



# Anatomy & Embryology

## Lecture 2: Axial Skeleton

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The Skeletal System

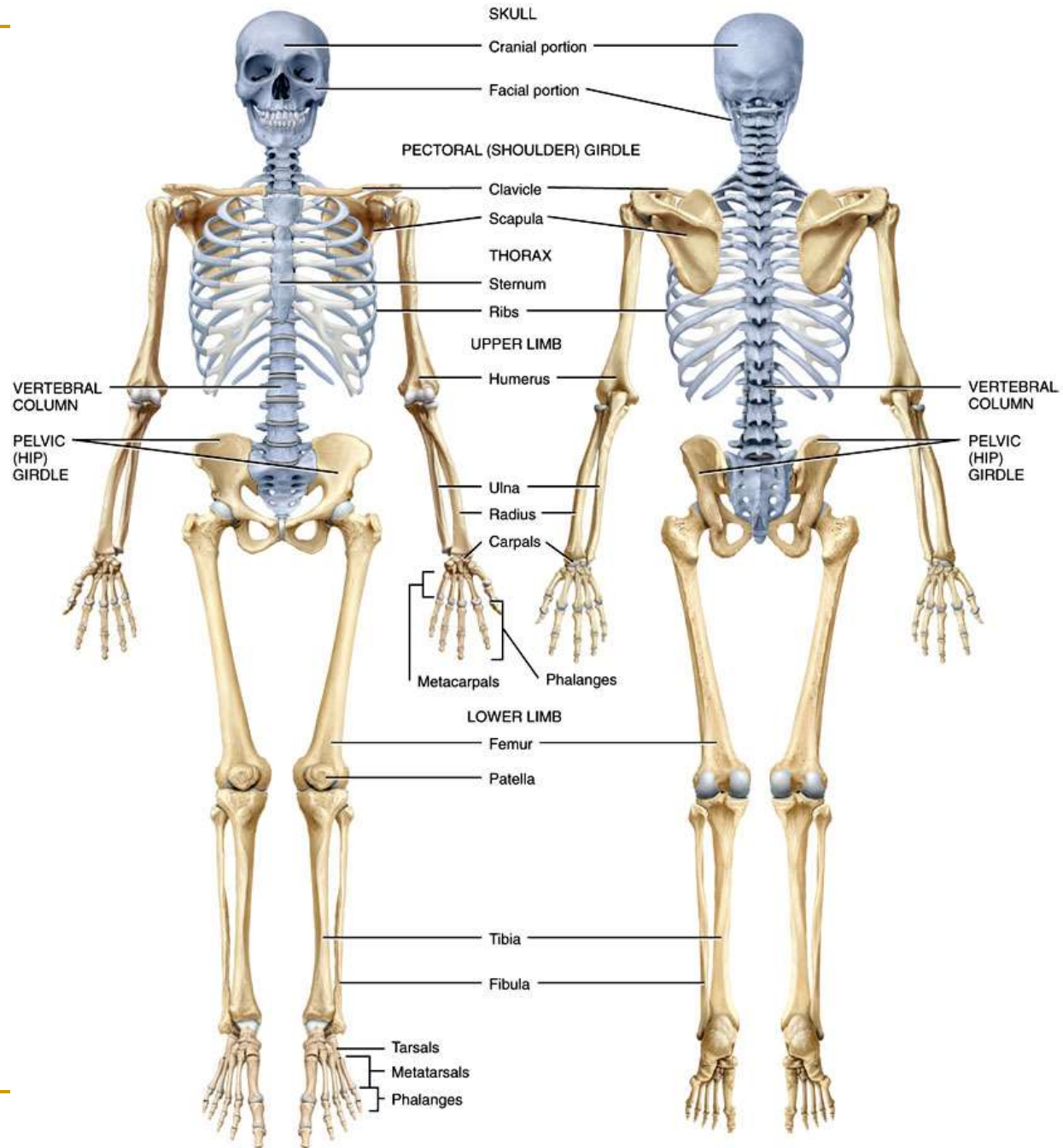
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\* **Divisions of the skeleton:**

- 1. Exoskeleton:** rudimentary in man.  
It is represented by: nails & enamel of teeth .
  - 2. Endoskeleton:** about 206 bones & is formed of:
    - a. The axial skeleton.**
    - b. The appendicular skeleton.**
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# Divisions of the Skeletal System

- The human skeleton consists of **206 named bones**
- Bones of the skeleton are grouped into two principal divisions:
  - **Axial skeleton**
    - Consists of the bones that lie around the longitudinal axis of the human body: Skull bones, auditory ossicles (ear bones), hyoid bone, ribs, sternum (breastbone), and bones of the vertebral column.
    - The primary function is protection of vital organs.
  - **Appendicular skeleton**
    - Consists of the bones of the **upper** and **lower limbs (extremities)**, plus the bones forming the **girdles** that connect the limbs to the axial skeleton. The primary function of this division is movement.





