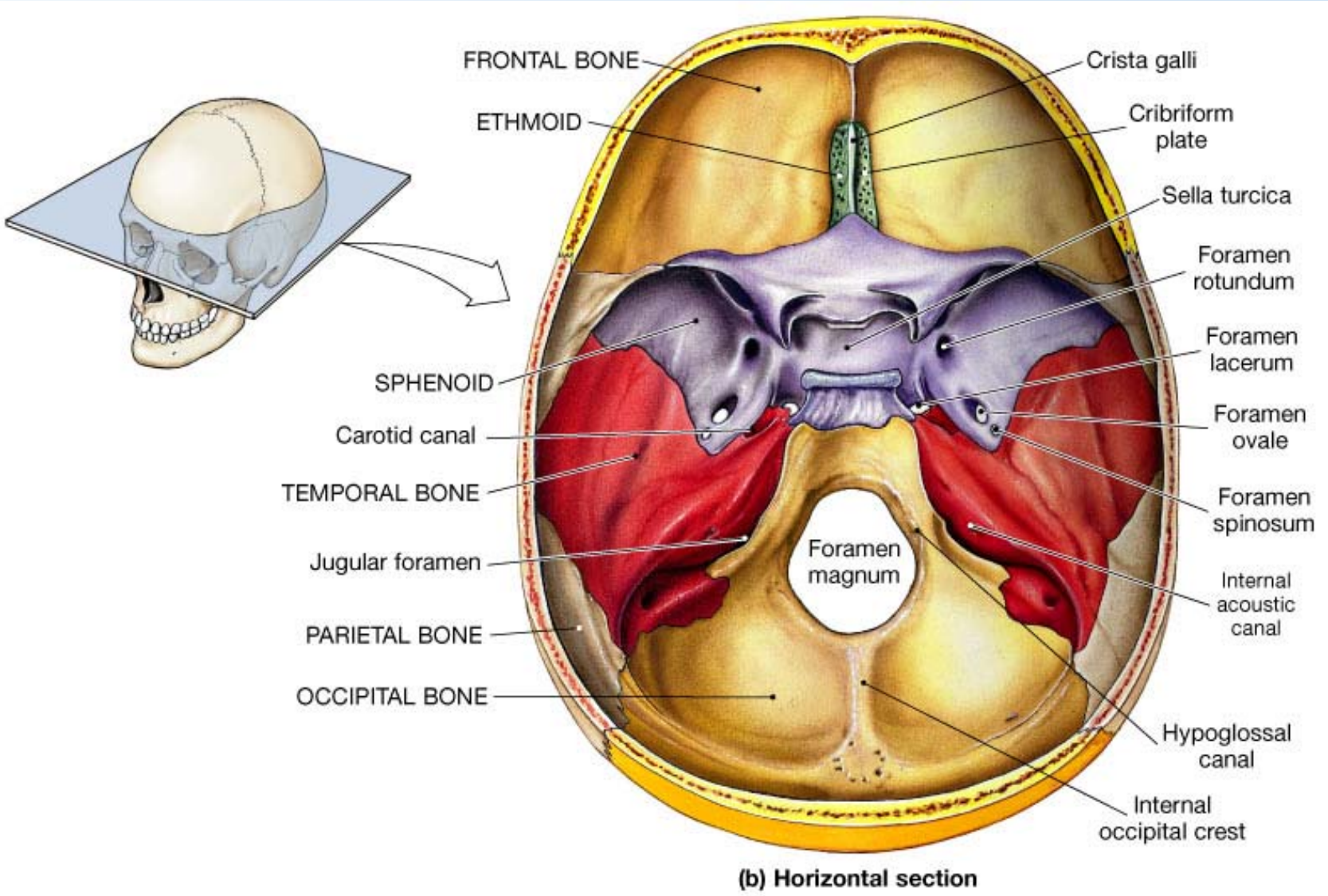
Facial Bones

Cranial Bones

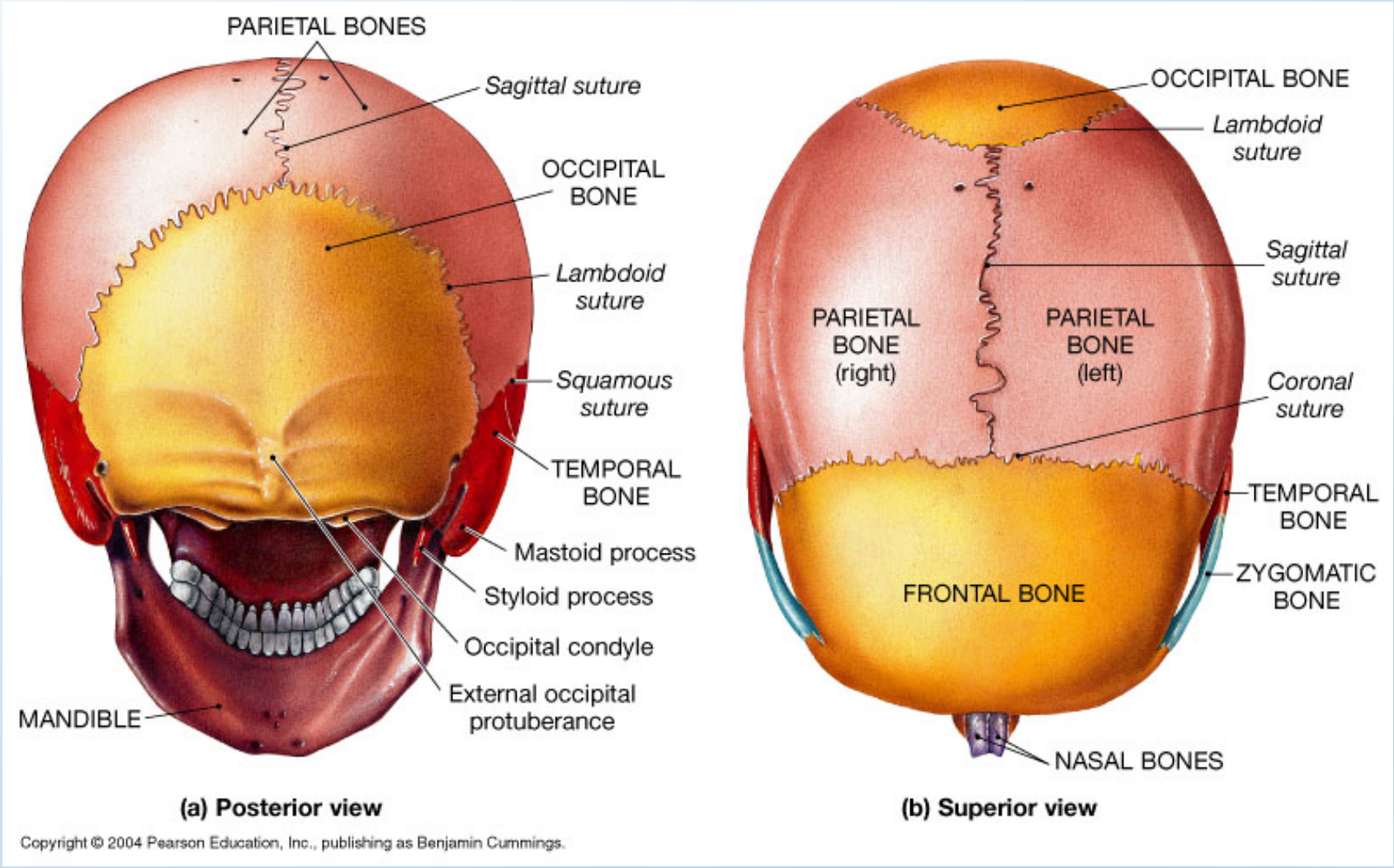
- Cranial bones create the cranial cavity.

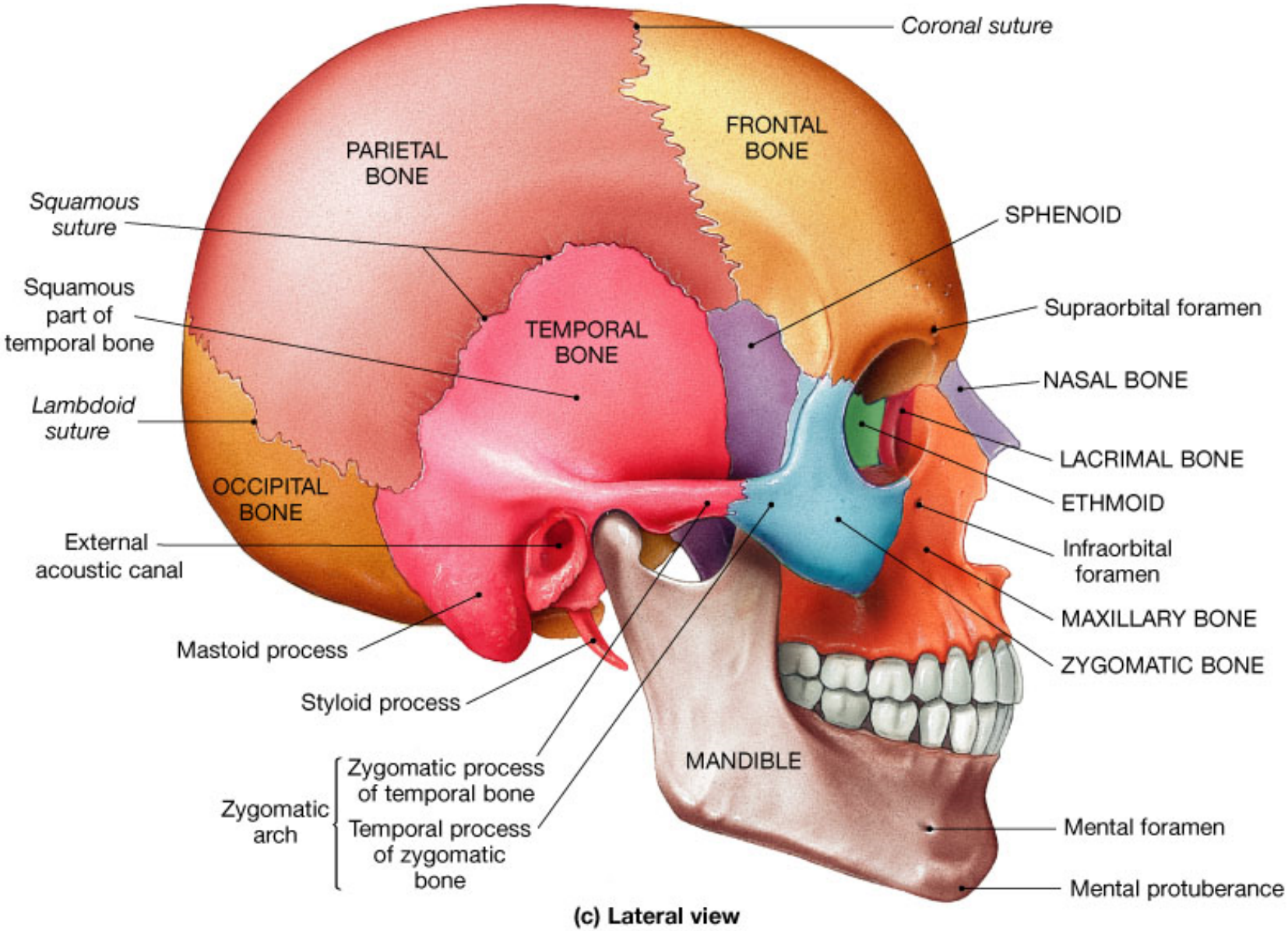
- Brain in direct contact with protective membrane in between bones and brain called the **meninges**.

1 frontal bone
2 parietal bones
2 temporal bones
1 occipital bone
1 sphenoid bone
1 ethmoid bone



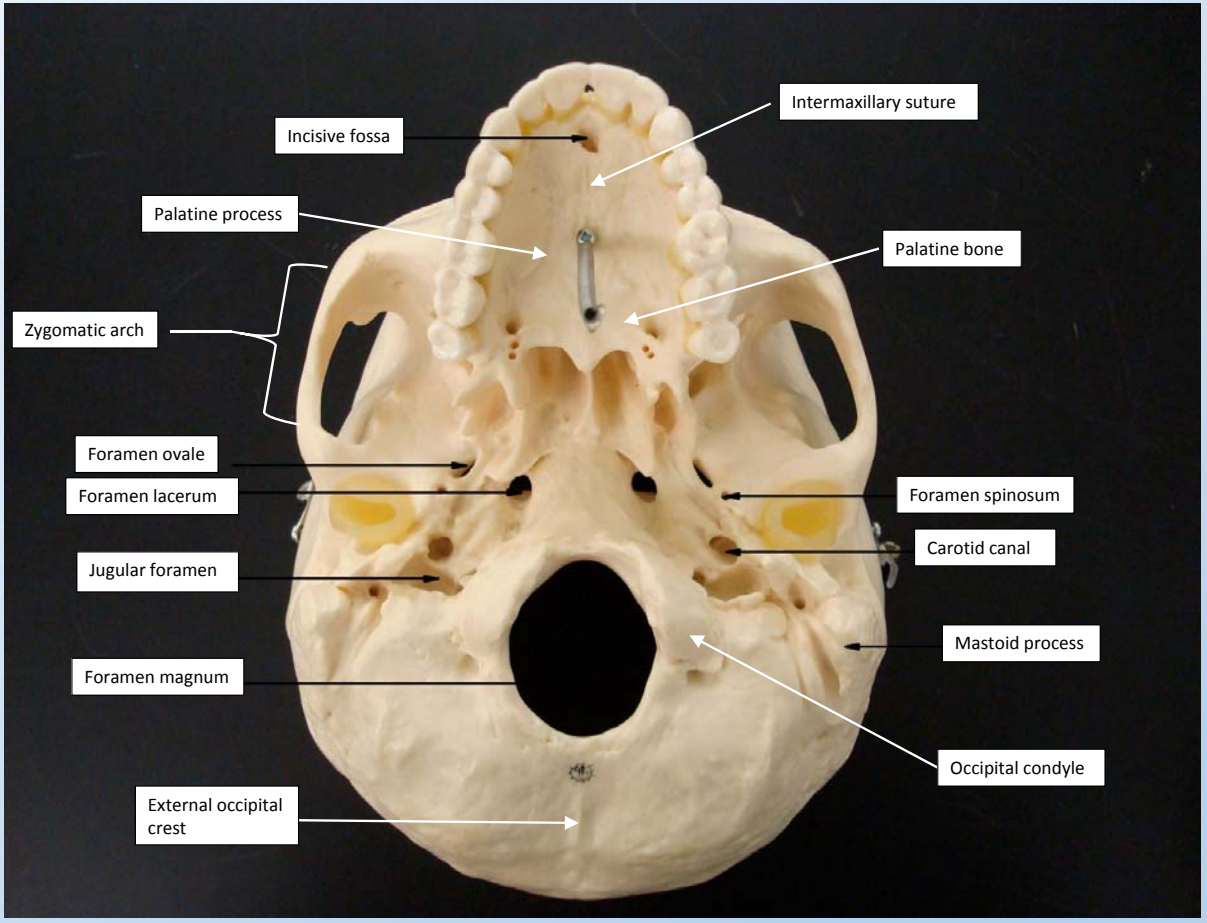
(b) Horizontal section

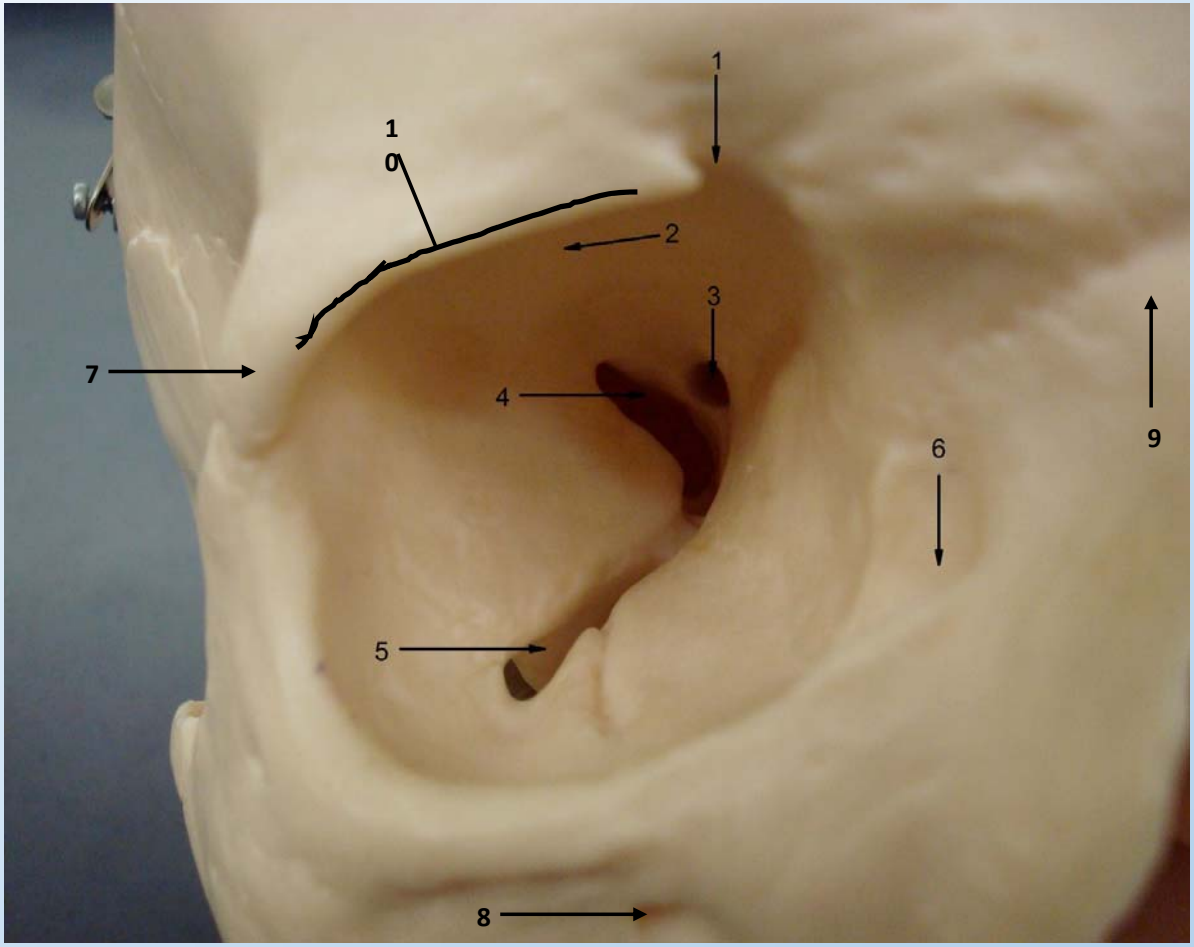




(c) Lateral view

Inferior View of The Skull





Structures:

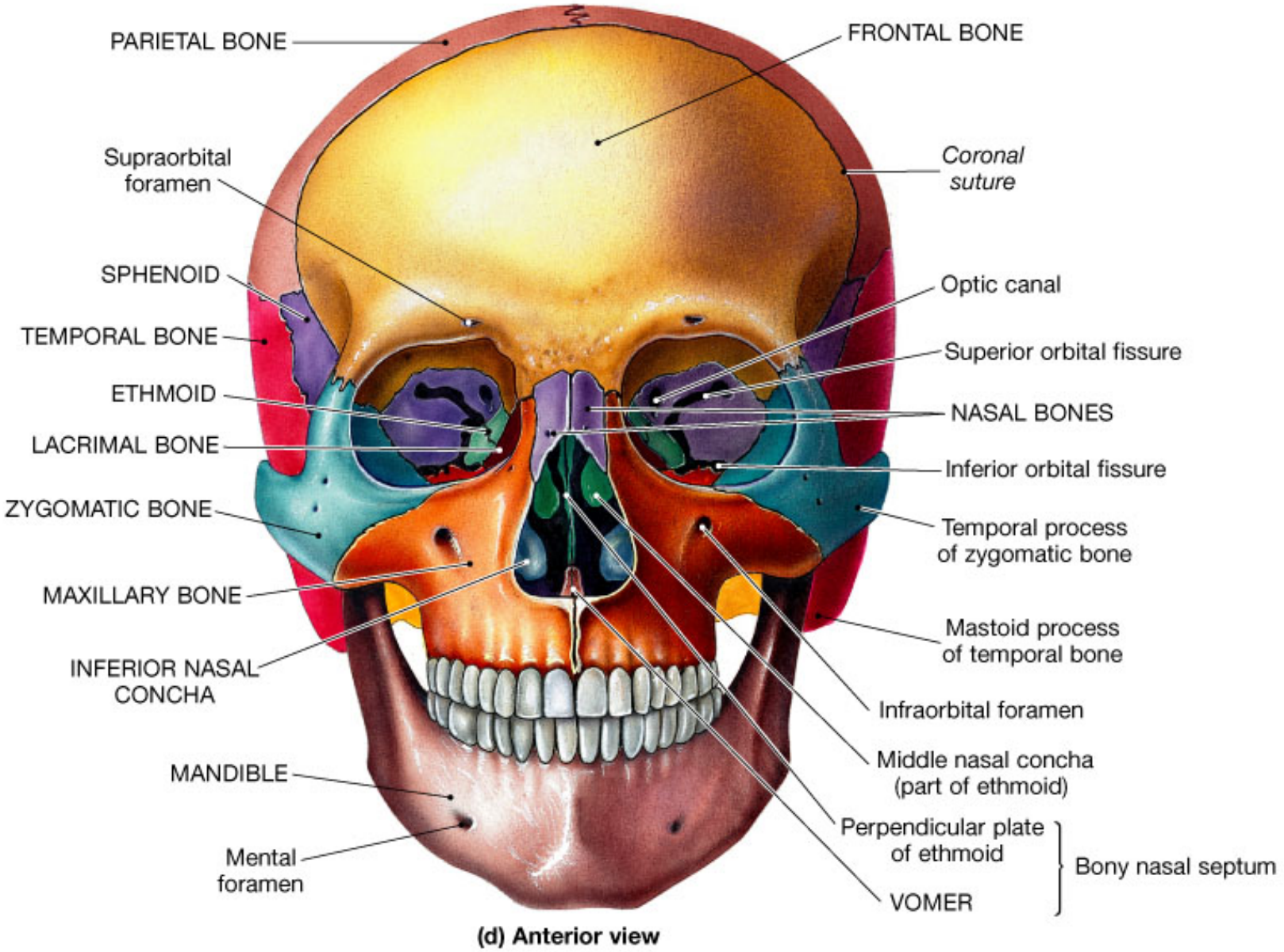
1. supraorbital notch
2. orbital surface*
3. optic canal
4. superior orbital fissure
5. inferior orbital fissure
6. lacrimal canal
7. zygomatic process*
8. infraorbital foramen
9. zygomatic process**
10. supraorbital margin

** of frontal bone*
*** of maxillary bone*

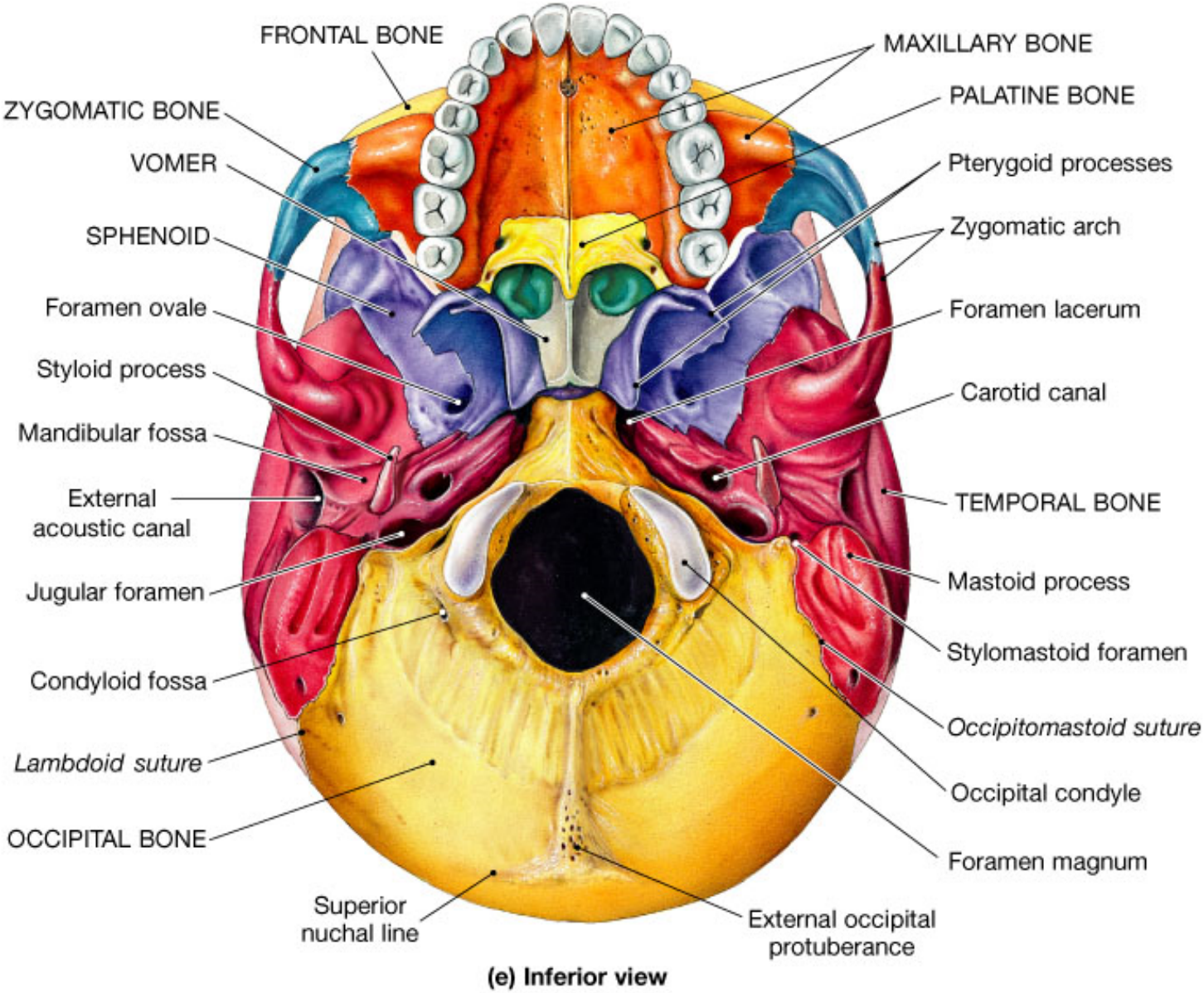
Facial Bones

- Facial bones have no direct contact with the brain or meninges.

