

وسهلا



أهلا

يُمنع أخذ السلايدات بدون
إذن المحرر واي اجراء
يخالف ذلك يقع تحت طائلة
المسؤولية القانونية
جميع المعلومات للاستخدام
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الأستاذ الدكتور يوسف حسين

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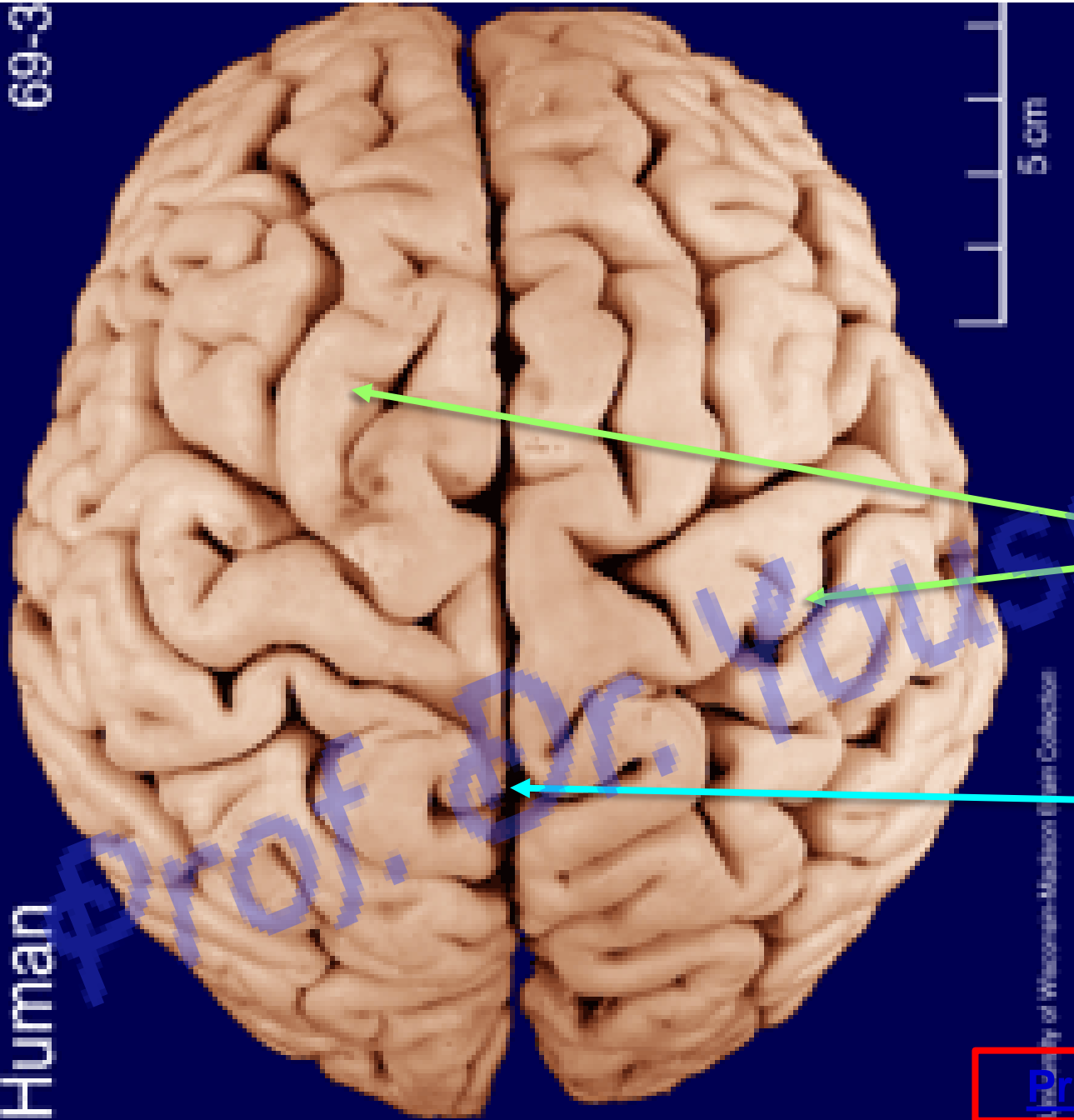
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Cerebrum

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69-3

Human

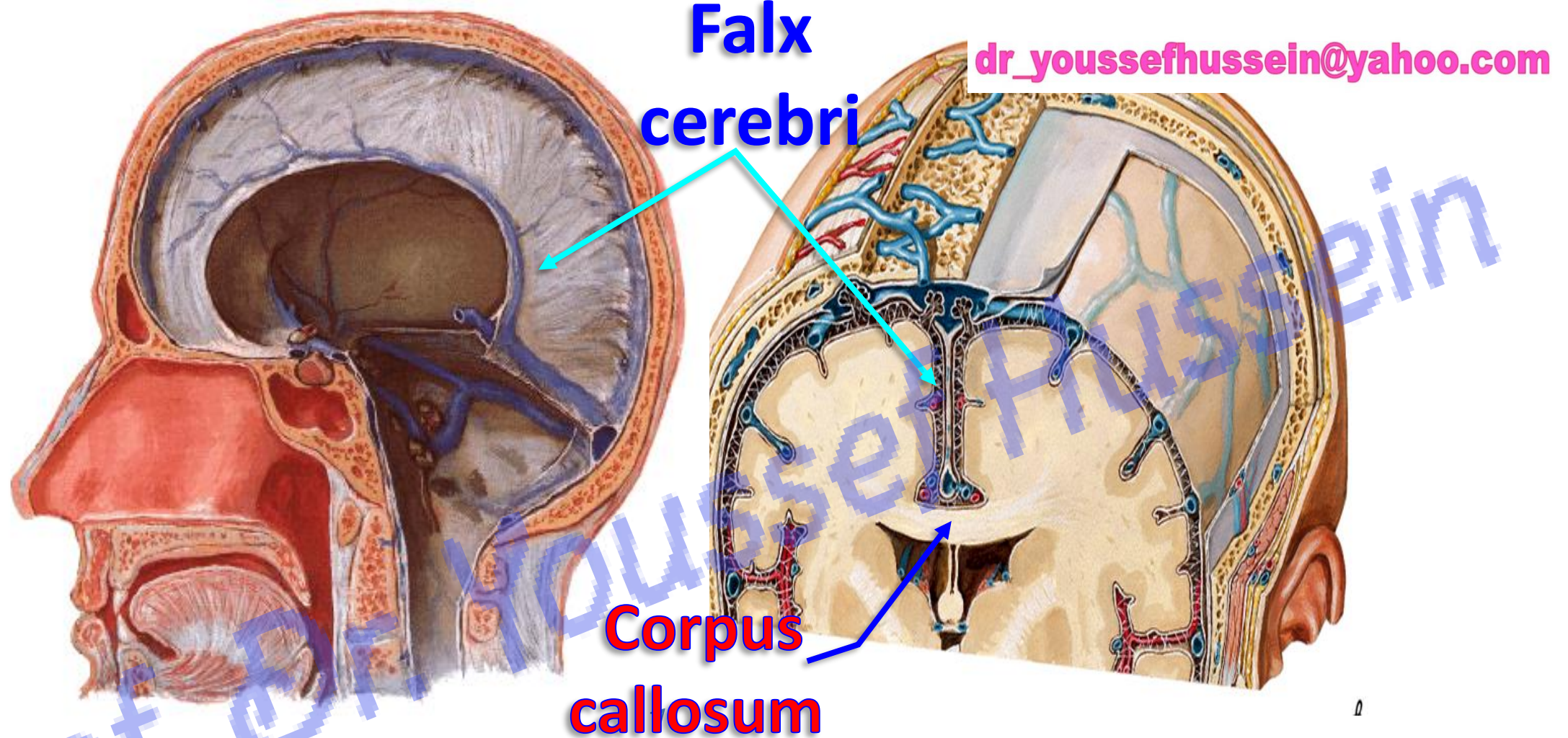


5 cm

It is divided into two cerebral hemispheres, separated by longitudinal fissure

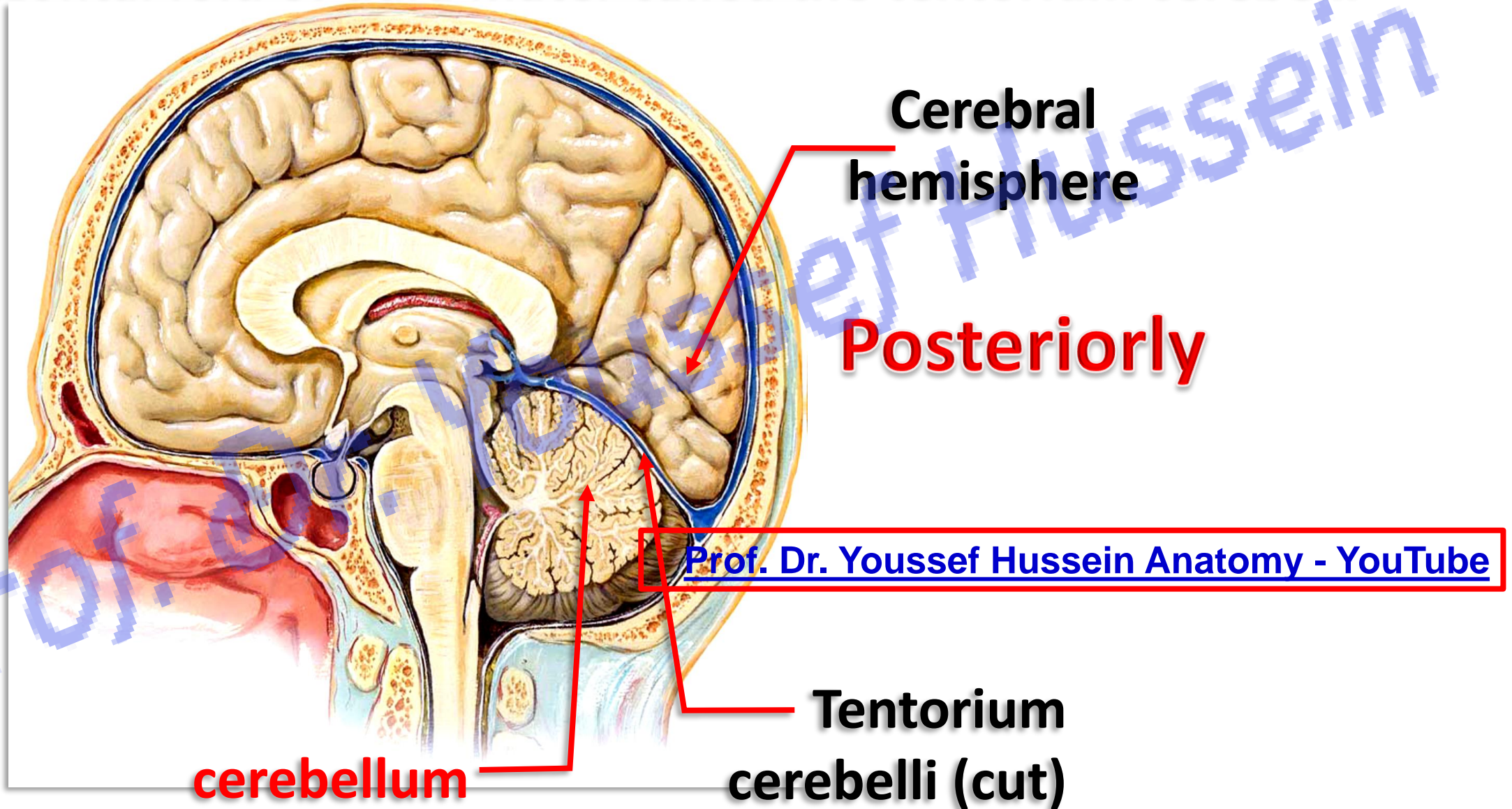
2 cerebral hemispheres

longitudinal fissure

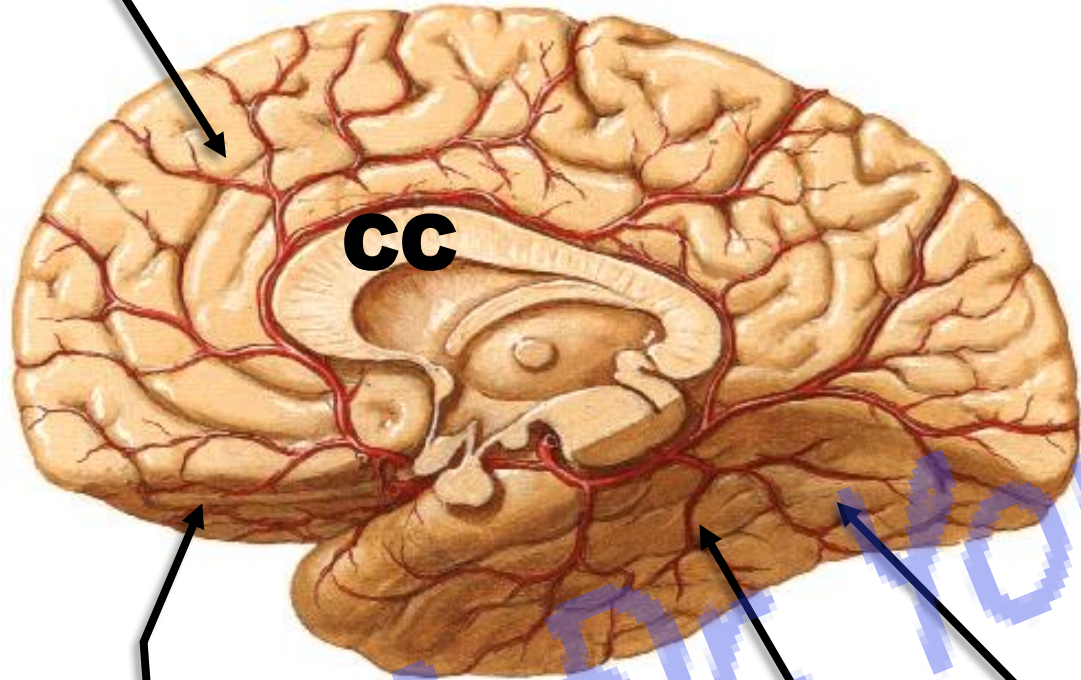


- The longitudinal fissure contains the sickle-shaped fold of dura matter, the falx cerebri and anterior cerebral arteries
- Two hemispheres connected together by CC

The cerebral hemispheres are separated from the cerebellum by a horizontal fold of dura mater called the tentorium cerebelli



2- Medial Surface

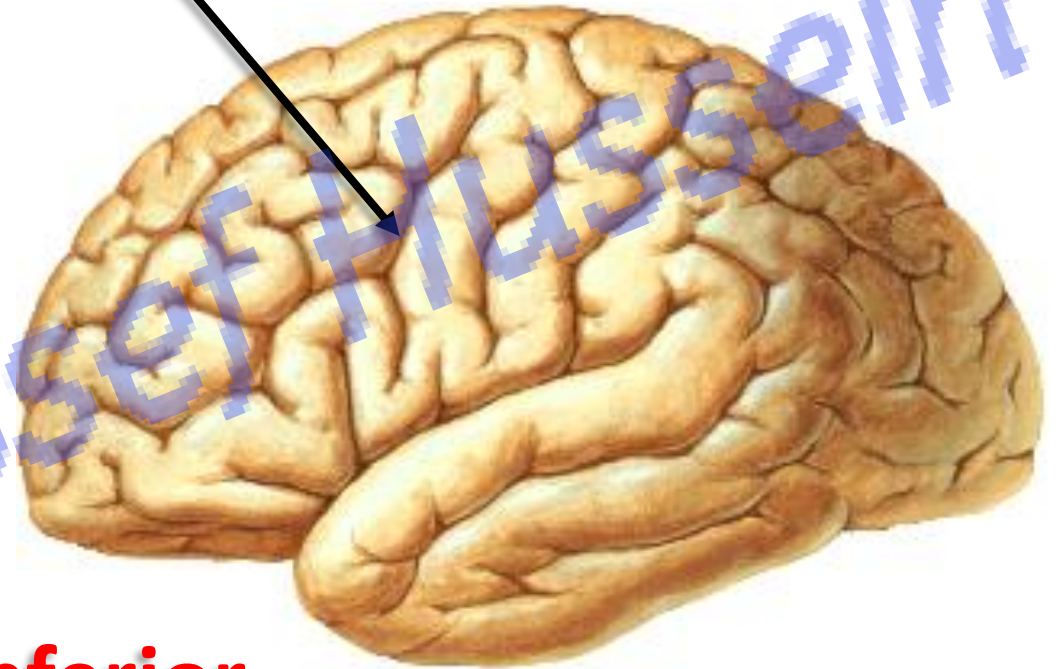


3A- Orbital part

3B- Tentorial part

3- Inferior Surface

1- Superolateral Surface



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Each cerebral hemisphere has 3 surfaces

- **Surfaces of the Cerebral Hemisphere**

1- Superolateral surface: the widest surface of the hemisphere.