(a) Anterior view

(b) Posterior view

# Bones of the Human Body

**TABLE 7.1**

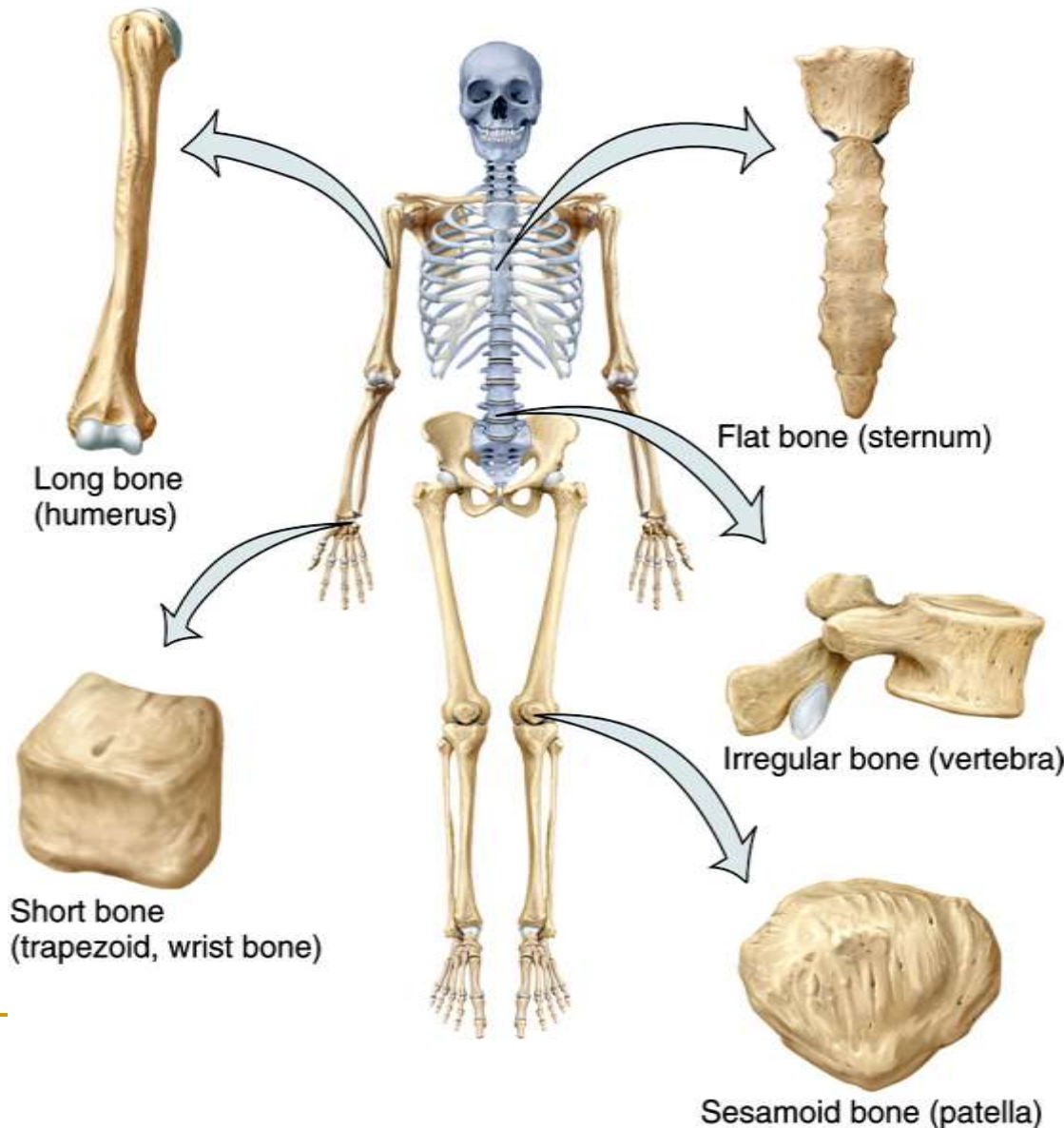
The Bones of the Adult Skeletal System

DIVISION OF THE SKELETON	STRUCTURE	NUMBER OF BONES	DIVISION OF THE SKELETON	STRUCTURE	NUMBER OF BONES
<b>Axial Skeleton</b> 	<b>Skull</b>		<b>Appendicular Skeleton</b> 	<b>Pectoral (shoulder) girdles</b>	
	Cranium	8		Clavicle	2
	Face	14		Scapula	2
	<b>Hyoid</b>	1		<b>Upper limbs</b>	
	<b>Auditory ossicles</b>	6		Humerus	2
	<b>Vertebral column</b>	26		Ulna	2
	<b>Thorax</b>			Radius	2
	Sternum	1		Carpals	16
	Ribs	<u>24</u>		Metacarpals	10
	Subtotal = 80			Phalanges	28
			<b>Pelvic (hip) girdle</b>		
			Hip, pelvic, or coxal bone	2	
			<b>Lower limbs</b>		
			Femur	2	
			Patella	2	
			Fibula	2	
			Tibia	2	
			Tarsals	14	
			Metatarsals	10	
			Phalanges	<u>28</u>	
			Subtotal = 126		
			<b>Total in an adult skeleton = 206</b>		

