



Gaza Ophthalmic Centre

7.1.2 Cerebral Cortex Functional Anatomy

2

Neurosciences I

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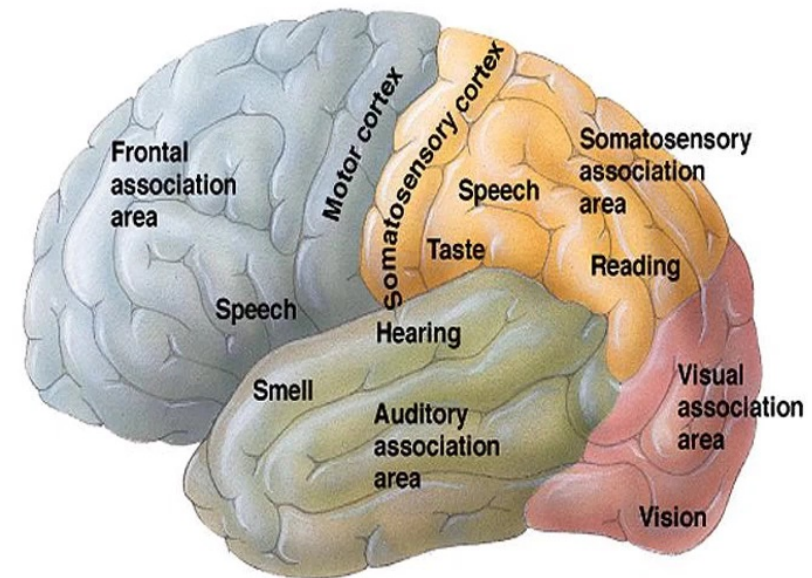
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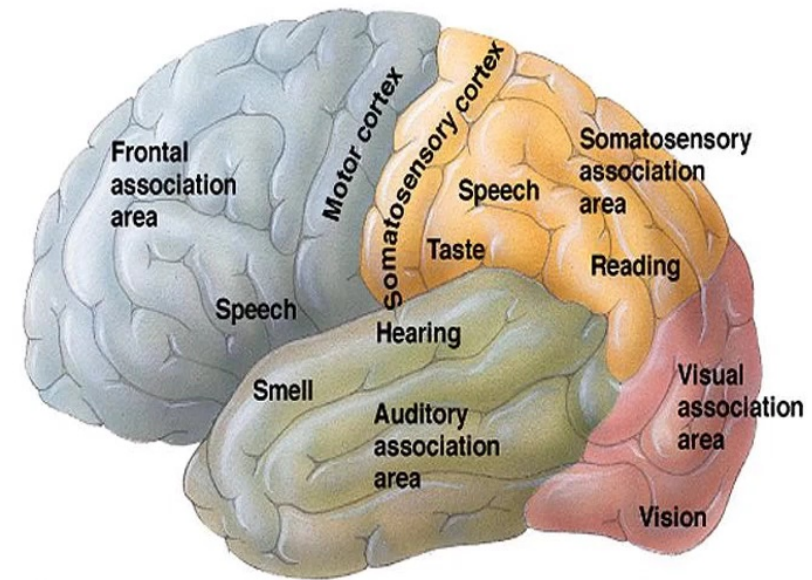
Temporal lobe

1. Cognition
2. Emotion
3. Memory
4. Links to the hippocampus and the limbic system



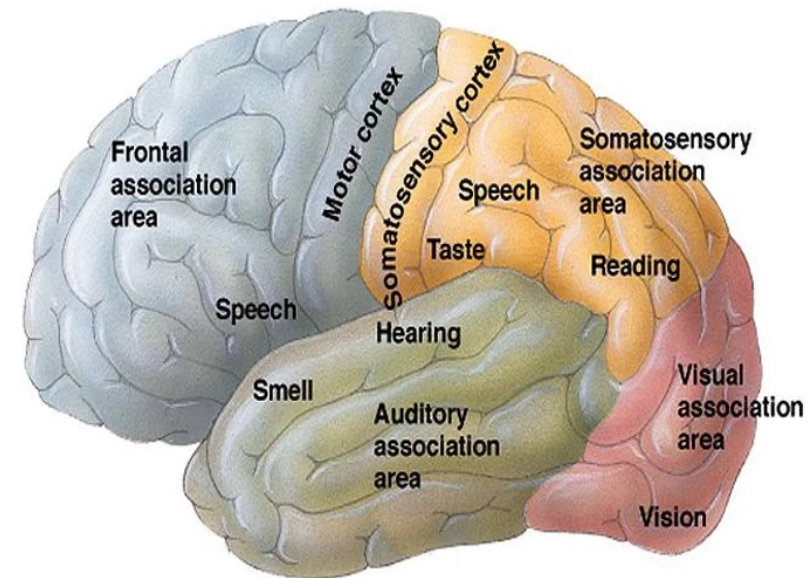
Wernicke's area

- Temporo-parietal
- Special role in
 1. Auditory association and
 2. Speech comprehension



