



# ANATOMY

**SHEET NO. 3**

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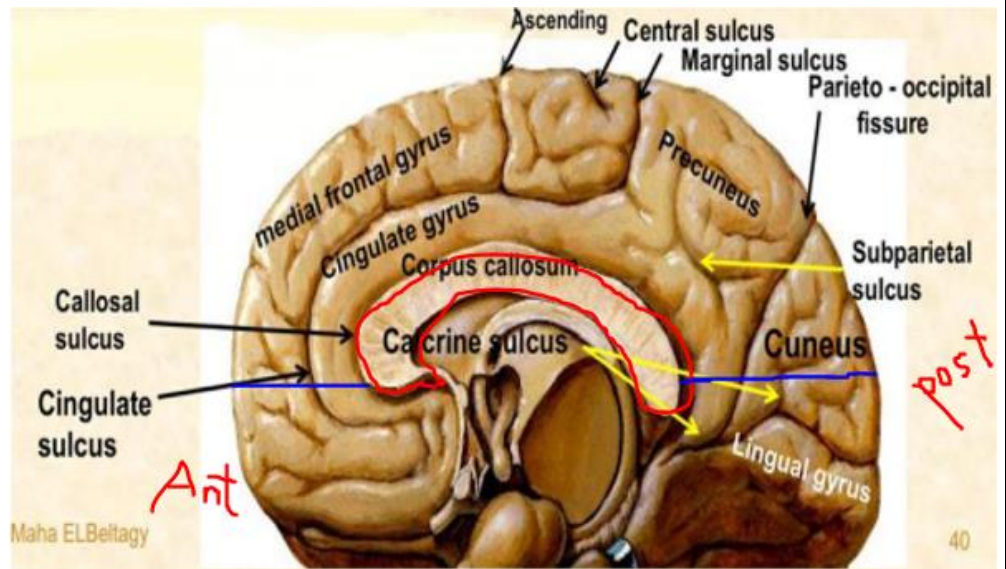
**DOCTOR : Dr. Maha ELBeltagy**

## ○ The medial surface (sagittal section )

How to determine the anterior from posterior part in the medial surface?

Draw a line from either ends of the brain till it reach Corpus Callosum.

The longest one is the posterior side.



### ➤ **Corpus callosum:**

In the sagittal section we run in the longitudinal fissure, so we cut the connection between the right and left hemisphere which is corpus callosum (the biggest commissural fibers).

### ➤ **Fornix:**

Commissural fibers below the corpus callosum in the sagittal section.

### ➤ **The thalamus:**

egg shaped structure below the fornix in the sagittal section (the largest sensory and relay station in the brain, the secretary of the brain, it receives all sensations that come from the spinal cord and then distributes it to different parts of the brain. For example, if the sensation is vision, it will send this sensation to the occipital lobe. If it is pain, touch or temperature, it will send it to the parietal lobe or if it is related to the auditory system, it would send it to the temporal lobe.

### ➤ **Hypothalamus:** anterior to the thalamus.

### ➤ **Septum lucidum:**

between the corpus callosum and fornix (this septum closes the cavity inside the cerebral cortex (the lateral ventricle) If you cut the sagittal section correctly, you will see the septum lucidum.

*So up to now we have from the superior to the inferior: corpus callosum then septum lucidum then fornix then thalamus and anterior to the thalamus we have the hypothalamus.*

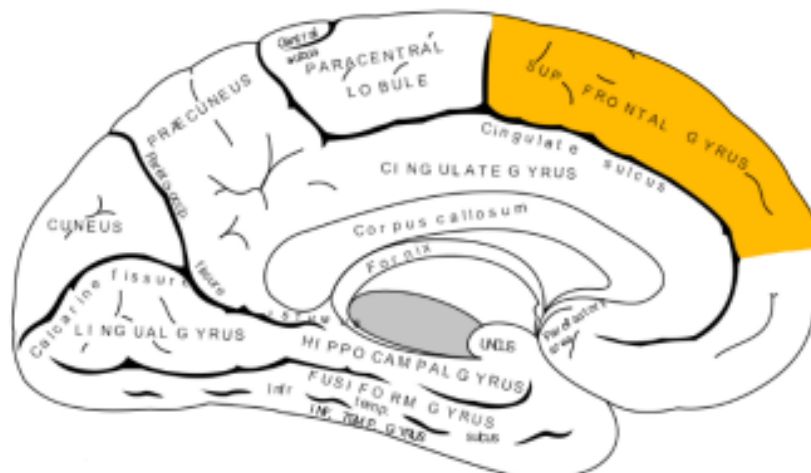
## Sulci of the sagittal section:

- **Callosal sulcus** (surrounds corpus callosum), it is very important sulcus as it has the anterior cerebral artery (ACA) passing in it. (ACA originates from the internal carotid artery).
- **Cingulate sulcus**: runs above and parallel to callosal sulcus.
  - o It begins with the anterior end of the callosal sulcus then curves around corpus callosum -does not surround the corpus callosum completely- it **terminates** by turning upwards to meet the superomedial border of the brain to form **the marginal sulcus** (the end of cingulate sulcus).
  - o It also gives the **ascending** ramus of cingulate sulcus (like the ascending ramus from the posterior ramus of the lateral fissure)
- **Subparietal (suprasplenial) sulcus**: appears as a continuation of cingulate sulcus in the medial side of the parietal lobe.

### Nomination

Why suprasplenial?? Because it is above the splenium (part of corpus callosum). The parietal lobe has the intraparietal fissure in the superolateral surface & **Subparietal (suprasplenial)** sulcus in the medial surface

- **Parieto-occipital fissure**: between the parietal & occipital lobes, this extends totally in the medial surface as we mentioned before; do you remember that? Here it is in the sagittal section check it out!
- **Calcarine sulcus**: or calcarine fissure (fissure is a deep sulcus) begins near the occipital pole. Its importance comes from its location around the visual area.



## Gyri of the sagittal section:

- ❖ **Cingulate gyrus:** lies between Corpus callosum (or callosal sulcus) & cingulate sulcus.

It is important as it represents the main part (the main gyrus) of **the limbic system** and therefore we called it **the limbic lobe** which is considered the 6th lobe of the brain.

Little about the limbic system in the next page. So, we have 4 anatomical lobes in the lateral surface, and the insula (5th lobe) and finally the limbic lobe (6th lobe).

- ❖ **Paracentral lobule:** lies between ascending ramus and the marginal sulcus.

Importance: It has the motor and sensory area of the lower limb. Also, it controls the movement of the sphincters in the body.

- ❖ **Medial frontal gyrus:** (sup frontal gyrus in the picture) Anterior to the paracentral lobule.

Function: it plays a role in human's personality.

- ❖ **Cuneus:** is the wedge area between the parieto-occipital fissure & the calcarine sulcus.

Function: it has the visual association centre which helps the visual area in understanding the visual stimulus.

- ❖ **Precuneus:** lies in front the parieto-occipital fissure and posterior to the end of cingulate sulcus (marginal sulcus) which is the medial aspect of the parietal lobe.

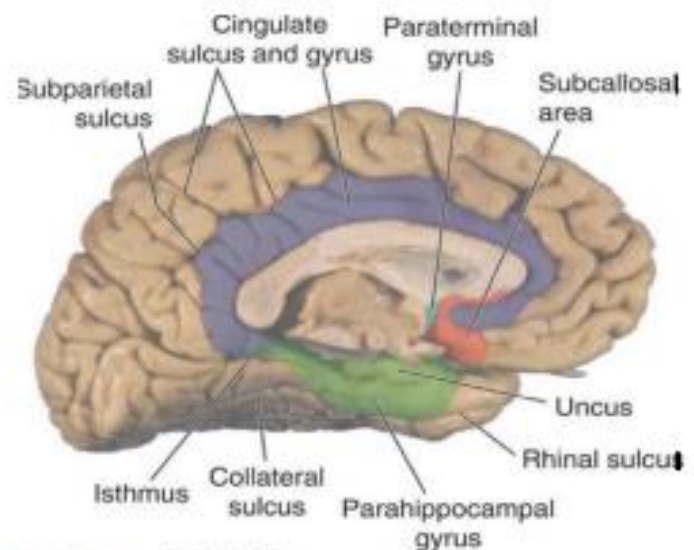
Function: Plays a role in memory.