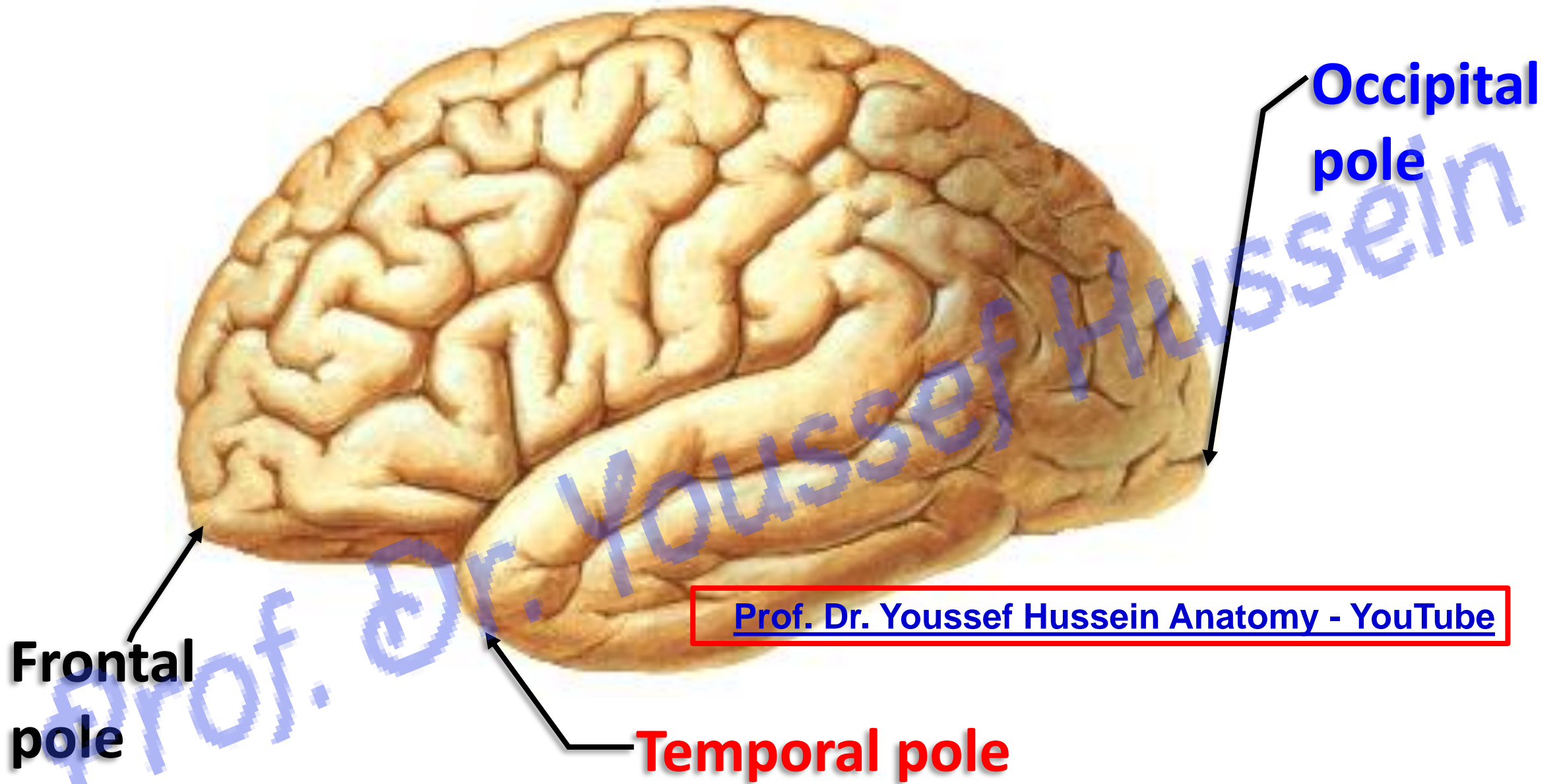
- This is a convex surface which is directed upward and laterally.

2- Medial surface: is a flat surface which is separated from the opposite side by the longitudinal fissure which lodges the falx cerebri. It contains the **corpus callosum** which connects the two cerebral hemispheres.

3- Inferior surface: is directed inferiorly and is divided by the stem of the lateral sulcus into two parts:

a- Anterior (orbital surface) rests on the roof of the orbit.

b- Posterior (tentorial surface) rests on the tentorium cerebelli.



**Frontal
pole**

Temporal pole

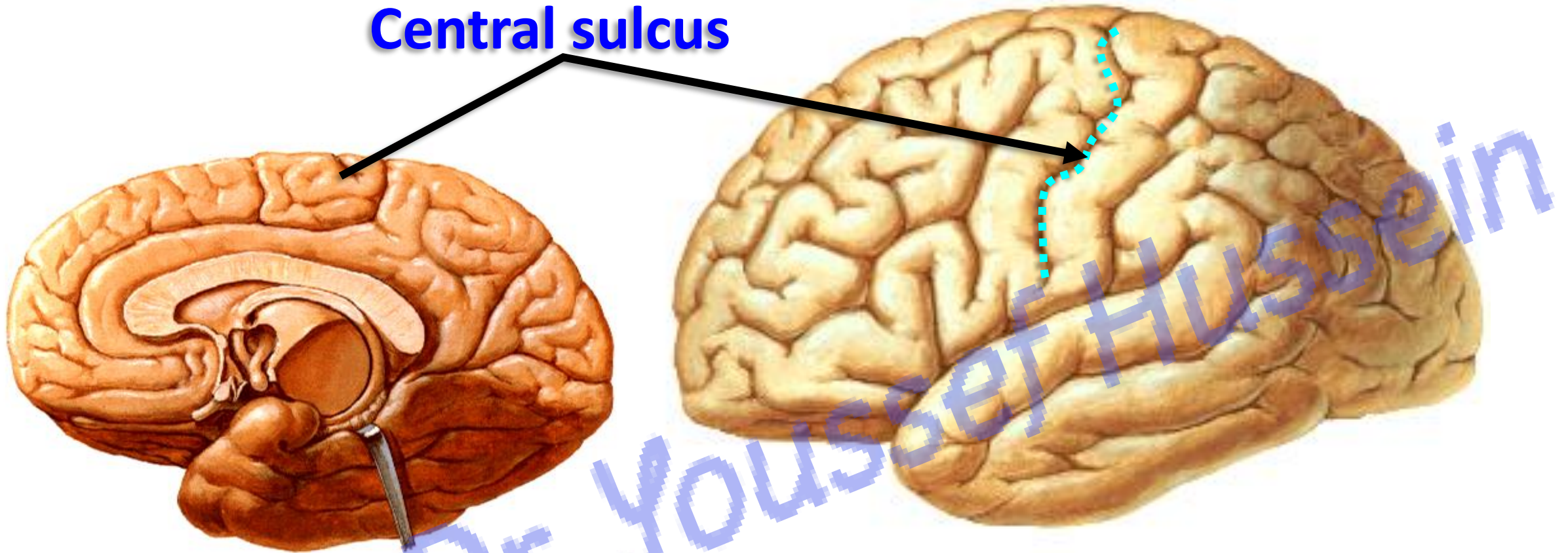
**Occipital
pole**

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Each cerebral hemisphere has 3 poles

Main Sulci and Lobes of the cerebral hemisphere

Central sulcus

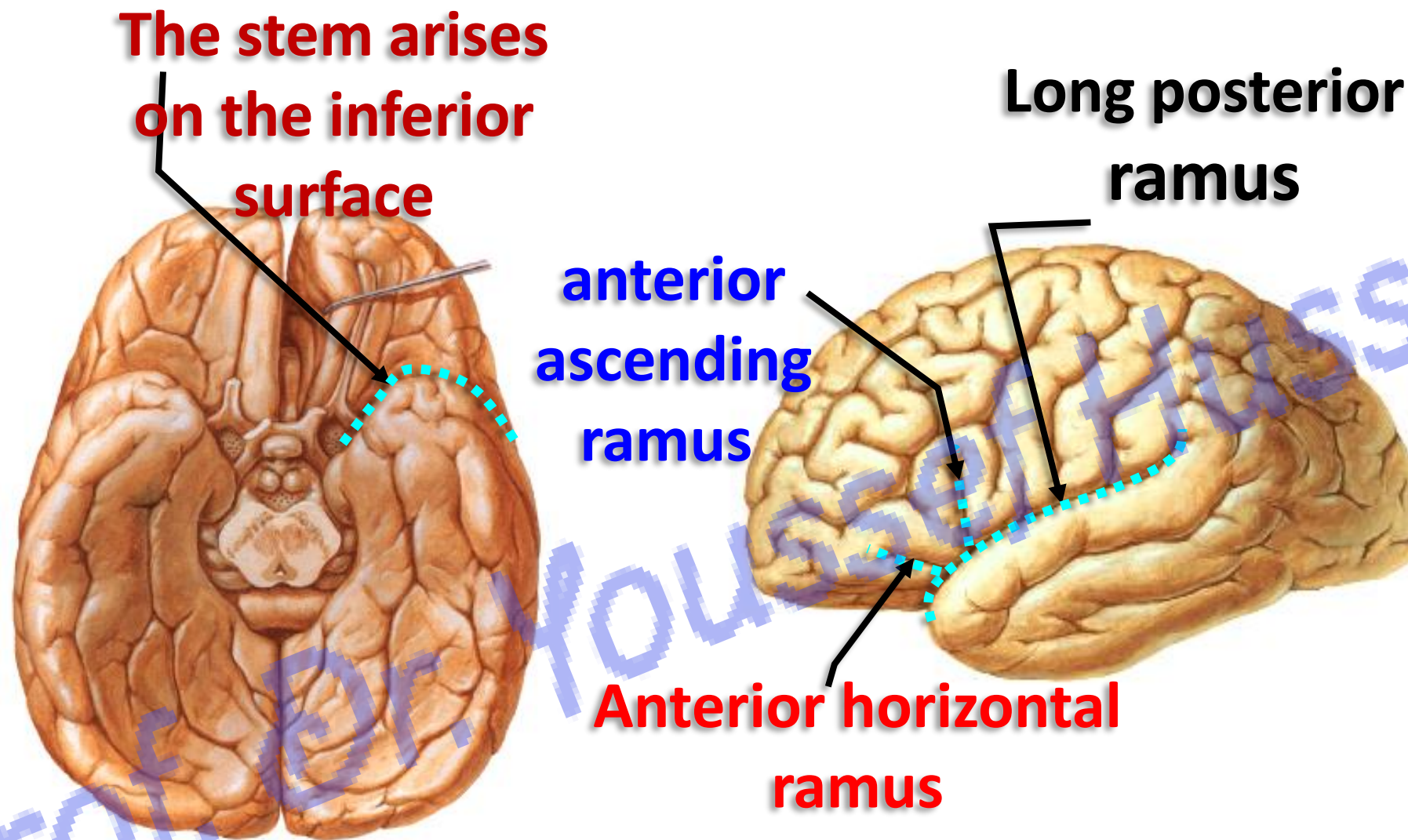


1- Central sulcus (Fissure of Rolando) a deep sulcus about 1/2 inch behind the midpoint between frontal and occipital poles.

- It extends obliquely downwards and forwards and ends slightly above the lateral sulcus.

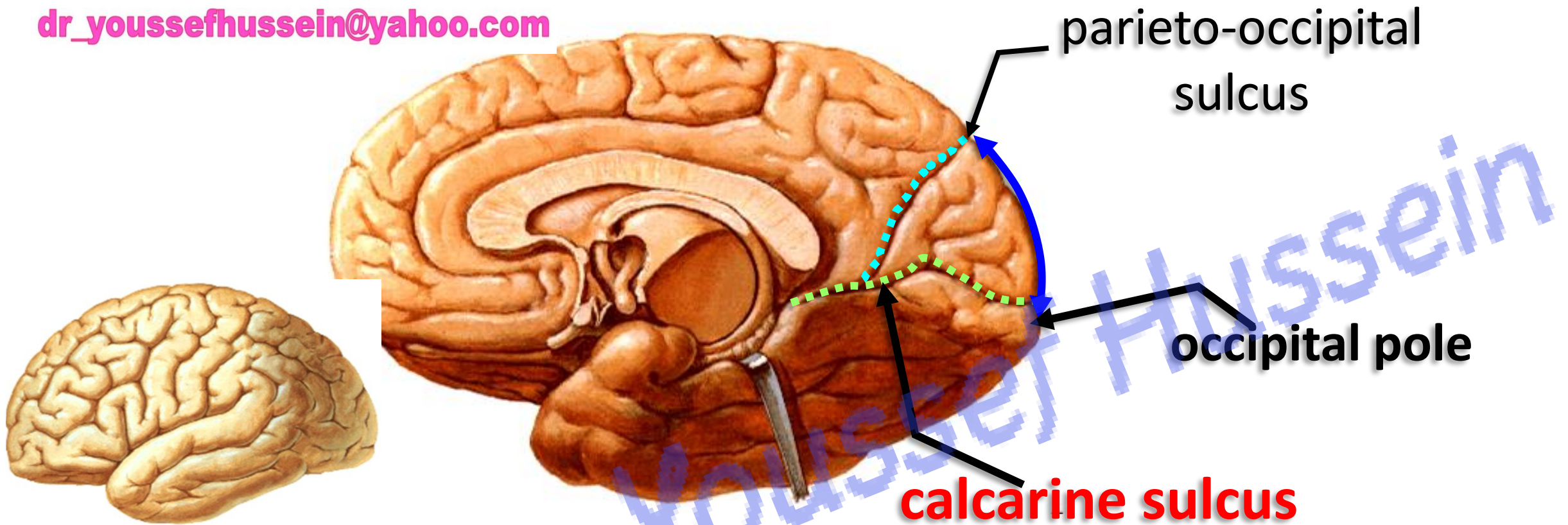
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- It extends a little on the medial surface



2- Lateral sulcus (fissure of Sylvius) consists of a short stem (inferior surface) that divides into three rami (superolateral surface).

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3- Parieto-occipital sulcus begins on the medial margin of the hemisphere about 2 inches (5 cm) anterior to the occipital pole, extends downward & forward

4- Calcarine sulcus; begins below the splenium of the corpus callosum to the occipital pole.

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- It is divided by parieto-occipital sulcus into precalcarine and postcalcarine sulcus.

