



MSS Module

Dr. Gamal Taha Abdelhady

Assistant Professor of Anatomy & Embryology



Axial Skeleton - Skull



Axial Skeleton - Skull

- **By the end of this session, you should be able to:**
 1. Identify the main component of the skull
 2. Recognize its most relevant features



The Axial Skeleton

- ***The axial skeleton***

- Forms the longitudinal axis of the body
- Has 80 bones

- **The skull (protects the brain):**

- **8 cranial bones**
- **14 facial bones**

- **Bones associated with the skull:**

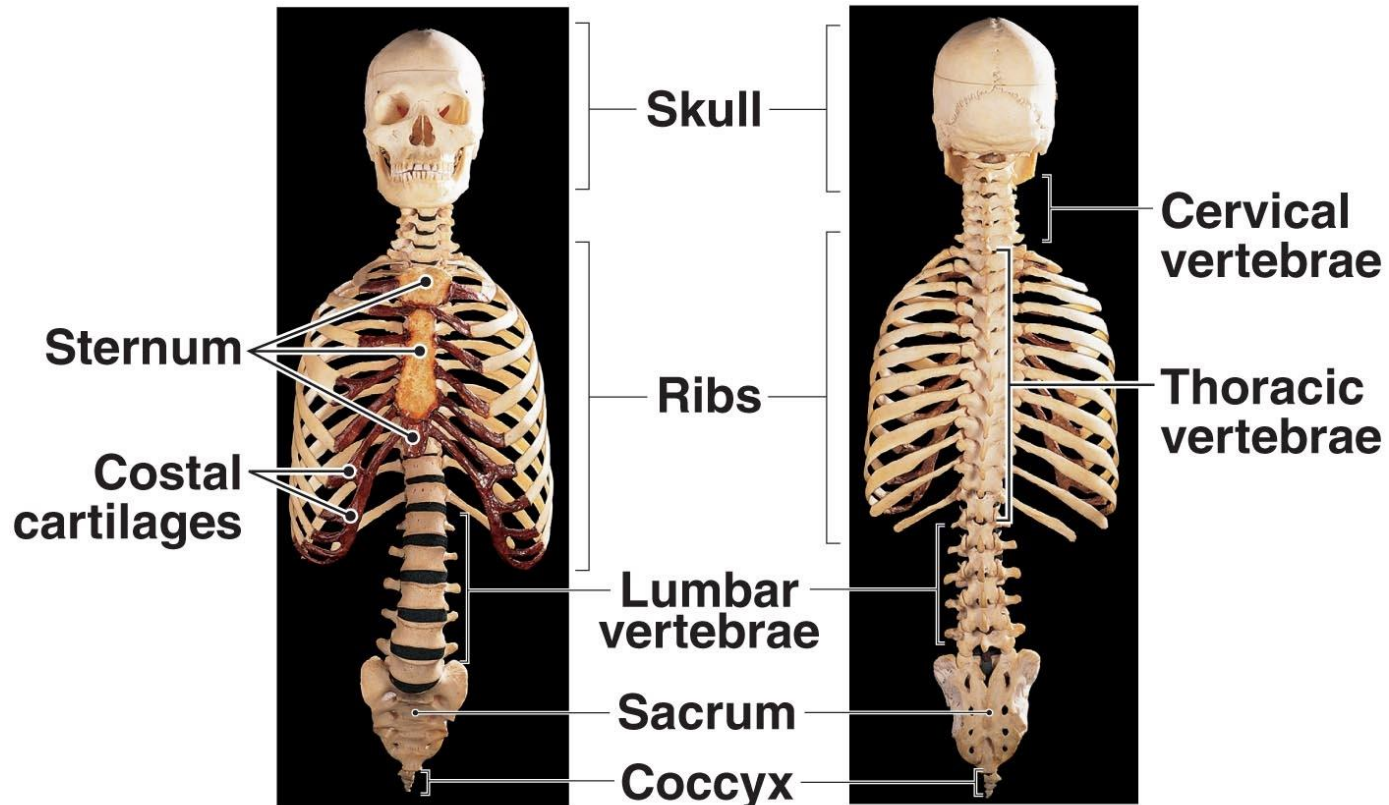
- **6 auditory ossicles** (3 in each ear)
- **A hyoid bone**
- **Mandible**



The Axial Skeleton

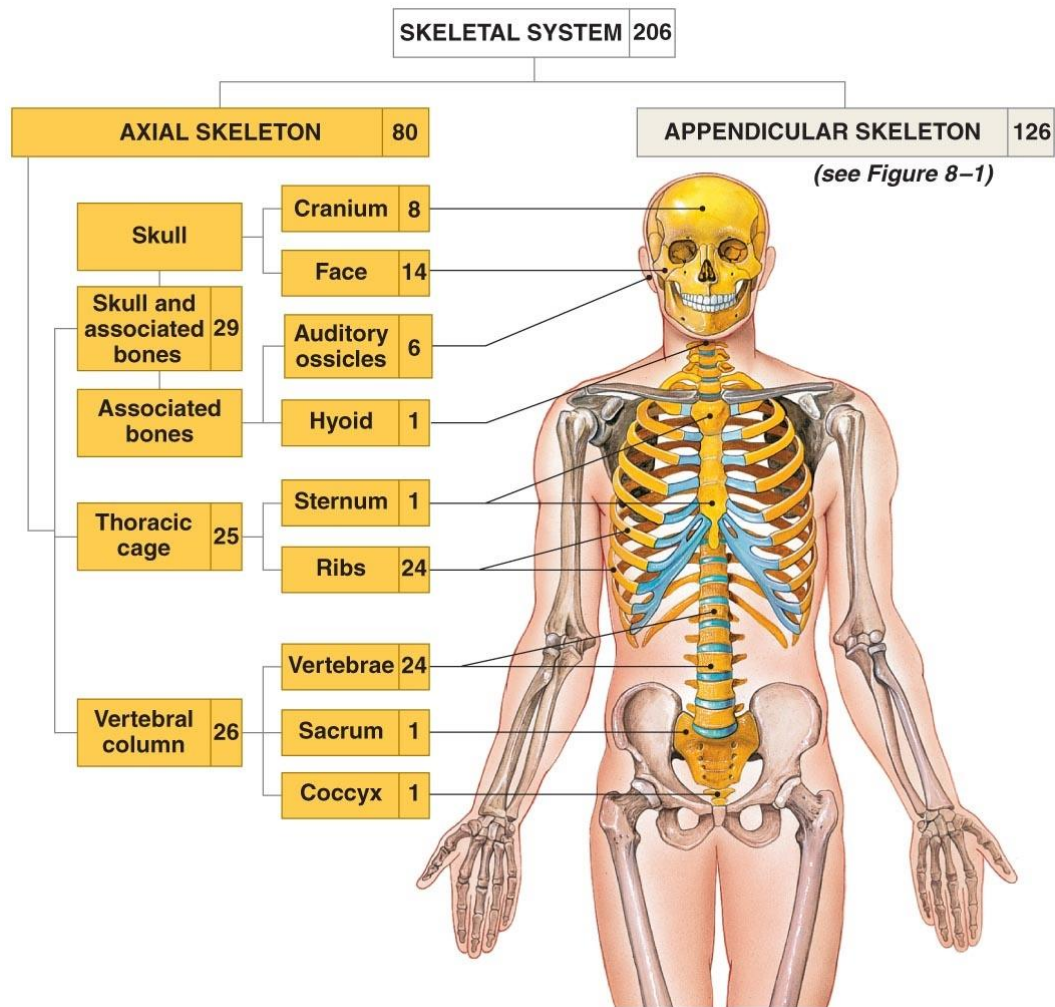
- ***The axial skeleton***
 - **The vertebral column**
 - 24 vertebrae (singular = vertebra)
 - The sacrum
 - The coccyx
 - **The thoracic cage**
 - 24 ribs
 - The sternum

The Axial Skeleton



(a)

The Axial Skeleton



(b)



The Axial Skeleton

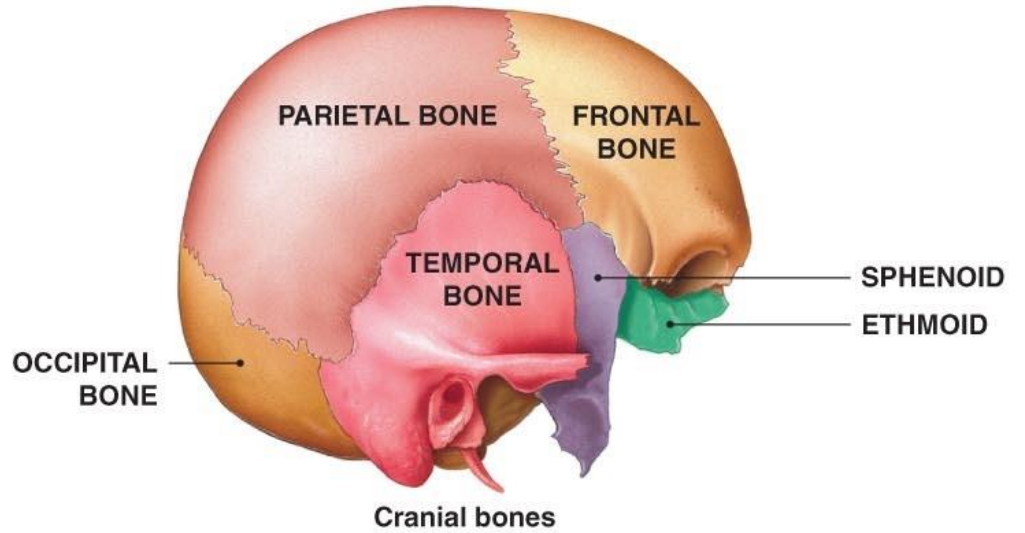
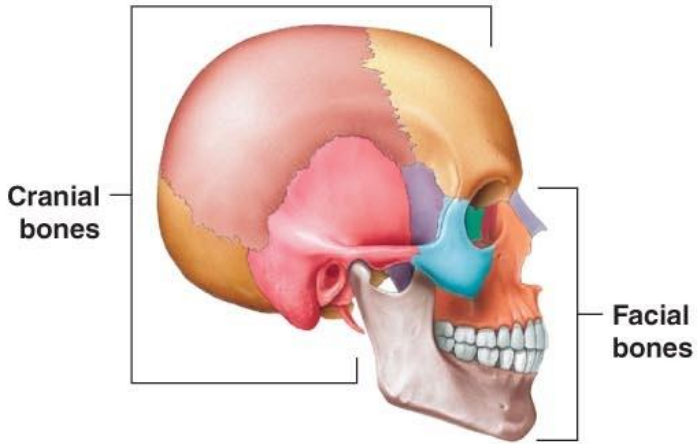
- Functions of the Axial Skeleton
 - Supports and protects organs in body cavities
 - Attaches to muscles of
 - Head, neck, and trunk
 - Respiration
 - Appendicular skeleton



The Skull

- The **skull** protects
 - The brain
 - Entrances to respiratory system
 - Entrance to digestive system

- The skull contains 22 bones
 - **8 cranial bones:**
 - Form the braincase or cranium (skull box)
 - **14 facial bones:**
 - Protect and support entrances to digestive and respiratory tracts

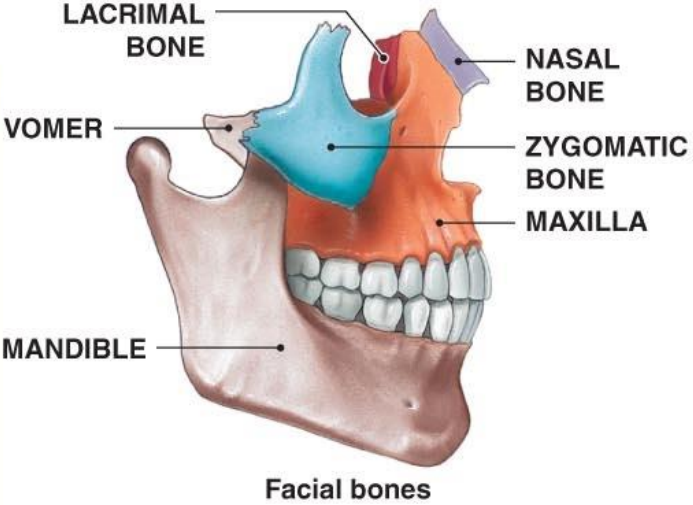


SKULL

ASSOCIATED BONES	7
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CRANIUM	8
Occipital bone	1
Parietal bones	2
Frontal bone	1
Temporal bones	2
Sphenoid	1
Ethmoid	1

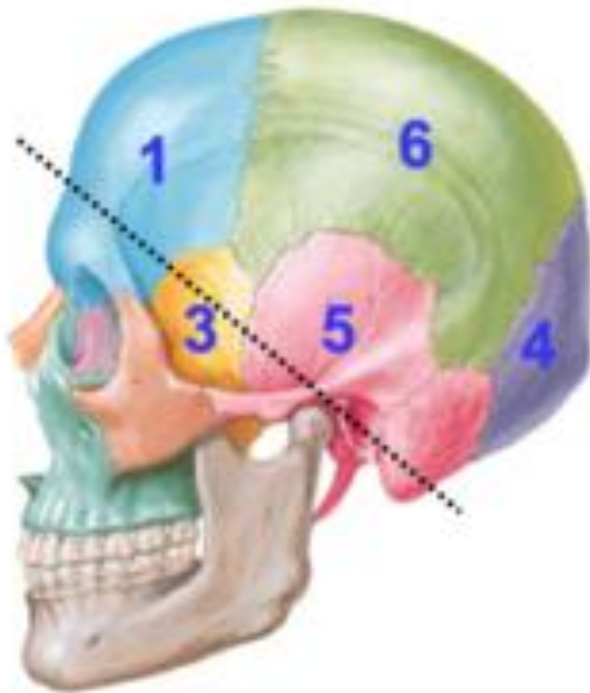
FACE	14
Maxillae	2
Palatine bones	2
Nasal bones	2
Inferior nasal conchae	2
Zygomatic bones	2
Lacrimal bones	2
Vomer	1
Mandible	1



Auditory ossicles enclosed in temporal bones (detailed in Chapter 17) 6

Hyoid bone 1

The Skull (Single – Paired Bones)



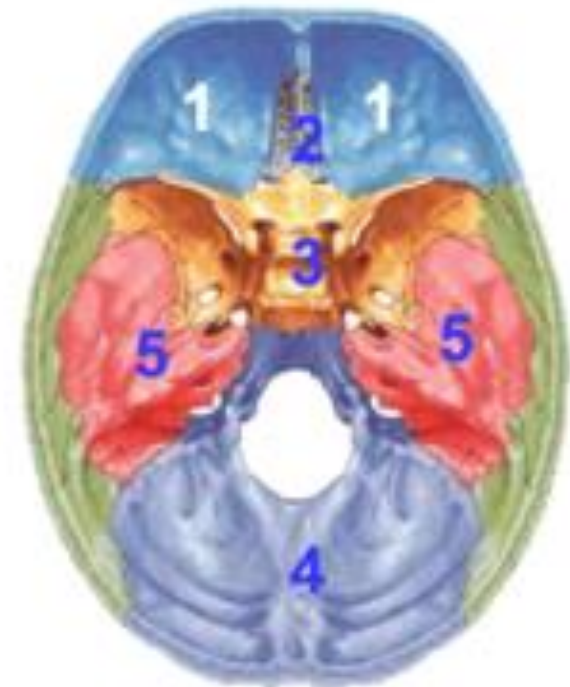
Lat.view

Unpaired bones

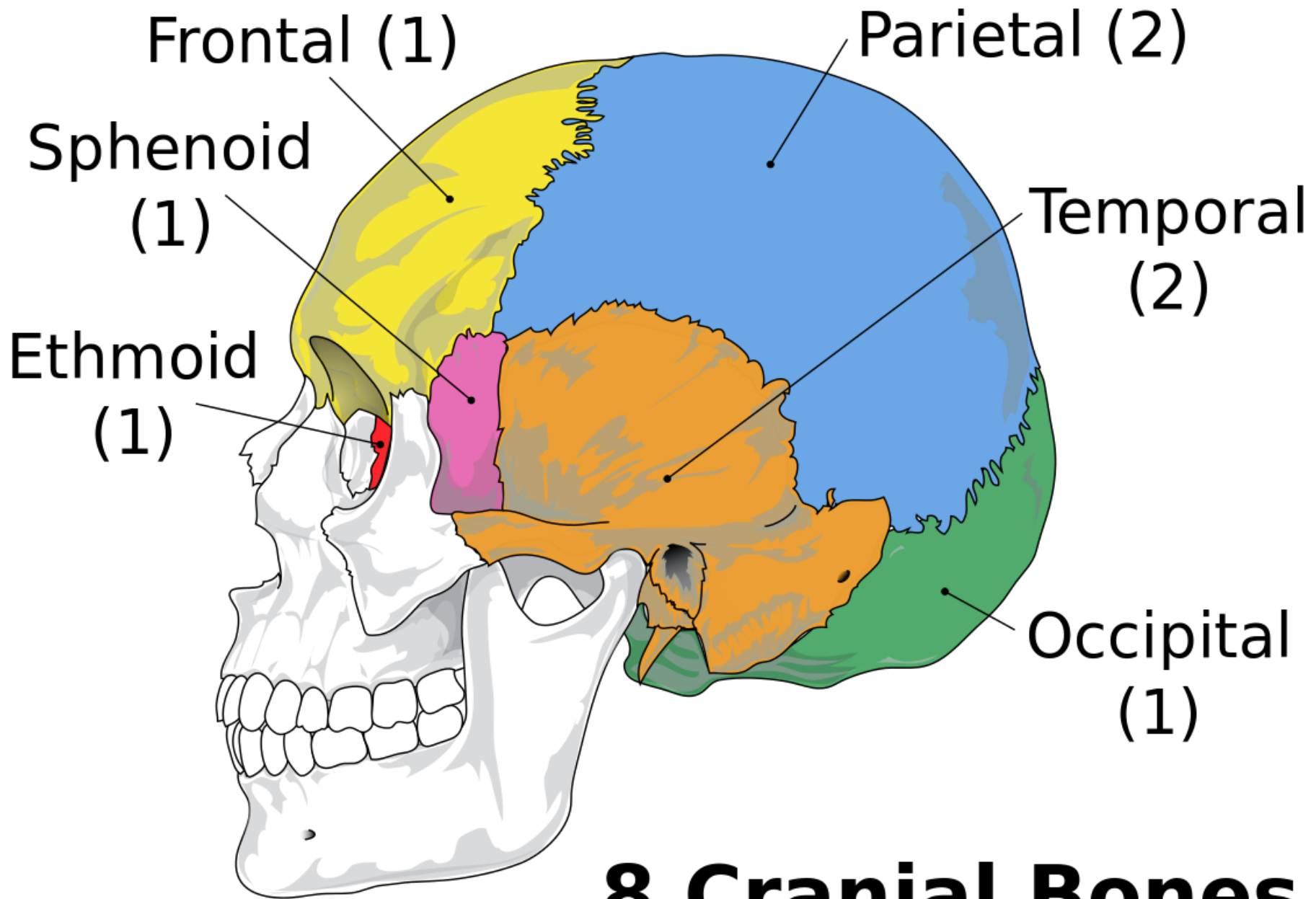
- 1-Frontal bone
- 2-Ethmoid bone
- 3-Sphenoid bone
- 4-Occipital bone

Paired bones

- 5-Temporal bone
- 6-Parietal bone

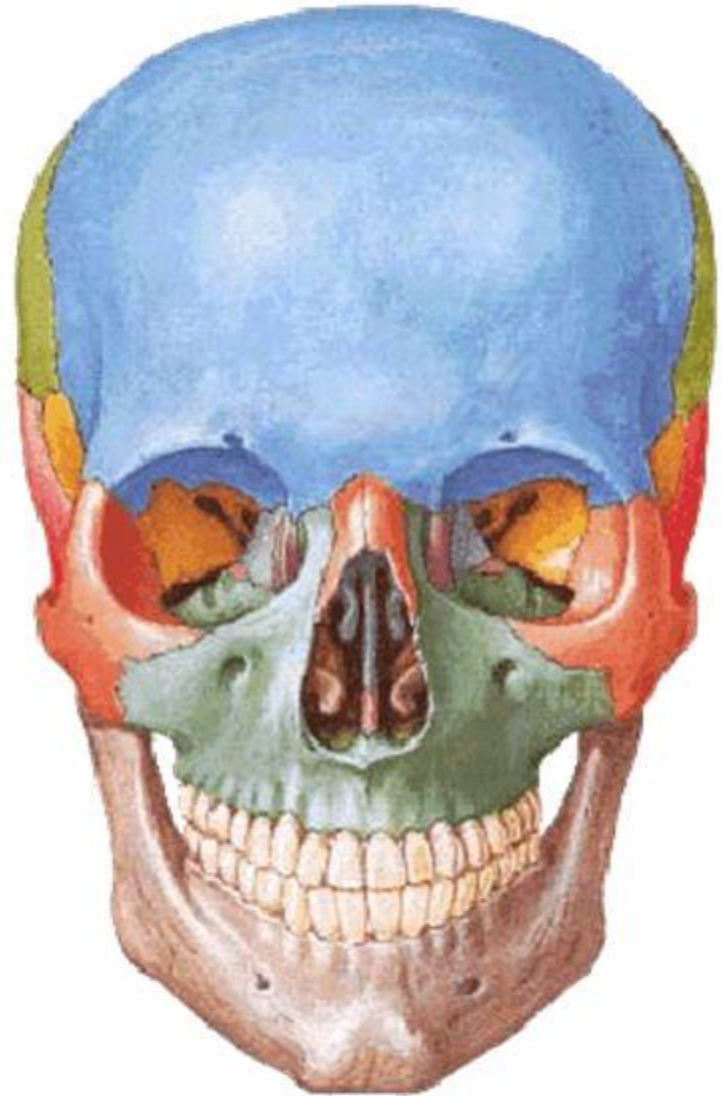


Sup.view of
the base



8 Cranial Bones

- **Facial skeleton (14)**
 - Unpaired bones:
mandible,
vomer
 - Paired bones:
maxilla,
nasal bone,
lacrimal bone,
palatine bone,
zygomatic bone,
inferior nasal concha





The Skull

- ***Superficial Facial Bones***

- Maxillae = maxillary bones
- Lacrimal
- Nasal
- Zygomatic
- Mandible

- ***Deep Facial Bones***

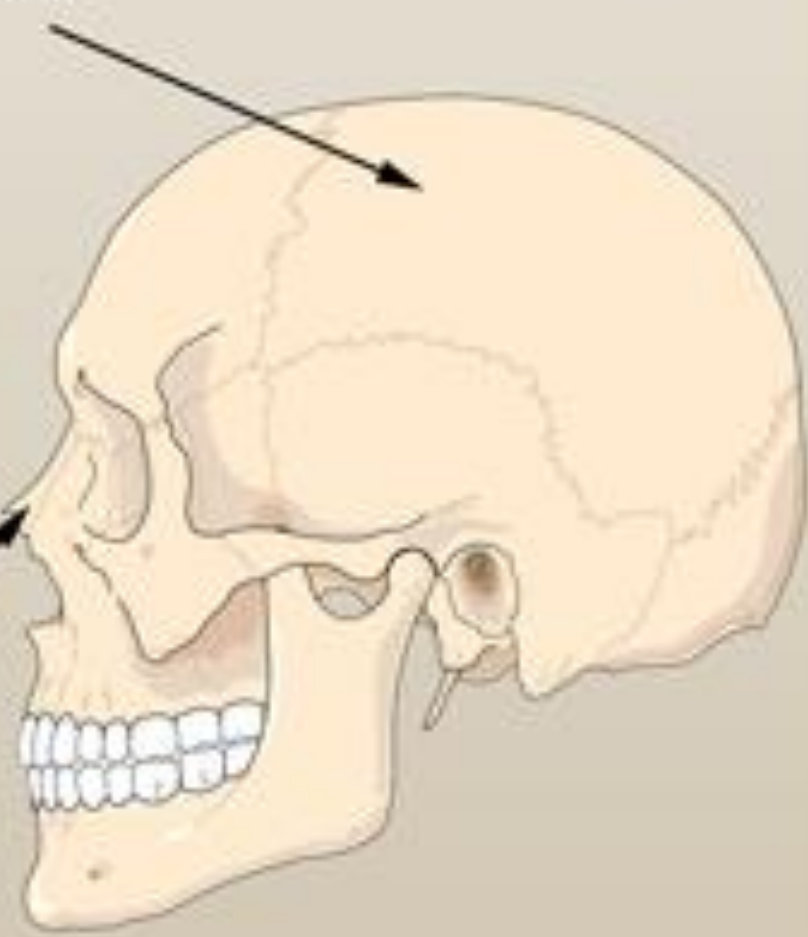
- Palatine bones
- Inferior nasal conchae
- Vomer

Front View

Side View



parietal bone



lacrimal bone

temporal bone

zygomatic bone

nasal bone

nasal concha

maxilla



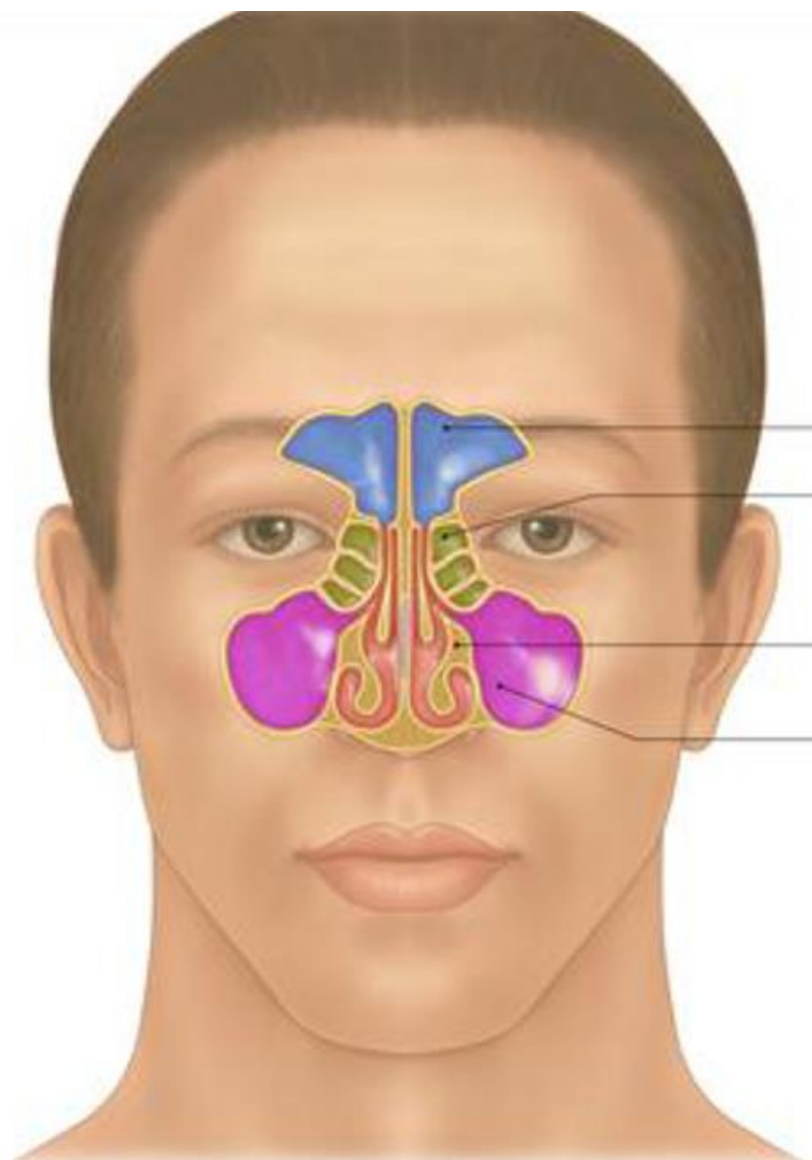
The Skull

- ***Sinuses***

- Cavities that decrease the weight of the skull
 - Lined with mucous membranes
 - Protect the entrances of the respiratory system

They are a group of four paired *air-filled spaces* that surround the nasal cavity:

1. **Maxillary sinus**
2. **Sphenoidal sinus**
3. **Frontal sinus**
4. **Ethmoidal cells**