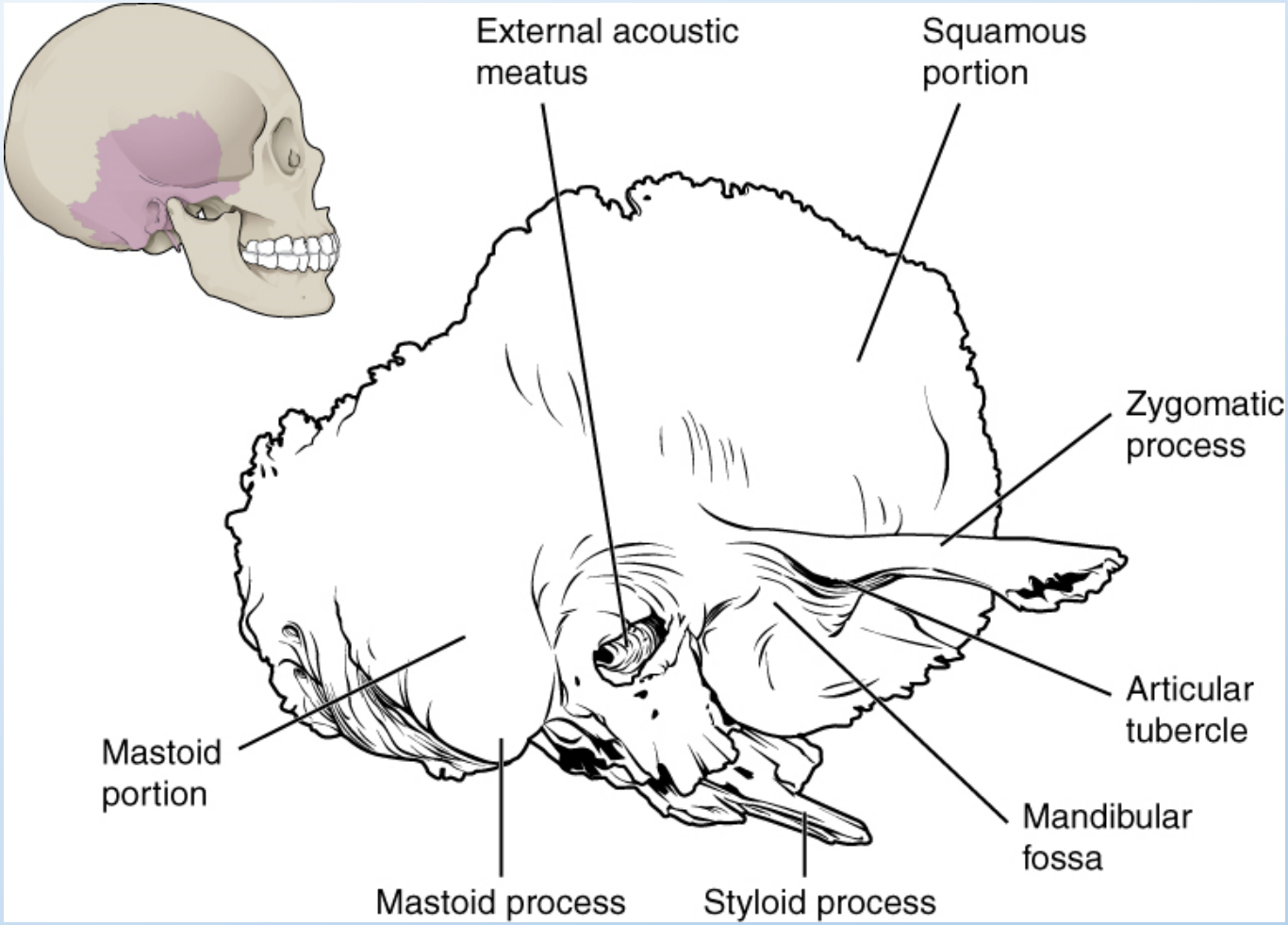
2 maxillae bones	2 nasal bones
2 palatine bones	2 inferior nasal conchae
2 zygomatic bones	1 vomer
2 lacrimal bones	1 mandible



(d) Anterior view

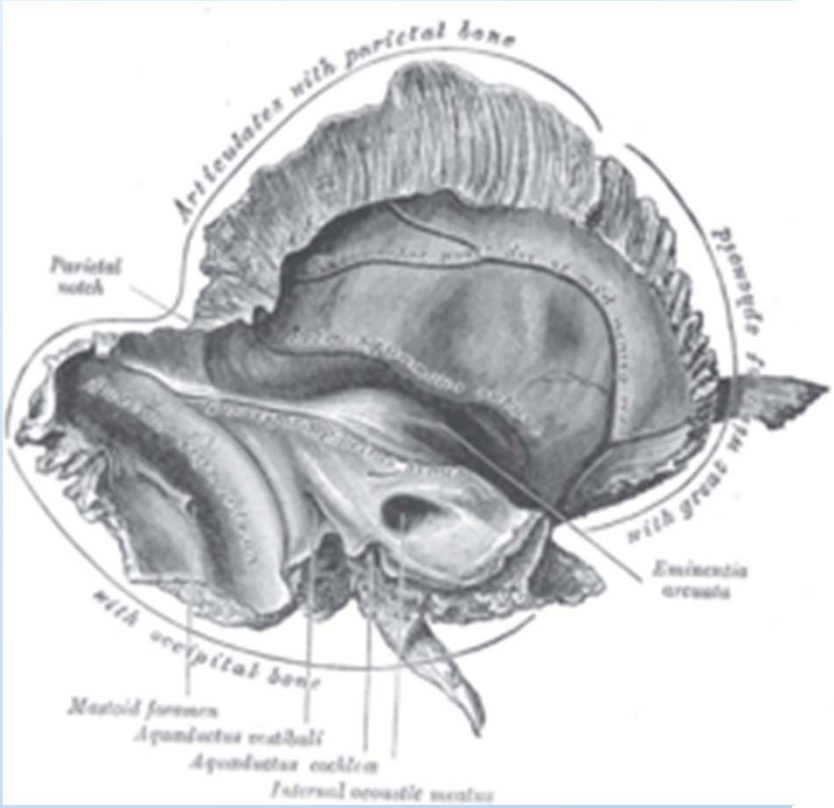


(e) Inferior view

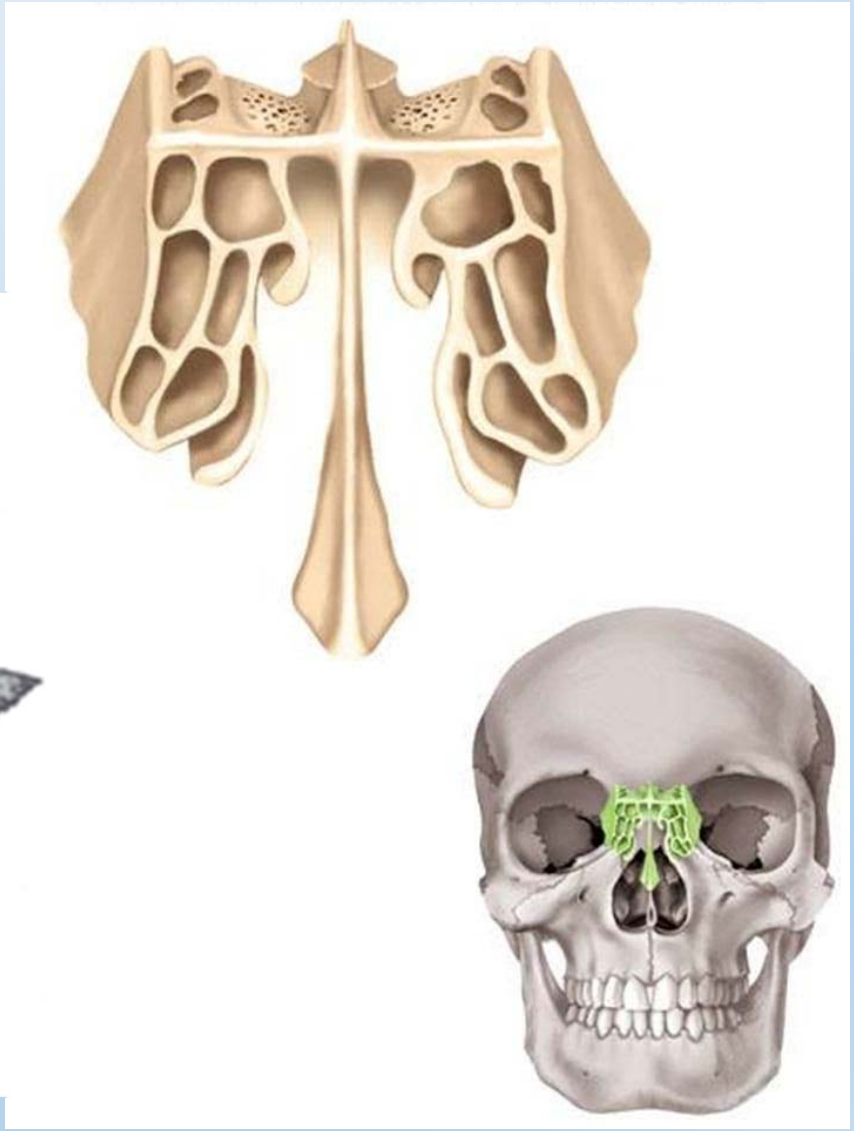


Temporal Bone

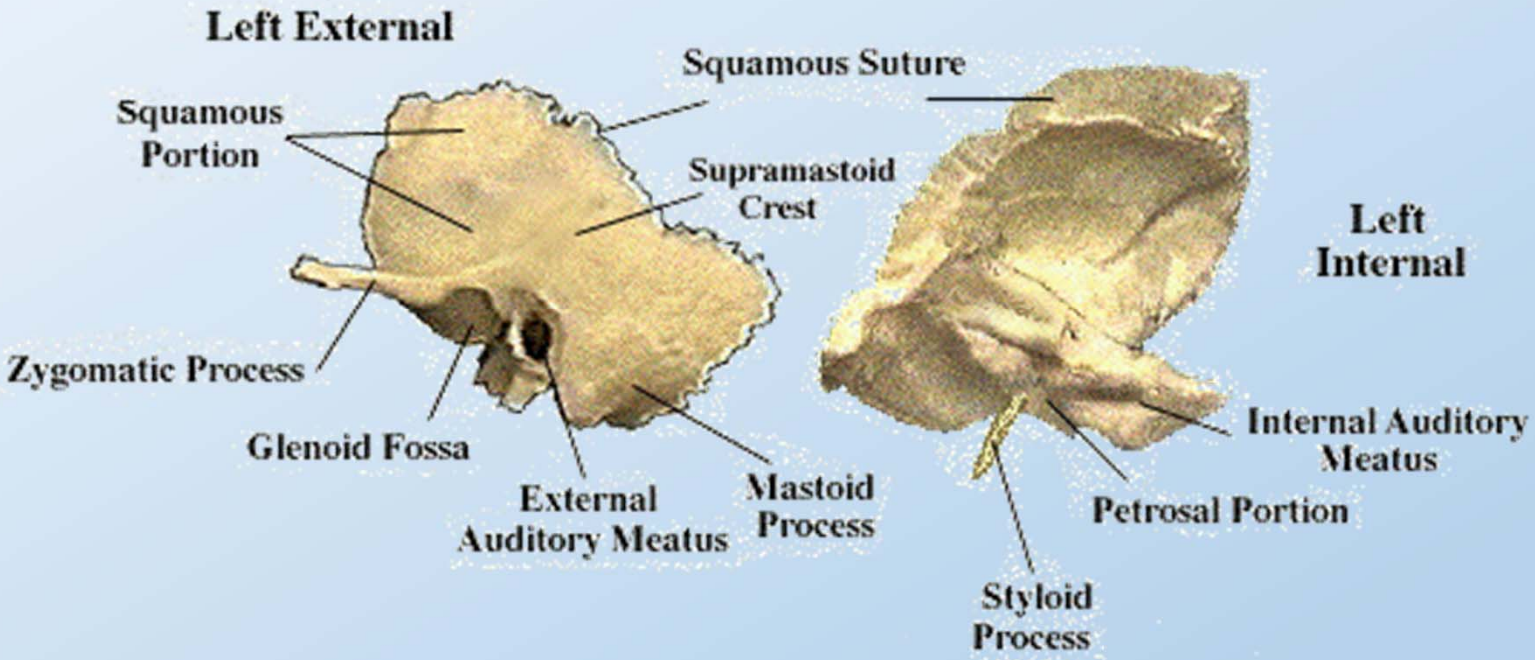
Temporal Bone



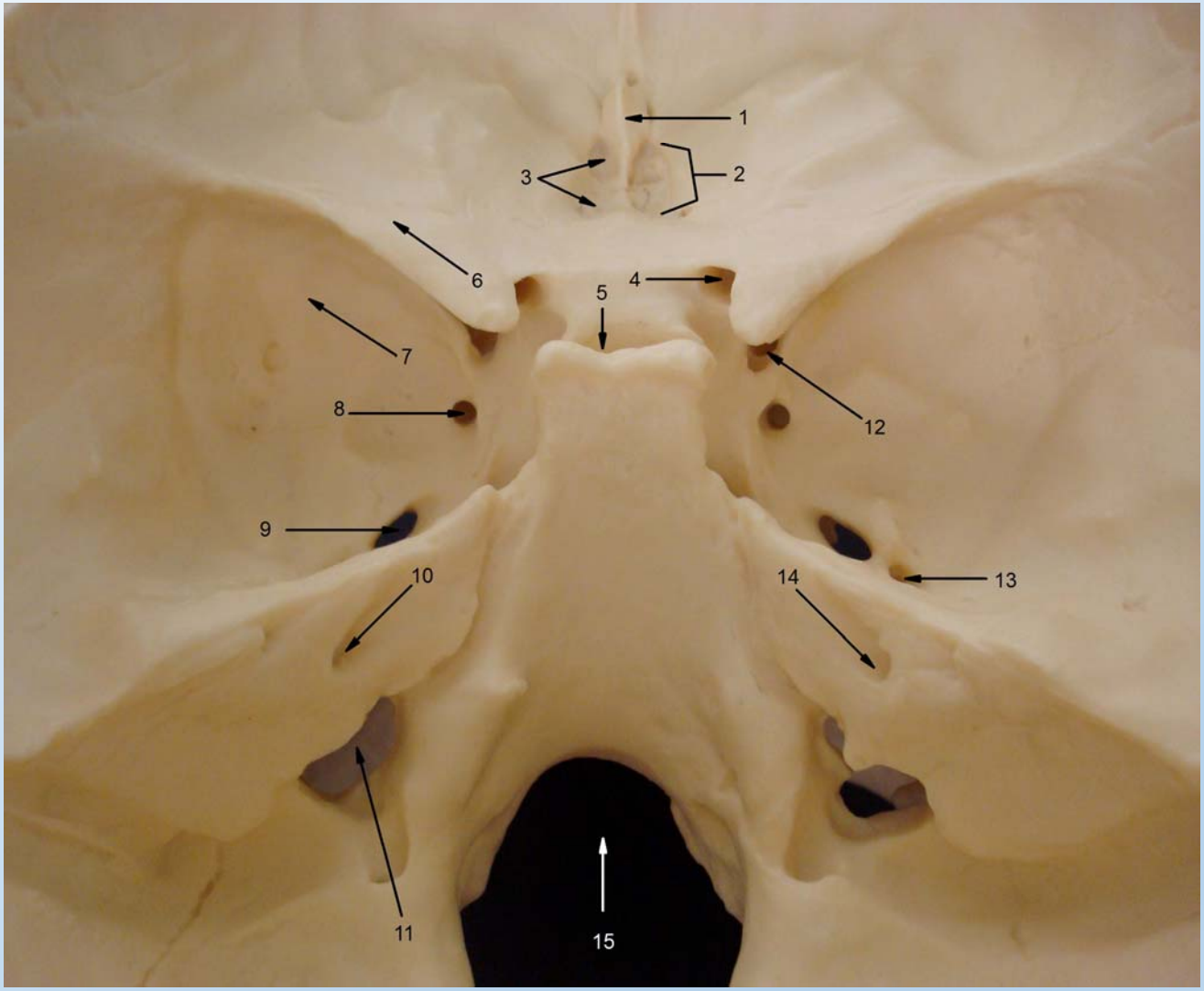
Ethmoid Bone



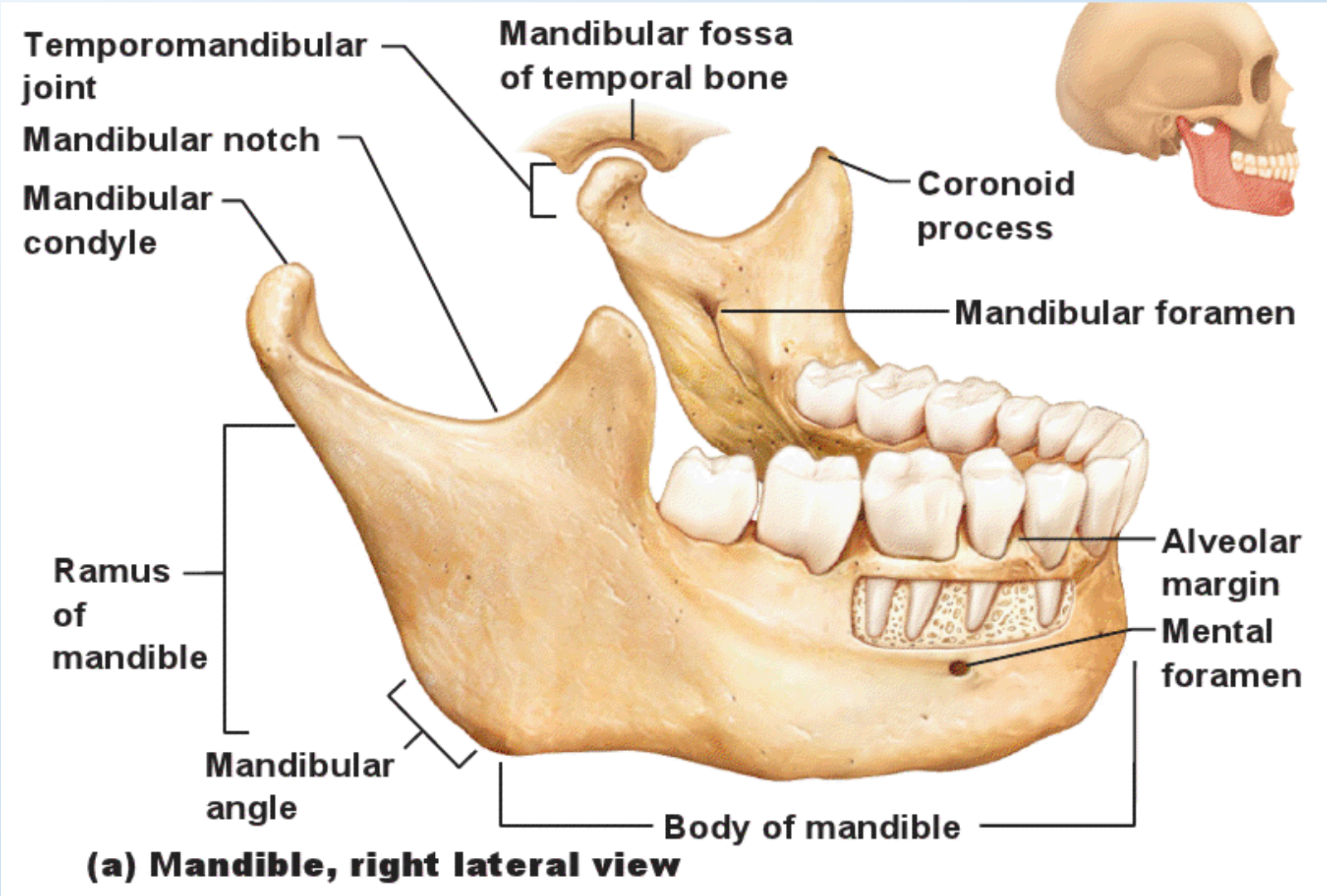
Temporal Bone



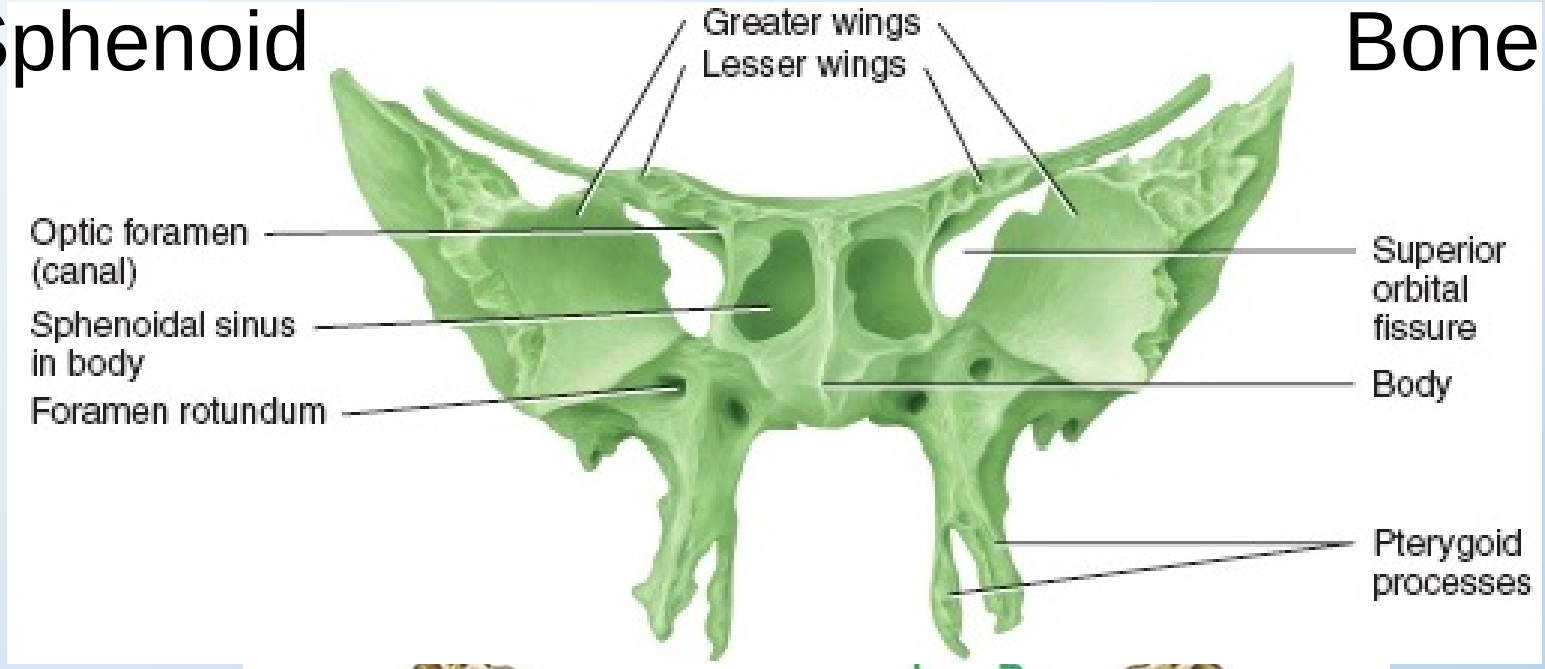
The Holes in the Skull!

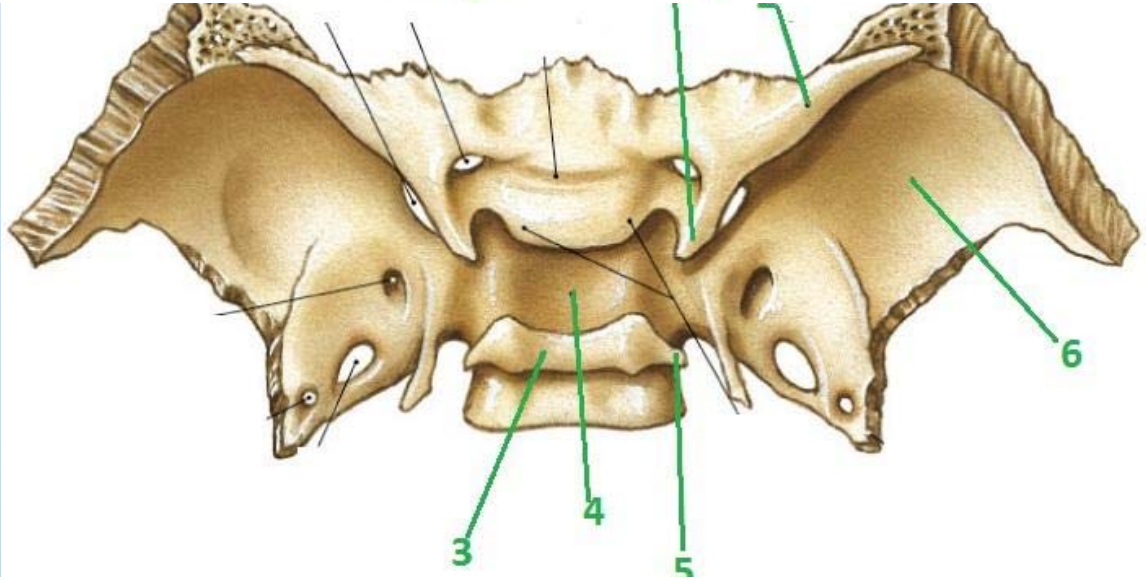


Mandible Bone



Sphenoid Bone



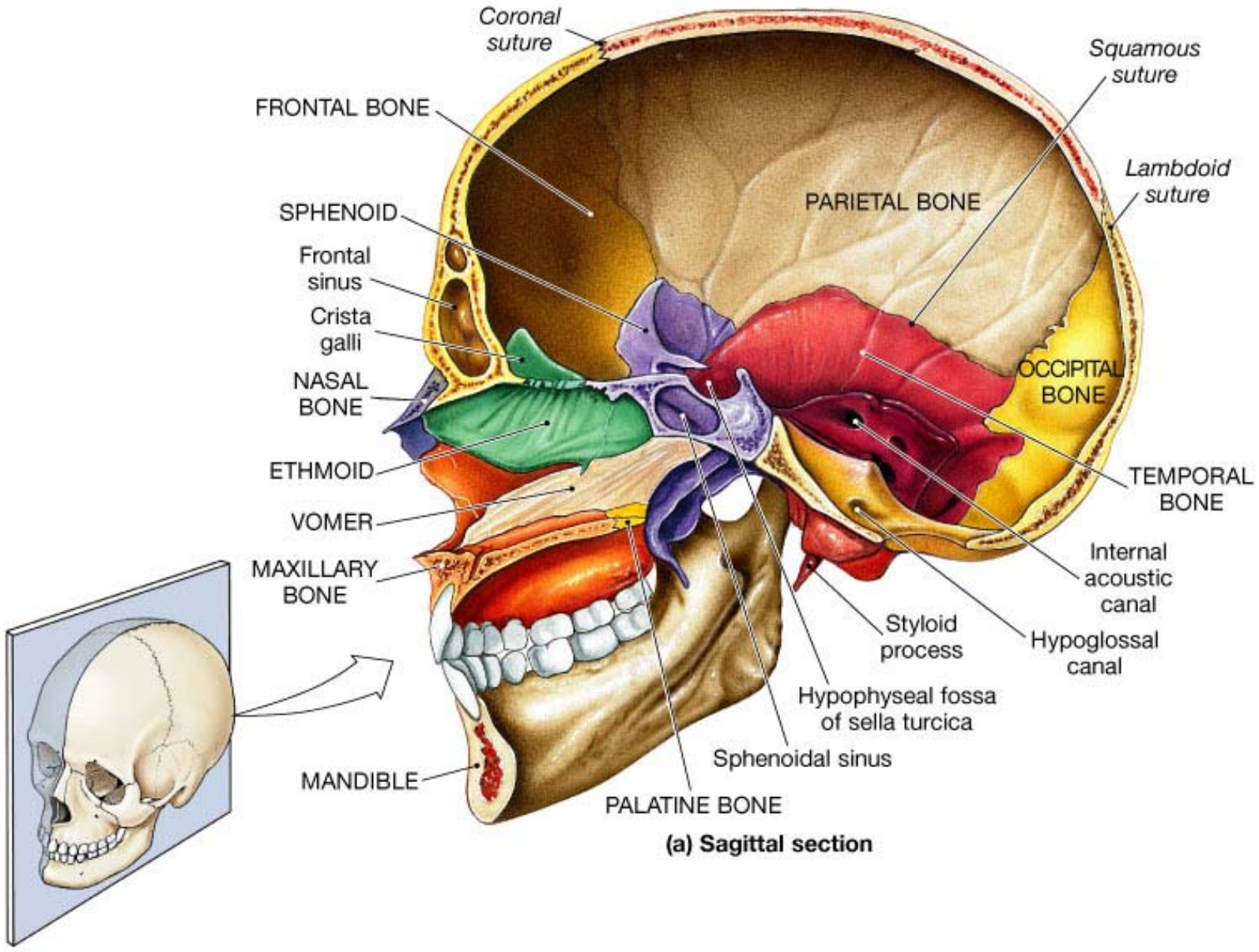


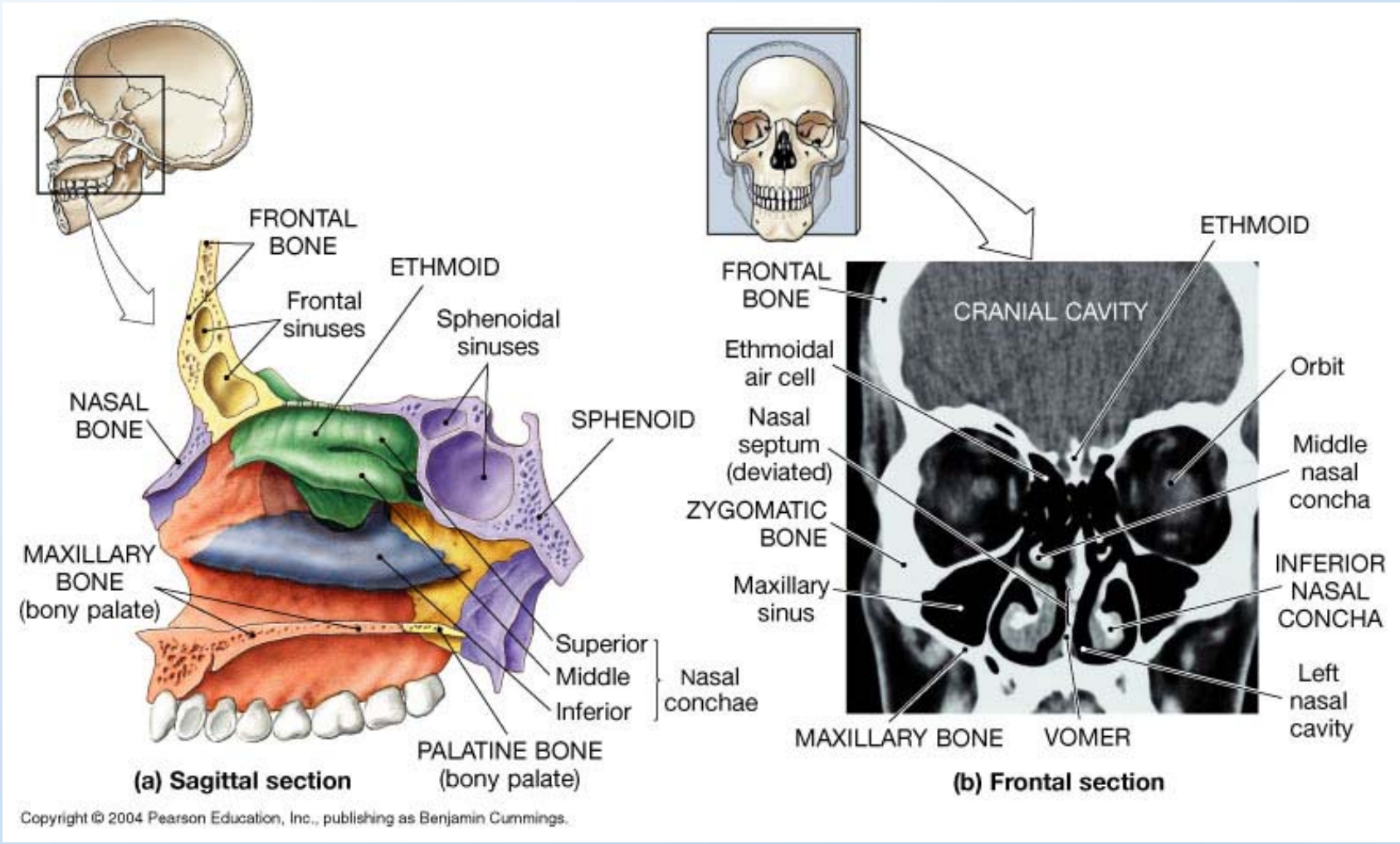
Sinuses in the skeletal system are cavities or chambers in bone.