- ❖ **Lingual gyrus:** below calcarine sulcus.

Function: has an importance in visual association area.

### Nomination

It resembles the shape of the tongue and thus called lingual gyrus.





- **The Limbic system:**

It consists of nuclei and tracts that exist in the cerebrum (between the cerebrum and the hypothalamus, also between the cerebrum and the thalamus). The major gyrus that represents this system is the cingulate gyrus.

**Its Function** Related to the control of the **emotions, behaviour, sexual function** and has a role in **olfaction**.

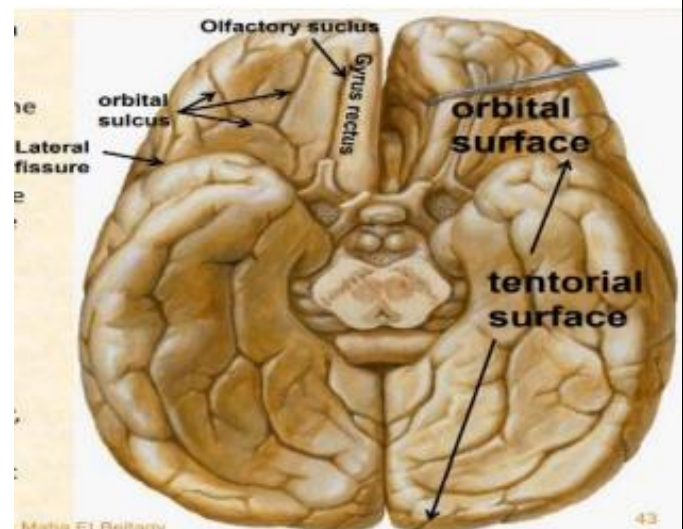
✓ **The Limbic loop** begins at the subcallosal area (anteriorly), then continues as cingulate gyrus, then goes inferiorly as para-hippocampal gyrus in the temporal lobe. (The limbic circuit and the limbic loop will be discussed in a separate lecture).

### Summary:

- ✚ The Sulci of the medial surface from posterior to anterior:
  1. Calcarine sulcus (fissure).
  2. Parieto-occipital fissure.
  3. Marginal sulcus.
  4. Central sulcus.
  5. Ascending sulcus (the marginal + ascending sulci are part of cingulate sulcus).
  - The Callosal sulcus is above the corpus callosum.
  - The Cingulate sulcus is above the callosal sulcus.
  - Subparietal sulcus is located in the medial aspect of the parietal lobe.
- ✚ The gyri of the medial surface (posterior TO anterior)
  1. Lingual gyrus.
  2. Cuneus gyrus.
  3. Precuneus gyrus.
  4. Paracentral gyrus.
  5. Medial frontal gyrus + cingulate gyrus

### Sulci & Gyri of the inferior surface of the brain:

✚ The inferior surface is divided by the **stem** of the lateral fissure into a smaller anterior part known as the orbital surface which exists above the orbital bone & (a posterior part known as the tentorial surface).



✓ The orbital surface contains the following:

➤ **Olfactory sulcus:** located medially in the orbital surface near & parallel to the median fissure.

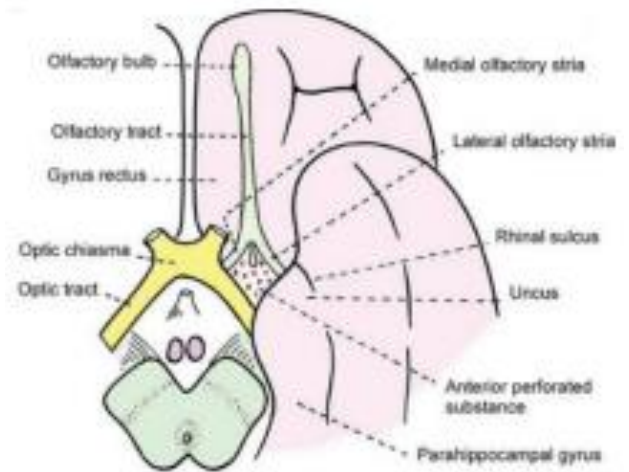
## ✓ The tentorial surface contains the following:

### Nomination

The olfactory sulcus is named so because it contains the olfactory bulb. (Olfactory epithelium-> olfactory stria->olfactory tract->the olfactory bulb)

- Side Note: branches of the anterior cerebral artery pass through **anterior perforated substance**. Also, branches of posterior cerebral artery pass through the **posterior perforated substance**.

