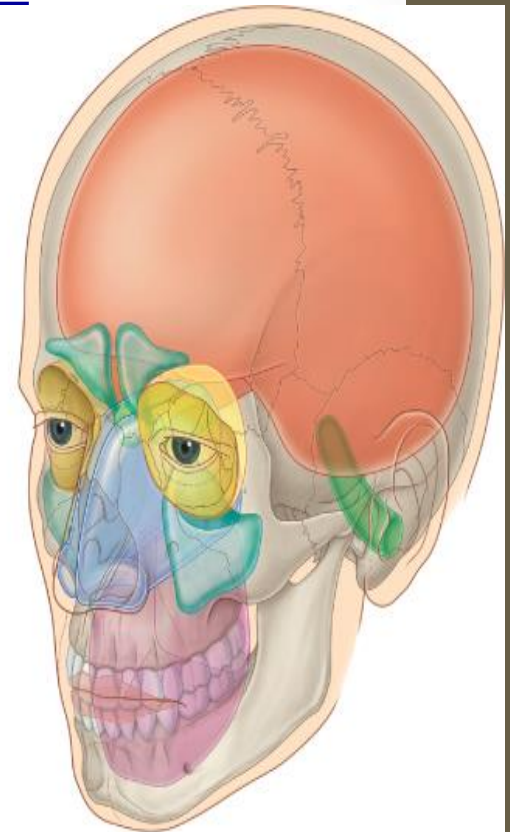
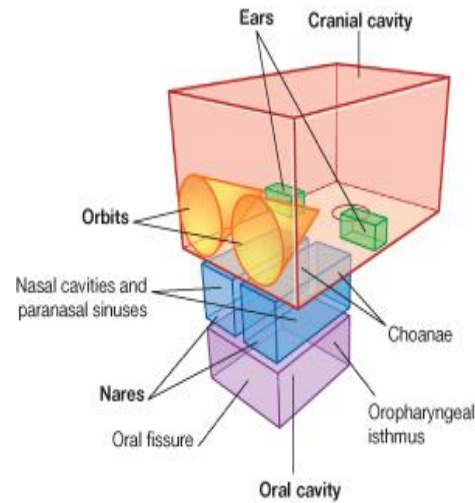
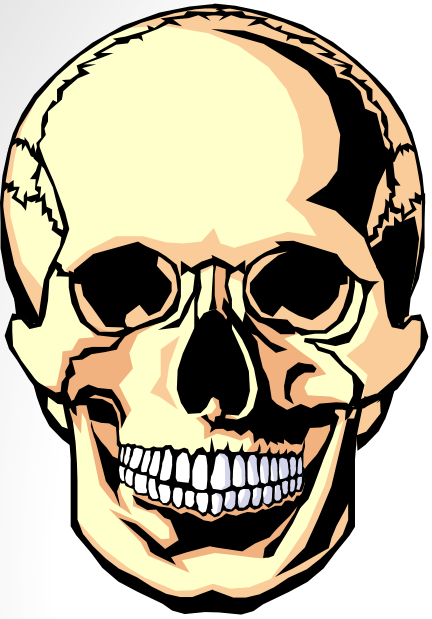


Skull :Cranial Bones

د. باسم المظفر

Bones of the Cranium



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**The bones of the skull
are two parts :**

**1-Cranium (8 bones fused at sutures) –
protects brain, provides muscle
attachment, sinuses reduce weight
of skull**

**2-Facial (14 bones) – gives shape to face,
provides muscle attachment**

BONES OF THE SKULL

- ❑ The skull has 22 bones, excluding the ossicles of the ear.
- ❑ Except for the mandible, which forms the lower jaw, the bones of the skull are attached to each other by sutures, are immobile, and form the **cranium**. The cranium can be subdivided into:
 - an upper part, the **Cranial skeleton (the calvaria) (Neurocranium)**, which surrounds the cranial cavity containing the brain; which form from these bones ;;
 1. paired temporal
 2. paired parietal bones,
 3. single frontal
 4. single Sphenoid
 5. single Ethmoid
 6. single occipital bones.
 - lower anterior part- the **facial skeleton (viscerocranium)**. which form from these bones ;;
 1. paired nasal bones
 2. paired palatine bones
 3. paired lacrimal bones
 4. paired zygomatic bones
 5. paired maxillae
 6. paired inferior nasal conchae
 7. unpaired vomer.
- ❑ The mandible is not part of the cranium nor part of the facial skeleton.

❑ The bones forming the base of the cranium are mainly parts of the sphenoid, temporal and

Function of cranial bones

- 1. Enclose and protect the brain**
- 2. Attachment sites for head and neck muscles**

Function of facial bones

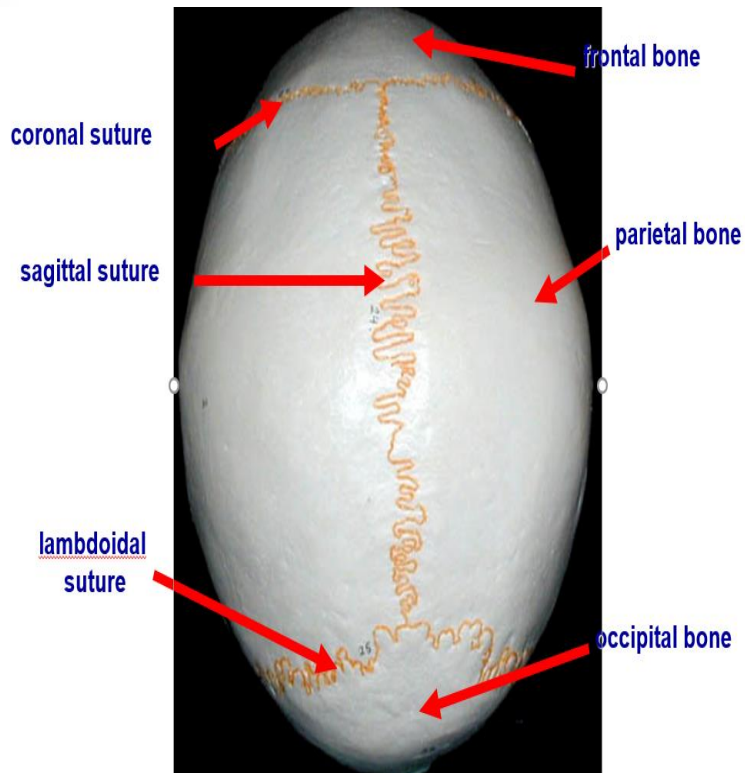
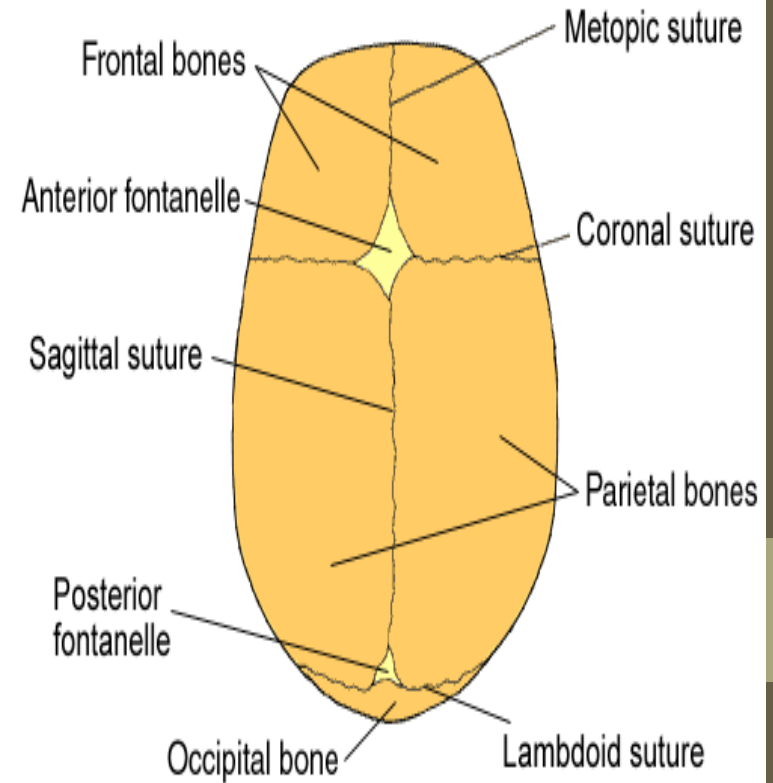
- 1. form framework of face**
- 2. contain cavities for special sense organs**
- 3. openings for food/air passage**
- 4. secure the teeth**
- 5. anchor the facial muscles of expression**

Sutures

- Sagittal.
- Lambdoidal.
- Coronal.
- Metopic.



Normal Skull of the Newborn



Cranial skeleton (the calvaria) (Neurocranium)

anterior view

The anterior view of the skull includes

- the forehead superiorly, and, inferiorly,
- the orbits, the nasal region,
- The part of the face between the orbit and the upper jaw,
- the upper jaw, and the lower jaw

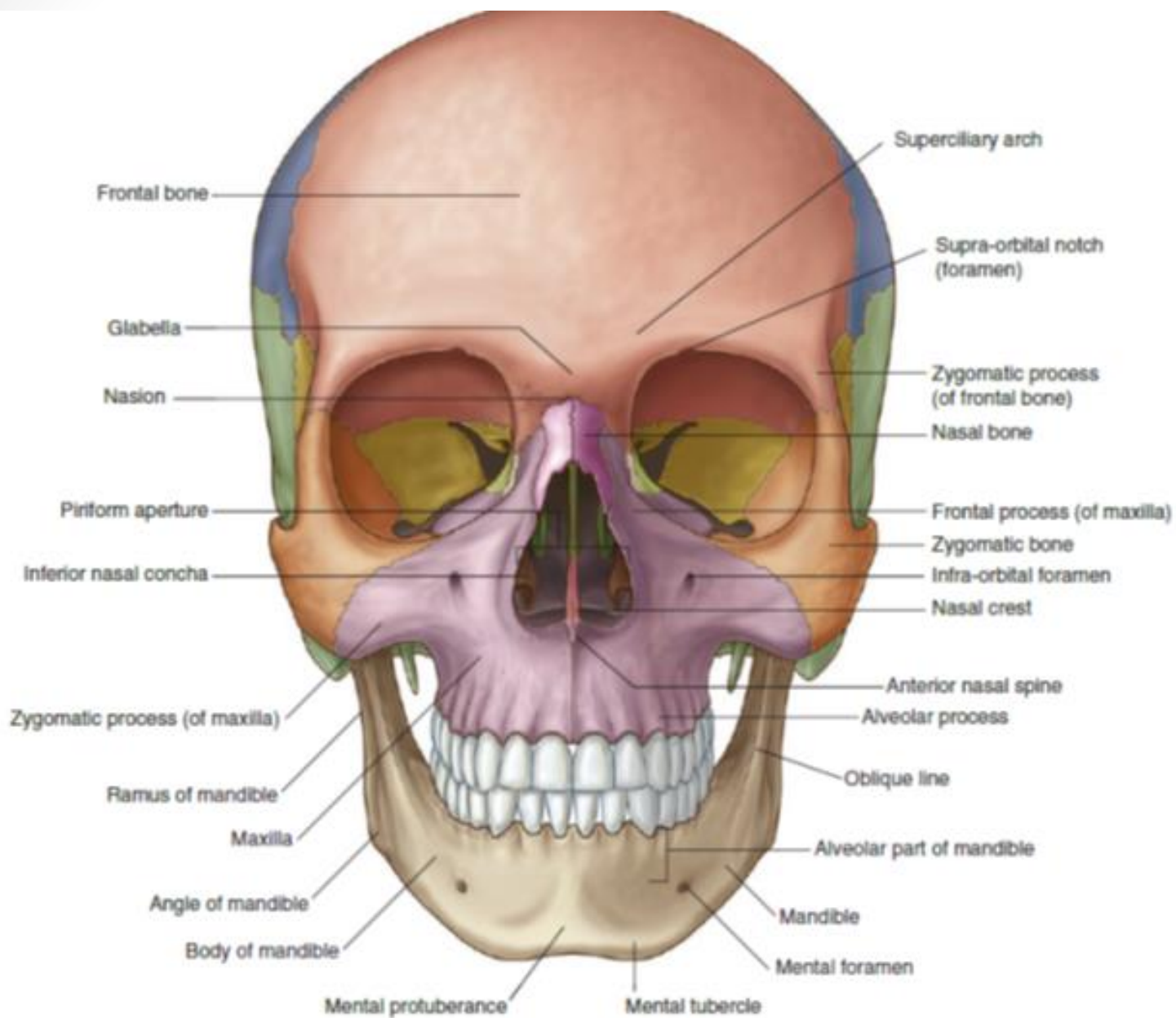
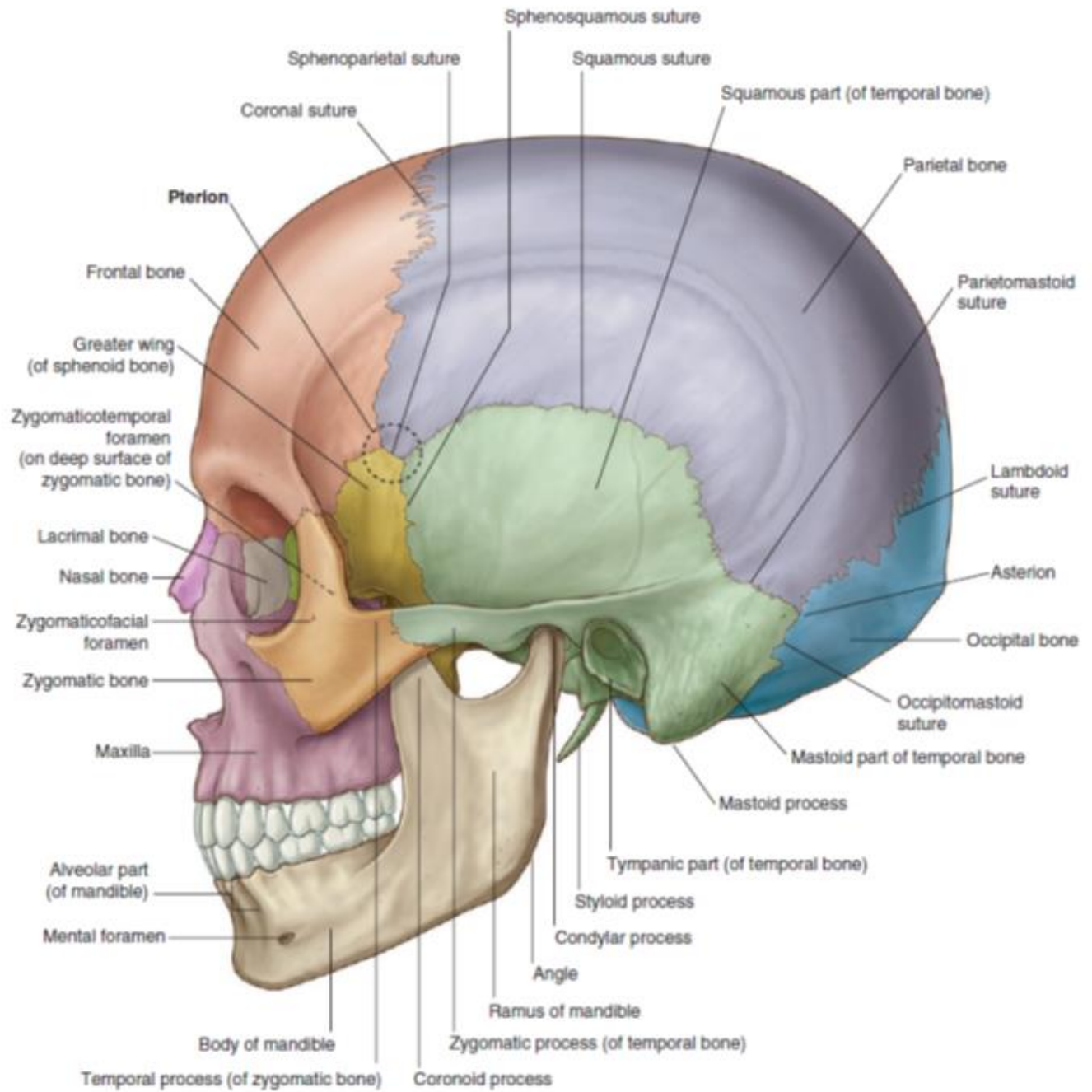


Fig. 8.18 Anterior view of the skull.

Lateral view

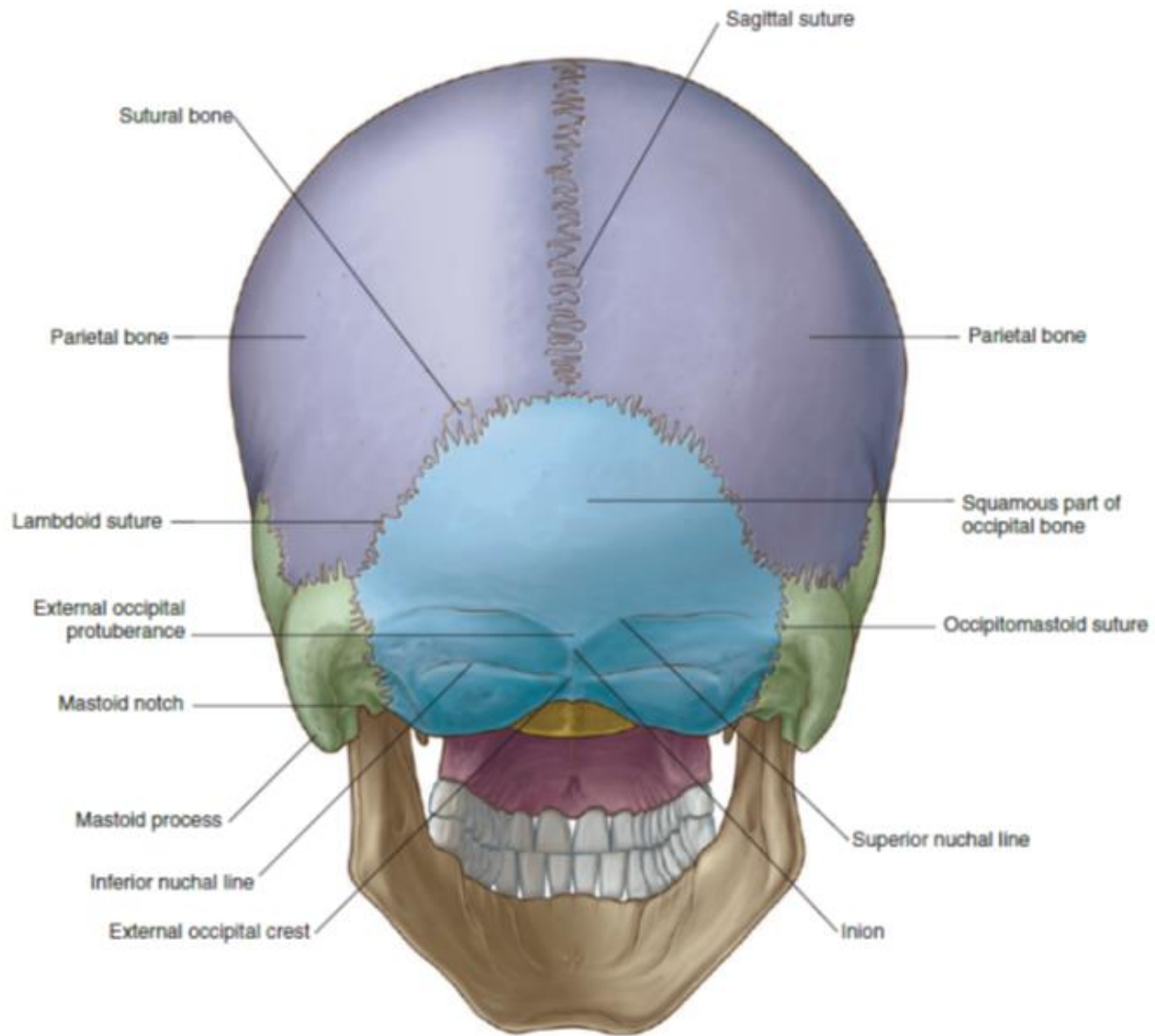
The lateral view of the skull consists of

- the lateral wall of the cranium, which includes lateral portions of the calvaria and the facial skeleton, and half of the lower jaw



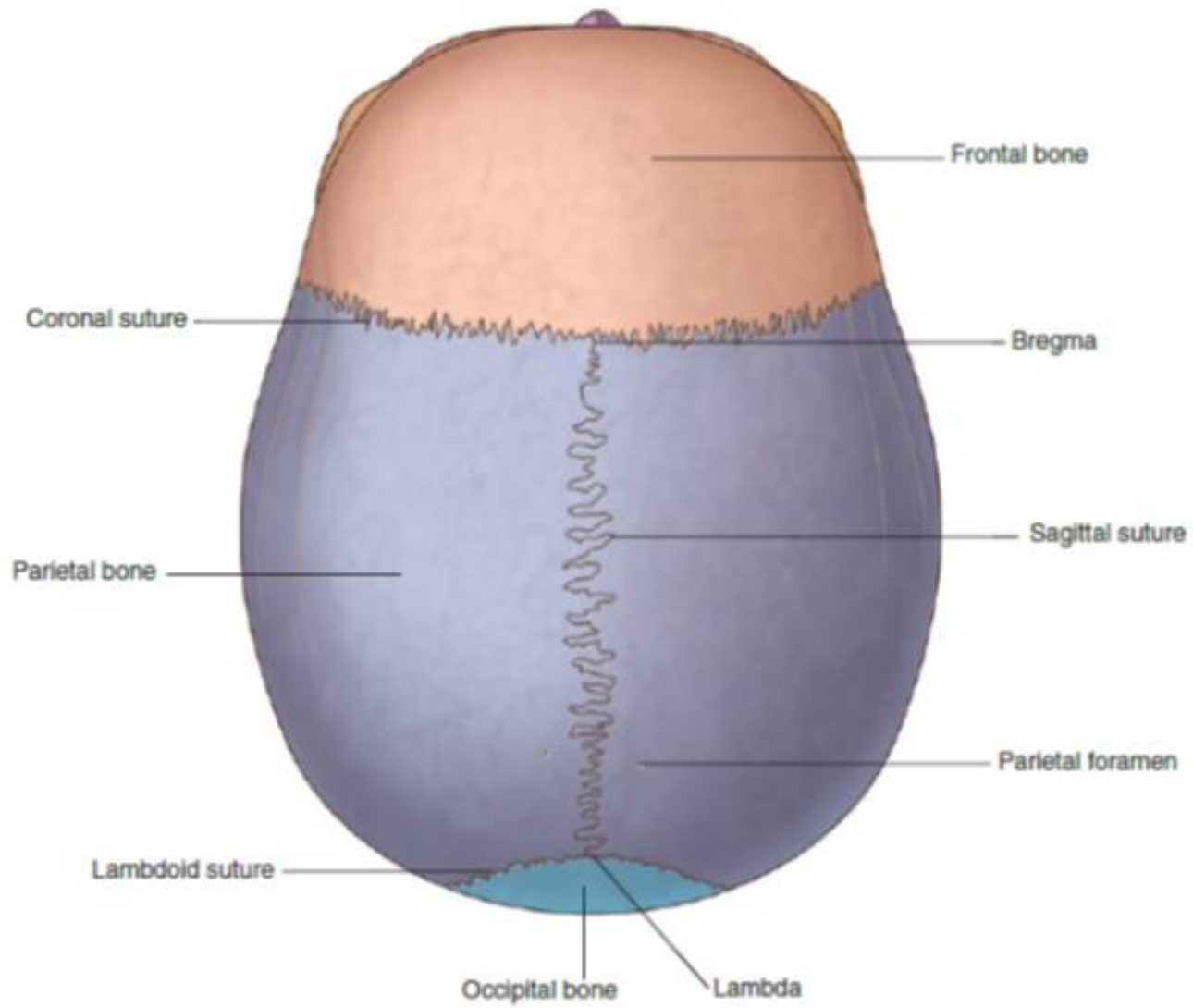
Posterior view

- The occipital, parietal, and temporal bones are seen in the posterior view of the skull.



Superior view

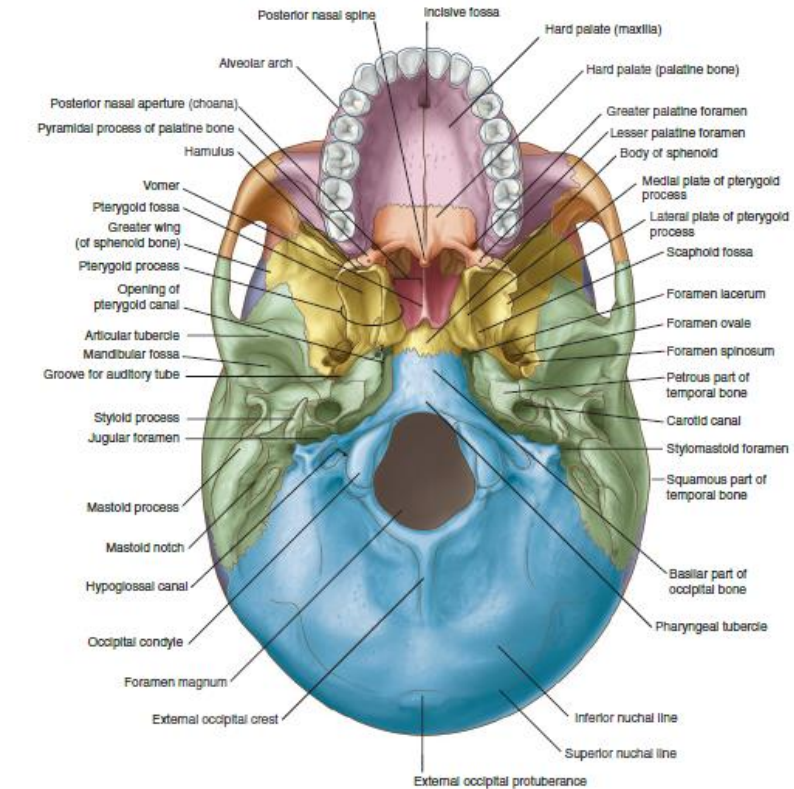
- The frontal bone, parietal bones, and occipital bone are seen in a superior view of the skull.