Medial

Frontal

Parietal

Occip

Temporal

frontal lobe

Parietal lobe

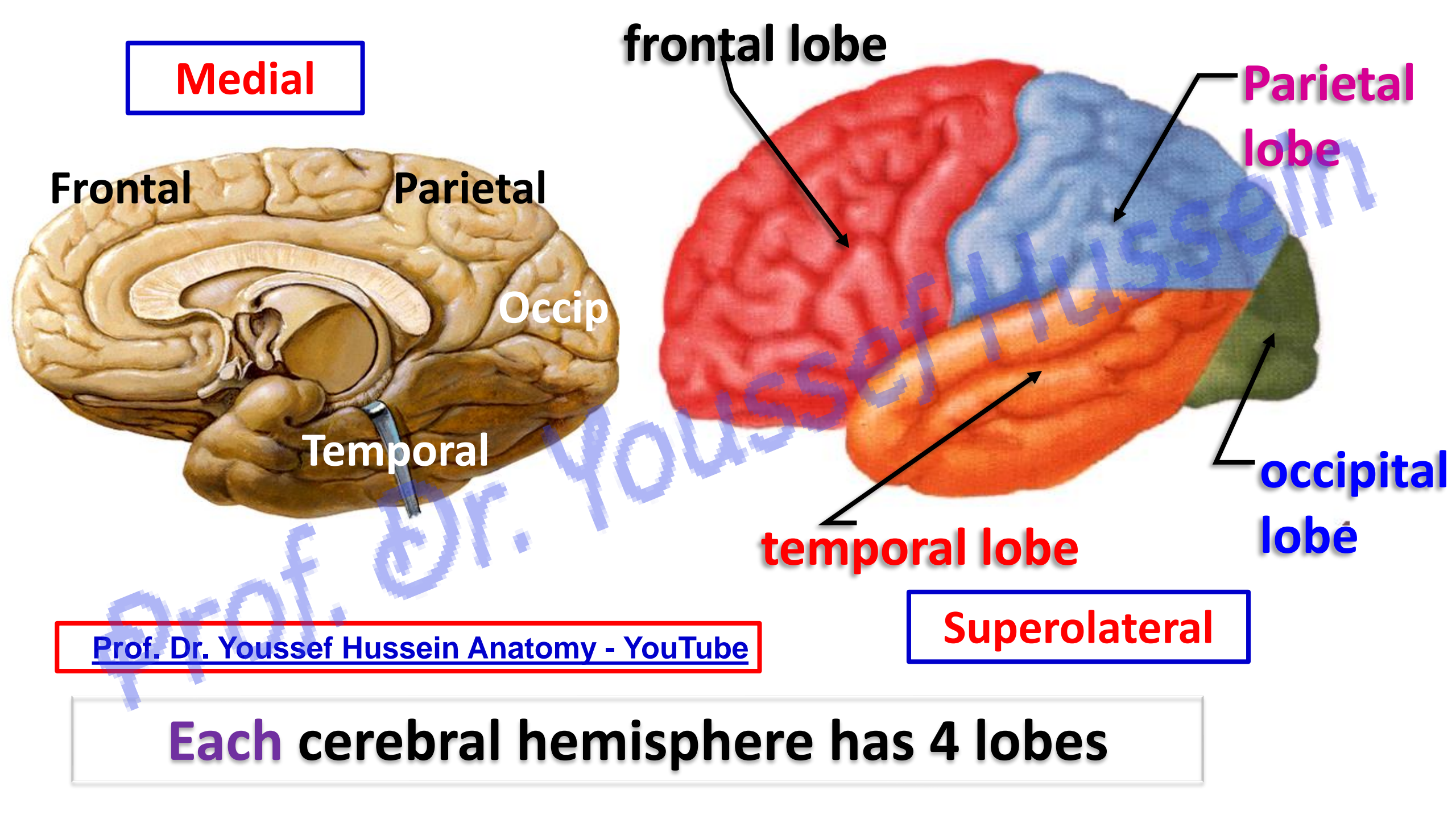
temporal lobe

occipital lobe

Superolateral

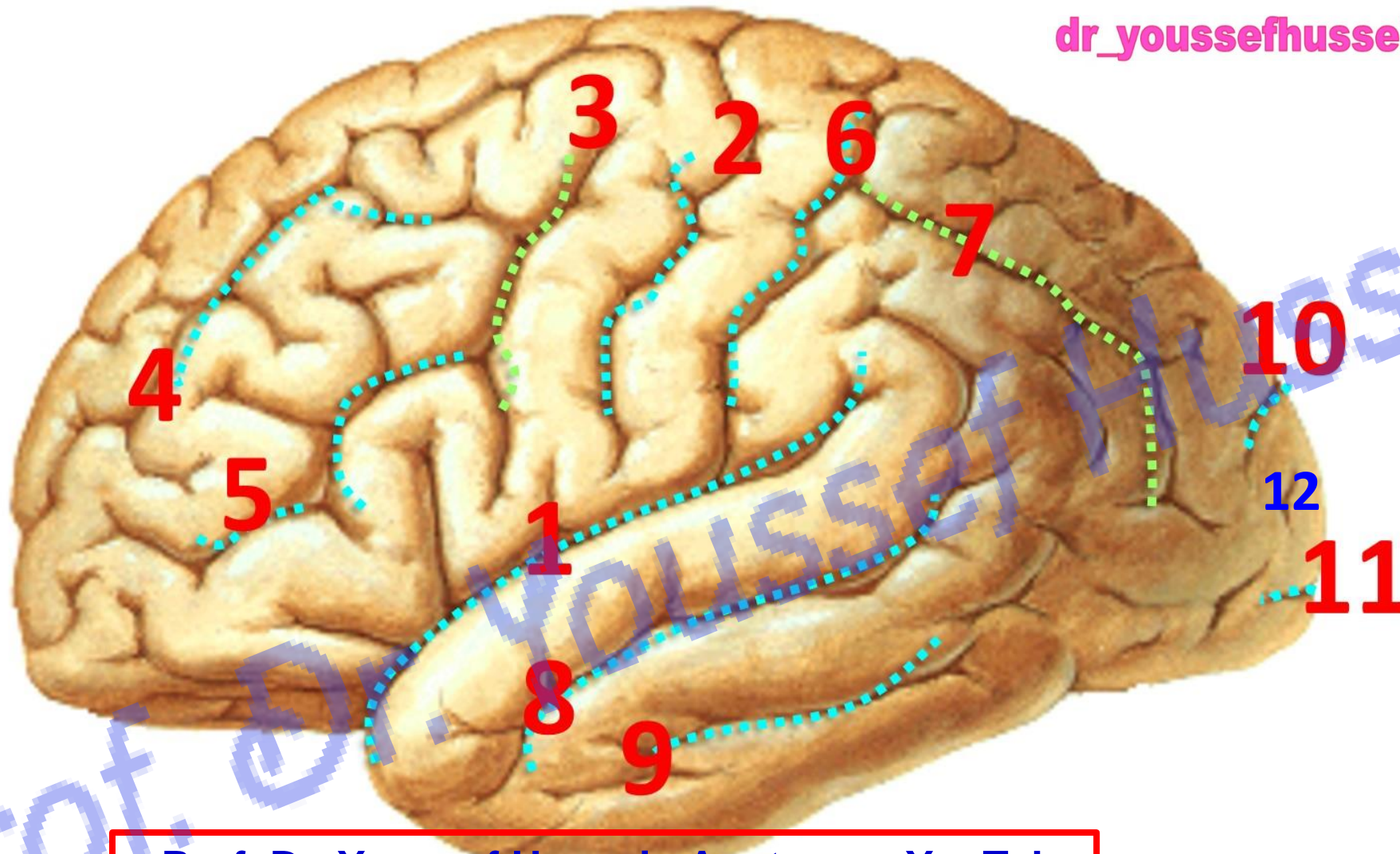
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Each cerebral hemisphere has 4 lobes



Sulci & Gyri of the supero- lateral surface

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Important Sulci on the superolateral surface

• Sulci on the Supero-lateral surface

1- **Lateral sulcus** (fissure of Sylvius):

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2- **Central sulcus** (Fissure of Rolando):

3- **Precentral sulcus**: about 1 cm (finger's breadth) in front of central sulcus.

4 & 5- **Superior and inferior frontal sulci**: begin close to the precentral sulcus and extend forwards.

6- **Postcentral sulcus**: about 1 cm (finger's breadth) behind central sulcus.

7- **Intraparietal sulcus**: extends backwards from the middle of the postcentral sulcus.

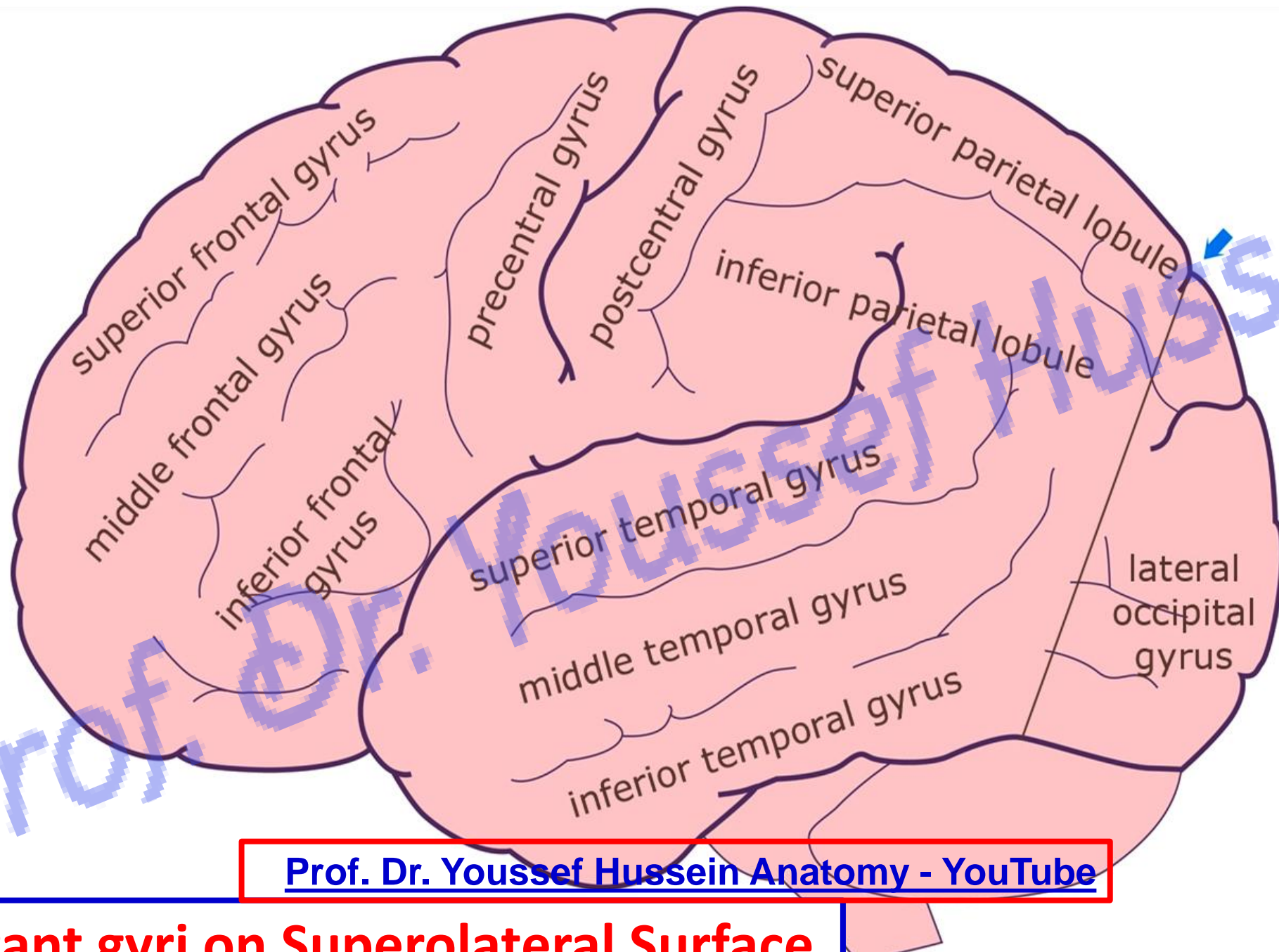
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8 & 9- **Superior and inferior temporal sulci**: on the temporal lobe parallel to the lateral sulcus.

10- **Parieto-occipital sulcus**: 5 cm in front of the occipital pole.

11- **Calcarine sulcus**: its posterior end reaches to the occipital pole.

12- **Lunate sulcus (Simian)** at the occipital lobe



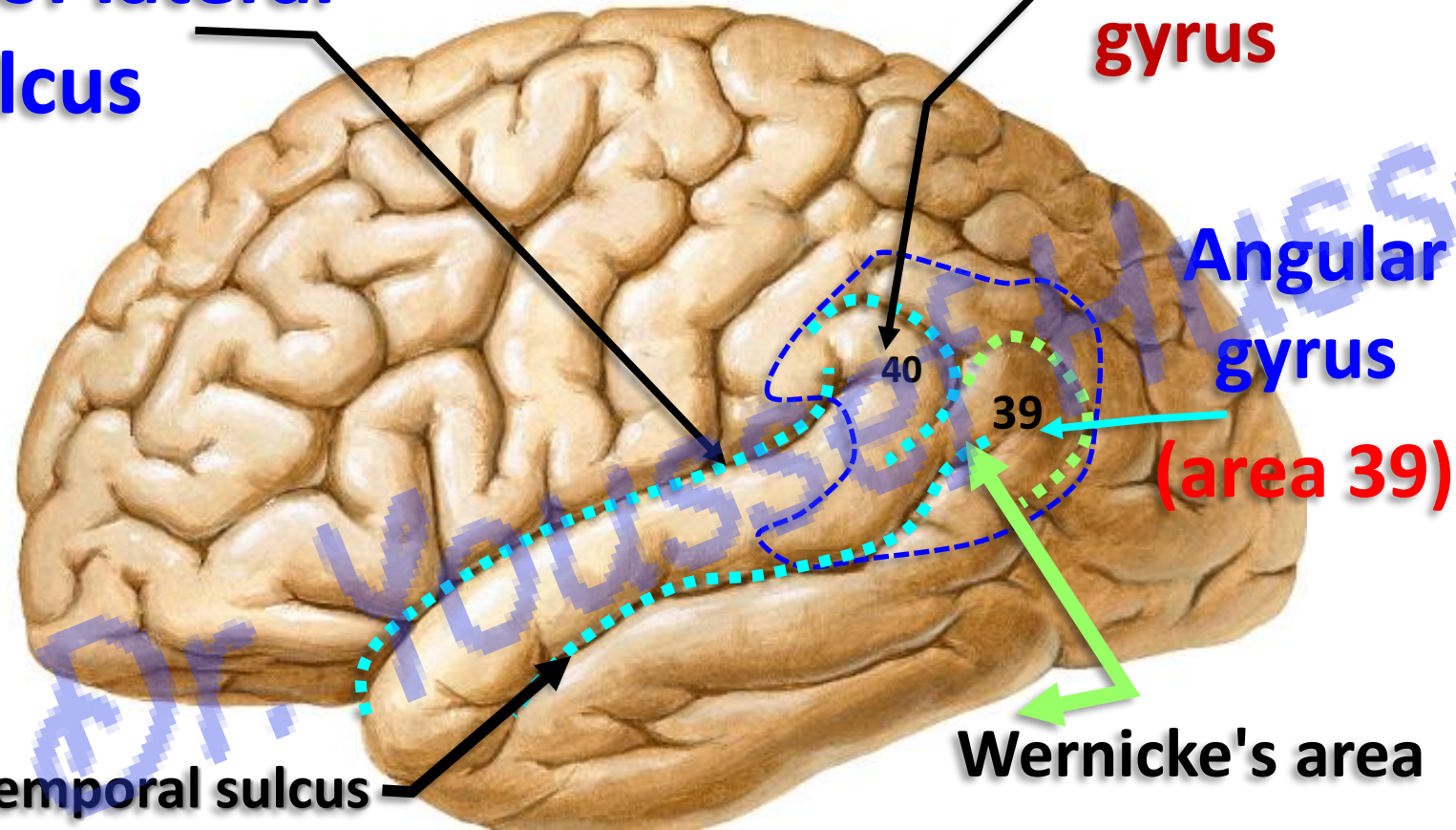
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Important gyri on Superolateral Surface

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Long posterior
ramus of lateral
sulcus

(area 40) Supramarginal
gyrus



Superior temporal sulcus

Wernicke's area

- **Supramarginal gyrus (area 40)** is gyrus around the posterior end of the lateral sulcus
- **Angular gyrus (area 39):** is gyrus around the posterior end of the superior temporal sulcus

- **Gyri On the supero-lateral surface**

A- Frontal lobe;

- 1- **Precentral gyrus** between the central and precentral sulci.
- 2- **Superior frontal gyrus**; lies above the superior frontal sulcus.
- 3- **Middle frontal gyrus** lies between the superior and inferior frontal sulci.
- 4- **Inferior frontal gyrus**; below inferior frontal sulcus, from anterior to posterior:
 - a- Orbital part below the anterior horizontal ramus.
 - b- Triangular between the horizontal, and ascending rami.
 - c- Opercular part behind the anterior ascending ramus.