# Classification of Bones According to Shape:

- Bones can be classified into five types based on shape:

- 1) Long
- 2) Short
- 3) Flat
- 4) Irregular
- 5) Sesamoid



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## ❑ Long Bones

- Greater length than width and are slightly curved for strength
- **Femur, tibia, fibula, humerus, ulna, radius, phalanges**

## ❑ Short bones

- Cube-shaped and are nearly equal in length and width
- **Carpal, tarsal**

## ❑ Flat bones

- Thin and composed of two nearly parallel plates of compact bone tissue enclosing a layer of spongy bone tissue
- **Cranial, sternum, ribs, scapulae**

## ❑ Irregular bones

- Complex shapes and cannot be grouped into any of the previous categories
- **Vertebrae, hip bones, some facial bones, calcaneus**

## ❑ Sesamoid bones

- Protect tendons from excessive wear and tear
  - **Patellae, in foot, in hand**
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# ■ The Axial Skeleton

**Axial Skeleton**





# The skull

Is formed of 22 separate bones

One movable bone

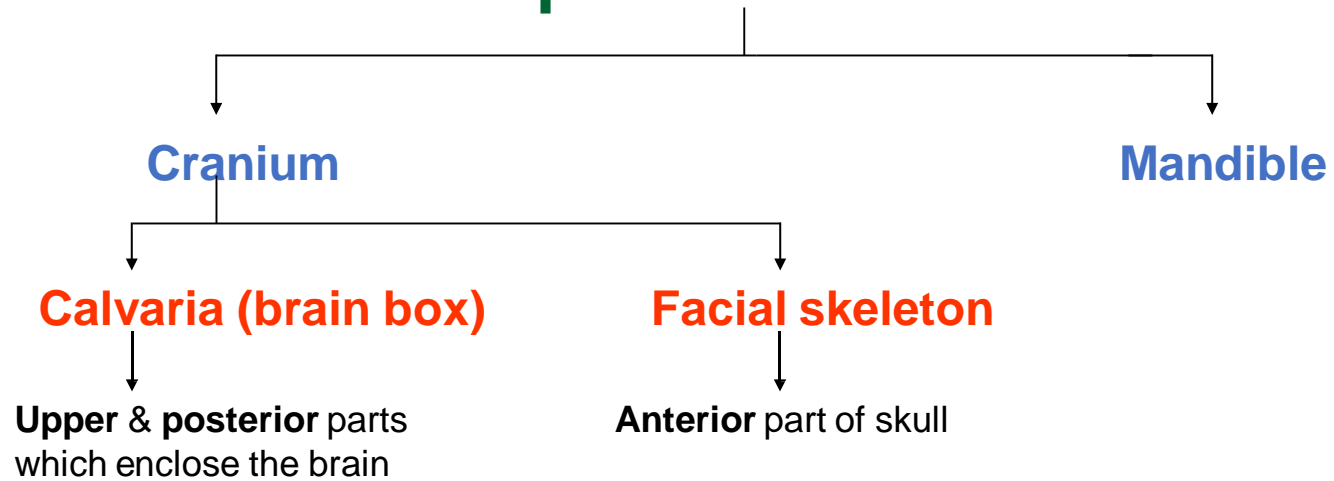
The mandible

21 immovable bones

Articulating together by **sutures**  
(which are fibrous joints)



# The parts of the skull



# The Skull

- The skull (Cranium) Consists of 22 bones
- Bones of the skull are grouped into two categories:
  1. **Cranial bones**
    - Eight cranial bones form the cranial cavity
      - Frontal bone, **two parietal bones**, **two temporal bones**, the occipital bone, the sphenoid bone, ethmoid bone
  2. **Facial bones**
    - Fourteen facial bones form the face
      - Two nasal bones, two maxillae, two zygomatic bones, the **mandible**, two lacrimal bones, two palatine bones, two inferior nasal conchae, **vomer**

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# Features of the Skull

- The cranial and facial bones protect and support special sense organs and the brain
  - Besides forming the large cranial cavity, the skull also forms several smaller cavities
    - **Nasal cavity**
    - **Orbits (eye sockets)**
    - **Paranasal sinuses**
    - **Small cavities which house organs involved in hearing and equilibrium**
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- Immovable joints called **sutures** fuse most of the skull bones together
  - The skull provides large areas of **attachment for muscles** that move various parts of the head
  - Skull and facial bones provide **attachment** for muscles that produce **facial expressions**
  - The facial bones form the framework of the face and provide support for the entrances to the **digestive** and **respiratory** systems
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# Cranial Bones:

## ■ Frontal Bone

- ❑ Forms the forehead

## ■ Parietal Bones

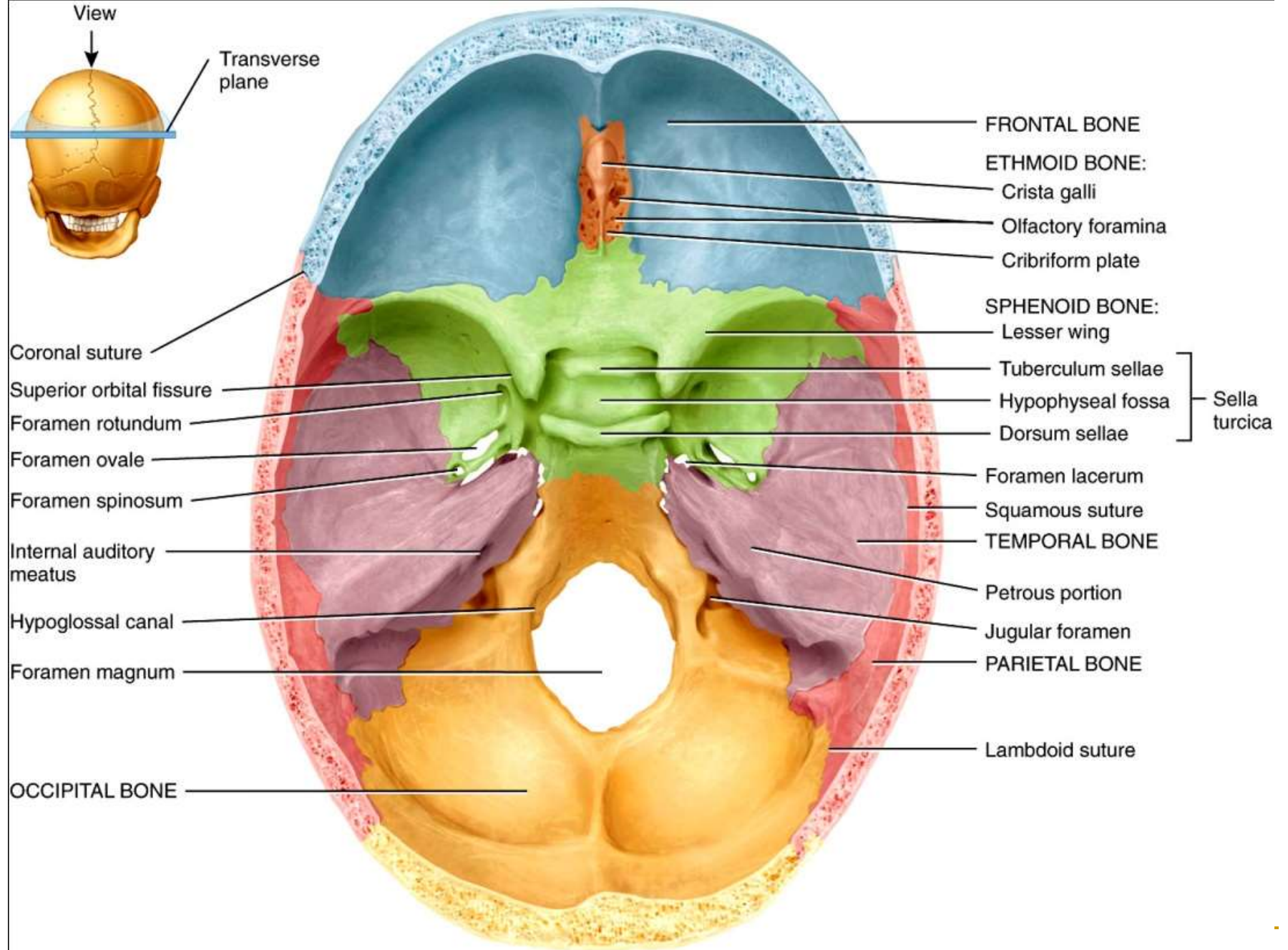
- ❑ Form the sides and roof of the cranial cavity