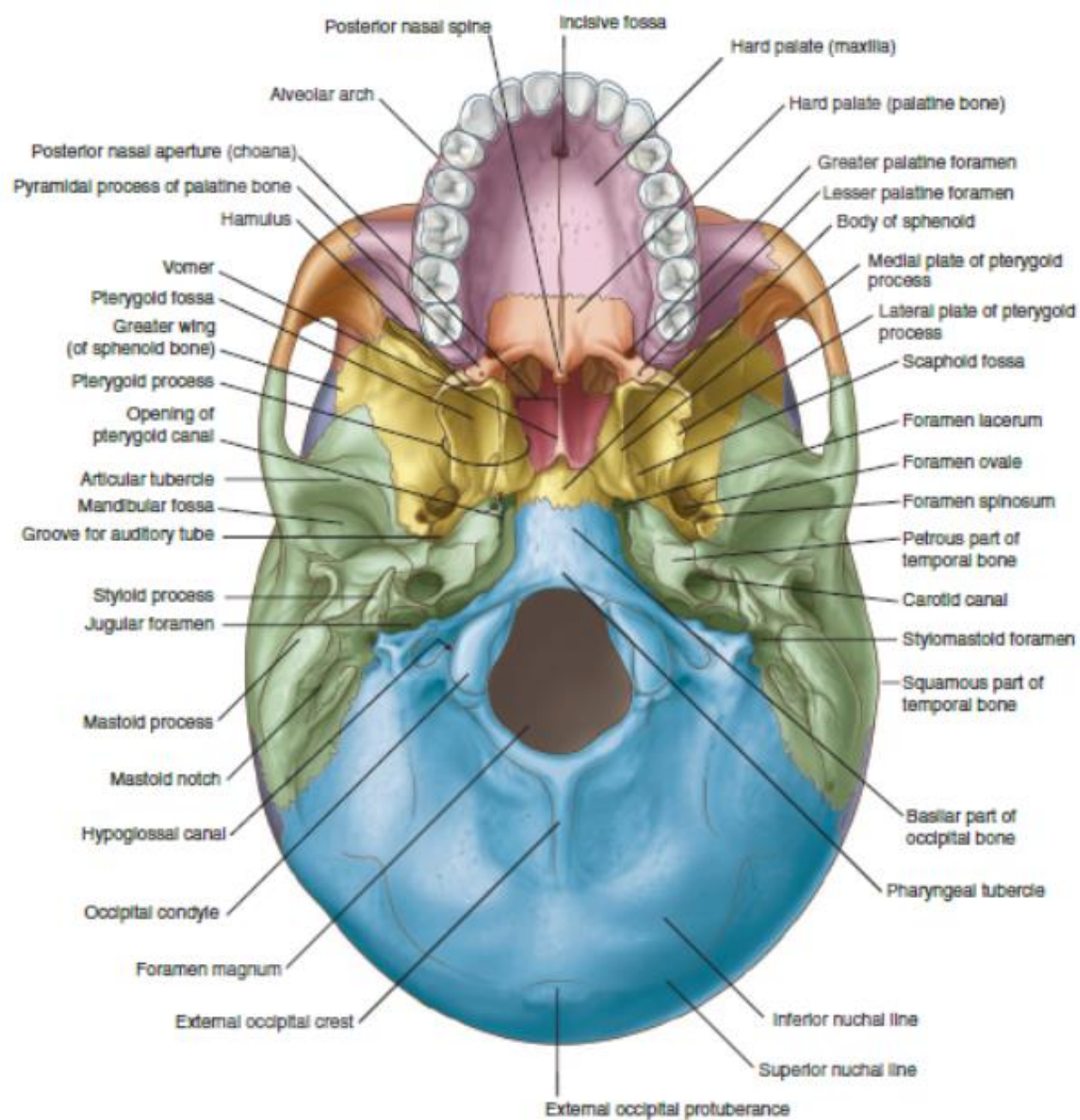


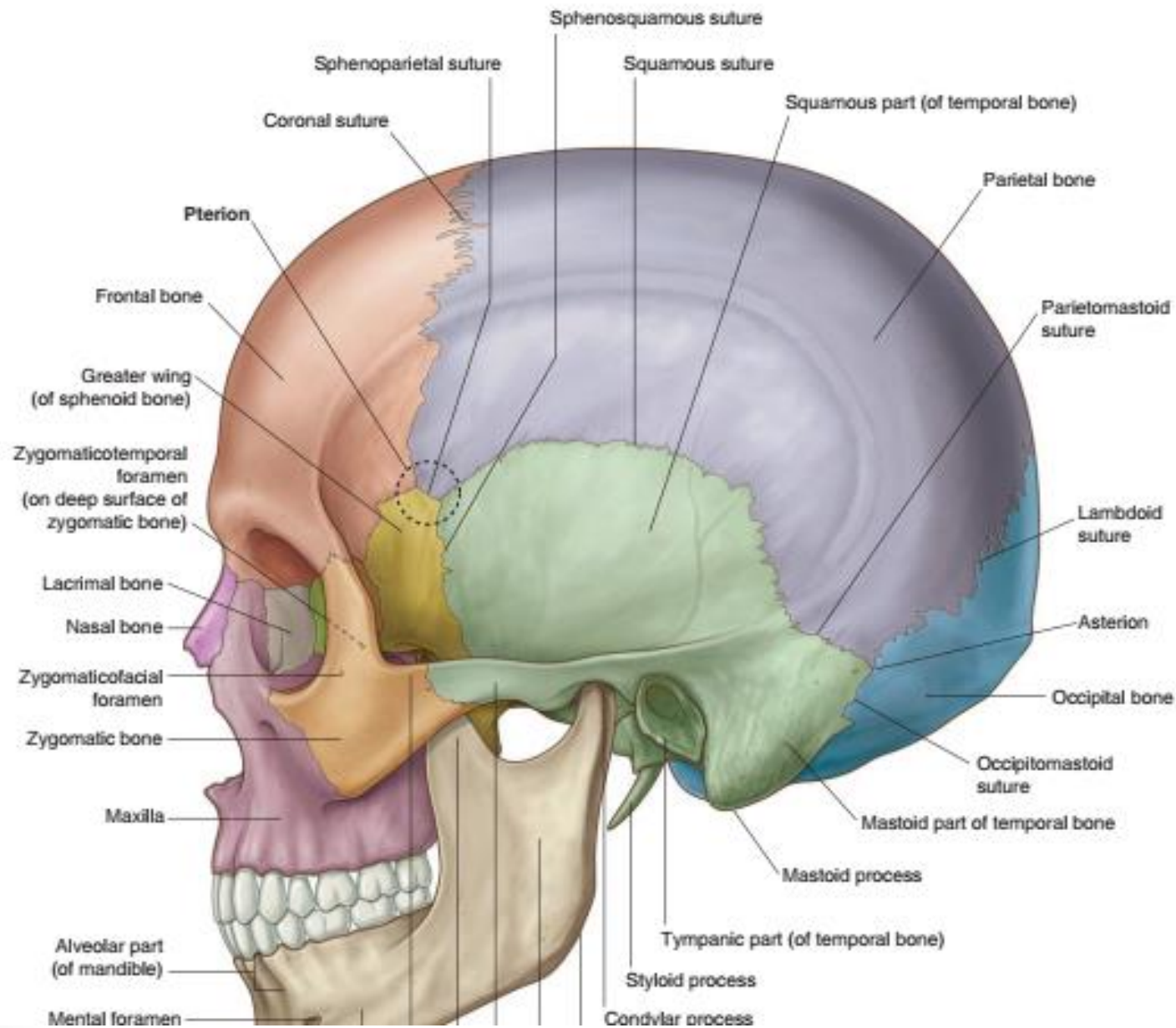
Inferior view

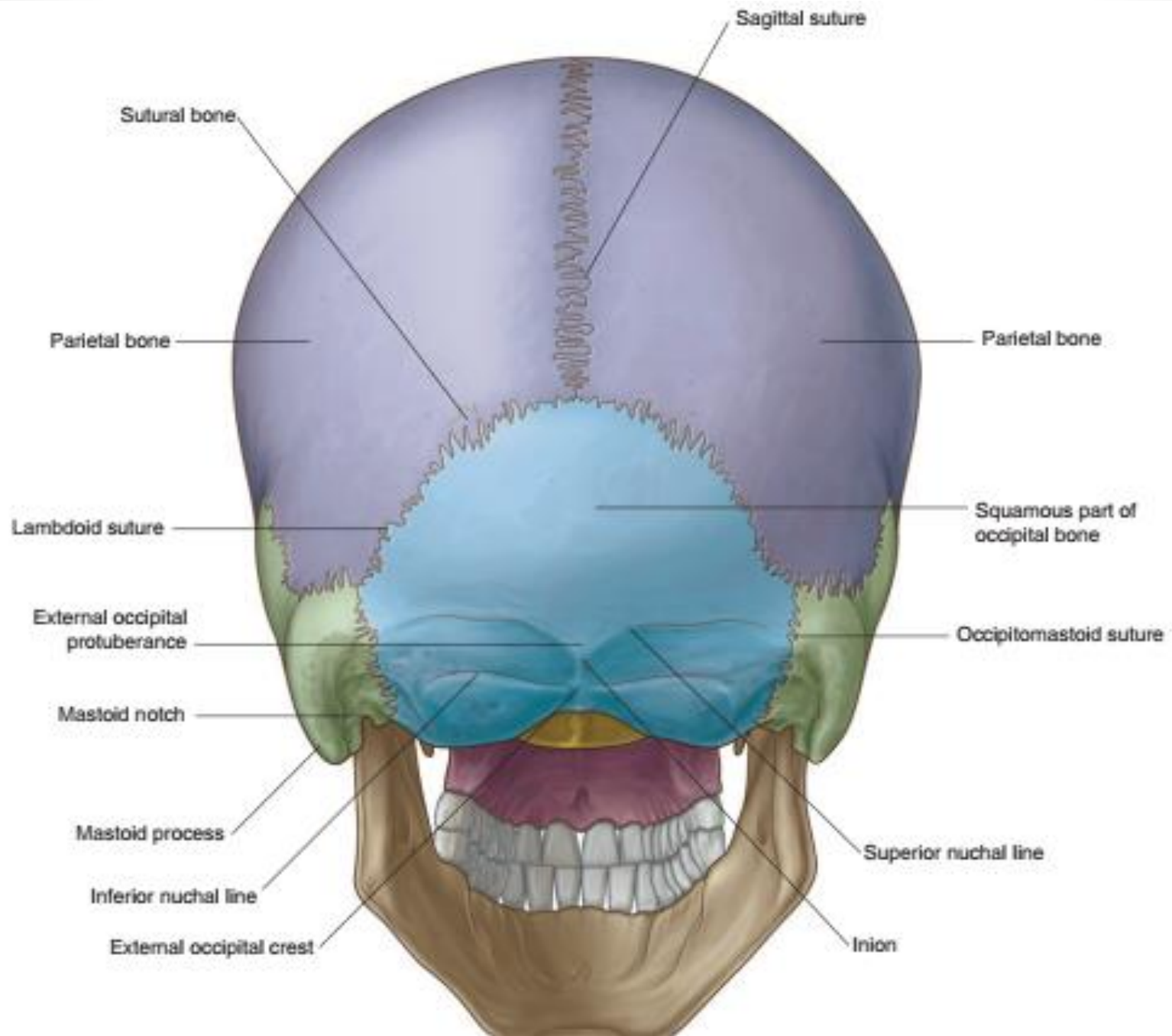
The base of the skull is seen in the inferior view and extends anteriorly from the middle incisor teeth posteriorly to the

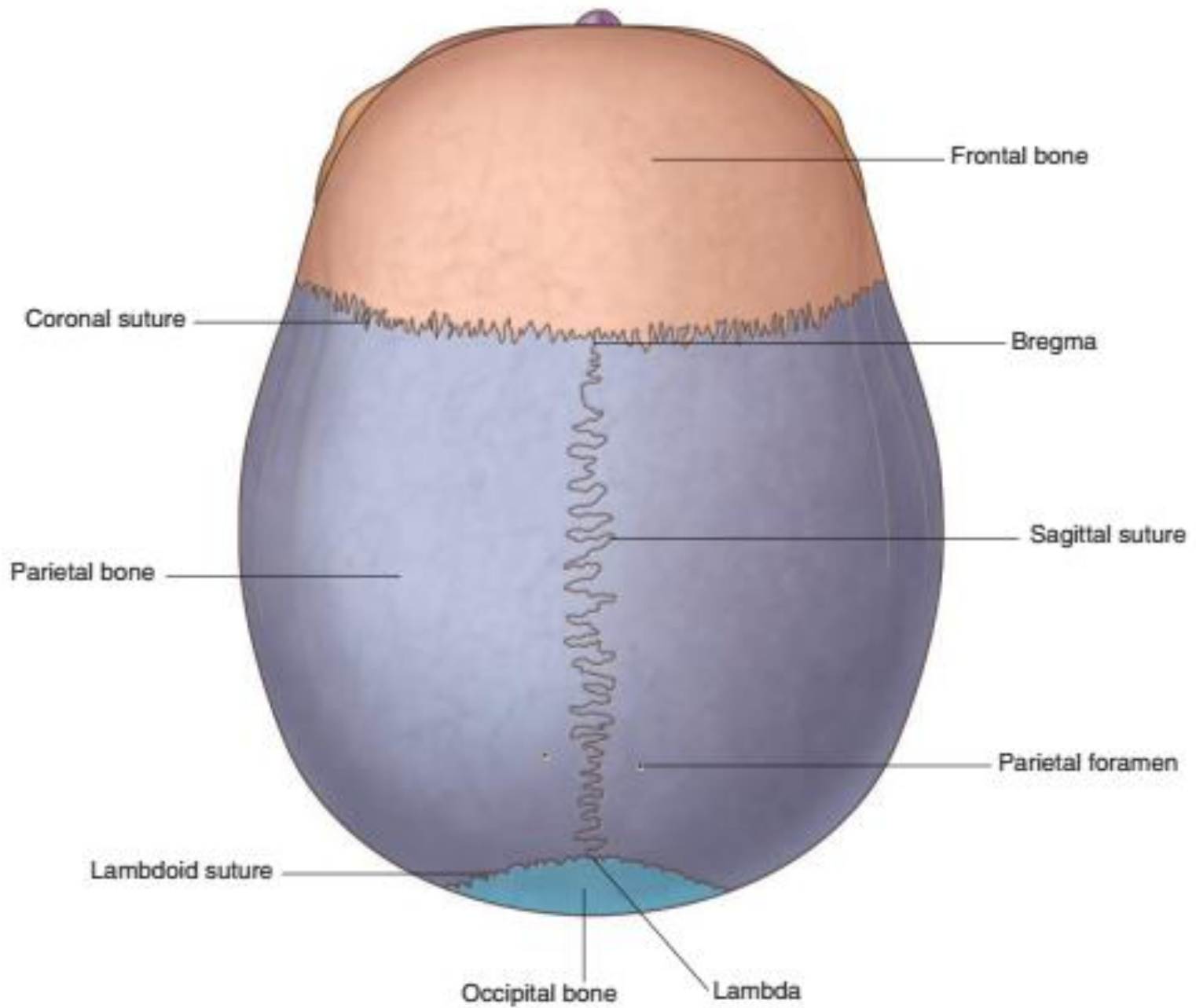
- superior nuchal lines and laterally to the mastoid processes and zygomatic arches
- **For descriptive purposes the base of the skull is often divided into:**
- anterior part
- middle part
- posterior part

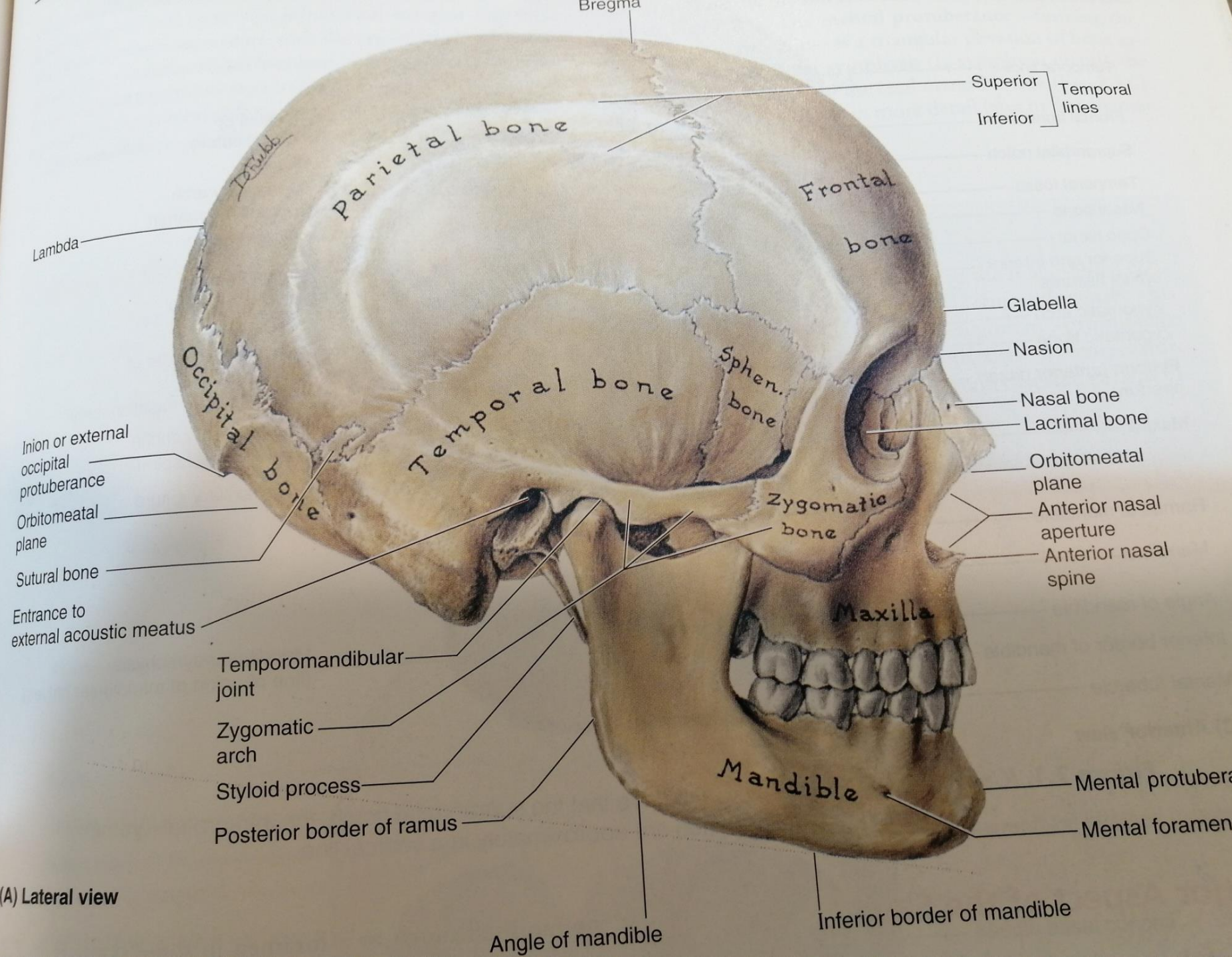






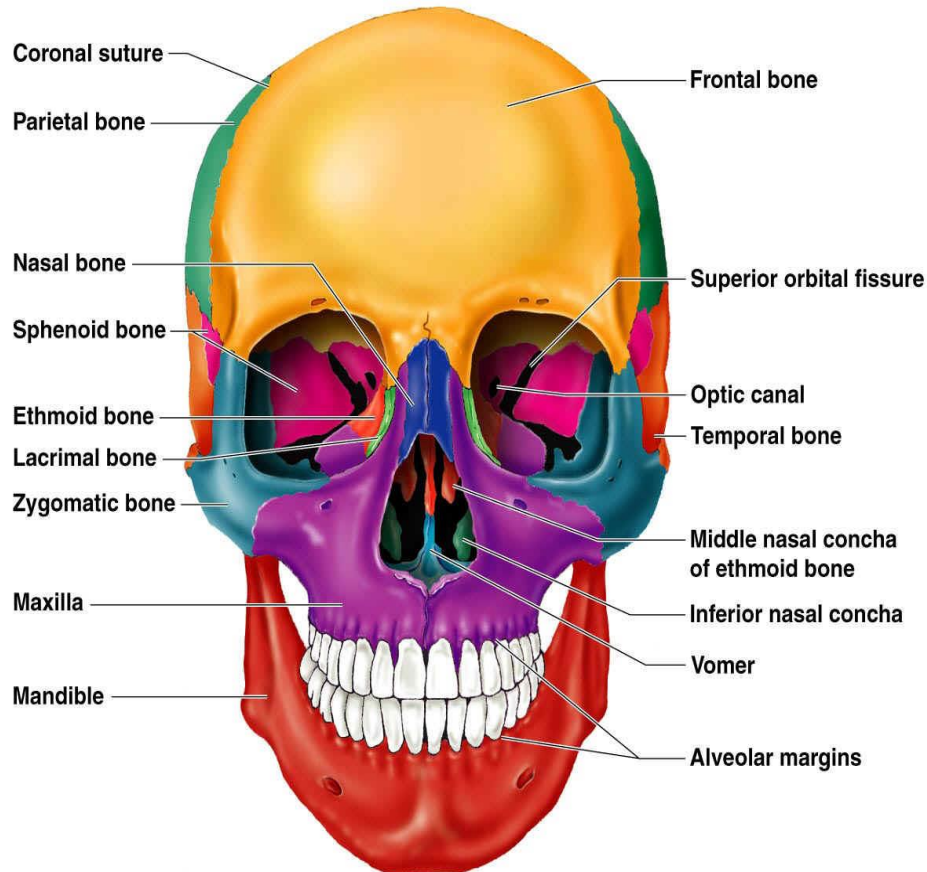




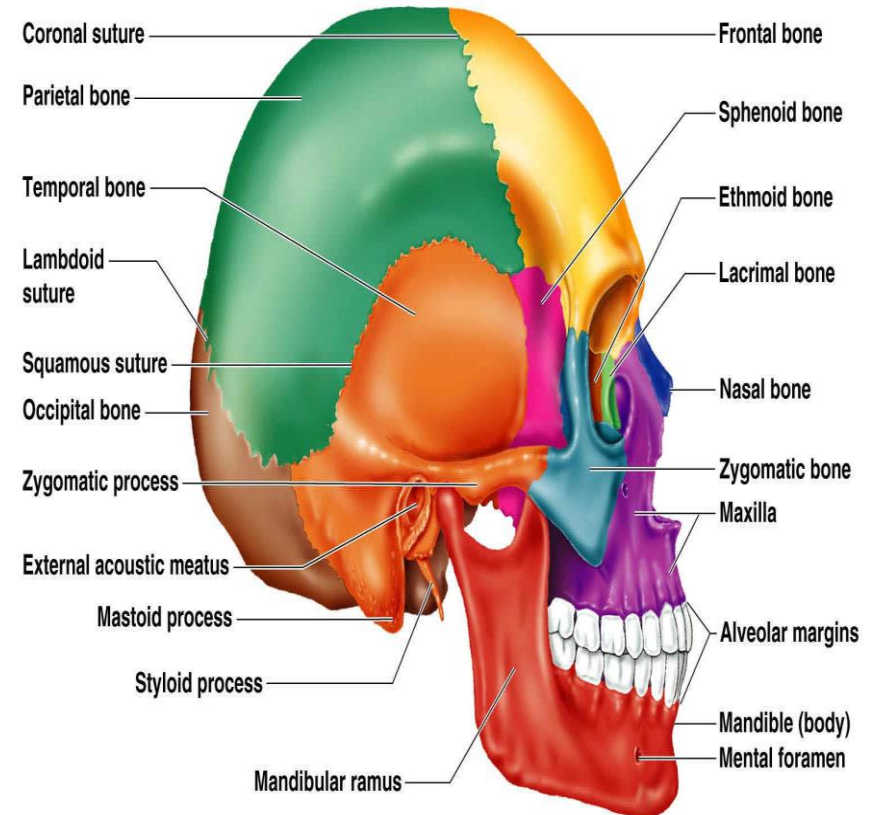


(A) Lateral view

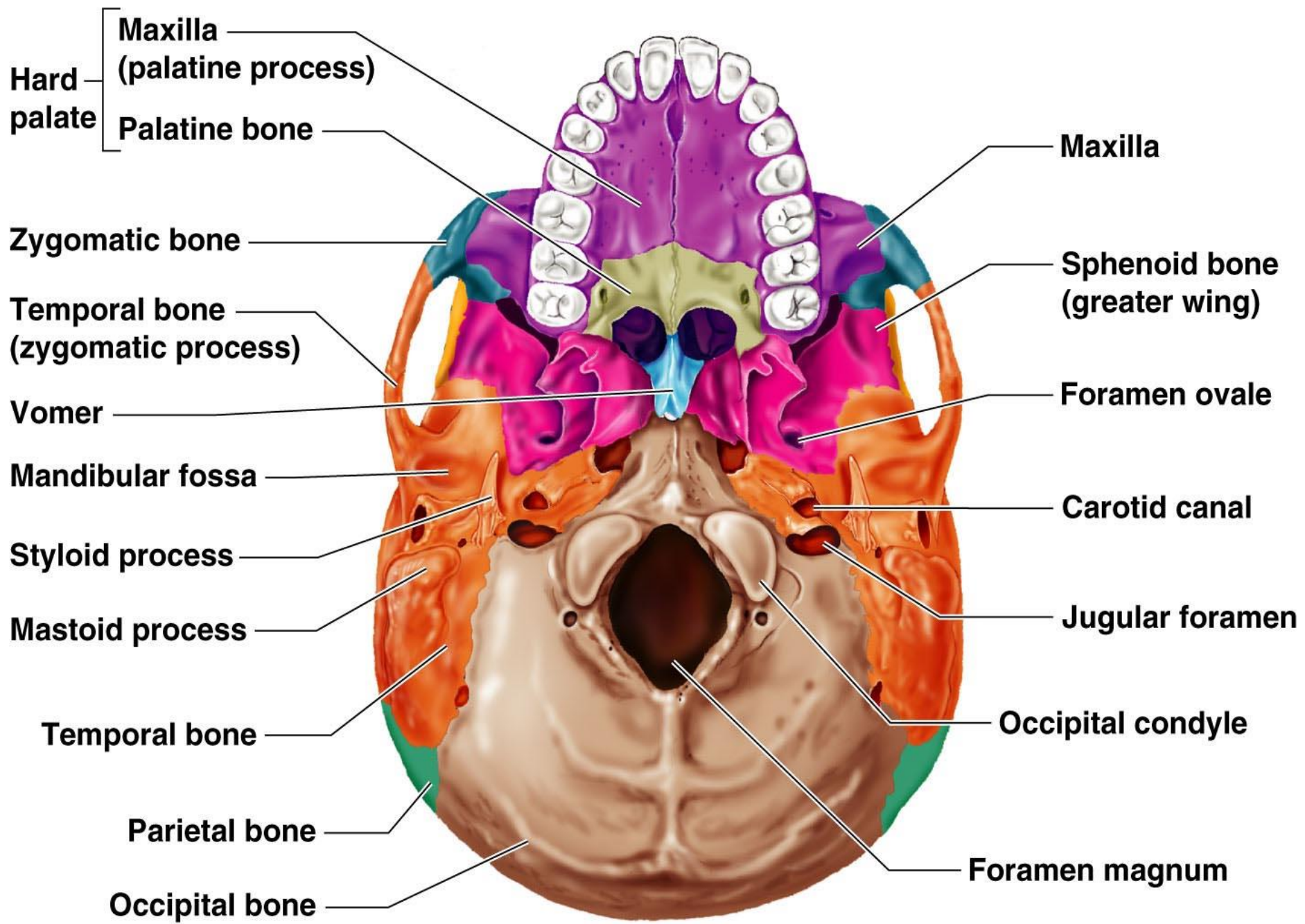
SKULL AND FACIAL SKELETON



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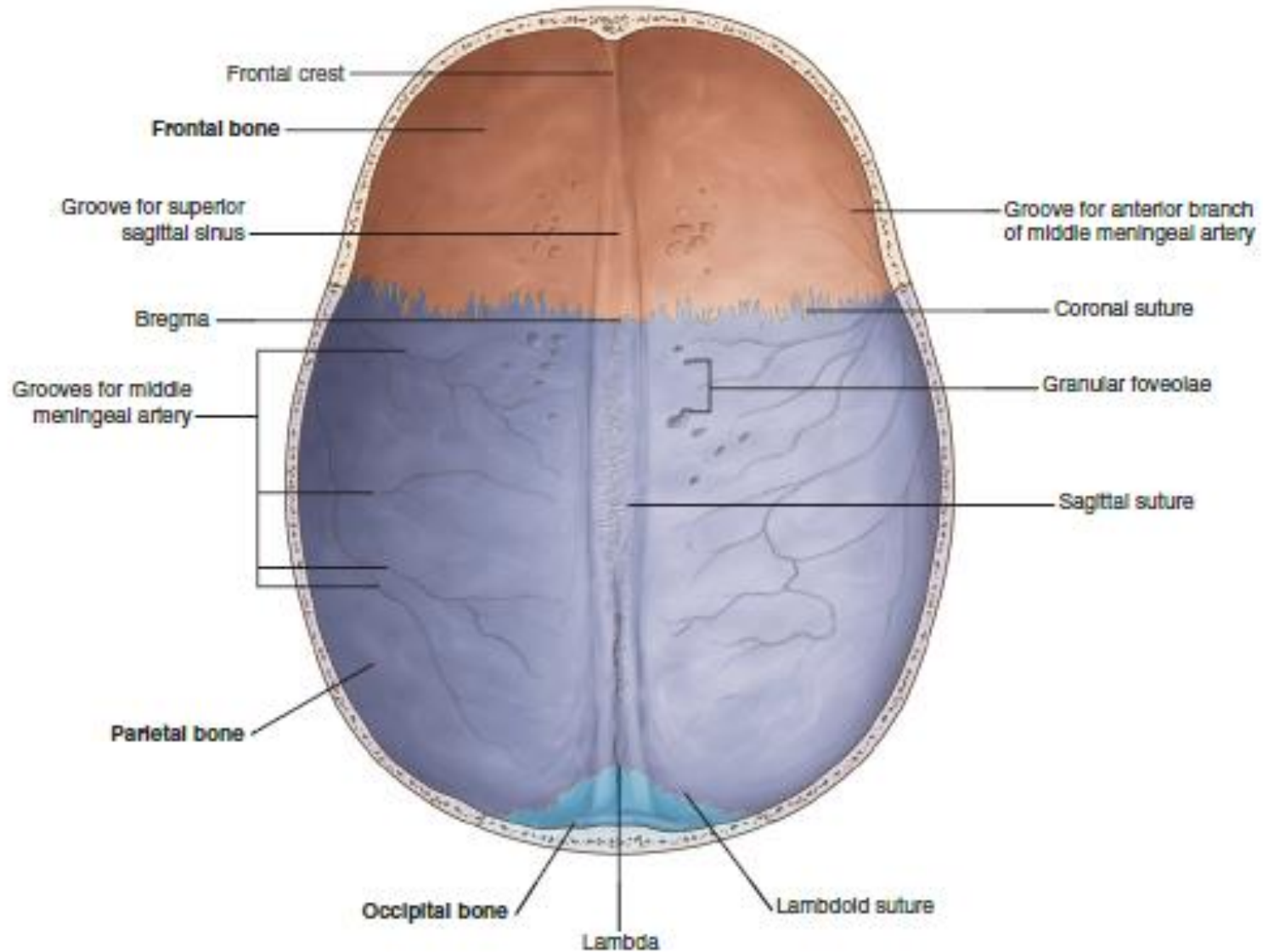
CRANIAL CAVITY