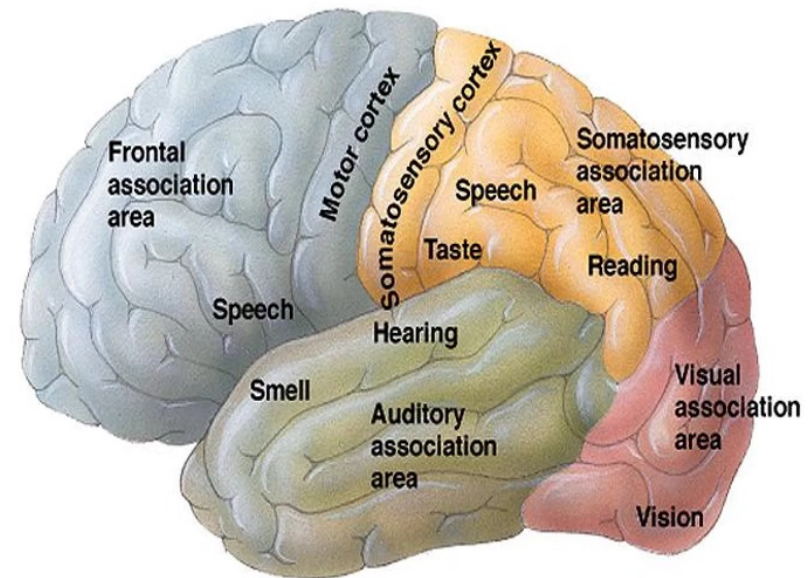
Auditory Cortex

- Found in
 - The superior margin of the temporal lobe,
 - Next to the lateral sulcus
- Sound waves
 - Excite cochlear receptors
 - in the inner ear
 - send info to the auditory cortex
- Auditory association area
 - Lets us interpret and
 - remember sounds



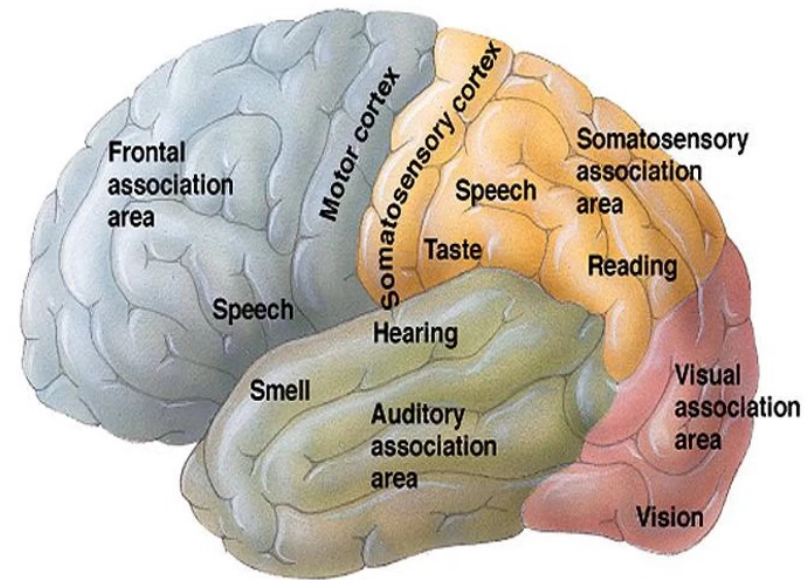
The Primary Auditory (Sensory) Area

- A1
- Area 41 & 42
- Site
 - Anterior Transverse Gyrus (Heschl's gyrus)
 - In the floor of the
 - posterior ramus of the
 - lateral sulcus
 - Adjacent part of the
 - superior temporal gyrus