Roles:
* Lighten weight of skull
* Produce mucus
* Sound resonation

There are 4 **paranasal** sinuses

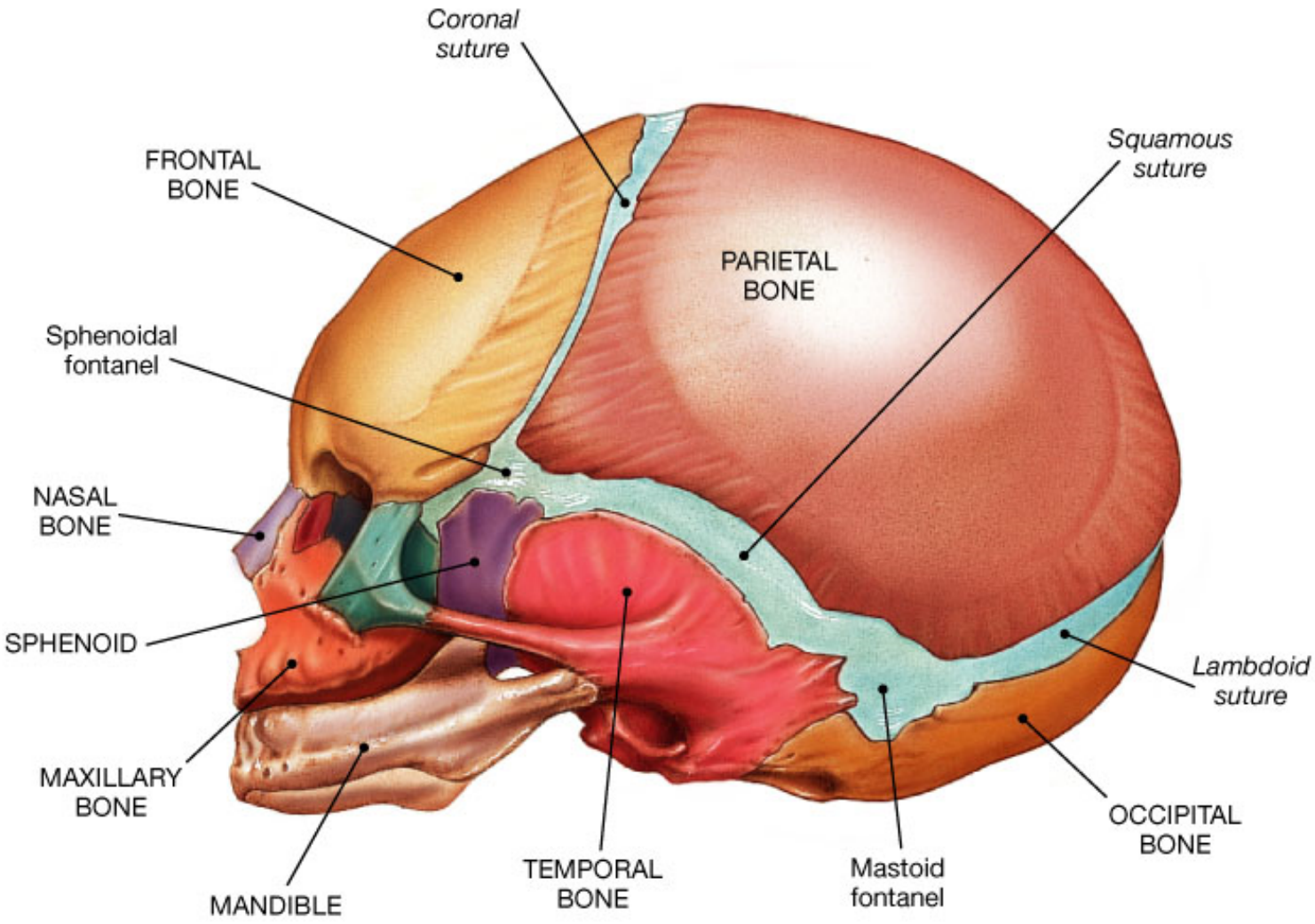
1. Frontal sinus
2. Maxillary sinus
3. Sphenoidal sinus
4. Ethmoidal sinus (air cells)



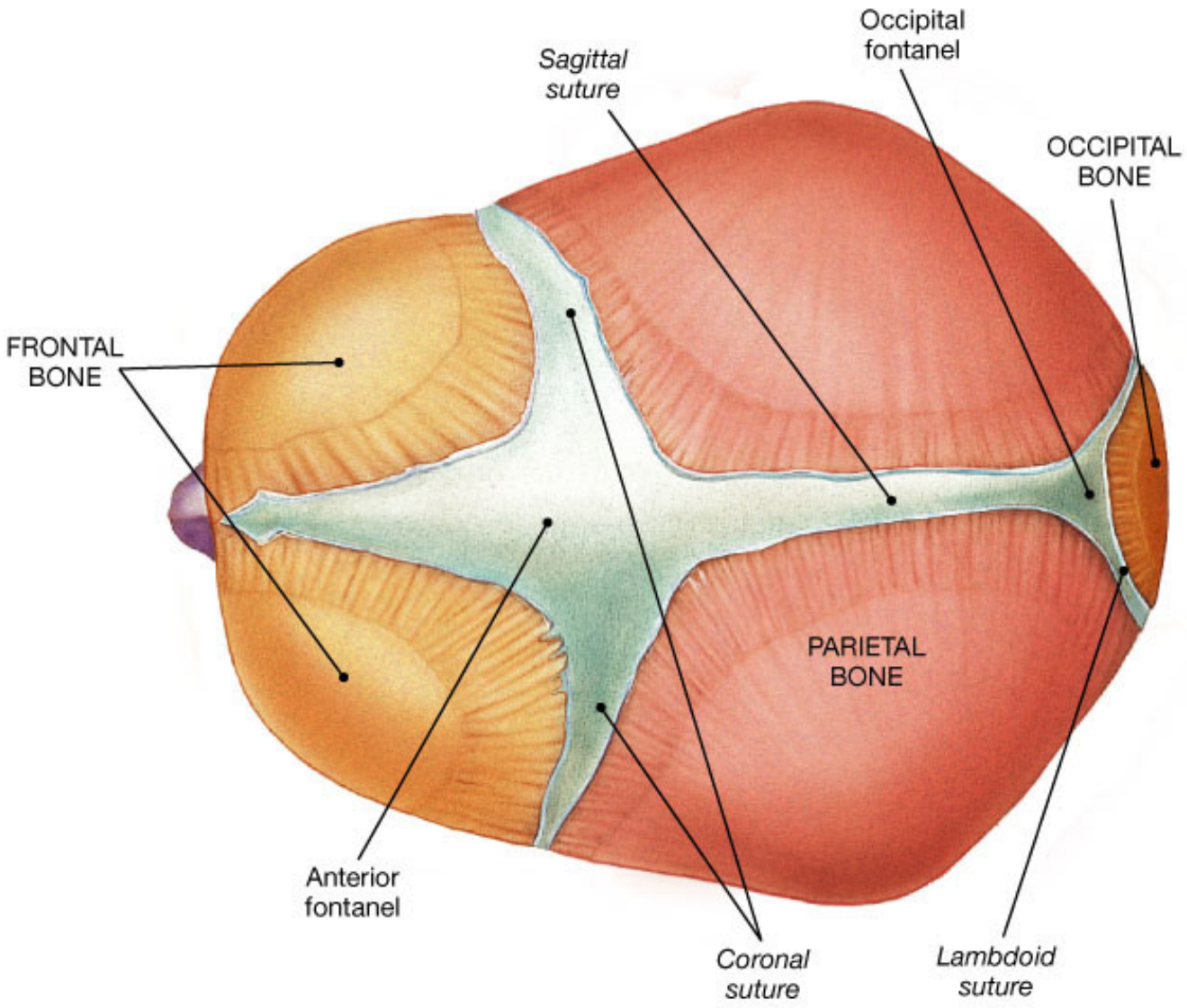


Fontanels are the fibrous regions between the cranial bones of a developing skull.

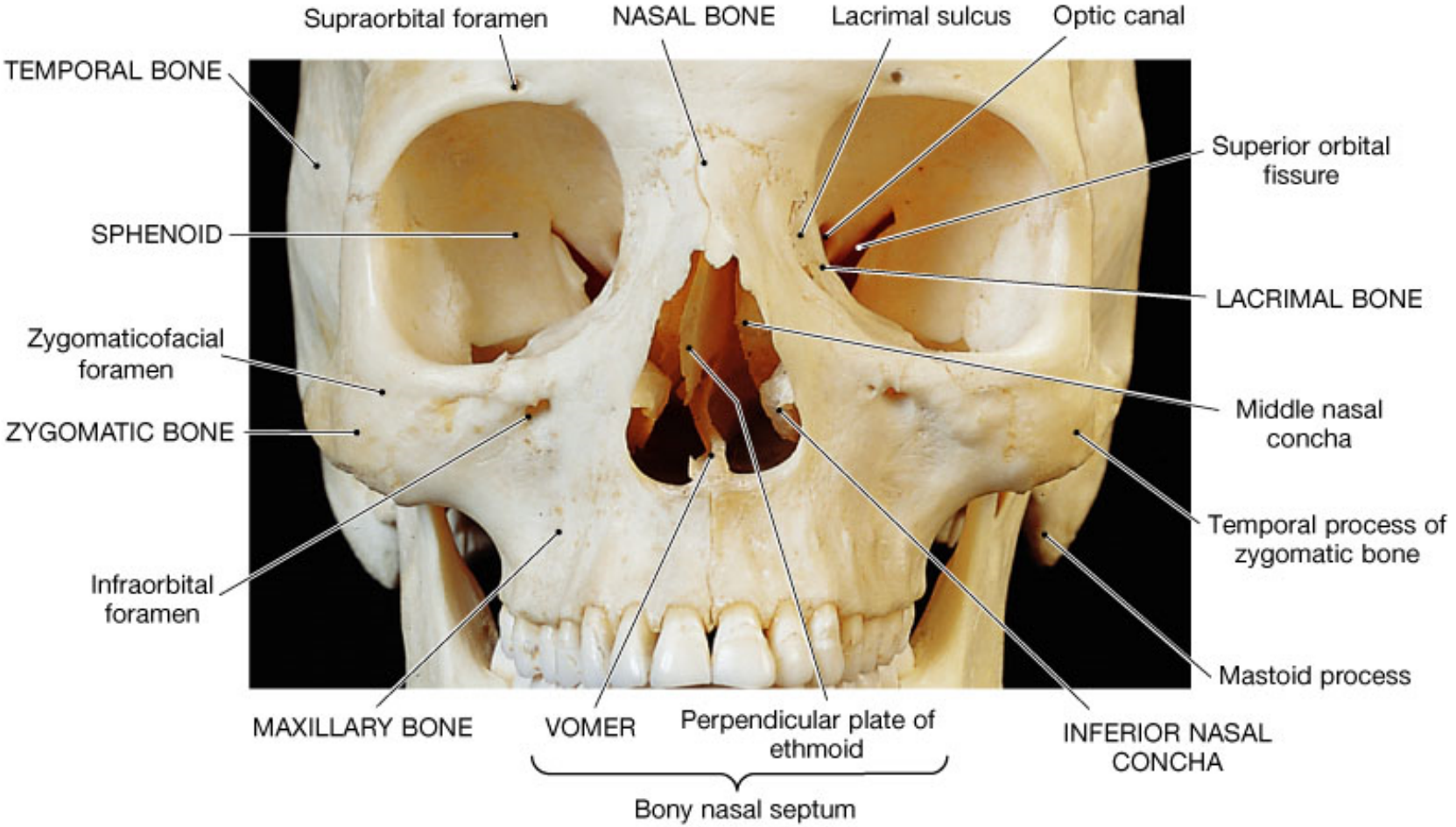
- Provide flexibility for growing brain.
- Allows distortion of skull during birth.
- Most fontanels are fully fused by 12 months.
- Anterior fontanel does not close for 18 to 20 months of age = “soft spot” on baby head!

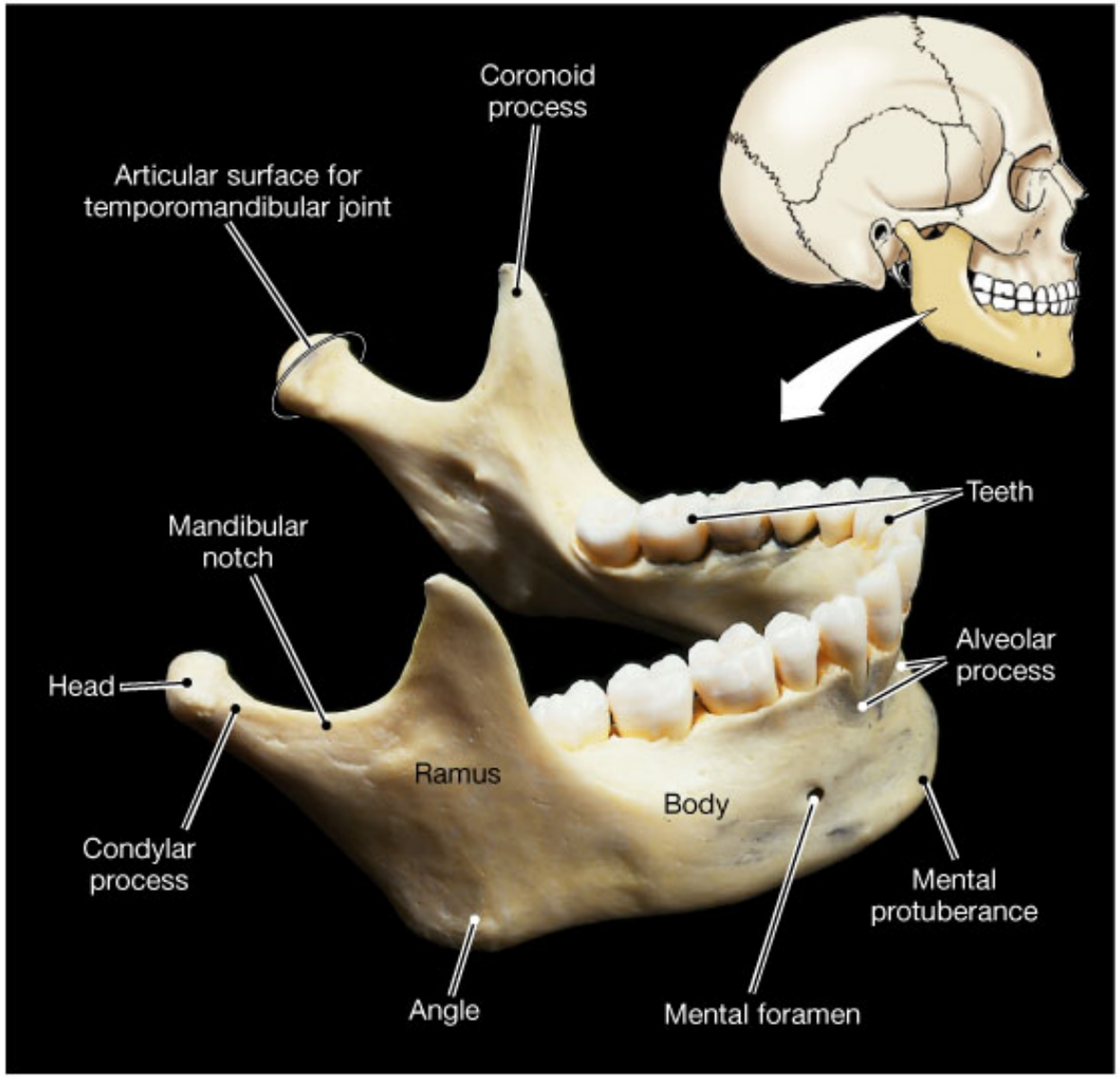


(a) Lateral view

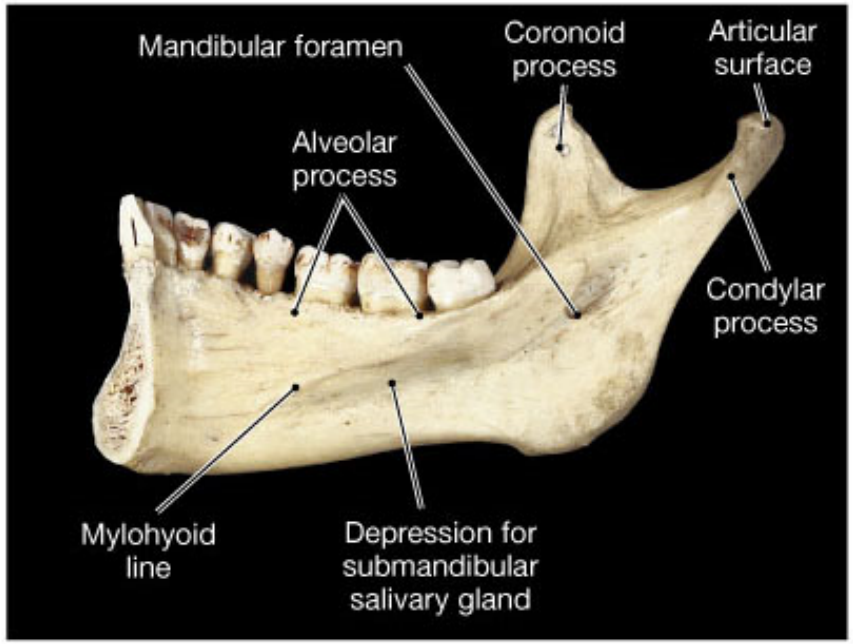


(b) Superior view

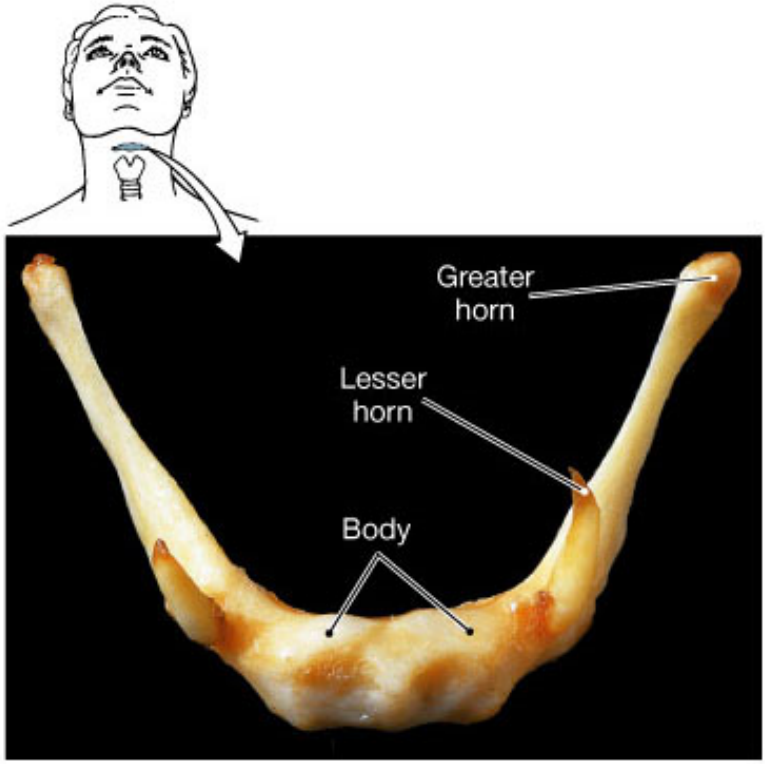




(a) Lateral view

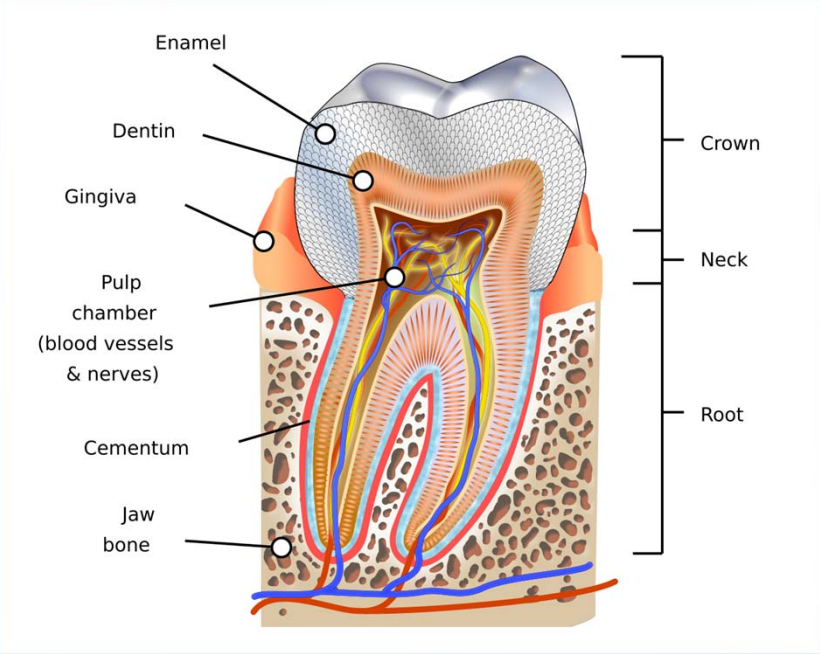


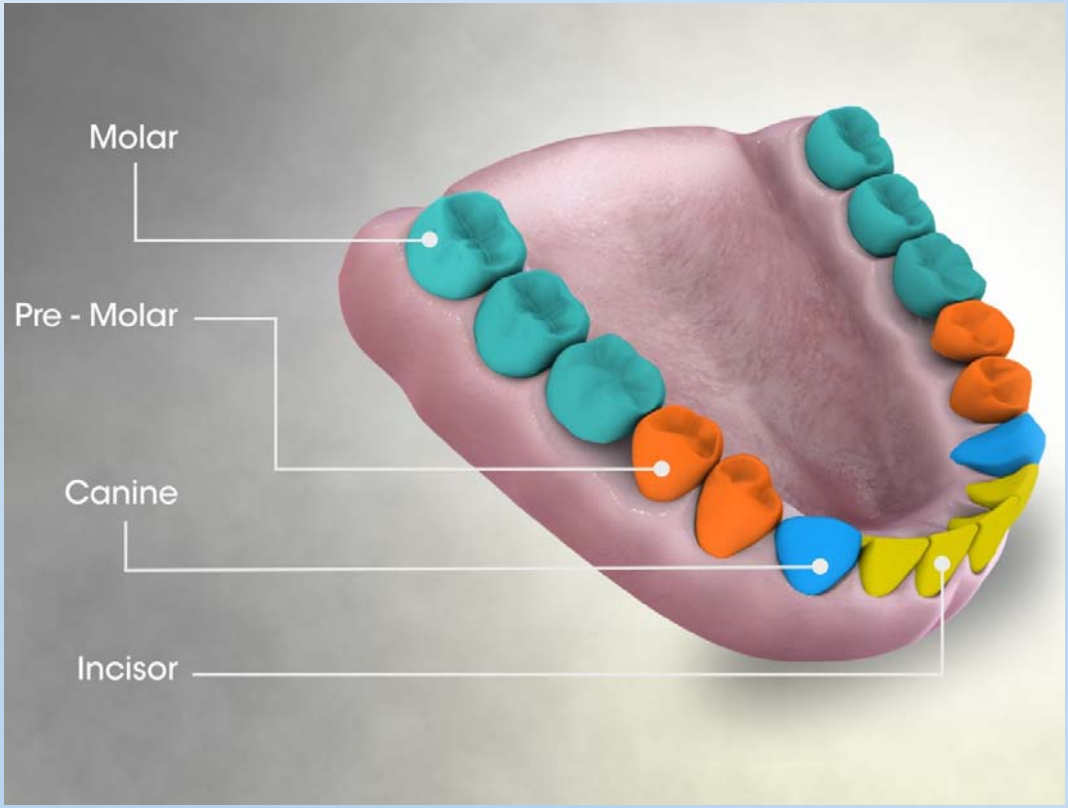
(b) Medial view



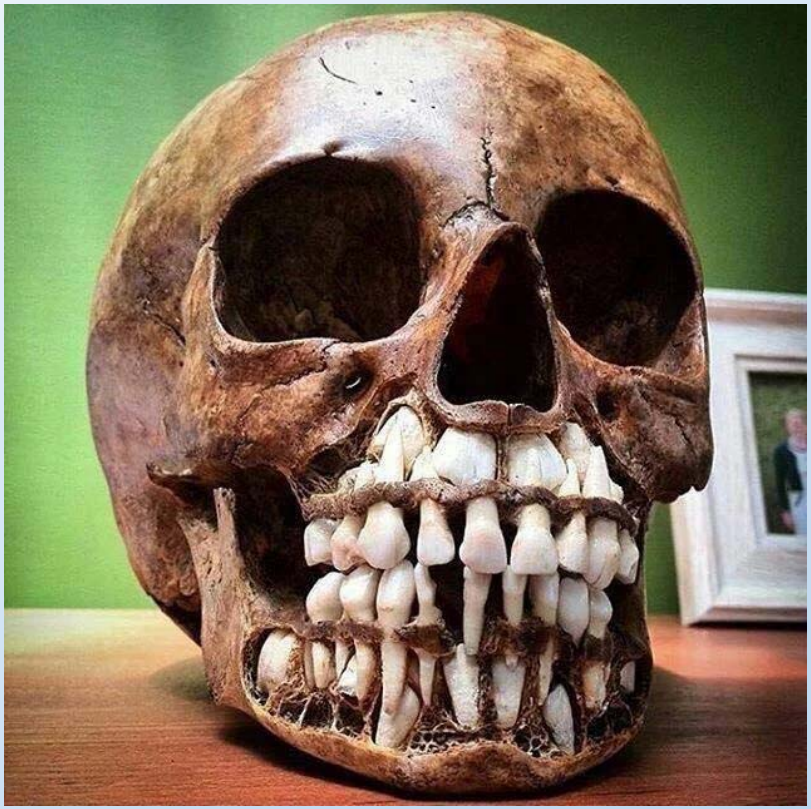
(c) Anterior-superior view

Tooth


Enamel
Dentin
Gingiva
Pulp chamber (blood vessels & nerves)
Cementum
Jaw bone
Crown
Neck
Root


Molar
Pre - Molar
Canine
Incisor

Tooth replacement



3143 -> 2123

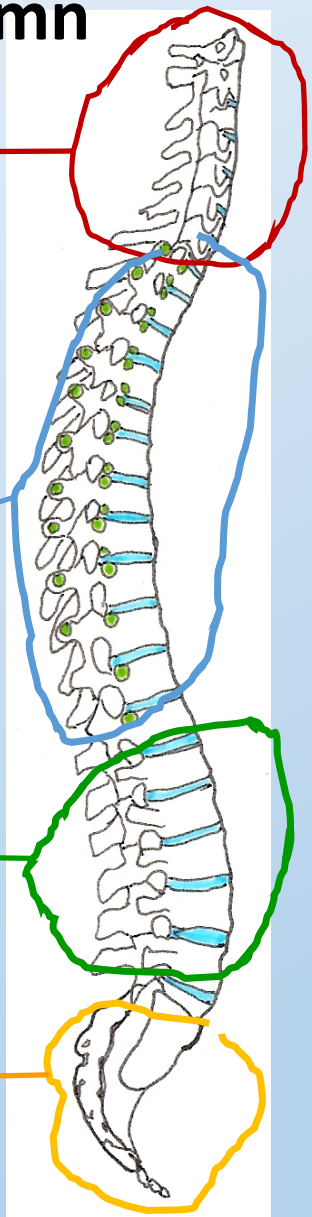
Bones of the vertebral column

Cervical, the top 7

Thoracic, attach to ribs, there are 12, cause there are 12 pairs of ribs!

Lumbar, big bottom ones!

Sacral and coccyx , these babies are all fused!