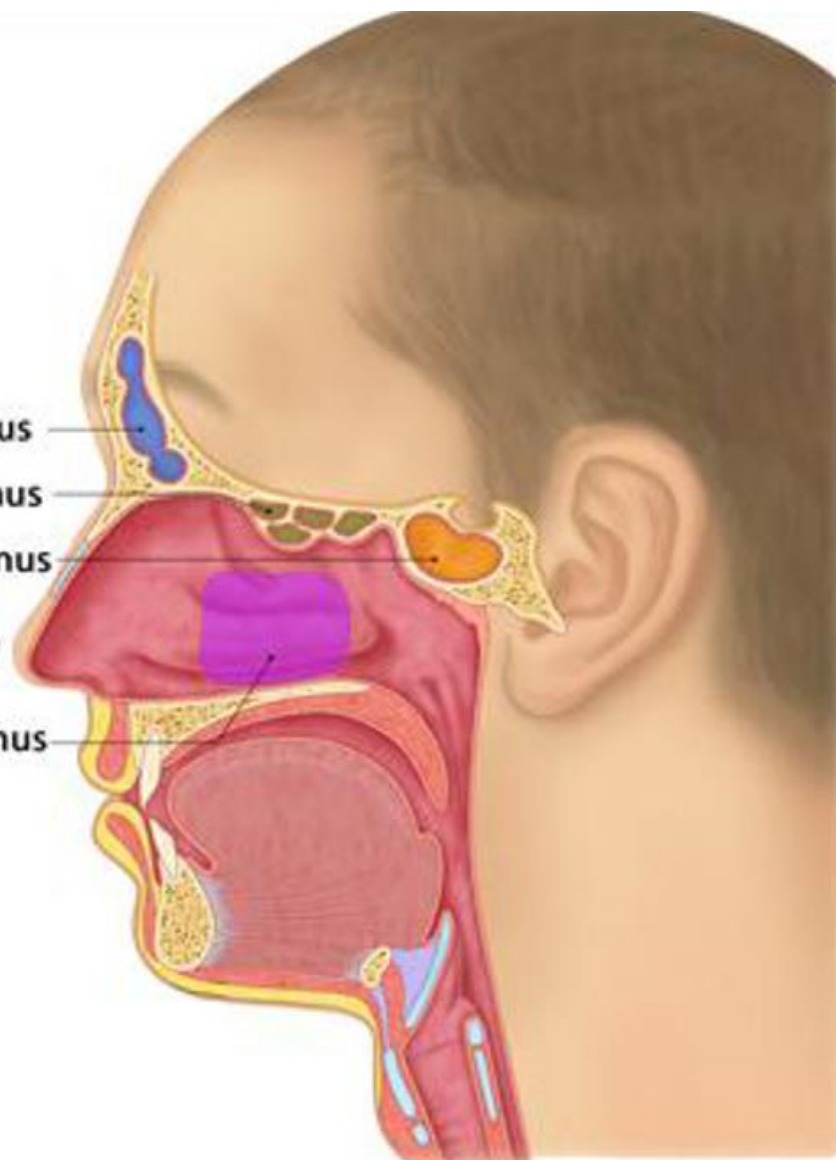
Frontal sinus

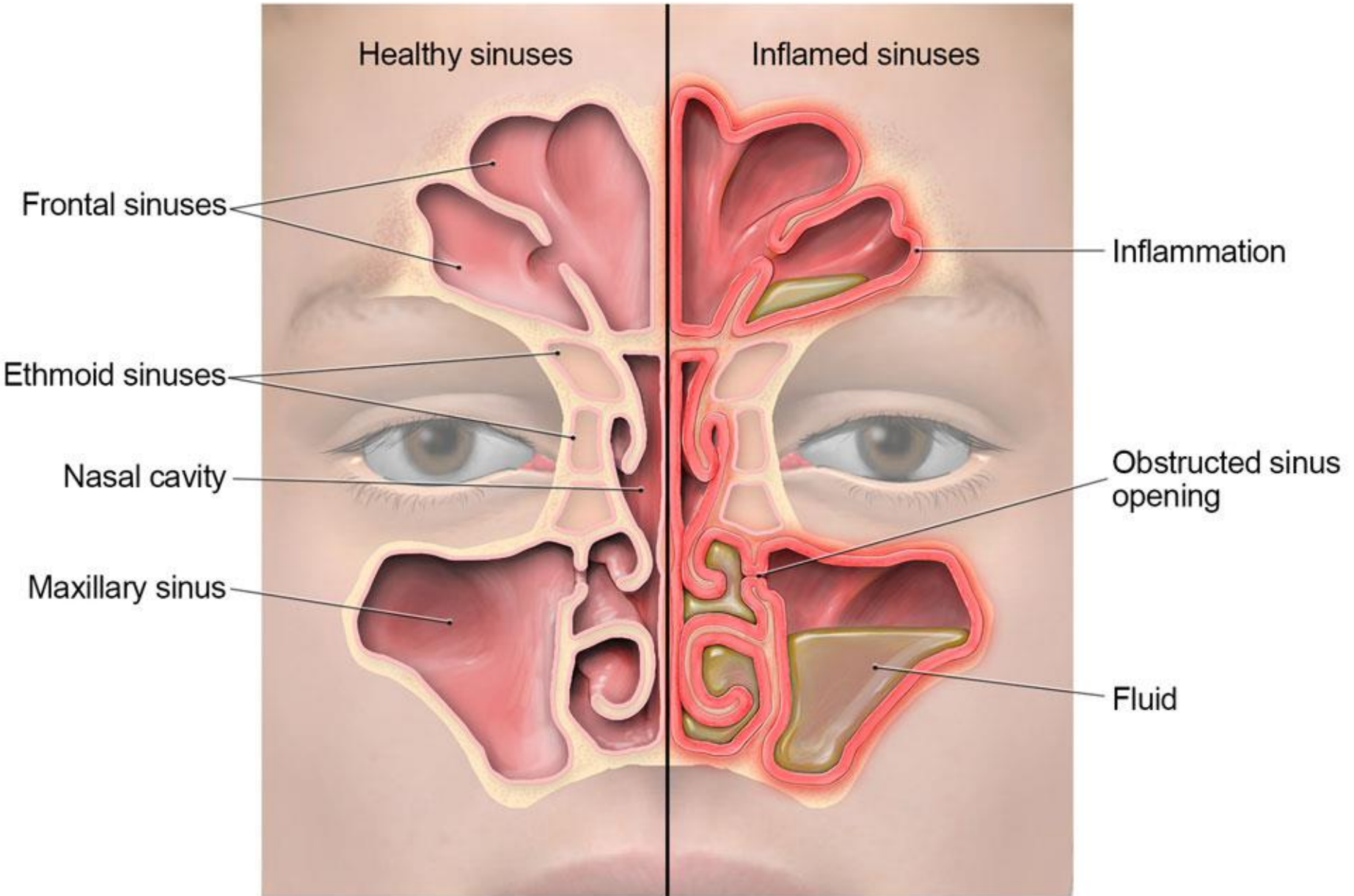
Ethmoid sinus

Sphenoid sinus

Nasal cavity

Maxillary sinus







The Skull

- ***Sutures***

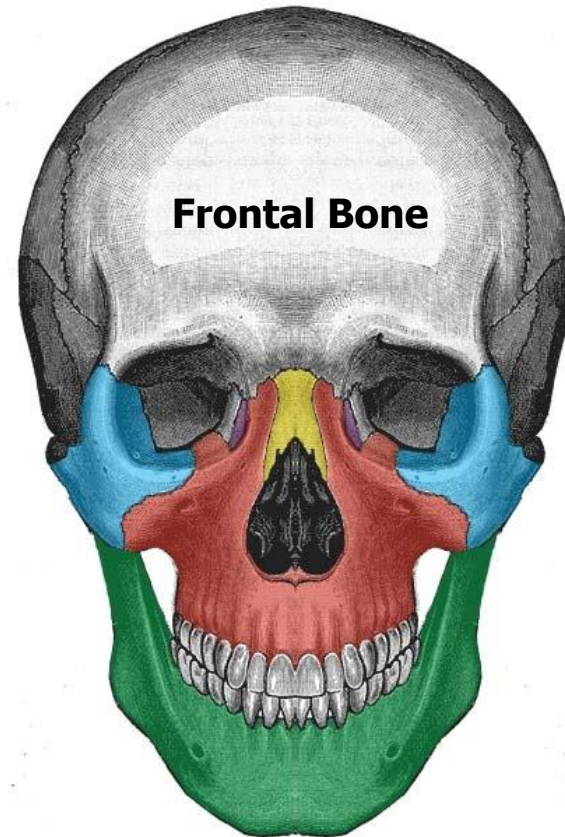
- The immovable joints of the skull
- The four major sutures
 - Lambdoid suture
 - Coronal suture
 - Sagittal suture
 - Squamous suture



- ***Norma Frontalis***

Norma Frontalis

The face is composed of 4 facial bones, surrounding apertures (***2 orbital and 1 nasal***)



-  Zygomatic
-  Maxilla
-  Nasal
-  Lacrimal
-  Mandible

Norma Frontalis

1. The frontal bone:

Forms mainly the forehead. Might contain a **metopic suture** which is usually ossified by (6-8) years, it persists in black race





Norma Frontalis

2. Maxilla:

Forms the upper jaw and contains maxillary air sinus

3. Nasal Bones: forms the bridge of the nose.

4. Zygomatic bone: Forms the prominence of the cheek

Frontal bone

Glabella

Sphenoid bone

Lacrimal bone

Nasal bone

Infraorbital foramen

Zygomatic bone

Maxilla

Superciliary arch

Supraorbital margin

Supraorbital notch

Superior orbital fissure

Inferior orbital fissure

Perpendicular plate
of ethmoid bone

Vomer

Inferior nasal concha

Anterior nasal spine

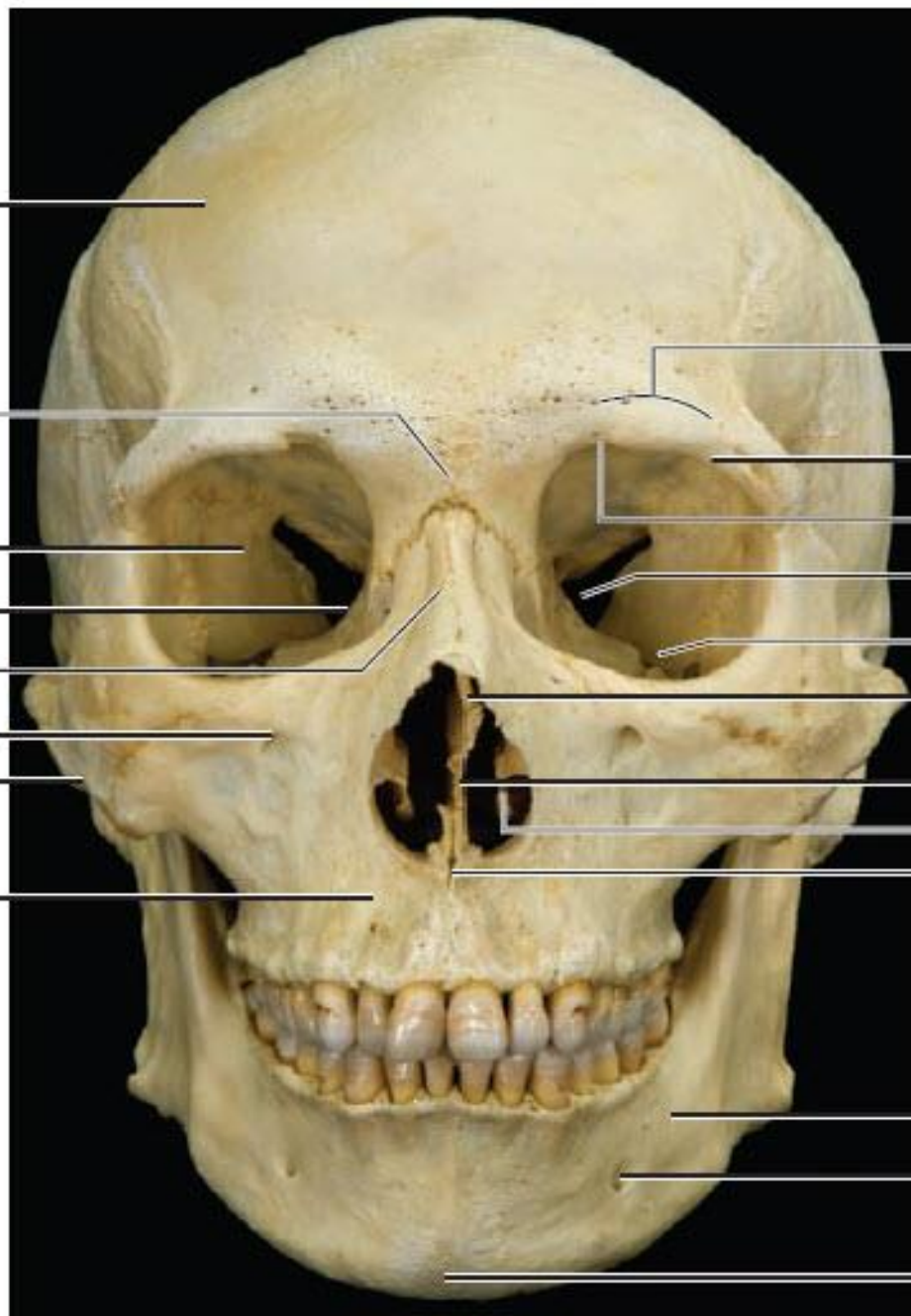
Nasal septum

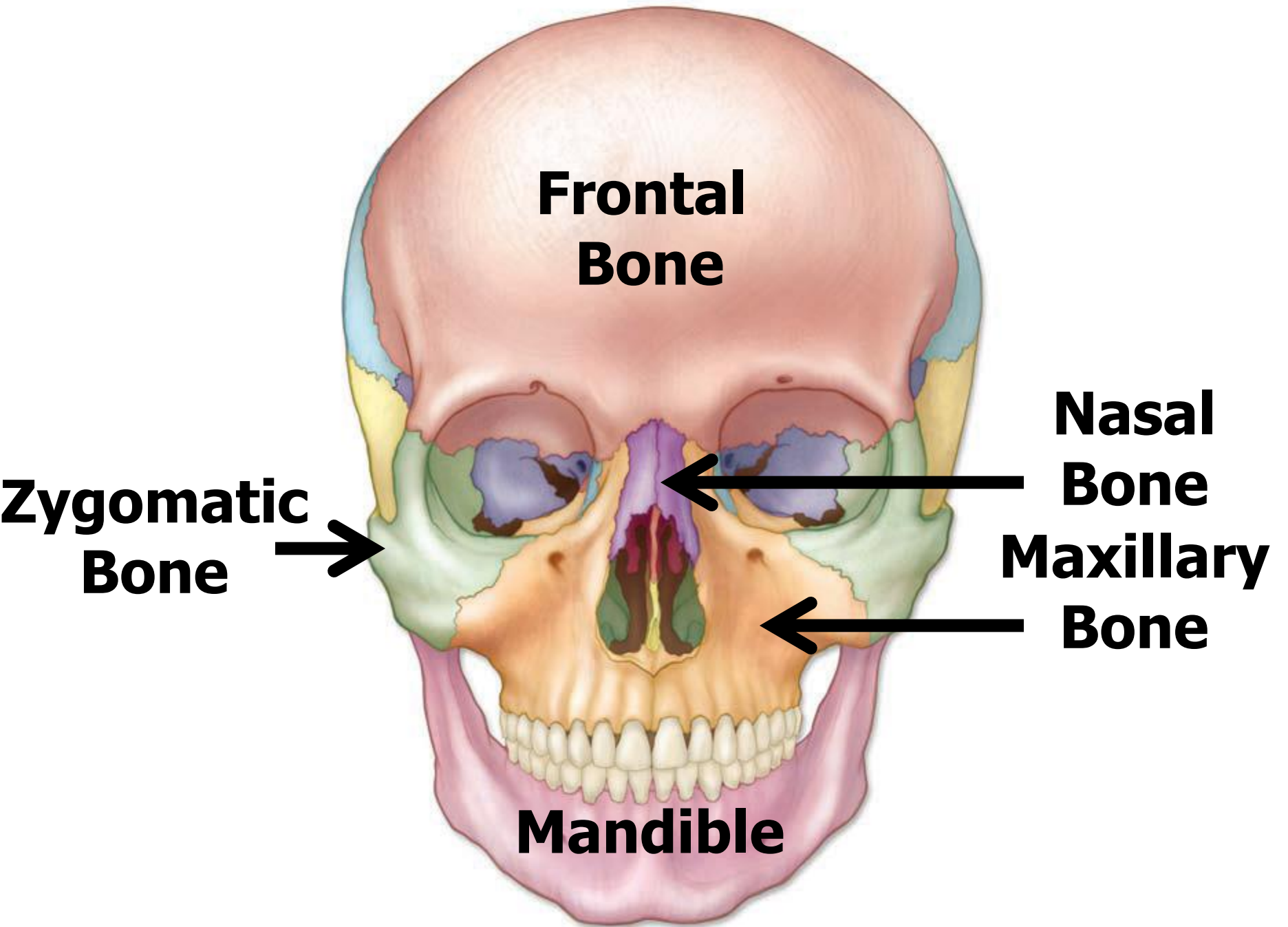
Mandible

Mental foramen

Mental protuberance

Anterior view





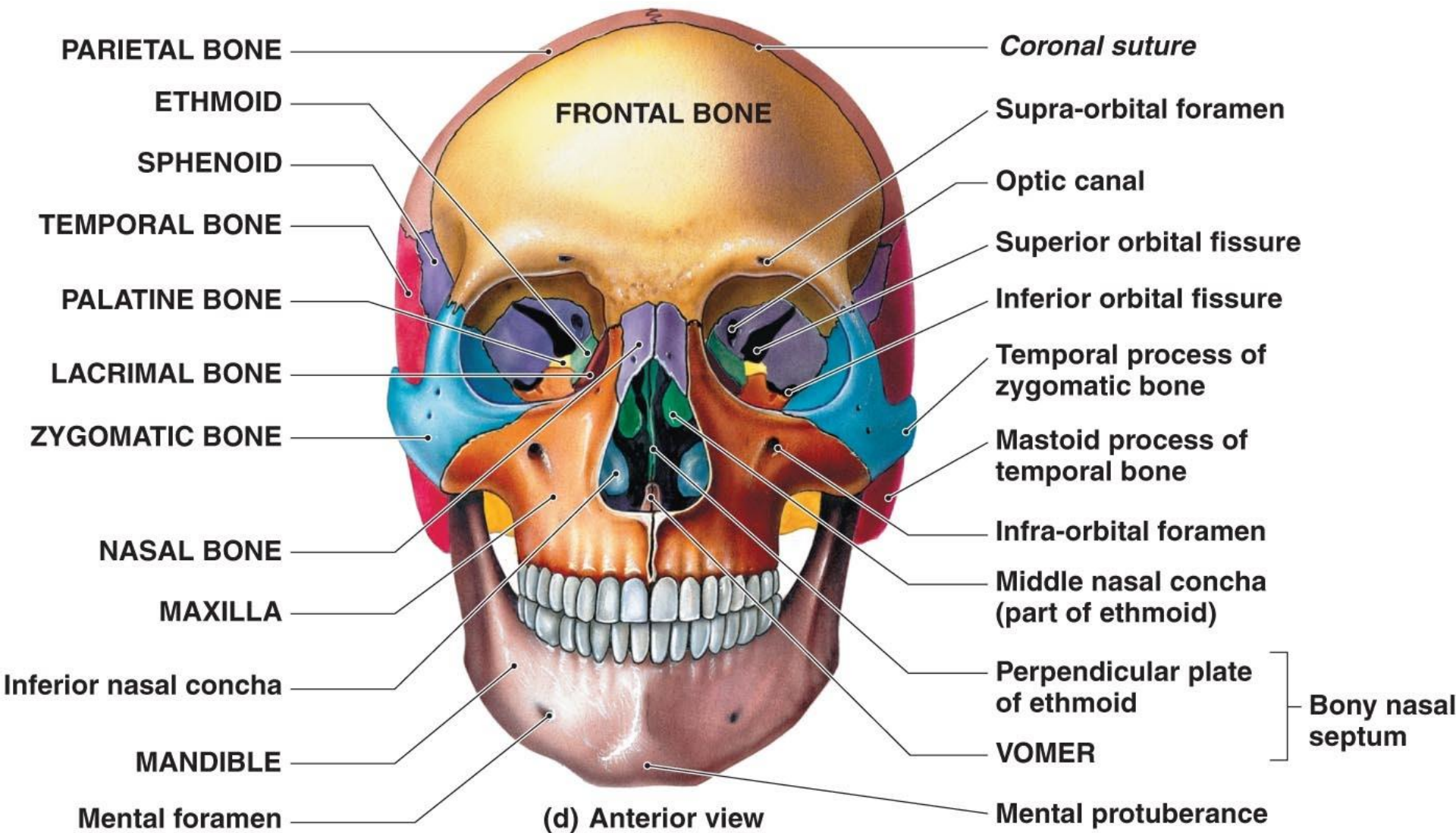
**Frontal
Bone**

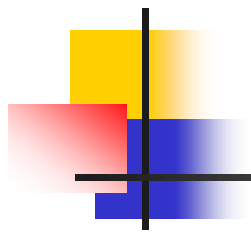
**Nasal
Bone**

**Maxillary
Bone**

**Zygomatic
Bone**

Mandible





■ ***Norma Verticalis***

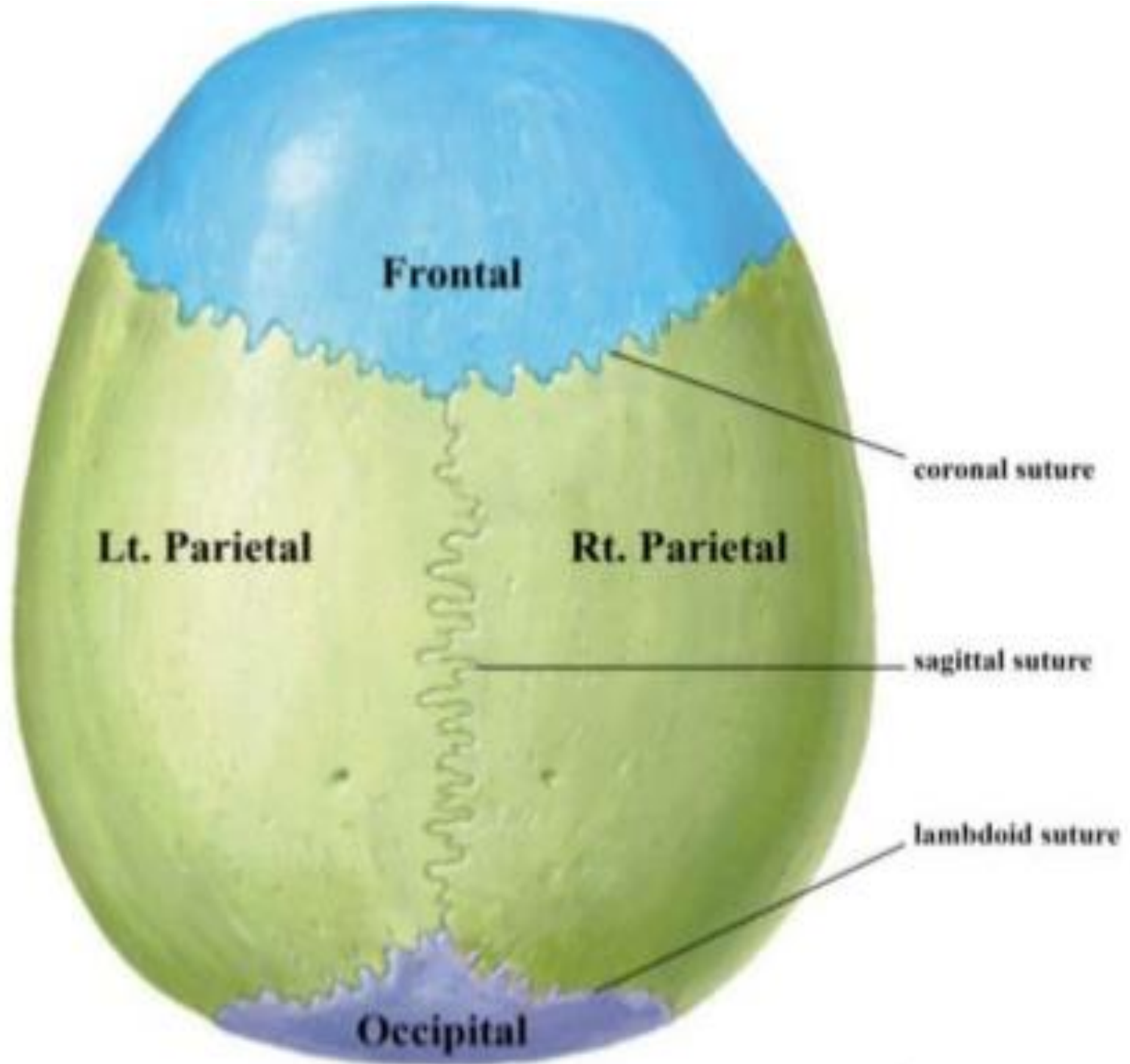


Norma Verticalis - Bones

Presents the superior view of the skull

Consists of 4 bones:

- ❖ Frontal bone towards the Front.
- ❖ Occipital bone to the back.
- ❖ 2 parietal bones lying in-between

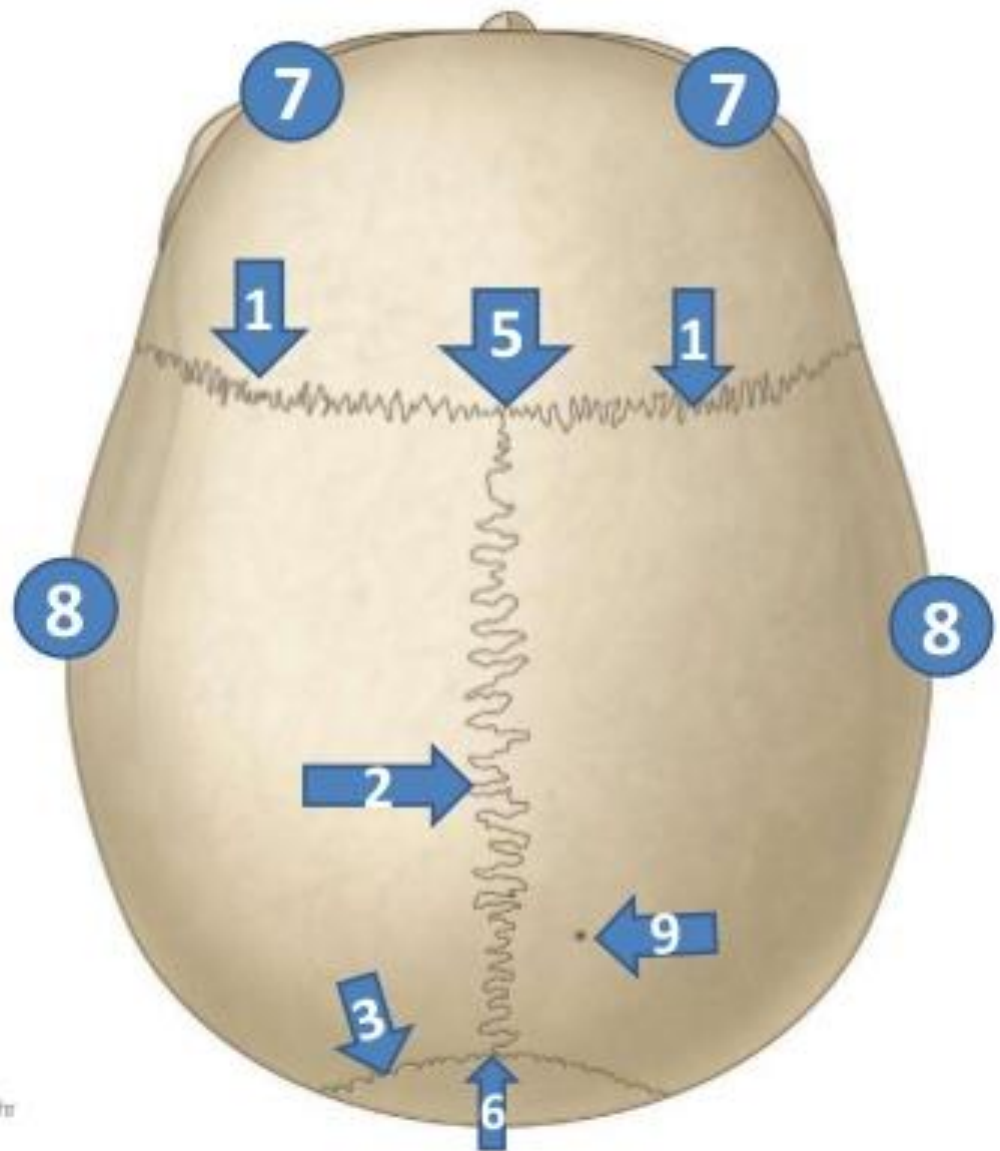




Norma Verticalis - Sutures

- 1. Coronal suture:*** between the frontal bone and the 2 parietal bones.
- 2. Sagittal suture:*** between the 2 parietal bones.
- 3. Lambdoid suture:*** between the occipital bone and the 2 parietal bones.

1. Coronal suture
2. Sagittal suture
3. Lambdoid suture
4. Metopic suture
5. Bergman
6. Lambda
7. Frontal
8. Parietal
9. Parietal emissary F





Sutures Meeting Points

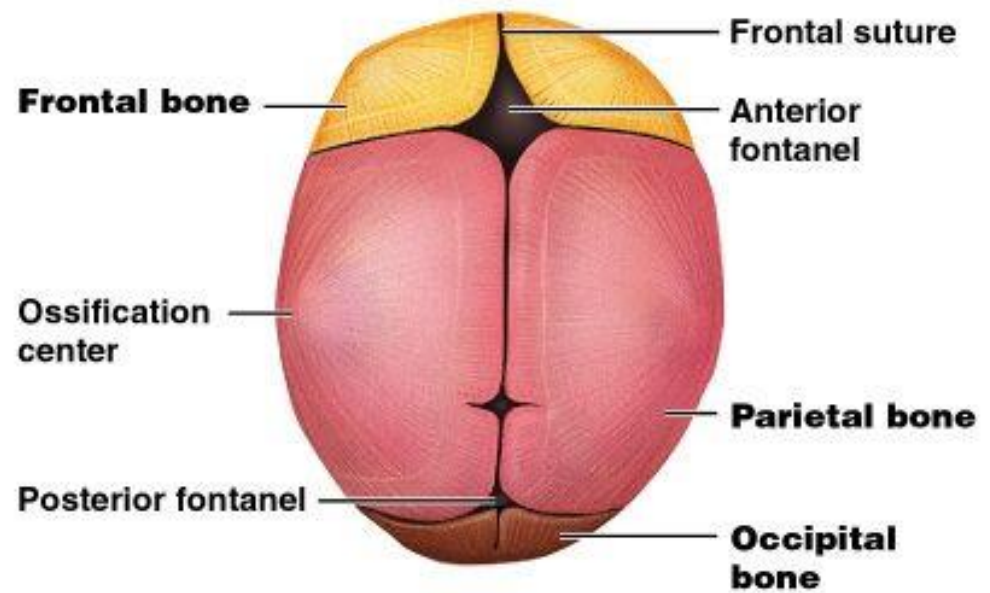
- ***Bregma:*** is the meeting of coronal and sagittal sutures.
- Formally an opening in the skull (***Anterior fontanel***) just covered with skin, admits the tip of 3 fingers, closes 1 finger breadth every months. (closes at 18M)
- ***Lambda:*** is the meeting of the lambdoid and sagittal sutures.
- Also formally an opening in the skull (***Posterior fontanel***) just covered with skin, admits the tip of 1 fingers, closes 1 finger breadth every months (closes at 6M)

Clinically:

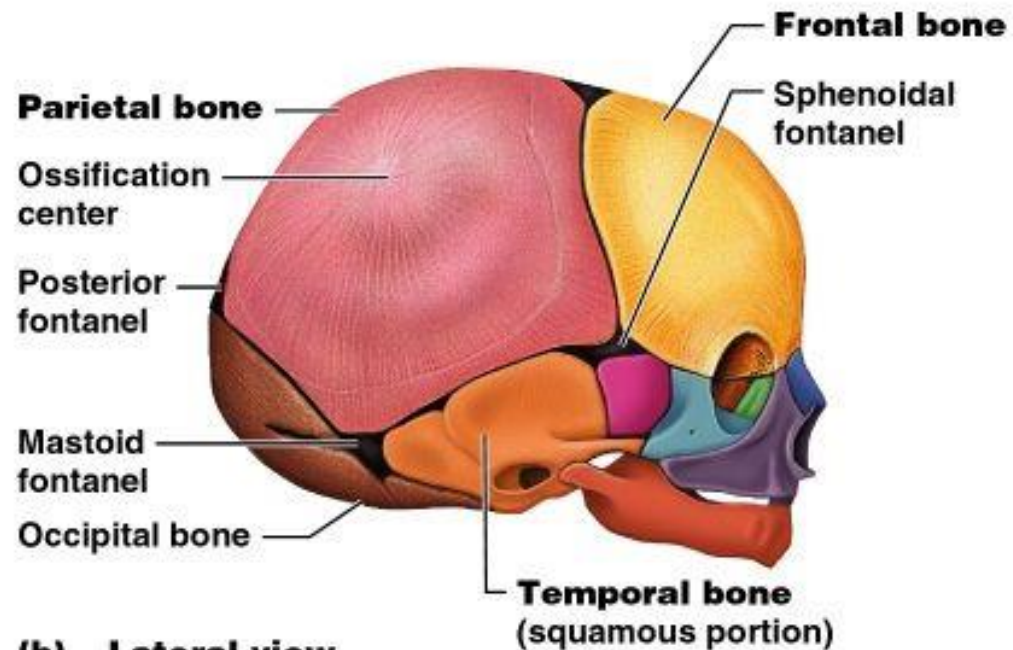
1. They allow overlap of skull bones during delivery.