Roof

- The calvaria is the dome-shaped roof that protects the superior aspect of the brain. It consists mainly of **the frontal bone anteriorly, the paired parietal bones in the middle, and the occipital bone posteriorly**

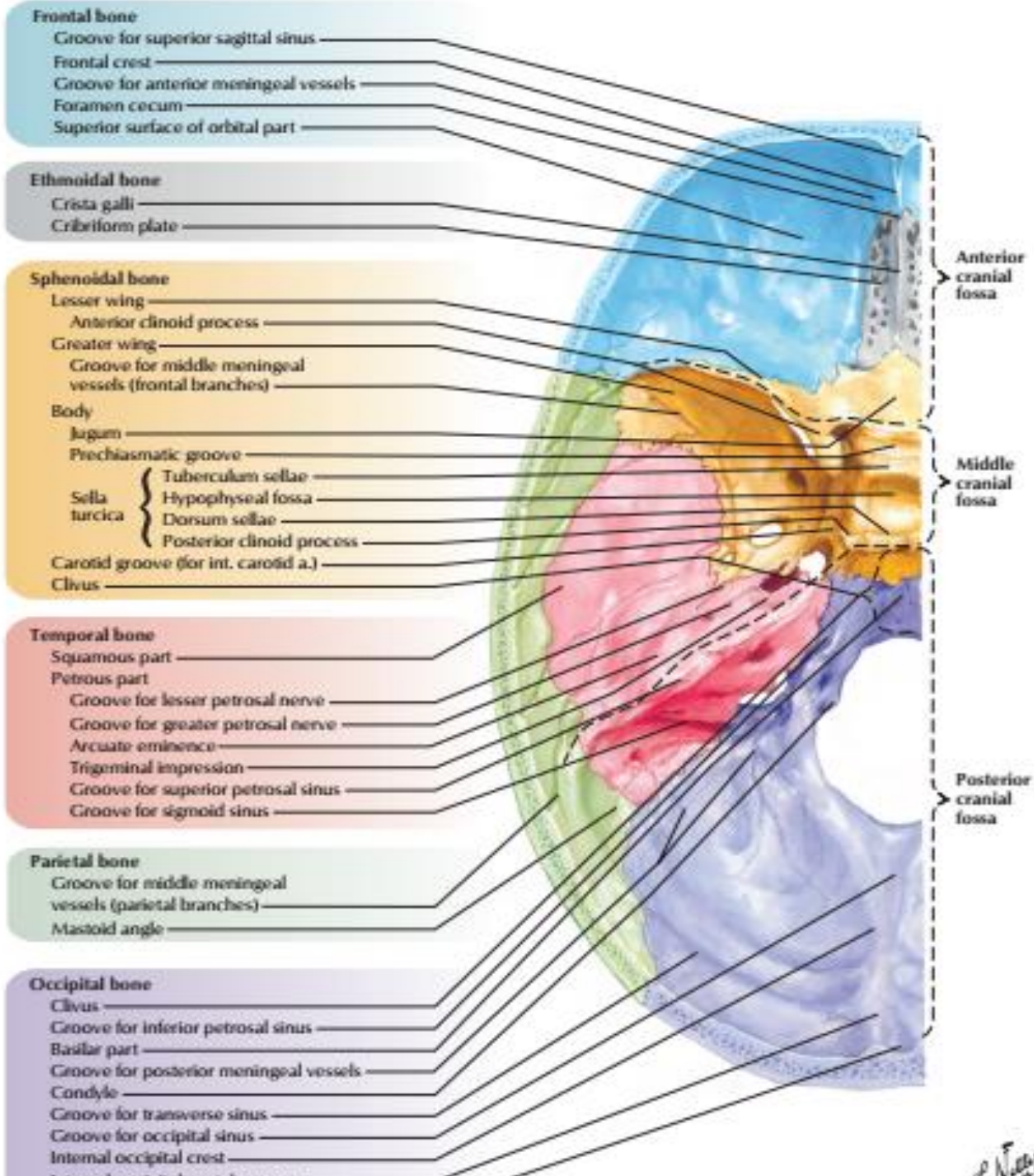
Sutures visible internally include;

- coronal
- sagittal
- lambdoid



Floor

- The floor of the cranial cavity is divided into anterior, middle, and posterior cranial fossae.



Frontal bone

- Groove for superior sagittal sinus
- Frontal crest
- Groove for anterior meningeal vessels
- Foramen cecum
- Superior surface of orbital part

Ethmoidal bone

- Crista galli
- Cribriform plate

Sphenoidal bone

- Lesser wing
- Anterior clinoid process
- Greater wing
- Groove for middle meningeal vessels (frontal branches)
- Body
 - Jugum
 - Prechiasmatic groove
 - Sella turcica
 - Tuberculum sellae
 - Hypophysial fossa
 - Dorsum sellae
 - Posterior clinoid process
 - Carotid groove (for int. carotid a.)
 - Clivus

Temporal bone

- Squamous part
- Petrous part
 - Groove for lesser petrosal nerve
 - Groove for greater petrosal nerve
 - Arcuate eminence
 - Trigeminal impression
 - Groove for superior petrosal sinus
 - Groove for sigmoid sinus

Parietal bone

- Groove for middle meningeal vessels (parietal branches)
- Mastoid angle

Occipital bone

- Clivus
- Groove for inferior petrosal sinus
- Basilar part
- Groove for posterior meningeal vessels
- Condyle
- Groove for transverse sinus
- Groove for occipital sinus
- Internal occipital crest

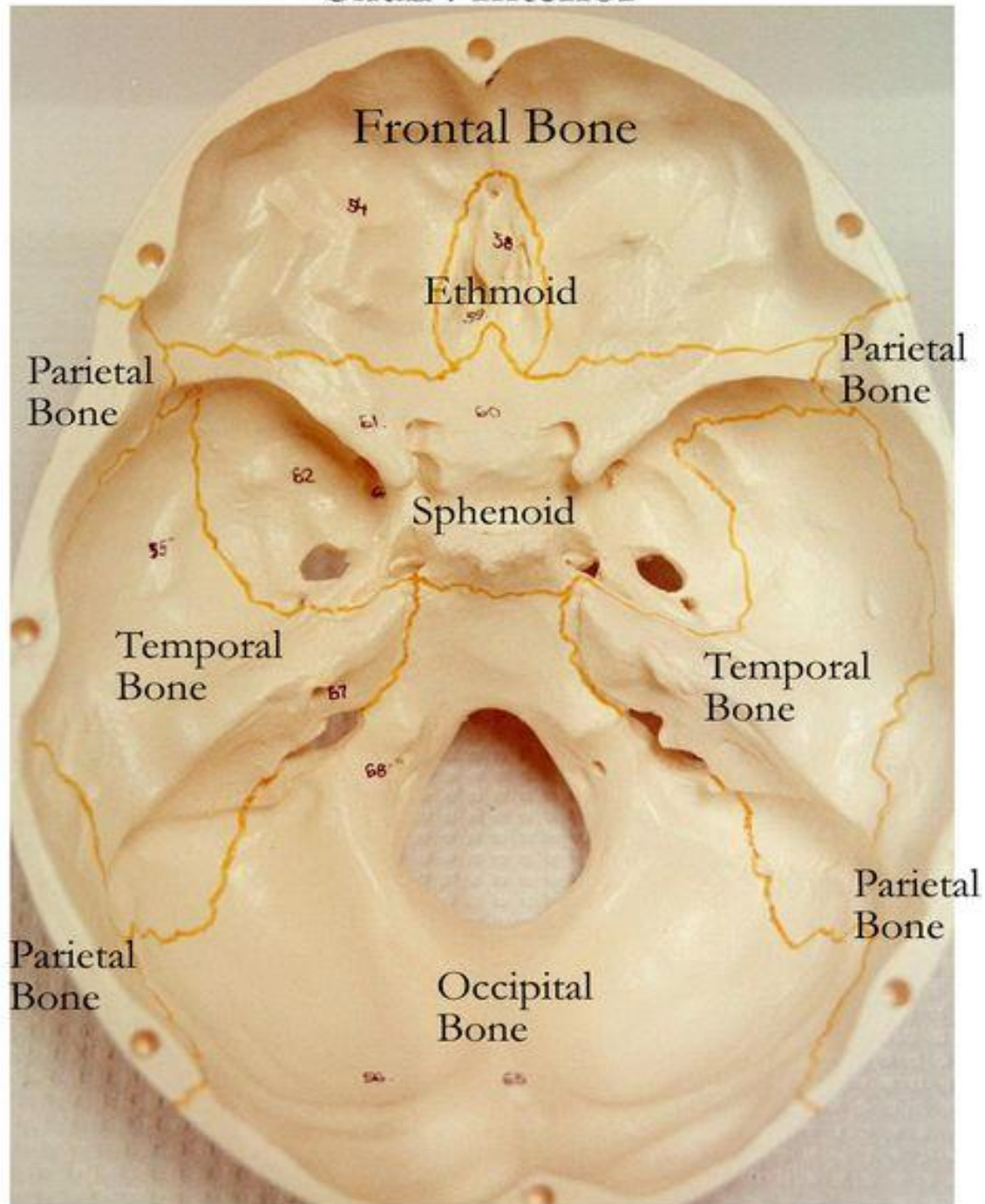
Anterior cranial fossa

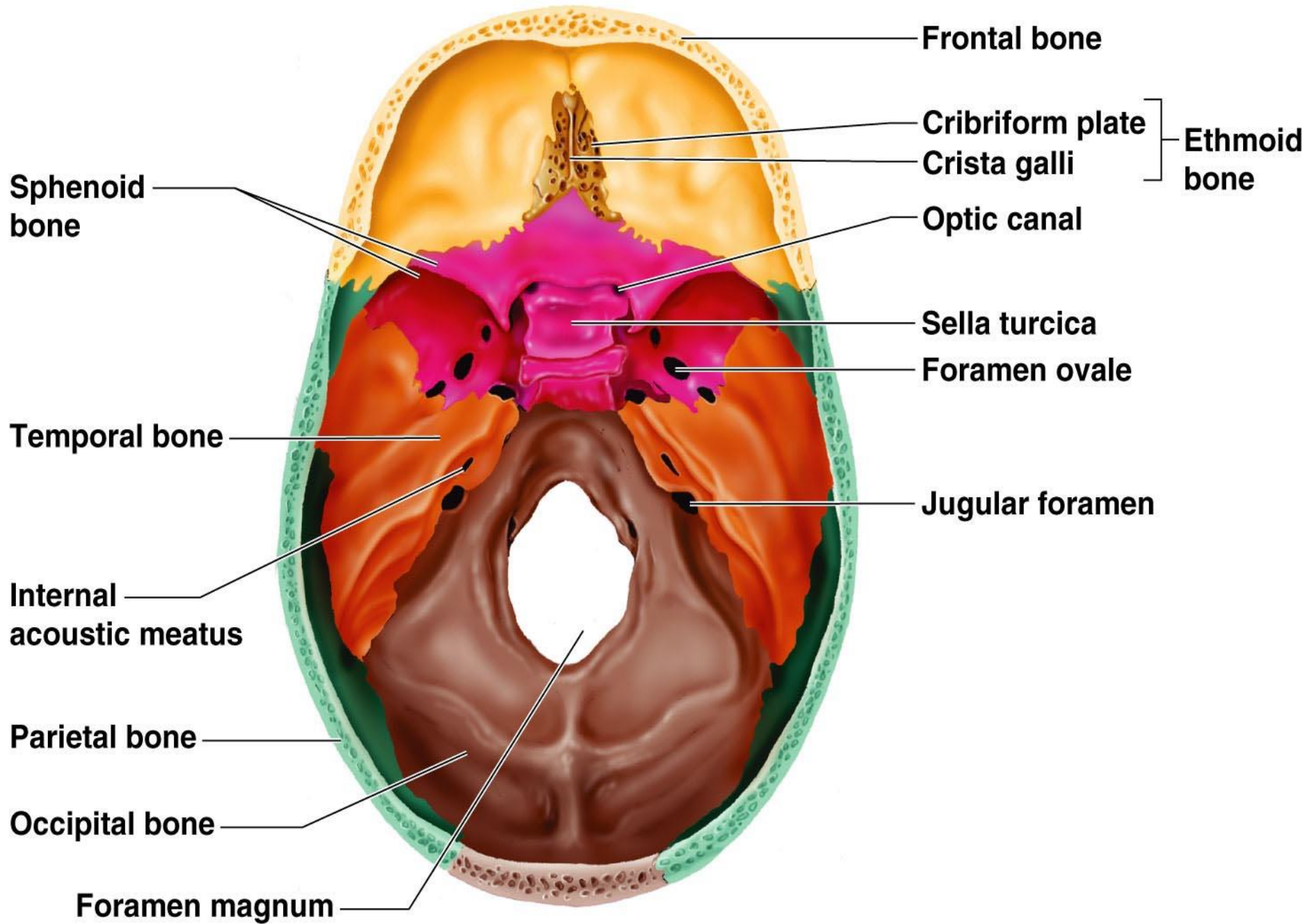
Middle cranial fossa

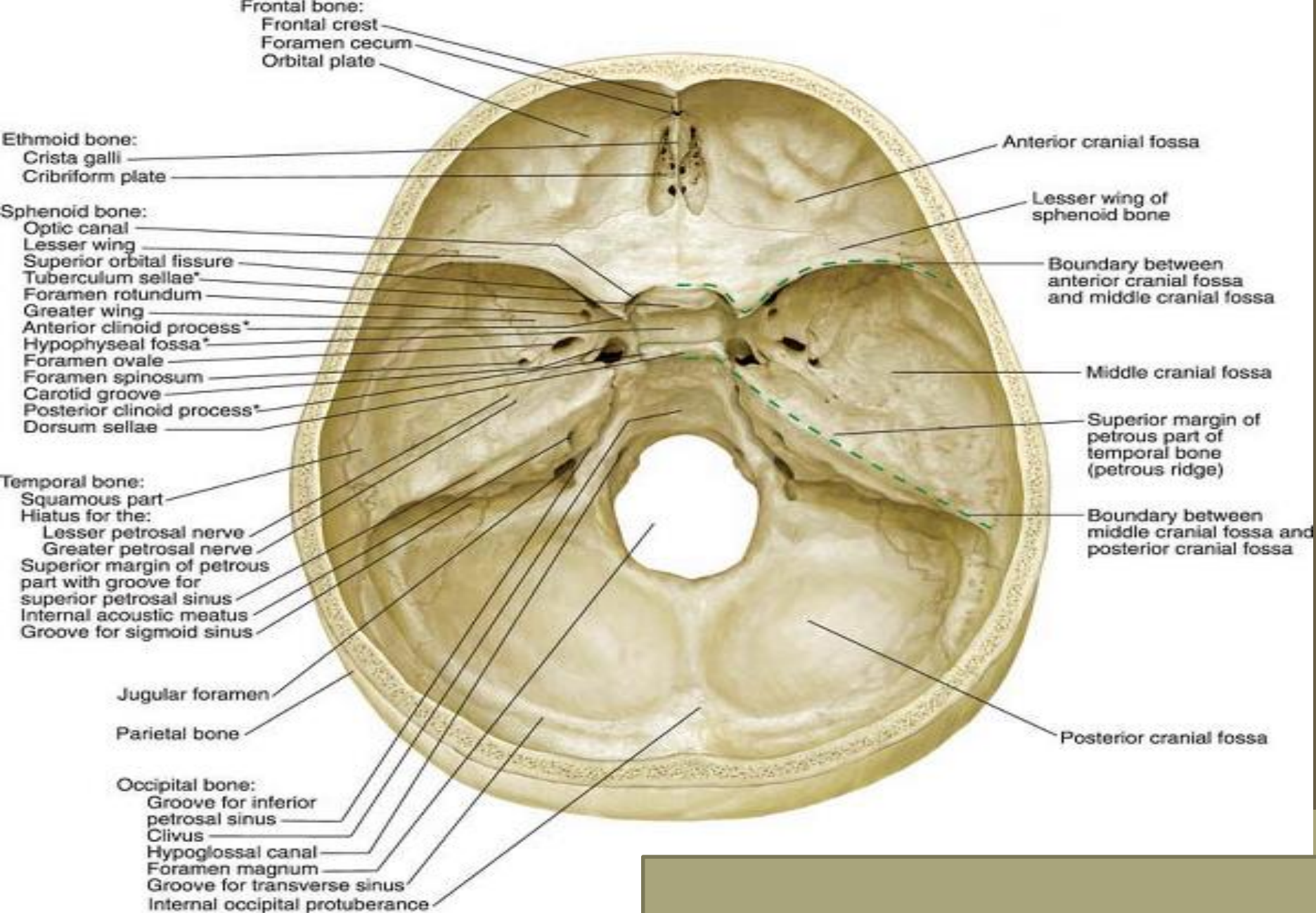
Posterior cranial fossa

p. N. 2020

Skull : Interior





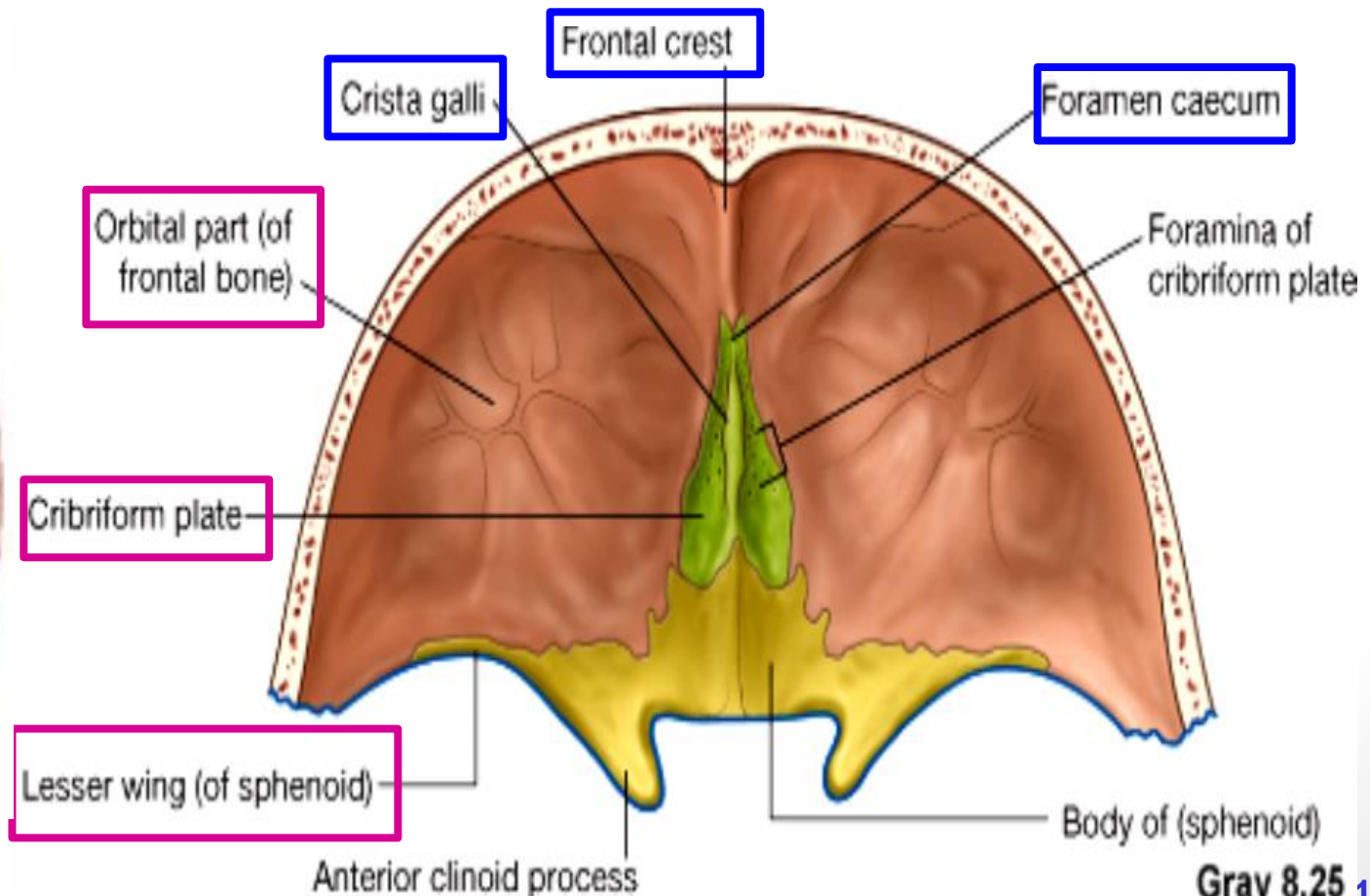


SKULL From interior (inside)

*These four structures make up the sella turcica

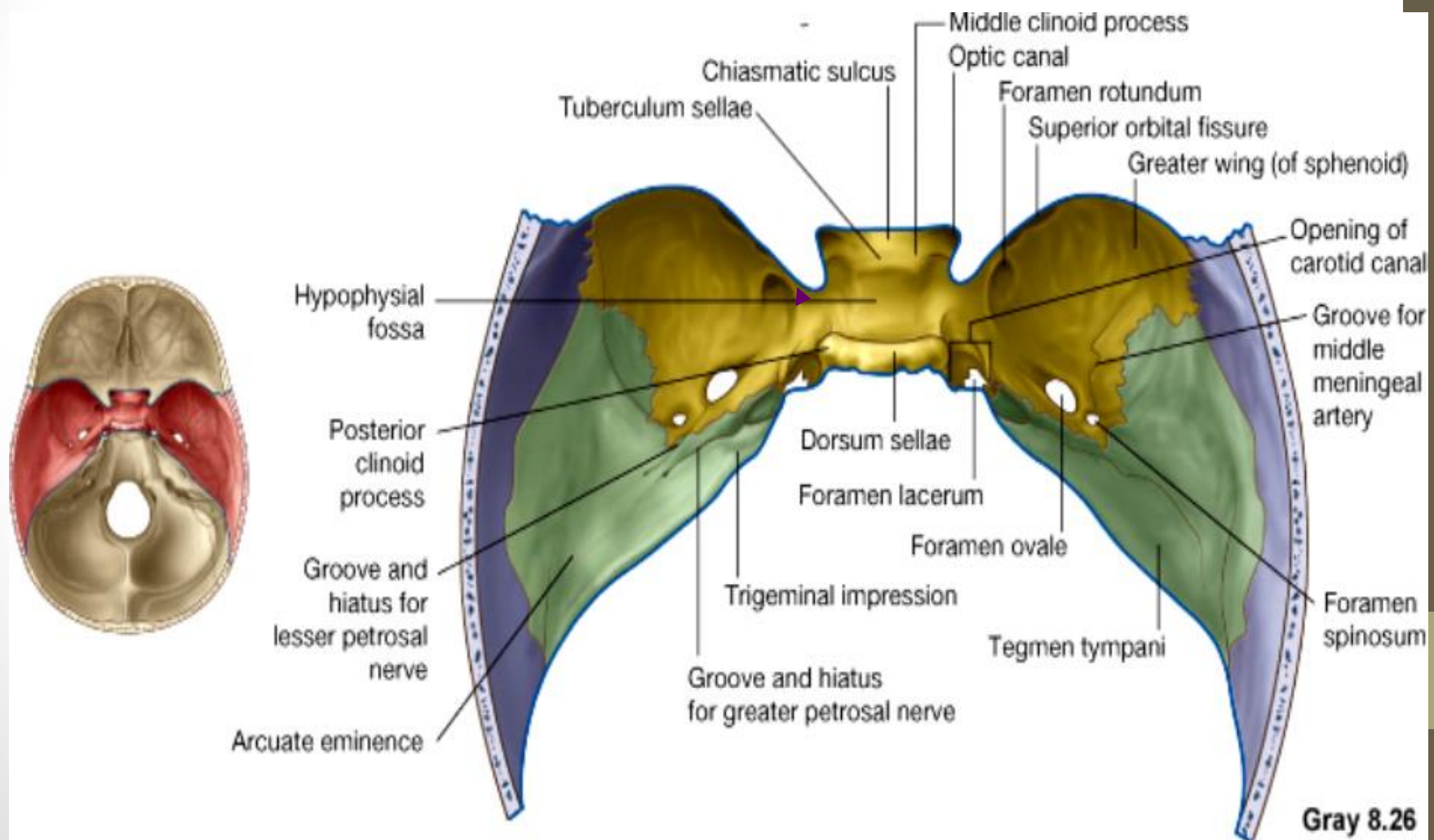
Anterior cranial fossa

1. **Frontal bone:** **Orbital plate:** thin except near superciliary arch; frontal air sinus
2. **Lesser wing of sphenoid:** **ant. clinoid processes**
3. **Ethmoid bone:** **crista galli** (*attachment of falx cerebri*)
4. **Foramen caecum; cribriform plate**