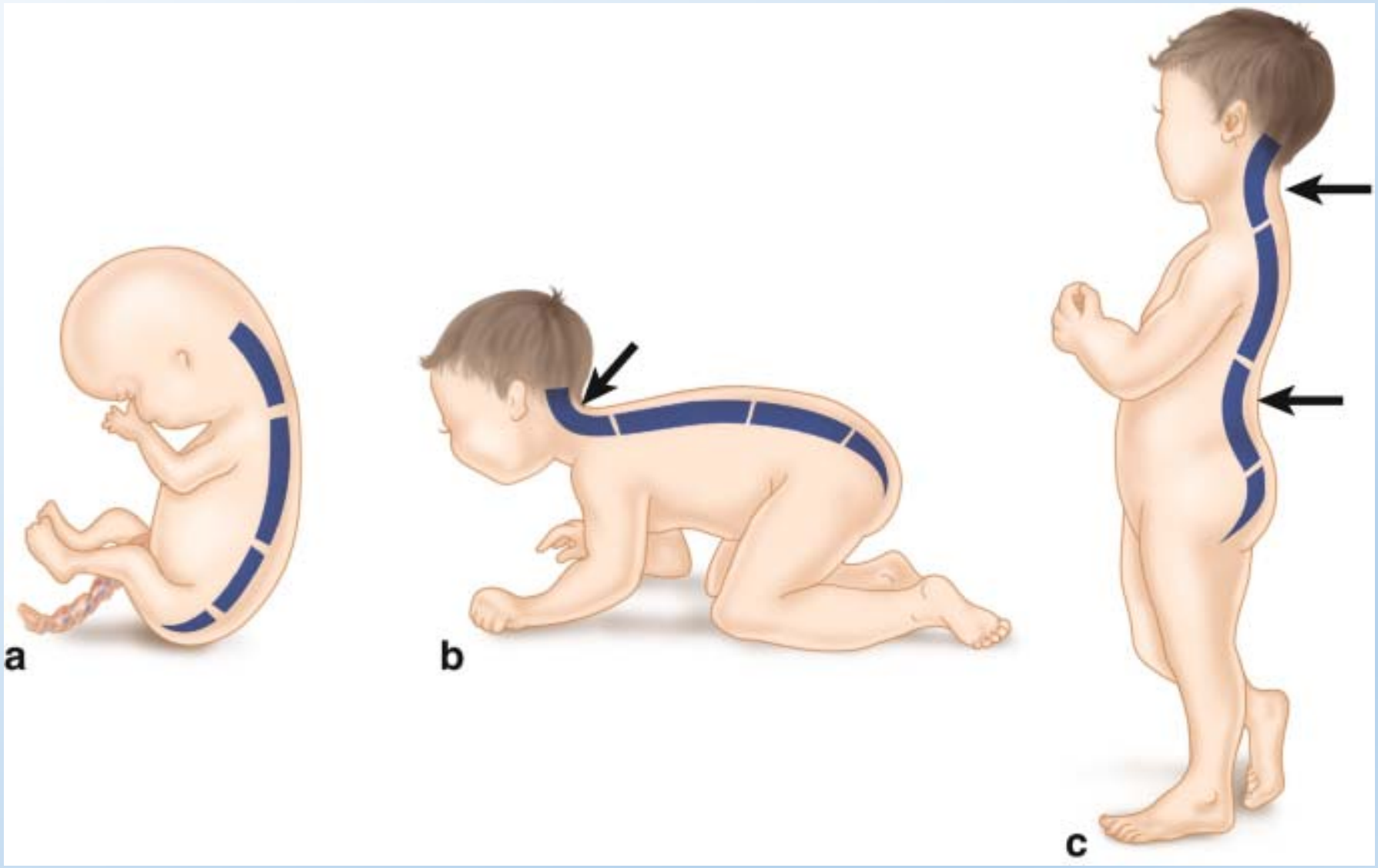
Curvatures:

The Cervical Curvature is a secondary curvature

The Thoracic Curvature is a primary curvature

The Lumbar Curvature is a secondary curvature

The Sacral Curvature is a primary curvature


a
b
c

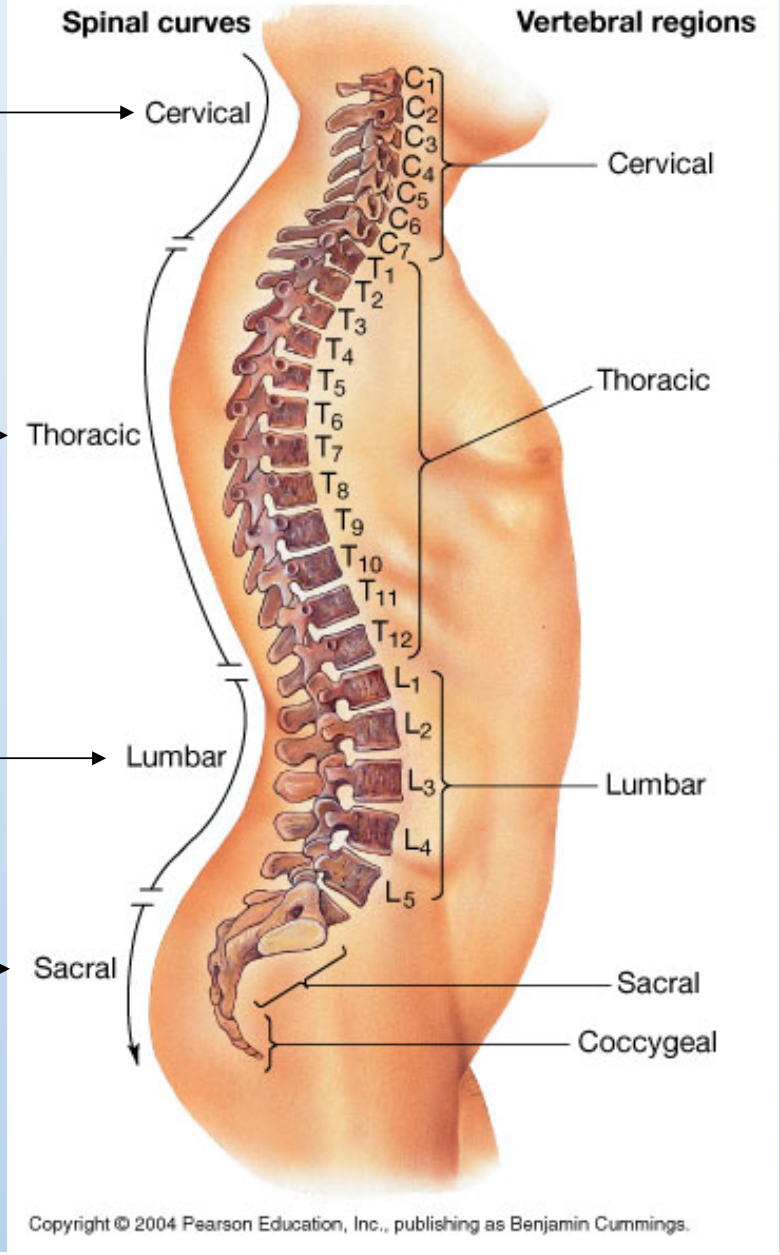
Normal Spinal Curvature

2º → Cervical

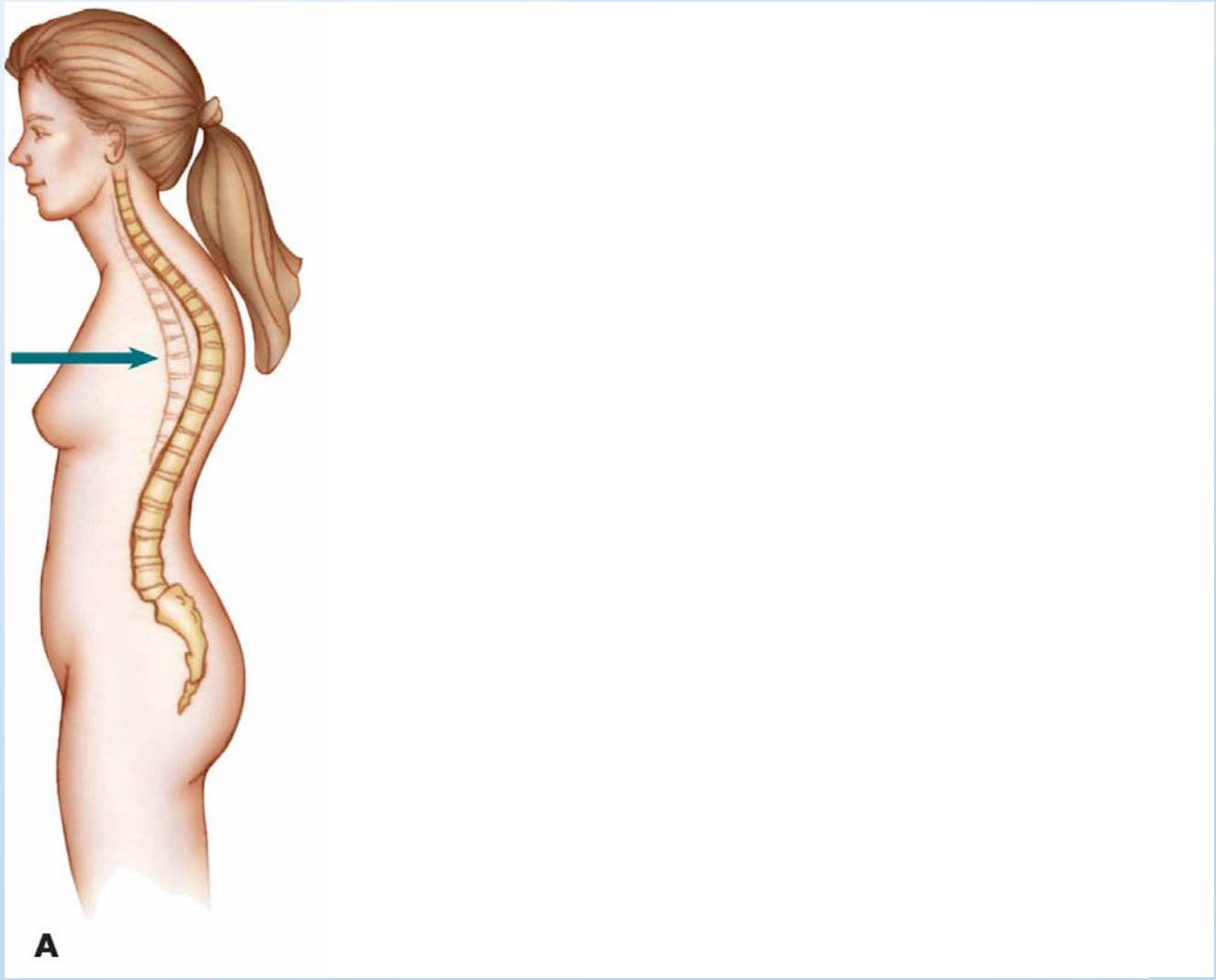
1º → Thoracic

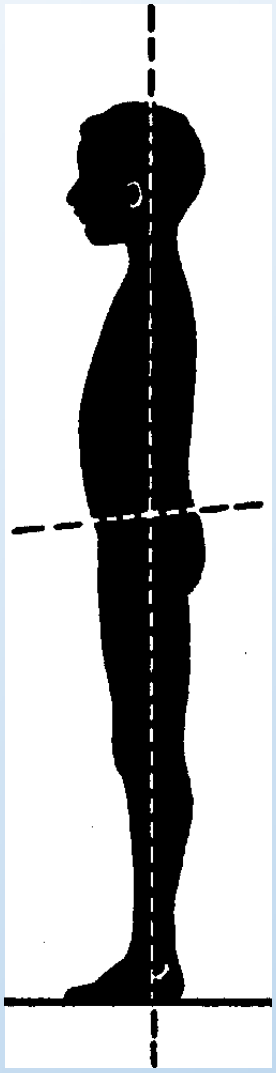
2º → Lumbar

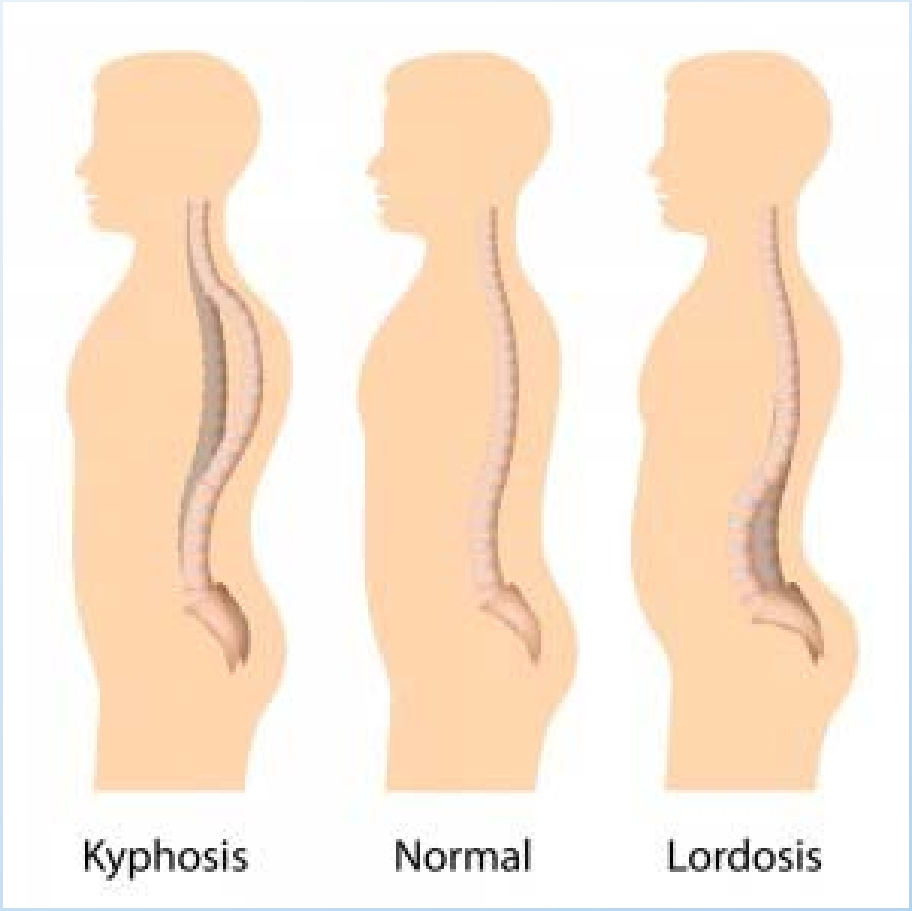
1º → Sacral

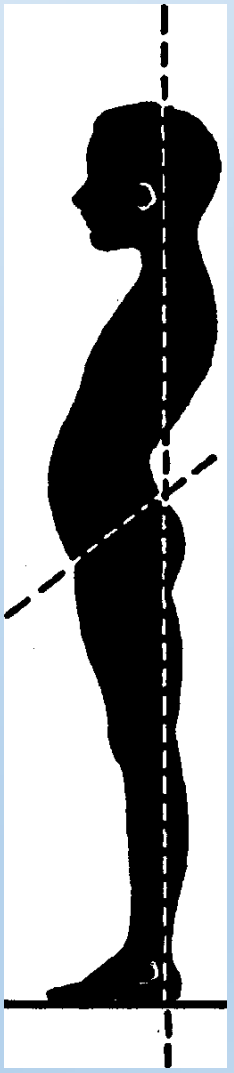


Abnormal Curvatures of the Spinal Column






Kyphosis
Normal
Lordosis



Vertebrae – The bones of the vertebral column.

There are a total of 33 total bones in the 4 regions:

24 separate vertebrae

+ sacrum (5 fused vertebrae)

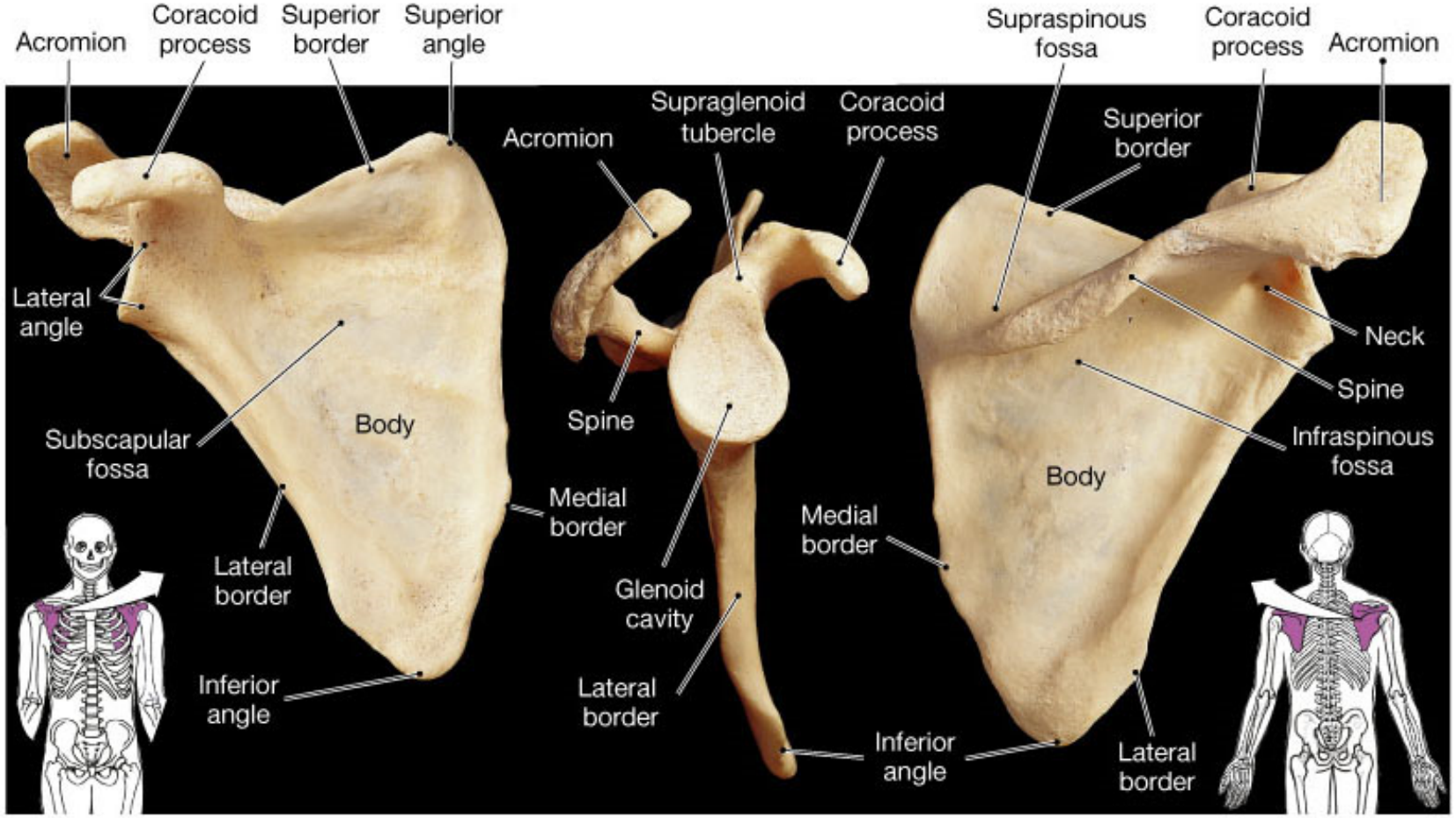
+ coccyx (4 fused vertebrae)

Cervical vertebrae = 7 bones, (C_1, C_2, C_3 etc.)

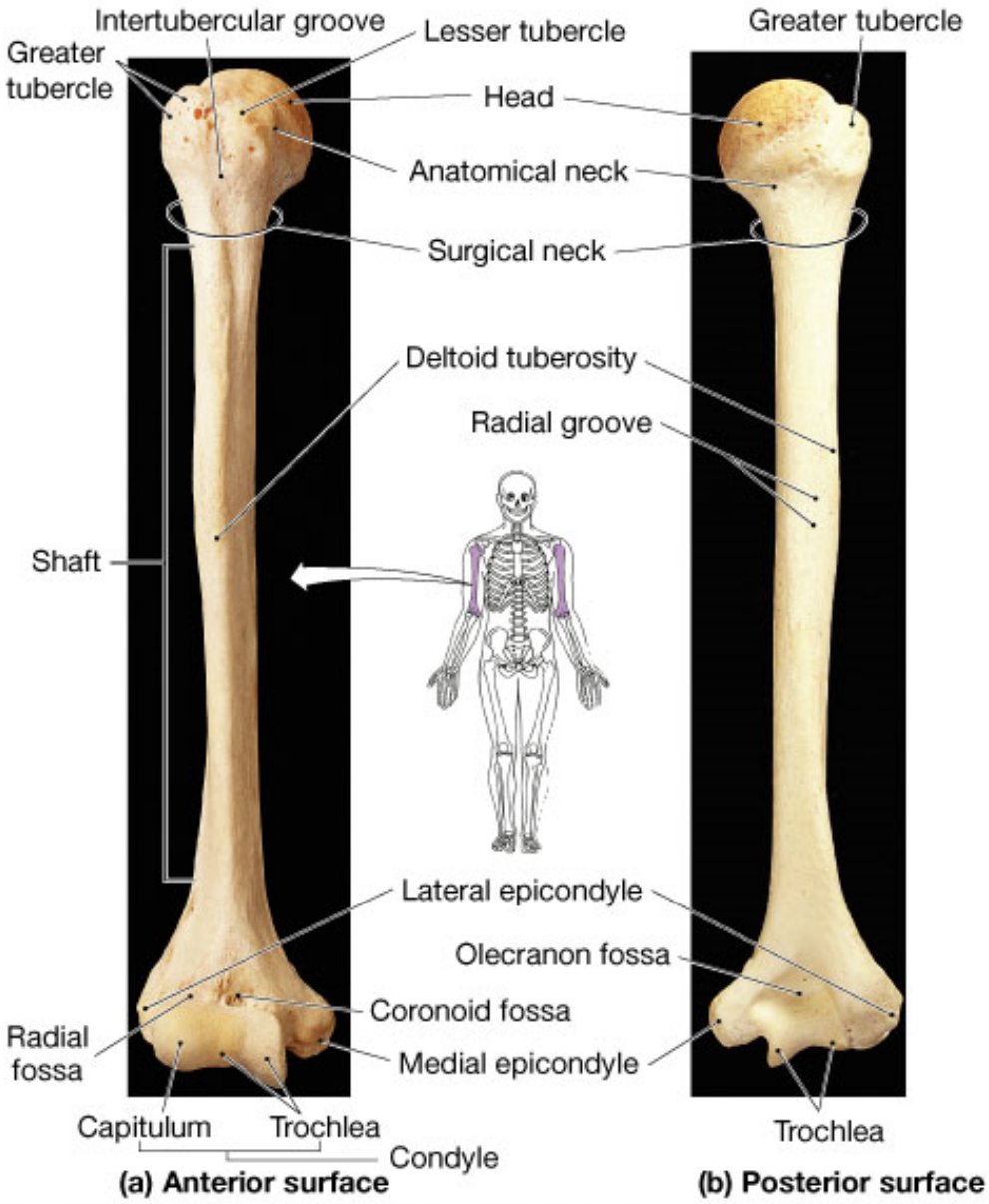
Thoracic vertebrae = 12 bones, (T_1, T_2, etc.)

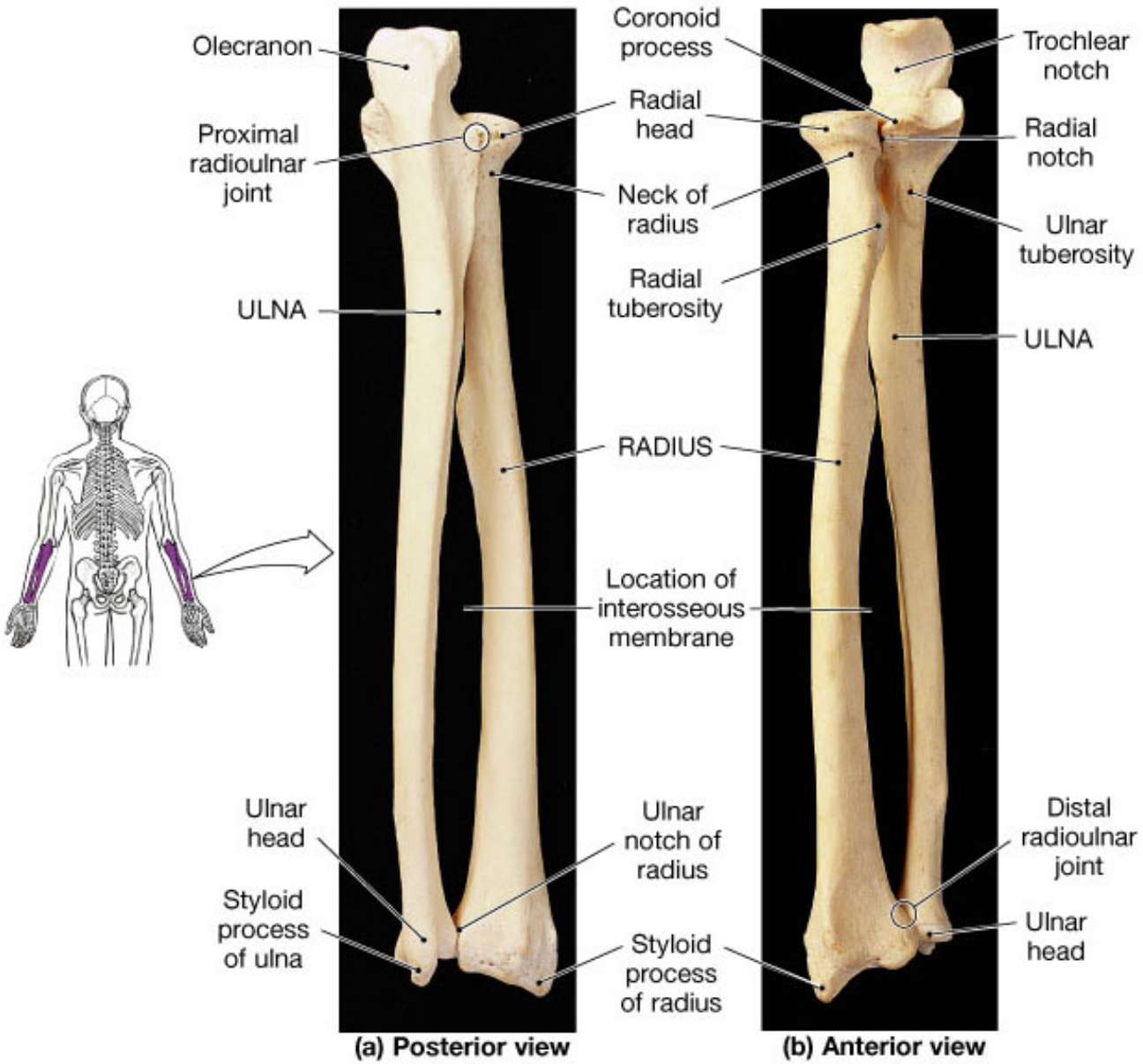
Lumbar vertebrae = 5 bones, (L_1, L_2, etc.)