2. Indicator for intra cranial pressure:

If the pressure it bulges outward, If the pressure it sinks inward



(a) Superior view



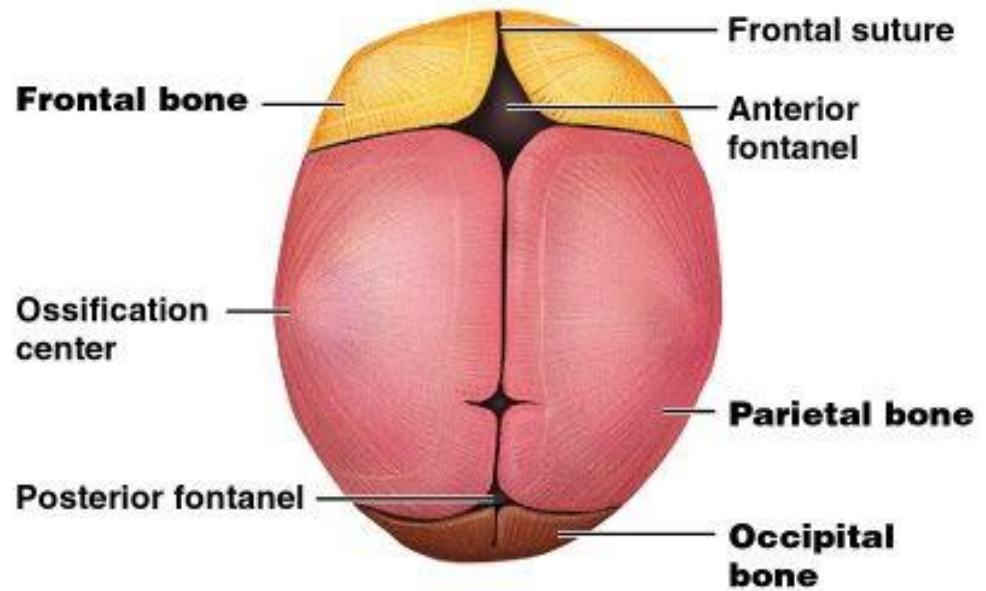
(b) Lateral view

Clinically:

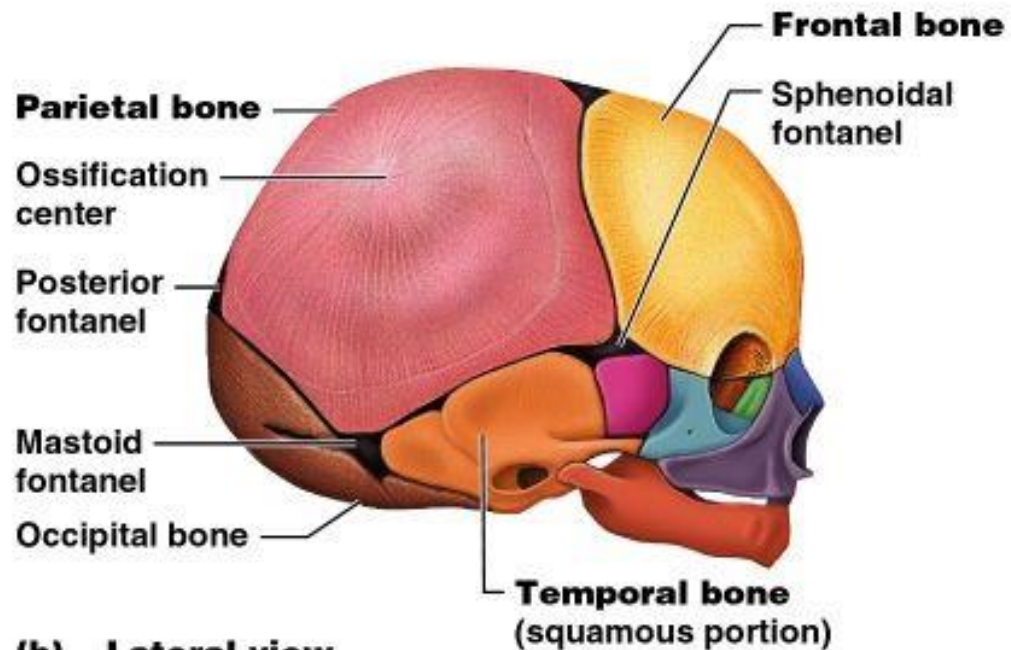
3. Rapid closure may be a sign of craniostenosis

4. Delayed closure is a sign of rickets.

5. Can be used as a site for IV injection



(a) Superior view

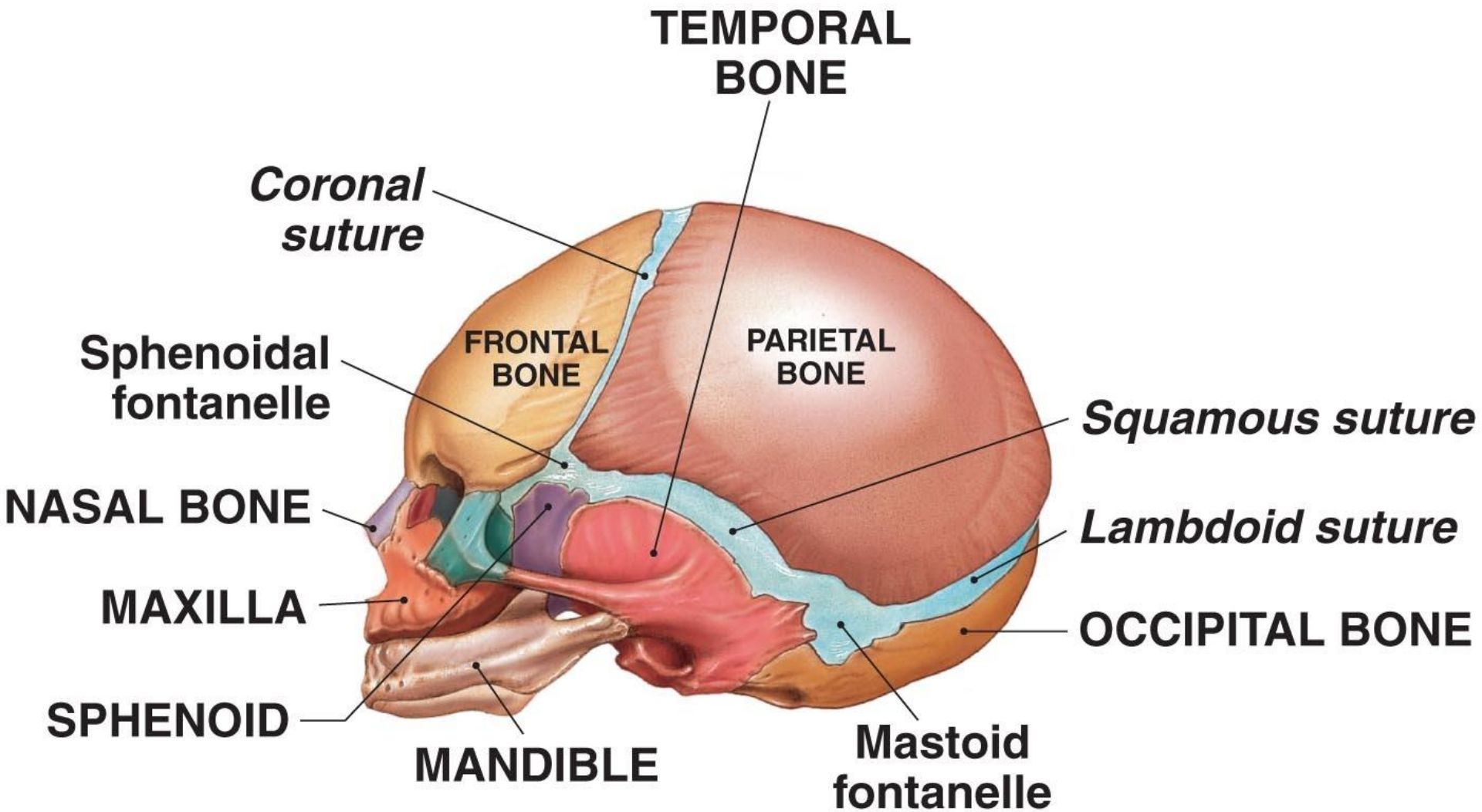


(b) Lateral view

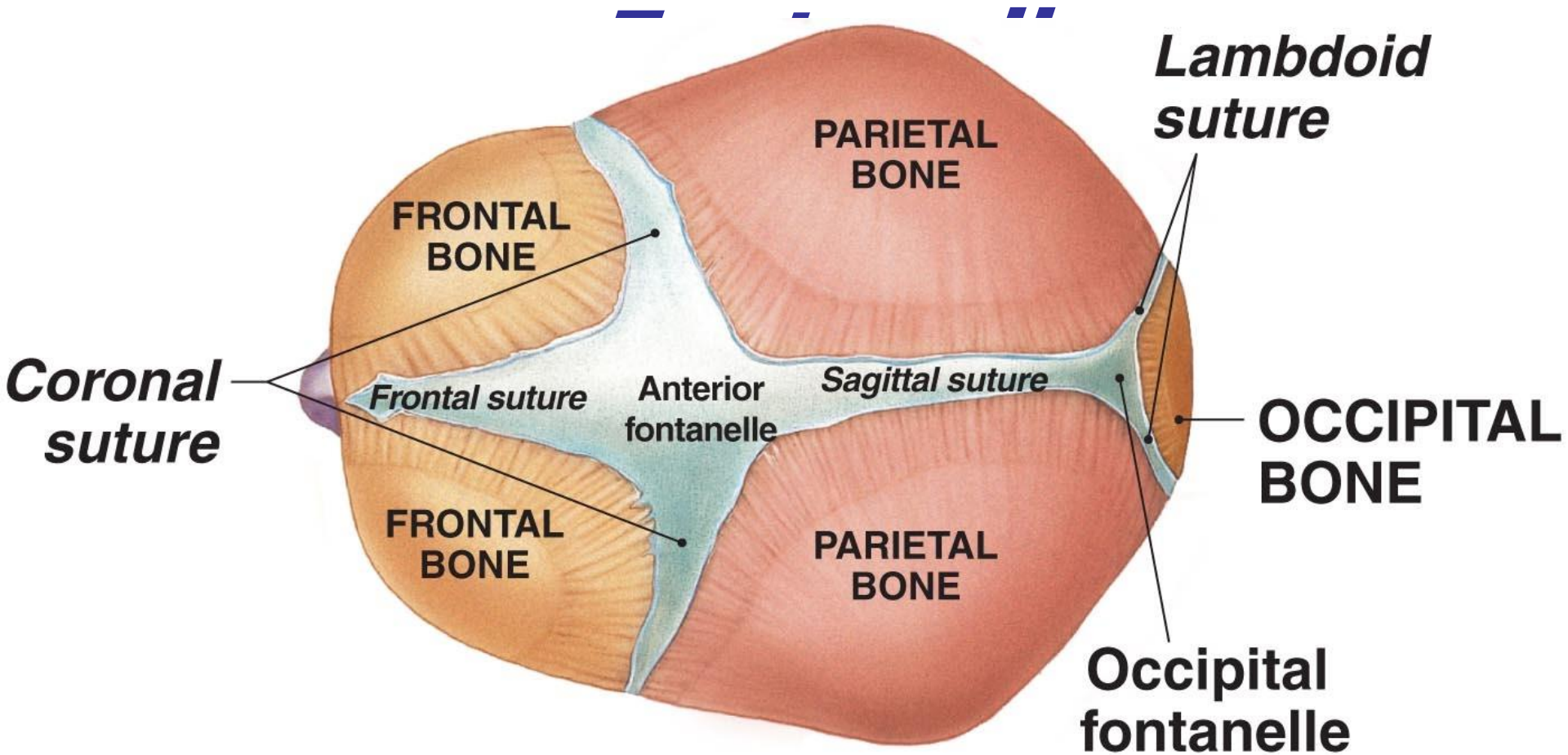


Fontanelles

- Fontanelles, are areas of fibrous connective tissue (soft spots)
 - Cover unfused sutures in the infant skull
 - Allow the skull to compress during birth
 - **Anterior fontanelle** (admits the tip of 3 fingers)
 - **Posterior fontanelle** (admits the tip of 1 finger)
 - Both fuses 1 finger breadth every 6 month

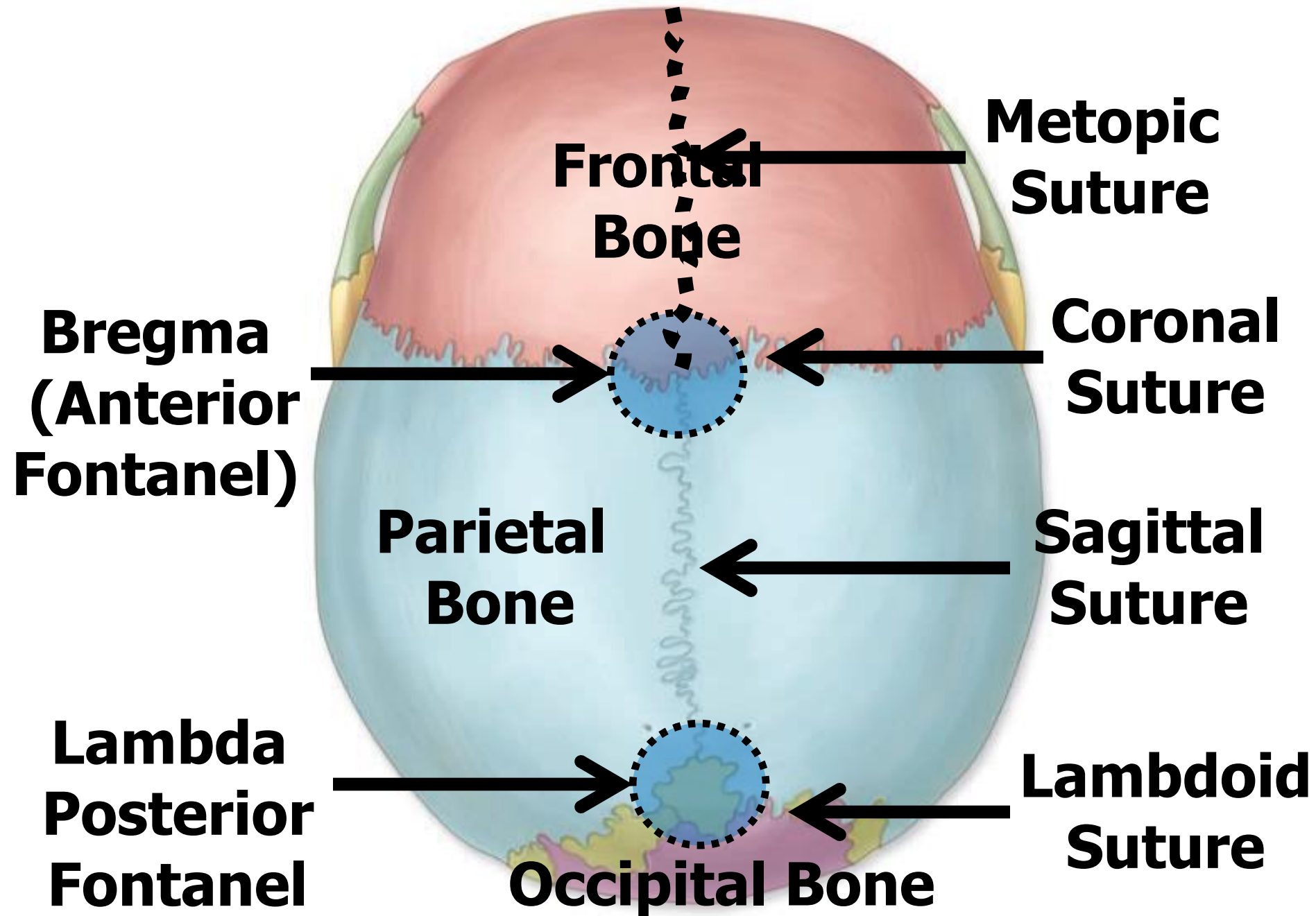


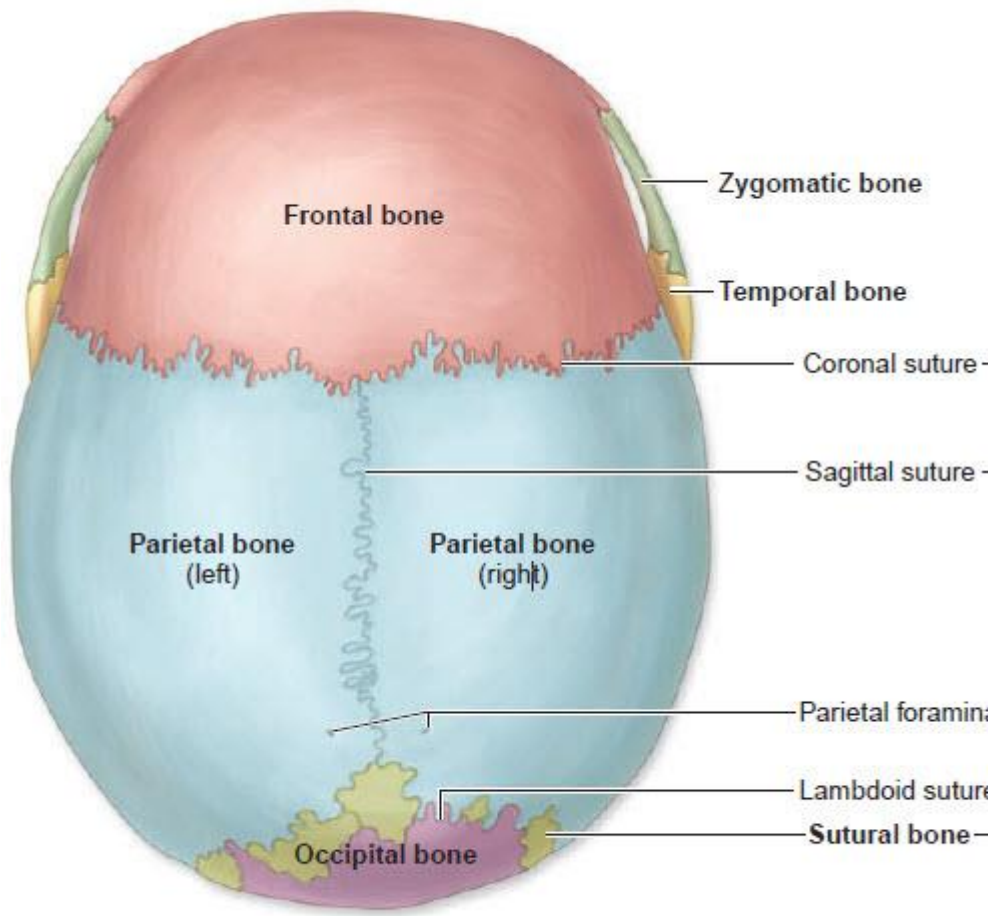
(a) Lateral view



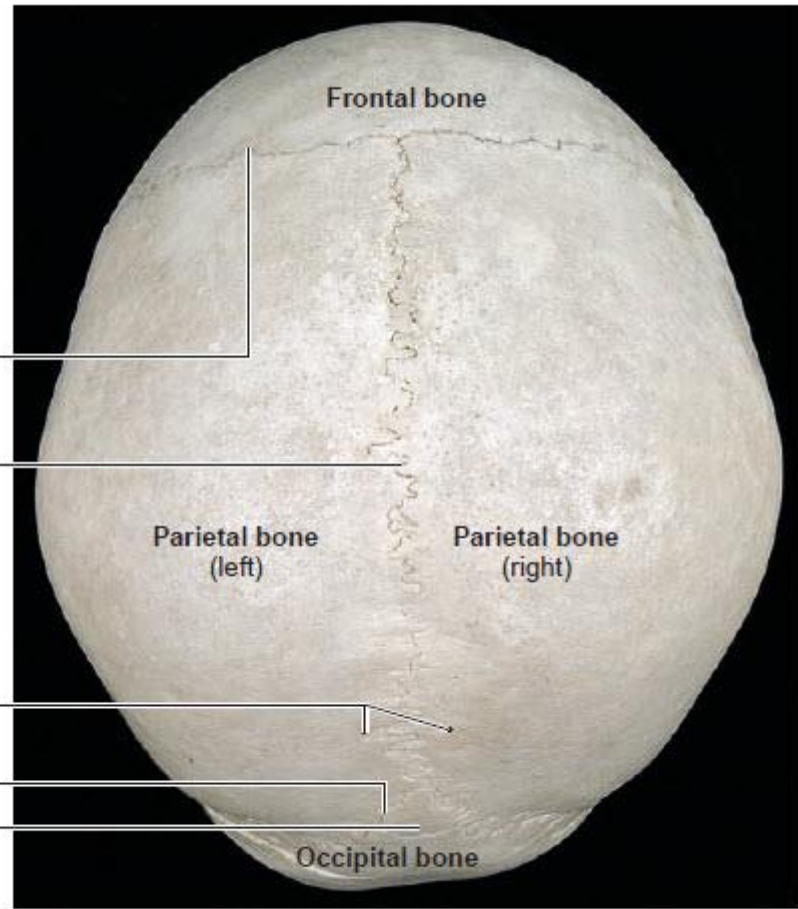
(b) Superior view

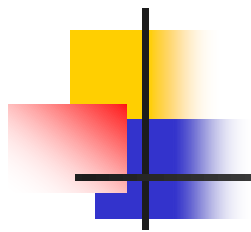






(a) Superior view



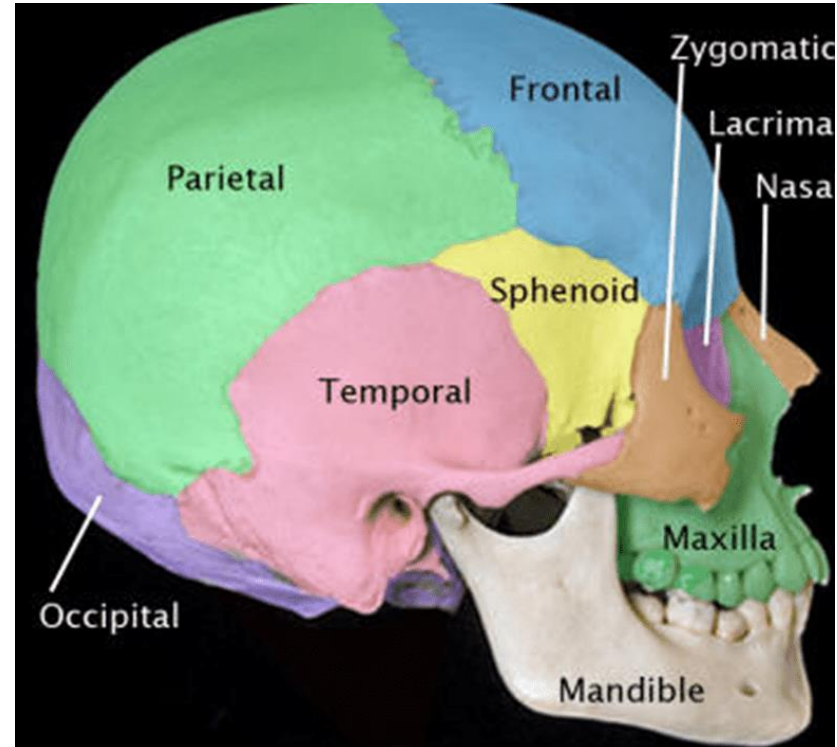


- ***Norma Lateralis***

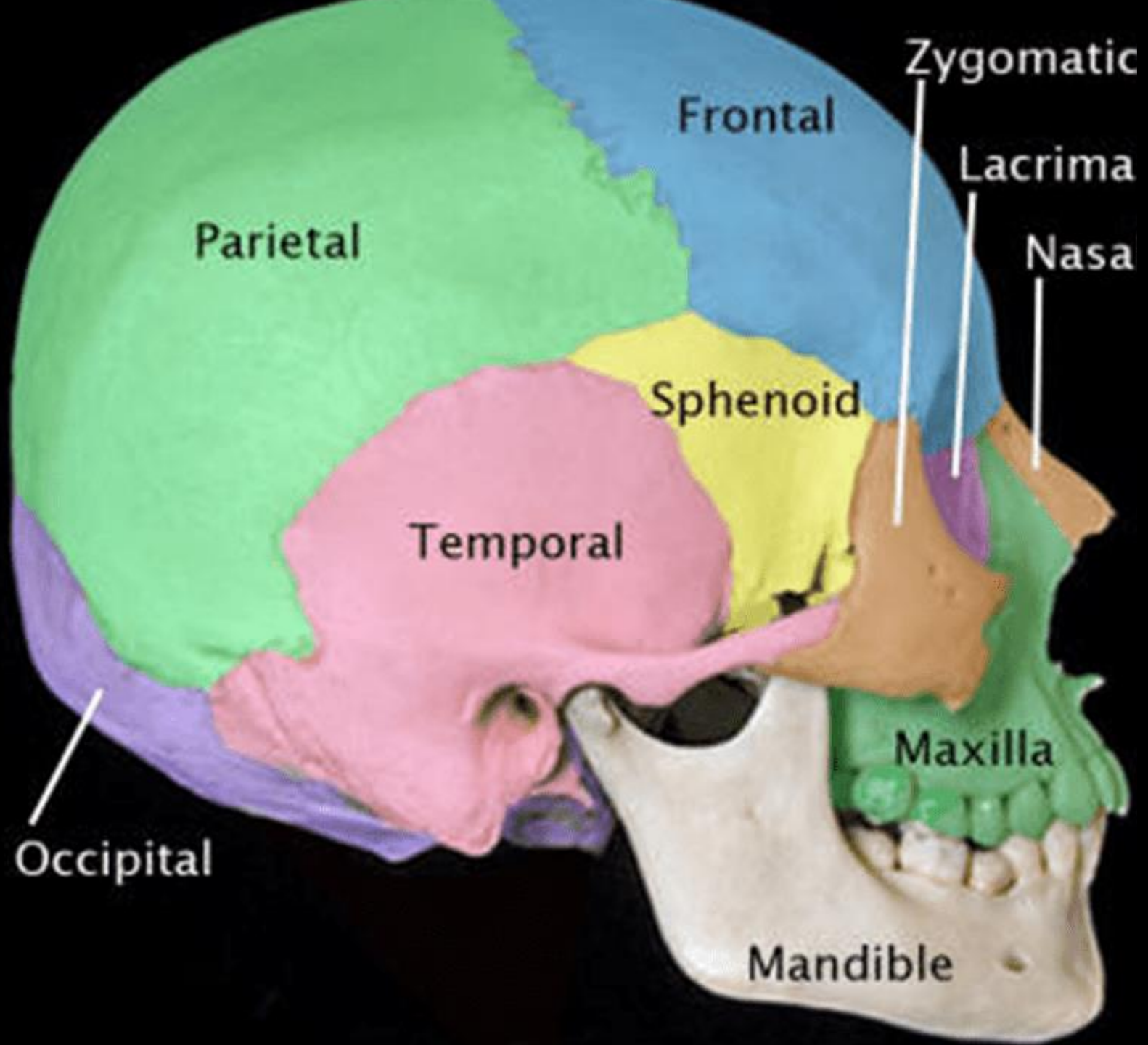
Norma Lateralis - Bones

Main bones forming this side are;

1. **Frontal**
2. **Maxilla**
3. **Parietal**
4. **Occipital**
5. **Temporal**
6. **Zygomatic bones.**
7. **Greater wing of sphenoid bone**









Norma Lateralis

The external auditory meatus:

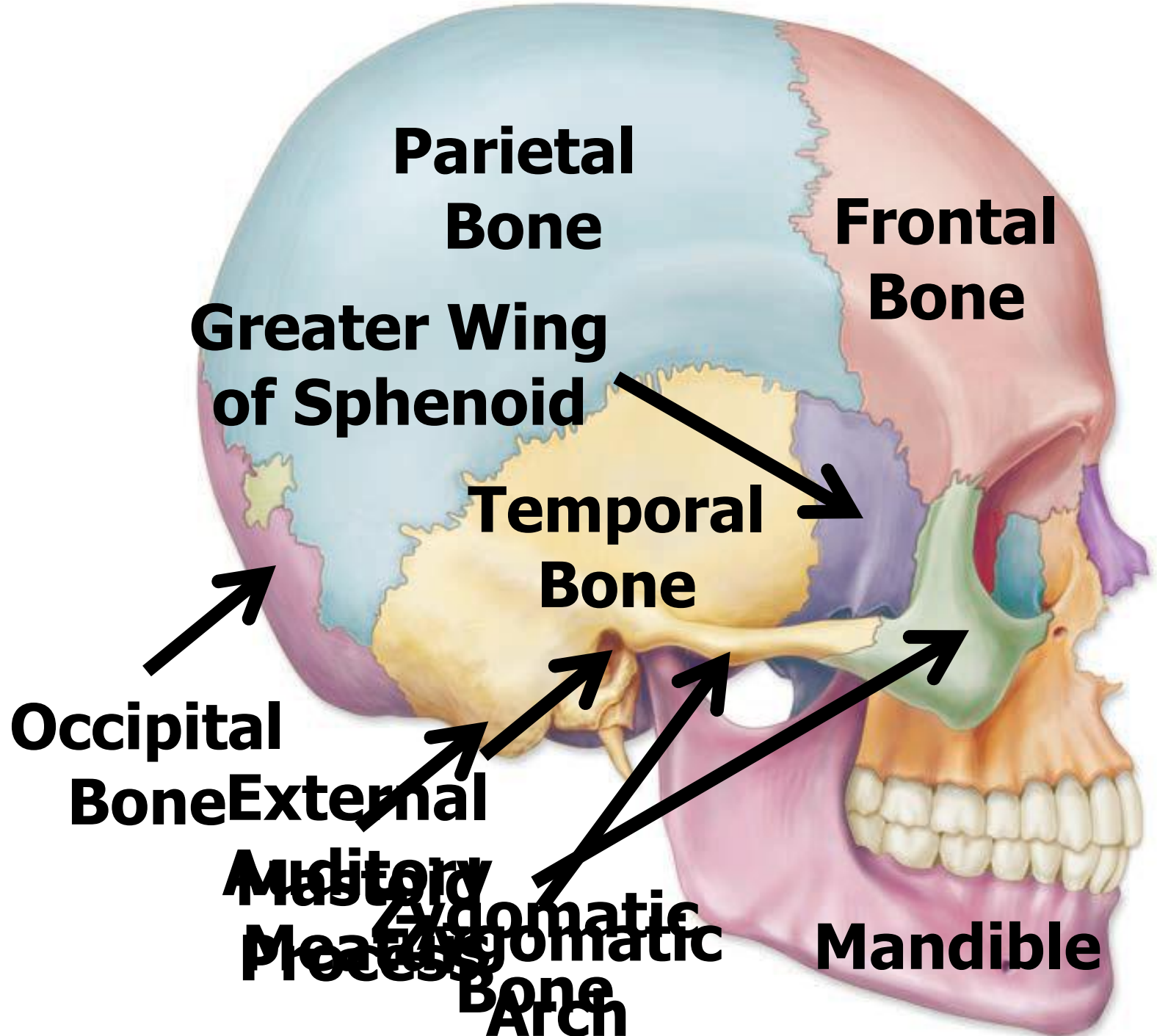
On the outer aspect of the temporal bone.