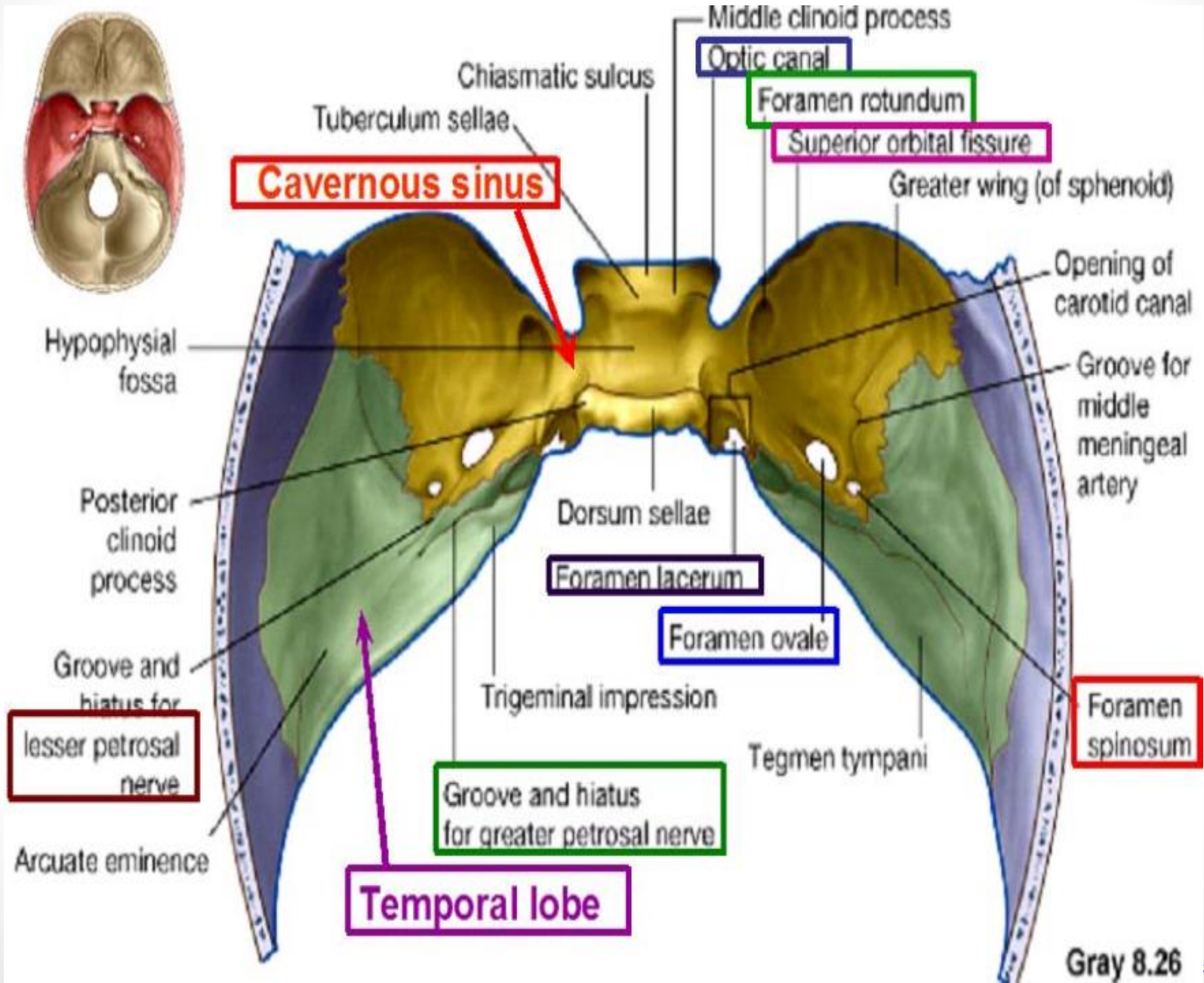


Middle cranial fossa

1. Temporal bone; petrous part: thick, contains inner ear
2. Hypophyseal fossa ; sella turcica
3. Anterior Clinoid process (clinoid in latin = bed-side)
4. Posterior Clinoid process; diaphragma sellae



Inner surface of Middle cranial fossa (2/2)



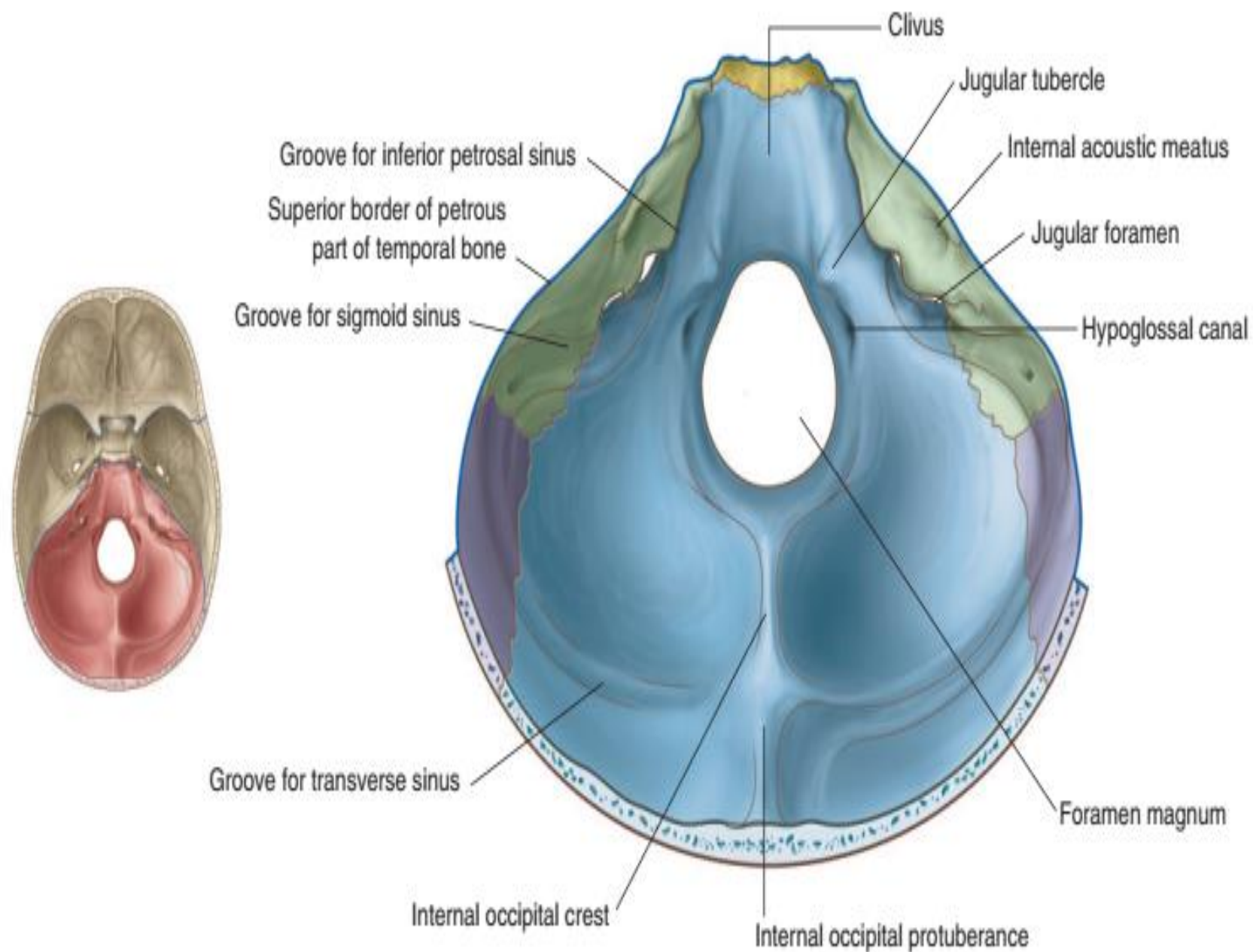
Posterior cranial fossa

largest and deepest of the three cranial fossae consists mostly parts of ;

1. Temporal
2. Occipital bones,
3. Sphenoid
4. Parietal bones

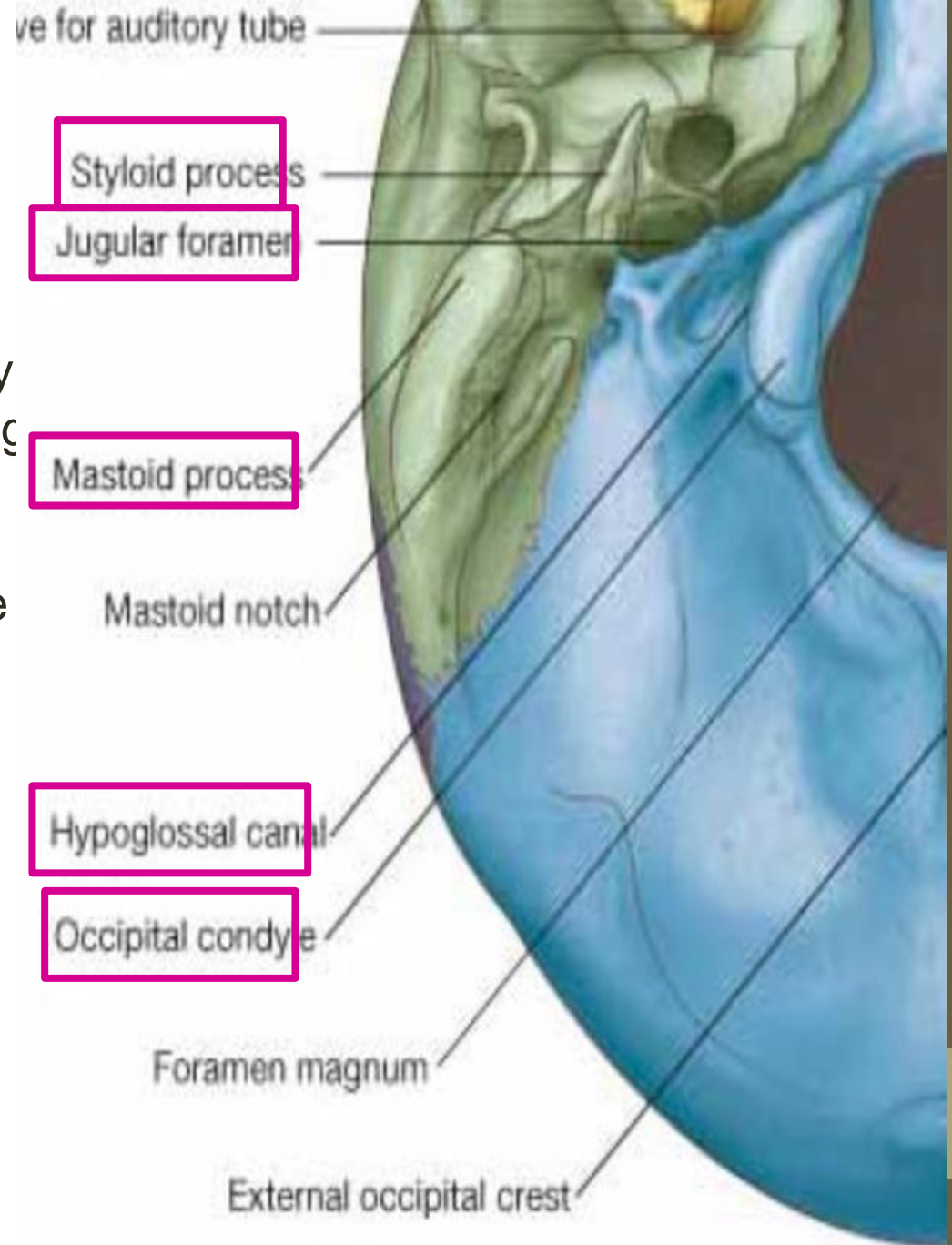
Contains

1. brainstem (midbrain, pons, and medulla)
2. cerebellum

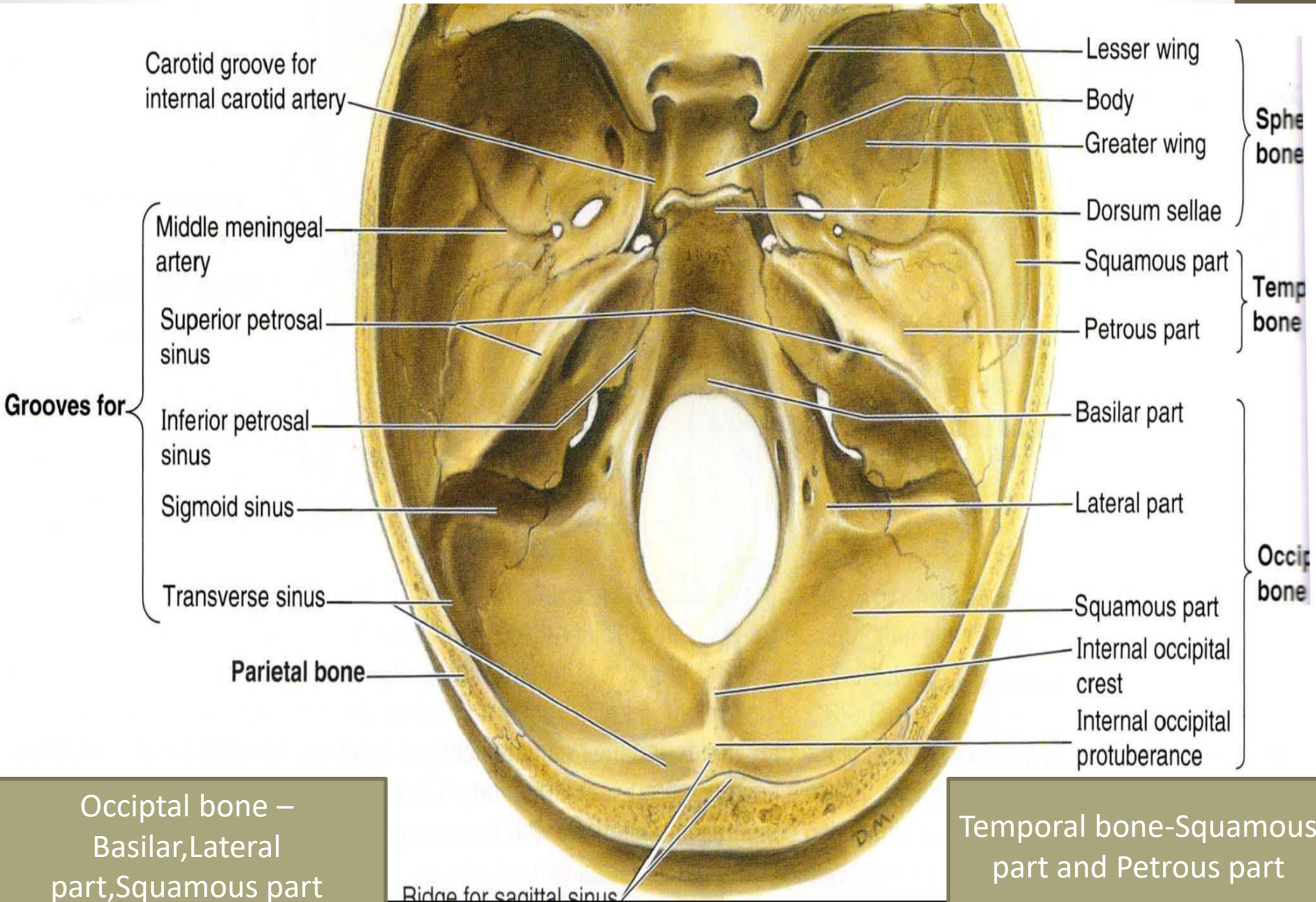


Outer surface of Post. cranial fossa

- ❑ jugular foramen
- ❑ occipital condyle
- ❑ hypoglossal canal (medial opening hidden under condyle)
- ❑ styloid process: stylohyoid lig
- ❑ mastoid process: air cell ↔ middle ear
- ❑ Sternocleidomastoid muscle attaches



Inner surface of Occipital bone, Temporal bone



Occipital bone –
Basilar, Lateral
part, Squamous part

Temporal bone – Squamous
part and Petrous part

Foramina

Foramen	Structures passing through foramen
Anterior cranial fossa	
Foramen cecum	Emissary veins to nasal cavity
Olfactory foramen in cribriform plate	Olfactory nerves [I]
Middle cranial fossa	
Optic canal	Optic nerve [III]; ophthalmic artery
Superior orbital fissure	Oculomotor nerve [III]; trochlear nerve [IV]; ophthalmic division of the trigeminal nerve [V1]; abducent nerve [VI]; ophthalmic veins
Foramen rotundum	Maxillary division of the trigeminal nerve [V2]
Foramen ovale	Mandibular division of the trigeminal nerve [V3]; lesser petrosal nerve
Foramen spinosum	Middle meningeal artery
Hiatus for the greater petrosal nerve	Greater petrosal nerve
Hiatus for the lesser petrosal nerve	Lesser petrosal nerve
Posterior cranial fossa	
Foramen magnum	End of brainstem/beginning of spinal cord; vertebral arteries; spinal roots of the accessory nerve; meninges
Internal acoustic meatus	Facial nerve [VII]; vestibulocochlear nerve [VIII]; labyrinthine artery
Jugular foramen	Glossopharyngeal nerve [IX]; vagus nerve [X]; accessory nerve [XI]; inferior petrosal sinus, sigmoid sinus (forming internal jugular vein)
Hypoglossal canal	Hypoglossal nerve [XII]; meningeal branch of the ascending pharyngeal artery
Condylar canal	Emissary vein

Foramen rotundum:

(middle cranial fossa/
pterygopalatine fossa)

- [V₂] Maxillary division of [V] (trigeminal nerve)

Foramen ovale:

(middle cranial fossa/
infratemporal fossa)

- [V₃] Mandibular division of [V] (trigeminal nerve)

Carotid canal:

(middle cranial fossa/neck)

- Internal carotid artery

Foramen spinosum:

(middle cranial fossa/
infratemporal fossa)

- Middle meningeal artery

Jugular foramen:

(posterior cranial fossa/neck)

- [IX] Glossopharyngeal nerve
- [X] Vagus nerve
- [XI] Accessory nerve
- Internal jugular vein

Foramen magnum:

(posterior cranial fossa/neck)

- Spinal cord
- Vertebral arteries
 - Roots of accessory nerve [XI] pass from upper region of spinal cord through the foramen magnum into the cranial cavity and then leave the cranial cavity through the jugular foramen

Cribriform plate:

(anterior cranial fossa/nasal cavity)

- [I] Olfactory nerves

Optic canal:

(middle cranial fossa/orbit)

- [II] Optic nerve
- Ophthalmic artery

Superior orbital fissure:

(middle cranial fossa/orbit)

- [V₁] Ophthalmic division of [V] (trigeminal nerve)
- [III] Oculomotor nerve
- [IV] Trochlear nerve
- [VI] Abducent nerve
- Superior ophthalmic vein

Foramen lacerum

(filled with cartilage in life)

Internal acoustic meatus:

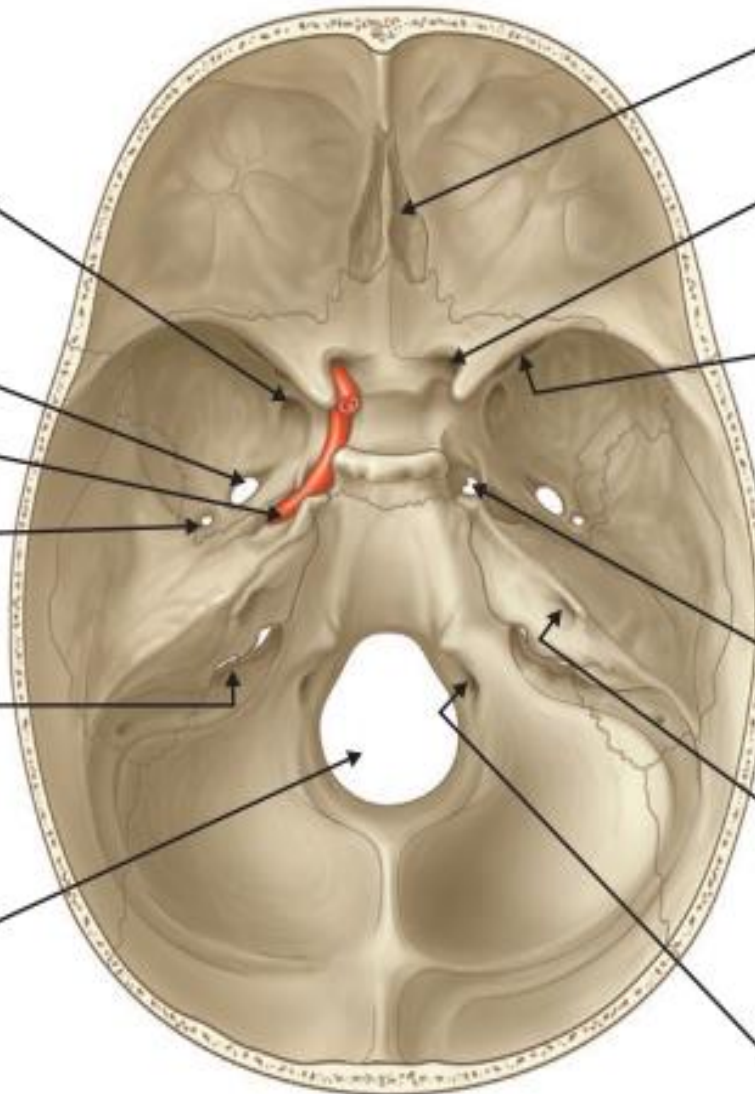
(posterior cranial fossa/ear, and neck via stylomastoid foramen)

- [VII] Facial nerve
- [VIII] Vestibulocochlear nerve
 - Labyrinthine artery and vein

Hypoglossal canal:

(posterior cranial fossa/neck)

- [XII] Hypoglossal nerve



A

Carotid canal:

- Internal carotid artery

Stylomastoid foramen:

- [VII] Facial nerve

Foramen magnum:

- Spinal cord
- Vertebral arteries
 - Roots of accessory nerve [XI] pass from upper region of spinal cord through the foramen magnum into the cranial cavity and then leave the cranial cavity through the jugular foramen

Foramen ovale:

- [V₃] Mandibular division of [V] (trigeminal nerve)

Foramen spinosum:

- Middle meningeal artery

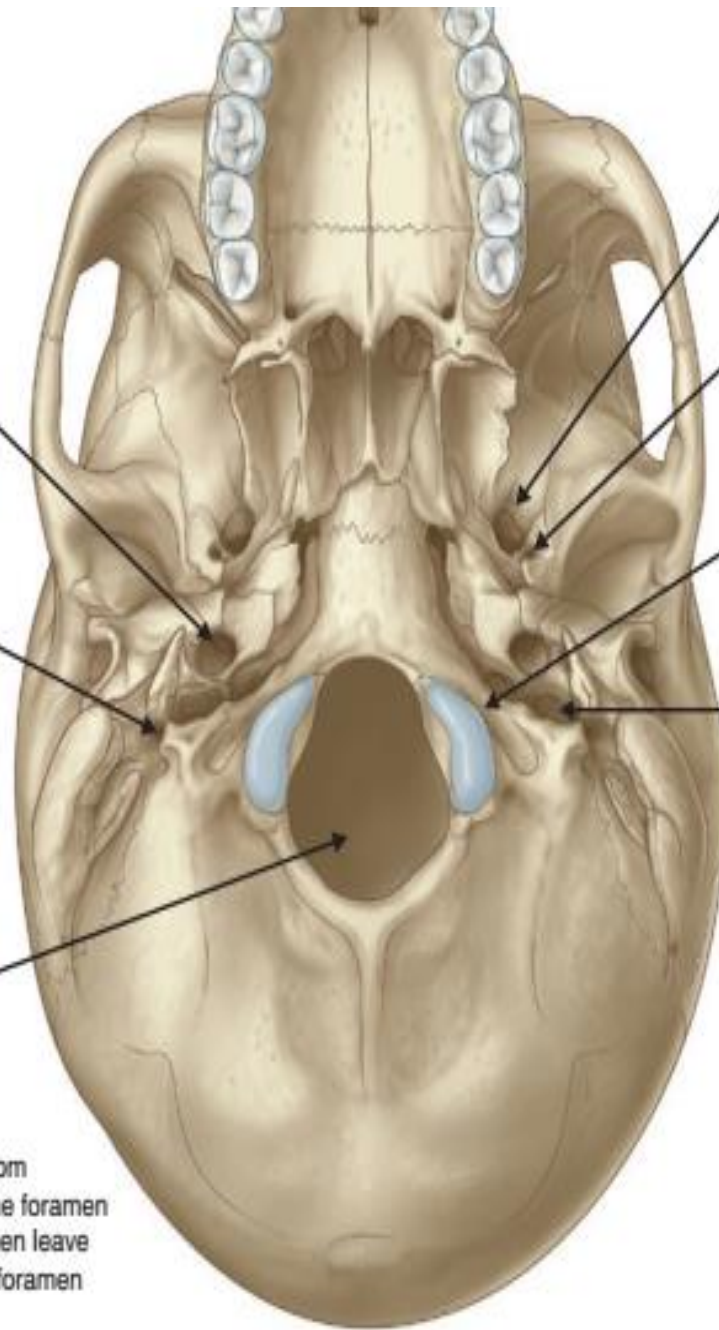
Hypoglossal canal:

- [XII] Hypoglossal nerve

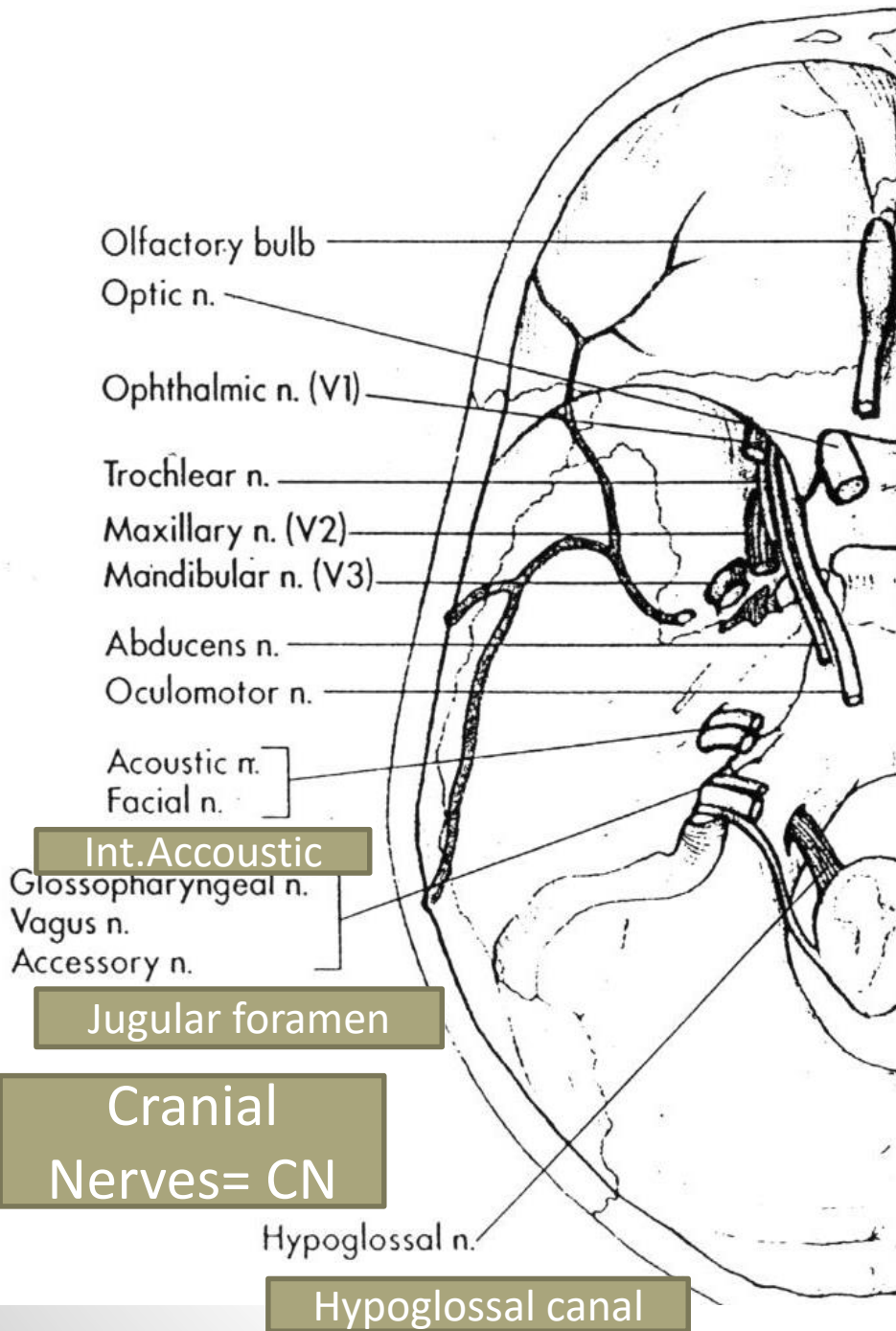
Jugular foramen:

- [IX] Glossopharyngeal nerve
- [X] Vagus nerve
- [XI] Accessory nerve
- Internal jugular vein

B



INTERIOR VIEW FORAMINA



CN 1. Olfactory Nerve=Cribriform plate

CN 2. Optic Nerve= Optic canal

Sphenoid bone

CN 3. Oculomotor Nerve=Superiore orbital fissure –sphenoid bone lesser and greater wings

CN 4. Trochlear Nerve=Superiore orbital fissure

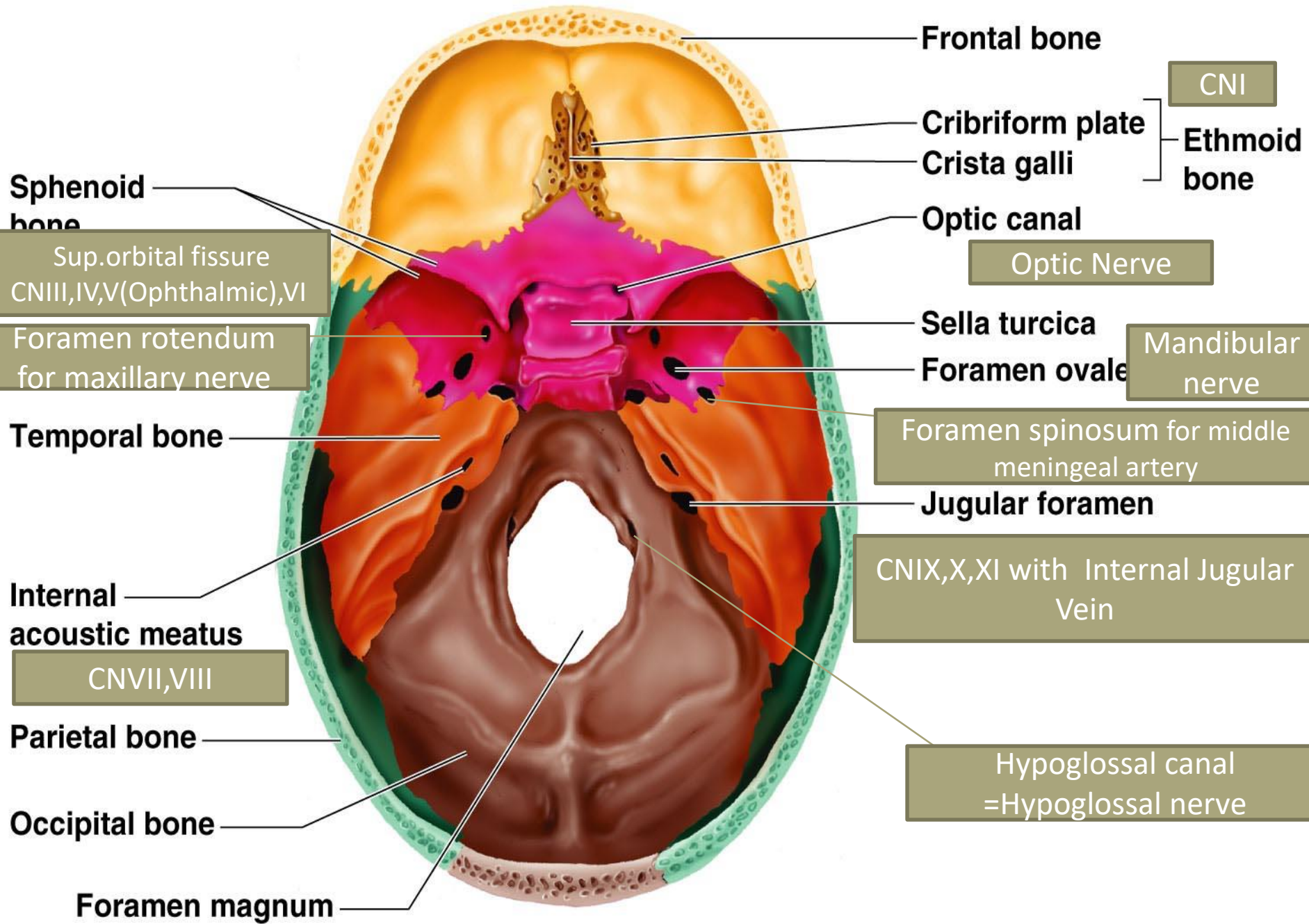
CN 5. Trigeminal Nerve=Ophthalmic branch=Superiore orbital fissure.

Maxillary branch=Foramen rotandum

Mandibular branch=Foramen ovale.

CN 6. Abducens Nerve= Sup.orbital fissure.

CN 7 Facial Nerve =Stylomastoid foramen.



Frontal bone

CNI

Cribriform plate

Ethmoid bone

Crista galli

Sphenoid bone

Optic canal

Sup. orbital fissure
CNIII,IV,V(Ophthalmic),VI

Optic Nerve

Foramen rotundum
for maxillary nerve

Sella turcica

Mandibular nerve

Foramen ovale

Temporal bone

Foramen spinosum for middle meningeal artery

Jugular foramen

Internal acoustic meatus

CNVII,VIII

CNIX,X,XI with Internal Jugular Vein

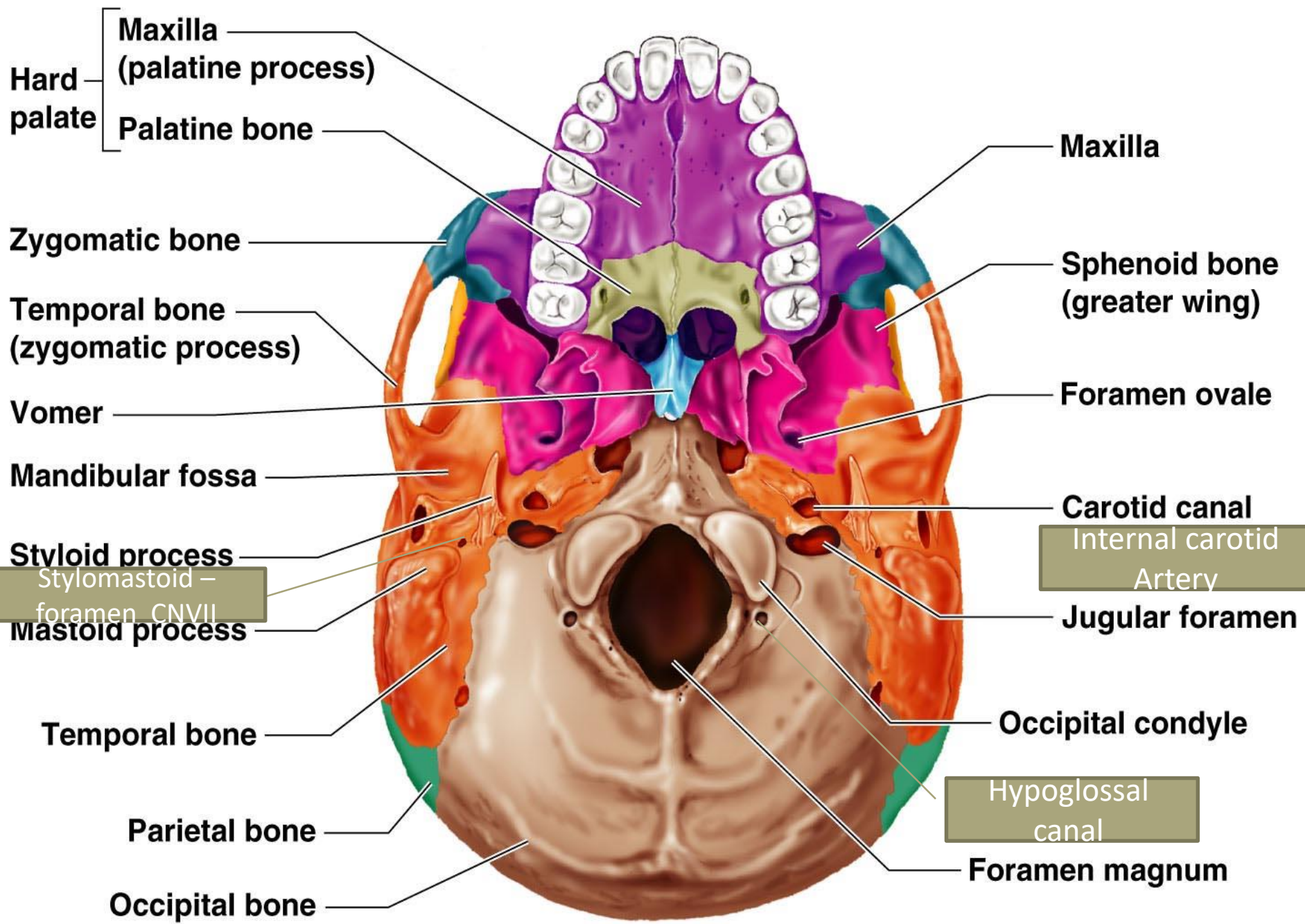
Parietal bone

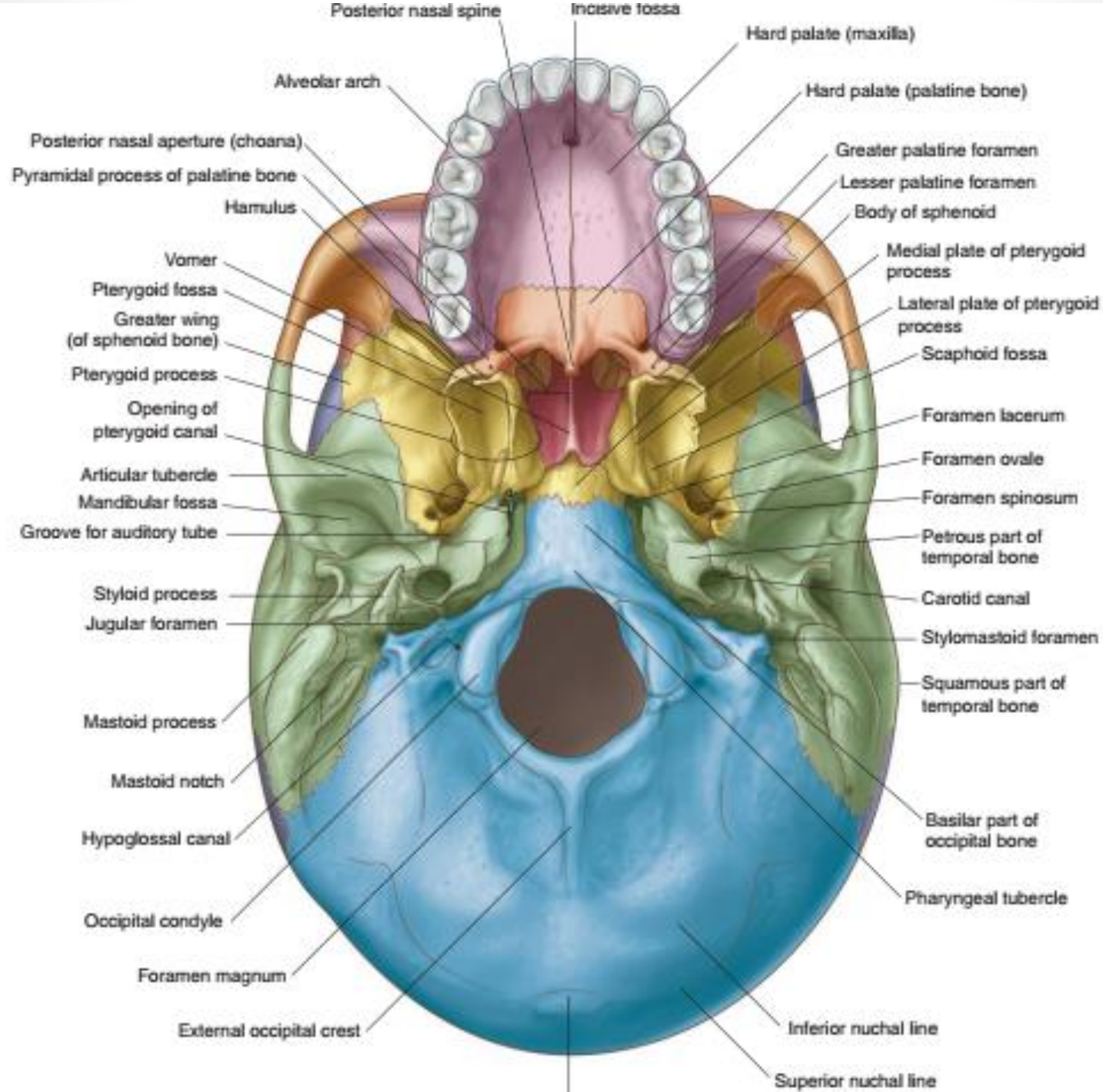
Hypoglossal canal =Hypoglossal nerve

Occipital bone

Foramen magnum

Spinal Cord





Grooves for middle meningeal arteries

Foramen spinosum

Middle meningeal artery

Anterior meningeal arteries
(from ethmoidal arteries)

Middle meningeal artery

Maxillary artery

Posterior meningeal artery
(from ascending pharyngeal artery)

Meningeal branch
(from ascending pharyngeal artery)

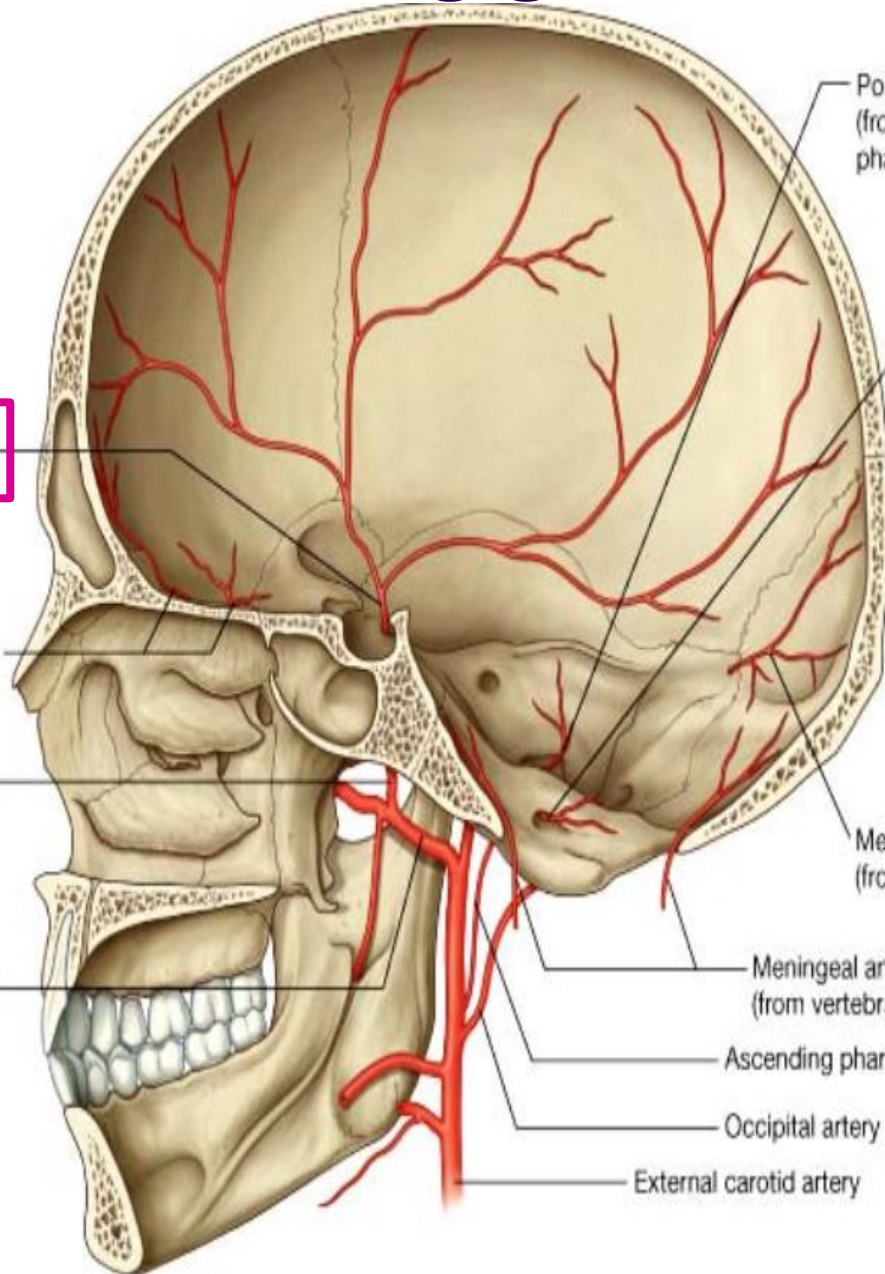
Meningeal artery
(from occipital artery)

Meningeal artery
(from vertebral artery)

Ascending pharyngeal artery

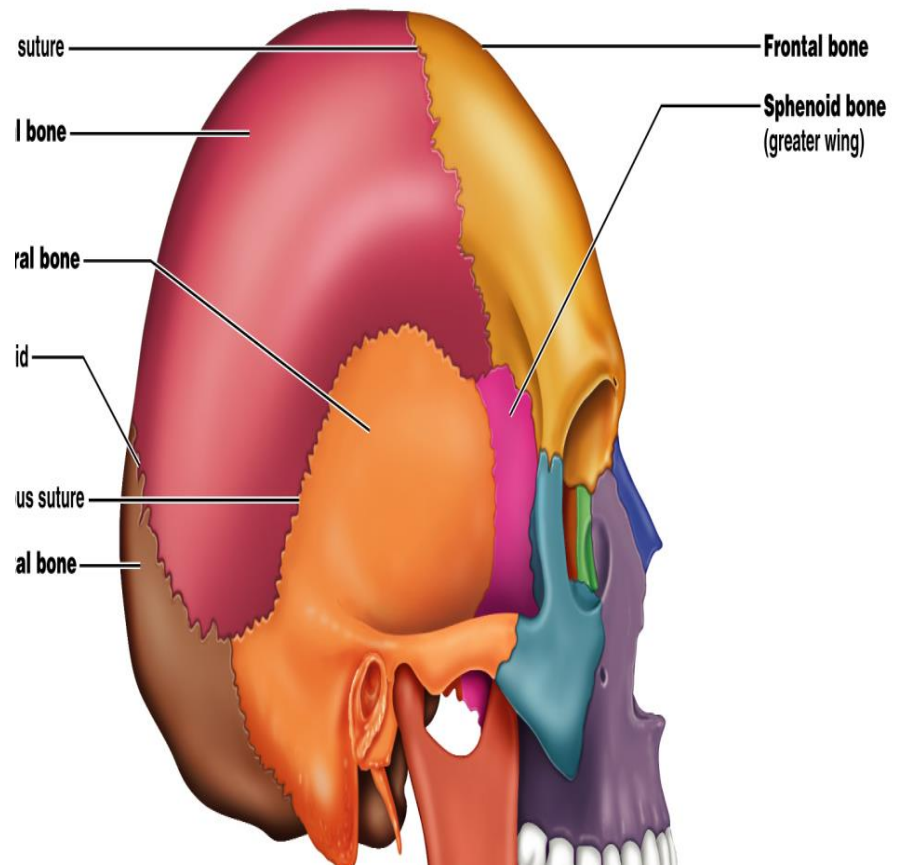
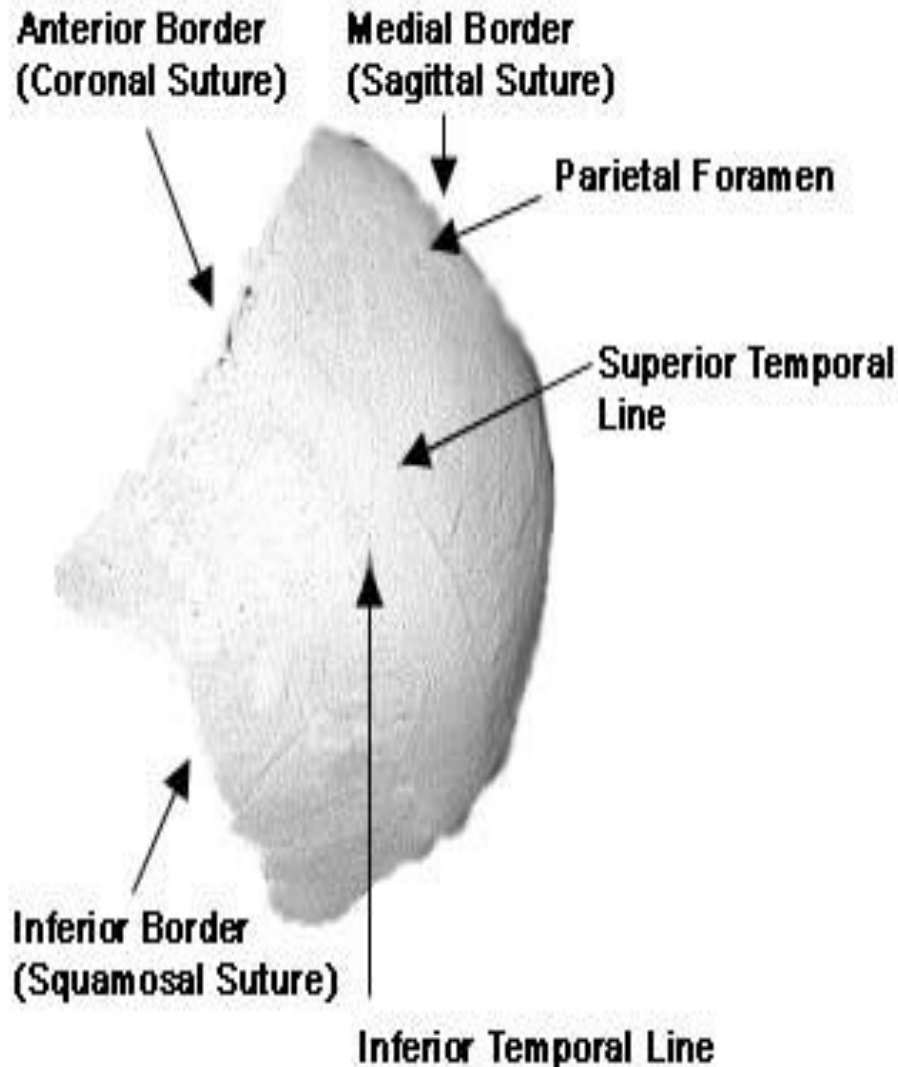
Occipital artery