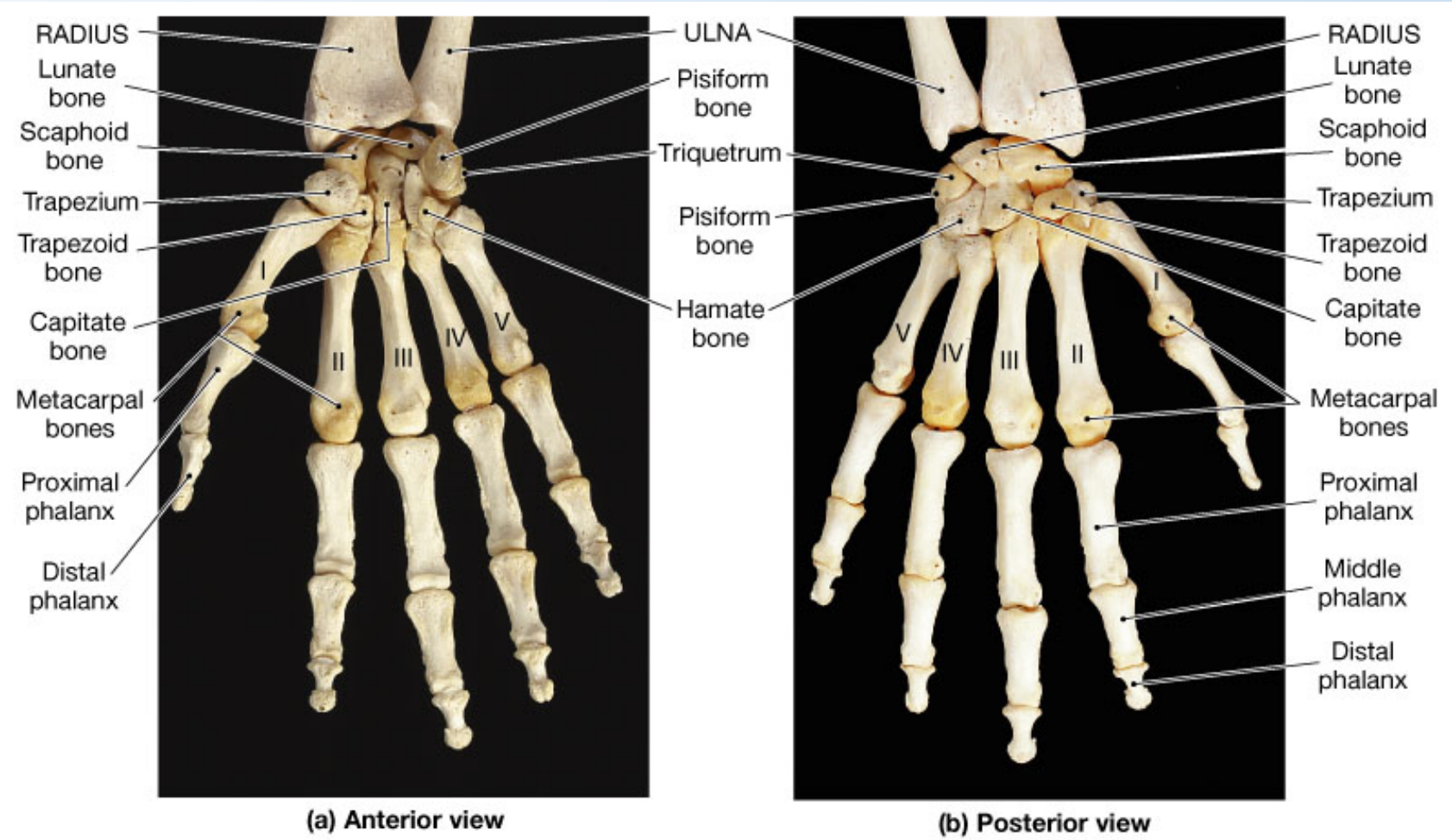
Total = 24 individual bones

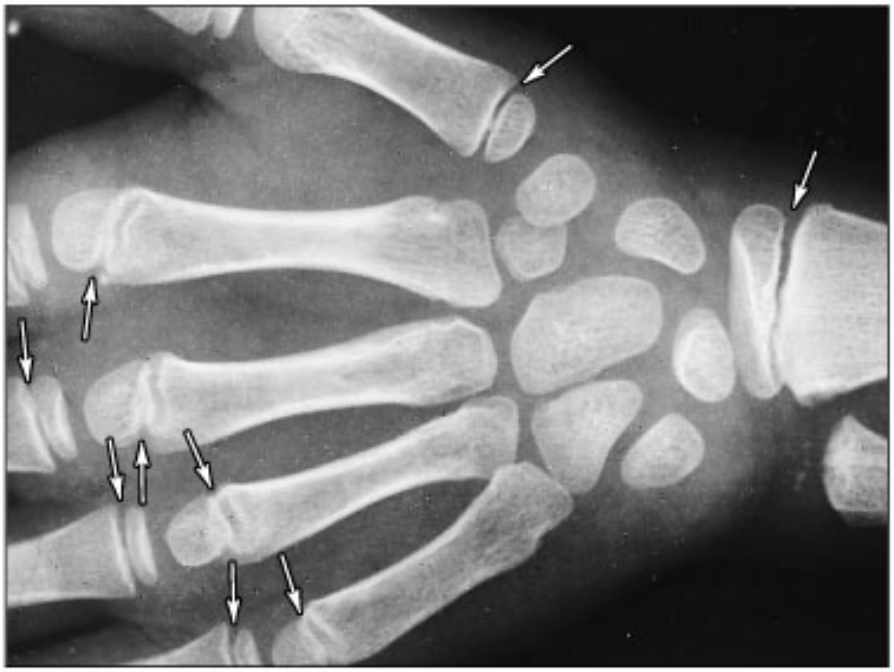


(a) Anterior view (b) Lateral view (c) Posterior view



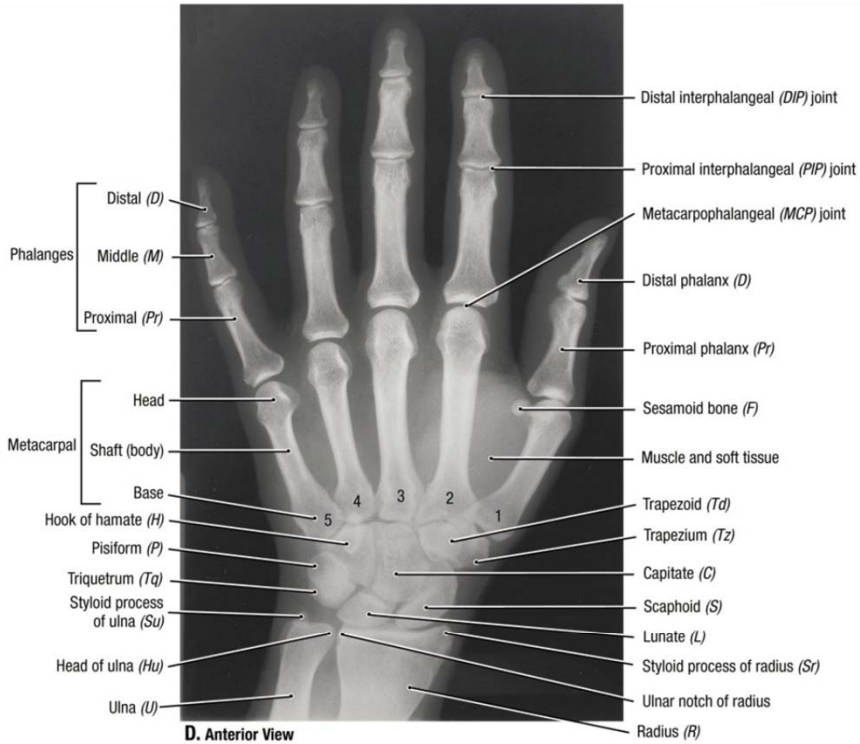




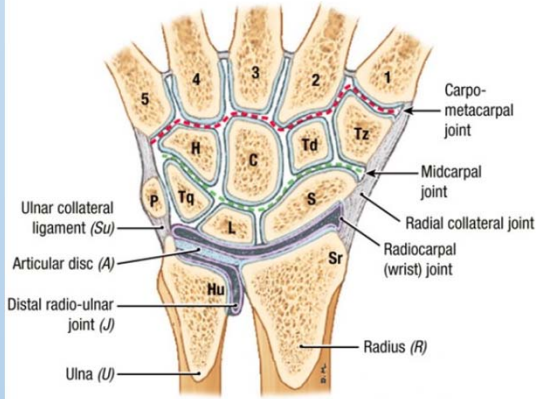


(a) Epiphyseal cartilages

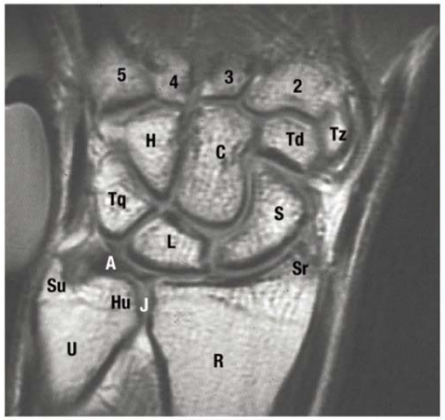
(b) Epiphyseal lines



D. Anterior View



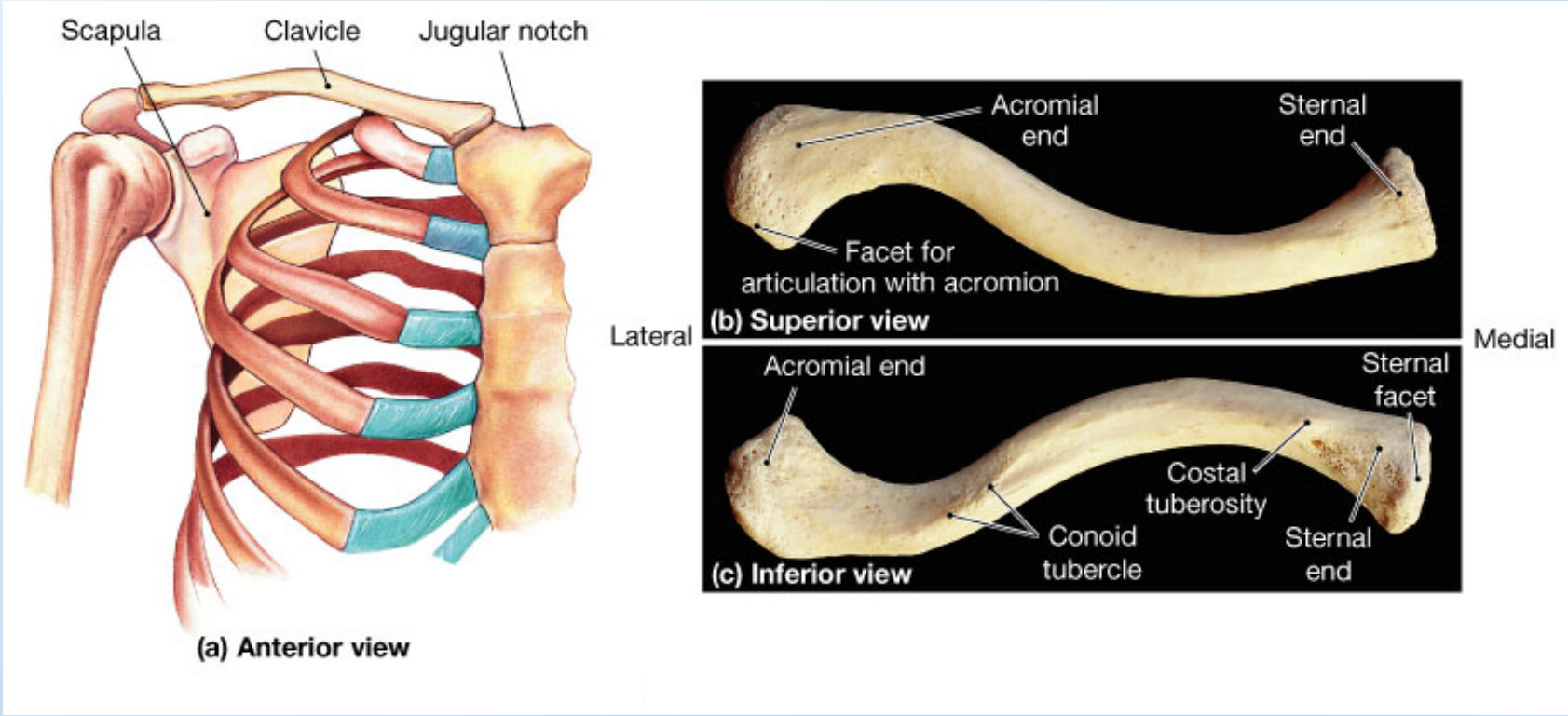
E

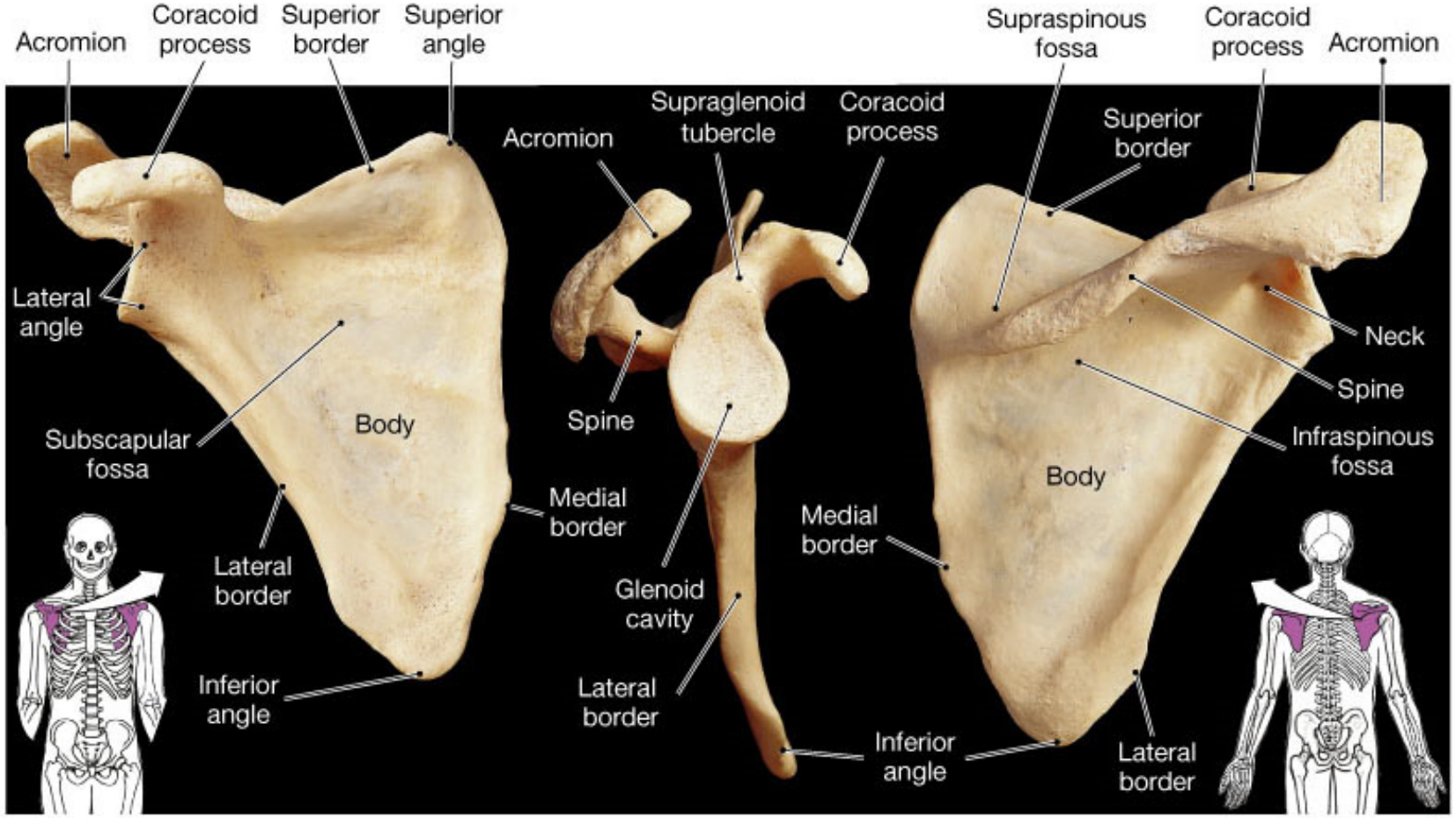


F

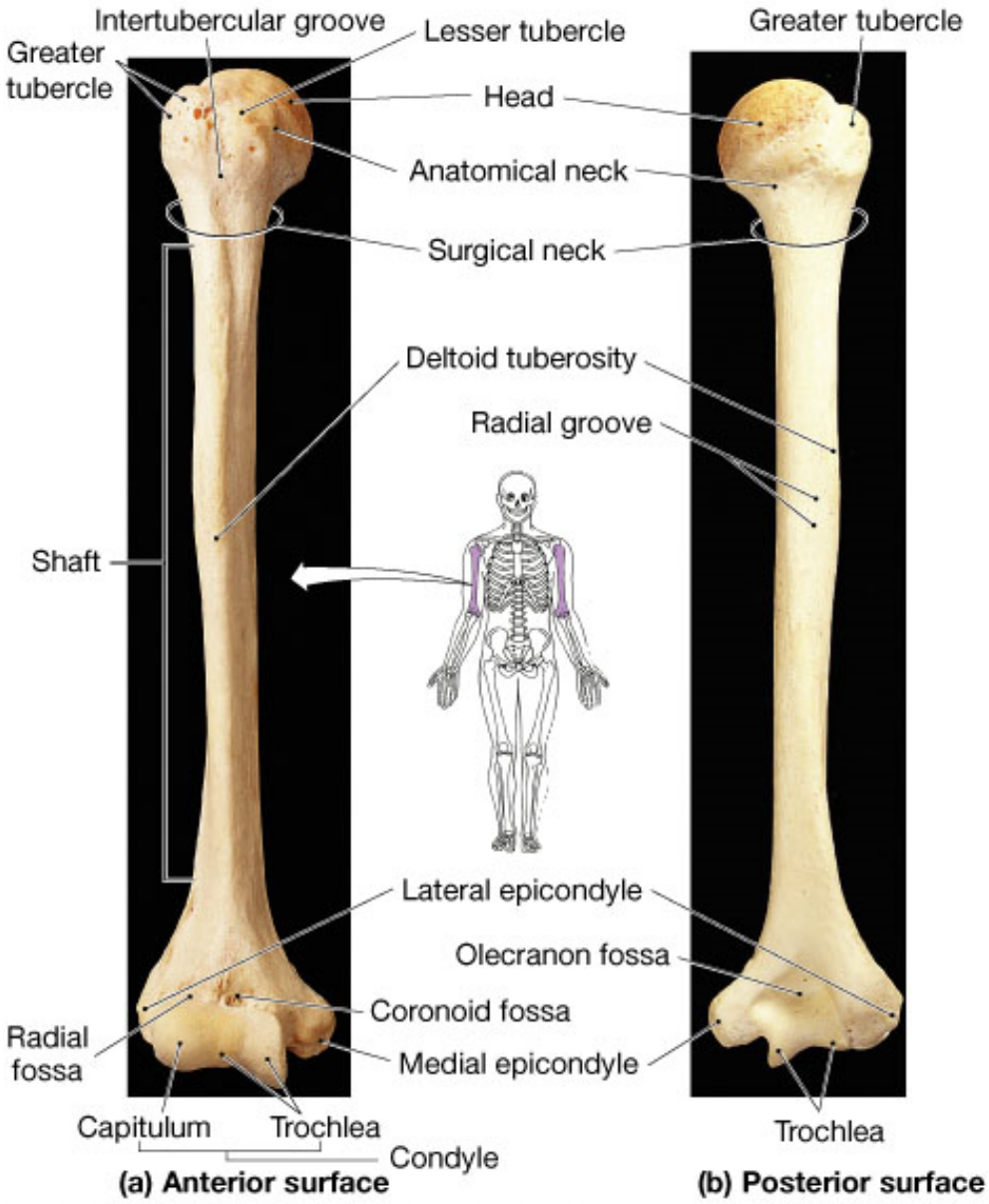
The Appendicular Skeleton

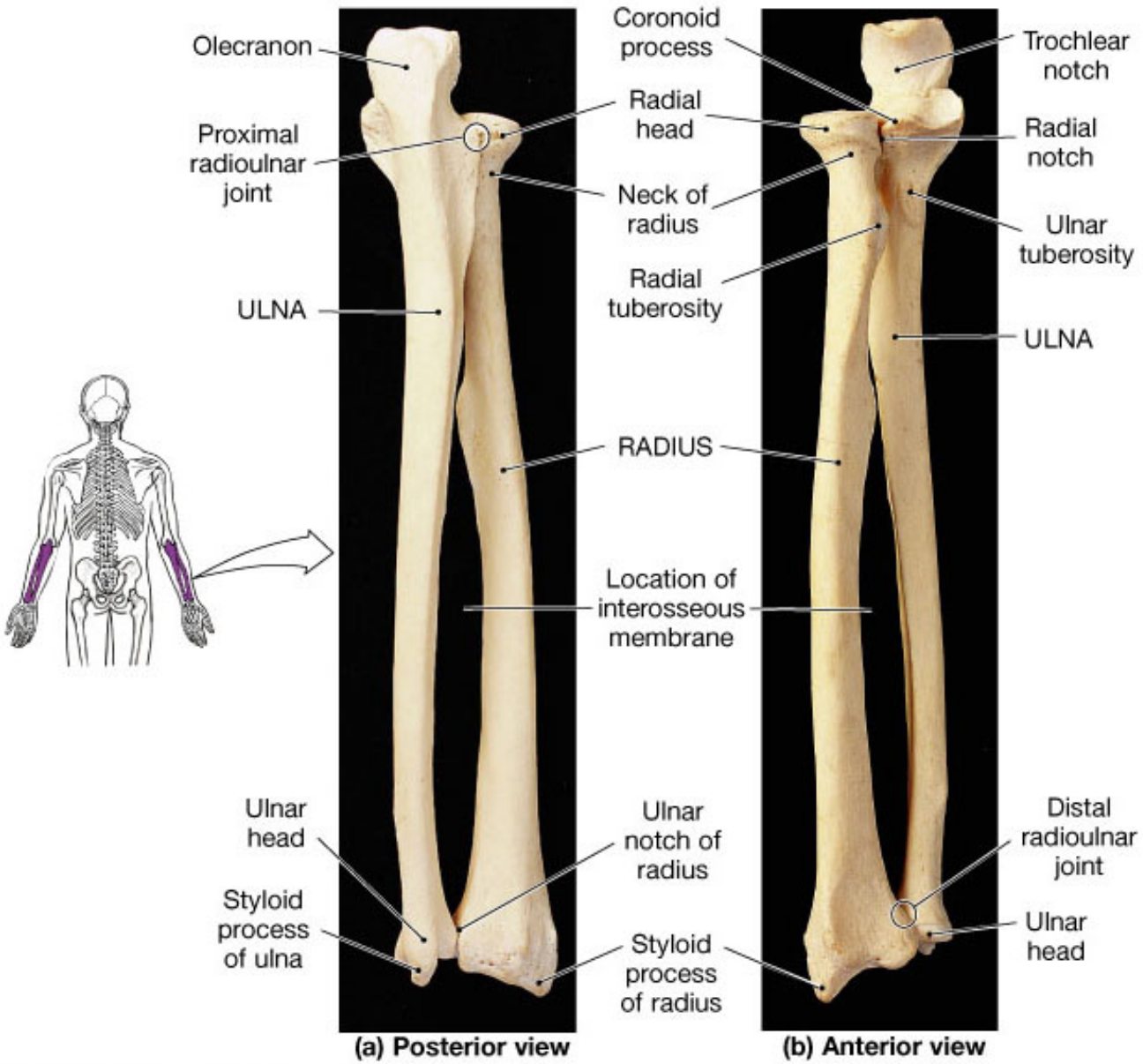
= The Pectoral and Pelvic Girdles

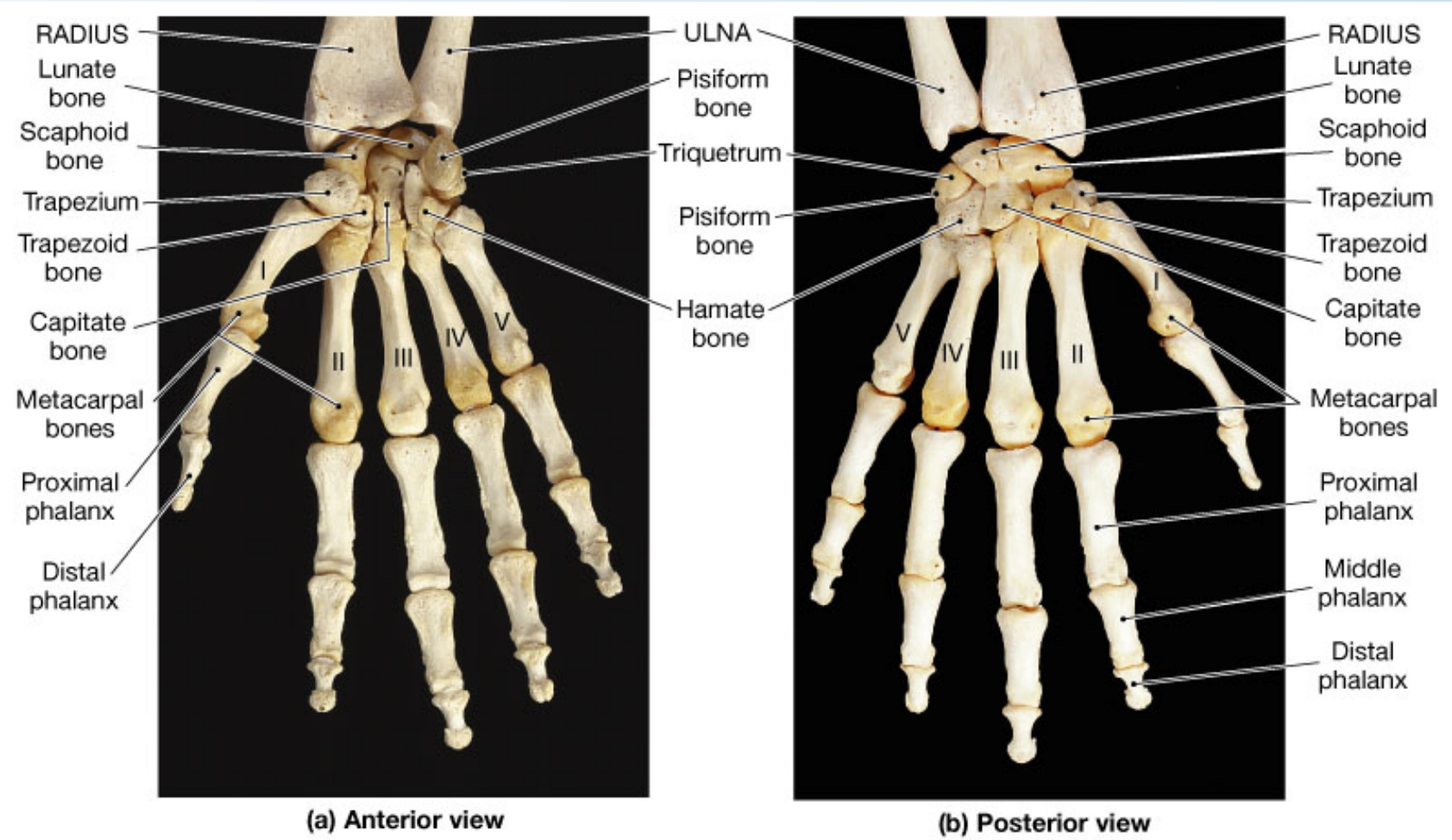




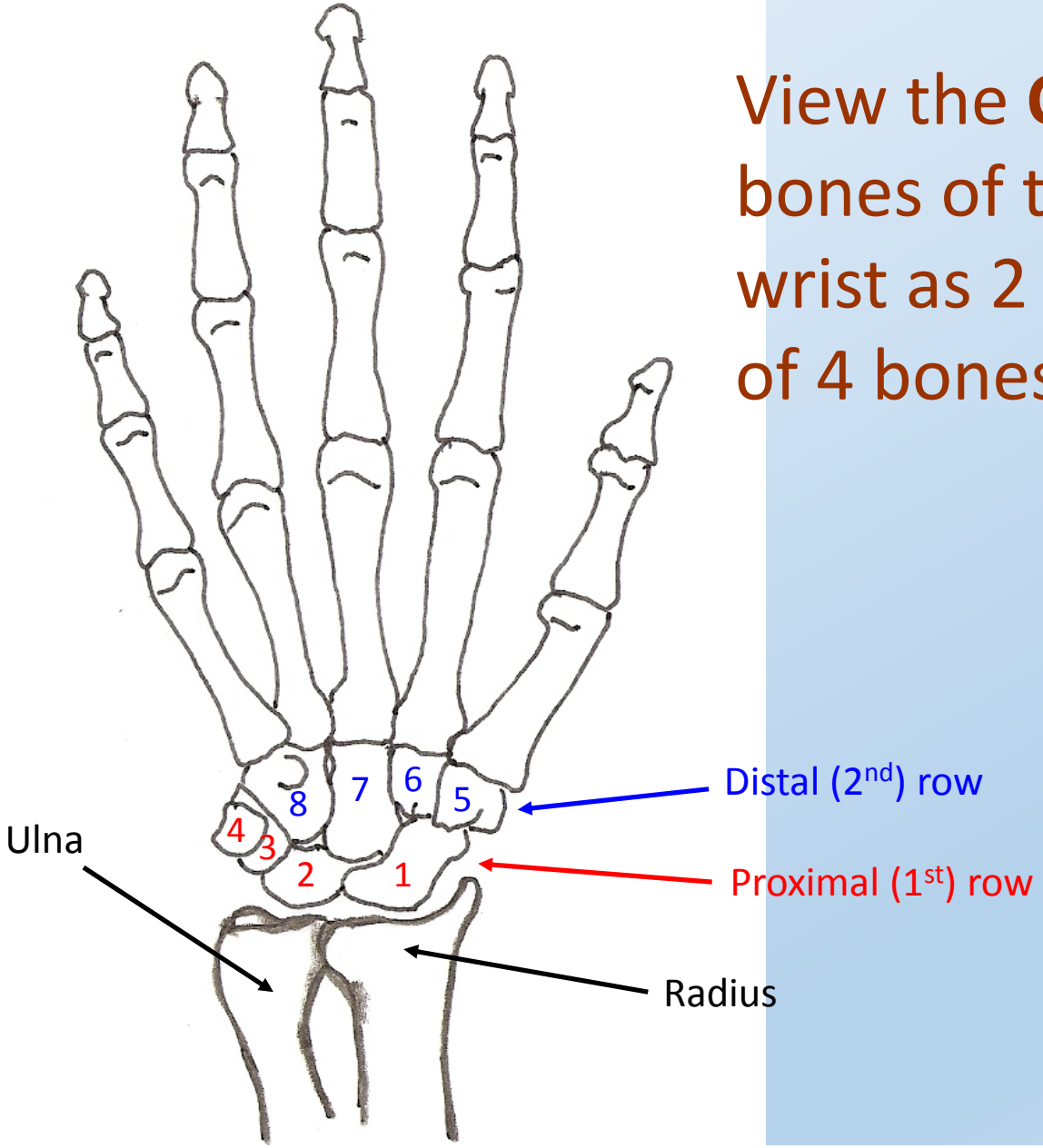
(a) Anterior view (b) Lateral view (c) Posterior view