## ■ Temporal Bones (Zygomatic process and Mandibular fossa of TMJ)

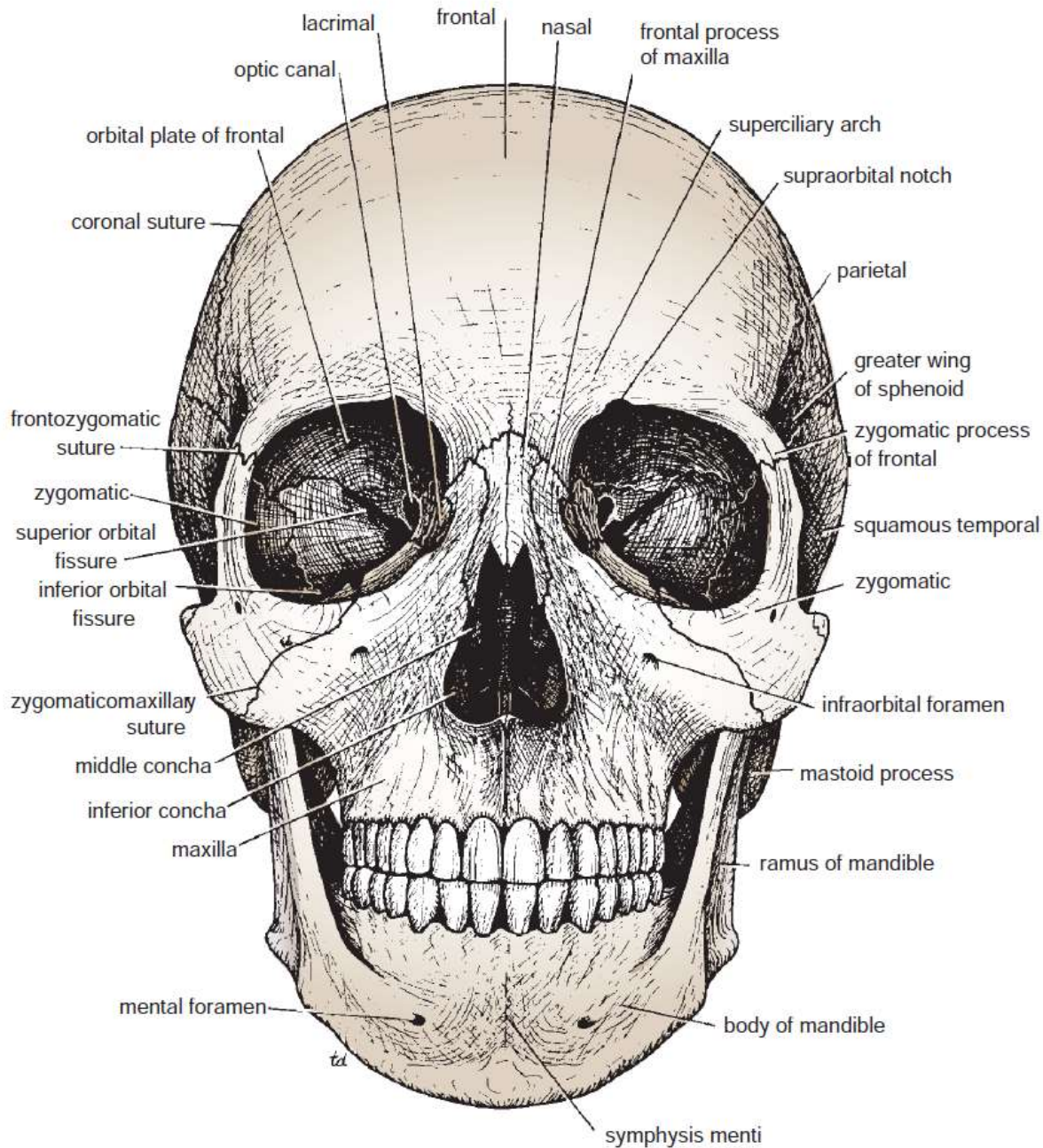
- ❑ Form the lateral aspects and floor of the cranium
- ❑ Consists of 5 parts: squamous part, petrous part, tympanic part, mastoid part and the styloid process

## ■ Occipital Bone (foramen magnum?)

- ❑ Forms the posterior part and most of the base of the cranium
- ❑ The perceptible protrusion on the back of the head is the external occipital protuberance