External carotid artery



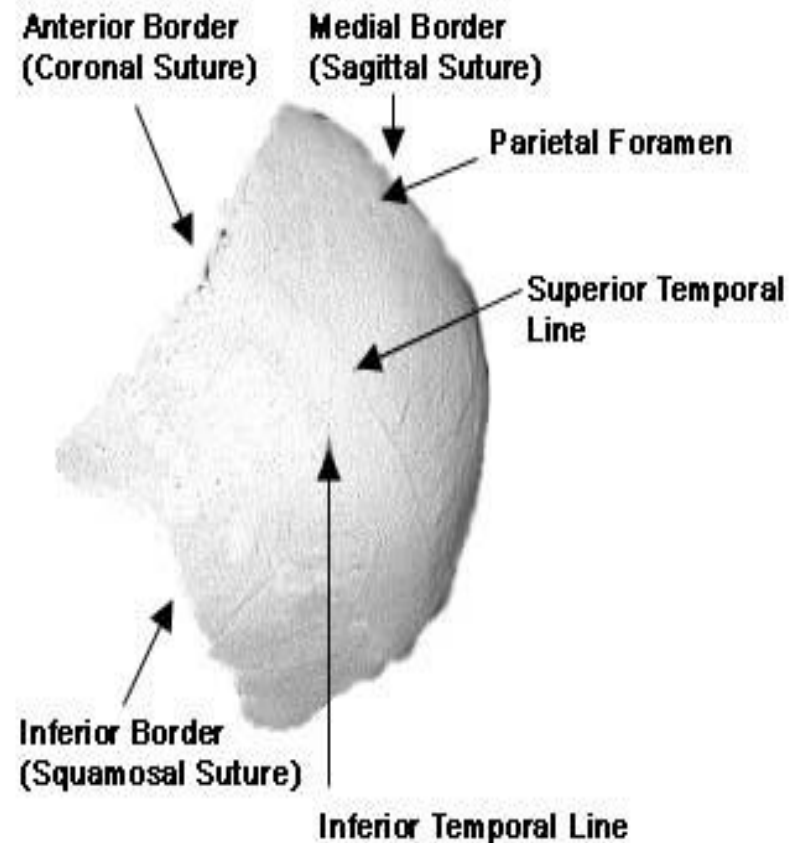
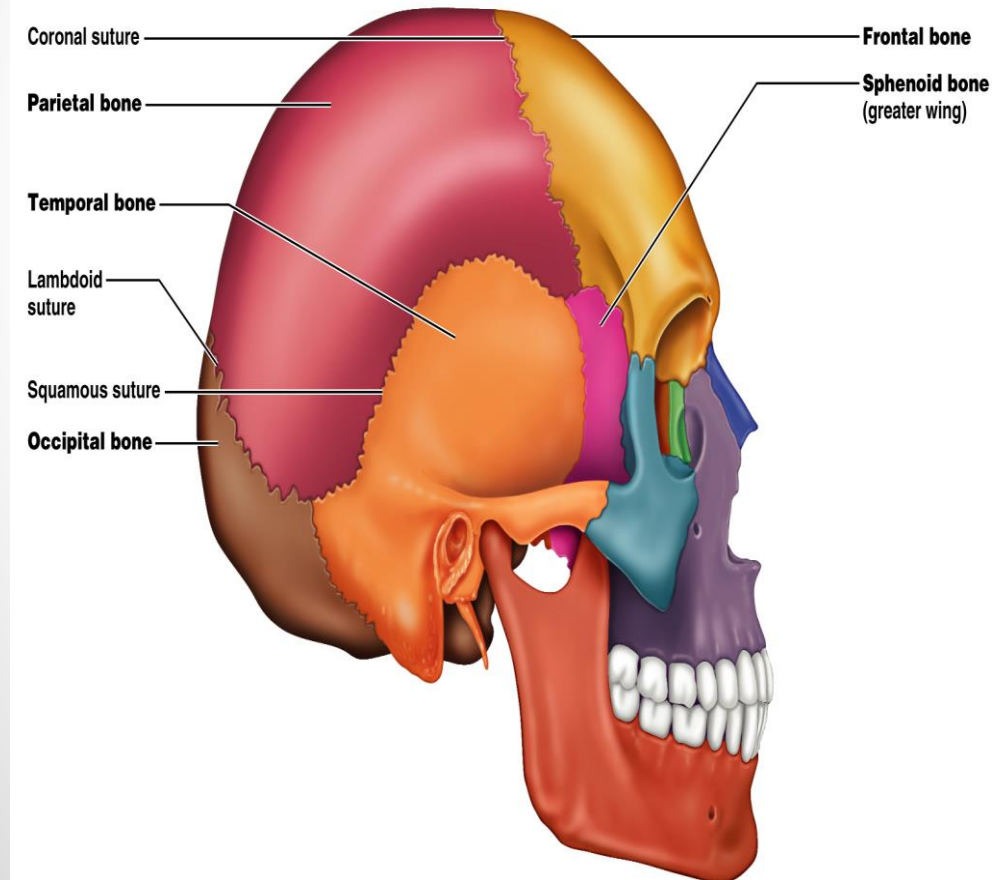
PARIETAL BONES:

- ❑ Form most of the superior and lateral aspects of the skull
- ❑ Curved, rectangular bones forming **majority of the cranium**
- ❑ All four **major sutures articulate** with this bone



FOUR SUTURES MARK THE ARTICULATIONS OF THE PARIETAL BONES

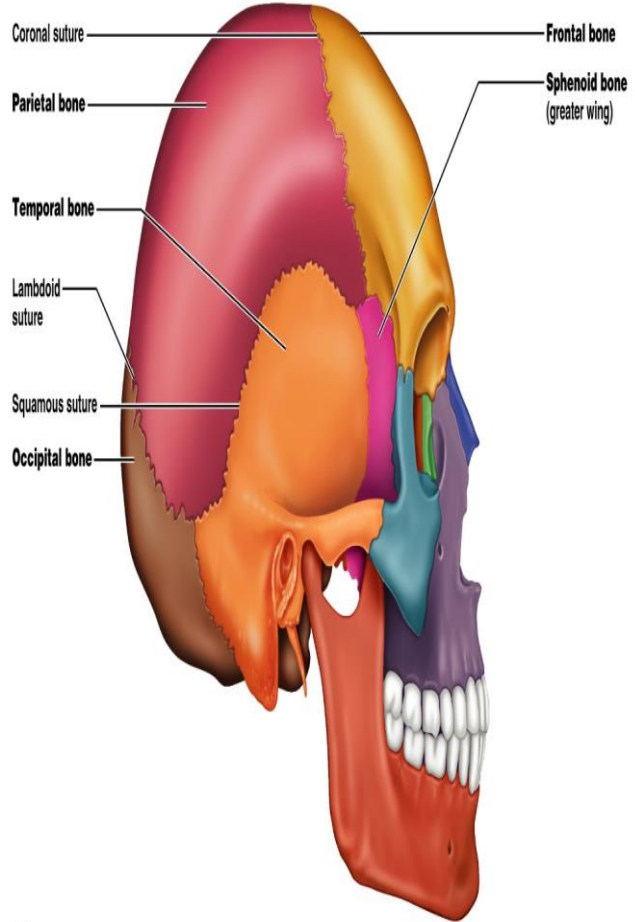
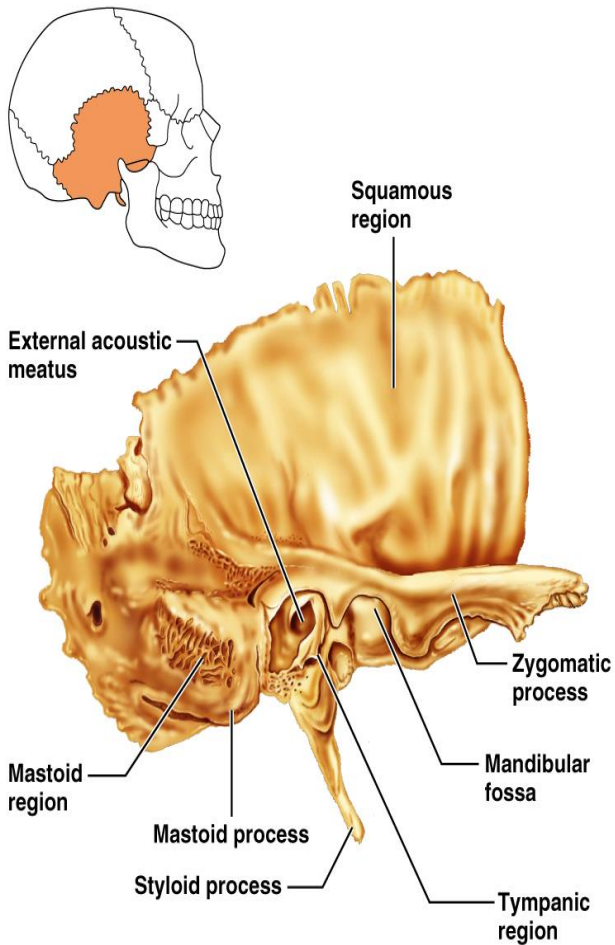
- ❑ **Coronal suture** ; frontal bone anteriorly
- ❑ **Sagittal suture** ; where right and left parietal bones meet superiorly
- ❑ **Lambdoid suture**; where parietal bones meet the occipital bone posteriorly
- ❑ **Squamosal or squamous suture**; where parietal and temporal bones – articulation



TEMPORAL BONES

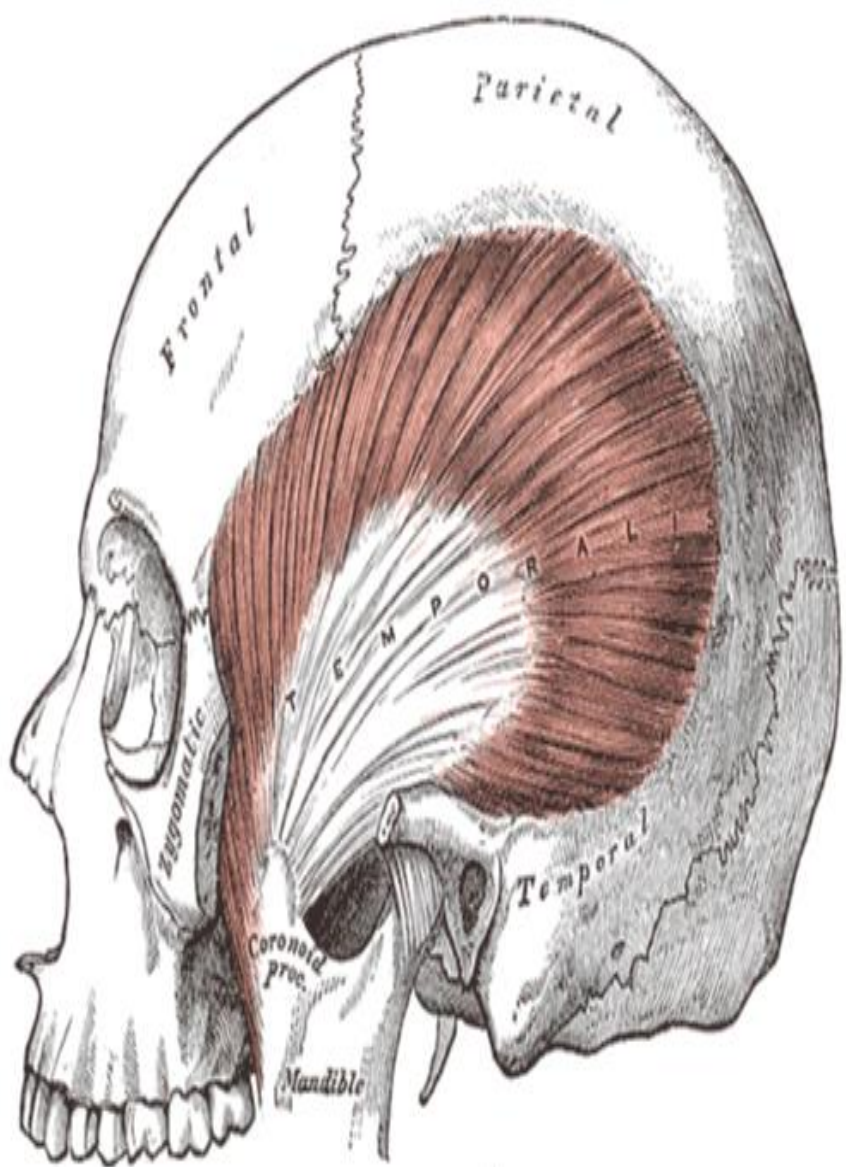
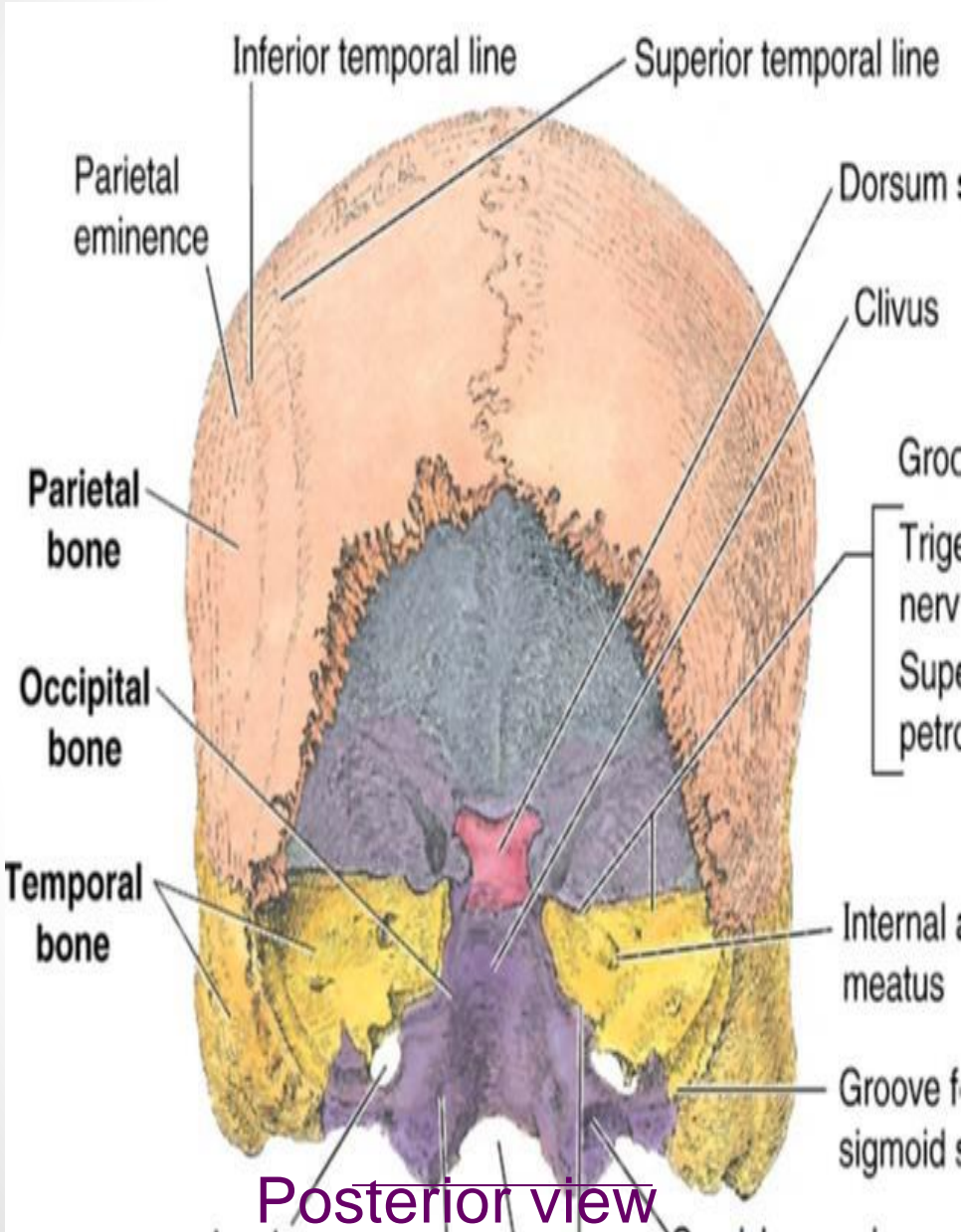
Lateral sides of the skull, formed from ;

- ❑ **Zygomatic process**; connects with zygomatic arch
- ❑ **External auditory meatus** (external ear)
- ❑ **Styloid process**; muscle attachment for tongue and neck
- ❑ **Mastoid process**; neck muscles



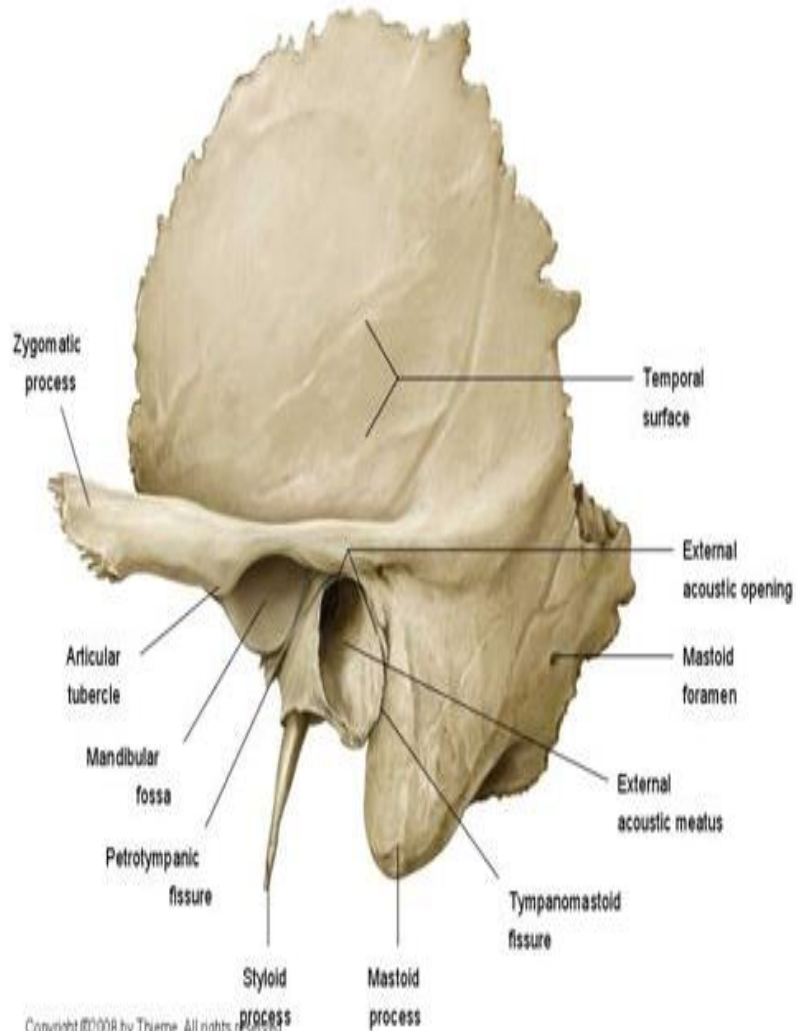
(a)

Superior temporal line and Temporalis muscle

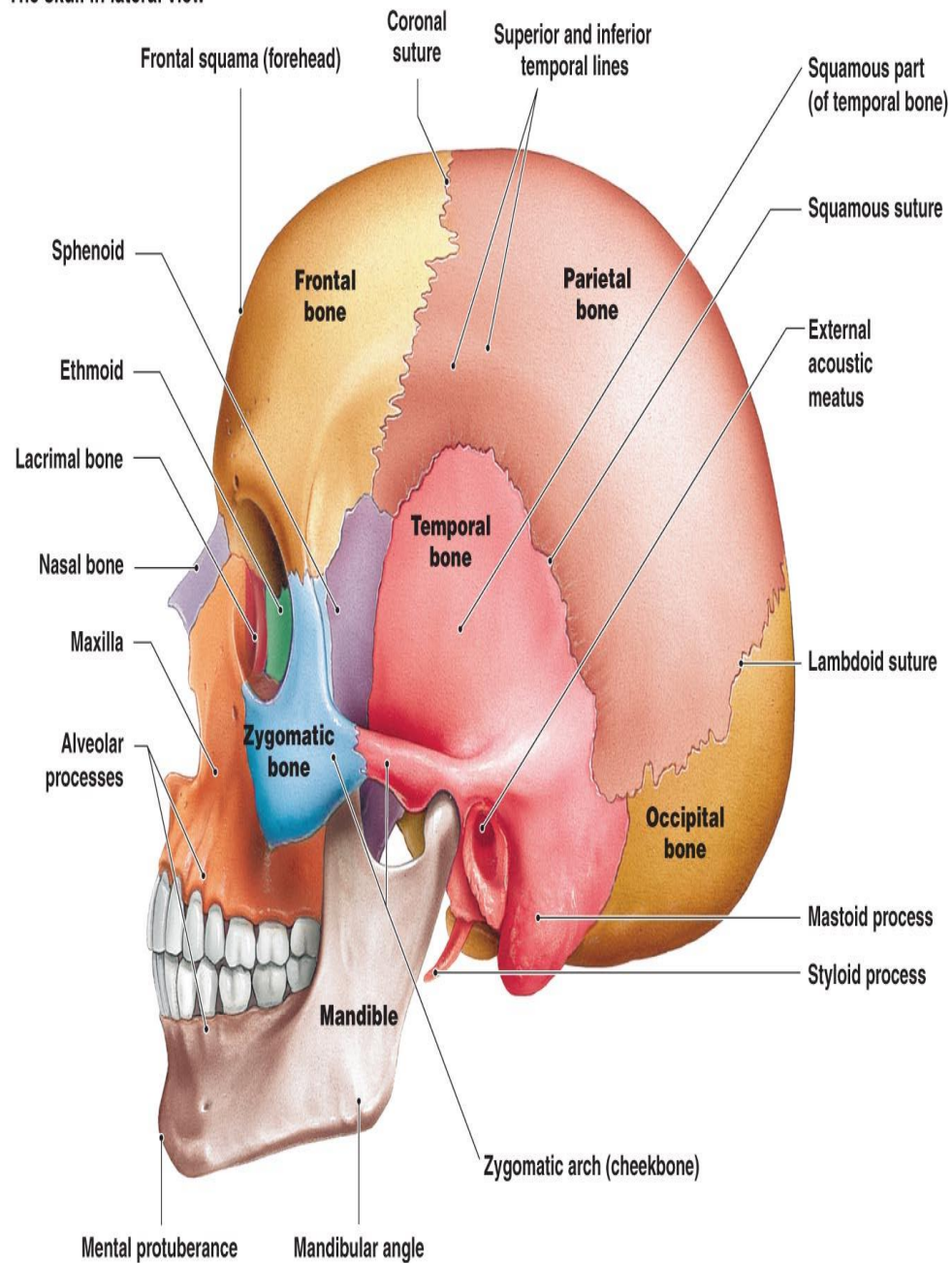


Temporal bone. Left bone.

Left lateral view.



The skull in lateral view



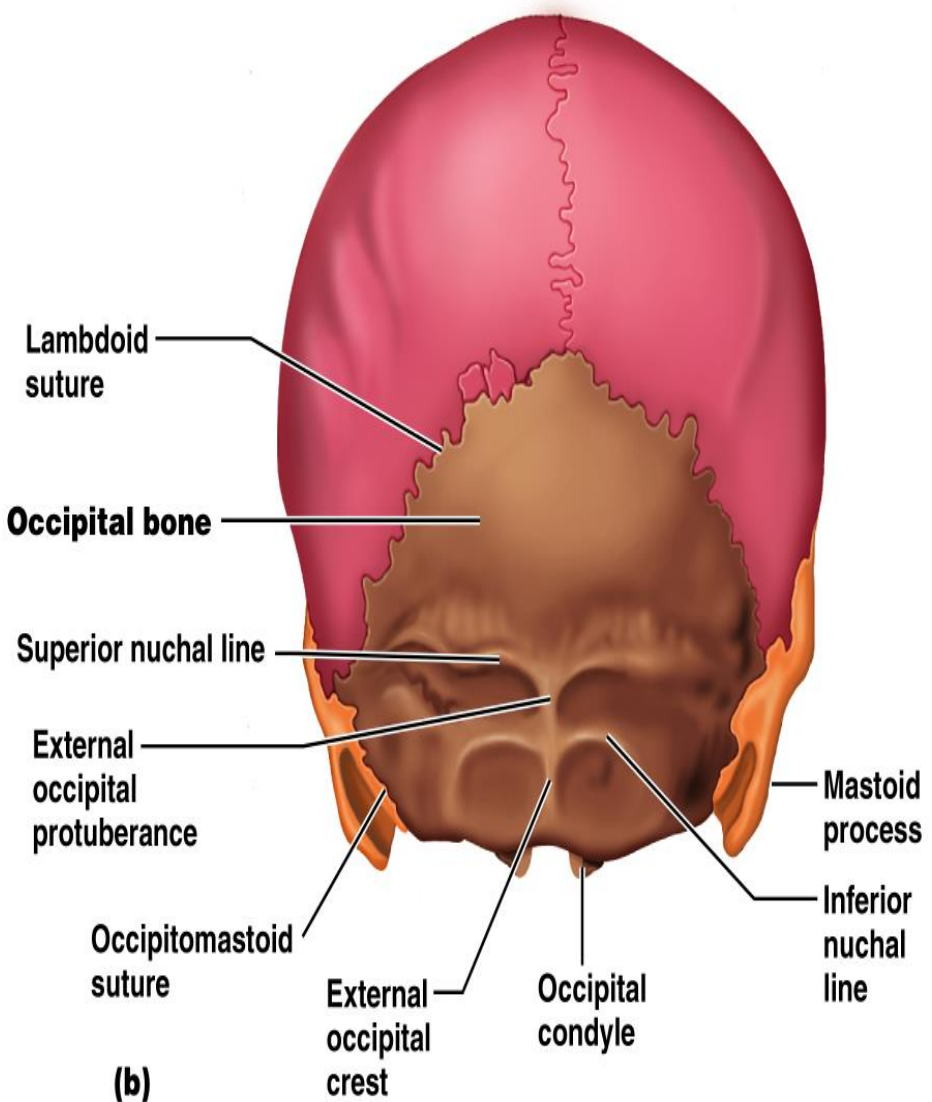
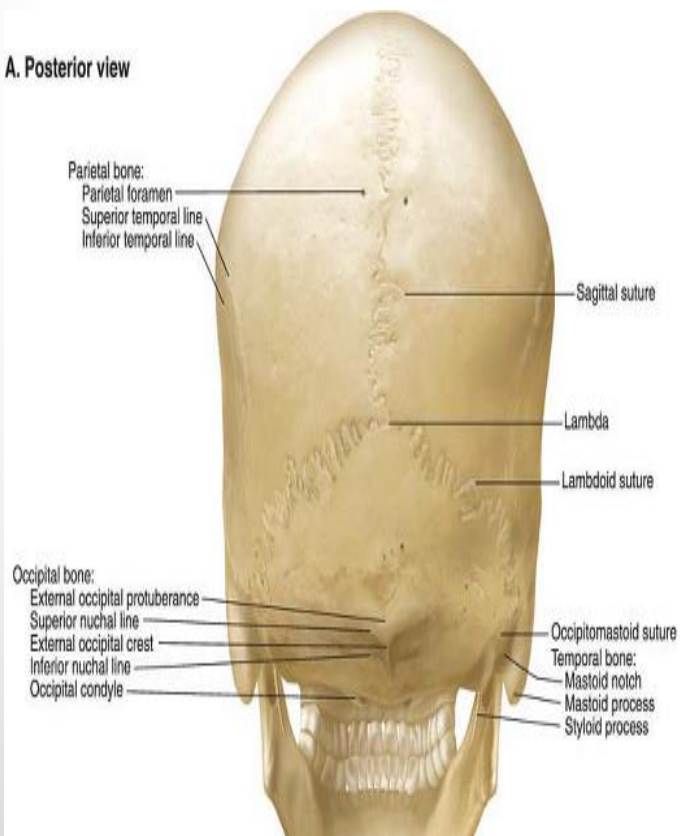
OCCIPITAL BONE AND ITS MAJOR MARKINGS