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B- Parietal lobe;

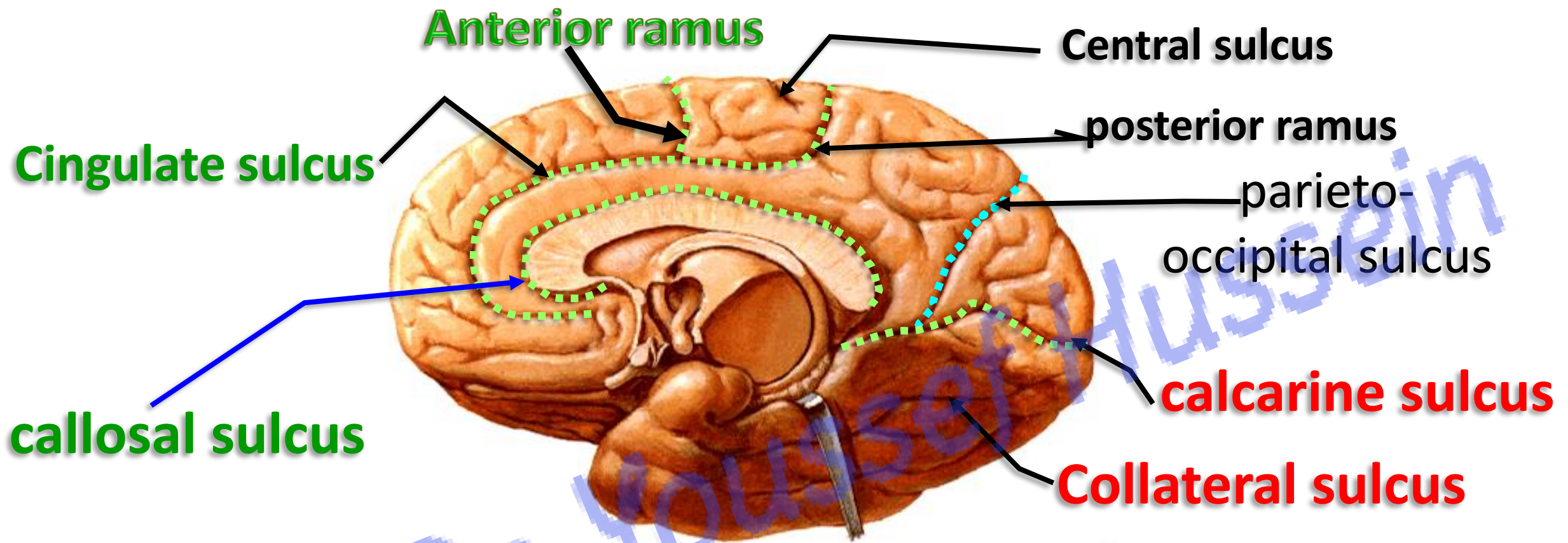
- 1- **Postcentral gyrus**: between the central and postcentral sulci.
- 2- **Superior parietal gyrus (lobule)** above the intraparietal sulcus.
- 3- **Inferior parietal gyrus (lobule)** below the intraparietal sulcus.
- 4- **Supramarginal gyrus** around the posterior end of the lateral sulcus.

C- Temporal lobe;

- 1- **Superior temporal gyrus** between lateral sulcus and superior temporal sulcus.
- 2- **Middle temporal gyrus** lies between the superior and inferior temporal sulci.
- 3- **Inferior temporal gyri**: lies below the inferior temporal sulcus.
- 4- **Angular gyrus** around the posterior end of the superior temporal sulcus.

Sulci & Gyri of the medial surface

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- **Sulci on the Medial Surface**

- 1- **Callosal sulcus:** close to the upper surface of the corpus callosum.
- 2- **Cingulate sulcus;** about finger's breadth above and parallel to the callosal sulcus.
 - It **ends** by dividing into two rami in front and behind the central sulcus.
- 3- **Central sulcus:** between the two branches of the cingulate sulcus.
- 4- **Parieto-occipital sulcus.**
- 5- **Calcarine sulcus.**

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cingulate
gyrus

medial frontal
gyrus

paracentral
lobule

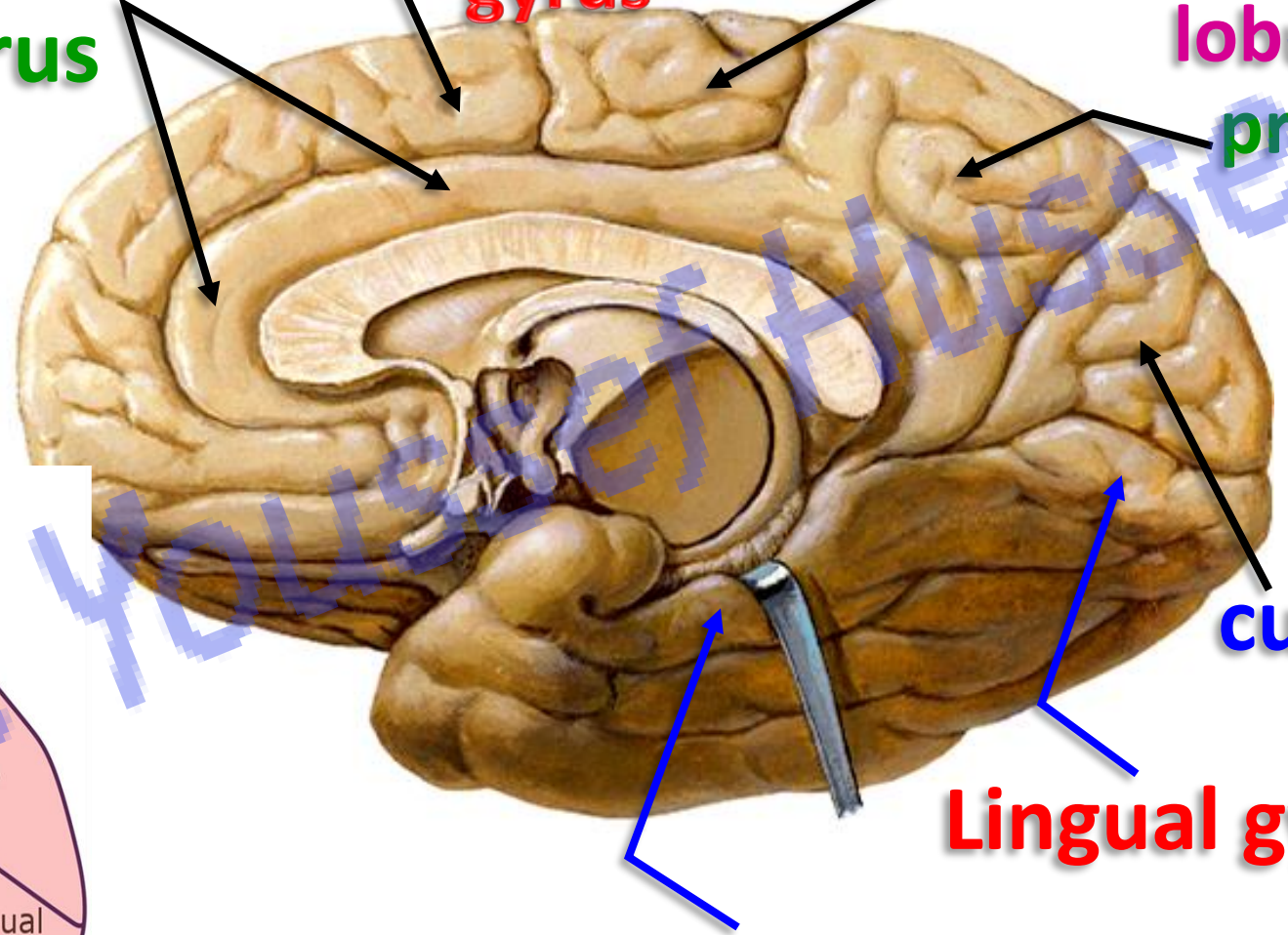
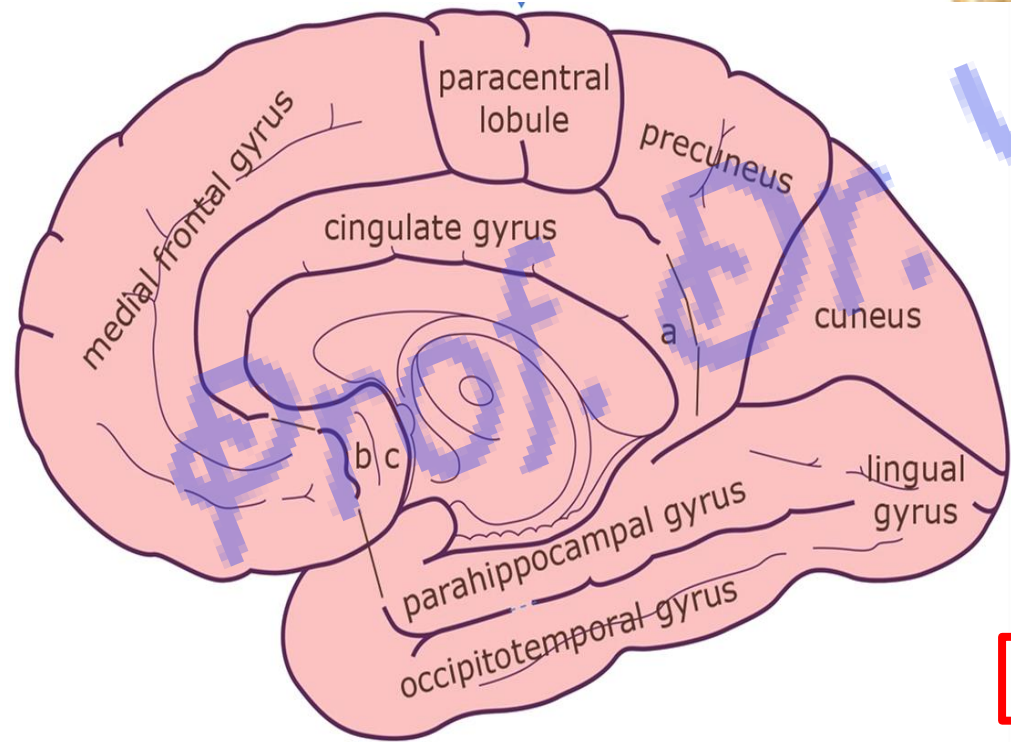
precuneus

cuneus

Lingual gyrus

Parahippocampus

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- **Gyri on the Medial Surface**

1- Cingulate gyrus: between the callosal and cingulate sulci.

- The lower part of the posterior end curves downward behind the splenium of corpus callosum and forms a narrow area (**isthmus**) that connects it with the **para-hippocampal gyrus**.

2- Medial frontal gyrus: between the superomedial border and cingulate sulcus.

3- Paracentral lobule: surrounds the central sulcus between the two rami of the cingulate sulcus.

4- Precuneus; Infront parieto-occipital sulcus.

5- Cuneus: the triangular gyrus between the parieto-occipital and postcalcarine sulci (between the two branches of the Y).

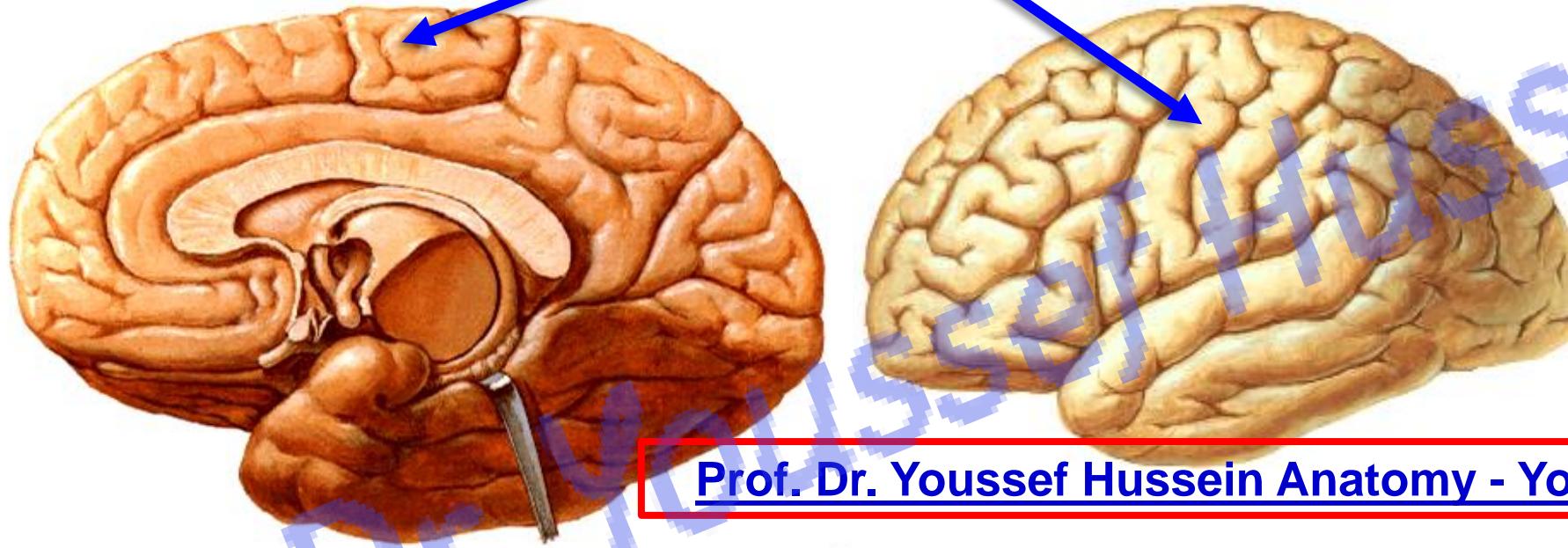
6- Lingual gyrus: the elongated, tongue-like gyrus extending below the postcalcarine sulcus to the occipital pole.