The zygomatic arch:

Connecting zygoma of the face with the temporal bone

Mastoid Process:

Bony prominence present behind the external auditory meatus



**Parietal
Bone**

**Frontal
Bone**

**Greater Wing
of Sphenoid**

**Temporal
Bone**

**Occipital
Bone**

**External
Auditory
Meatus**

**Mastoid
Process**

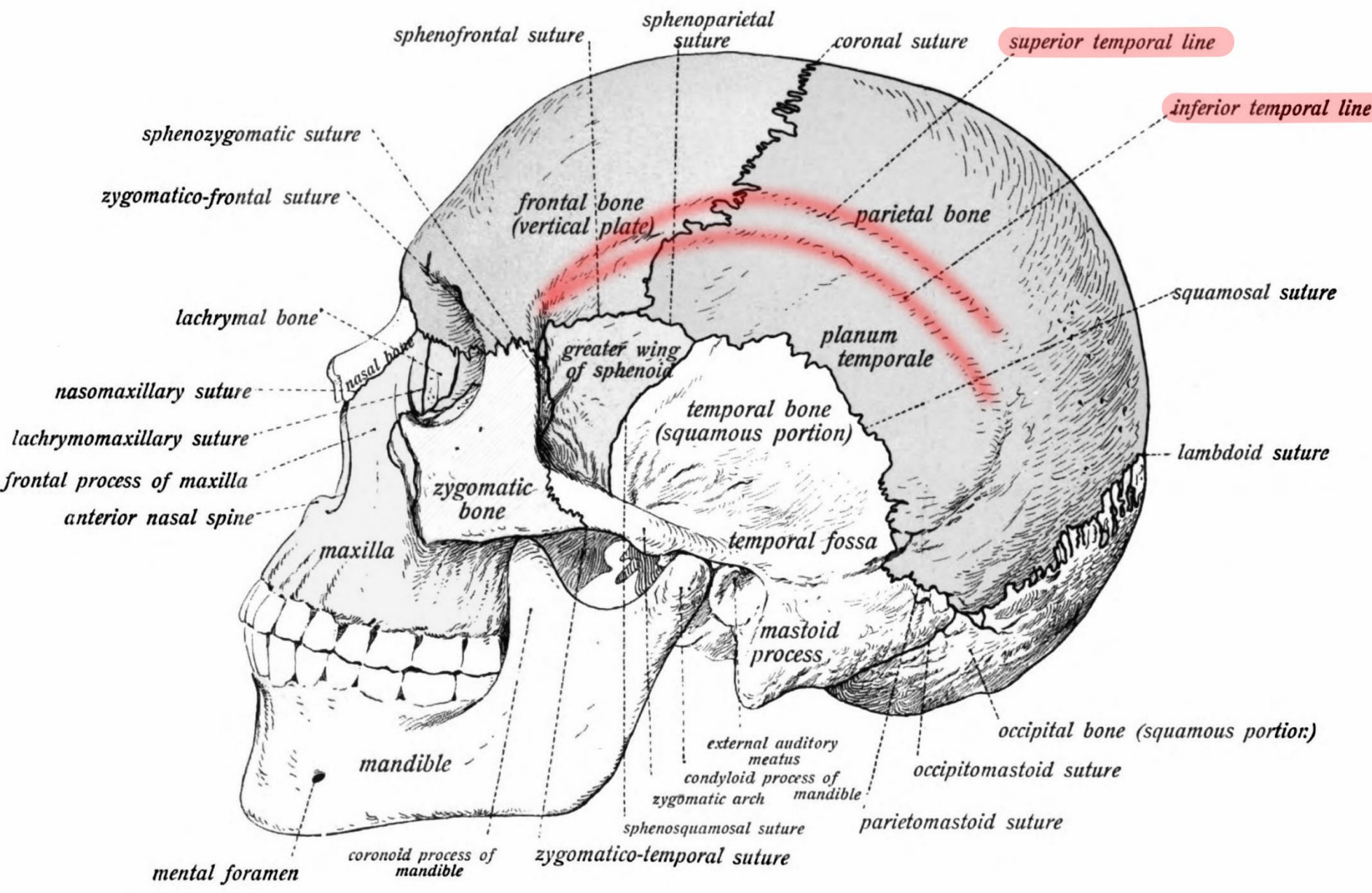
**Zygomatic
Bone
Zygomatic
Arch**

**Mandible
Bone**



Norma Lateralis

- 1. *The superior temporal line:*** extends from zygomatic bone and passes backwards.
- 2. *The inferior temporal line:*** with **the temporal fossa** lies below it.
- 3. *Styloid Process:*** Downward projection of the temporal bone





Styloid process

This anatomical illustration shows a lateral view of a human skull. The bones are color-coded: the frontal bone is light blue, the parietal bone is pink, the temporal bone is purple, the occipital bone is yellow, the sphenoid bone is green, the ethmoid bone is red, the maxilla is orange, the mandible is pink, and the zygomatic bone is purple. A black arrow points to the styloid process, a small, sharp projection of bone extending downwards from the base of the skull, specifically from the styloid process of the temporal bone.



Norma Lateralis

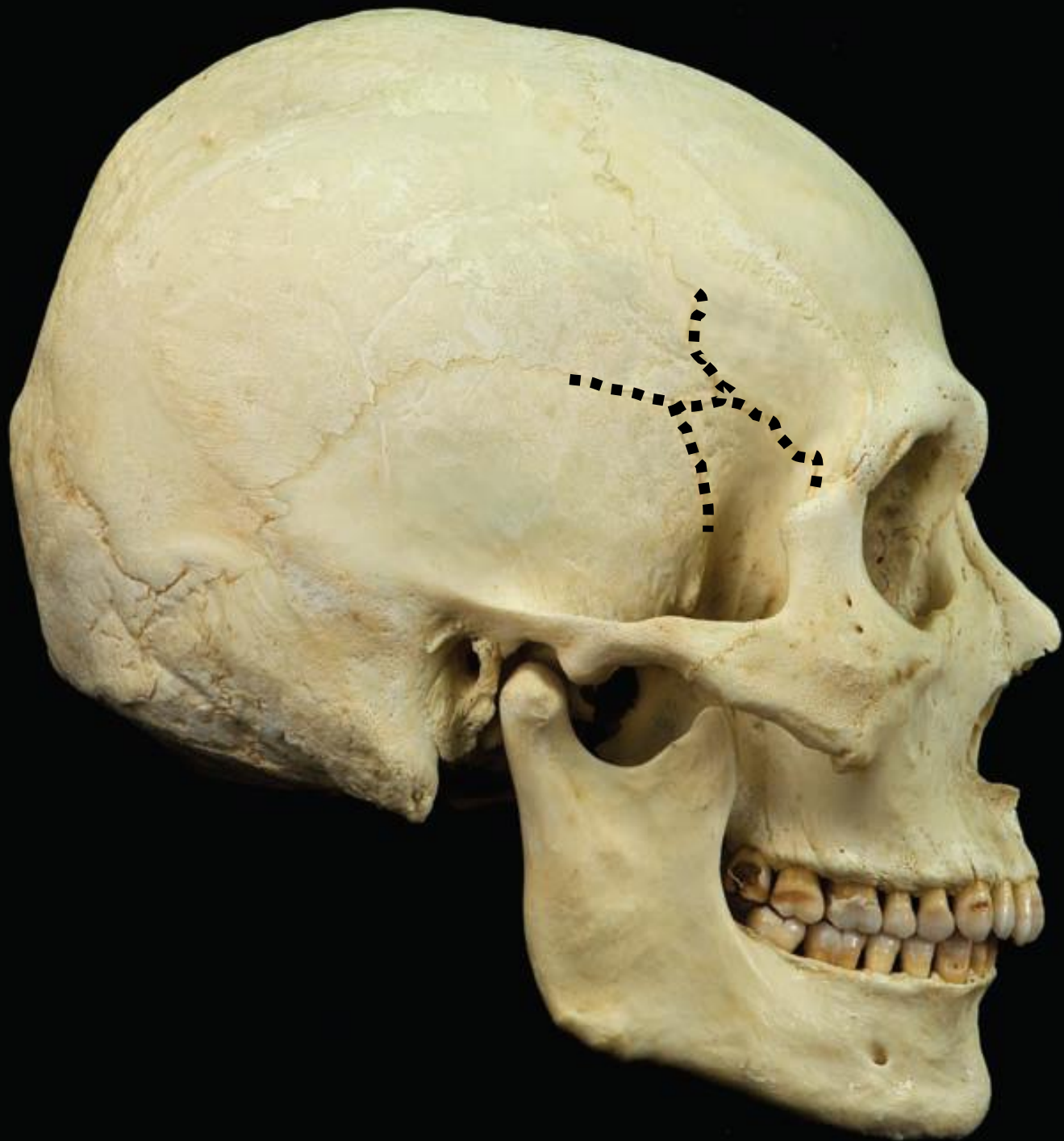
Pterion:

It is an H-shaped suture, meeting point of 4 bones, the frontal, parietal, temporal and greater wing of sphenoid.

Surface anatomy: 4 cm above the mid-point of the zygomatic arch & 3.5 cm behind frontozygomatic suture.

At birth, called anterolateral fontanelle, ossifies by the age of 3M.

It is related to the middle meningeal A. **(?!!!)**





Norma Lateralis

Asterion:

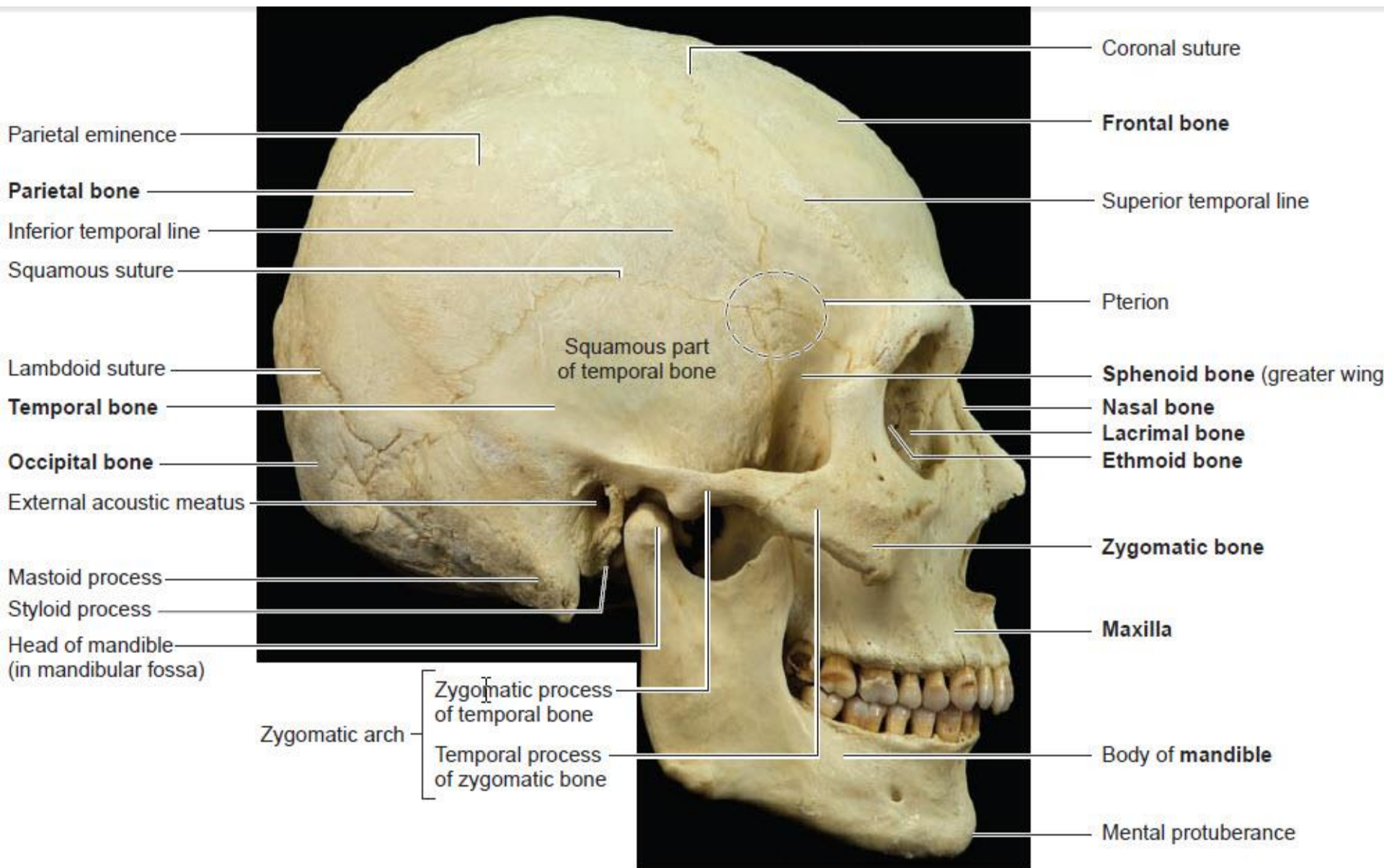
It is the meeting point of the parietal, occipital & mastoid part of temporal bones.

At birth, called postrolateral fontanelle, ossifies by the age of 3M.

Asterion







Lateral view



- ***Norma Occipitalis***



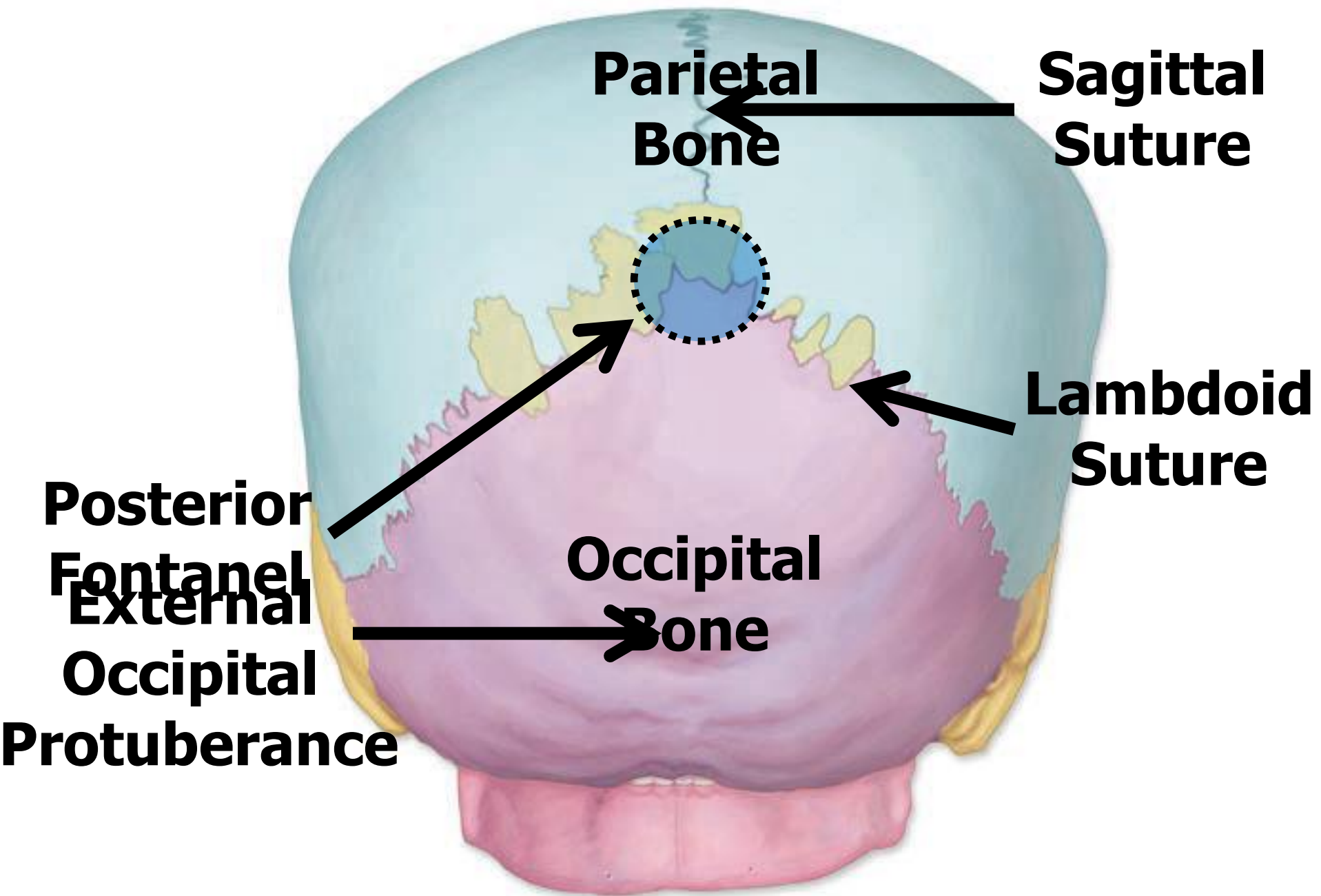
Norma Occipitalis

Formed mainly by the *Occipital bone* (*squamous part*)

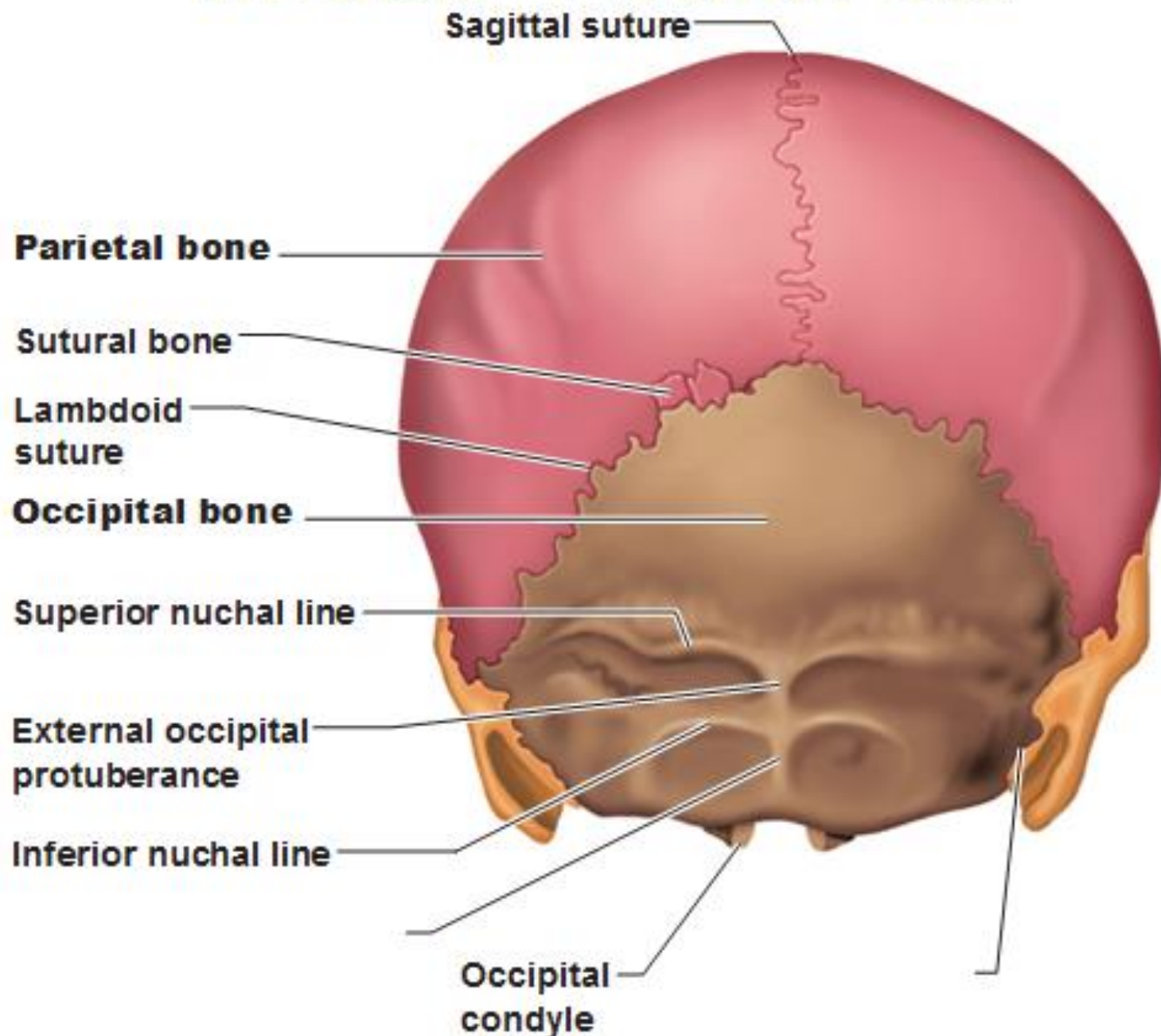
A landmark present in the area is the *External Occipital Protuberance* that can be felt low the skin, and *the crest* extending from it towards the foramen magnum

3 lines comes out both sides (*superior, inferior and highest nuchal lines*)