⇒ **Gyrus rectus**: Lies medial to the olfactory sulcus. Continuous with superior frontal gyrus.



**Its Function** Has a role in sexual function in human.

⇒ **H-shaped orbital sulcus**: divides the remaining part into **anterior, posterior, lateral & medial orbital gyri**.

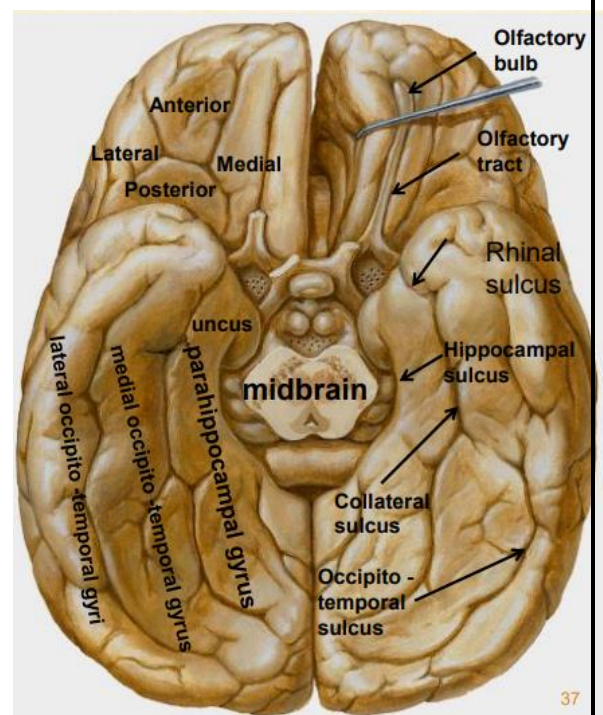
o Orbital gyri are connected with limbic system especially nucleus accumbens (reward reinforcement. (not mentioned by the doctor)

## ✓ The tentorial surface contains the following:

### Nomination

According to the tentorium cerebelli that lies between the brain above and cerebellum below.

- ◆ **Hippocampal sulcus** or Parahippocampal sulcus: Separates the Parahippocampal gyrus (the tentorial surface) from the midbrain (midbrain). And it's given its name according to the hippocampus which is located in the Parahippocampal gyrus.
- ◆ **Collateral sulcus**: below & parallel to the calcarine sulcus.
- ◆ **Rhinal sulcus**: (the anterior part of collateral sulcus) separates the temporal pole from the uncus.
- ◆ **Occipito-temporal sulcus**: extends from the occipital pole (posteriorly) into the temporal pole (anteriorly), lies between the medial occipitotemporal or fusiform gyrus & lateral occipito-temporal or inferior temporal gyrus.



## The Gyri of the tentorial surface:

### ✓ Para hippocampal gyri:

Between hippocampal sulcus and collateral sulcus. The structure inside it is the hippocampus. (It is in the temporal lobe)

**Its Function** - Very important for recent and short-term memory

### ✓ **Uncus:** is the anterior end of Parahippocampal gyrus

It has a nucleus called amygdala

**Its Function** Has a role in the olfaction and the fear sense - amygdala-

o So the amygdala anatomically is related to the basal nuclei, but functionally it's related to the limbic system

### ✓ **Medial occipito-temporal gyrus** (lateral to the hippocampal gyrus).

Lies between the collateral sulcus and occipito-temporal sulcus.