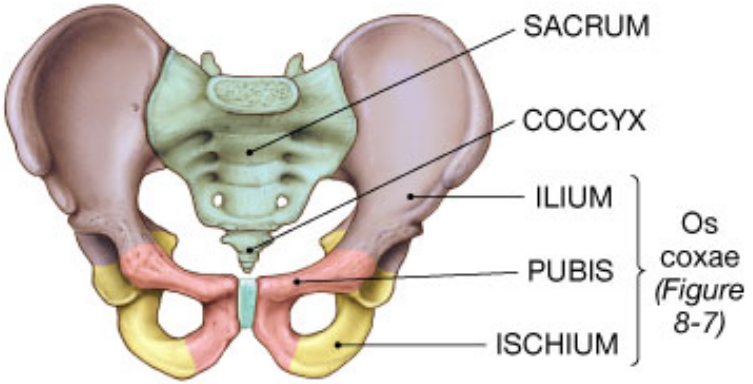


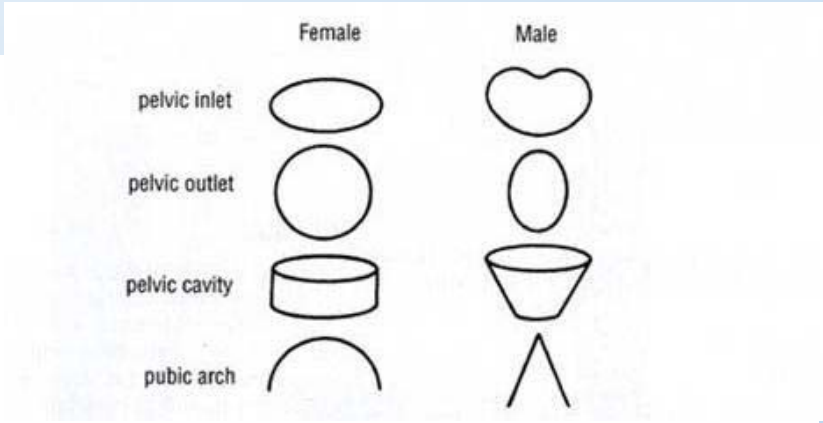


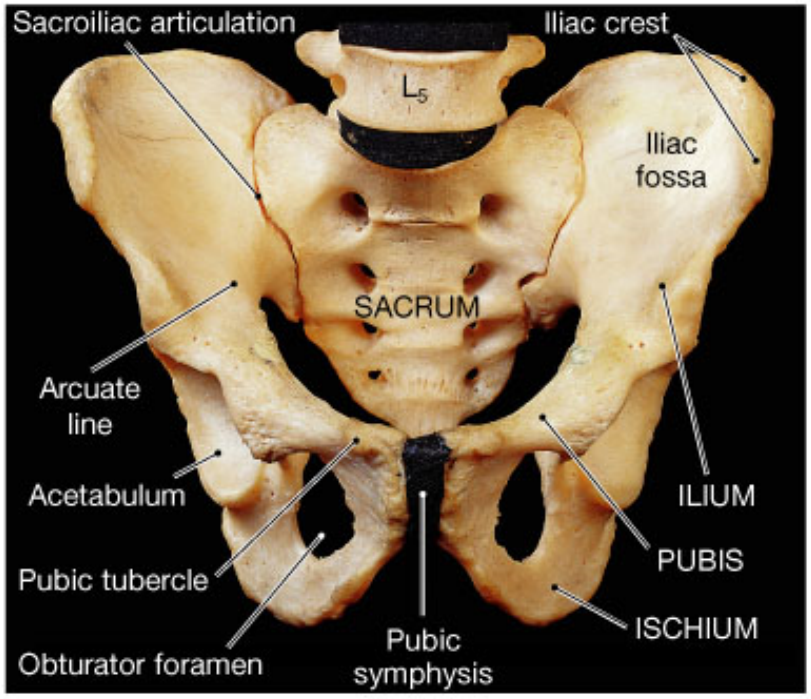


View the **Carpal** bones of the wrist as 2 rows of 4 bones

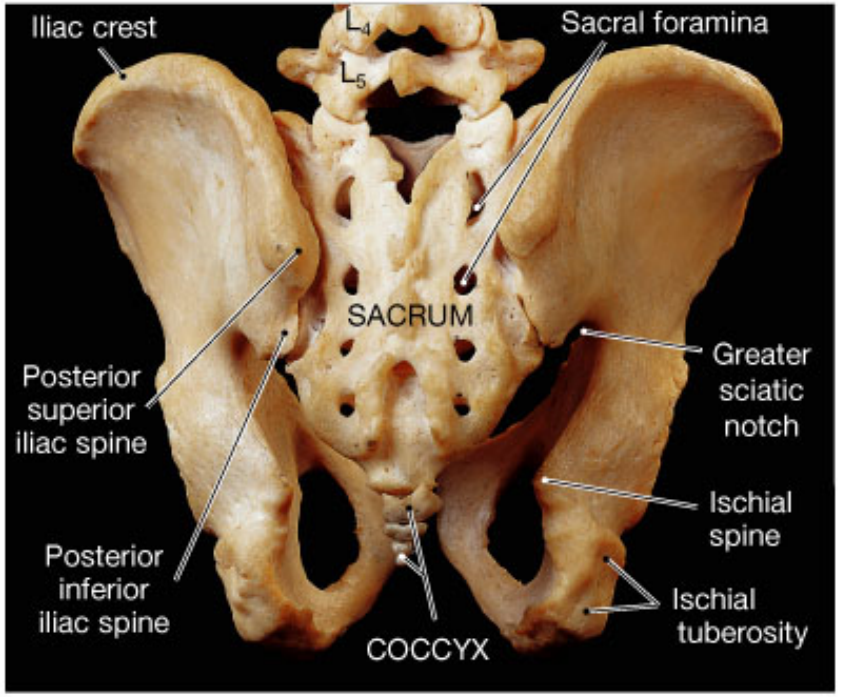




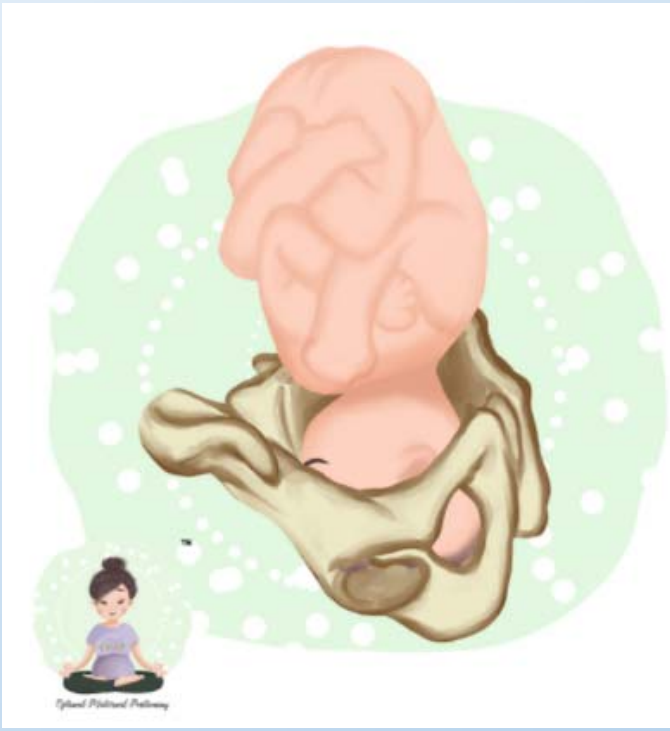




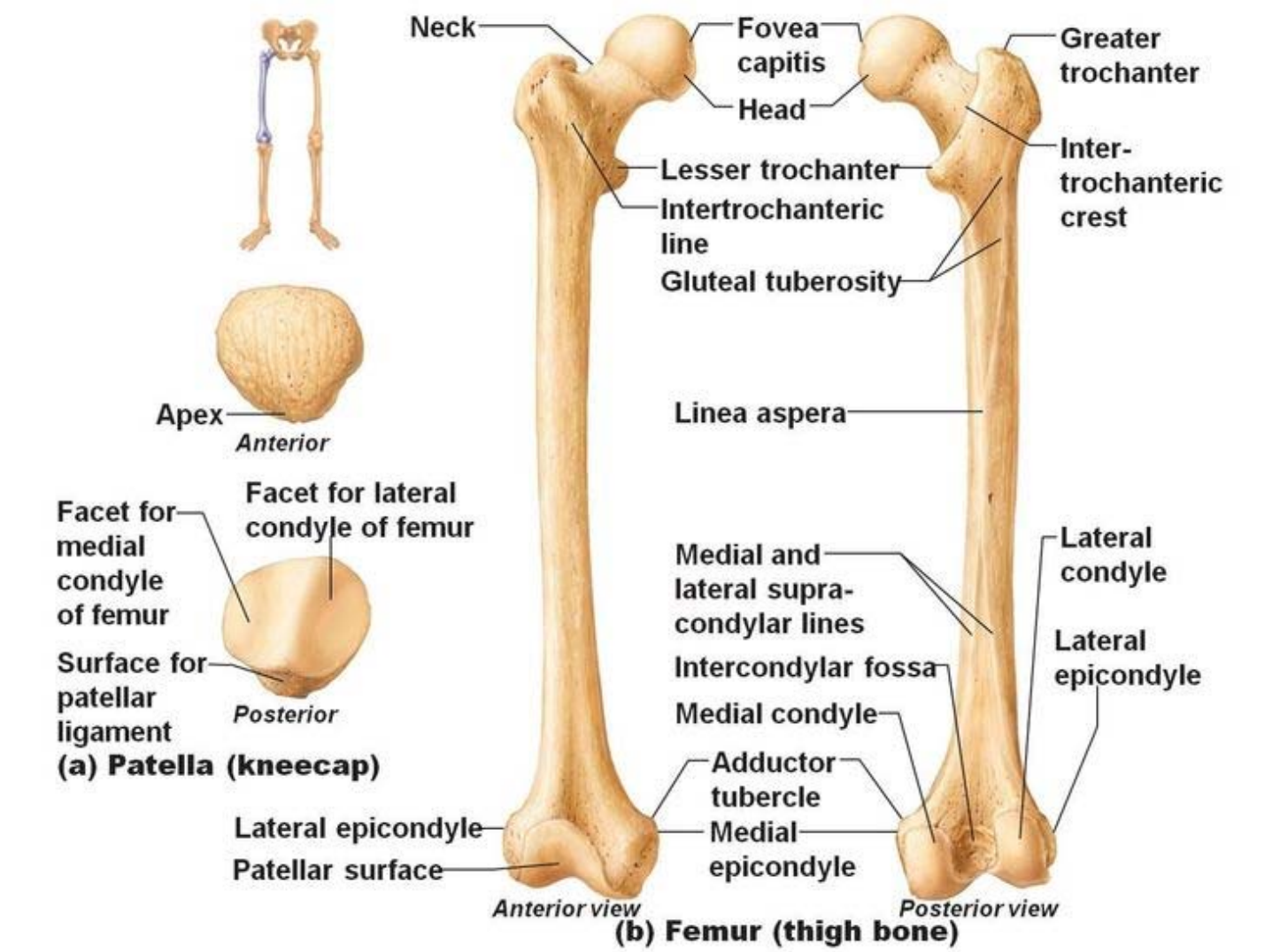
(a) Anterior view

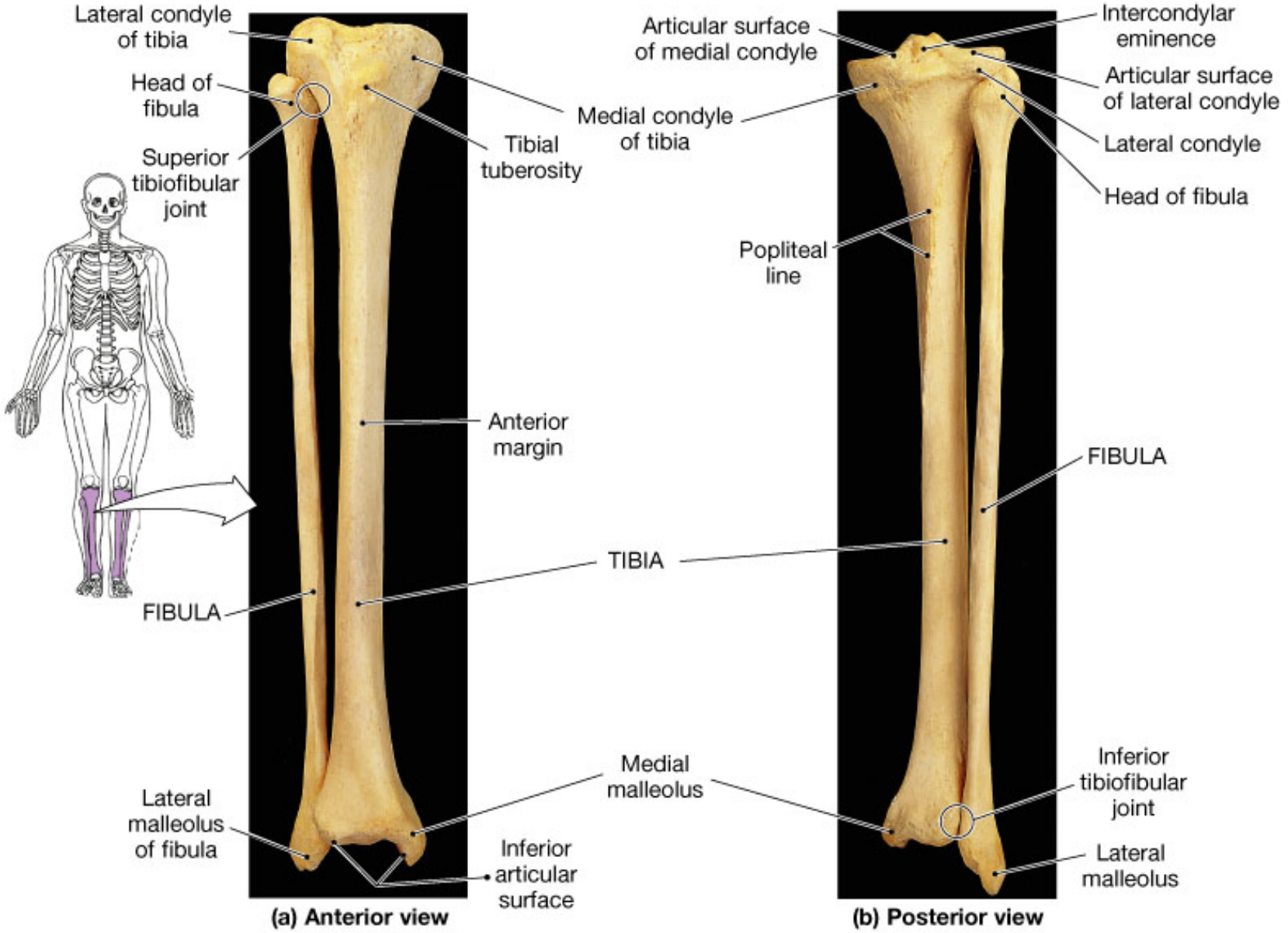


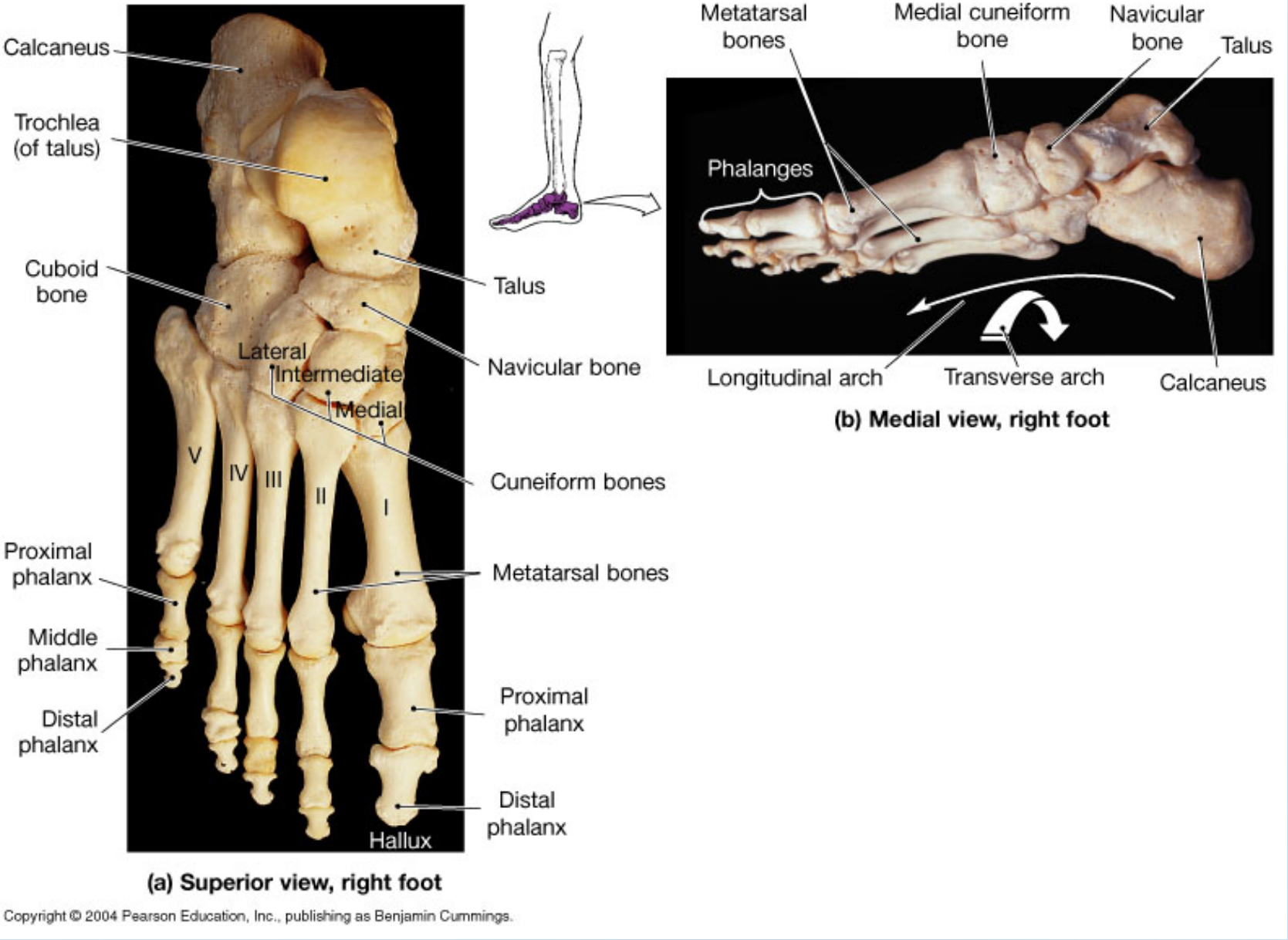
(b) Posterior view




-1
0
+1
+2
+3


Apex
Anterior
Facet for medial condyle of femur
Facet for lateral condyle of femur
Surface for patellar ligament
Posterior
(a) Patella (kneecap)
Neck
Fovea capitis
Head
Greater trochanter
Lesser trochanter
Intertrochanteric line
Gluteal tuberosity
Inter-trochanteric crest
Linea aspera
Medial and lateral supra-condylar lines
Lateral condyle
Lateral epicondyle
Intercondylar fossa
Medial condyle
Adductor tubercle
Lateral epicondyle
Medial epicondyle
Patellar surface
Anterior view
Posterior view
(b) Femur (thigh bone)





Bone Fractures

Simple (Closed): Skin remains intact.

Compound (Open): Skin is broken exposing the bone and deep tissues to the exterior.

Compound Fractures have:

- Risk of infection.
- Greater risk of blood loss if fracture lacerates blood vessels.

A **Pott's fracture** occurs at the ankle and affects both bones of the leg.

Comminuted fractures, such as this fracture of the femur, shatter the affected area into a multitude of bony fragments.

Transverse fractures, such as this fracture of the ulna, break a shaft bone across its long axis.

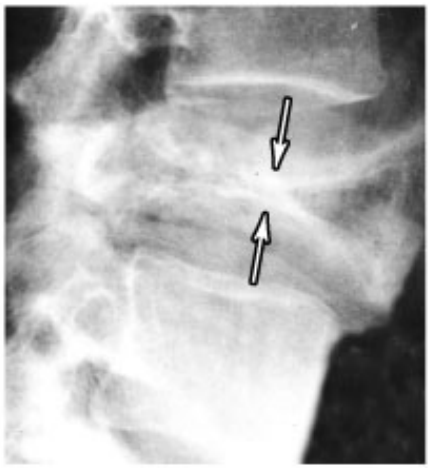
Spiral fractures, such as this fracture of the tibia, are produced by twisting stresses that spread along the length of the bone.

Displaced fractures produce new and abnormal bone arrangements; **nondisplaced fractures** retain the normal alignment of the bones or fragments.

A **Colles' fracture**, a break in the distal portion of the radius, is typically the result of reaching out to cushion a fall.

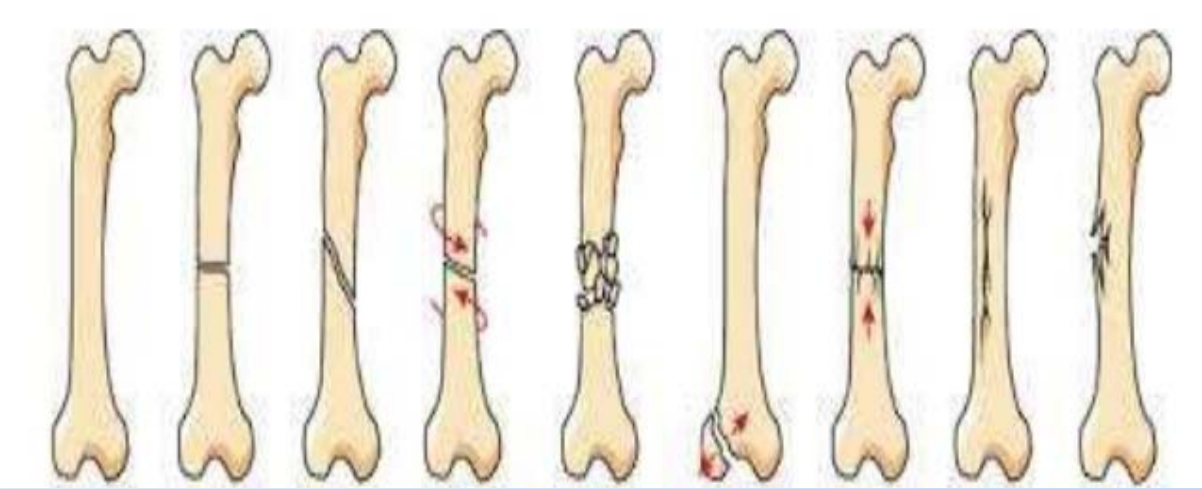
In a **greenstick fracture**, such as this fracture of the radius, only one side of the shaft is broken, and the other is bent. This type of fracture generally occurs in children, whose long bones have yet to ossify fully.

Epiphyseal fractures, such as this fracture of the femur, tend to occur where the bone matrix is undergoing calcification and chondrocytes are dying. A clean transverse fracture along this line generally heals well. Unless carefully treated, fractures between the epiphysis and the epiphyseal cartilage can permanently stop growth at this site.

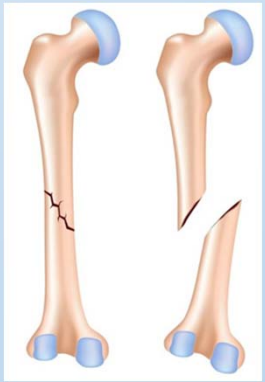


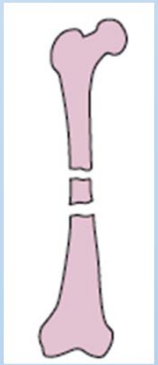
Compression fractures occur in vertebrae subjected to extreme stresses, such as those produced by the forces that arise when you land on your seat in a fall.

Review Typical Bone Fractures



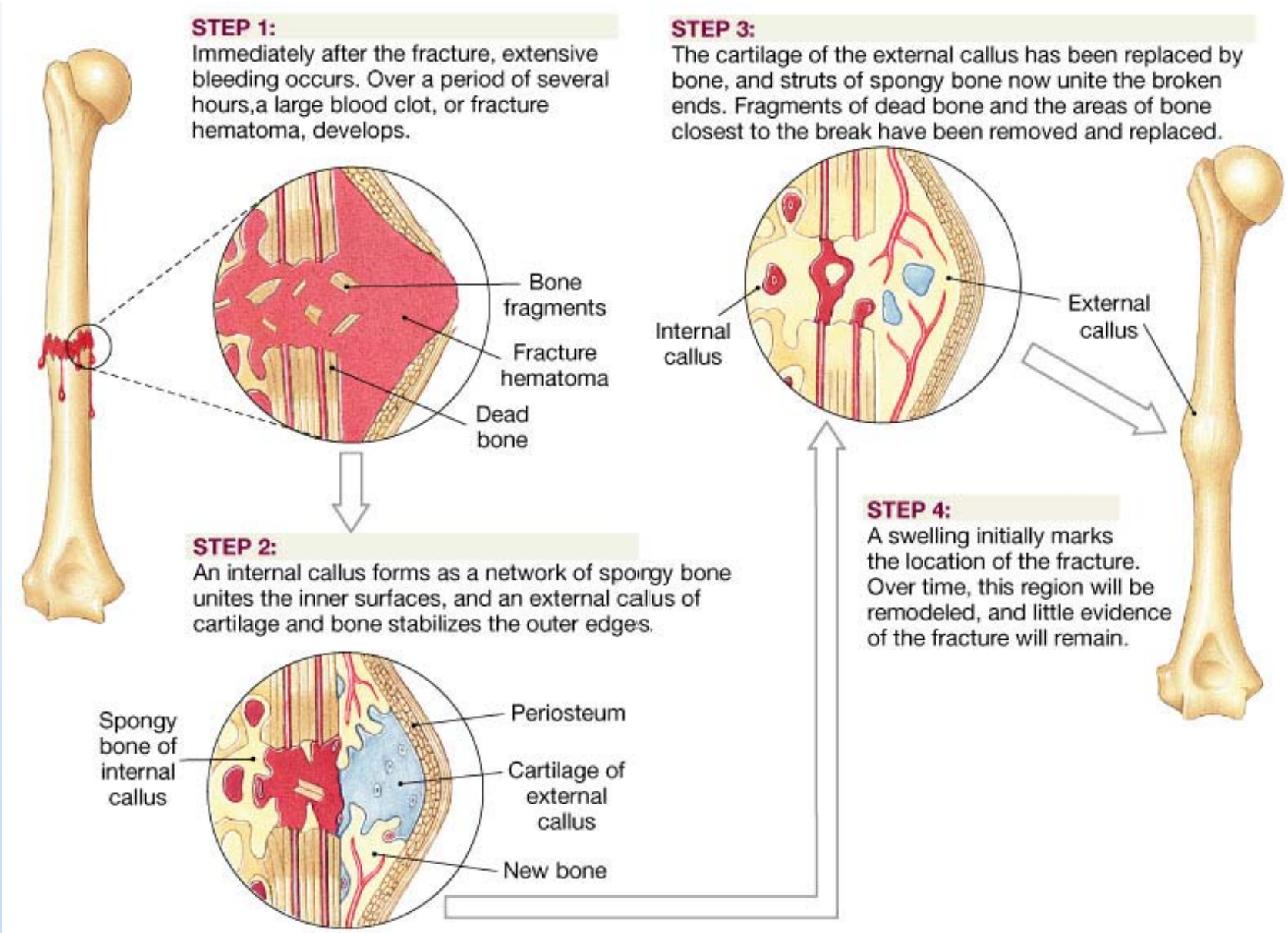
Normal Transverse Oblique Spiral Comminuted Avulsion Impacted Fissure Greenstick



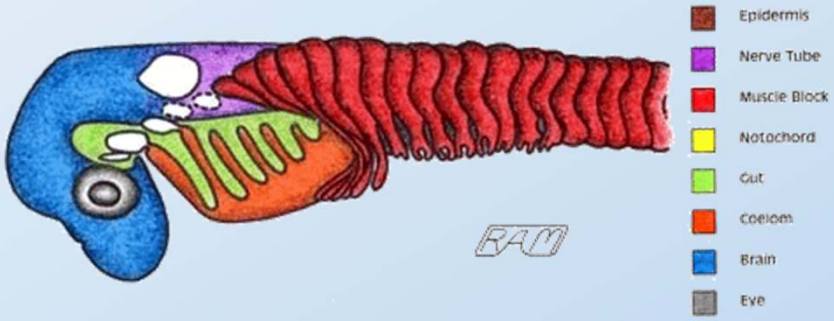


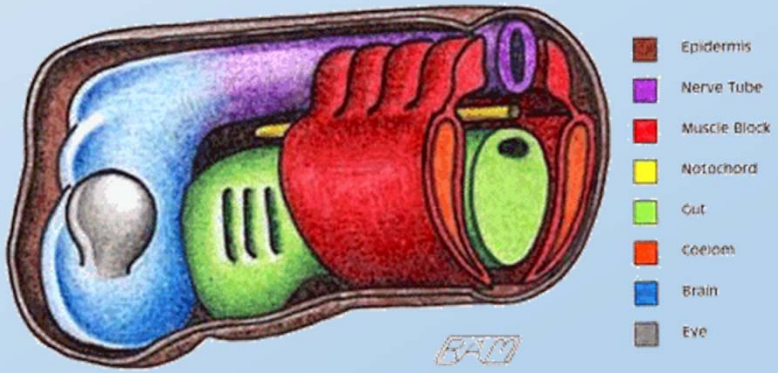
Comminuted	Compression
Transverse	Impacted
Greenstick	Longitudinal
Hairline	Stress
Avulsion	Torus (Buckle)
Oblique	Colle's
Spiral	Pott's
Segmental	Fissure

Bone Repair

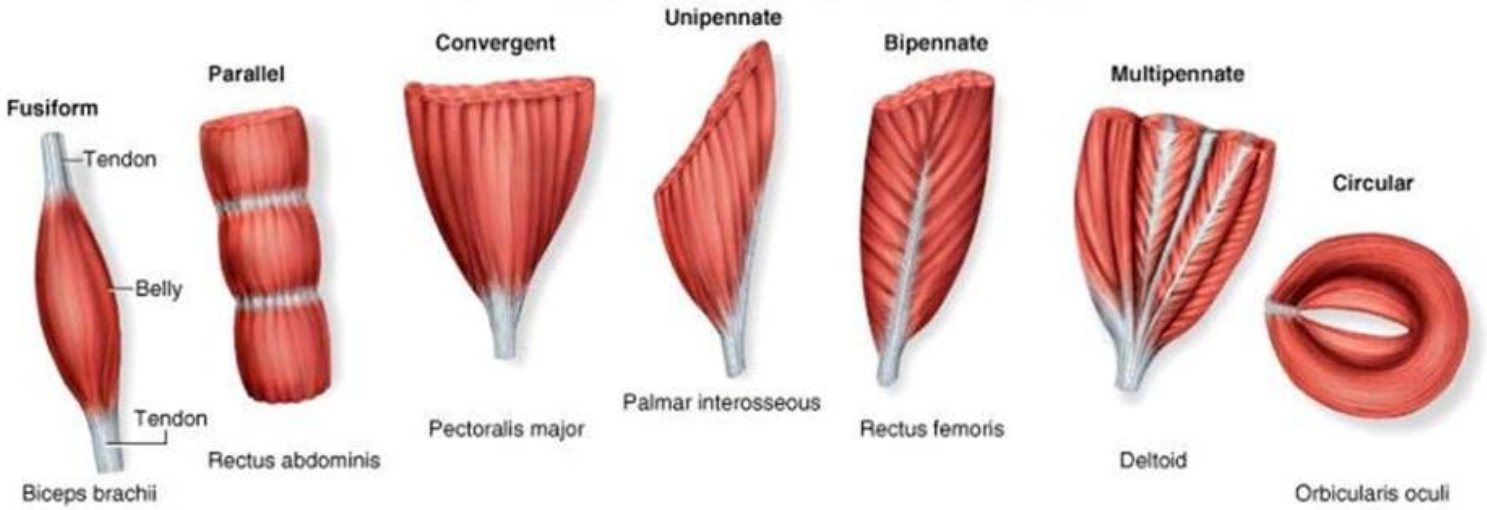

STEP 1:
Immediately after the fracture, extensive bleeding occurs. Over a period of several hours,a large blood clot, or fracture hematoma, develops.
Bone fragments
Fracture hematoma
Dead bone
STEP 2:
An internal callus forms as a network of spongy bone unites the inner surfaces, and an external callus of cartilage and bone stabilizes the outer edges.
Spongy bone of internal callus
Periosteum
Cartilage of external callus
New bone
STEP 3:
The cartilage of the external callus has been replaced by bone, and struts of spongy bone now unite the broken ends. Fragments of dead bone and the areas of bone closest to the break have been removed and replaced.
Internal callus
External callus
STEP 4:
A swelling initially marks the location of the fracture. Over time, this region will be remodeled, and little evidence of the fracture will remain.