Functional areas of the Superolateral surface

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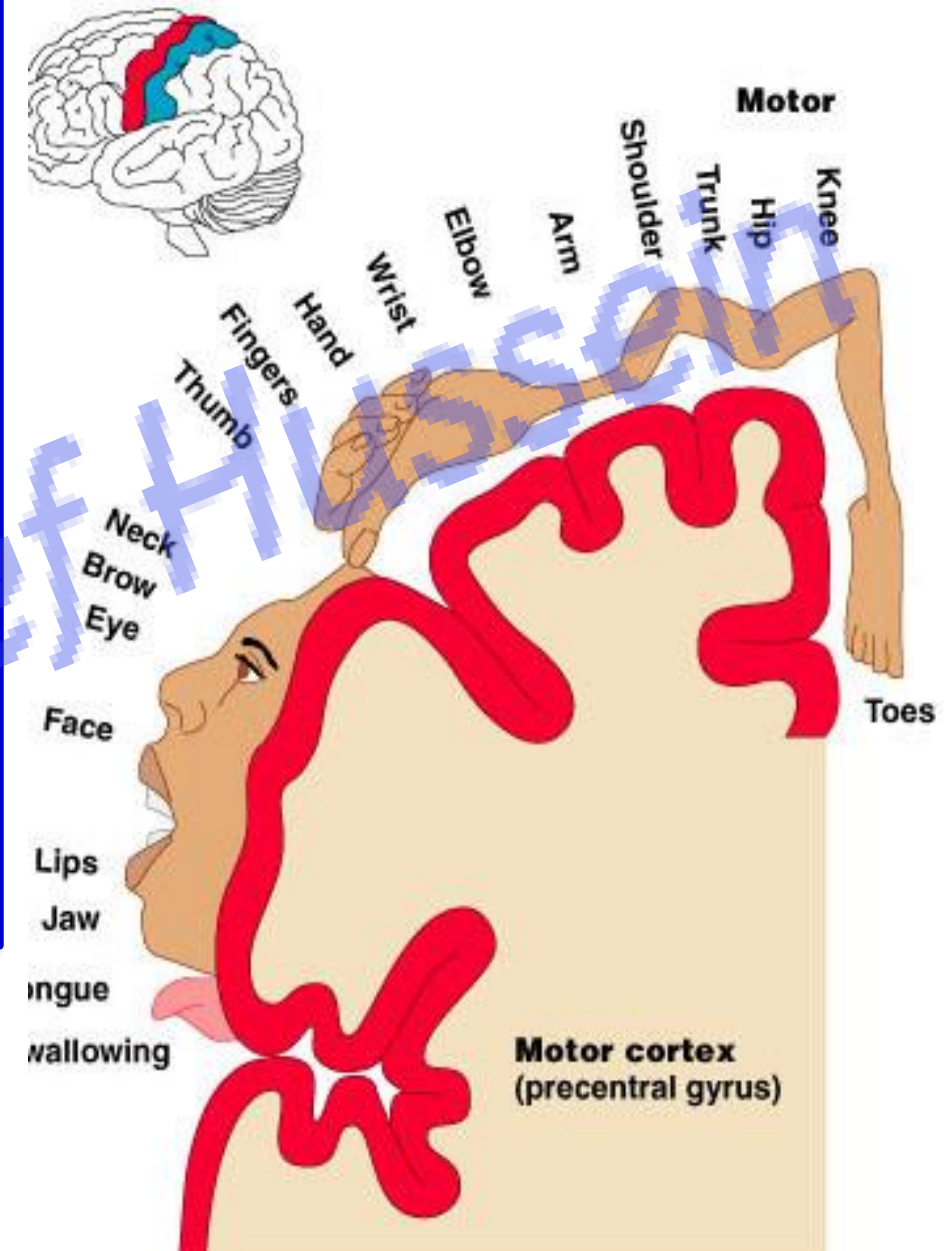
Motor area 4

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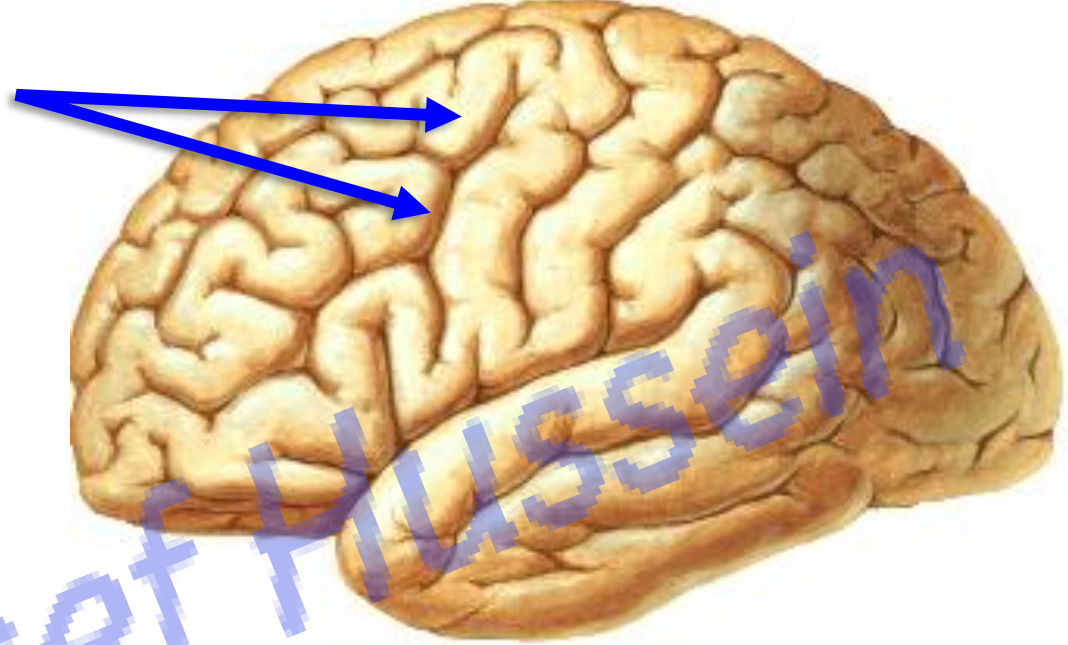


- **Primary motor area** corresponds to the precentral gyrus (**Brodman area 4**), anterior part of the paracentral lobule **Controls motor functions**, primarily on the opposite side of the body.

- A body represented in upside down.
- The muscles of the head are represented most ventrally closest to the lateral fissure; then, proceeding dorsally, are the regions for the neck, upper limb, and trunk on the lateral aspect of the hemisphere.
- On the medial aspect of the hemisphere is the motor representation for the pelvis and lower limb.
- size depends on skill, not mass of the muscle
- **Lesion** of the area 4 results in contra-lateral **hemiplegia (UMNL)**.



Premotor area 6

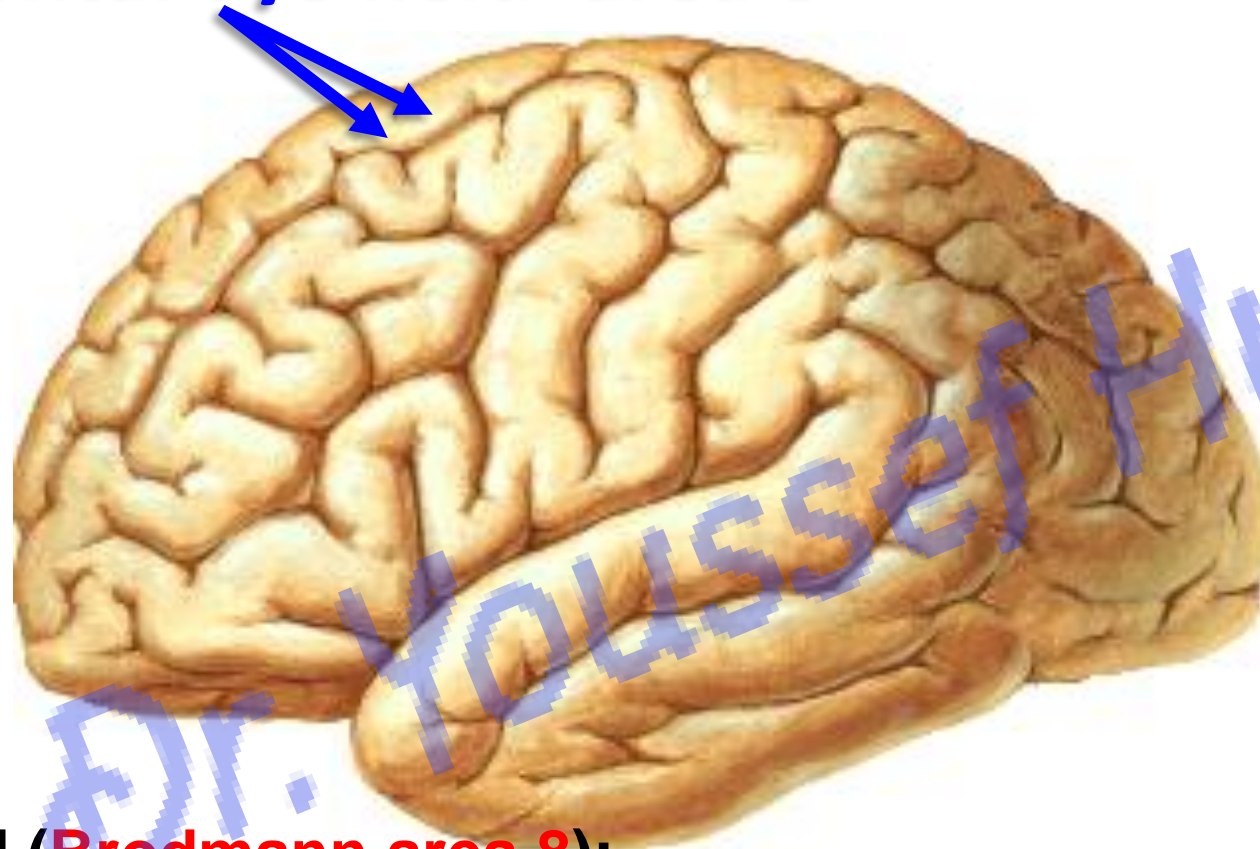


- Located anterior to the precentral gyrus
- It is the origin of extrapyramidal fibers
- Controls more complex movements
- Involved in the *planning* of movements and storage of the learned movements to bring them later on.

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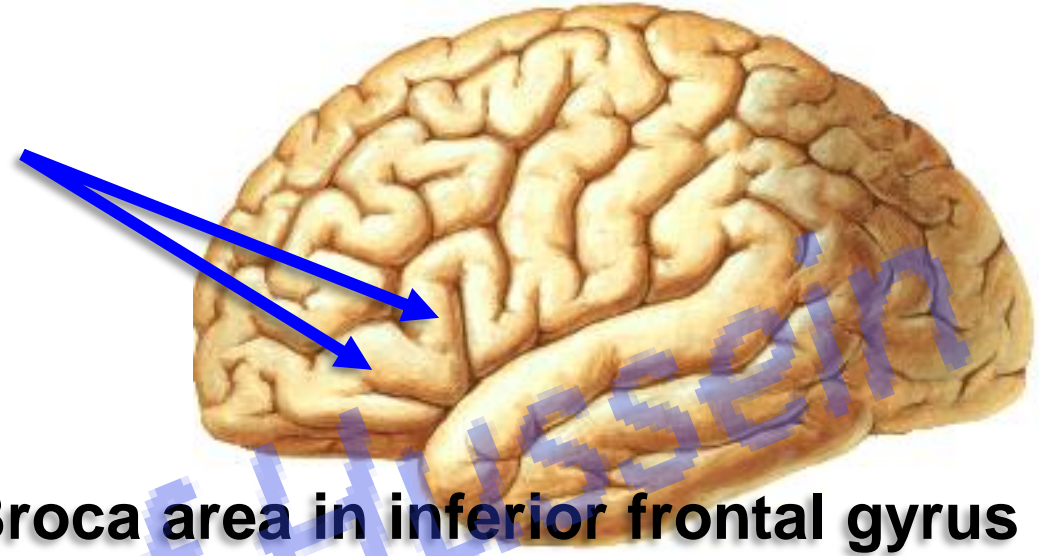
- Damage here results in an **apraxia**, a disruption of the patterning and execution of learned motor movements.
- Individual movements are intact, and there is no weakness, but the patient is unable to perform movements in the correct sequence.

Frontal eye field area 8



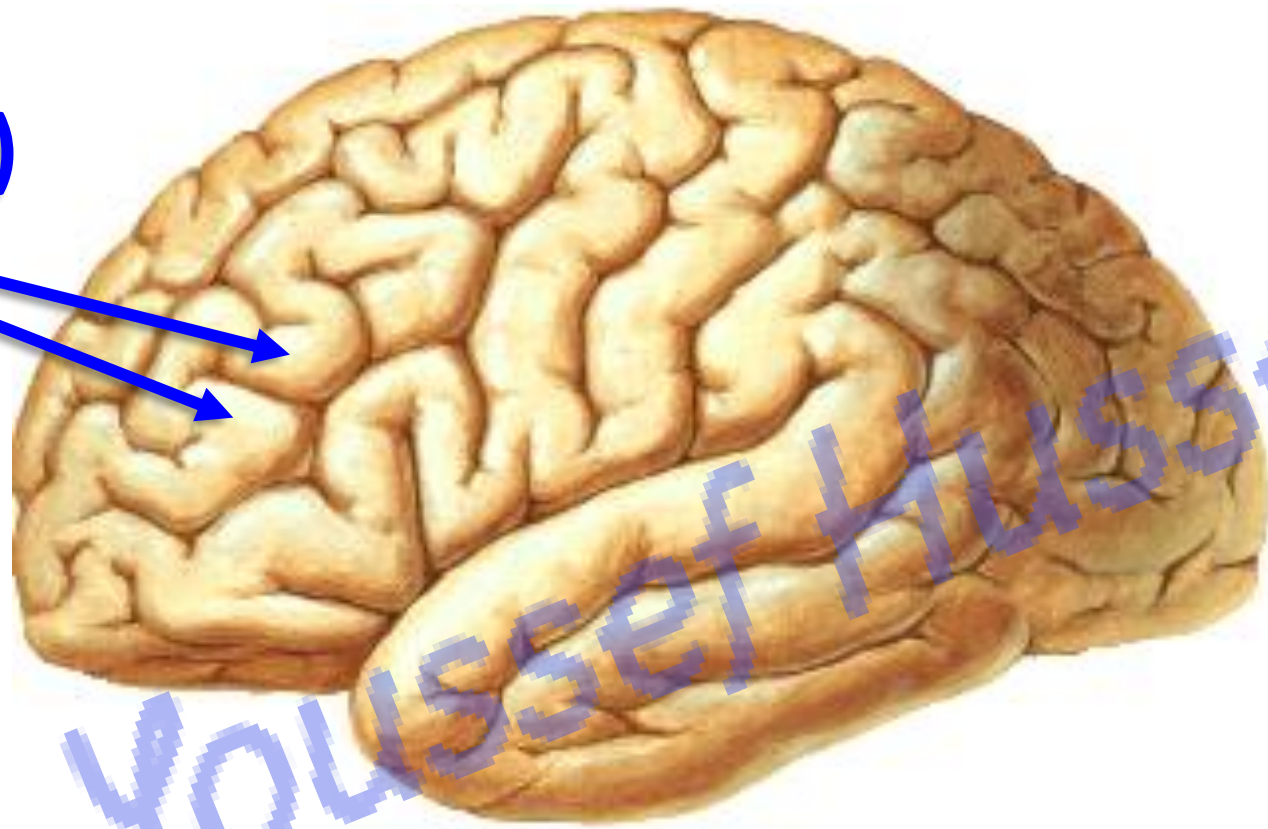
- **Frontal eye field (Brodmann area 8):**
 - It lies anterior to the premotor cortex
 - **It controls movements of the eyes when eyes follow a moving target.**
- A lesion here results in an inability to make voluntary eye movements toward the contralateral side.