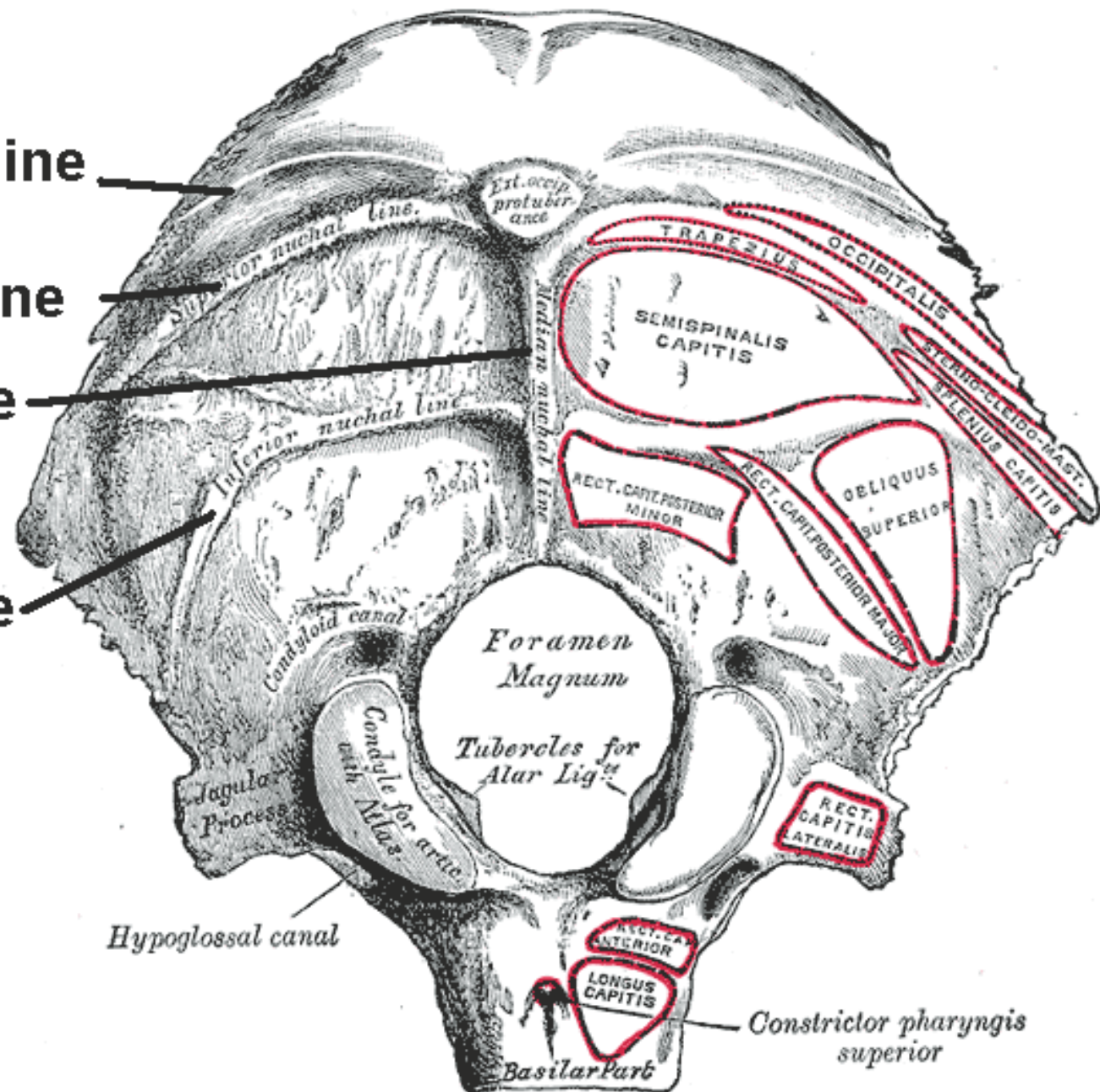


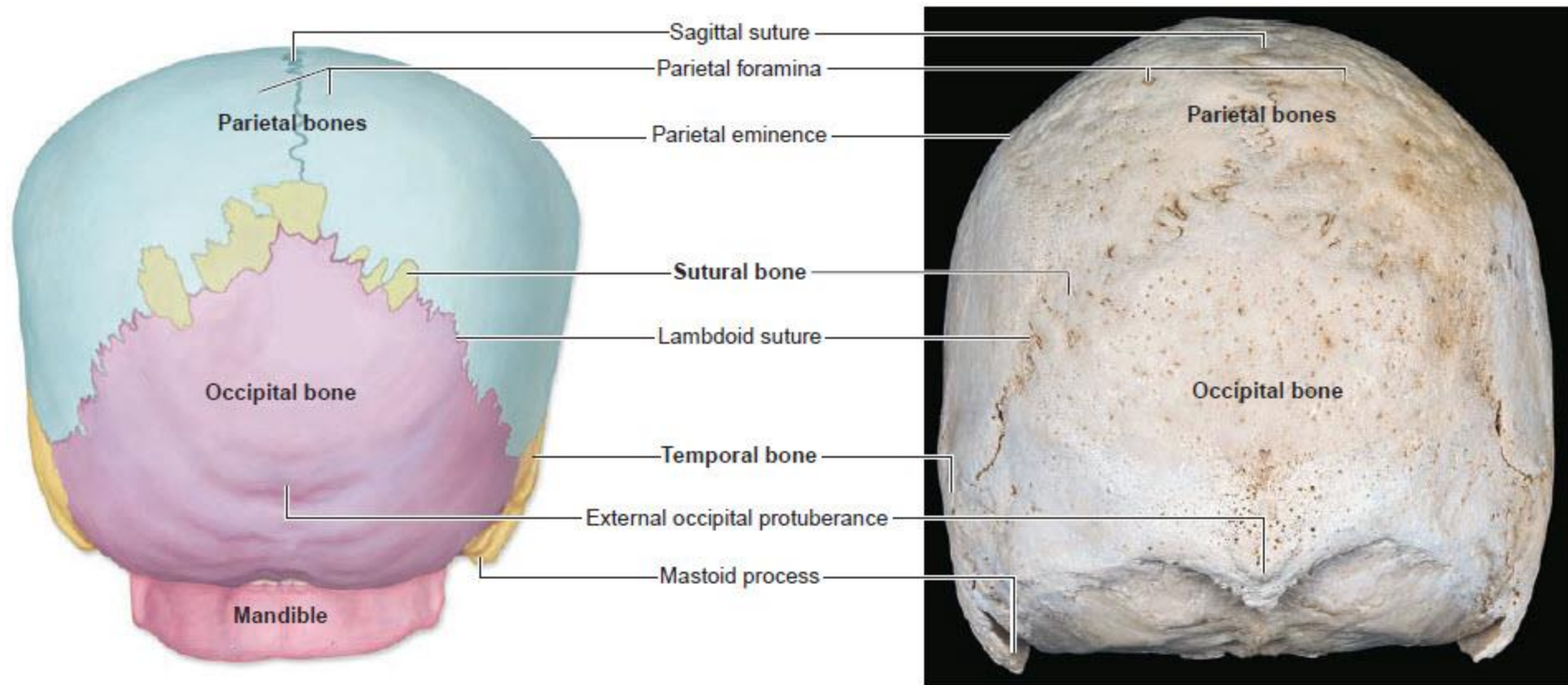


The Skull— Posterior View



highest nuchal line
superior nuchal line
median nuchal line
inferior nuchal line



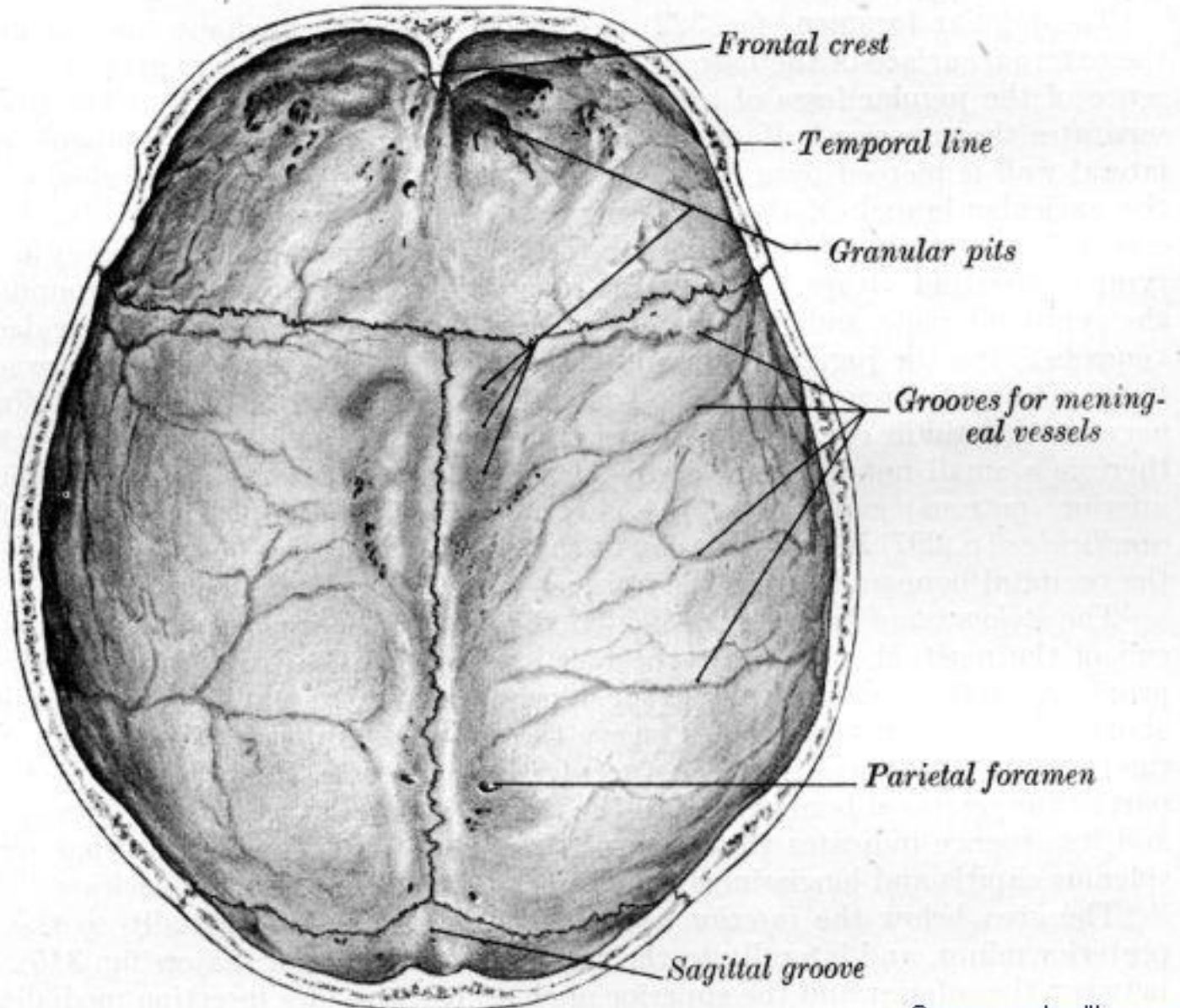


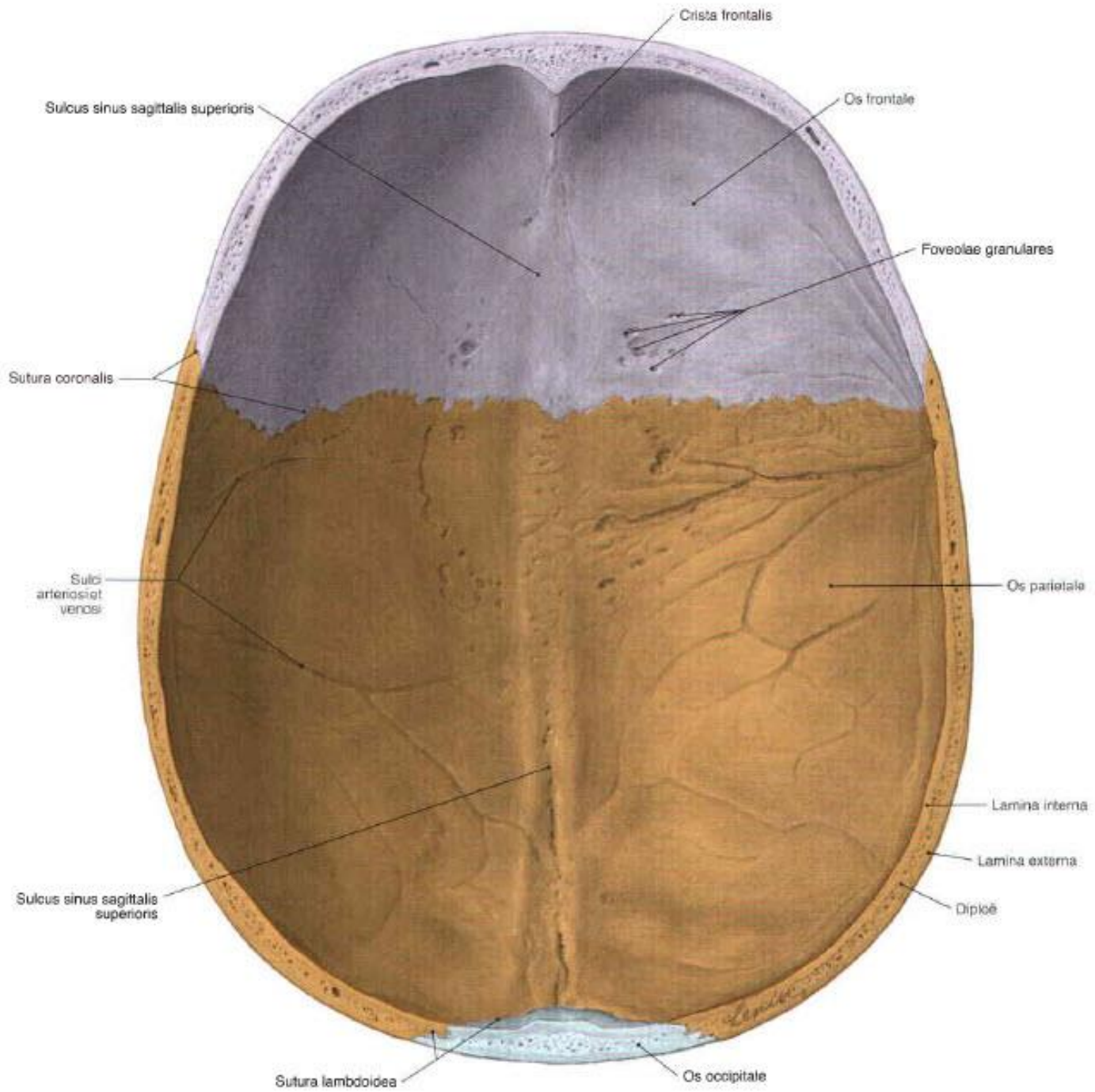


- ***Norma Basalis Interna***

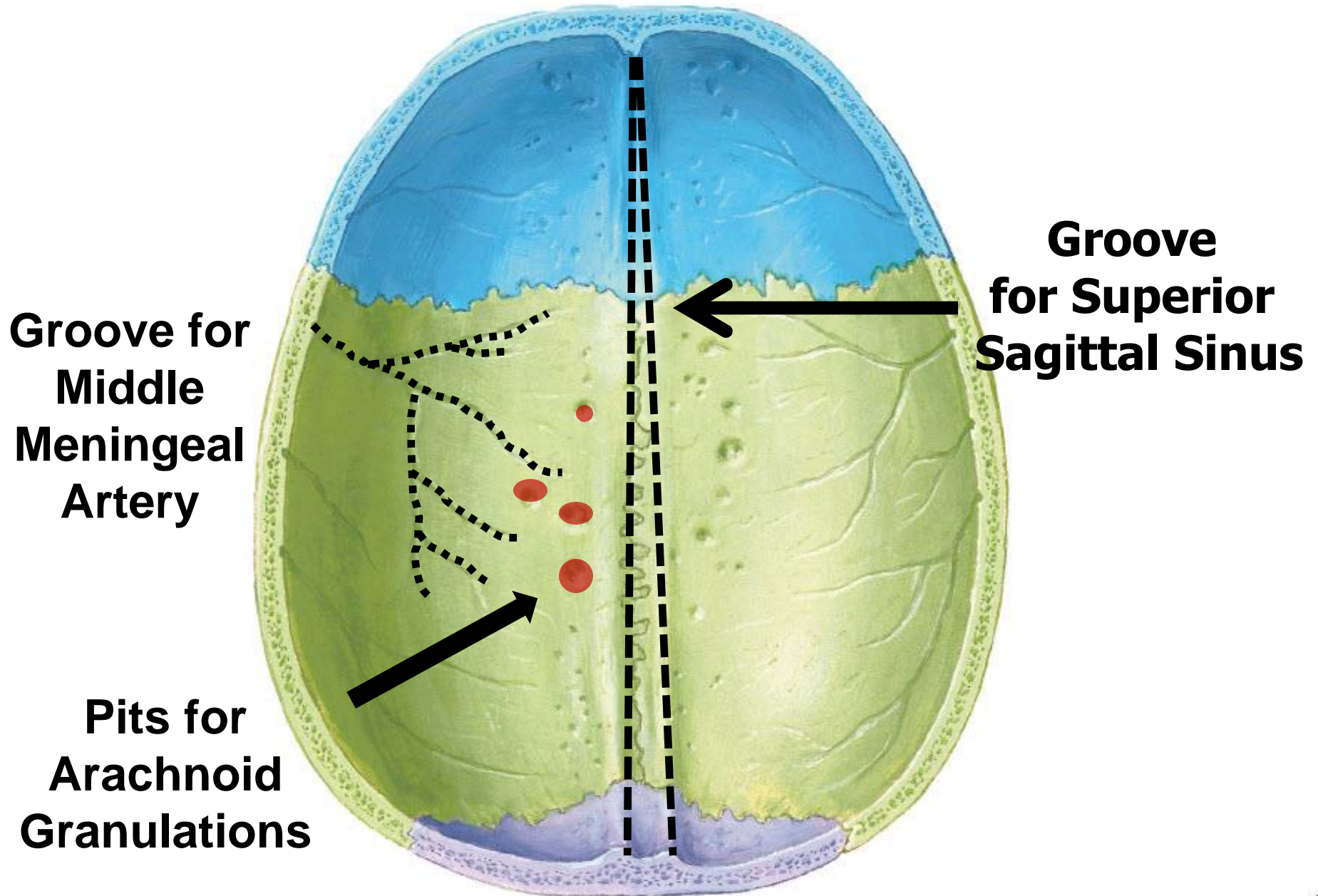
Skull Vault

FIG. 326.—The internal surface of the skull-cap.





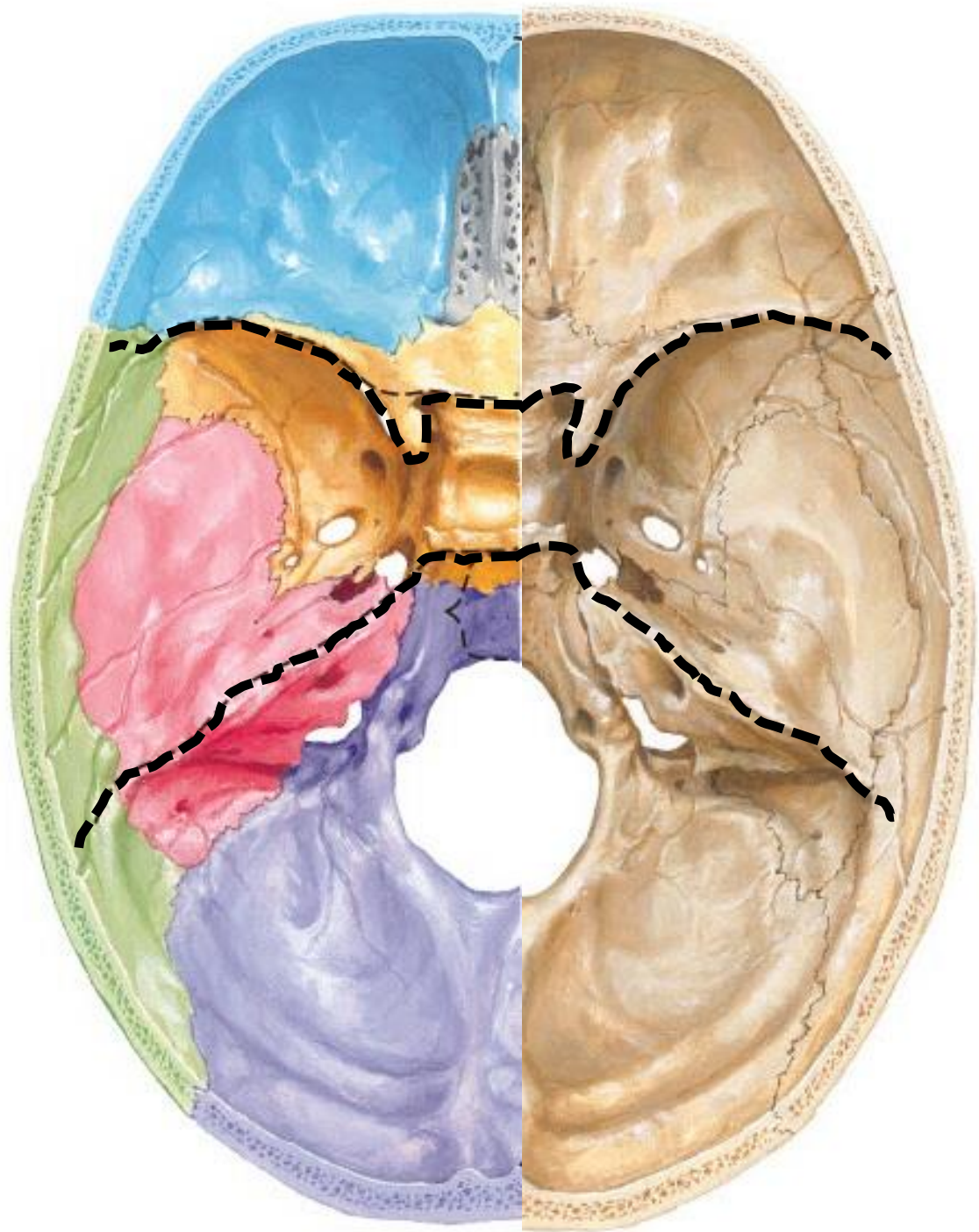
Calvaria
Inferior view

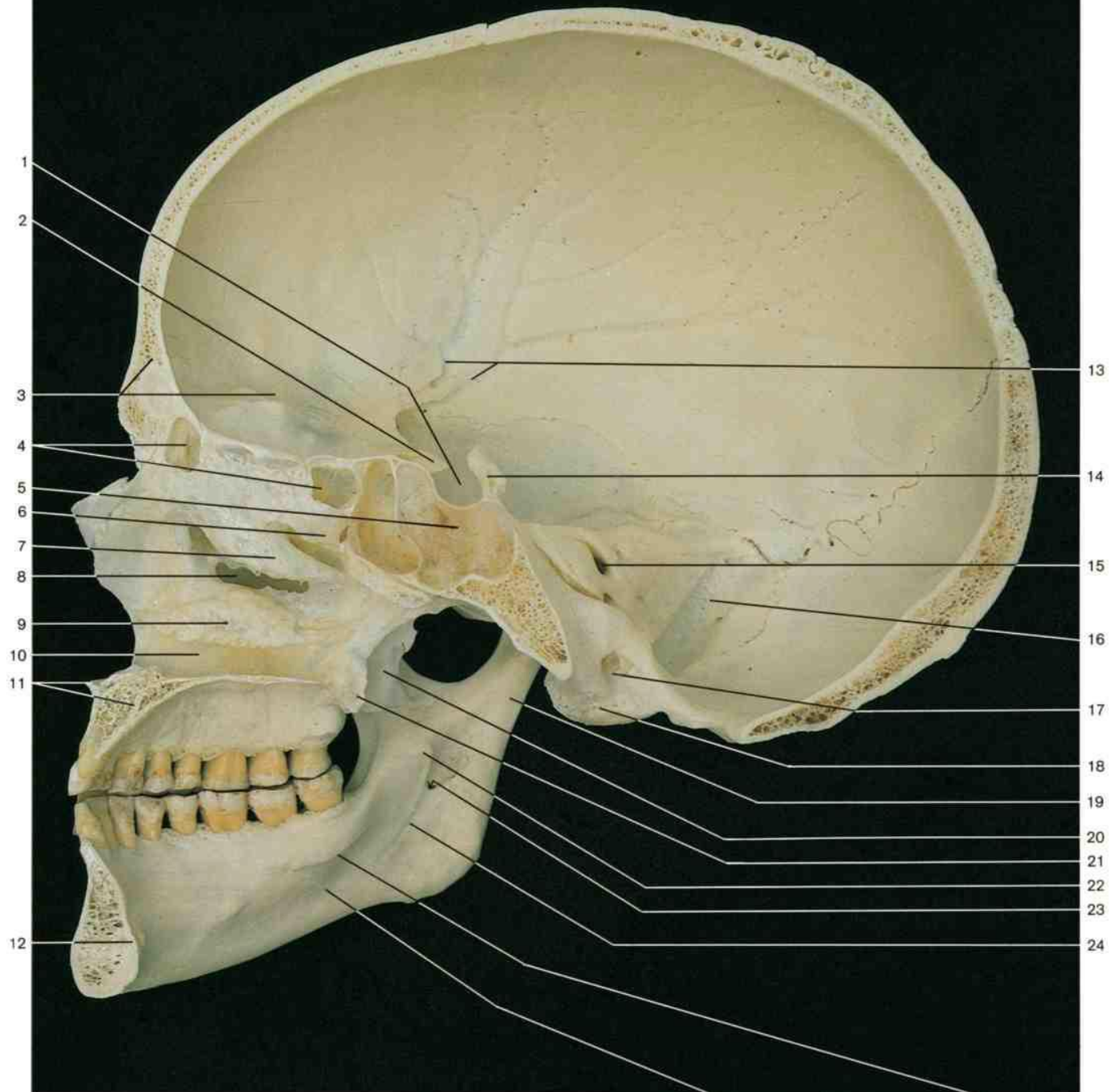


**Anterior
Cranial
Fossa**

**Middle
Cranial
Fossa**

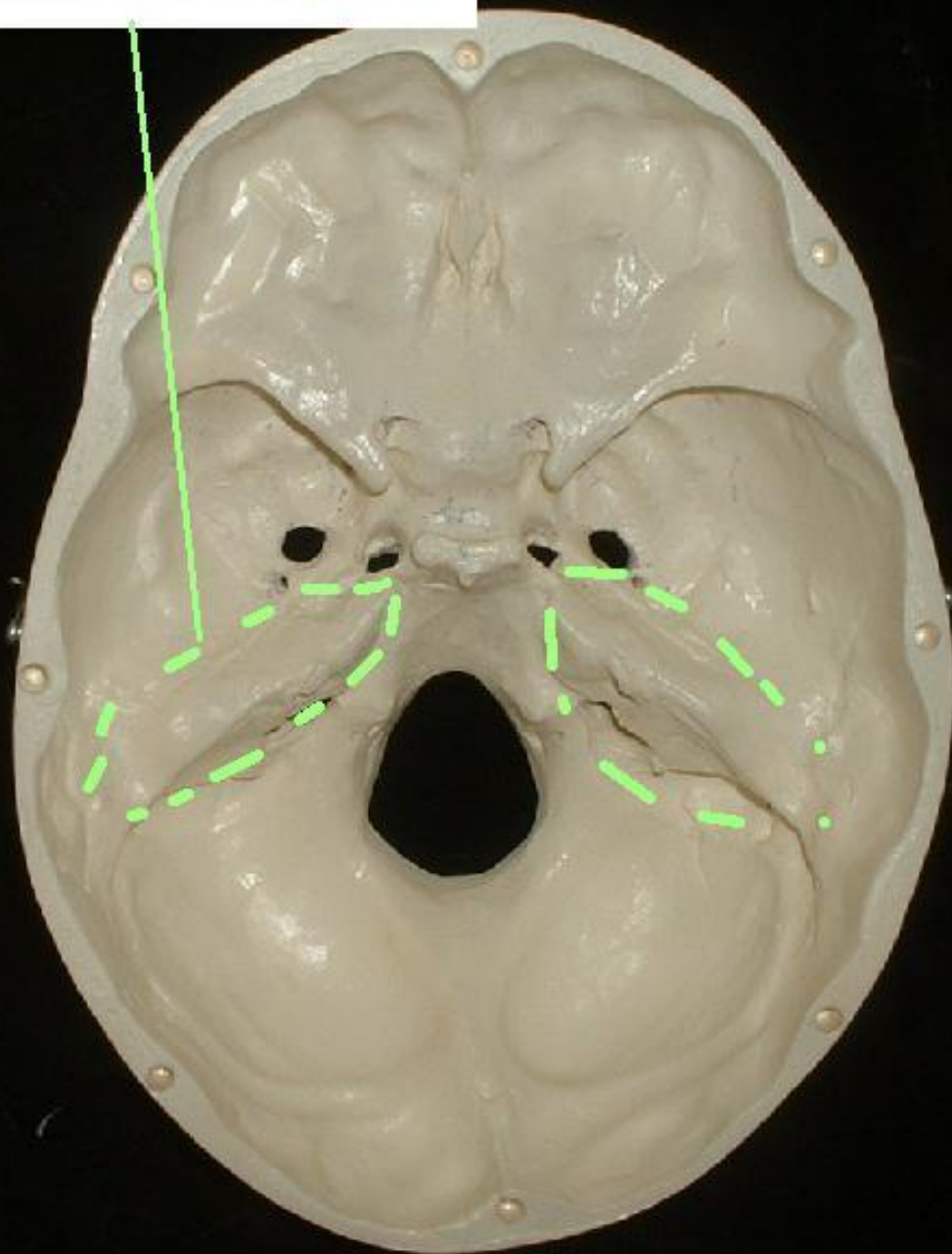
**Posterior
Cranial
Fossa**







Petrous Portion





Norma Basalis Interna

Contributing bony skeleton:

Anterior Cranial Fossa

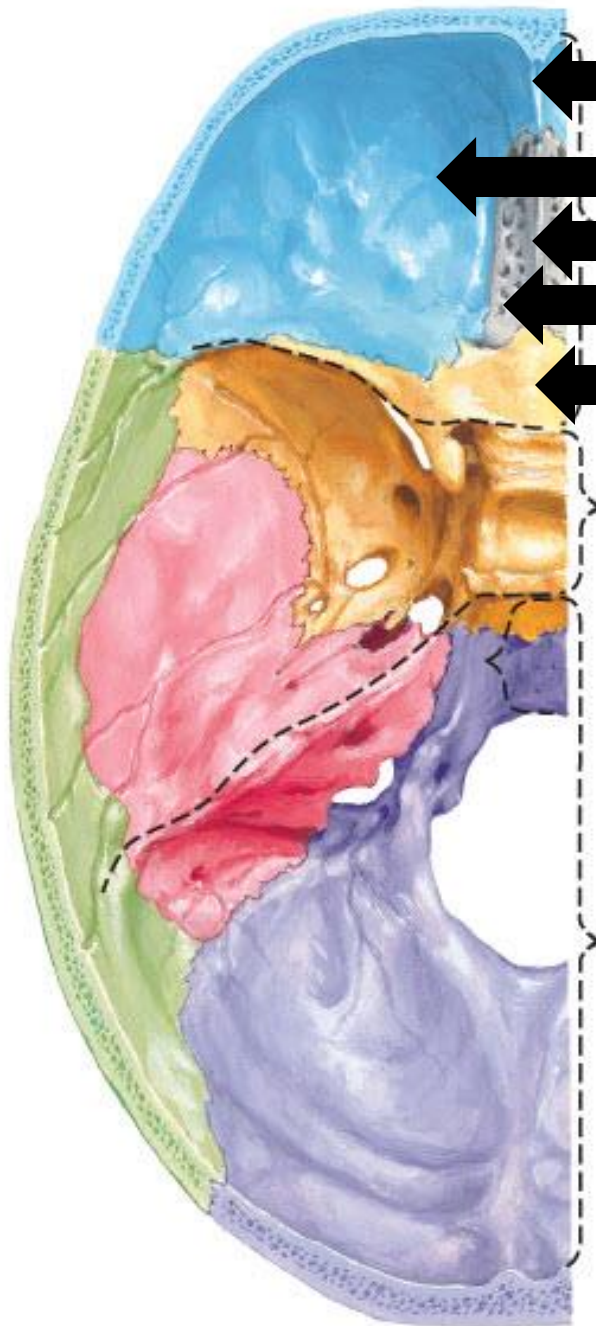
1. Frontal bone.
2. Ethmoid.
3. Sphenoid (Body & lesser wing).



Norma Basalis Interna

Features (Front backward):

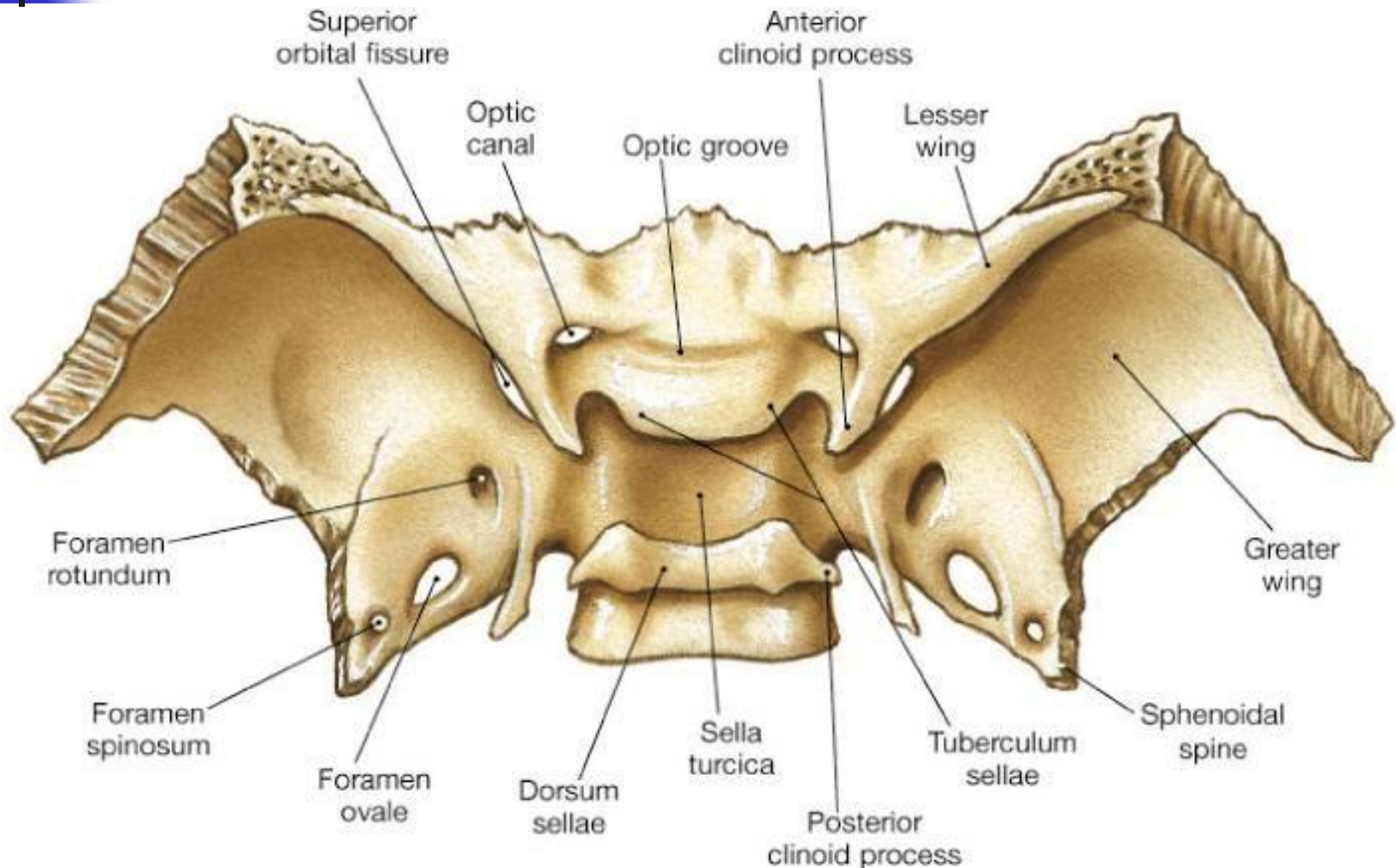
- 1. Frontal crest.**
- 2. Foramen caecum.**
- 3. Crista galli.**
- 4. Cribriform plate of ethmoid (gives passage to olfactory nerve).**



Frontal
Crest
Orbital Plate Of
Frontal Bone:
Cribriform Plate
of Ethmoid
Sphenoidale

Bony Features

Sphenoid Bone – Superior view





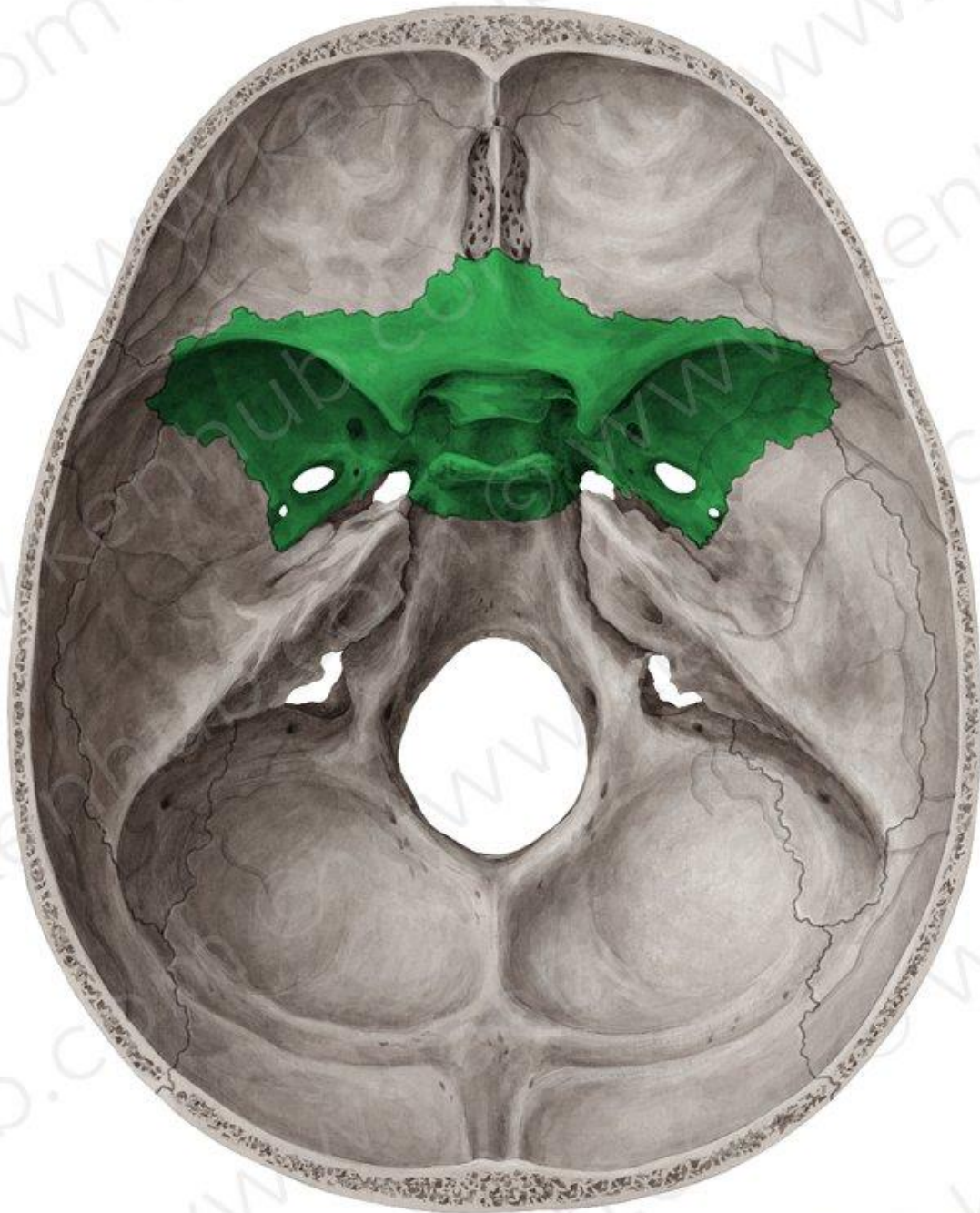
Norma Basalis Interna

Contributing bony skeleton of the **Middle Cranial Fossa**

Centrally, the sphenoid bone (body).