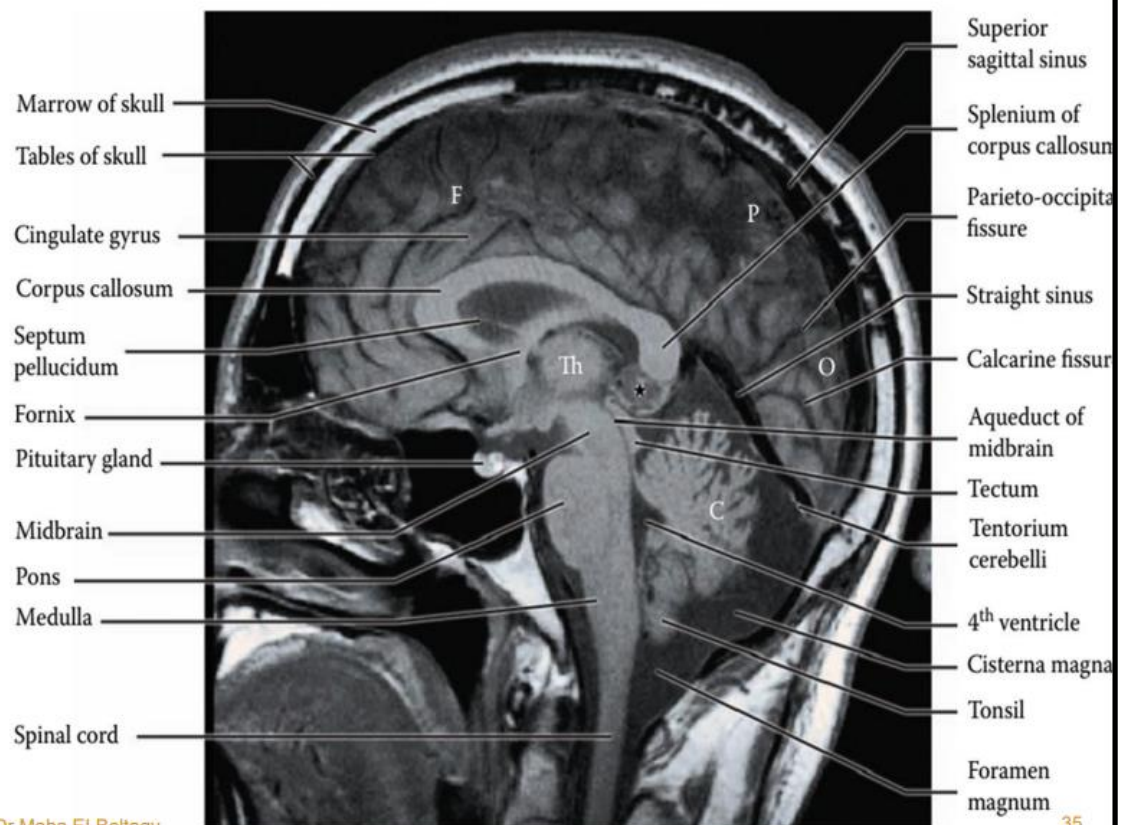
**Its Function** Involved in face recognition.

### ✓ **lateral occipito-temporal gyrus** (lateral to the Medial occipito-temporal gyrus).

**Its Function** Involved in location recognition memory

Practice this

Brain MRI





(minute 28:00)

Brodman areas (52 in number) are a system to divide the cerebral cortex according to functional areas.

Instead using postcentral gyrus, we use area 312.

## Morphological Classification of Cortical Areas

- ❖ based on cytoarchitectonic studies
- ❖ Campbell (1905) ----- about 20 areas
- ❖ **Brodman (1909)** ----- 47 areas  
- most popular
- ❖ Vogt and Vogt (1919) - over 200 areas
- ❖ von Economo (1929) -- 109 areas

### This is an introductory to the next lecture

Association areas are interpretation areas of the main function and they are located near the main functional areas.

Visual area 17 around calcarine fissure surrounded by visual association area 18 & 19.

The difference appears more in any lesion targeting these areas.

Lesion of association areas called agnosia according to the type of lesion

Lesion of right area 17 -> loss of vision contralateral homonymous hemianopia on the left

Lesion of visual association areas -> cannot describe what the person sees (visual agnosia)