(Broca's area) 44, 45



- **Motor speech (Broca's) area (areas 44, 45)** Broca area in inferior frontal gyrus of frontal lobe of the dominant hemisphere (95%). Associated with language production. It brings about the formation of words by its connections with the adjacent primary motor areas; the muscles of the speech.
- Lesion in this area produces **Aphasia**—higher-order language deficit (inability to understand/produce/use language appropriately); caused by pathology in dominant cerebral hemisphere (usually left in righthanded people).
- Damage of Broca area and primary motor cortex = full loss of language
- **Dysarthria**—partial loss of language (difficulty speaking), damage to the muscles or nerves that control speech.

(Writing area)



- **Writing area (Exner's area);**
 - It lies in the middle frontal gyrus.
 - The person able to express himself in written words
 - Lesion leading to **Agraphia** (loss of ability to write)

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Prefrontal areas



Prefrontal area (areas 9,10,11,& 12)

- It lies in the most anterior part of the frontal lobe **الناصية**

- **It is responsible for:**

A- Planning التخطيط , thinking التفكير , remember التذكر and problem solving حل المشكلات

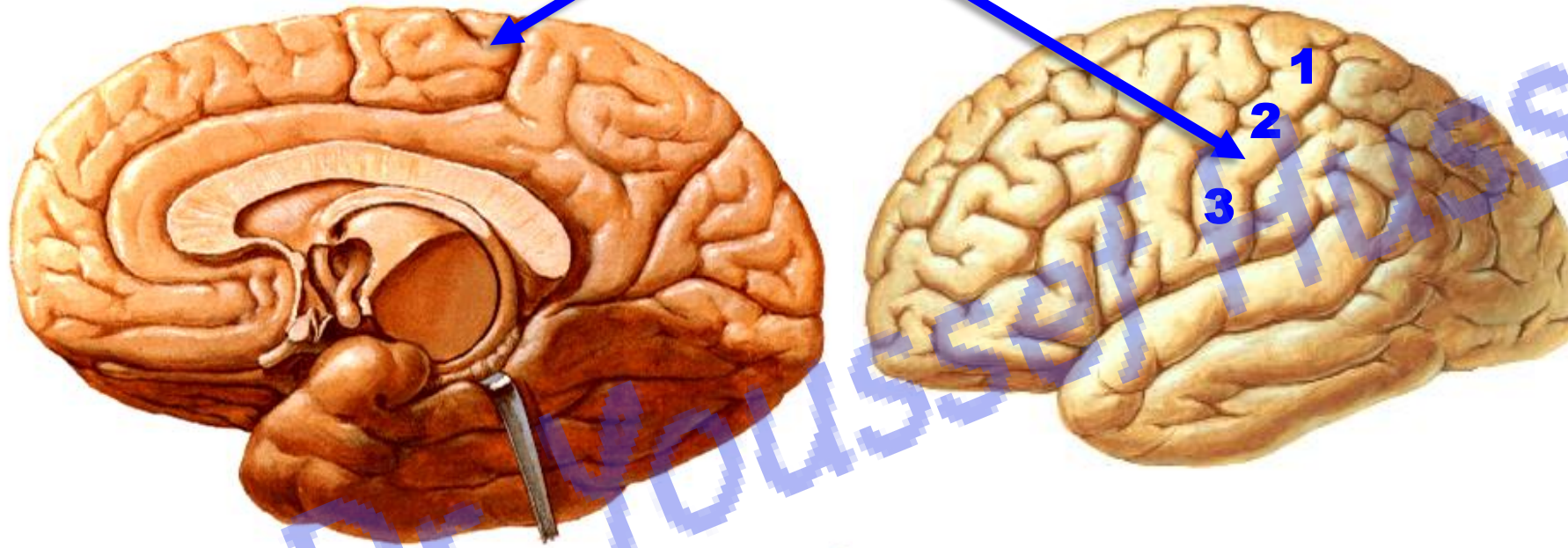
B- Motivating التحفيز , emotions الأنفعالات , good & sinful behavior السلوك الحسن و الخاطئ , mood المزاج , psychological activities الأنشطة النفسية .

C- Telling of lie and truth قول الكذب و الحقيقة

- Lesions in the prefrontal area produce what is called the **frontal lobe syndrome**.

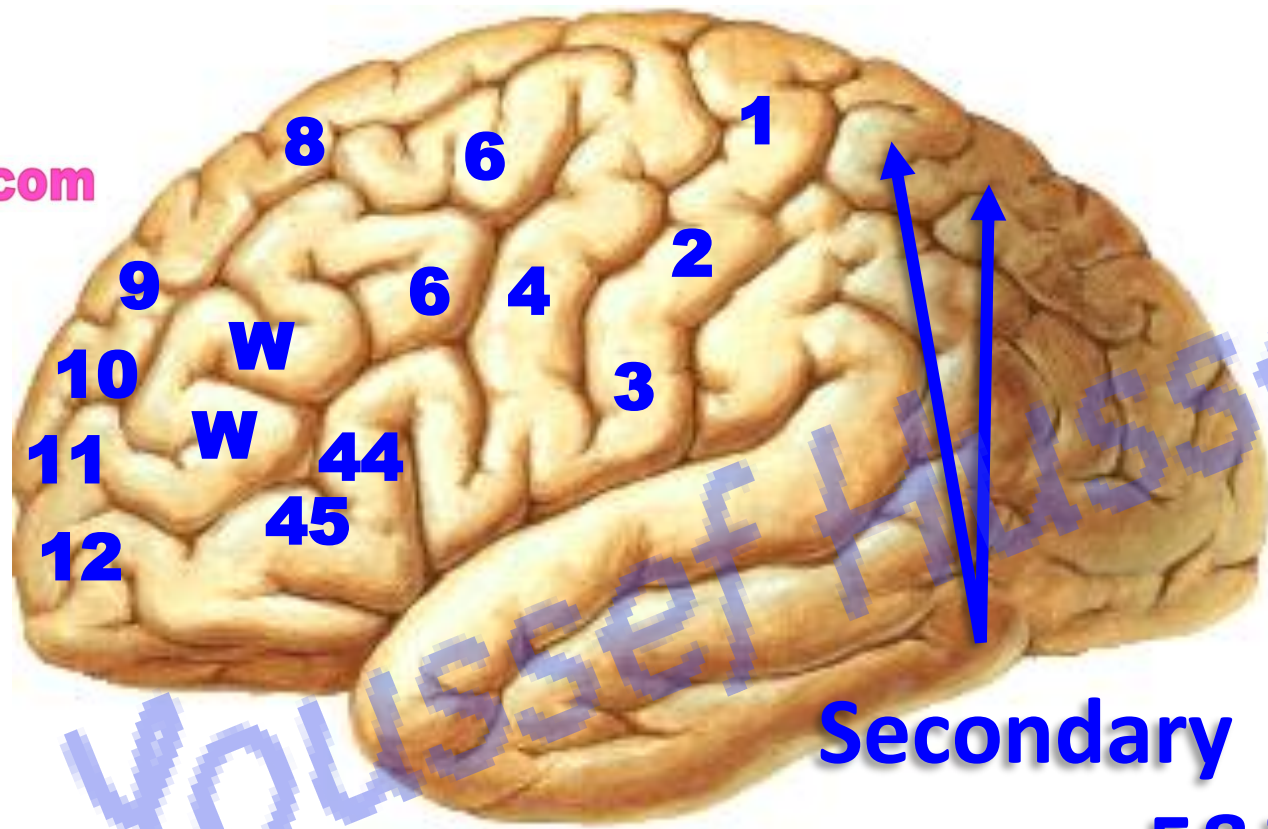
Somatosensory area 1,2,3

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- Somatosensory (**Primary sensory**) cortex corresponds to postcentral gyrus (**areas 1,2,3**), posterior part of paracentral lobule
- It receives sensations from opposite side of body.
- The body represented upside down [Prof. Dr. Youssef Hussein Anatomy - YouTube](https://www.youtube.com/channel/UC...)
- Lesion in this area leads to **loss of sensation** in opposite side of the body.

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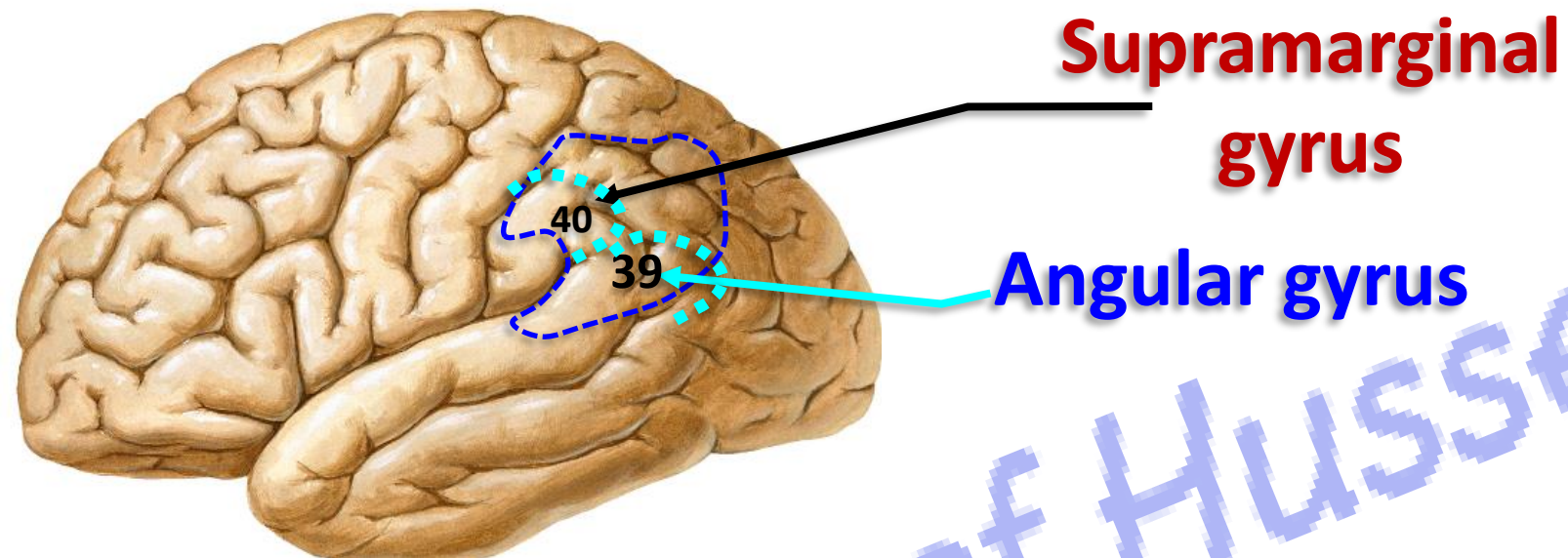


Secondary
sensory 5&7

Secondary (Association) sensory area (area 5, 7);

- It occupies the superior parietal gyrus.
- Function, **stereognosis** (ability to identify the familiar objective manually) **shape, roughness, size of objects**
- Lesion results in **asteriognosis**

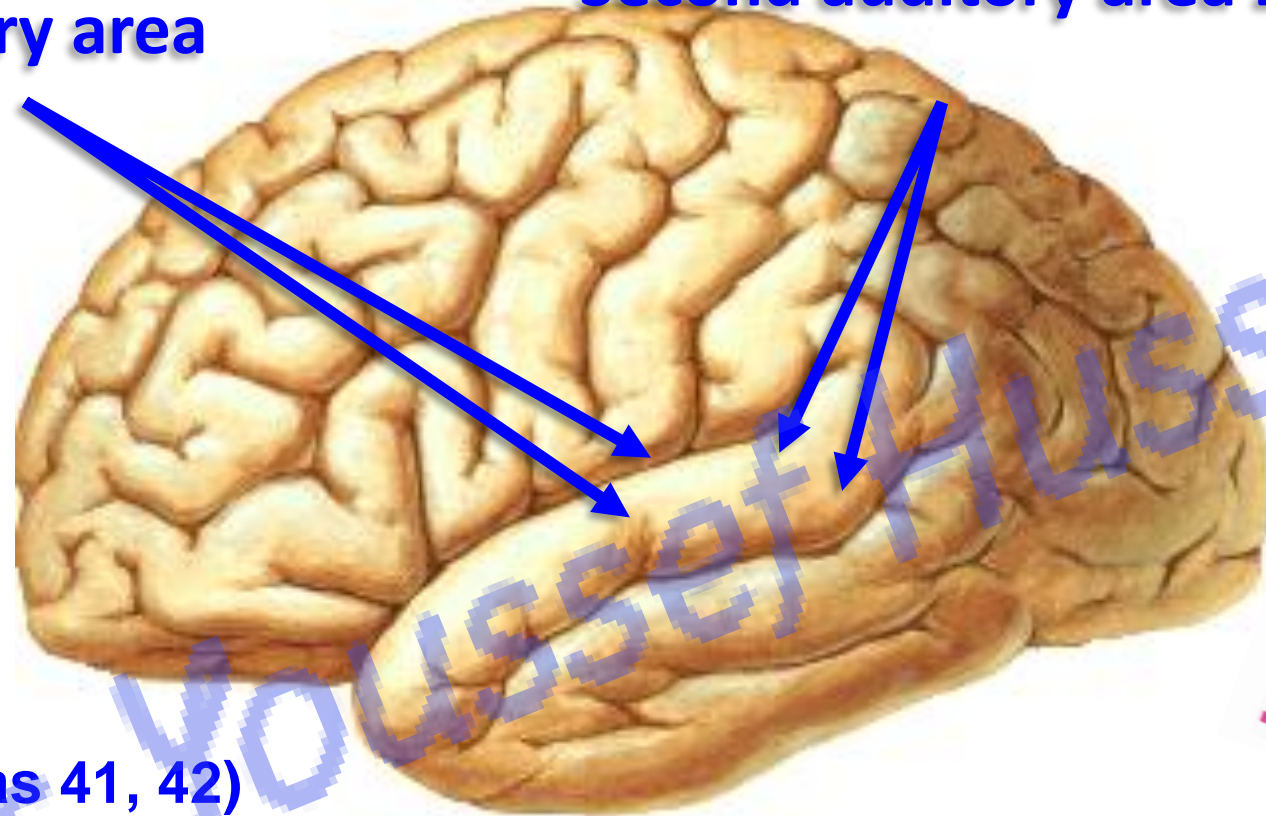
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- **Sensory speech area (Wernicke's- area 39, 40).** language comprehension
- **Wernicke area (receptive) in superior temporal gyrus of temporal lobe** extending to inferior parietal gyrus, angular and marginal gyri .
- **Lesion Associated with impaired language comprehension.**
- **Patients do not have insight. Wernicke is a word salad and makes no sense.**
- It is connected to motor speech area, auditory area and visual area.
- Lesion in this area produces **sensory aphasia** (can not understanding spoken and written words.). The deficit is characterized by fluent verbalization and lacks meaning.
- **Global aphasia is caused by lesion both Broca and Wernicke areas.**