On each side:

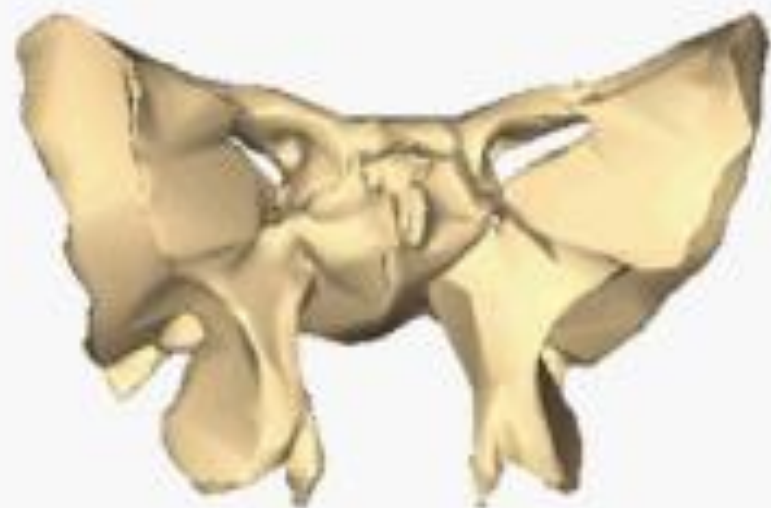
- 1. Greater wing of sphenoid**
- 2. Temporal bone:**
 - A. Petrous part.**
 - B. Squamous part.**
- 3. Parietal bone.**





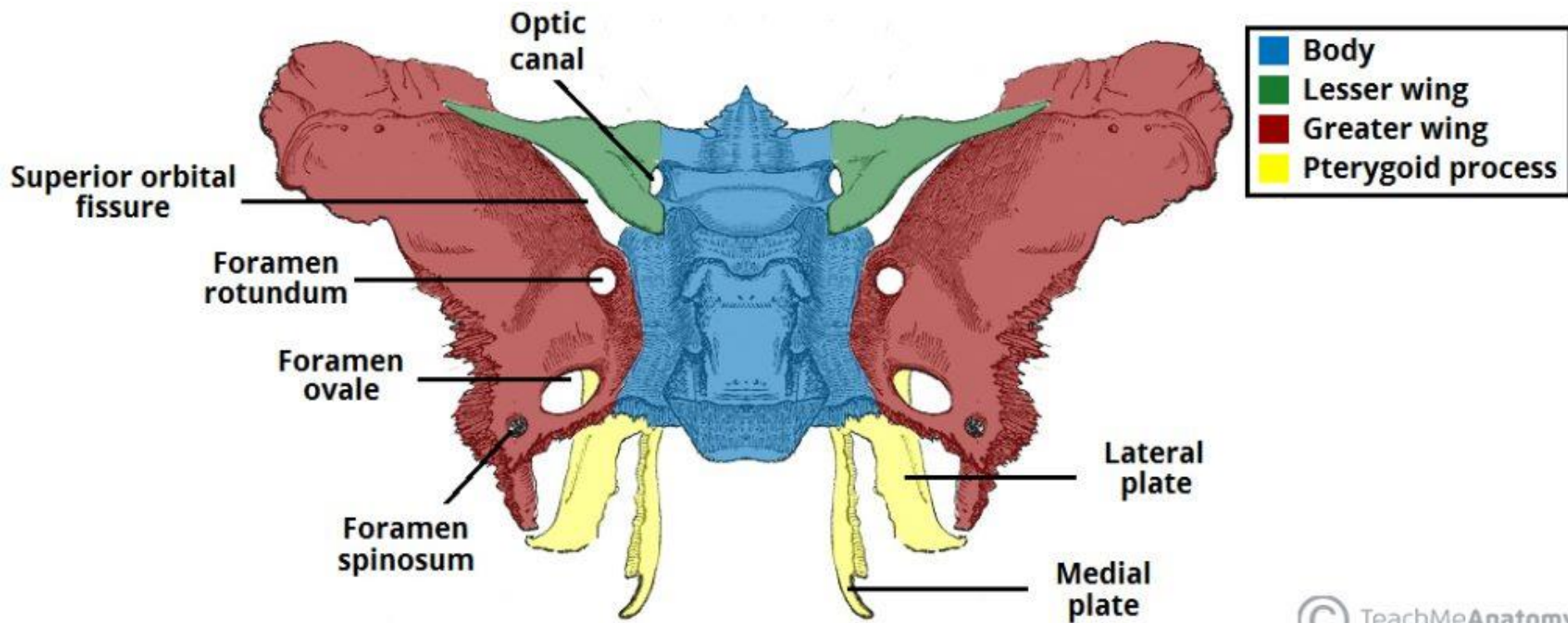


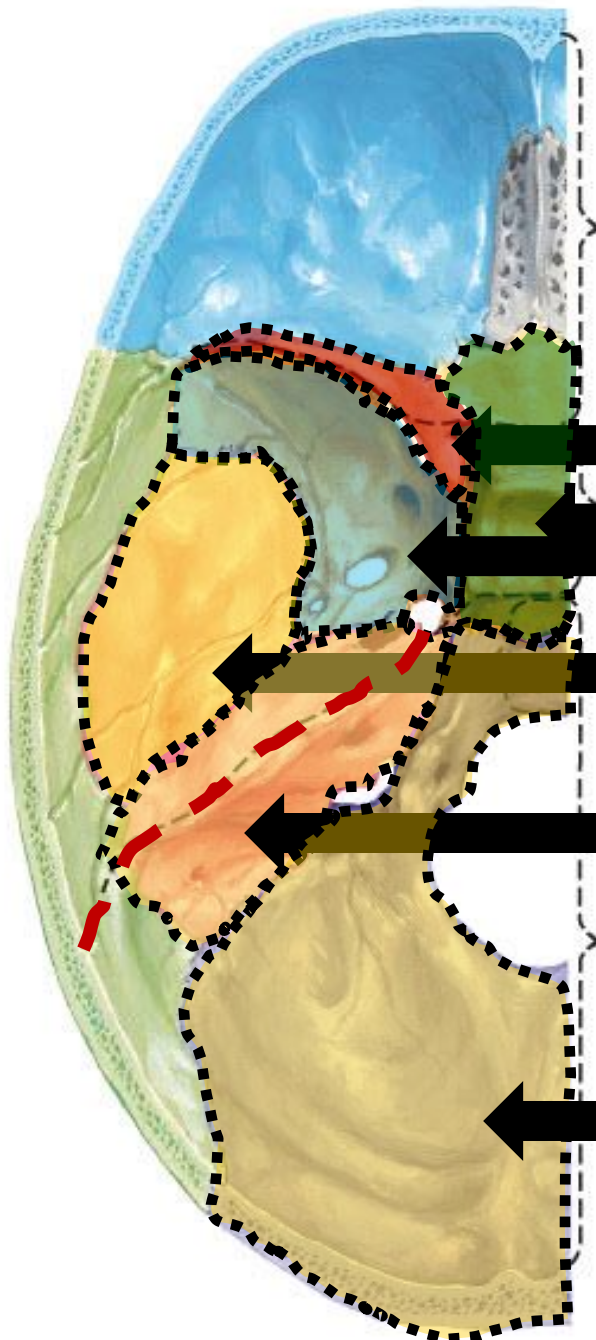
Hawkmoth's Akuma



Sphenoid bone

Sphenoid Bone – Anterior view





Lesser Wing
of Sphenoid
Greater Wing of
Sphenoid
Squamous Part of
Temporal Bone
Petrous Part of
Temporal Bone
Occipital Bone



Norma Basalis Interna

***Contributing bony skeleton of the
Posterior Cranial Fossa***

Centrally, the occipital bone.

On each side

1. Petrous part of temporal bone.
2. Parietal bone.
3. Occipital bone.



Norma Basalis Interna

Structures in Posterior Cranial Fossa (Central)

1. Internal occipital protuberance.
2. Internal occipital crest.
3. Foramen magnum.



Norma Basalis Interna

Structures in Posterior Cranial Fossa (One each side)

1. Transverse sulcus.
2. Sigmoid sulcus.
3. Jugular foramen (For IJV).
4. Hypoglossal canal.
5. Internal auditory meatus for the 7th & 8th cranial nerves).

Anterior Clinoid Process

Posterior Clinoid Process

Trigeminal Cave

Arcuate Imminence

Tegmen Tympani

Sigmoid Sulcus

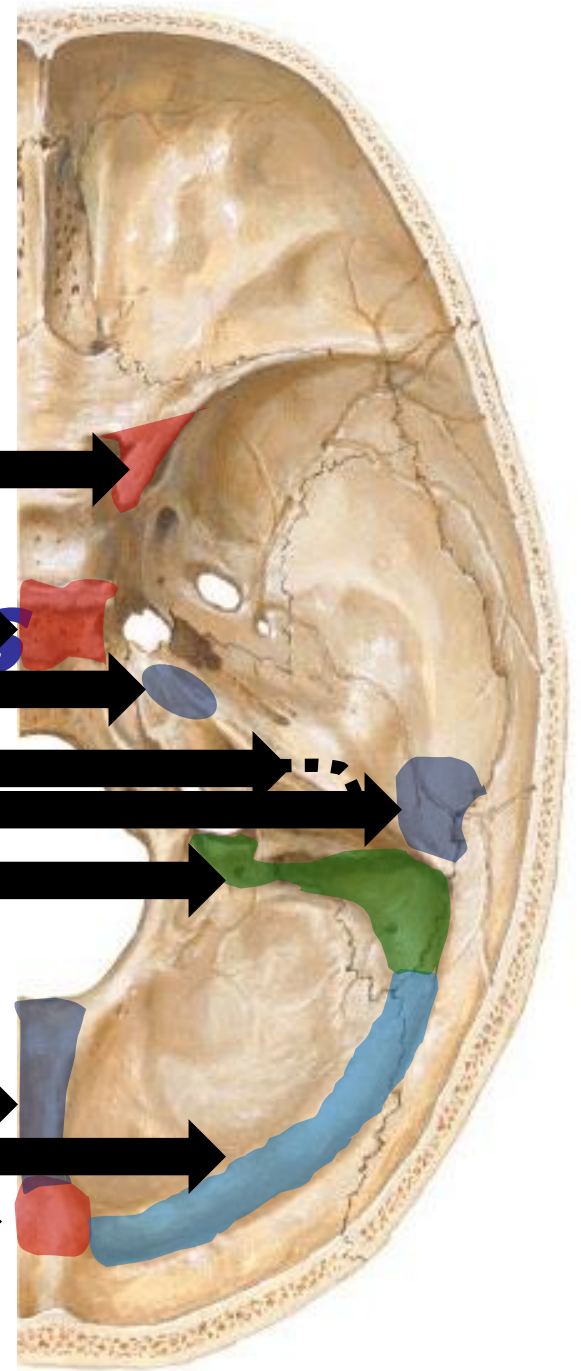
Internal Occipital Crest

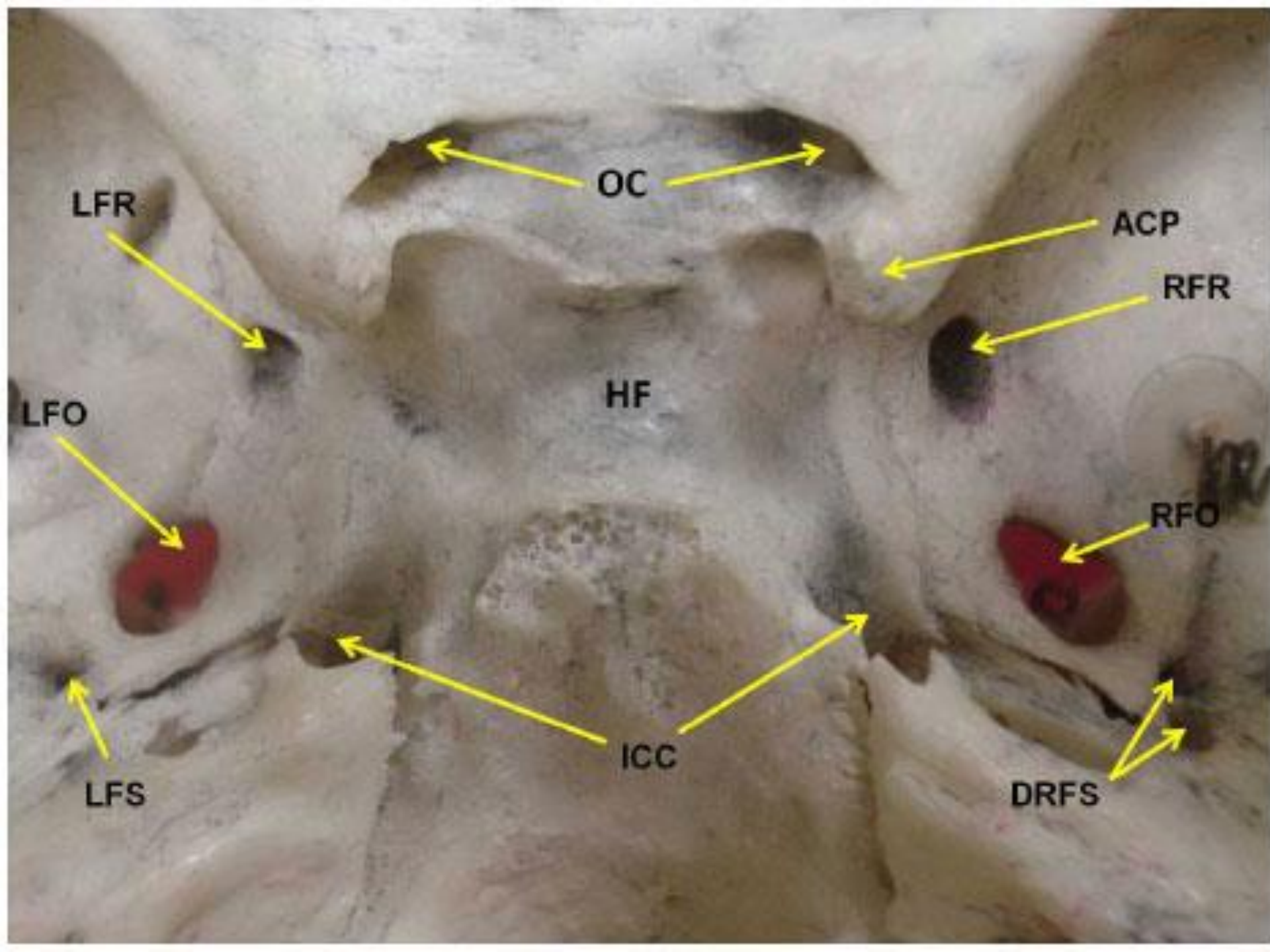
Transversers

Internal Occipital Sulcus

Protuberance

Bony Features







Norma Basalis Interna

- ***Communications through greater wing of sphenoid***
 1. **Sup. Orbital Fissure:** passes nerves & vessels to the orbit.
 2. ***Foramen Rotundum***
 3. ***Foramen Ovale.***
 4. ***Foramen Spinosum***

Foramen Caecum



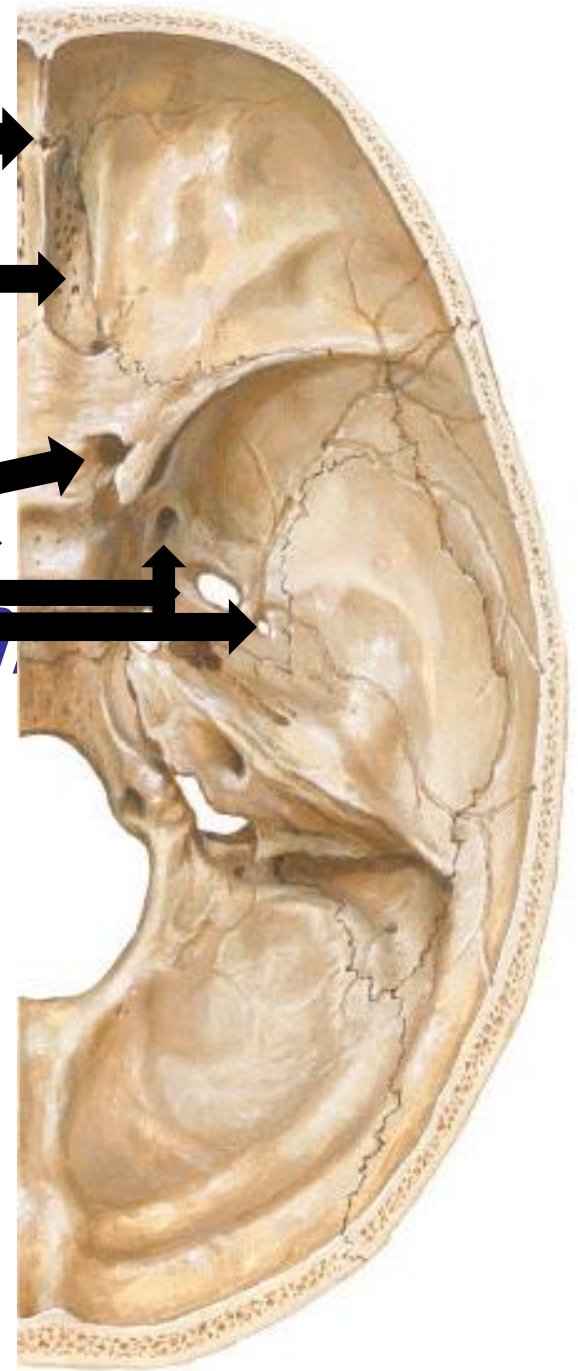
**Cribriform Plate
of Ethmoid**



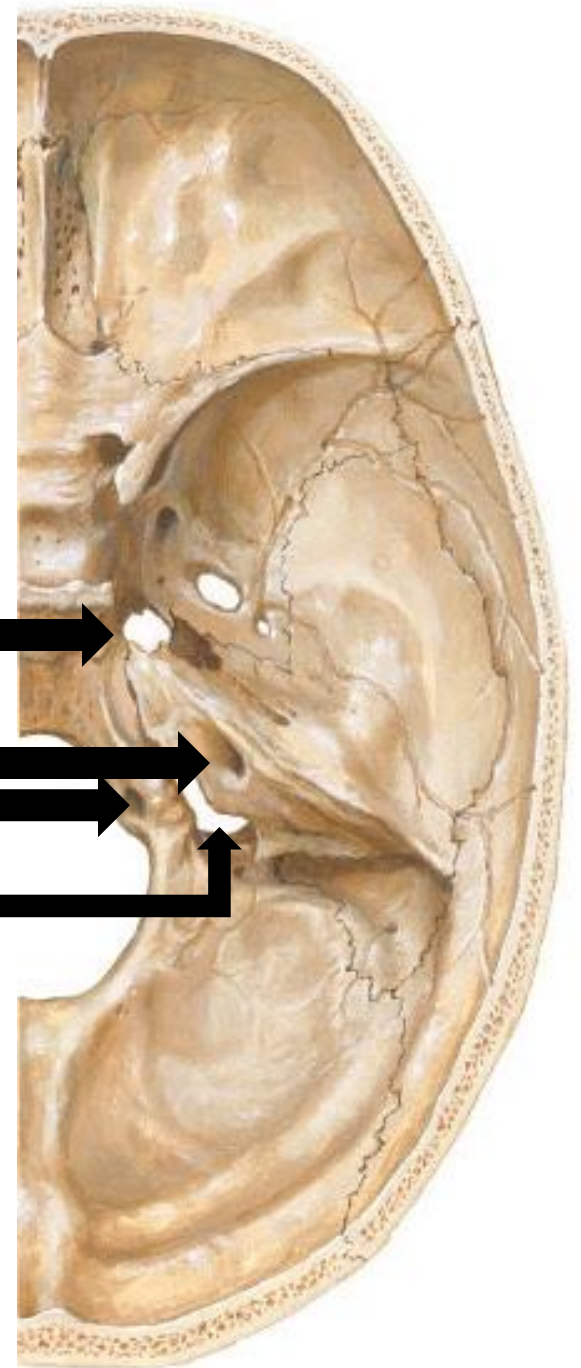
Sulcus

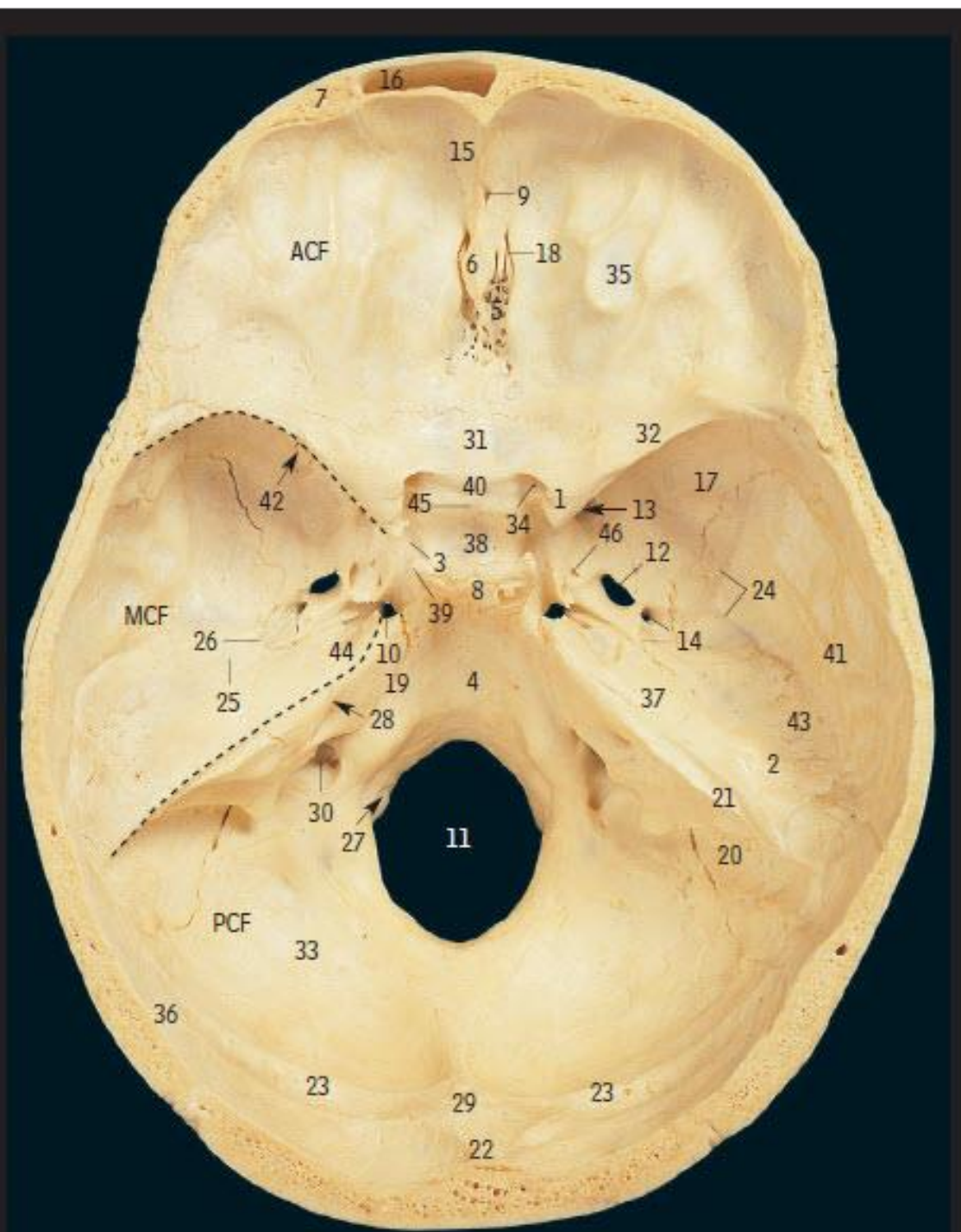


Canal Hypophysial
Foramen Ovale
Fossa Spinosum

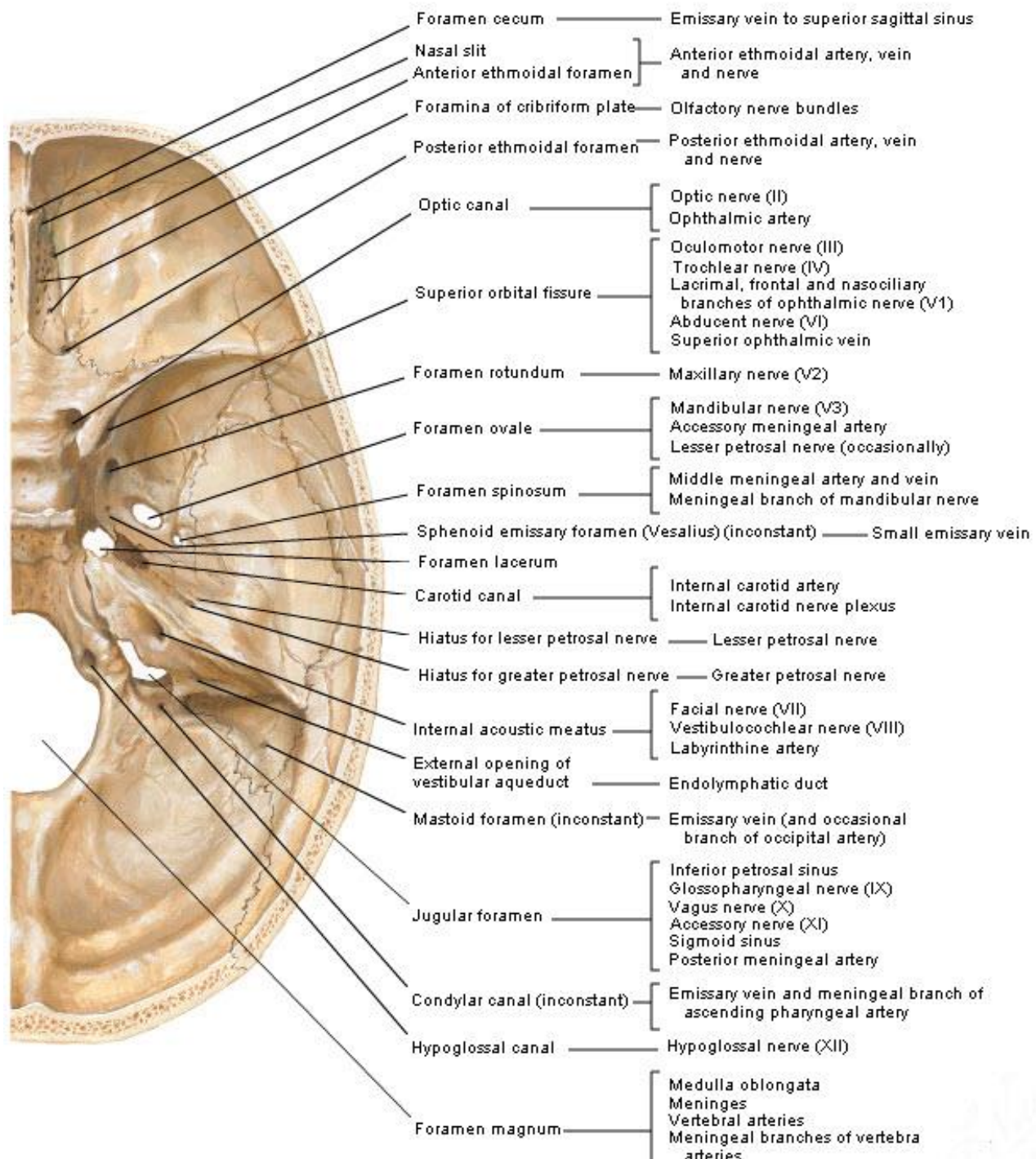


Foramen Lacerum
Internal Acoustic
Anterior Condylar
Meatus
Canal
(Hypoglossal Canal)
Jugular Canal