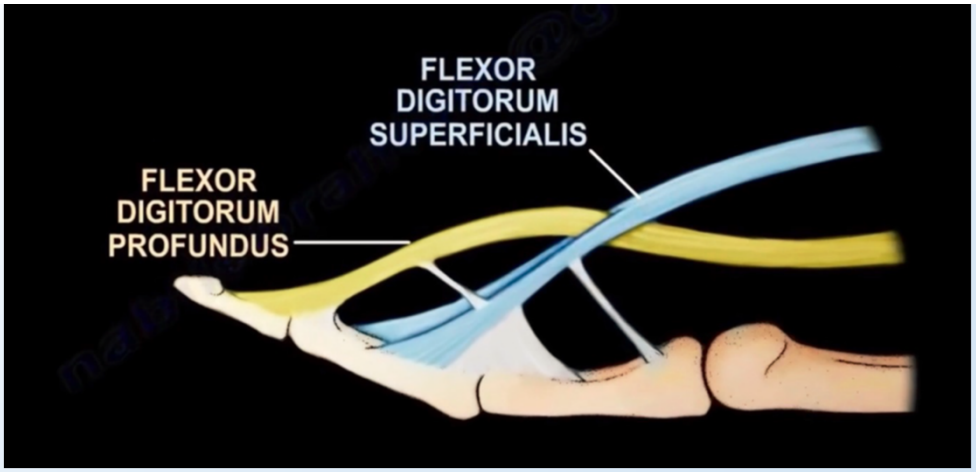
Shark Embryo diagram

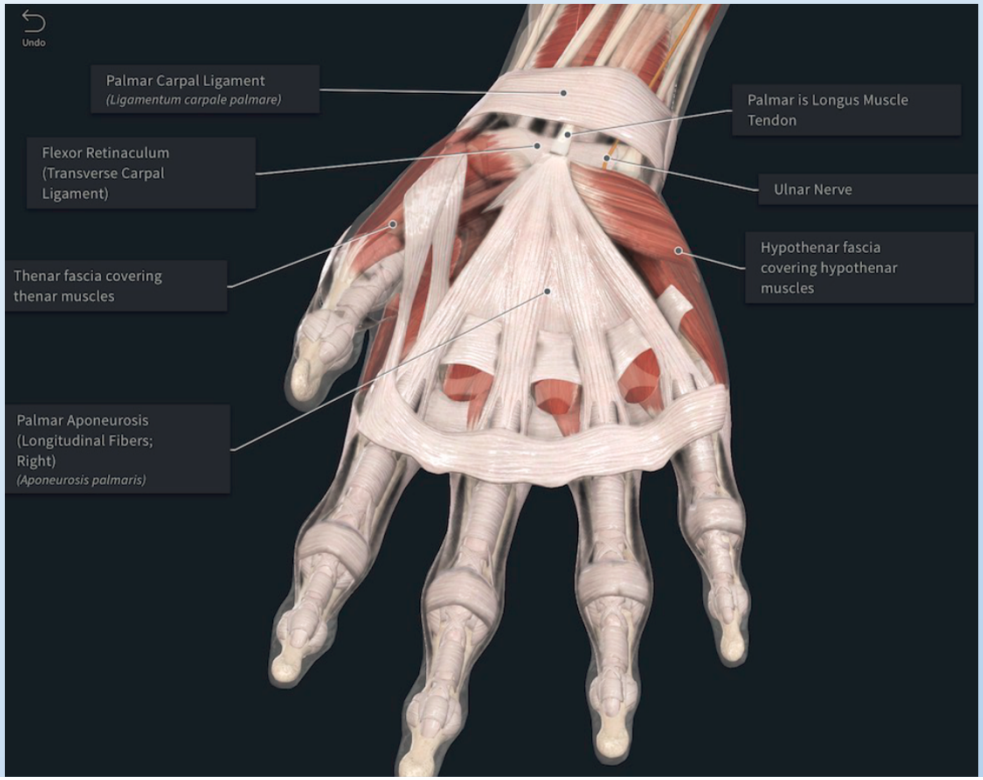


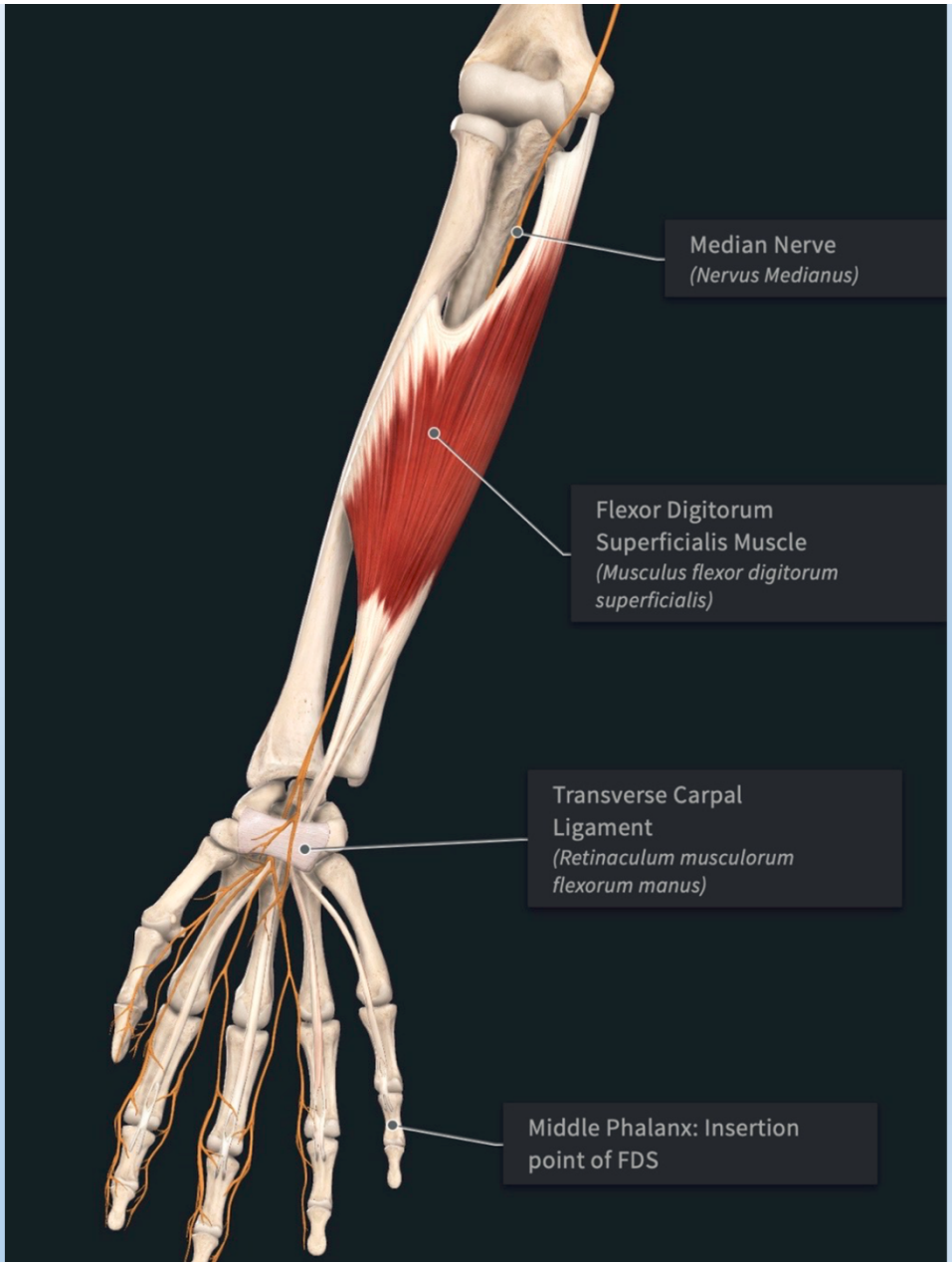


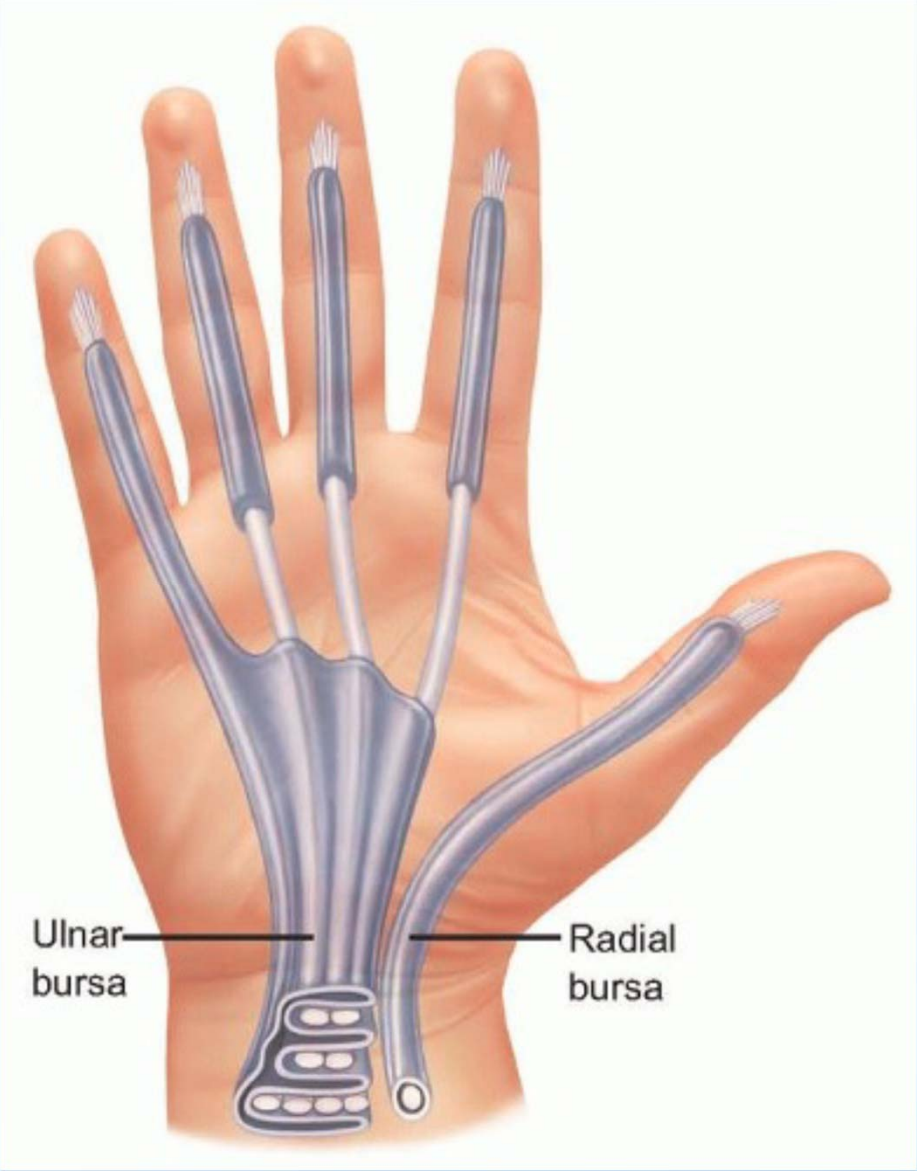
Classification of Skeletal Muscle by Fascicular Orientation



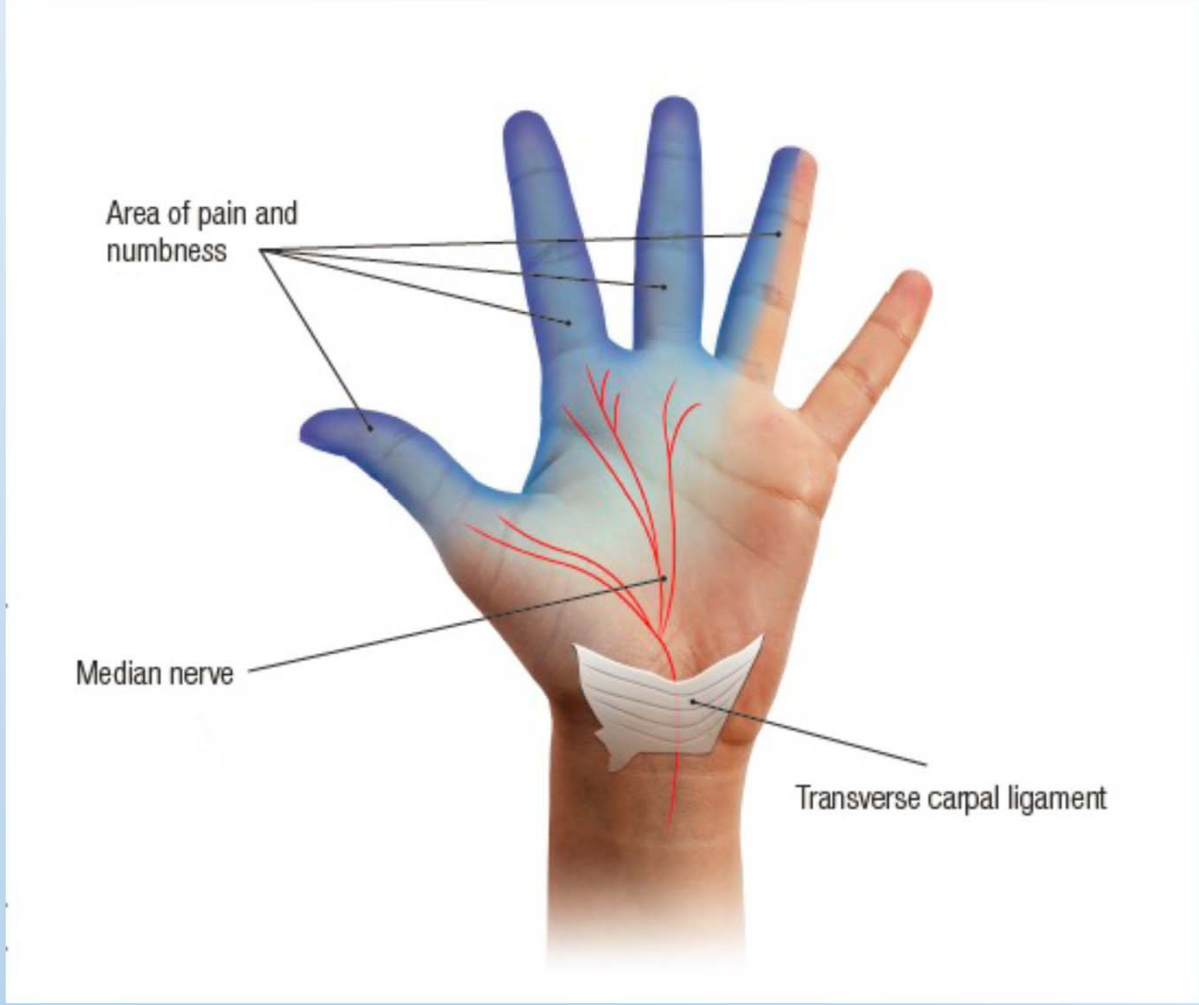

FLEXOR
DIGITORUM
SUPERFICIALIS
FLEXOR
DIGITORUM
PROFUNDUS


Undo
Palmar Carpal Ligament
(Ligamentum carpale palmare)
Palmar is Longus Muscle
Tendon
Flexor Retinaculum
(Transverse Carpal
Ligament)
Ulnar Nerve
Hypothenar fascia
covering hypothenar
muscles
Thenar fascia covering
thenar muscles
Palmar Aponeurosis
(Longitudinal Fibers;
Right)
(Aponeurosis palmaris)

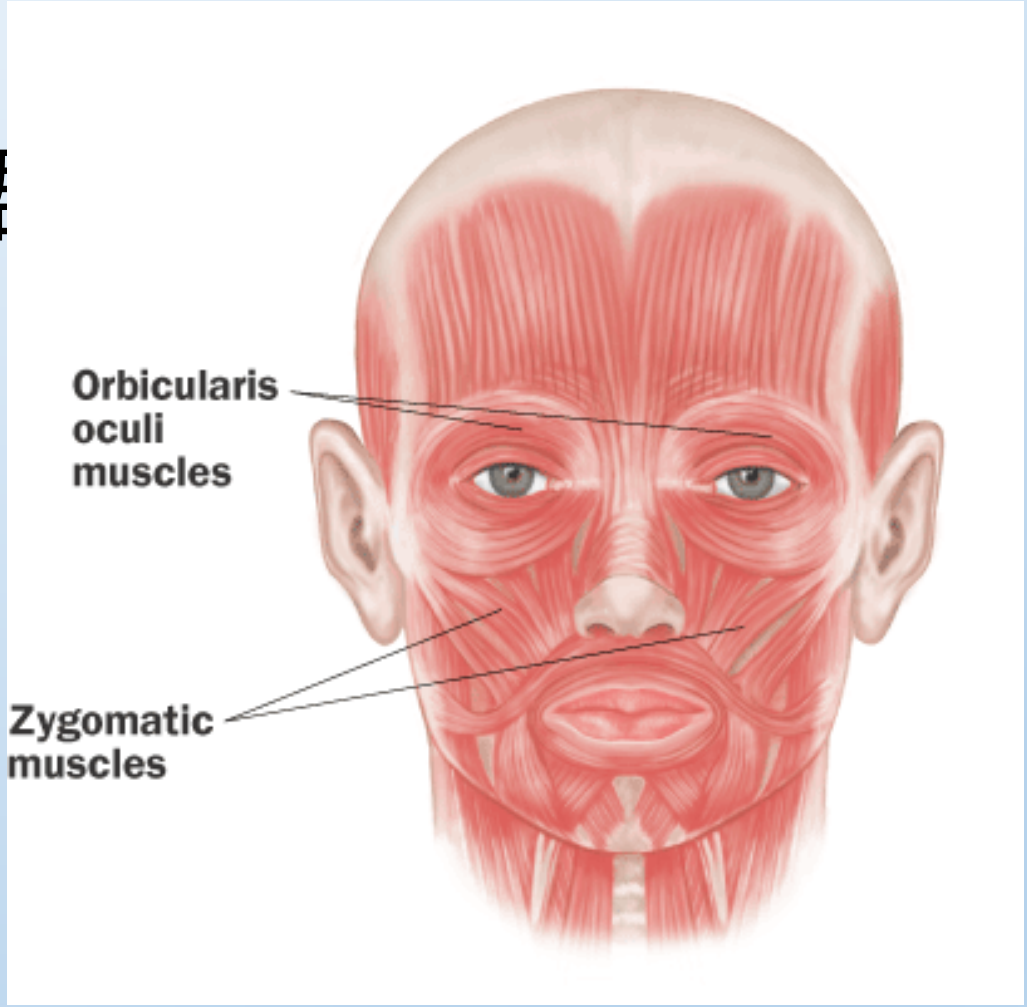

Median Nerve
(Nervus Medianus)
Flexor Digitorum
Superficialis Muscle
(Musculus flexor digitorum
superficialis)
Transverse Carpal
Ligament
(Retinaculum musculorum
flexorum manus)
Middle Phalanx: Insertion
point of FDS