Forms most of skull's **posterior wall** and base

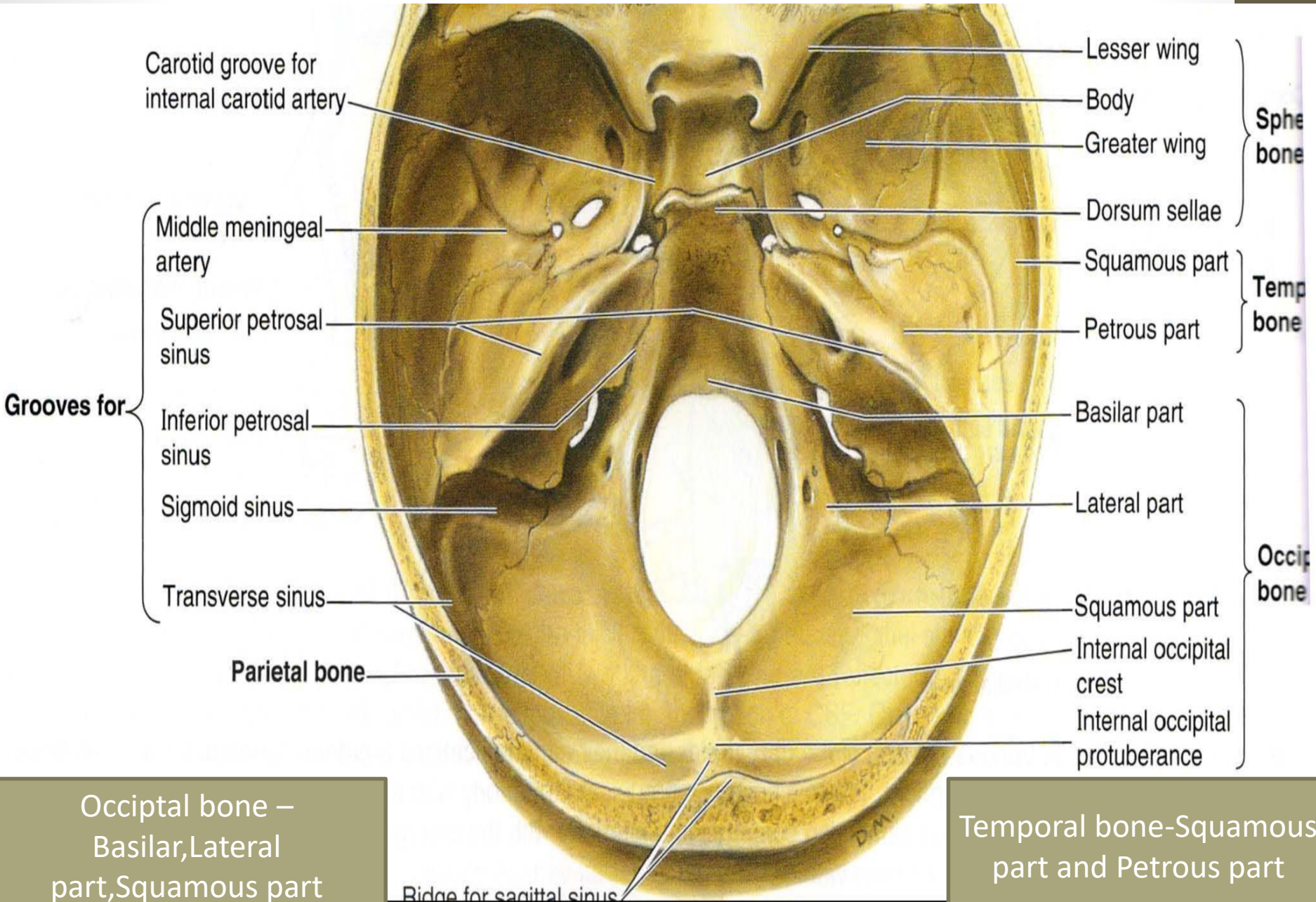
Major markings include the;

- posterior cranial fossa
- foramen magnum
- occipital condyles
- hypoglossal canal

A. Posterior view



Inner surface of Occipital bone, Temporal bone



Occipital bone –
Basilar, Lateral
part, Squamous part

Temporal bone – Squamous
part and Petrous part

SPHENOID BONE

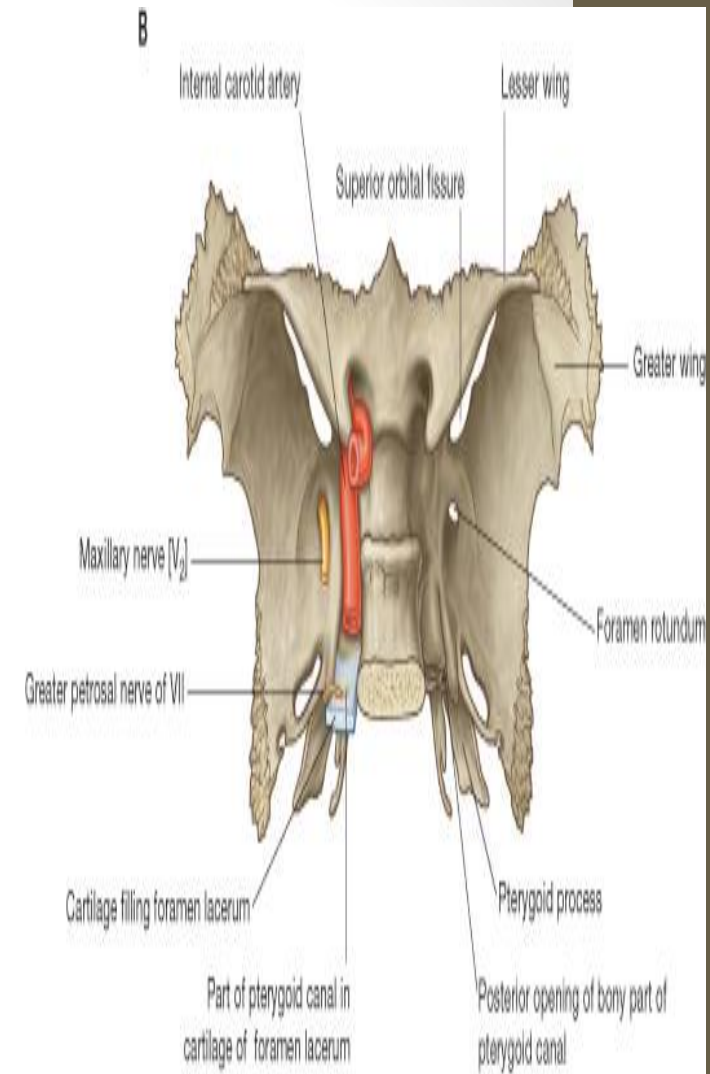
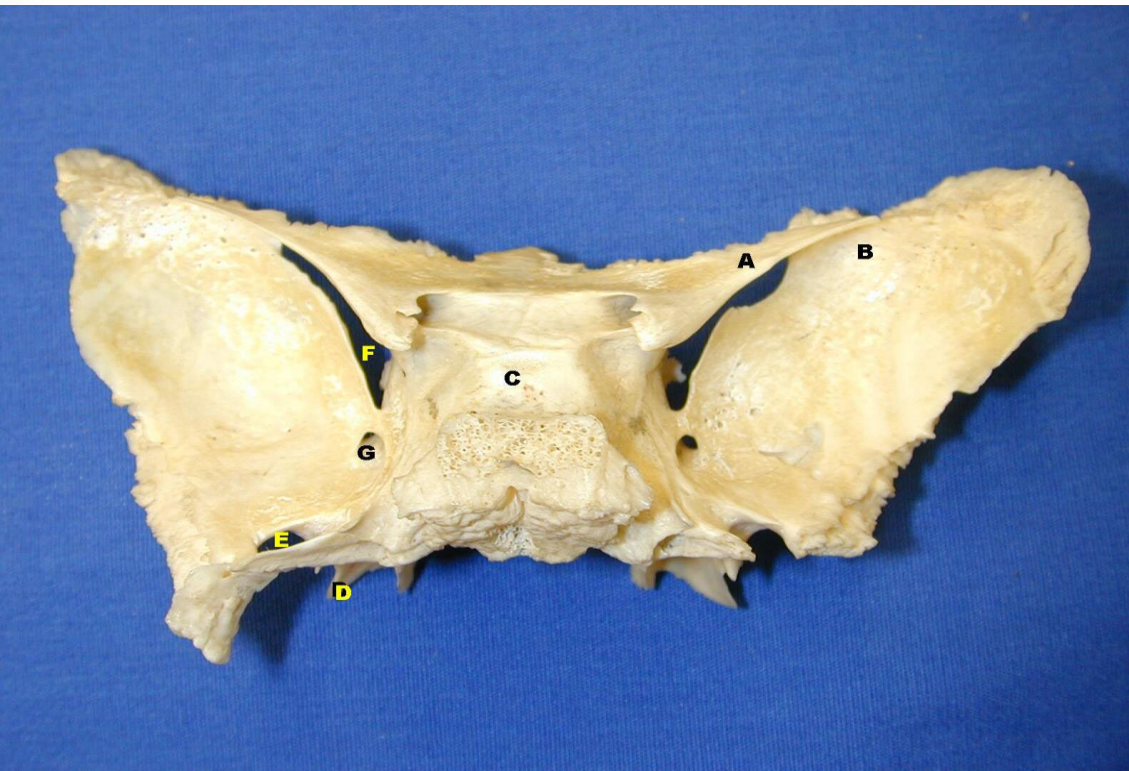
Spans width of **middle cranial fossa**

Articulates with all other cranial bones

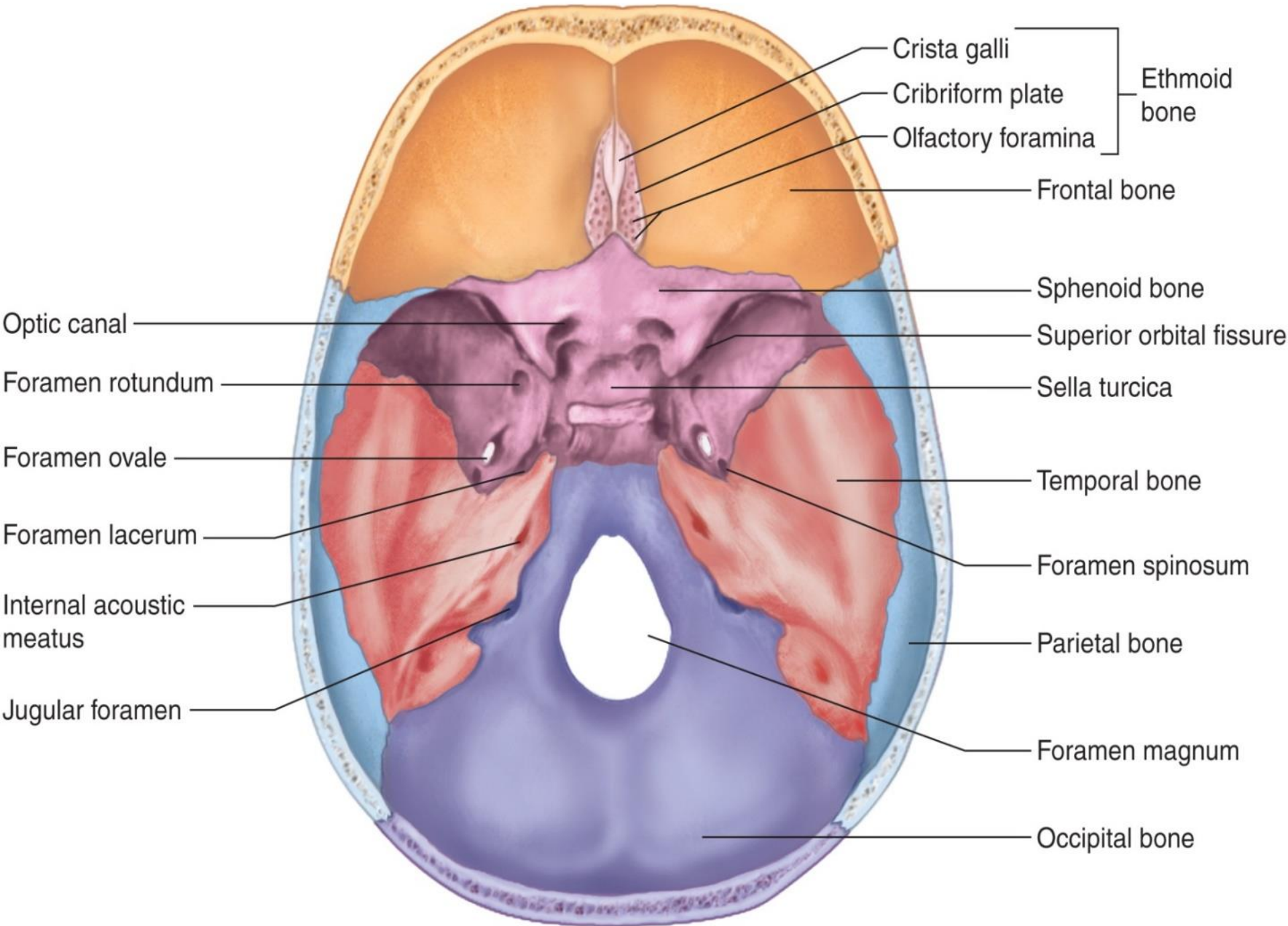
Three parts ;

- greater wing
- lesser wing
- pterygoid processes

Sella turcica; enclosure for **pituitary gland**

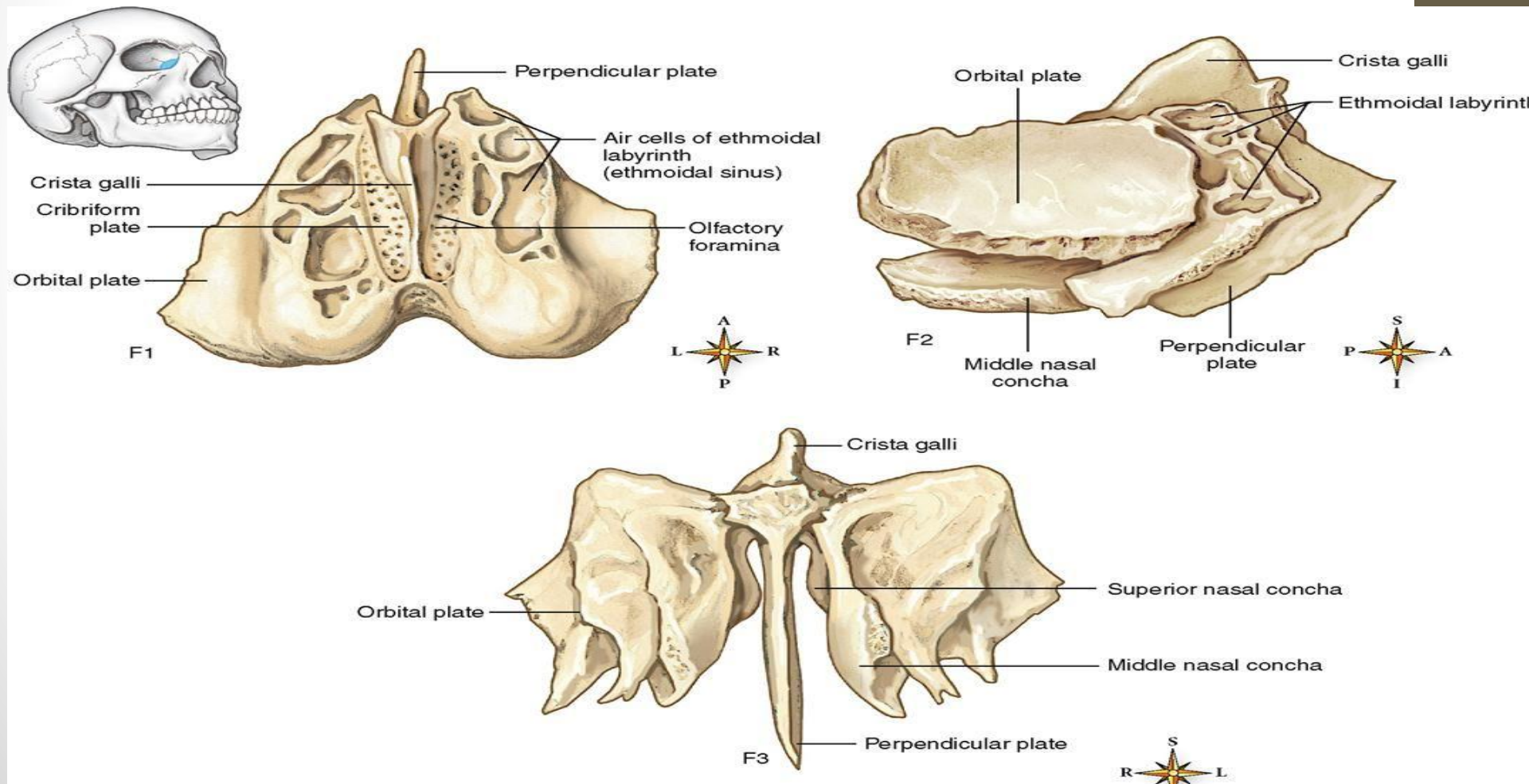


© Elsevier. Drake et al: Gray's Anatomy for Students - www.studentconsult.com

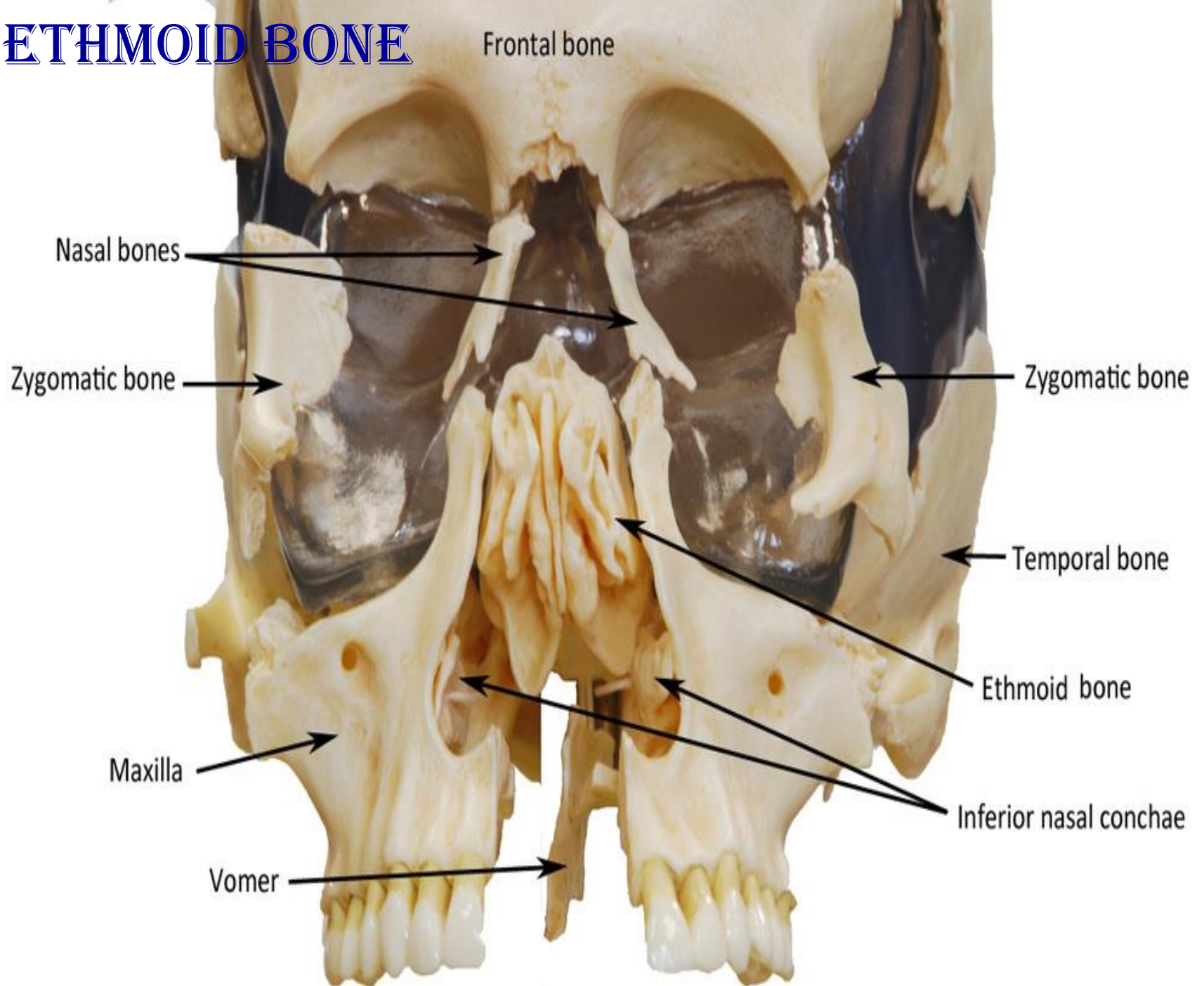


ETHMOID BONE

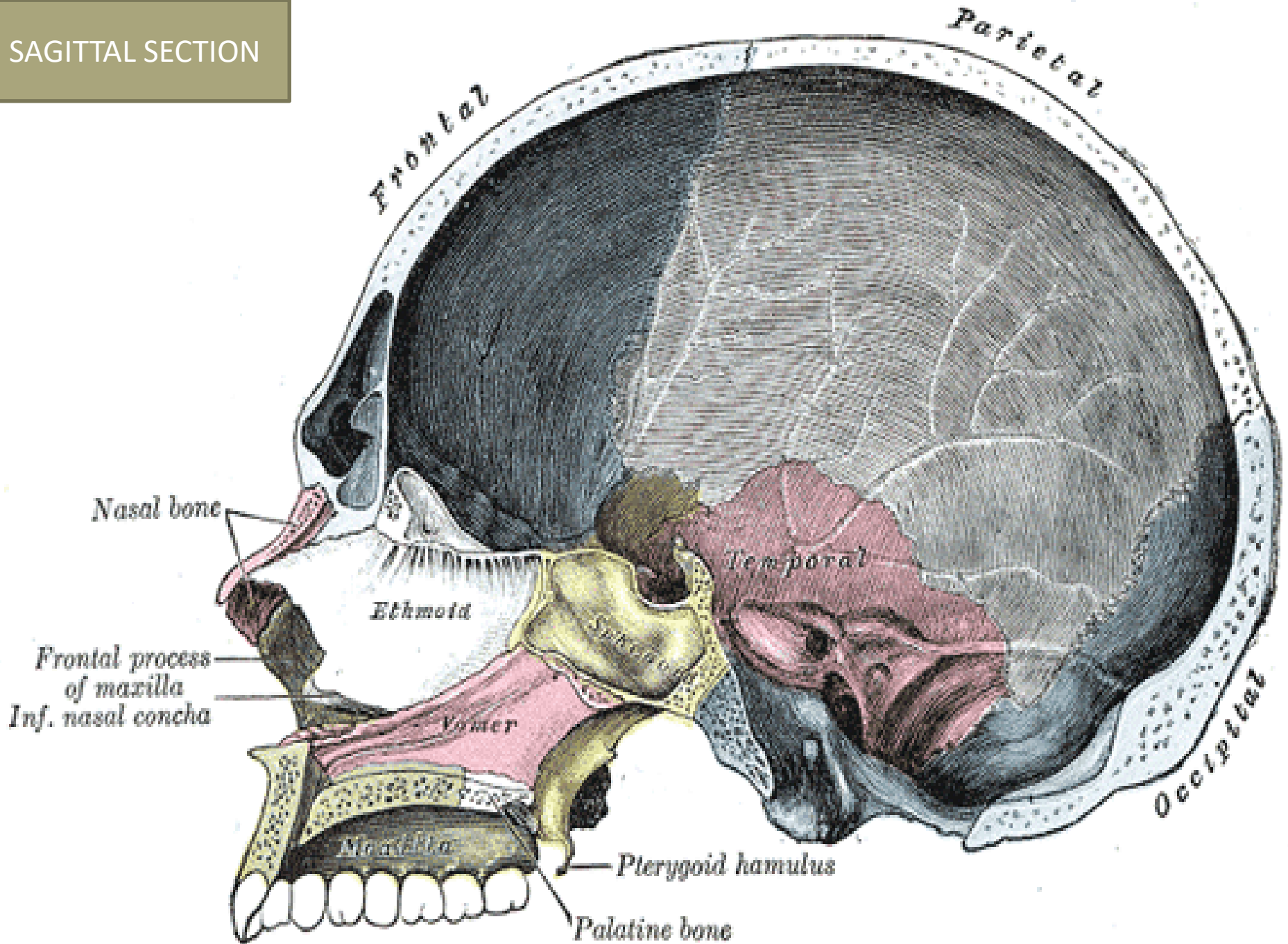
- Is a complex shape
- Nasal cavity and orbital cavity
- Cribriform plate; roof of the nasal cavity
- Crista galli; outermost covering of the brain cover connects here