- 1 Anterior clinoid process
- 2 Arcuate eminence
- 3 Carotid groove
- 4 Clivus
- 5 Cribriform plate of ethmoid bone
- 6 Crista galli
- 7 Diploë
- 8 Dorsum sellae
- 9 Foramen caecum
- 10 Foramen lacerum
- 11 Foramen magnum
- 12 Foramen ovale
- 13 Foramen rotundum
- 14 Foramen spinosum
- 15 Frontal crest
- 16 Frontal sinus
- 17 Greater wing of sphenoid bone
- 18 Groove for anterior ethmoidal nerve and vessels
- 19 Groove for inferior petrosal sinus
- 20 Groove for sigmoid sinus
- 21 Groove for superior petrosal sinus
- 22 Groove for superior sagittal sinus
- 23 Groove for transverse sinus
- 24 Grooves for middle meningeal vessels
- 25 Hiatus and groove for greater petrosal nerve
- 26 Hiatus and groove for lesser petrosal nerve
- 27 Hypoglossal canal
- 28 Internal acoustic meatus
- 29 Internal occipital protuberance
- 30 Jugular foramen
- 31 Jugum of sphenoid bone
- 32 Lesser wing of sphenoid bone
- 33 Occipital bone (cerebellar fossa)
- 34 Optic canal
- 35 Orbital part of frontal bone
- 36 Parietal bone (postero-inferior angle only)
- 37 Petrous part of temporal bone
- 38 Pituitary fossa (sella turcica)
- 39 Posterior clinoid process
- 40 Prechiasmatic groove
- 41 Squamous part of temporal bone
- 42 Superior orbital fissure
- 43 Tegmen tympani
- 44 Trigeminal impression
- 45 Tuberculum sellae
- 46 Venous (emissary) foramen

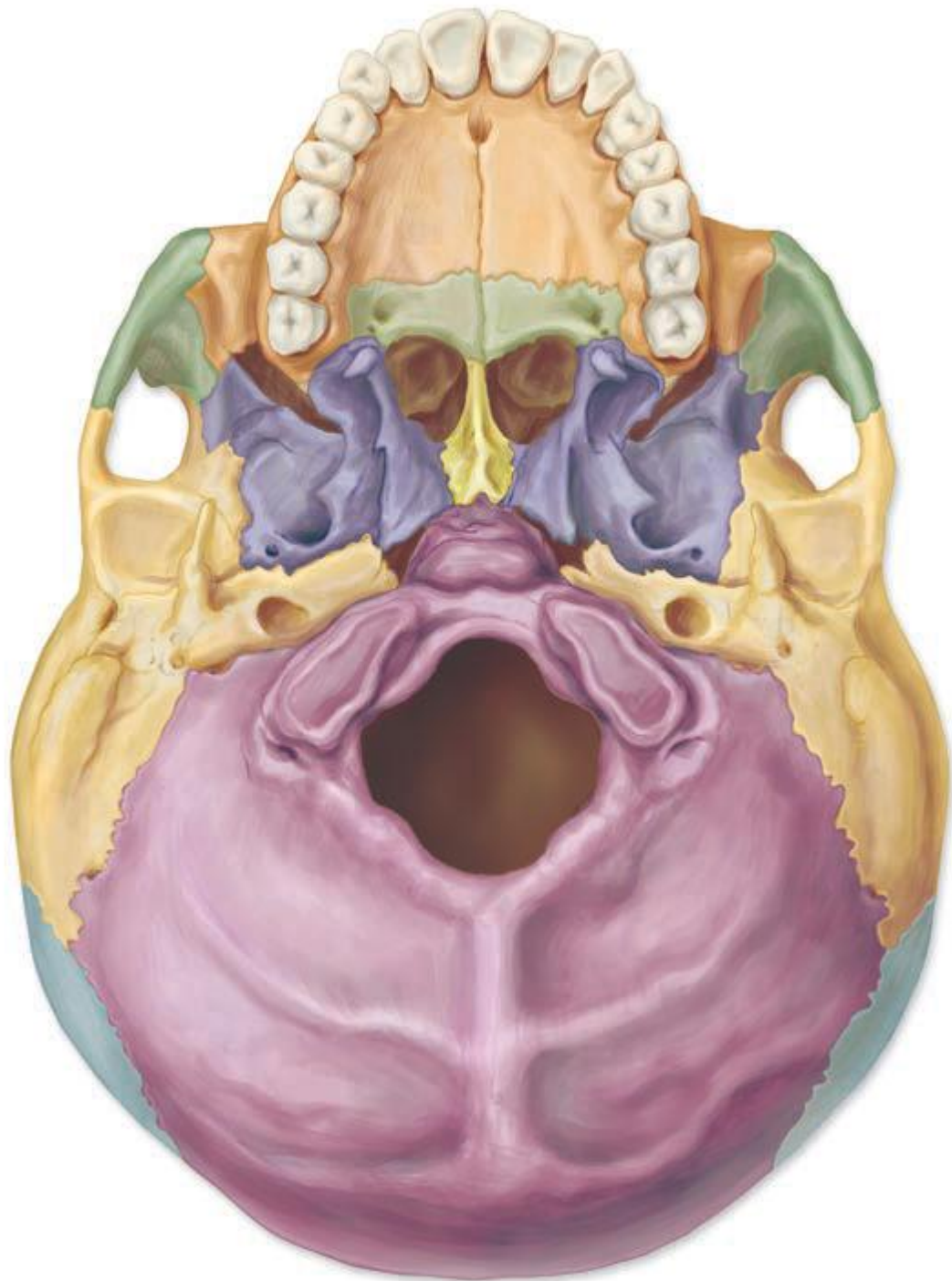






- ***Norma Basalis Externa***

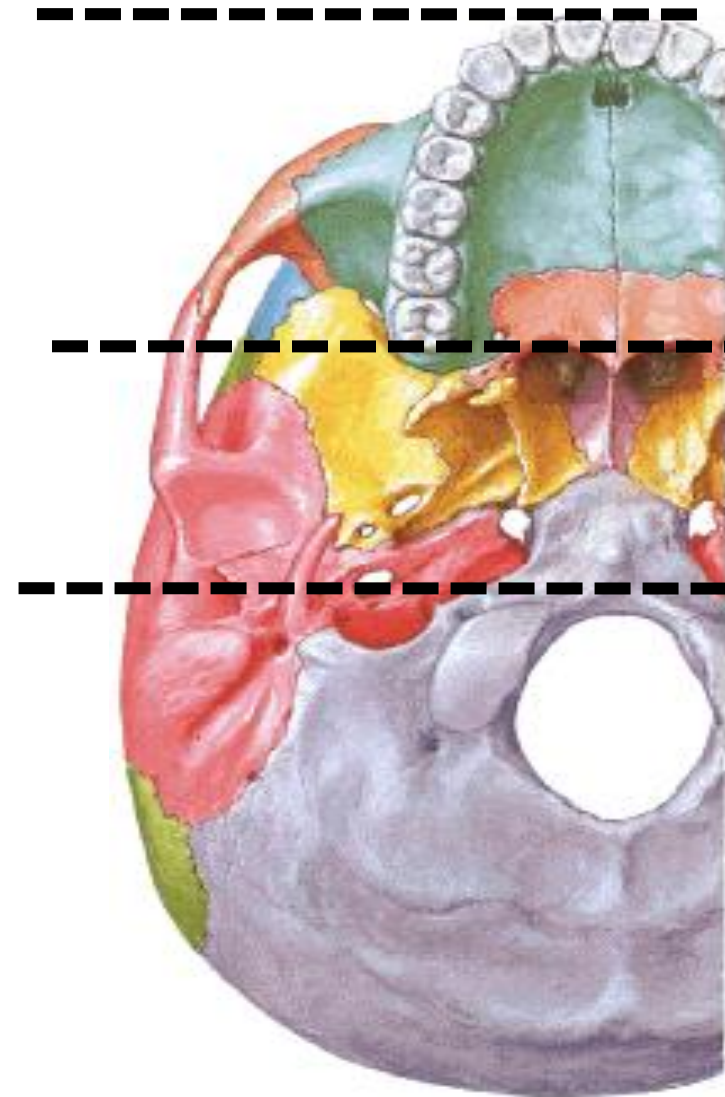




Norma Basalis Externa

- **Divided into 3 parts:**

- 1) **Anterior part** → formed by the bony palate (bounded by alveolar arch)
- 2) **Middle part** → extends from posterior border of bony palate to anterior margin of foramen magnum
- 3) **Posterior part** → parts of occipital bone surrounding foramen magnum



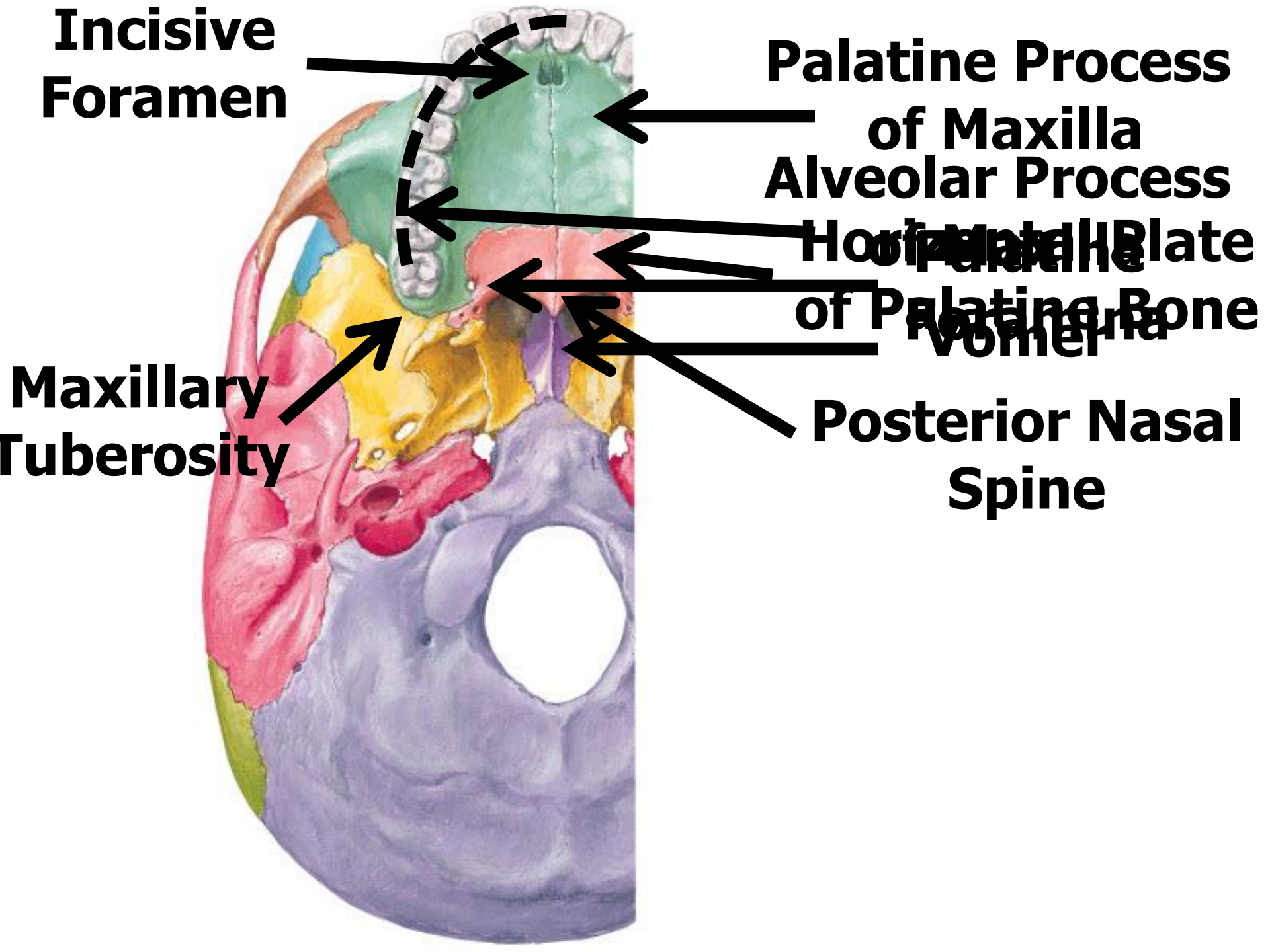


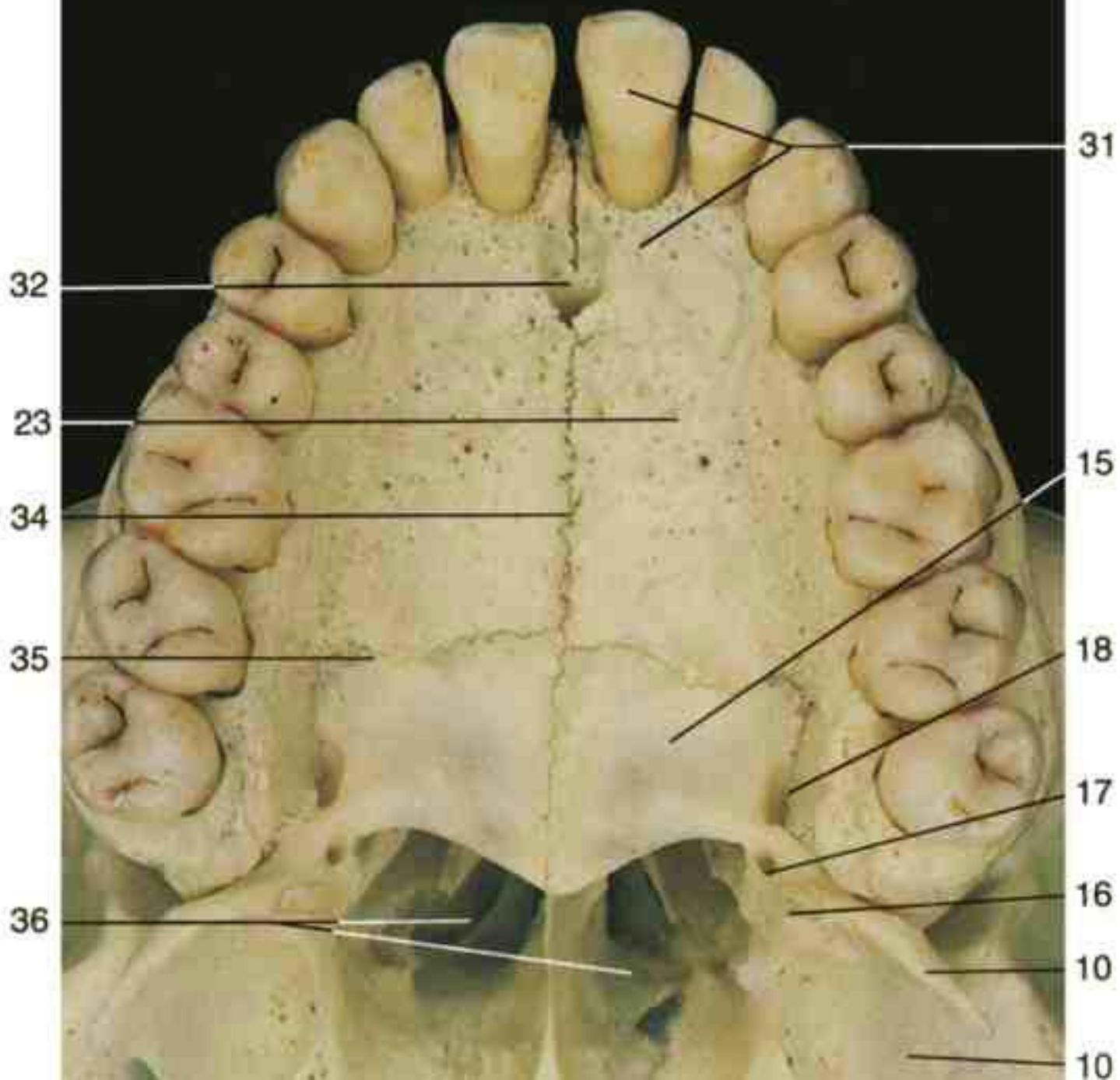
Norma Basalis Externa - Foramina

The incisive fossa: lies posterior to the central incisor teeth connecting between palate & nose.

Palatine foramina (Greater & Lesser): lies in the posterior part of the hard palate.

The maxillary tuberosity: is present at the posterior end of the alveolar arch.







Norma Basalis Externa

In the middle, the following structures are present:

Vomer.

Body of sphenoid.

Occipital bone.

Sideways shows the following structures:

Greater wing of sphenoid.

Petrous part of temporal bone.

Tympanic parts of temporal bone.

Mastoid process.

Posterior nasal openings (choanae) opens into this part of the base of the skull.

Foramina from the middle cranial fossa.



Norma Basalis Externa

Foramen lacerum: lies between petrous part of temporal bone, the occipital and the pterygoid process.

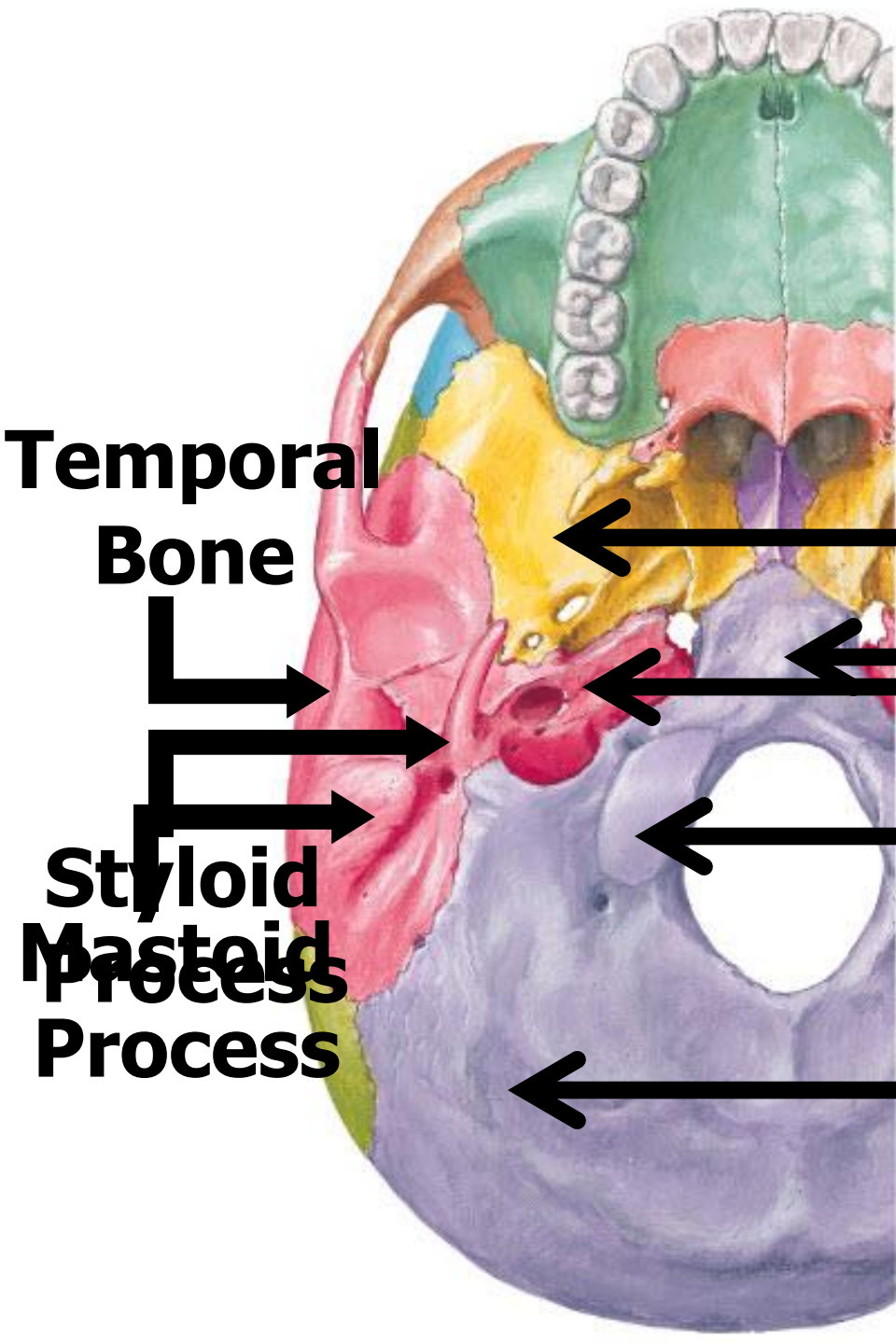
Carotid canal: lies posterolateral to foramen lacerum.

Jugular foramen: lateral to the occipital condyle.

Stylomastoid foramen: in-between styloid and mastoid processes.

Anterior condylar (hypoglossal) foramen: for the hypoglossal nerve.

Foramen magnum: communicating the cranial cavity with the vertebral canal



Temporal Bone



Styloid Process
Mastoid Process

Greater Wing of Sphenoid



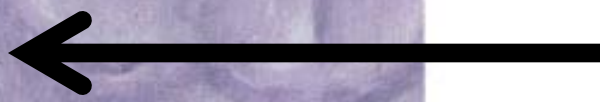
Basilar Part of Occipital Bone



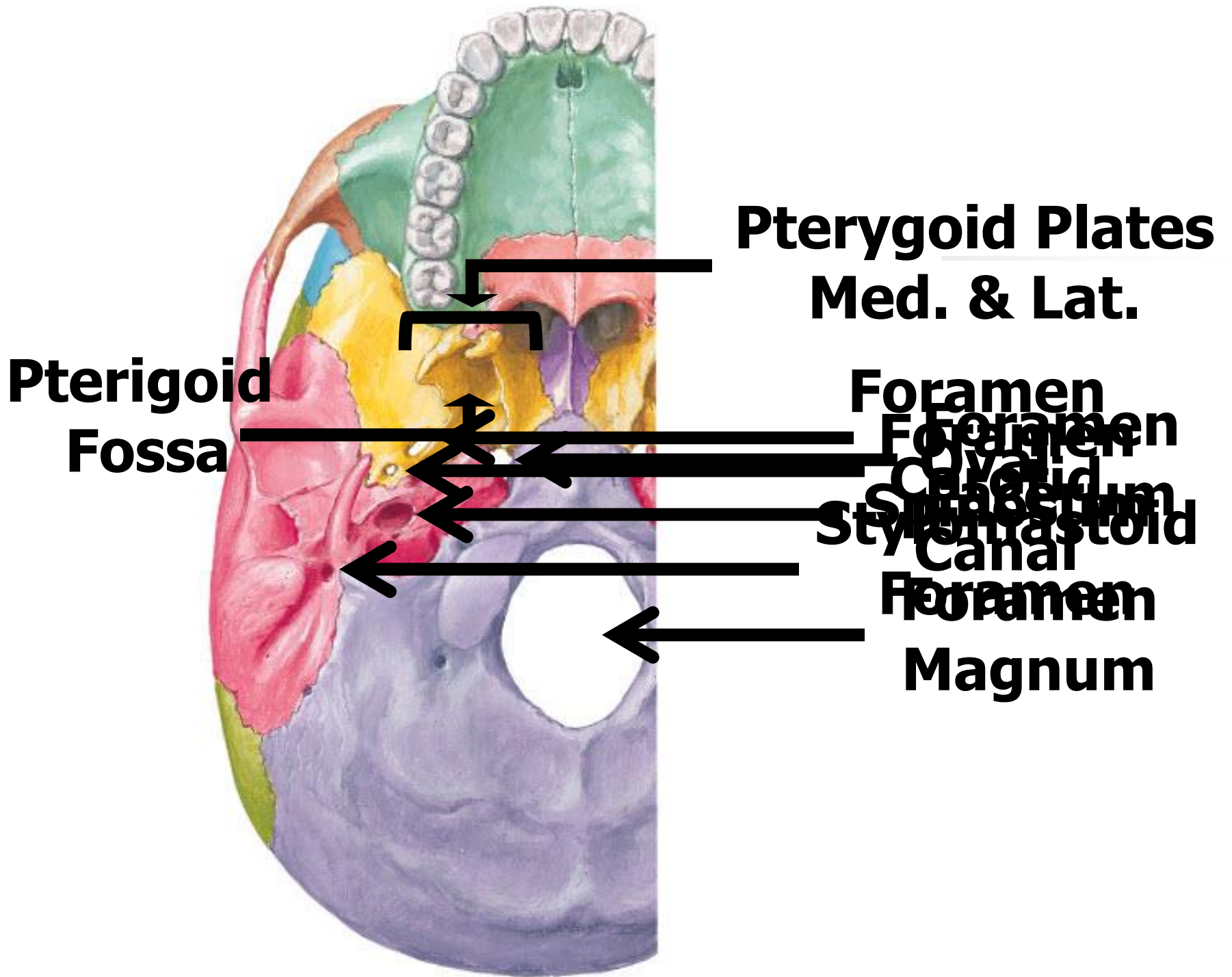
Condylar Part of Occipital Bone



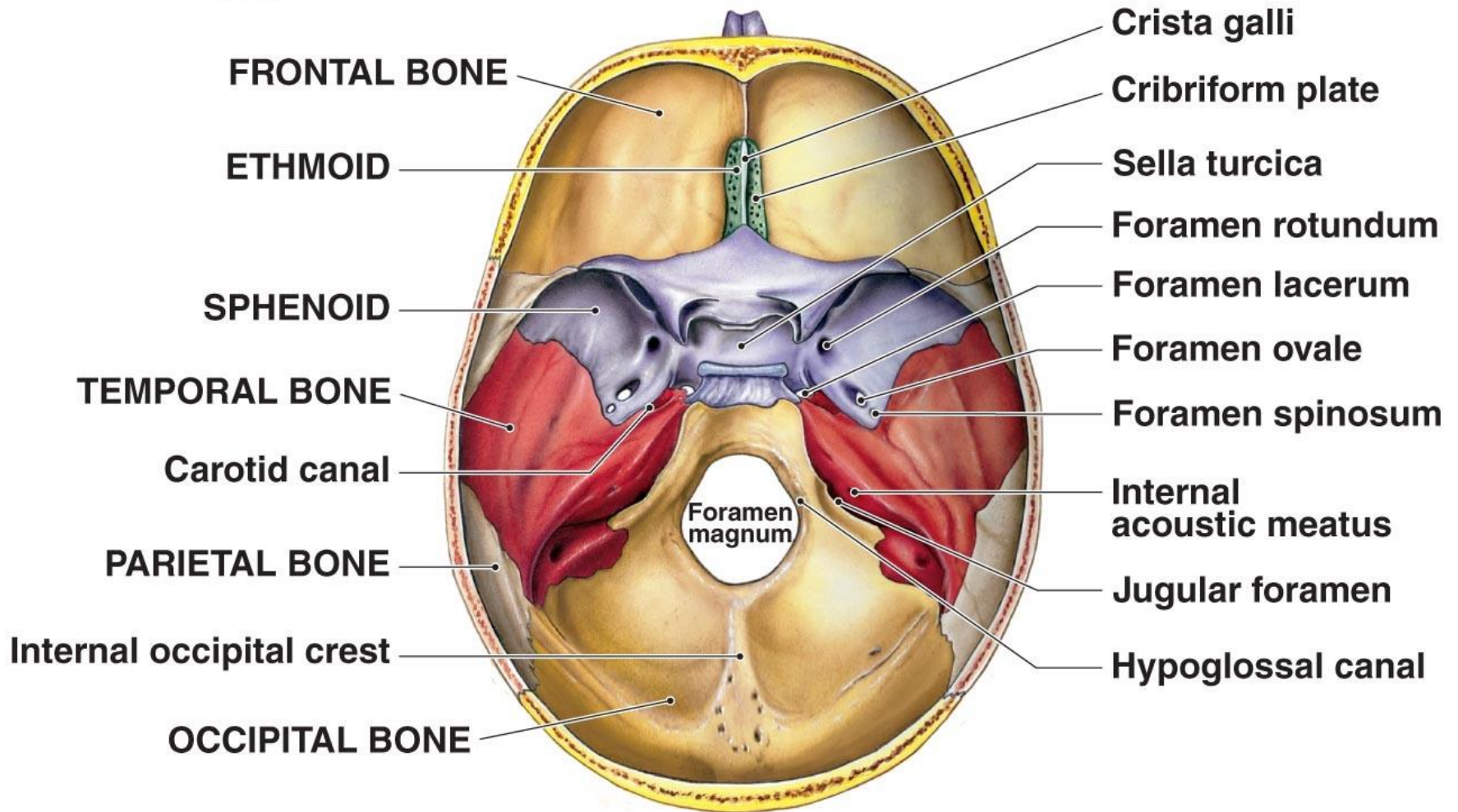
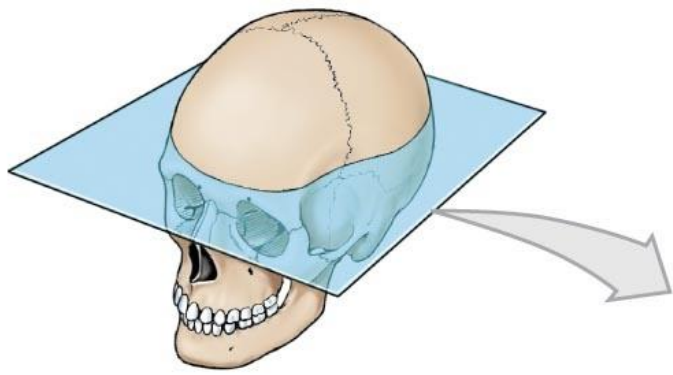
Squamous Part of Occipital Bone