**Primary auditory area
41&42**

Second auditory area 22



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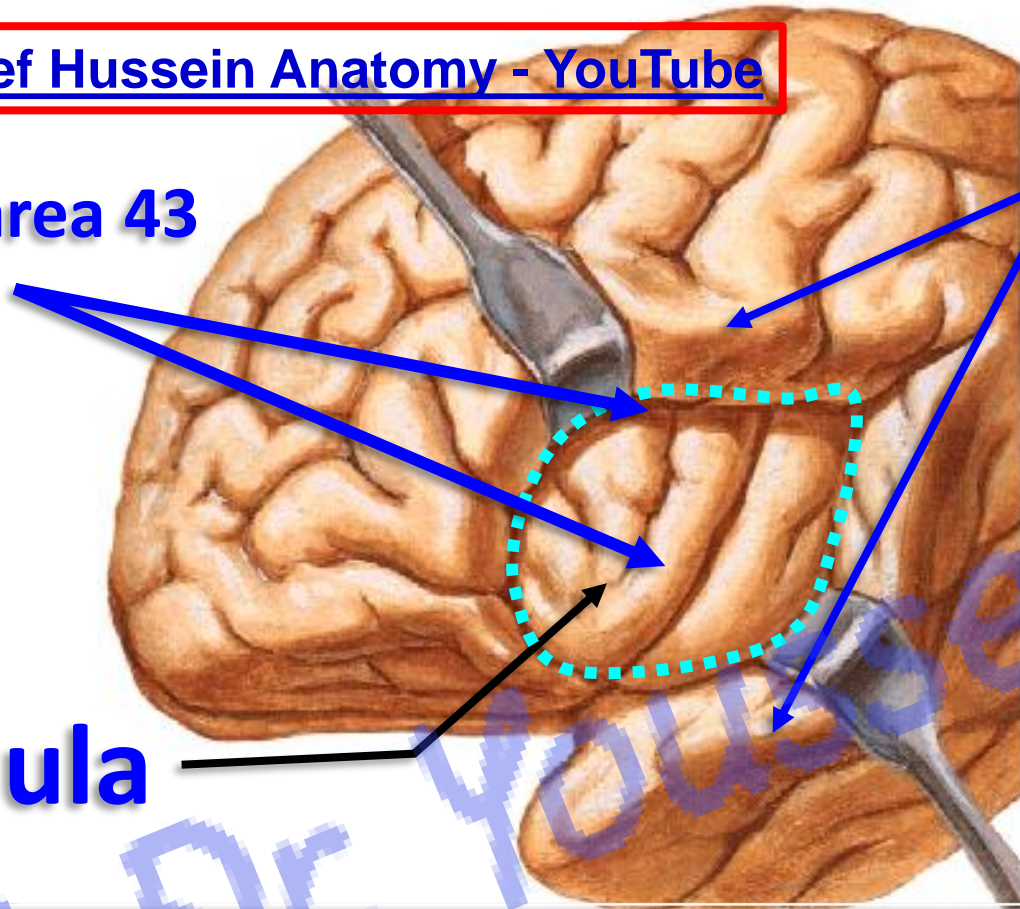
- **Primary auditory area (areas 41, 42)**
 - It is present in the floor of the lateral sulcus and the middle part of the superior temporal gyrus (Heschel's gyrus).
 - It receives auditory radiation from the medial geniculate body (MGB).
 - Lesion of this area leads to **diminished hearing**.
- **Auditory association area (Secondary) (area 22):** behind the primary auditory area.
 - It is responsible for recognition and interpretation of the sounds.

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Gustatory area 43

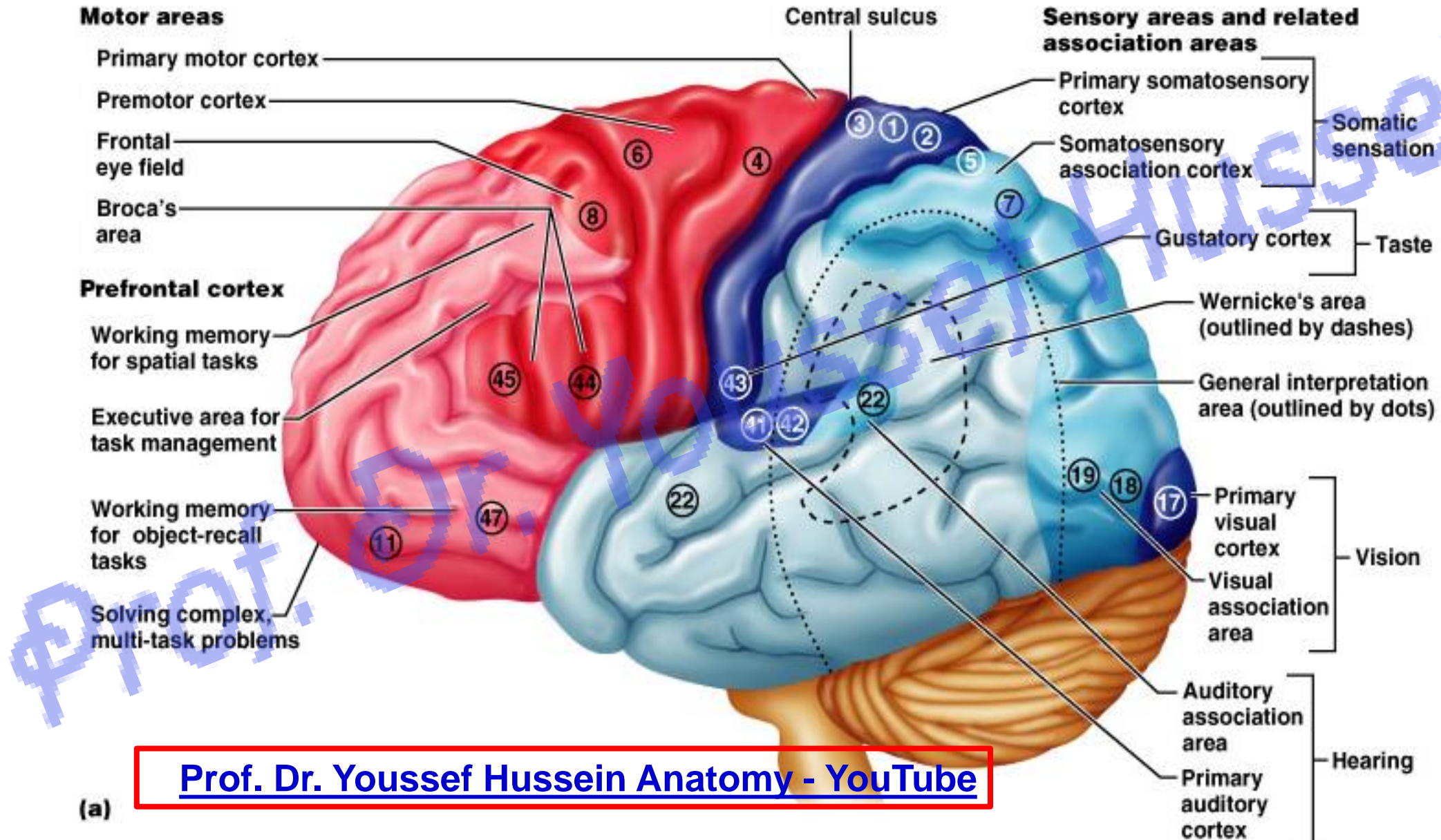
Insula

the lips of the lateral sulcus are separated



- **Insula** lies at the bottom of the deep lateral sulcus and cannot be seen from the surface unless the lips of the sulcus are separated.
- **Gustatory area** (area 43): lies in the insula .
- It is concerned with the recognition of the taste sensation.

Functional and Structural Areas of the



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(a)

Functional areas of the medial surface

1- Paracentral lobule;

- It is continues with the motor and sensory areas in the lateral surface.
- It gives motor fibres and receives sensation from the leg, foot and perineum of the opposite side.
- It controls the micturition and defecation.

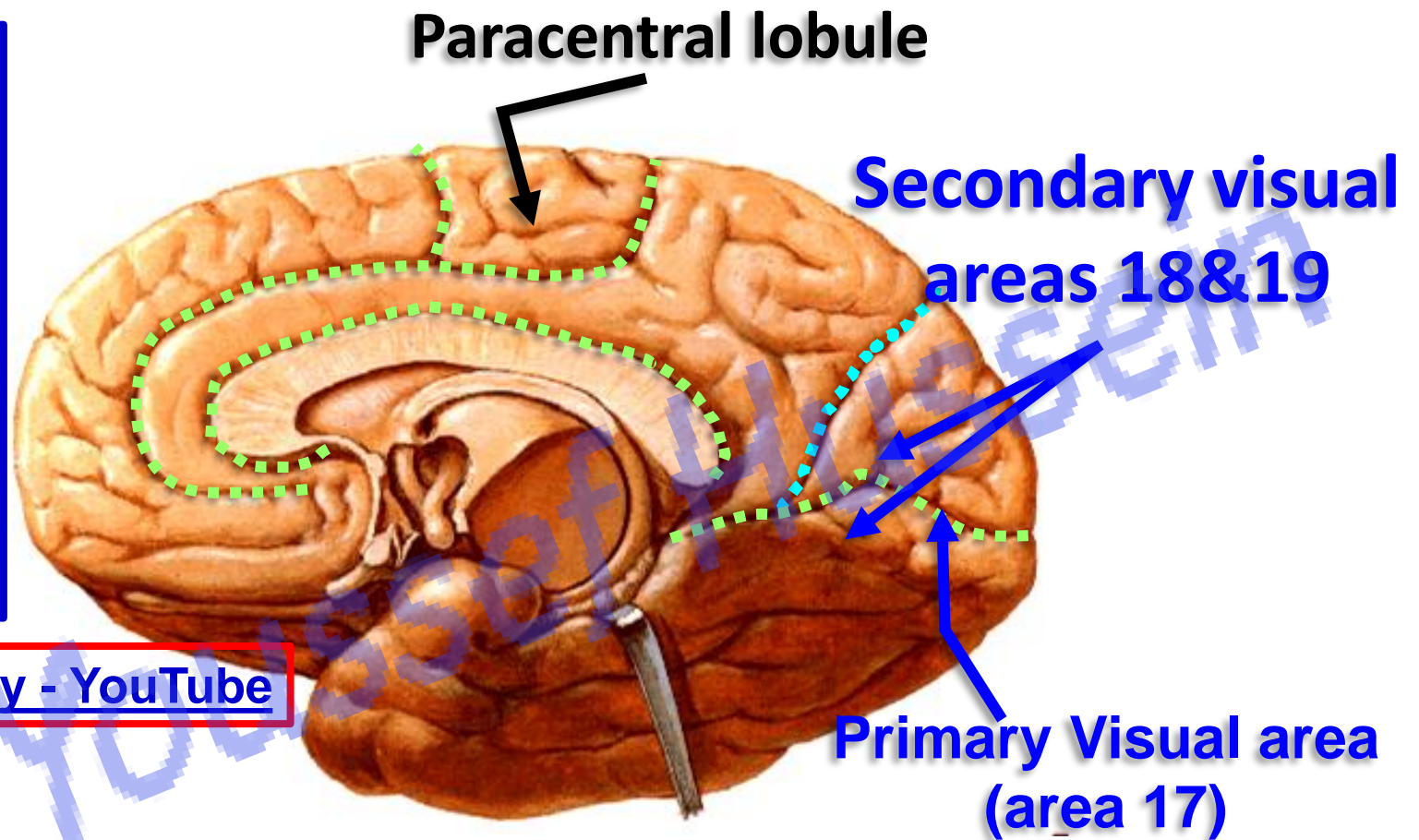
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2- Primary Visual area (area 17);

- It lies on the depth of calcarine sulcus
- It receives visual sensation from the lateral geniculate body (**LGB**) via the optic radiation..
- Damage of the primary visual area causes **blindness**.

3- Secondary Visual (association) area (area 18, 19):

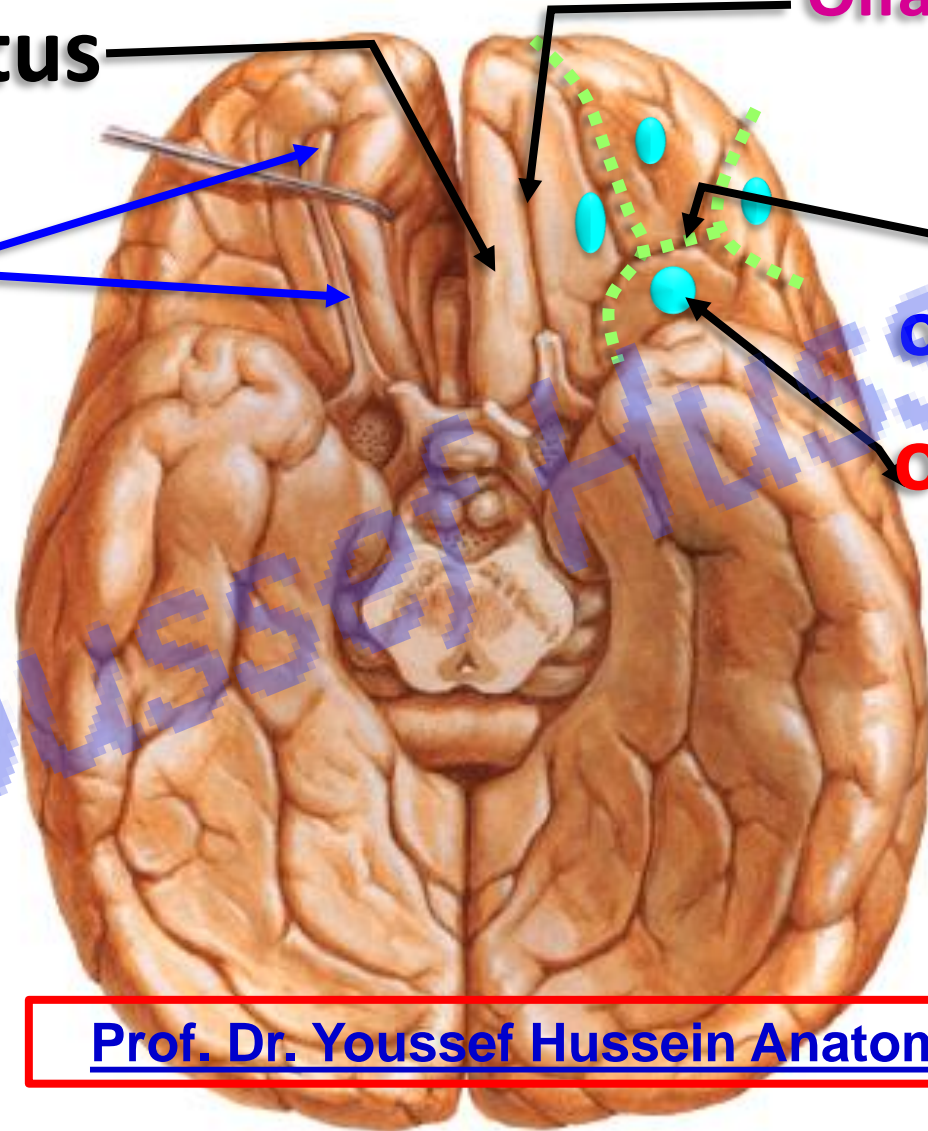
- It lies in the occipital lobe surrounding the primary visual area.
- Damage of this area causes **visual agnosia** (people can not identify the objects).