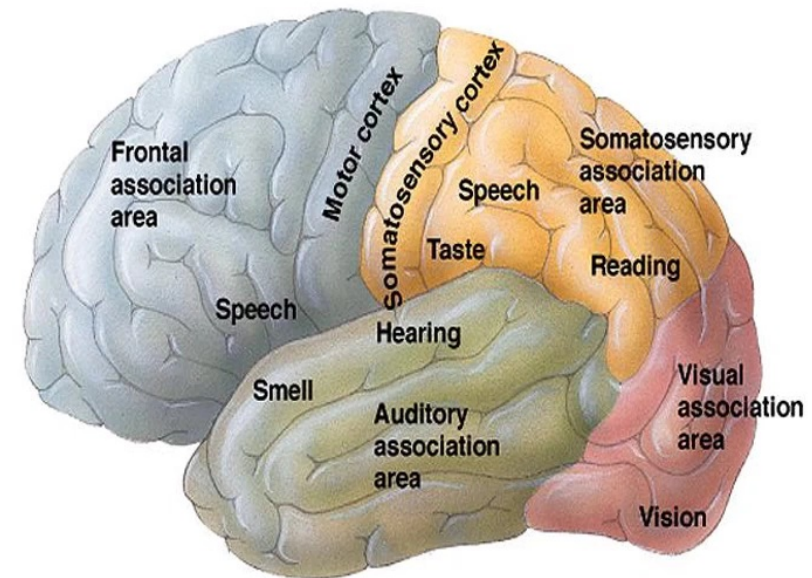
The Primary Auditory (Sensory) Area

- Input
 - Auditory Radiation from
 - MGB
- Output
 - → the Auditory Association Area A II
- Function
 - Hearing of
 - Audible sounds



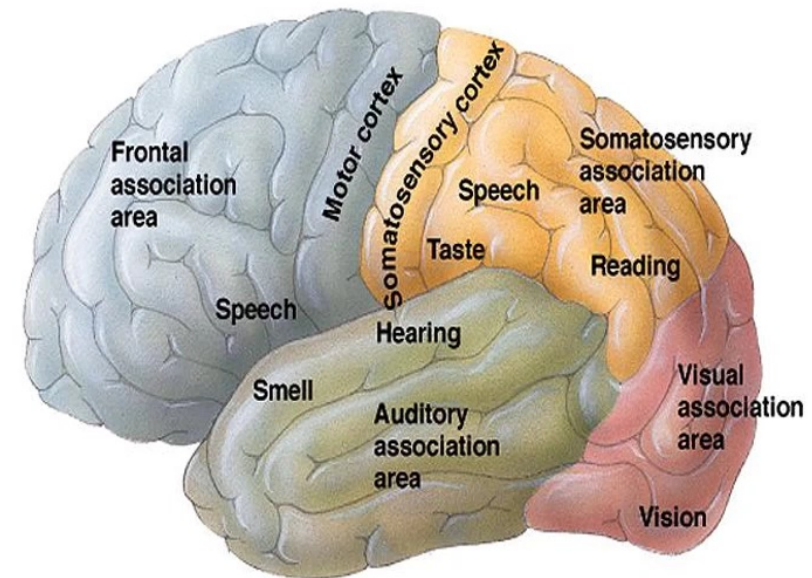
The Secondary Auditory (Association) Area

- A II
- Area 22
- Site
 - Surrounds the auditory sensory area
 - Most of the posterior part of the superior temporal gyrus



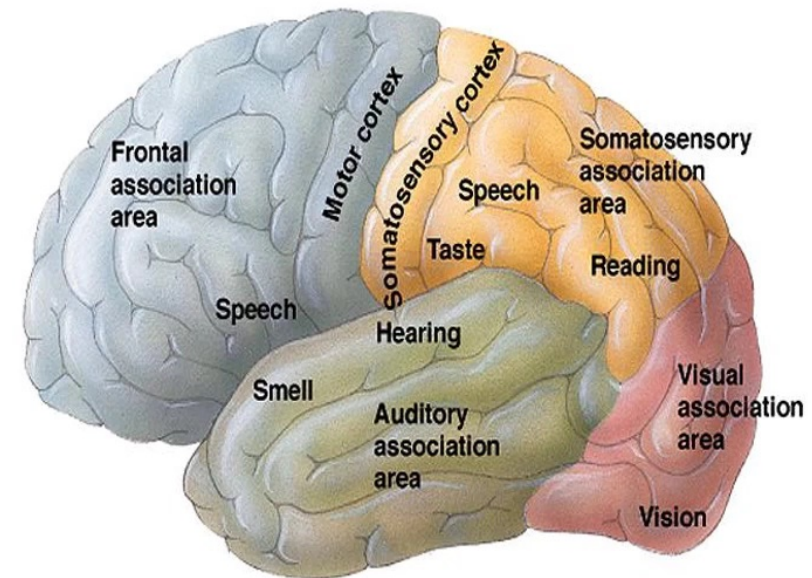
The Secondary Auditory (Association) Area