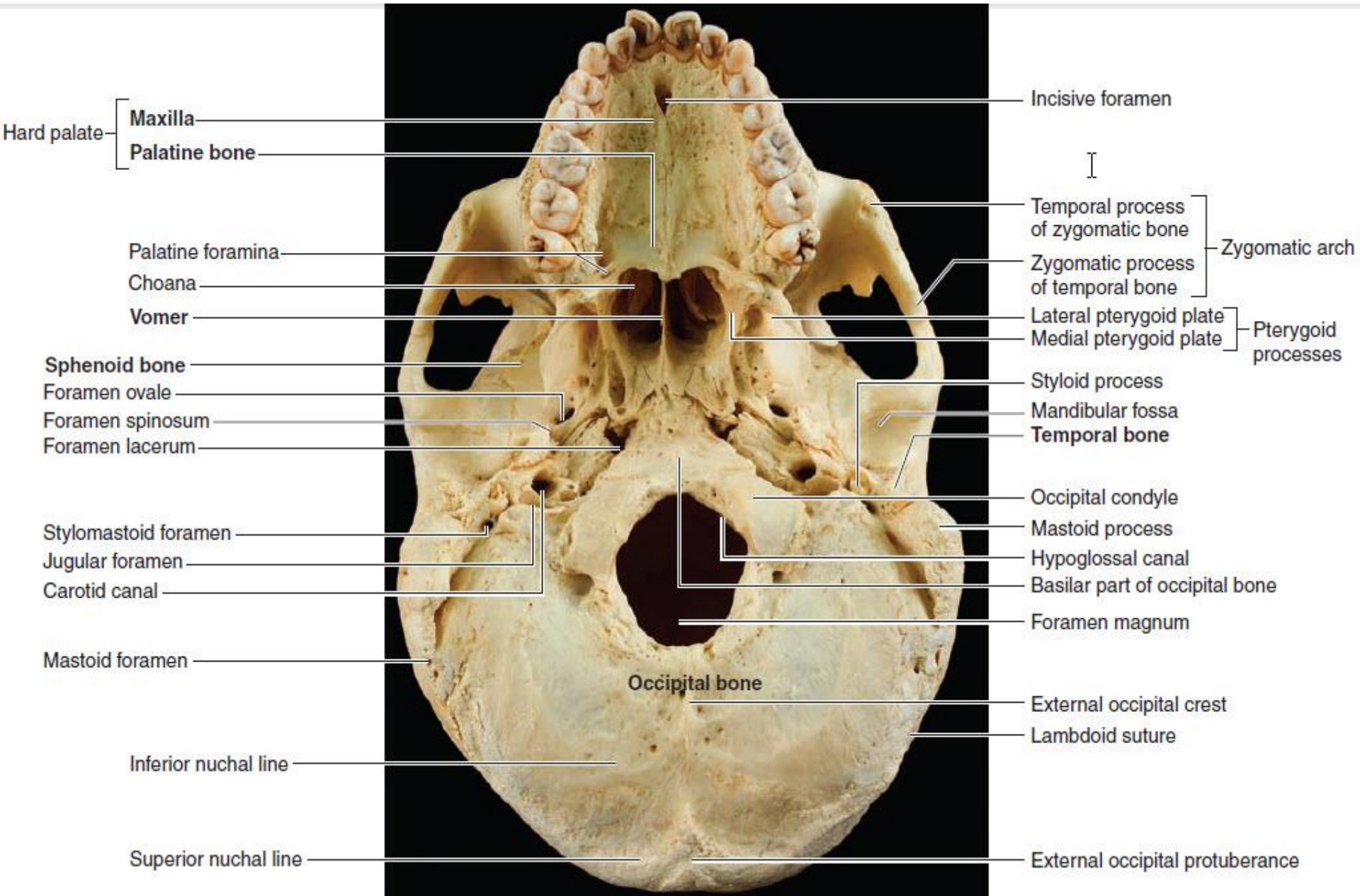
Squamous Part of Occipital Bone

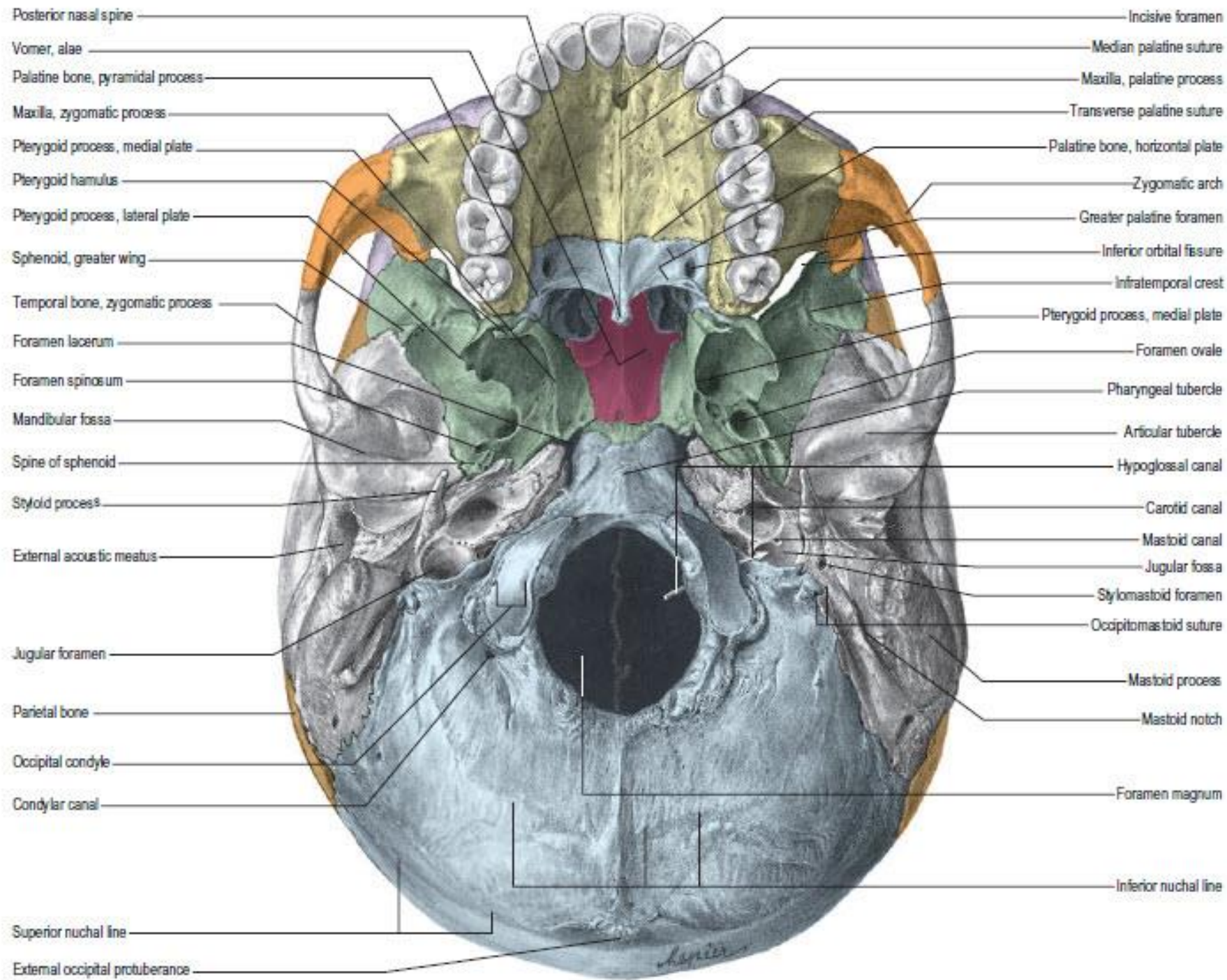


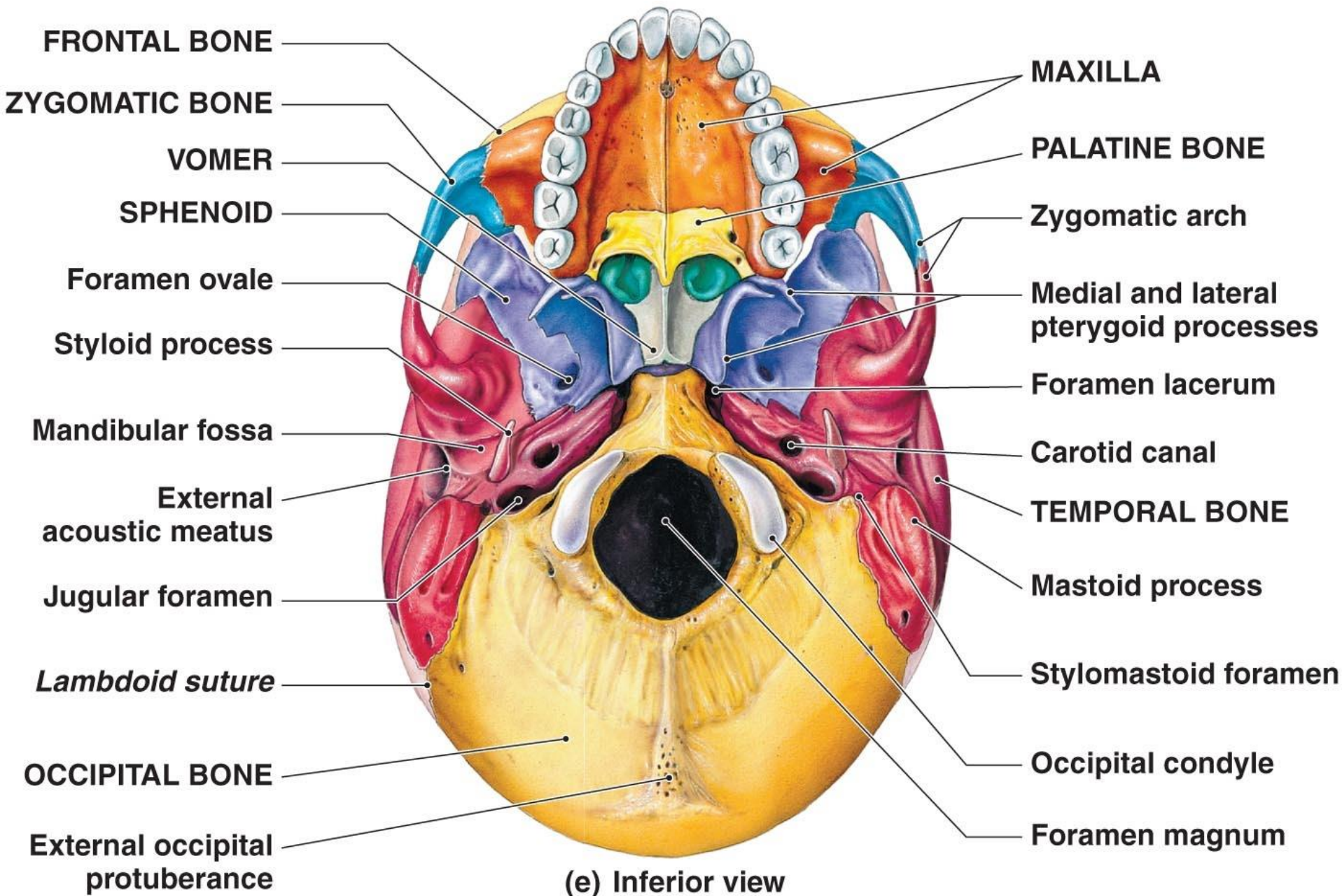


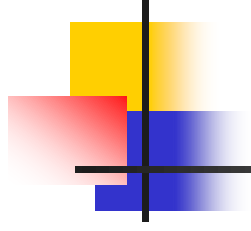


(b) Horizontal Section









The Mandible



The Mandible

The mandible consists of a horizontal **body** (anteriorly) and two vertical **rami** (posteriorly). The body and the rami meet on each side at the **angle** of the mandible.

The Body:

The body of the mandible is curved, shaped much like a horseshoe with **an Alveolar border (superior)** – contains 16 sockets to hold the lower teeth.



The Mandible - Rami

There are two **mandibular rami**, which project perpendicularly upwards from the angle of the mandible. Each ramus contains the following bony landmarks:

Head – situated posteriorly, and articulates with the ***temporal*** bone to form the ***temporomandibular*** joint.

Neck – supports the head of the ramus, and site of attachment of the lateral pterygoid muscle.

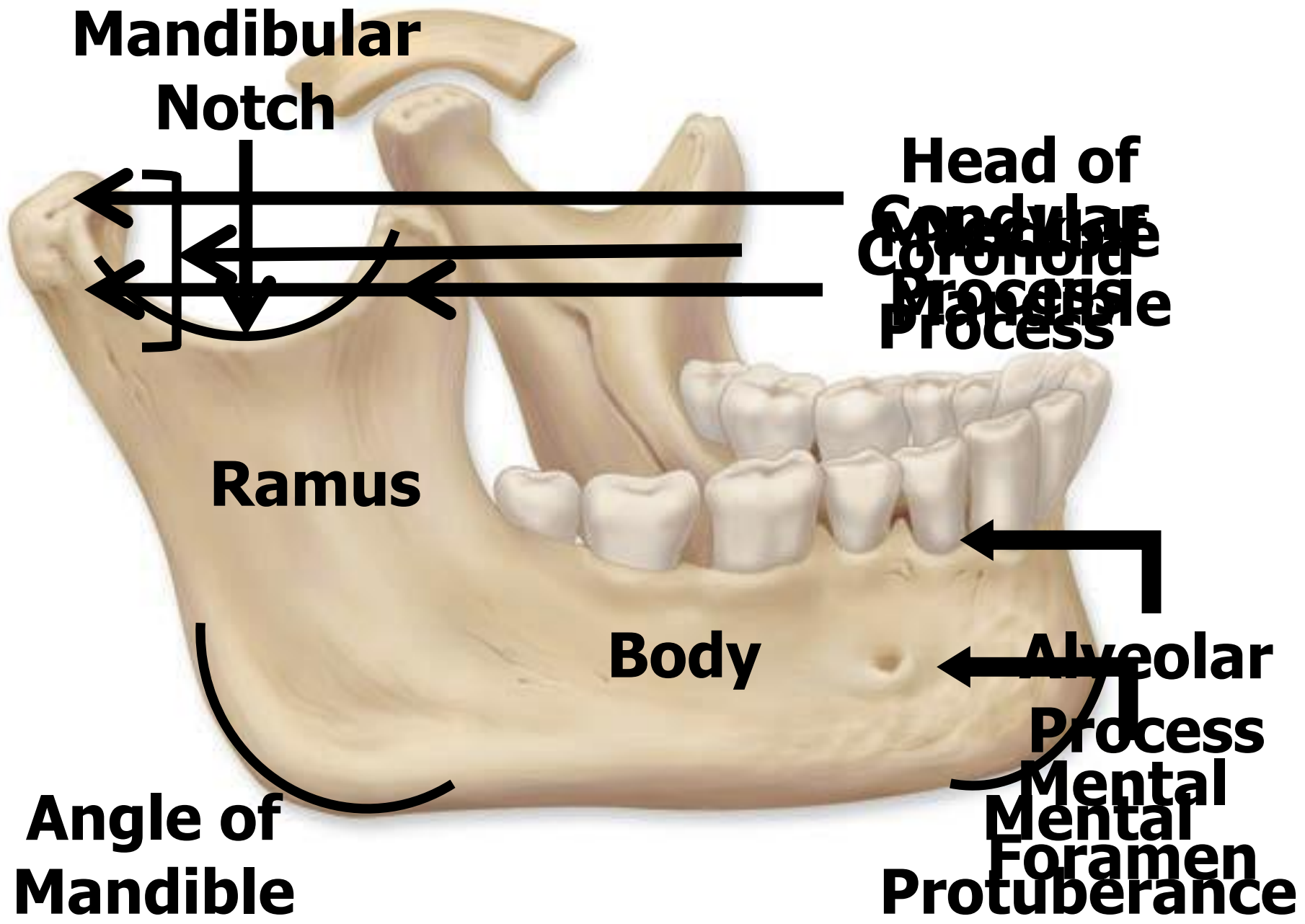
Coronoid process – site of attachment of the temporalis muscle
The internal surface of the ramus is also marked by the ***mandibular foramen***, which acts as a passageway for neurovascular structures.

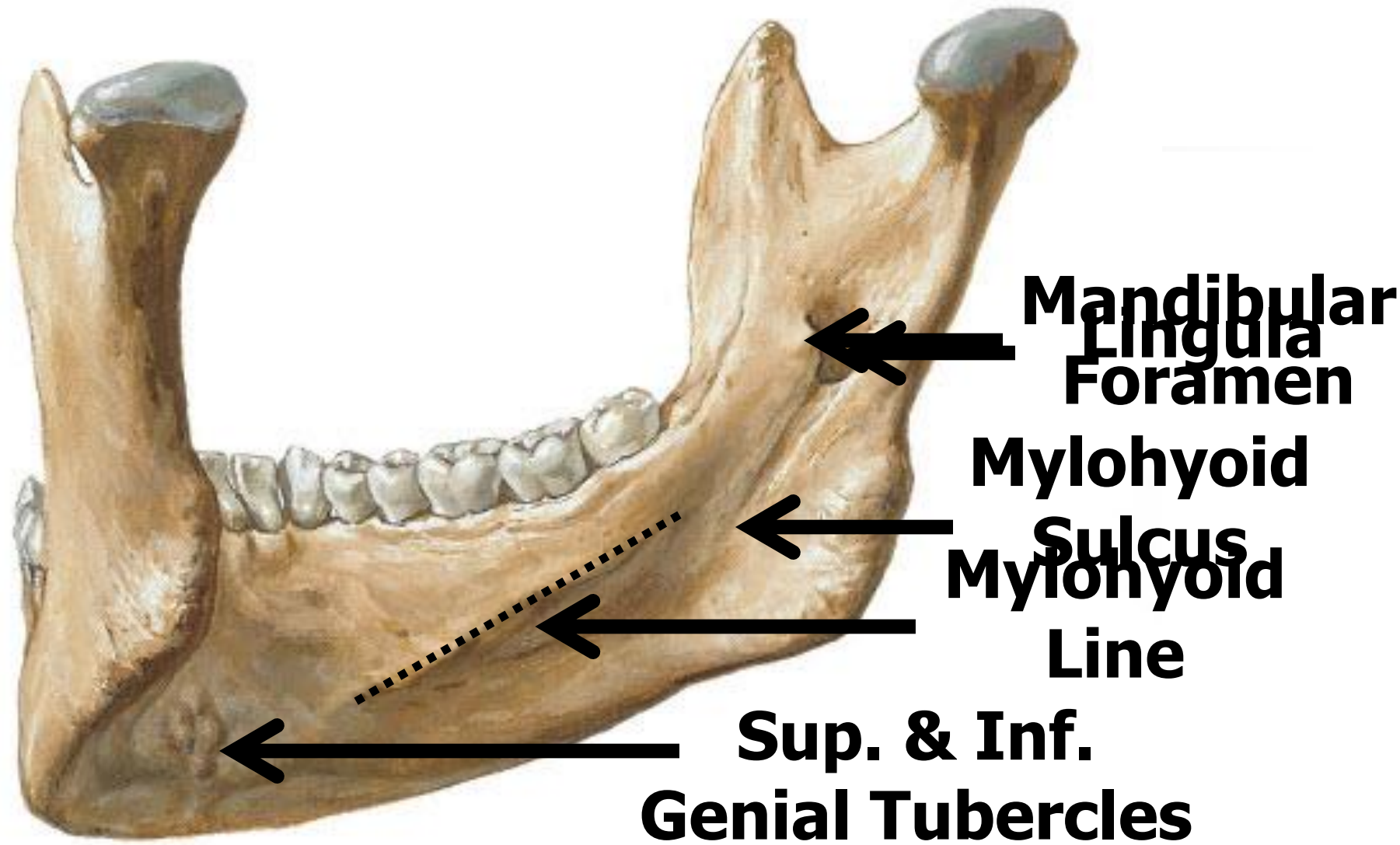


The Mandible - Foramina

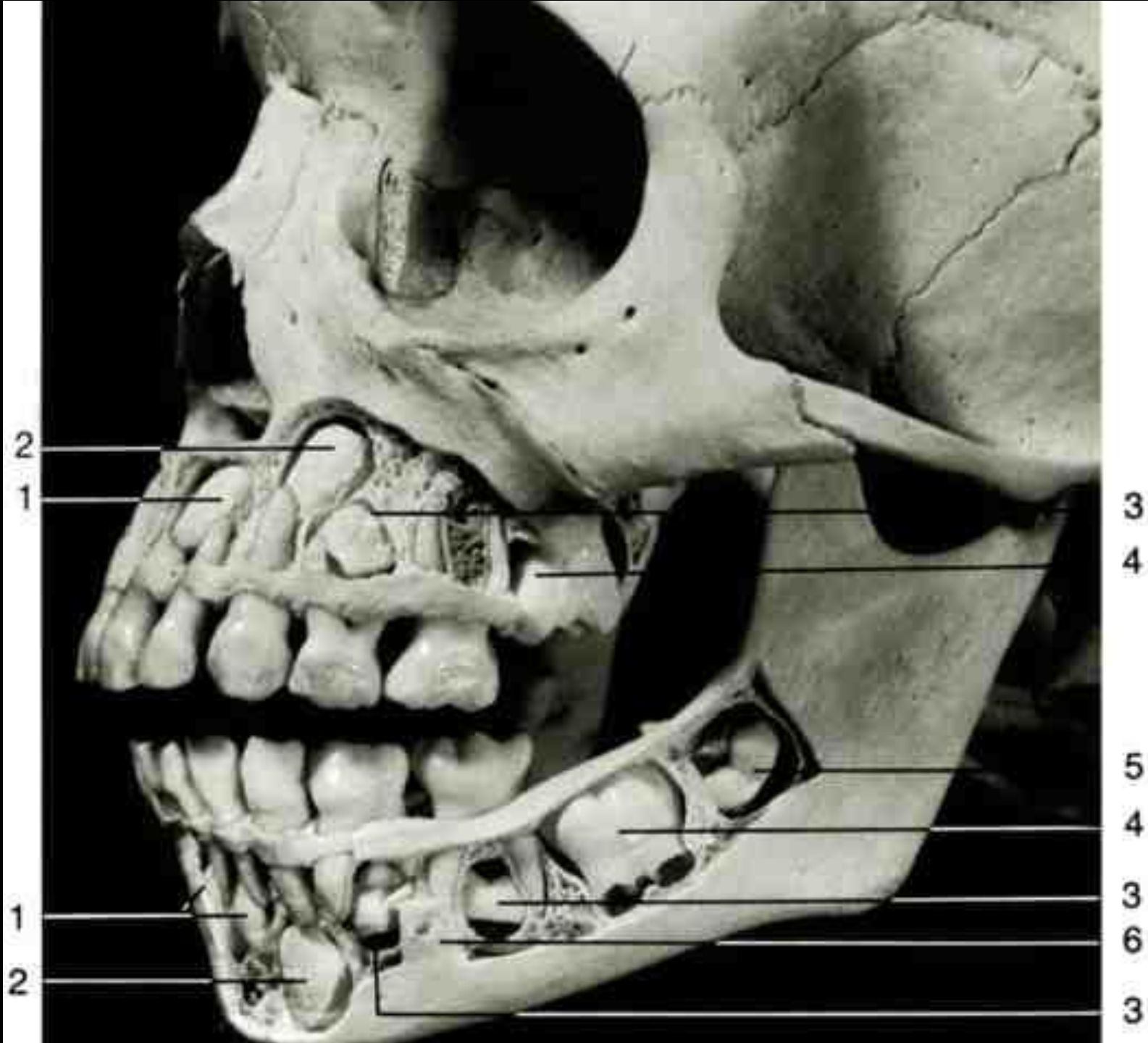
- The **mandibular foramen** is located on the internal surface of the ramus of the mandible. It serves as a conduit for the inferior alveolar nerve and inferior alveolar artery.
- The **mental foramen** is positioned on the external surface of the mandibular body, ***below the second premolar tooth***. It allows the inferior alveolar nerve and artery to exit the mandibular canal to become the **mental nerve** (***innervating the skin of the lower lip and the front of the chin***).











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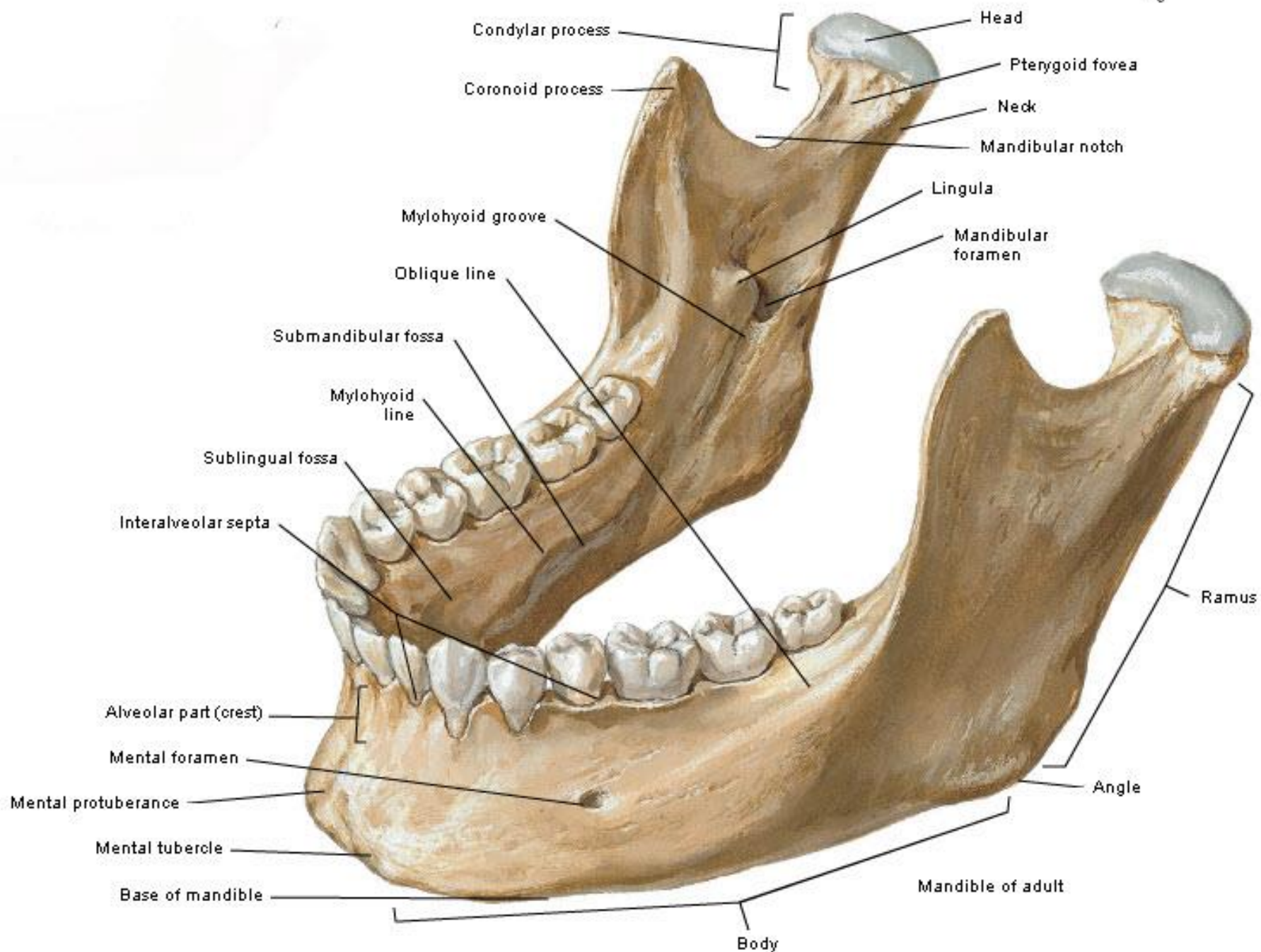
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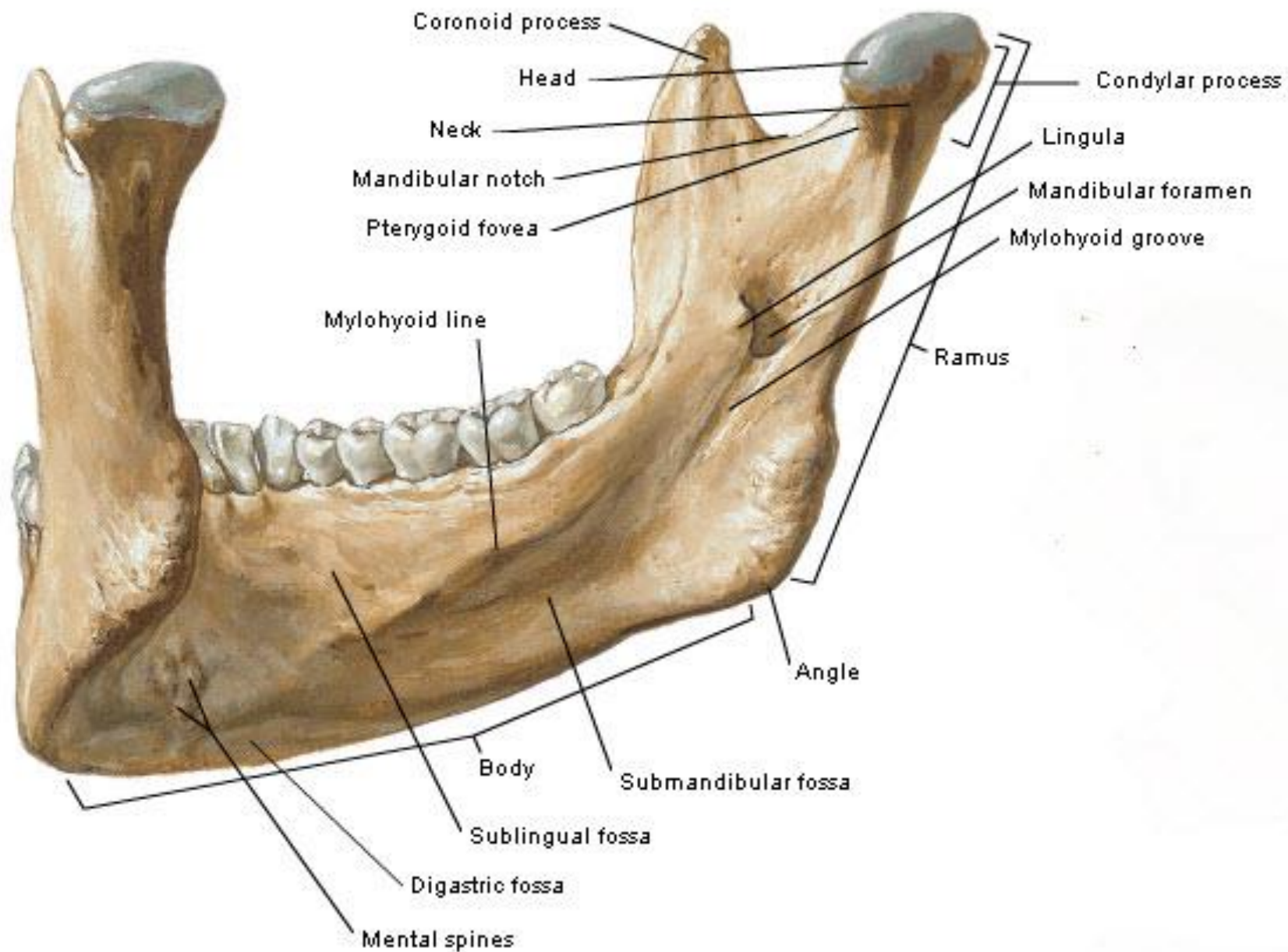
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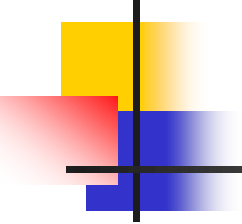
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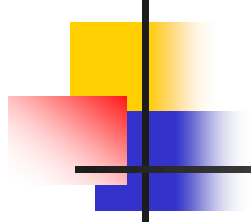


Mandible of adult

- 
-
- For further inquiries **PLZ** feel free to contact at any time through email

gamaltaha@med.asu.edu.eg

gamal.abdelhady@yu.edu.jo



Thank You