Carpal Tunnel Syndrome

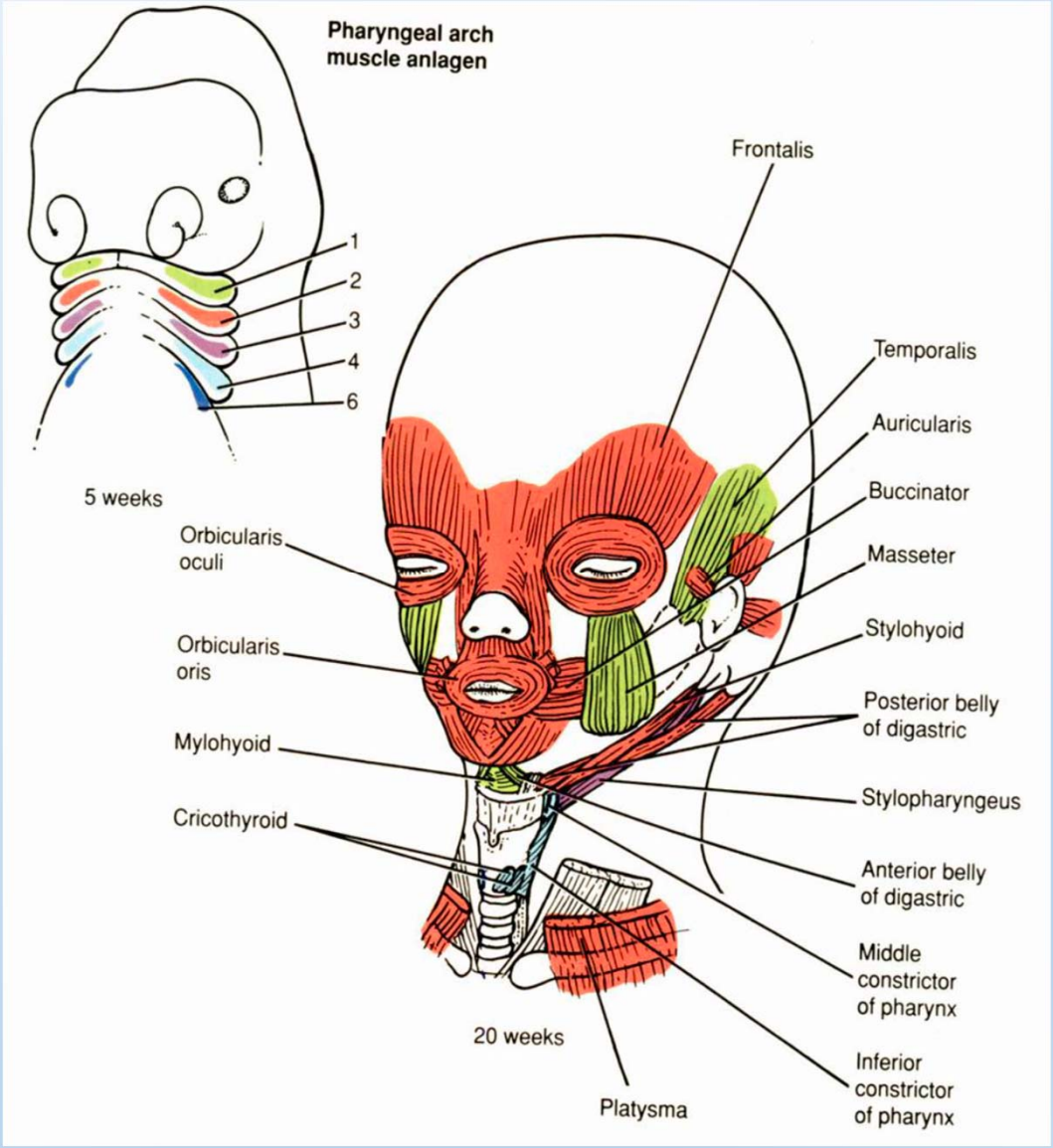


主要表情肌群



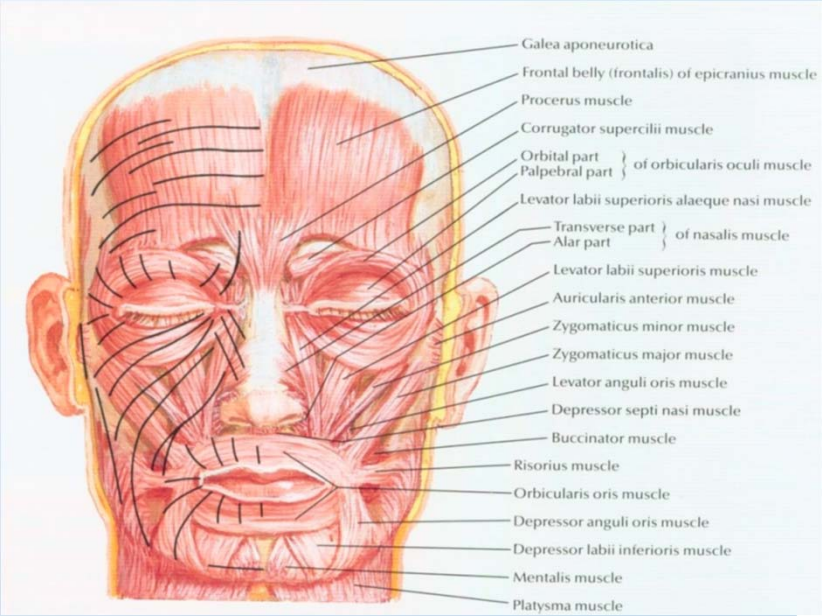
表情肌

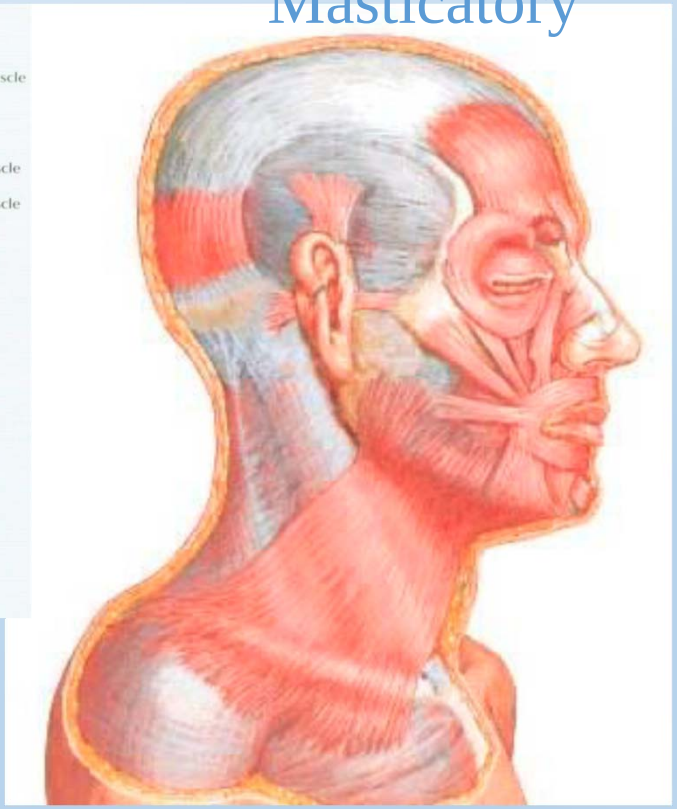
Muscle of facial expressions

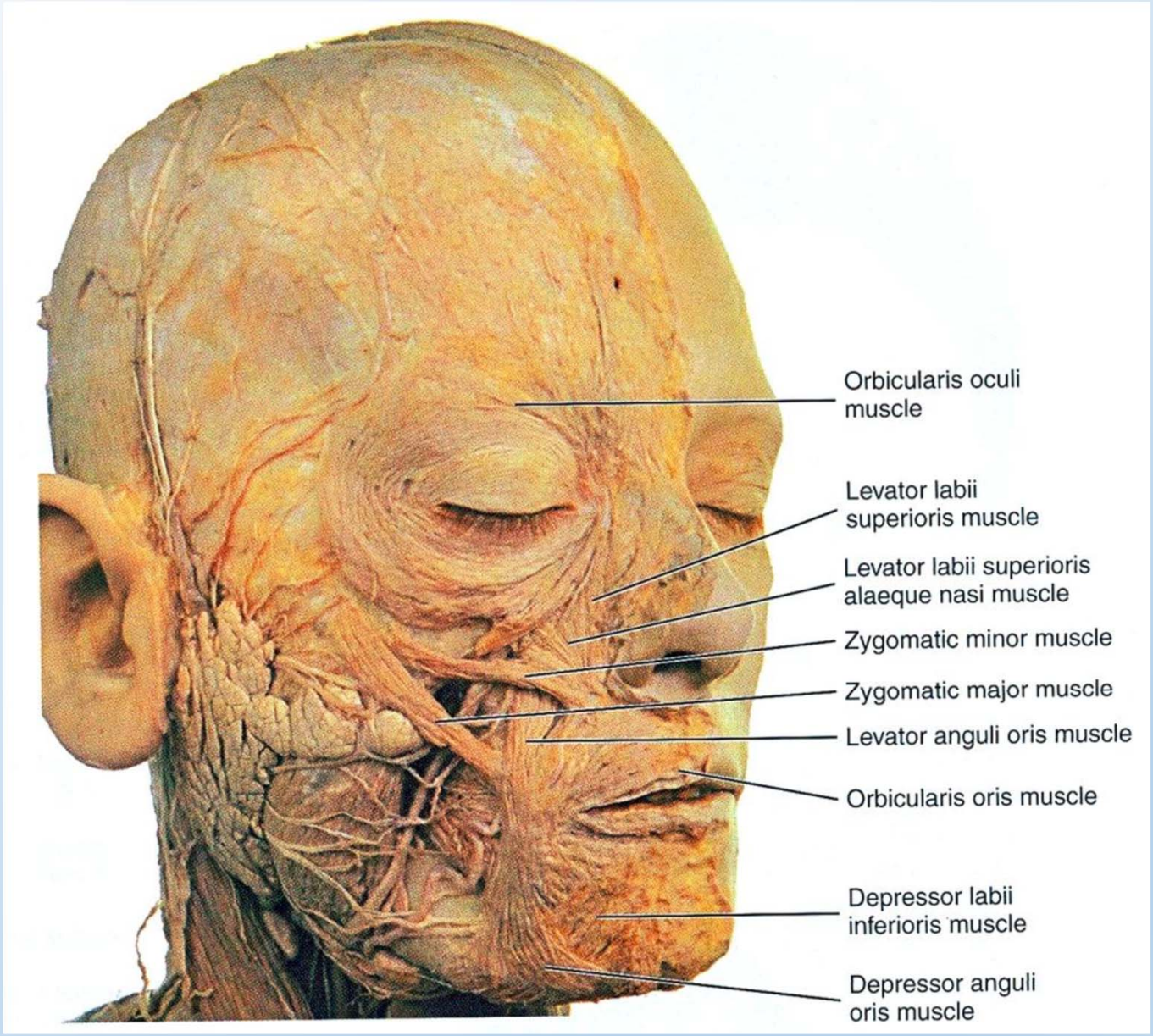


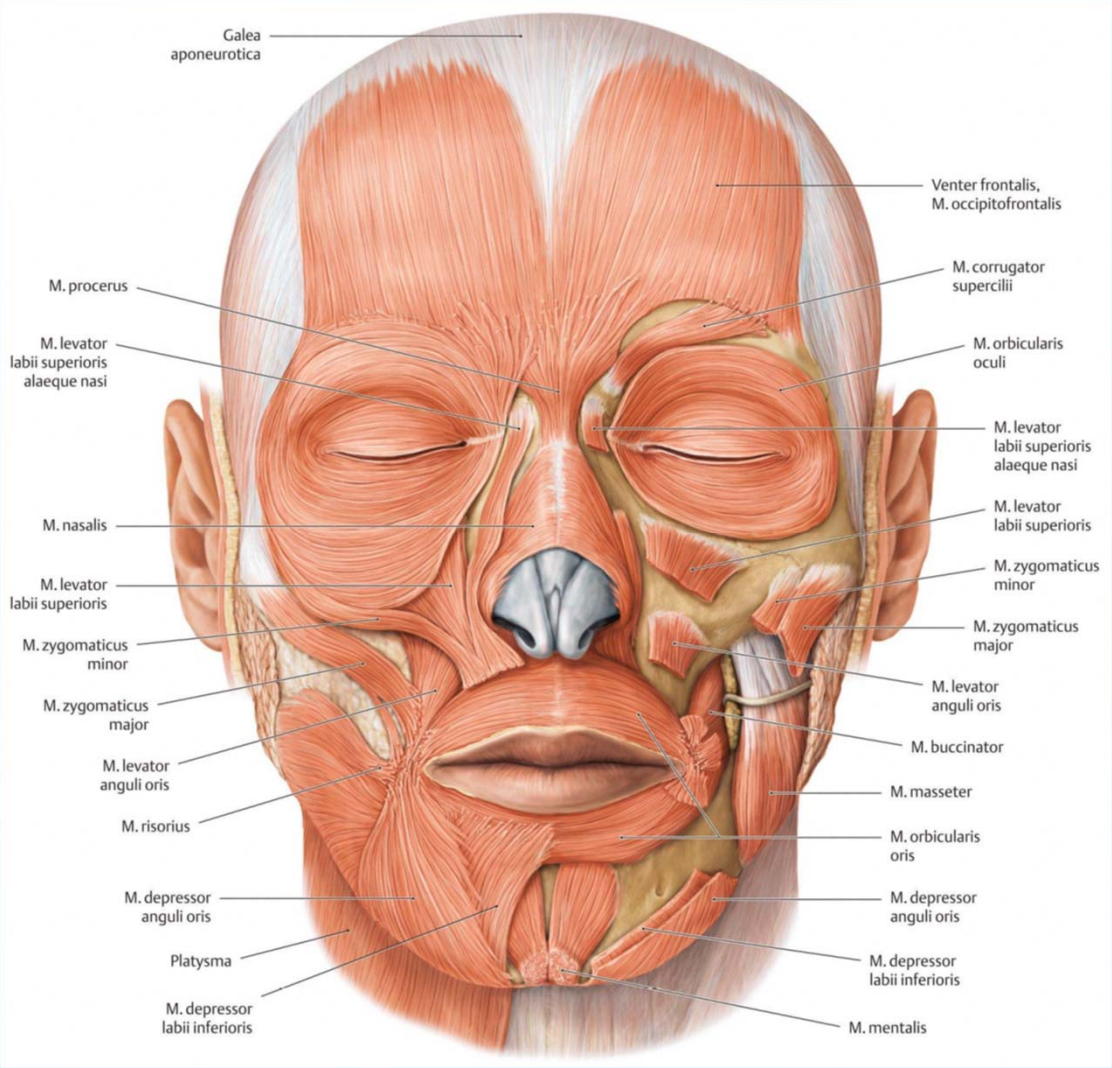
Langer´s cleavage lines

Mimic (faciales)
and
Masticatory





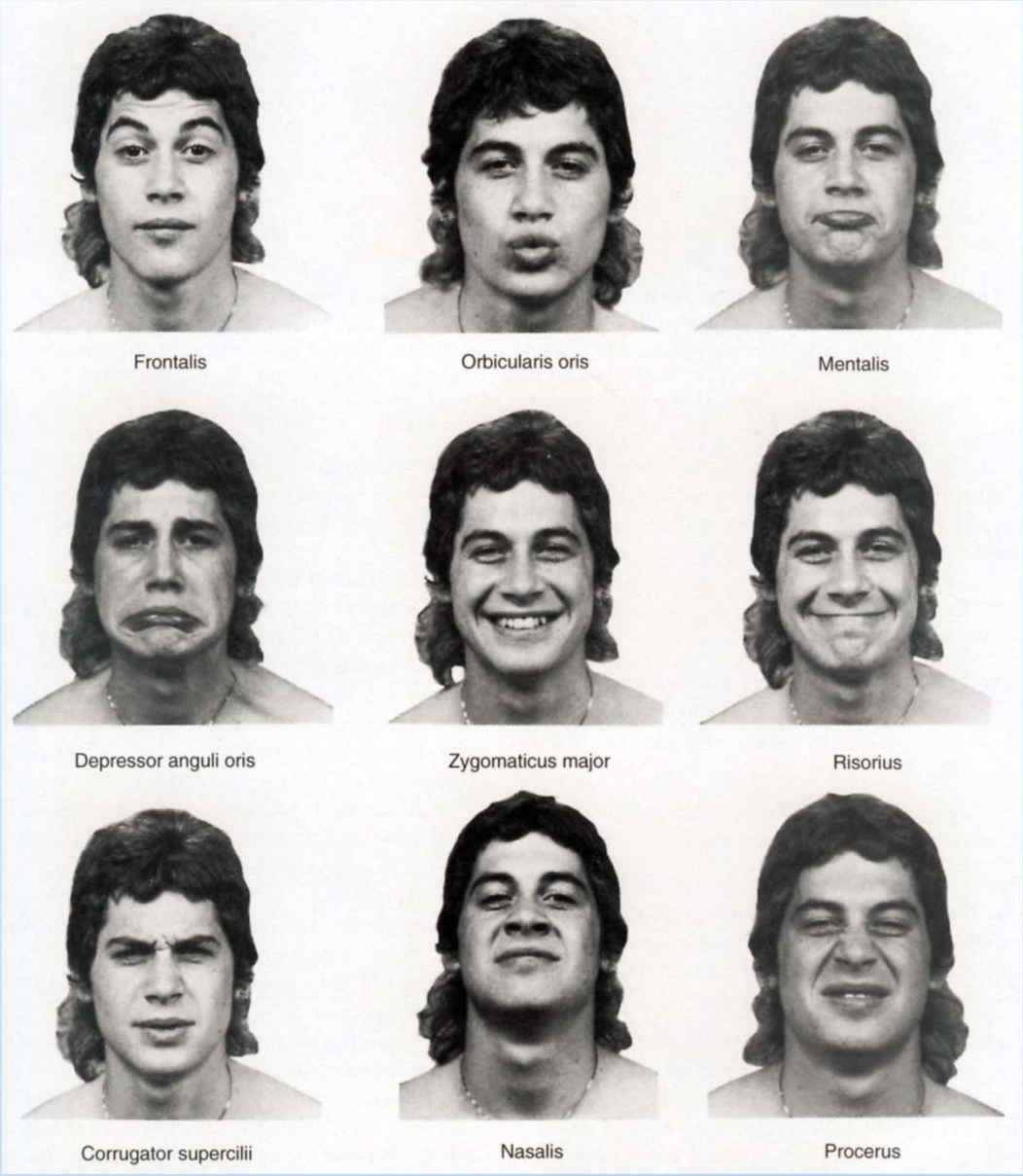

Orbicularis oculi muscle
Levator labii superioris muscle
Levator labii superioris alaeque nasi muscle
Zygomatic minor muscle
Zygomatic major muscle
Levator anguli oris muscle
Orbicularis oris muscle
Depressor labii inferioris muscle
Depressor anguli oris muscle


Galea aponeurotica
Venter frontalis, M. occipitofrontalis
M. corrugator supercilii
M. procerus
M. orbicularis oculi
M. levator labii superioris alaeque nasi
M. levator labii superioris alaeque nasi
M. nasalis
M. levator labii superioris
M. zygomaticus minor
M. levator labii superioris
M. zygomaticus minor
M. zygomaticus major
M. levator anguli oris
M. zygomaticus major
M. buccinator
M. levator anguli oris
M. masseter
M. risorius
M. orbicularis oris
M. depressor anguli oris
M. depressor anguli oris
Platysma
M. depressor labii inferioris
M. depressor labii inferioris
M. mentalis

主要运动方式

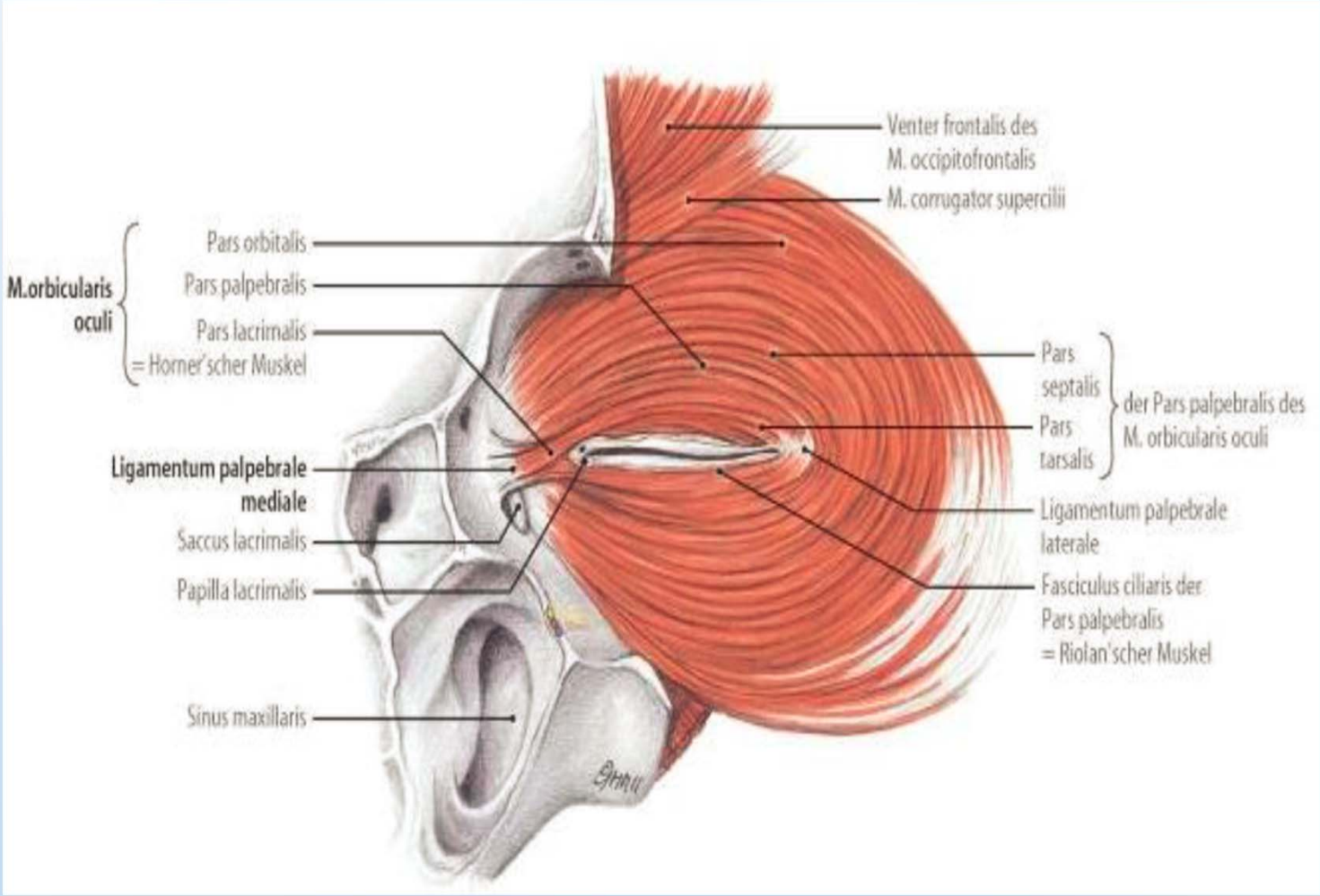
神经控制

facial paralysis

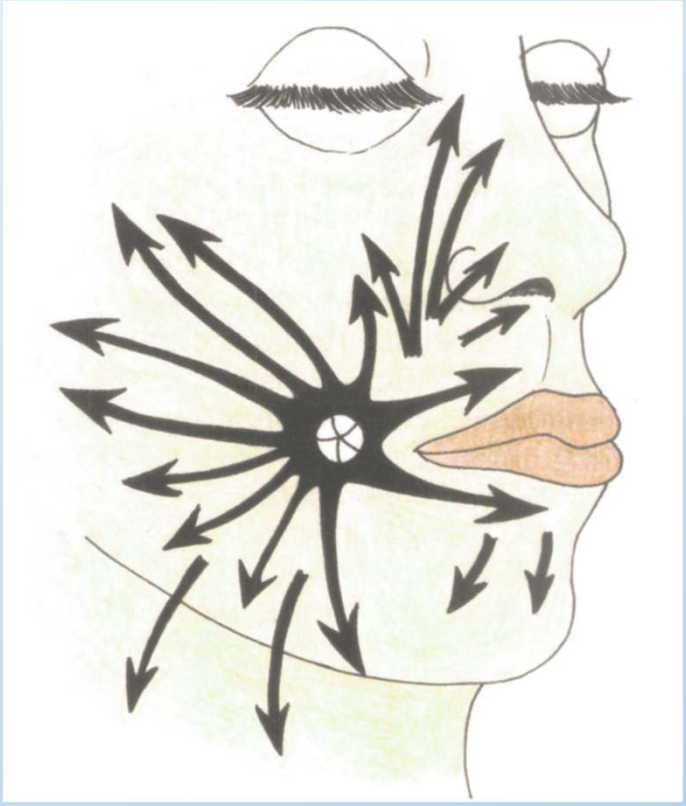

Frontalis
Orbicularis oris
Mentalis
Depressor anguli oris
Zygomaticus major
Risorius
Corrugator supercilii
Nasalis
Procerus

不同肌肉

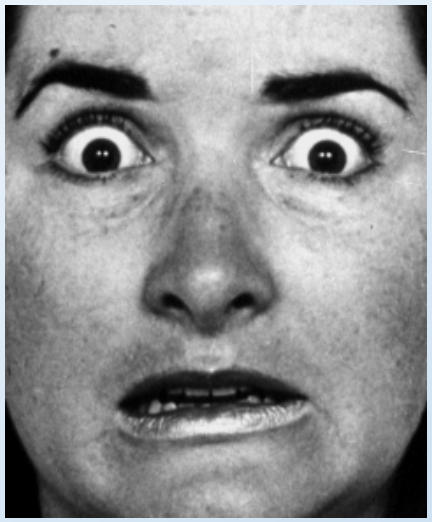
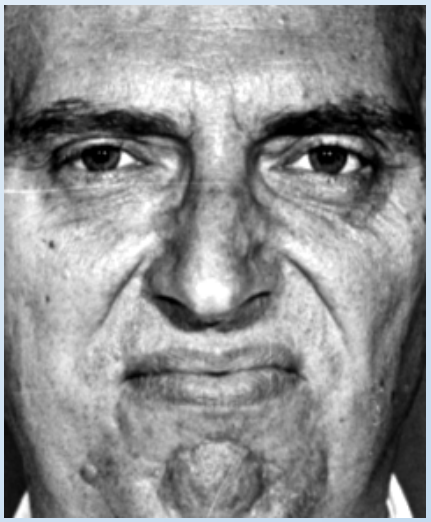
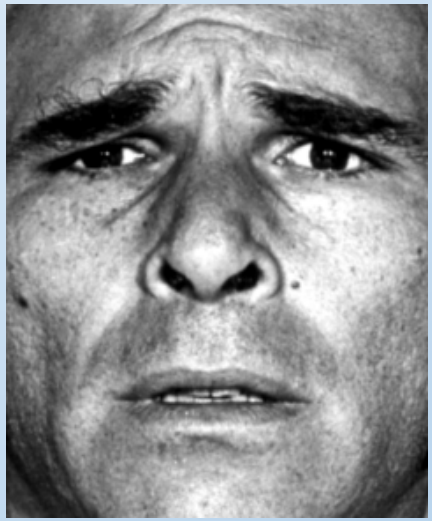
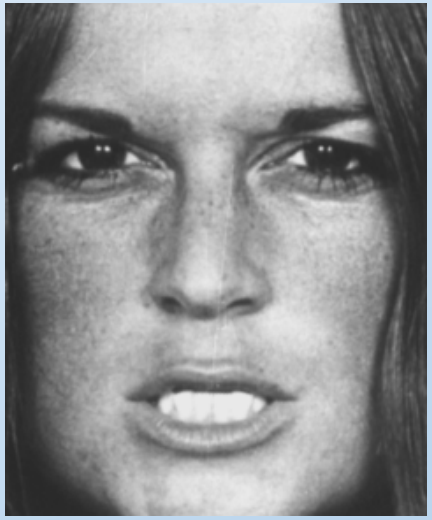
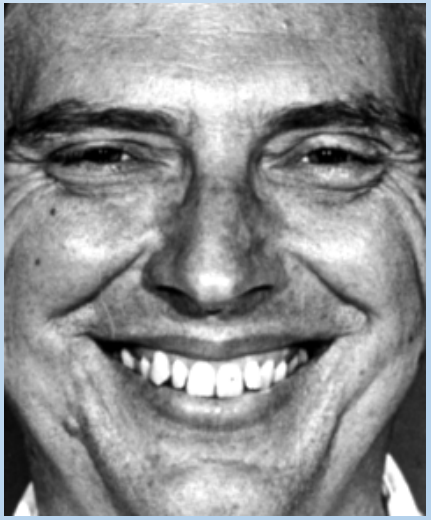
特征


Venter frontalis des
M. occipitofrontalis
M. corrugator supercilii
M.orbicularis oculi
Pars orbitalis
Pars palpebralis
Pars lacrimalis
= Horner'scher Muskel
Pars septalis
Pars tarsalis
der Pars palpebralis des M. orbicularis oculi
Ligamentum palpebrale mediale
Saccus lacrimalis
Papilla lacrimalis
Ligamentum palpebrale laterale
Fasciculus ciliaris der Pars palpebralis
= Riolan'scher Muskel
Sinus maxillaris

核心点



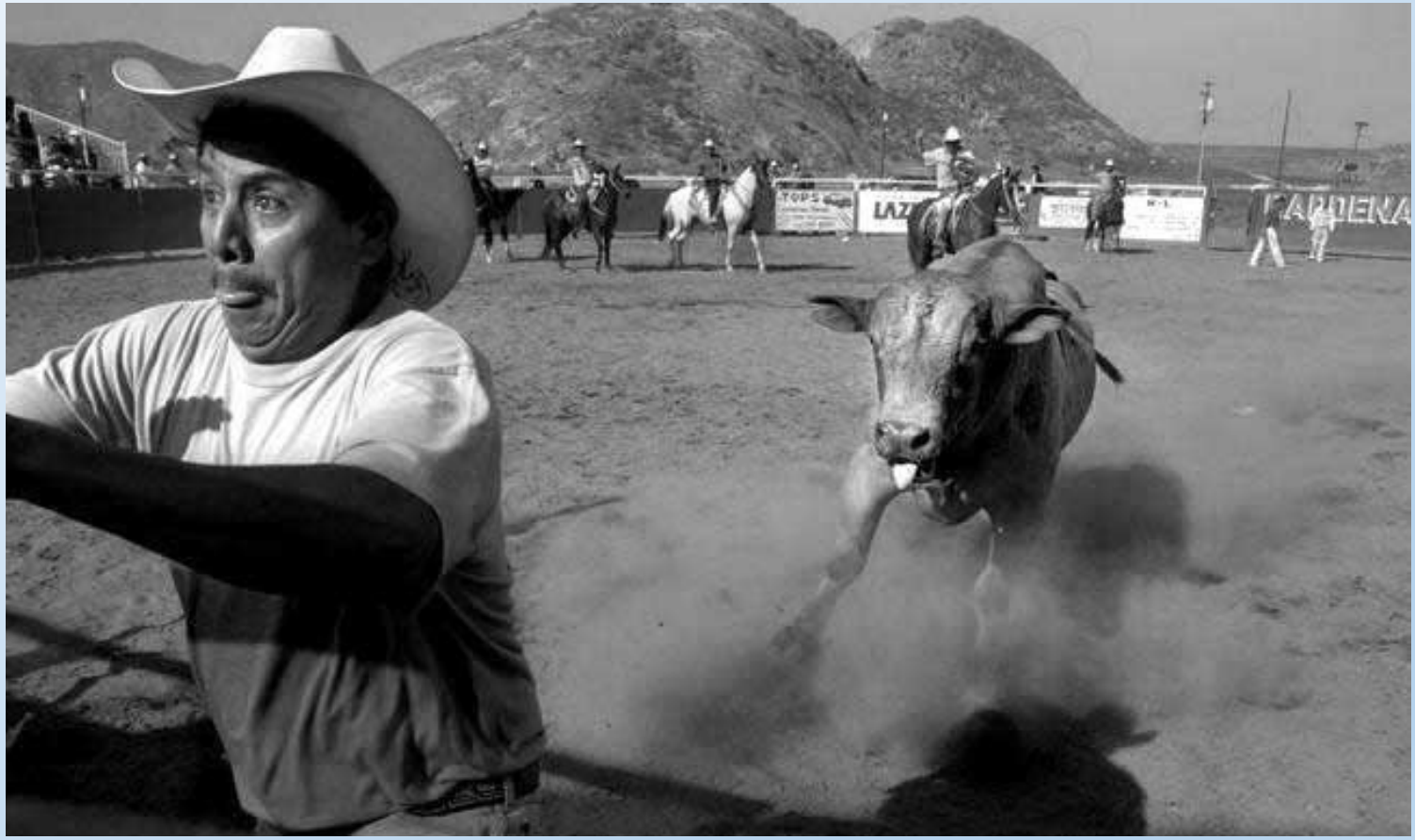
Ekman 的六大情绪


画一下你印象中的六种基本情绪

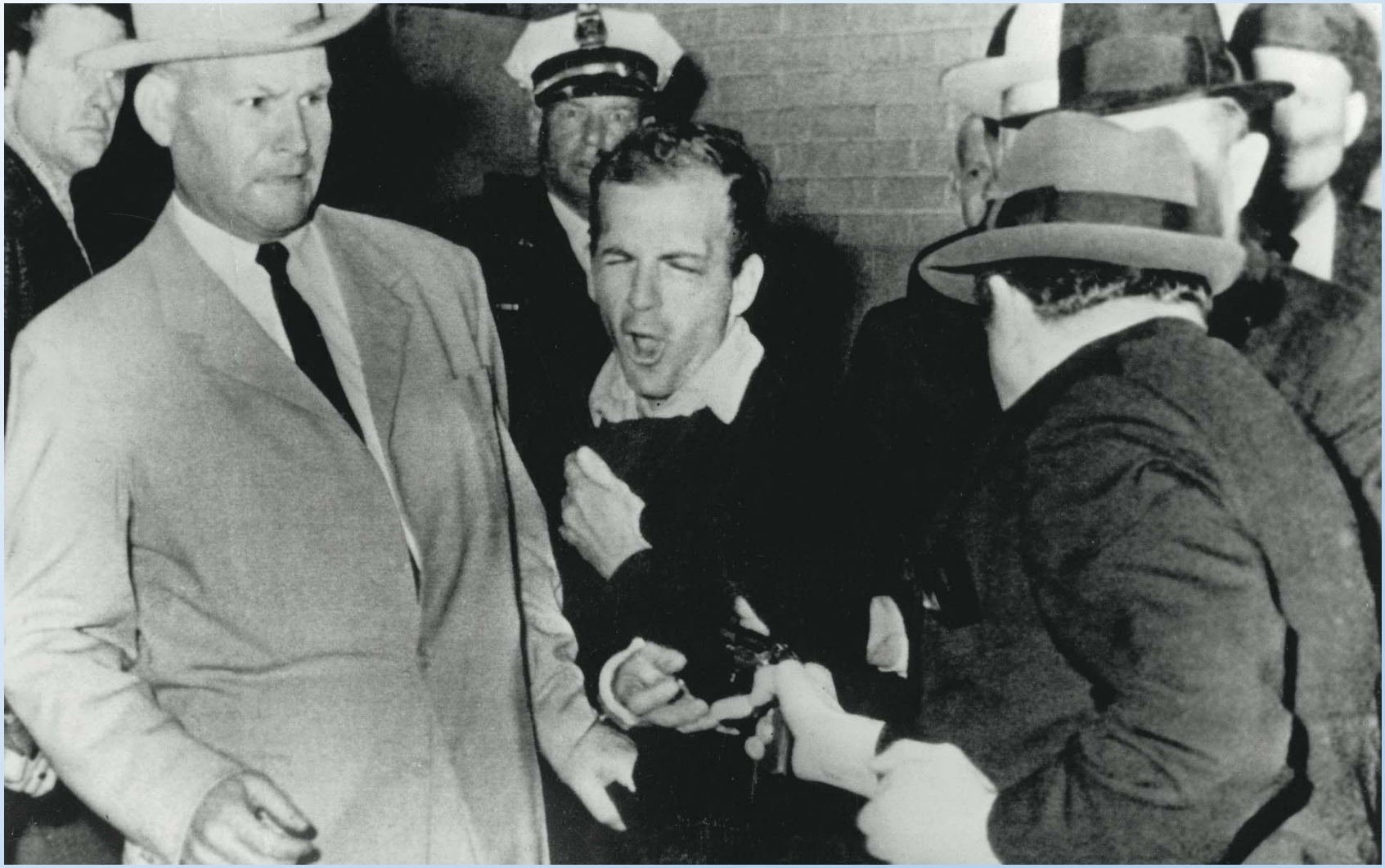
?

真恐惧



?


Sasha Mordovets via Getty Images




INTEREST
FEAR
DISGUST
ANGER
SADNESS
JOY

眼眶肌肉的运动

方法

Neutral　　Non-Duchenne Smile　　Duchenne Smile

微笑的历史起源

Submissive gesture