- Input
 - From A I
- Function
 - Knowing the
 - meaning of
 - sounds



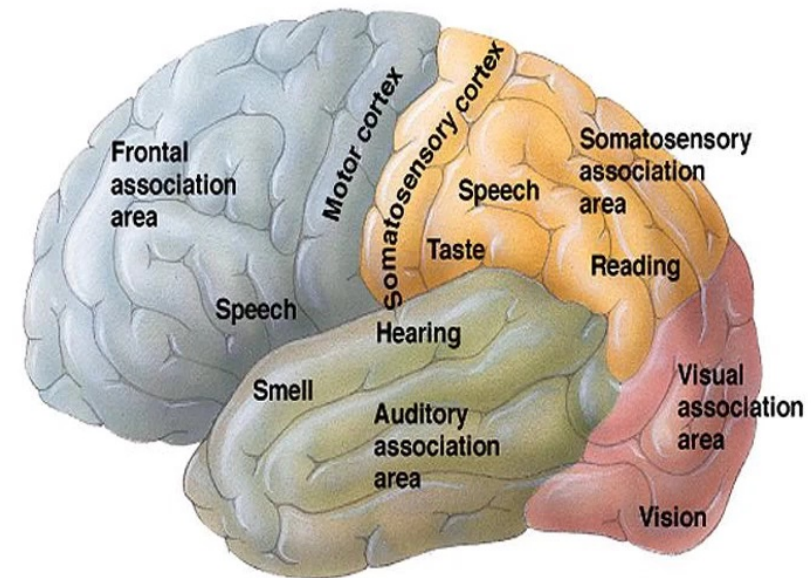
Vestibular Area

- Site
 - Superior Temporal G
 - Close to auditory area
 - Lower end of Postcentral G
- Input
 - Vestibular info
 - NVPM of Thalamus
- Function
 - Orientation of Head
 - Position
 - Movement in space