ETHMOID BONE



SAGITTAL SECTION



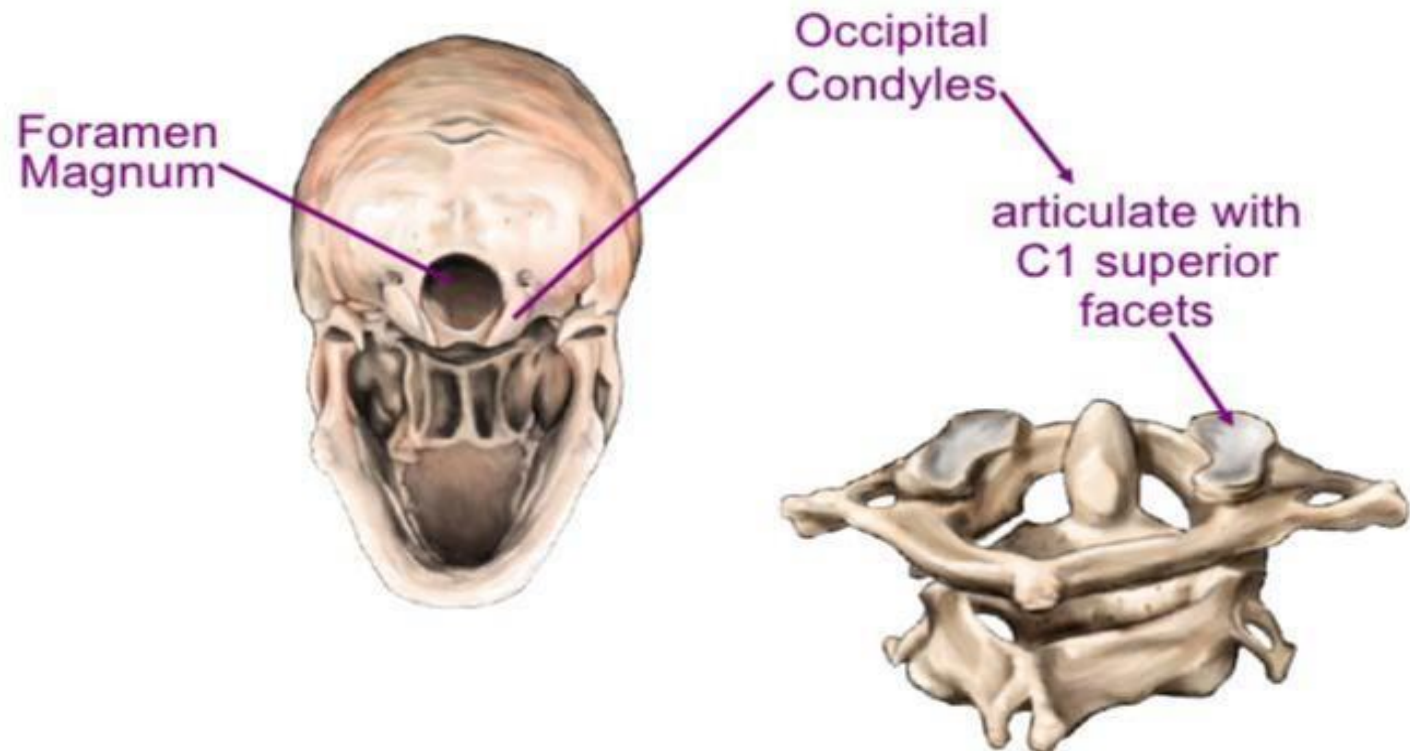
Atlanto-Occipital Joint

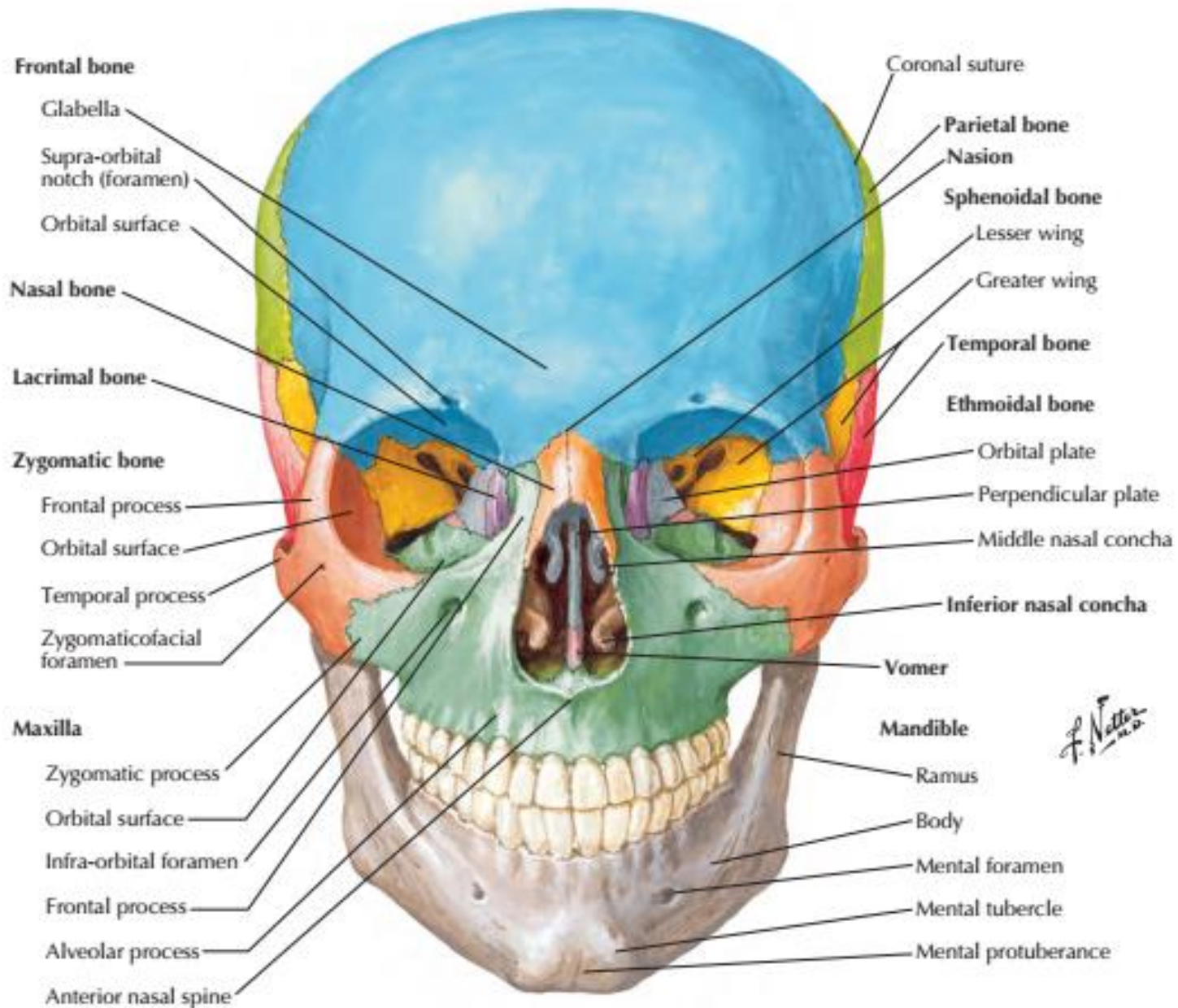
- Occipital bone:
(condyle)

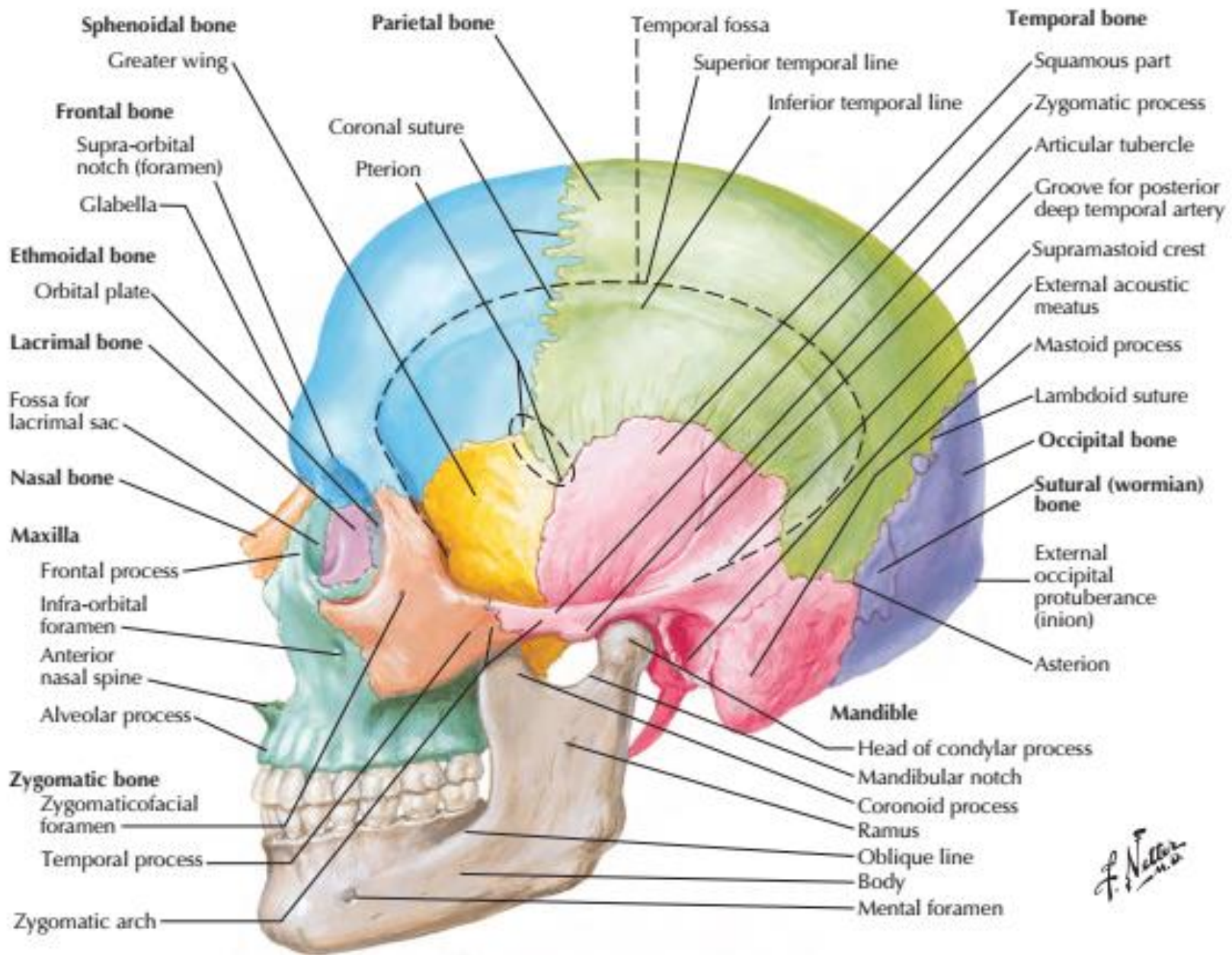
- C1 Atlas: sup. facet

ff

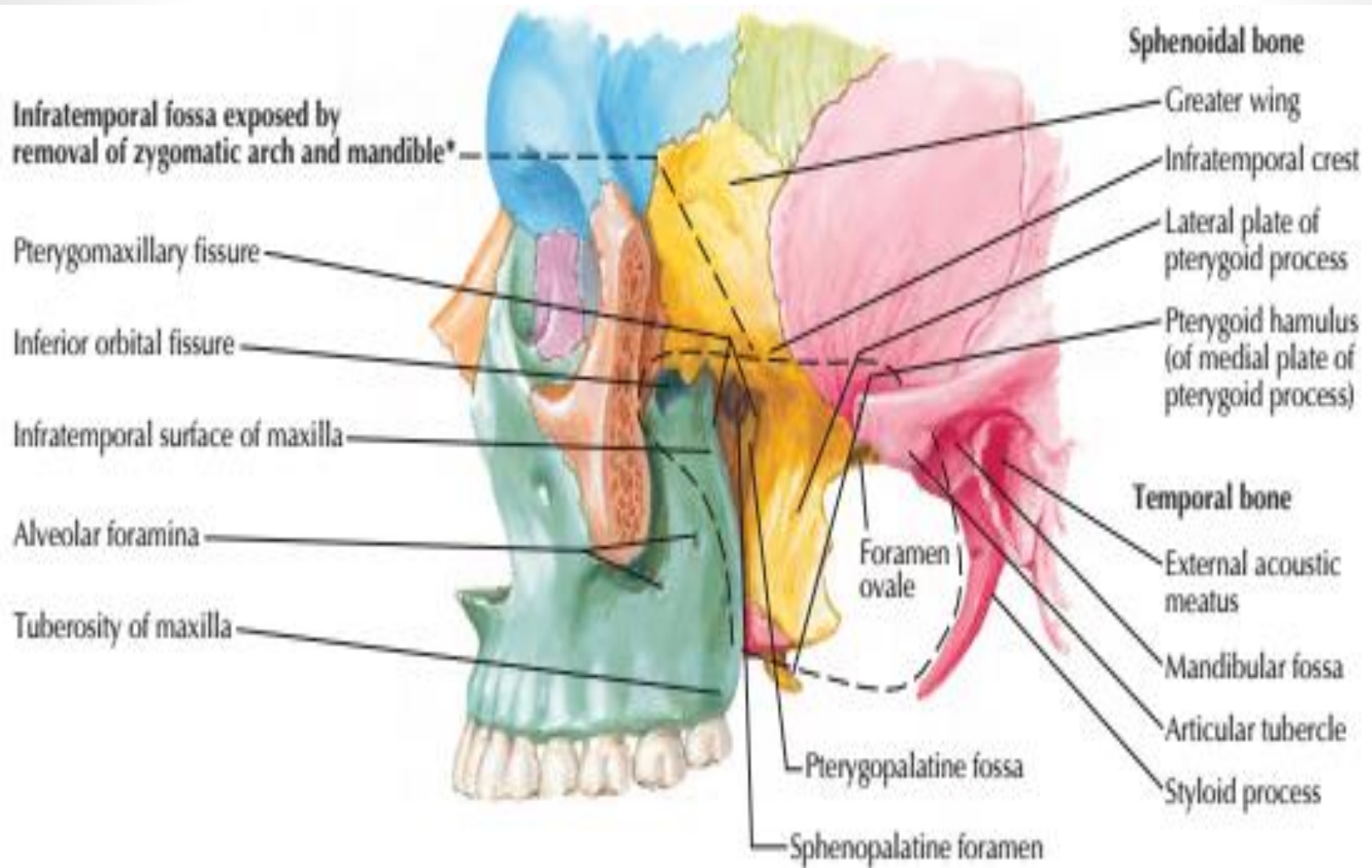
Occipitocervical Joint



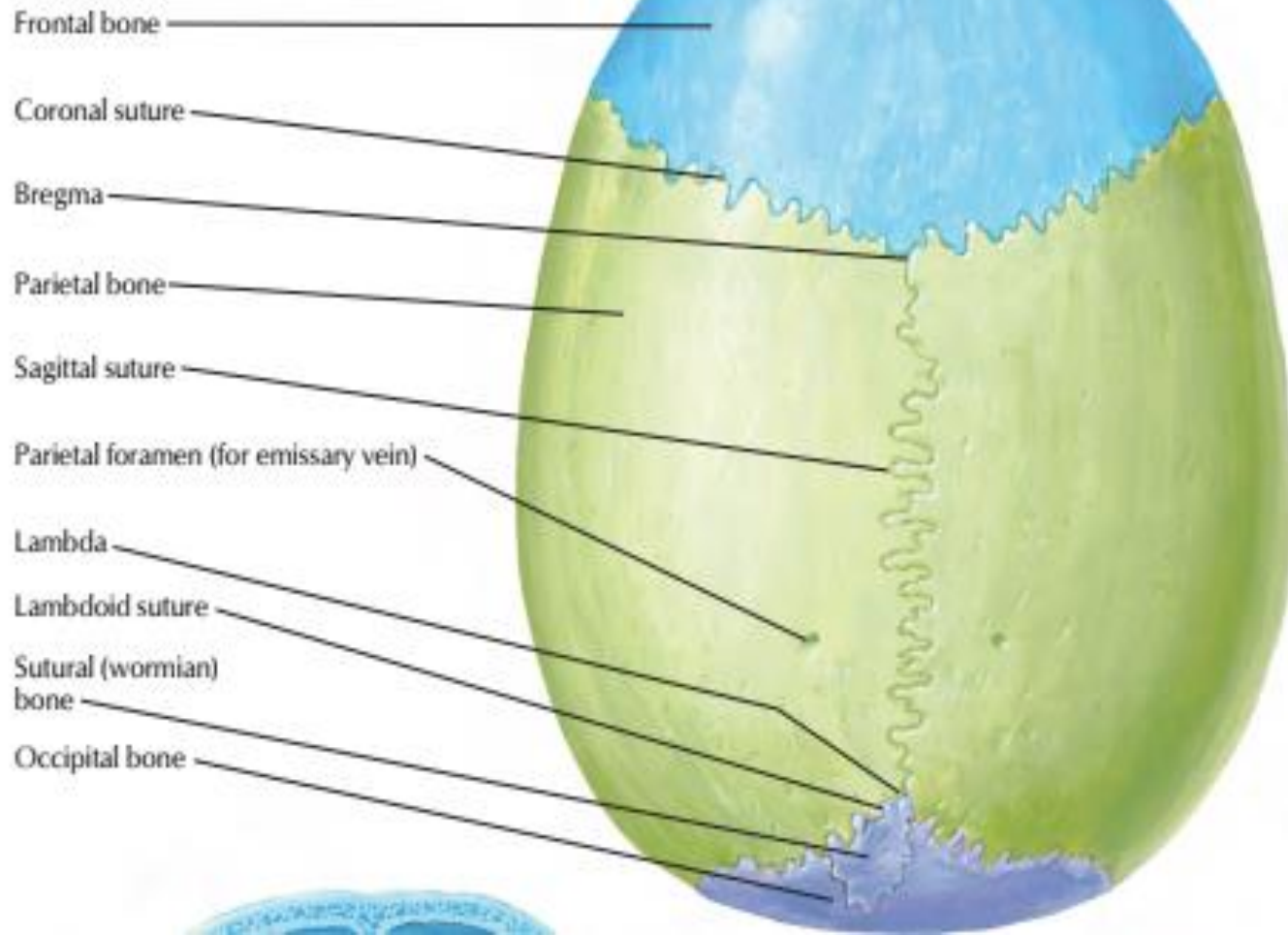




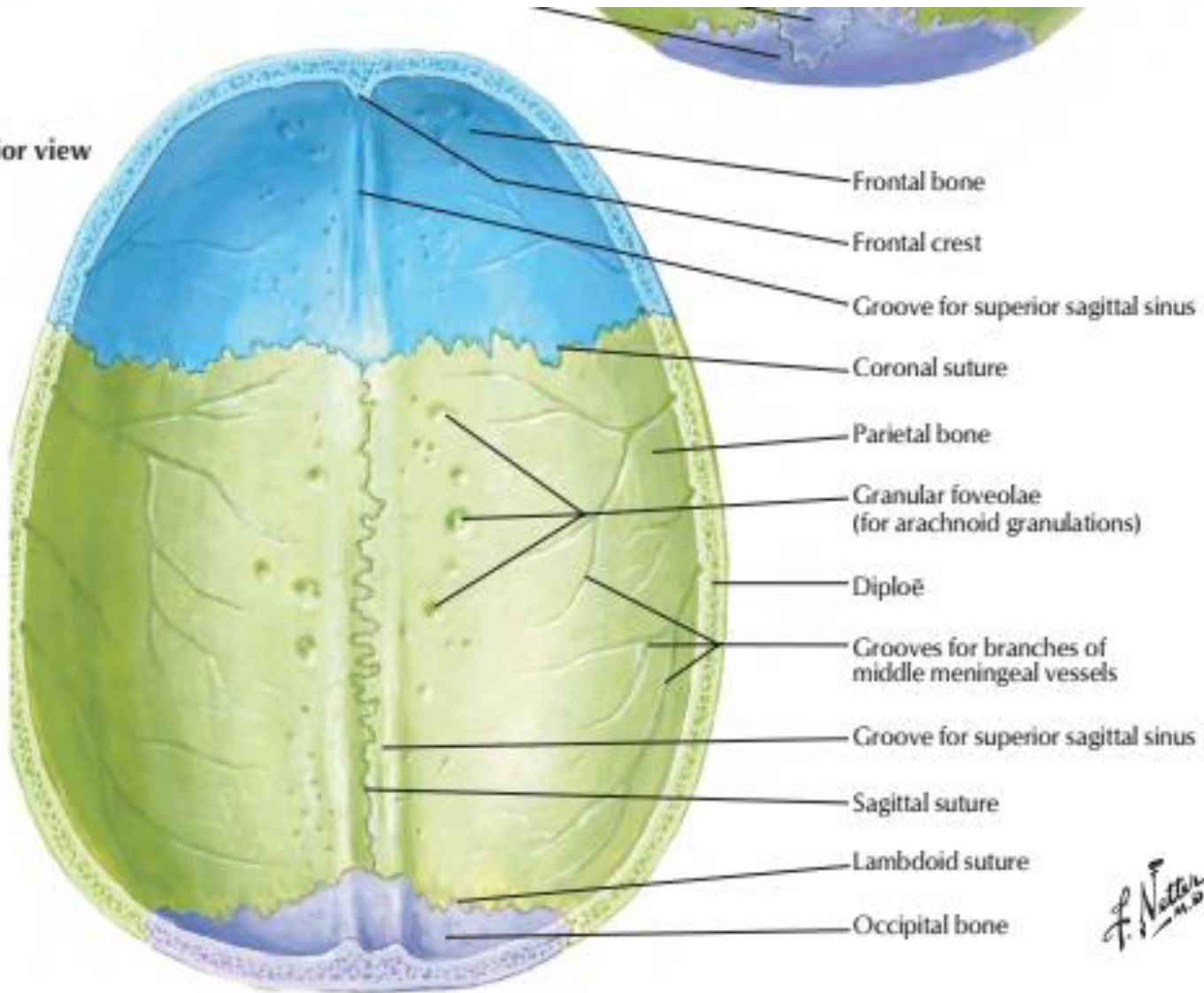
F. Natter



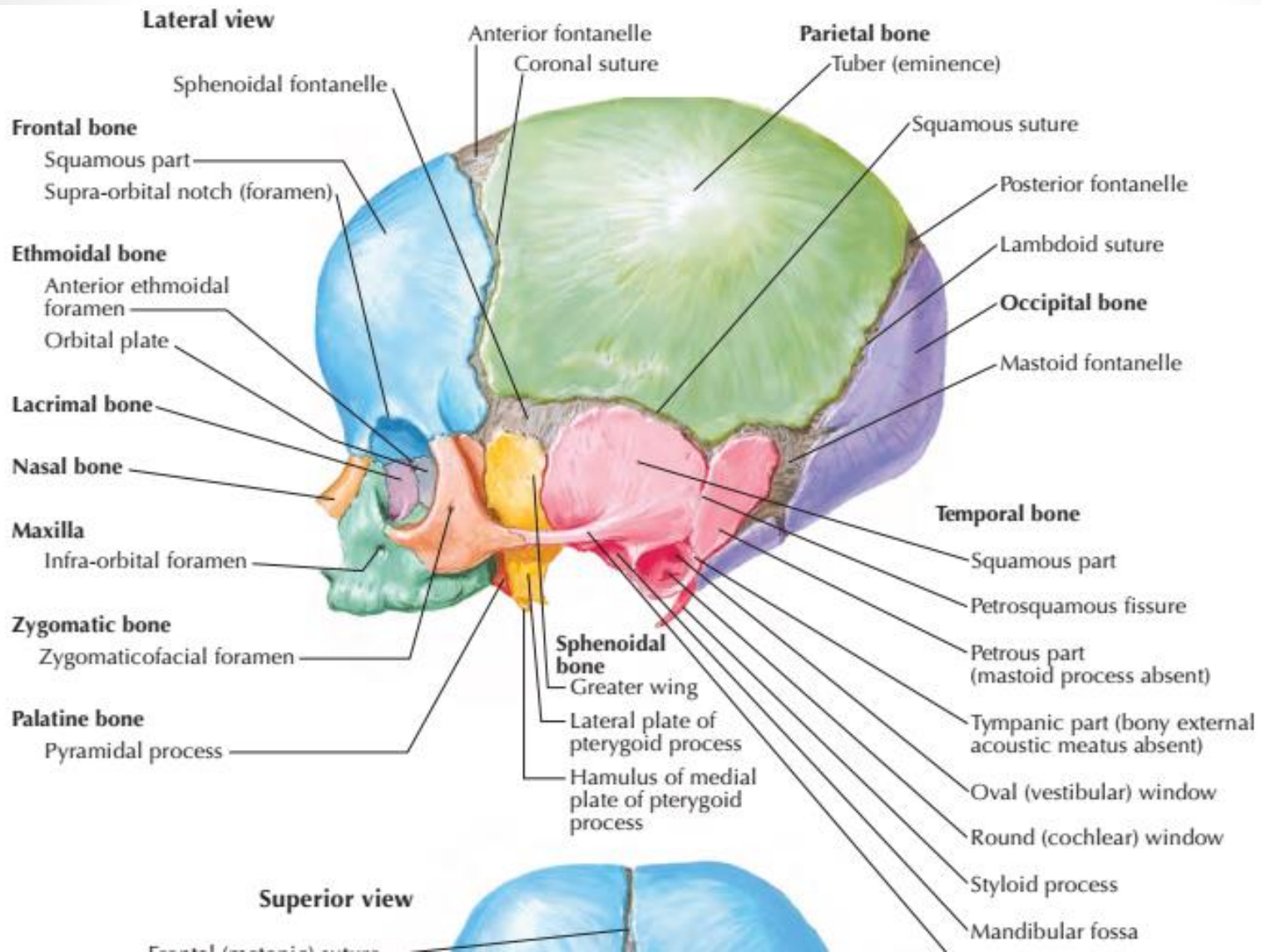
Superior view

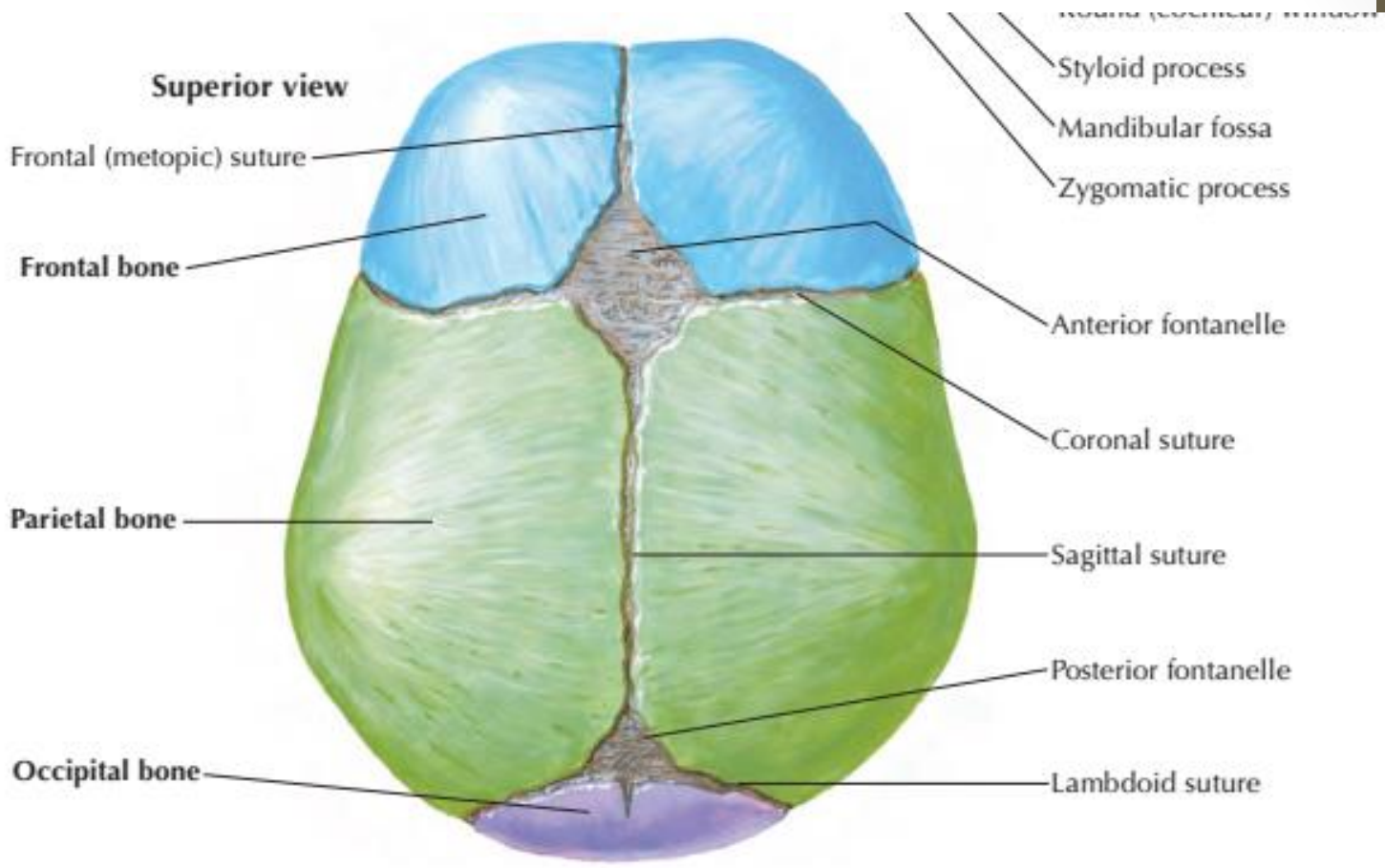


Inferior view



F. Netter M.D.





F. Natter
M.D.