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Sulci & Gyri of the inferior surface

gyrus rectus
olfactory bulb, tract
Olfactory Sulcus
H-shaped orbital sulcus
orbital gyri



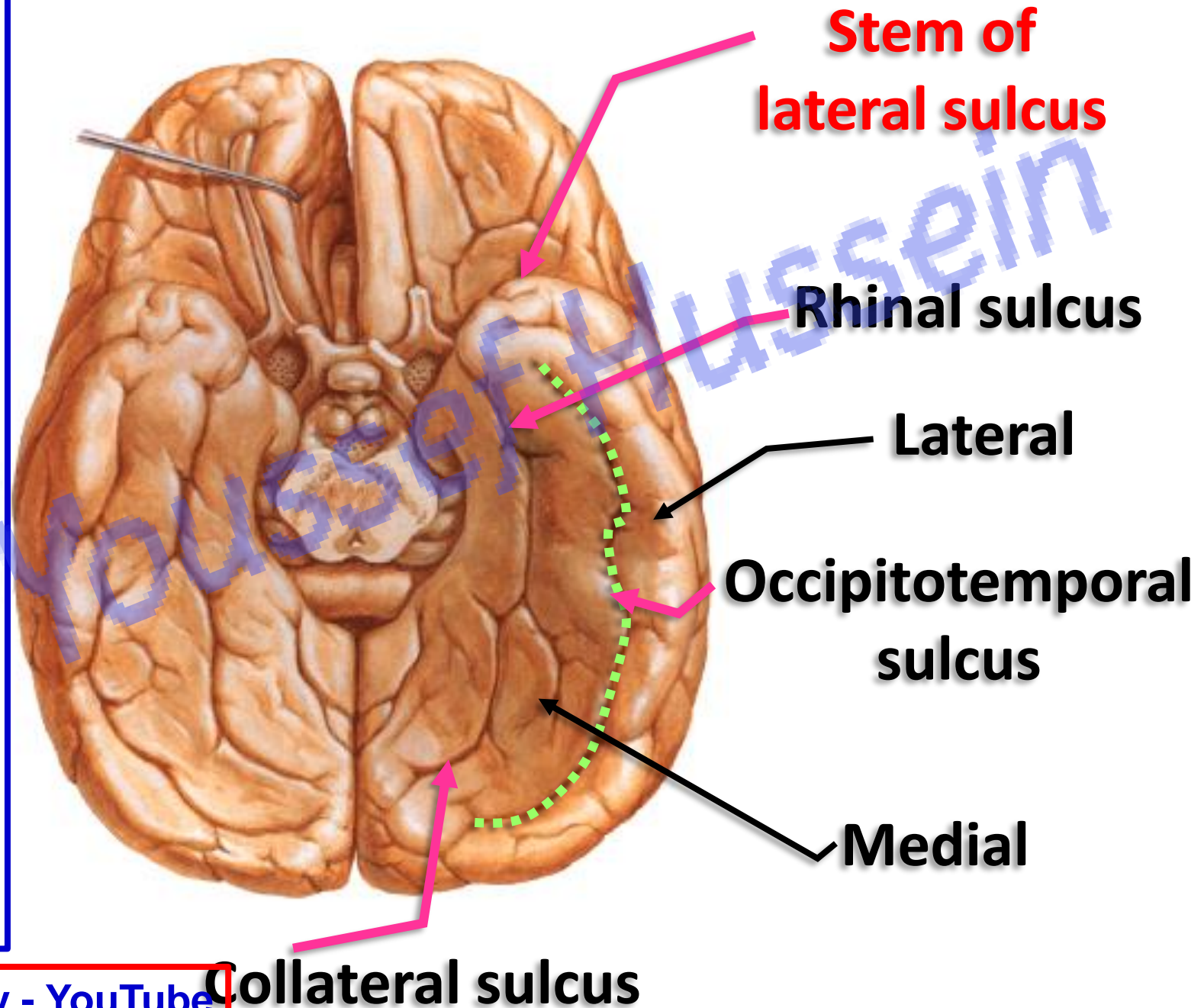
- **On the orbital surface:**
 - **Olfactory sulcus;** on orbital surface close and parallel to medial orbital border, contains olfactory bulb and tract.
 - Gyrus rectus:** between medial orbital border and olfactory sulcus. Its Functions (unclear) is related to Intellectual and emotional expression, It may be involved in higher cognitive function as personality

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- **Orbital sulcus:** is H shaped sulcus lateral to the olfactory sulcus.
- **Anterior, posterior, lateral and medial orbital gyri:** on the orbital surface.

- On the tentorial surface:

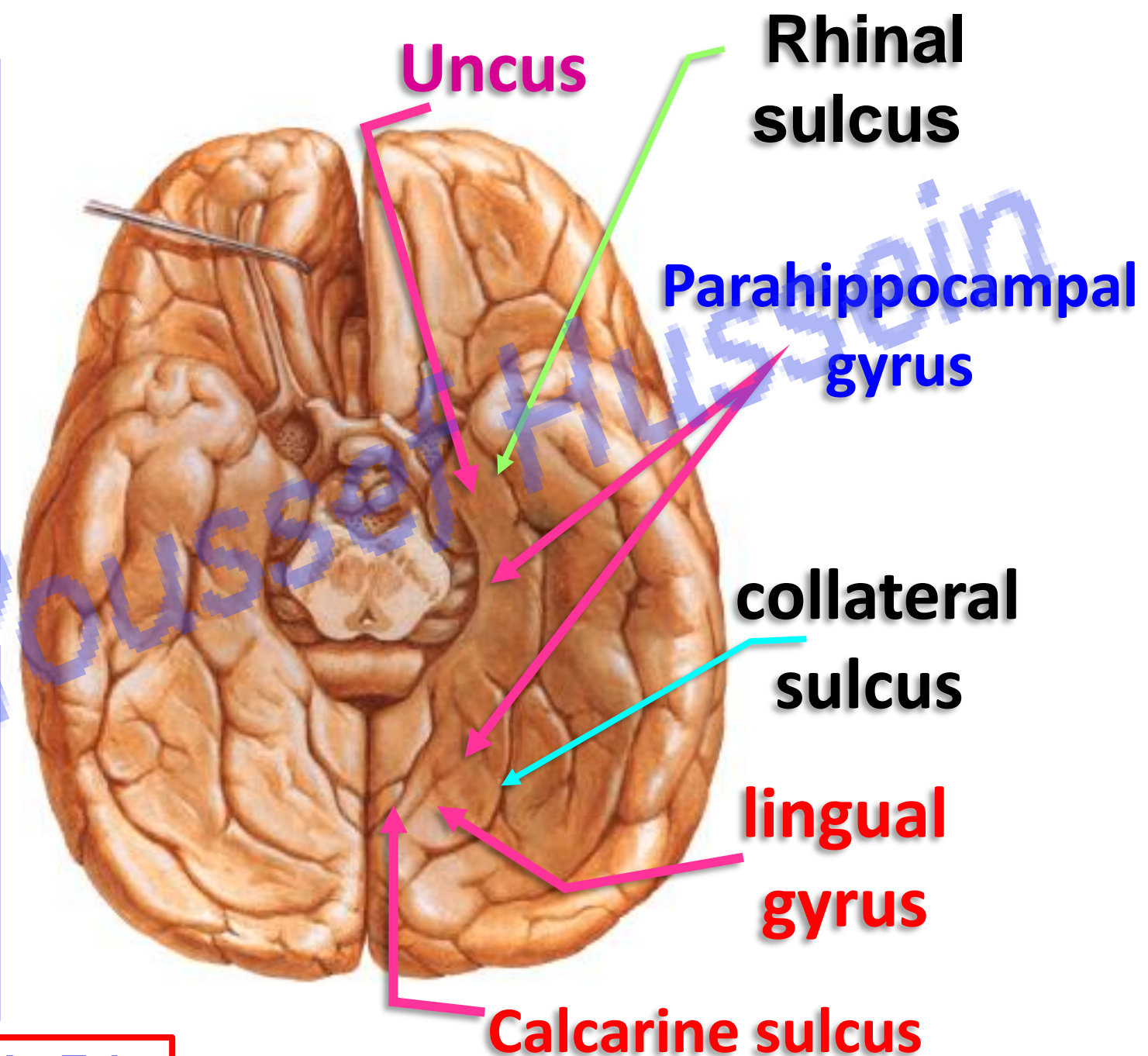
- 1- Stem of lateral sulcus** between the frontal and temporal lobes.
- 2- Occipito-temporal sulcus:** from occipital pole to temporal pole.
- 3- Medial and Lateral occipitotemporal gyrus:** medial and lateral to occipitotemporal sulcus.
- 4- Collateral sulcus:** It runs anteriorly below the calcarine sulcus.
- 5- Rhinal sulcus:** extends anteriorly from collateral sulcus.



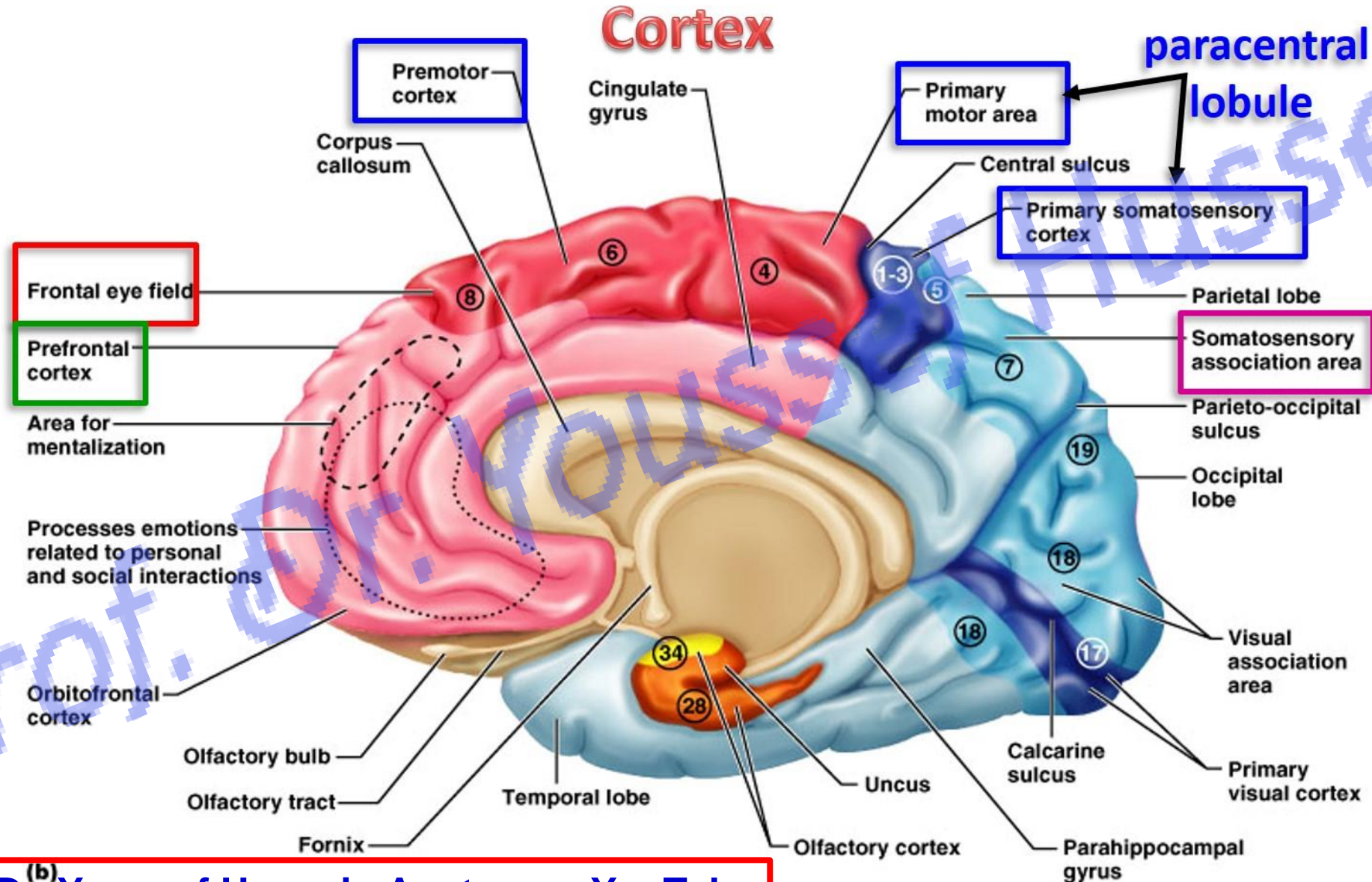
On the tentorial surface:

- **Lingual gyrus** between collateral sulcus and calcarine sulcus
- **Para hippocampal gyrus** anterior to the lingual gyrus (**Limbic system**)

- **Uncus** anterior to Para hippocampal gyrus, a hook-shaped convolution close to the temporal pole medial to the rhinal sulcus. **Center of the olfactory**



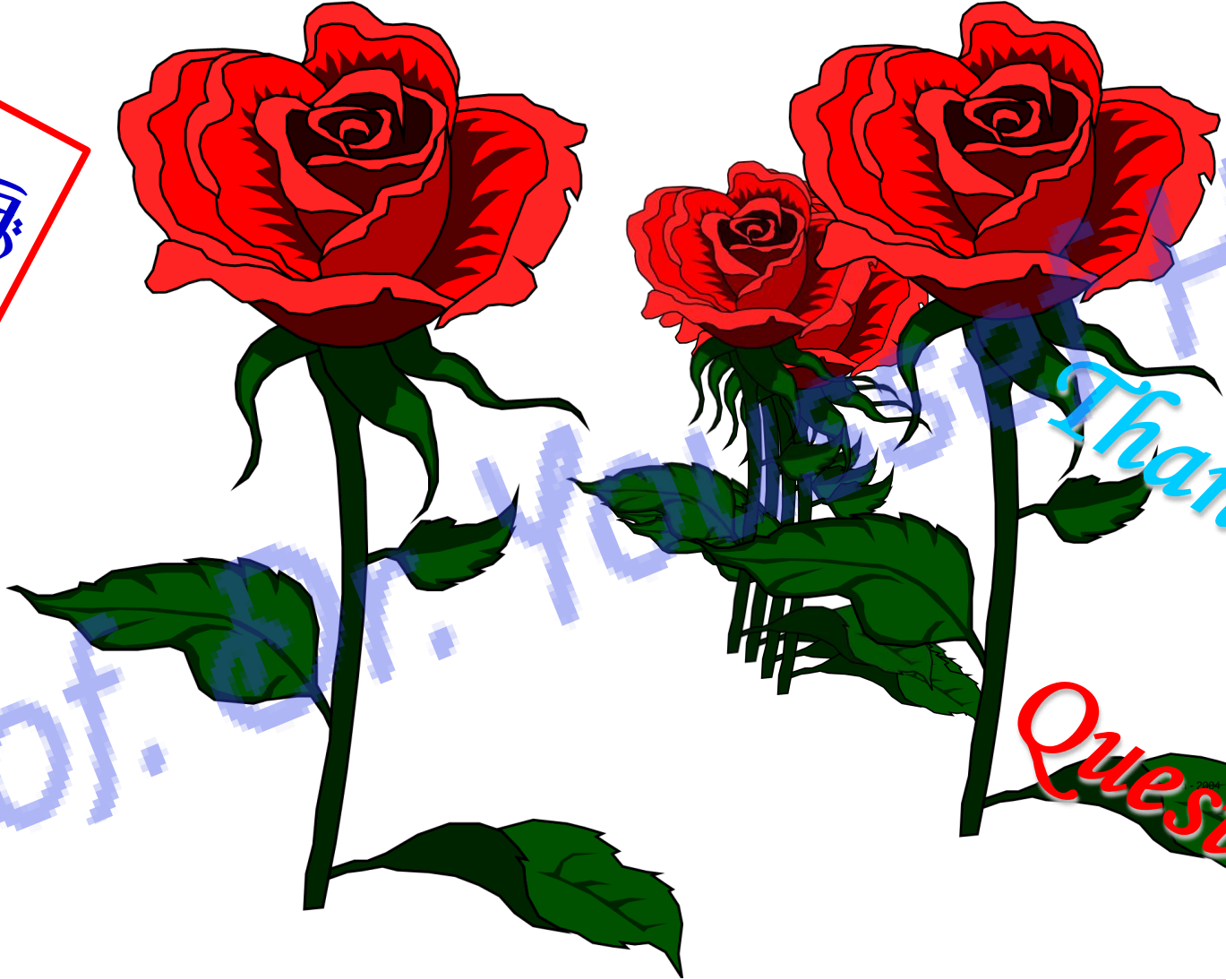
Functional and Structural Areas of the Cerebral Cortex



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Thank You

Questions

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