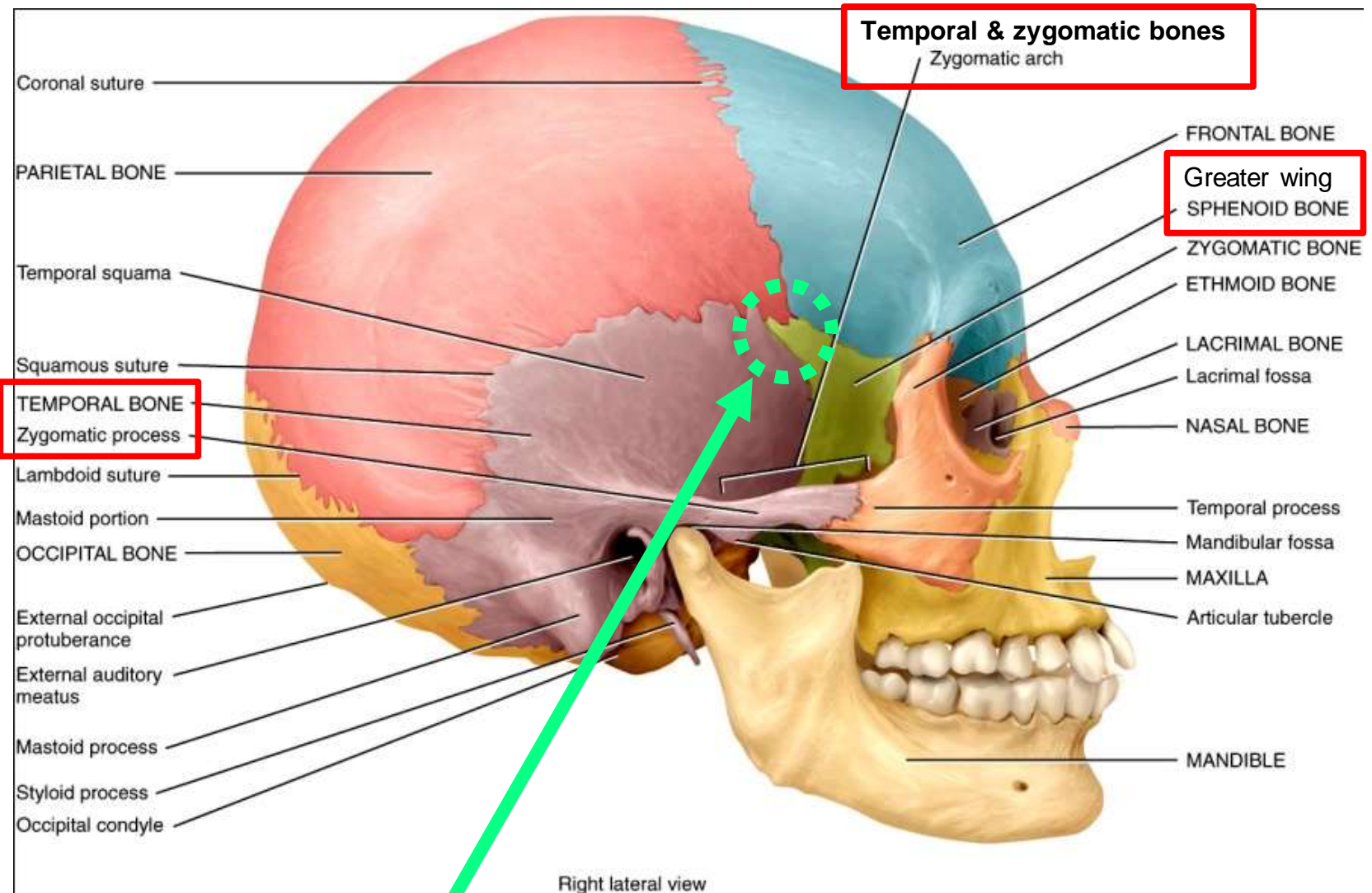


(a) Superior view of sphenoid bone in floor of cranium

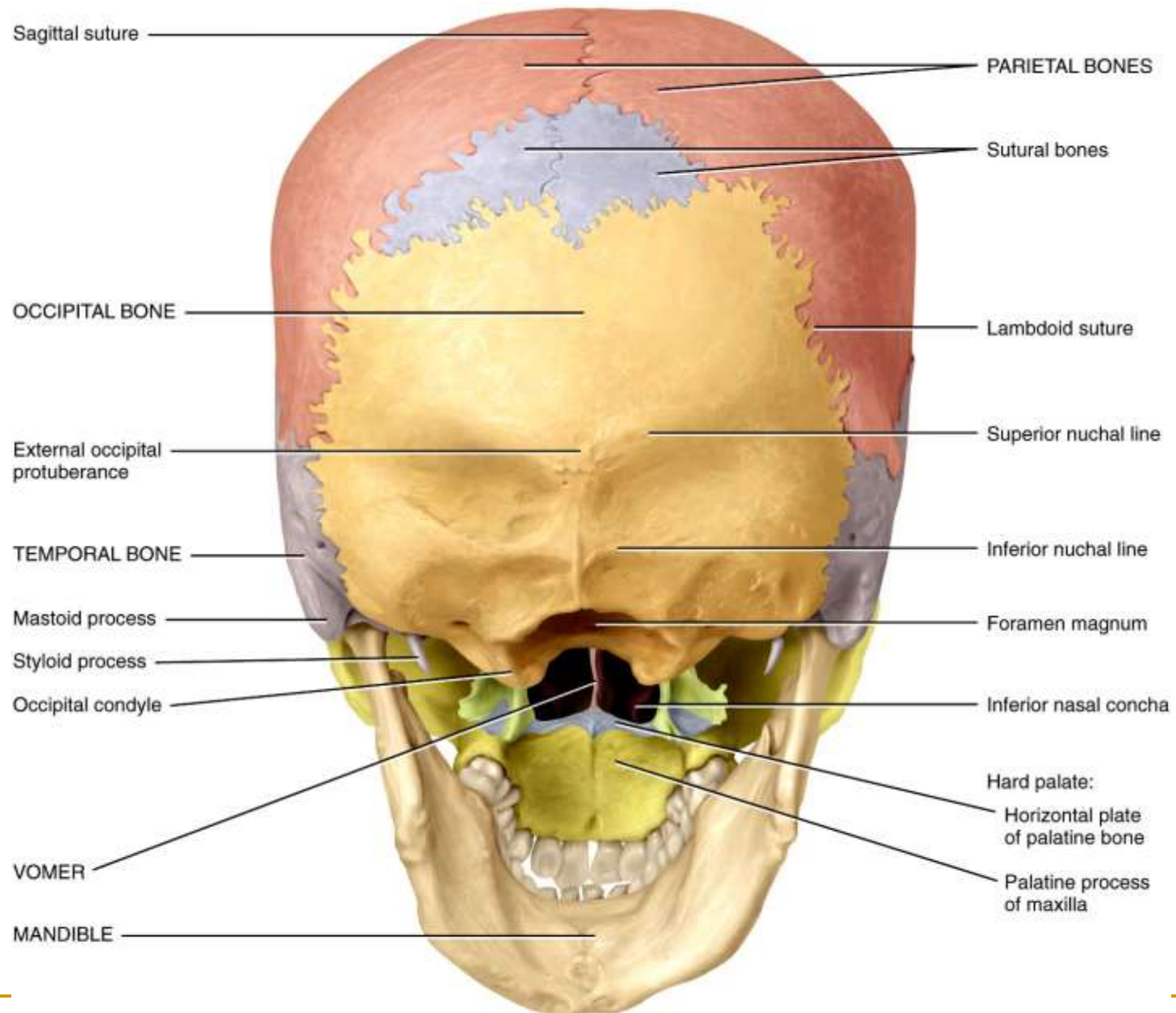


**FIGURE 11.1** Bones of the anterior aspect of the skull.





**Pterion: middle meningeal artery.**



Sagittal suture

PARIETAL BONES

Sutural bones

OCCIPITAL BONE

Lambdoid suture

External occipital protuberance

Superior nuchal line

TEMPORAL BONE

Inferior nuchal line

Mastoid process

Foramen magnum

Styloid process

Inferior nasal concha

Occipital condyle

Hard palate:

Horizontal plate of palatine bone

VOMER

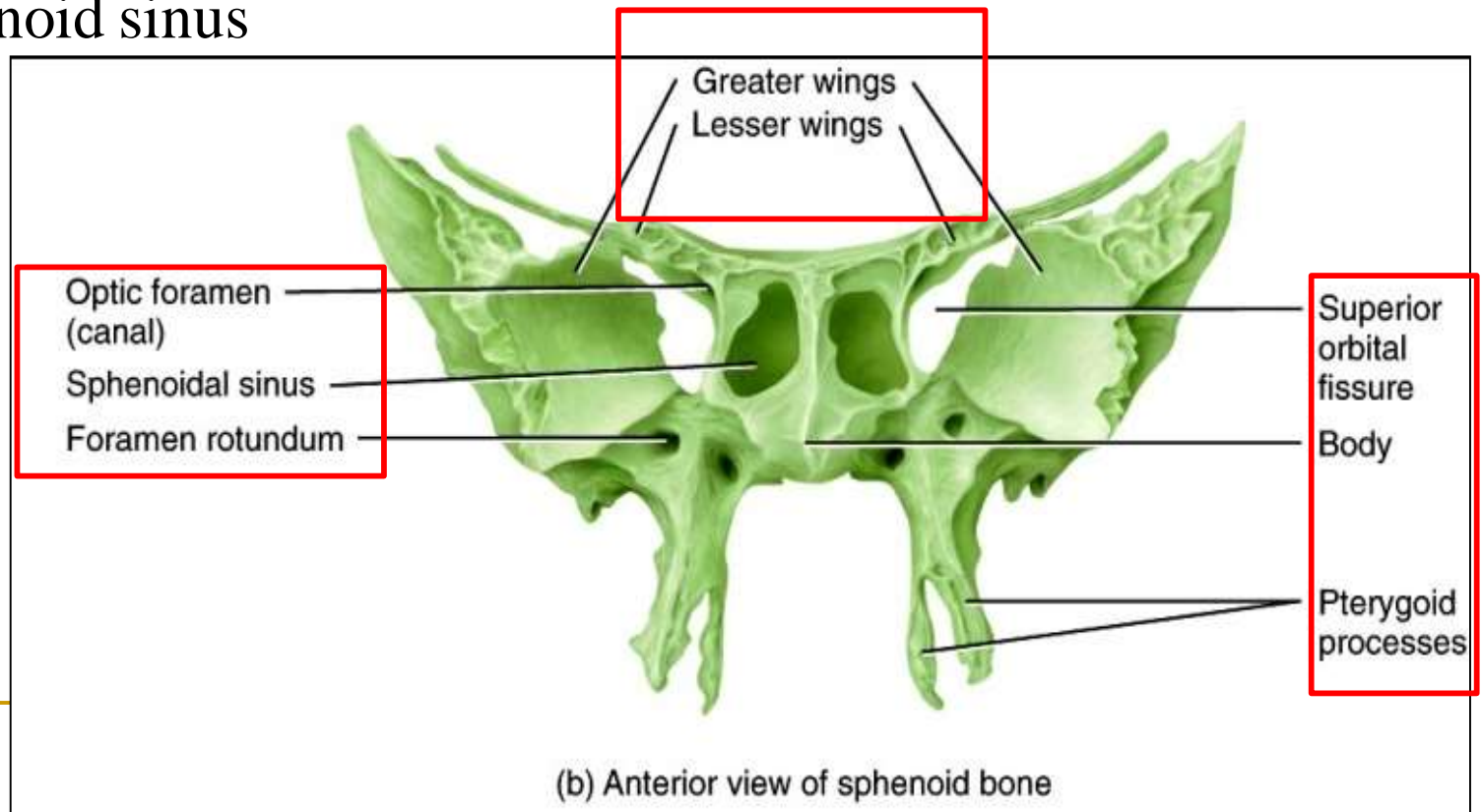
Palatine process of maxilla

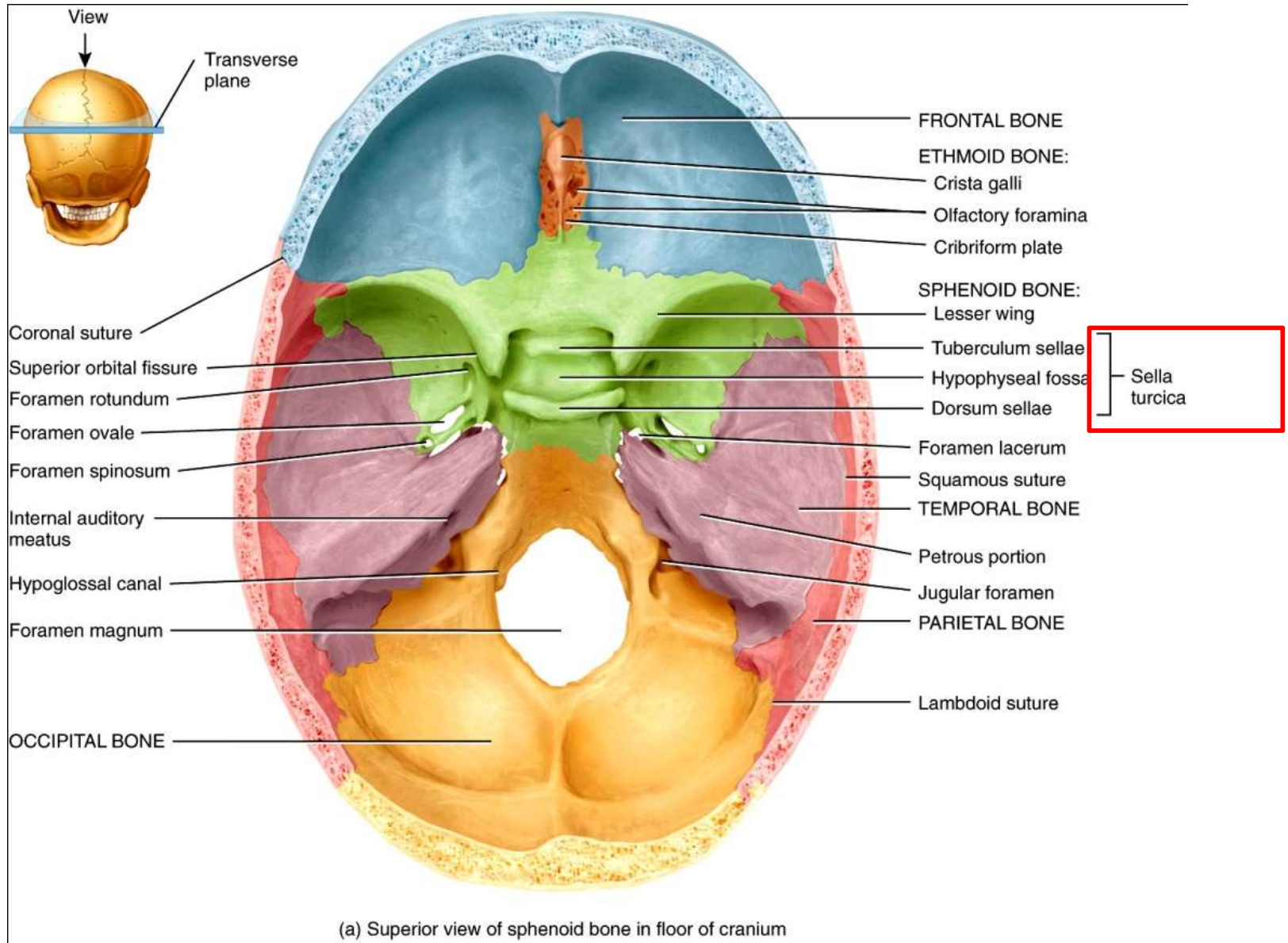
MANDIBLE

Posteroinferior view

## ■ Sphenoid Bone (optic nerve)

- ❑ Lies at the middle part of the base of the skull
- ❑ It's formed of:
  1. **Body (Sella turcica): contain the pituitary gland**
  2. Lesser wings
  3. Greater wings
  4. Pterygoid processes
  5. Sphenoid sinus





■ **Ethmoid Bone**  
**(olfactory nerve)**

□ Located in the midline in the anterior part of the cranial floor and forms the roof of the nasal cavity

**Parts:**

1. Superior and middle conchae: thin bony projections (nose)
2. Transverse plate
3. Perpendicular plate
4. Crista galli
5. Cribriform plate
6. Ethmoid sinuses