Rest of Temporal lobe

- Mainly silent
- ? Memory
- ? Record
- all modalities of sensation

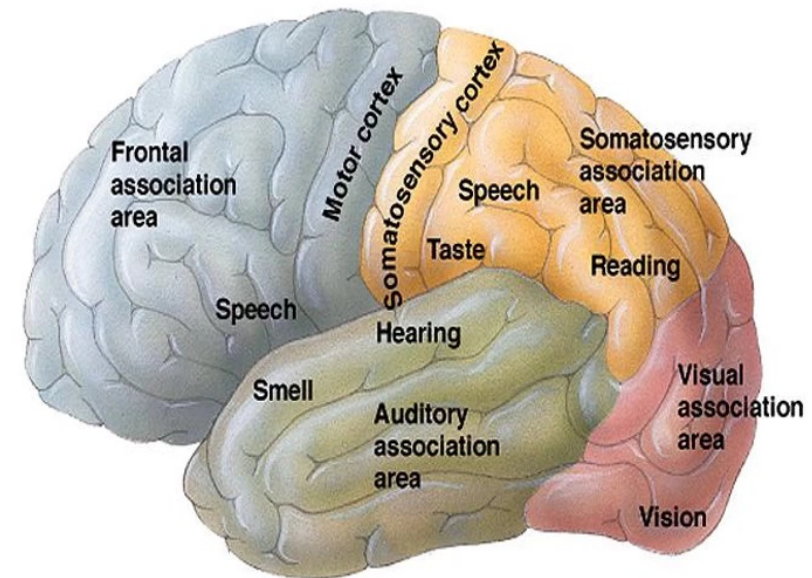


Occipital lobe

- Vision

1. Visual processing and
2. Visual association
3. Involved in eye movement

- Damage → Hemianopia



Occipital lobe

- 3 Visual Areas

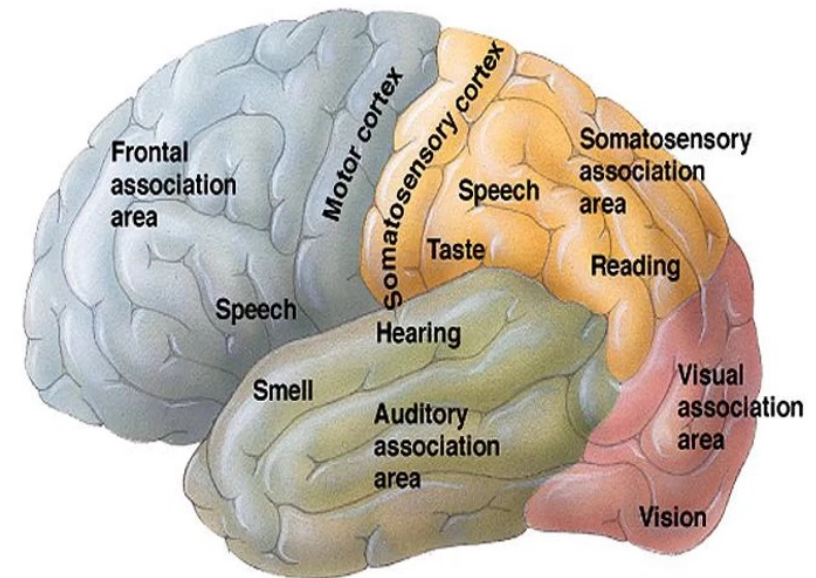
Primary Visual Area

1. Area 17

Visual Association Areas

2. Area 18,

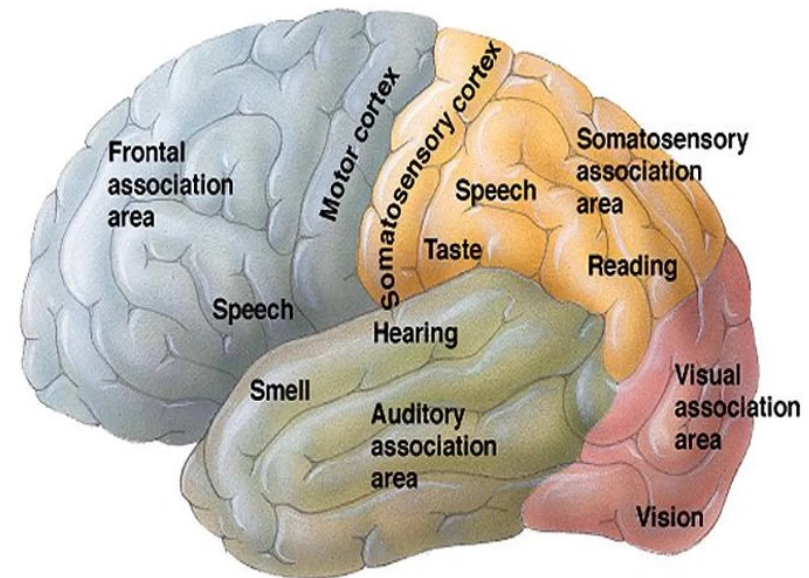
3. Area 19



Occipital lobe

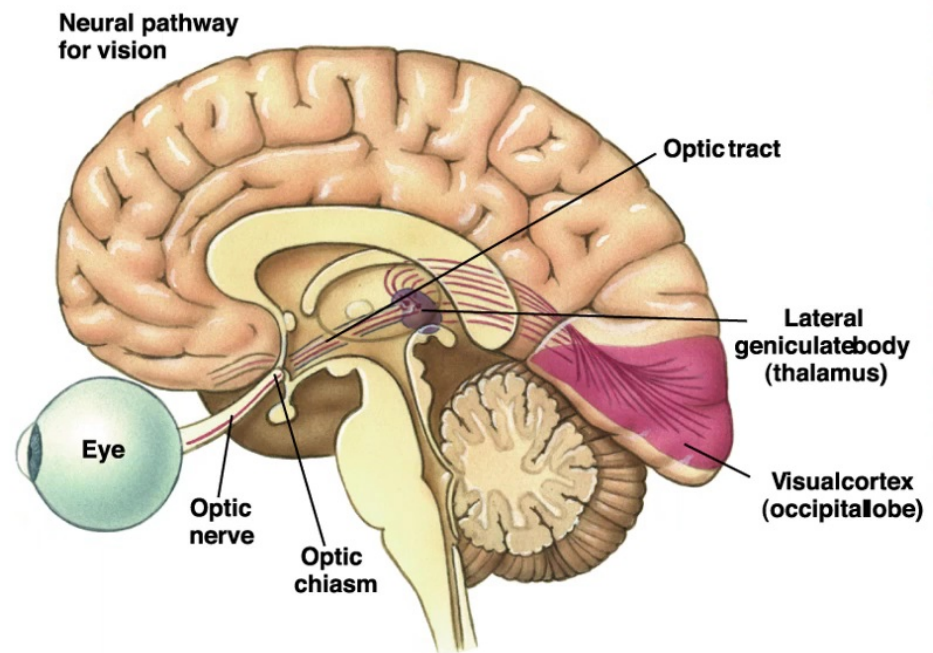
CORTEX has 3 Cortical Eye Fields

1. Frontal Eye Field area 8
2. Supplementary Eye Field
3. Occipital Eye Field



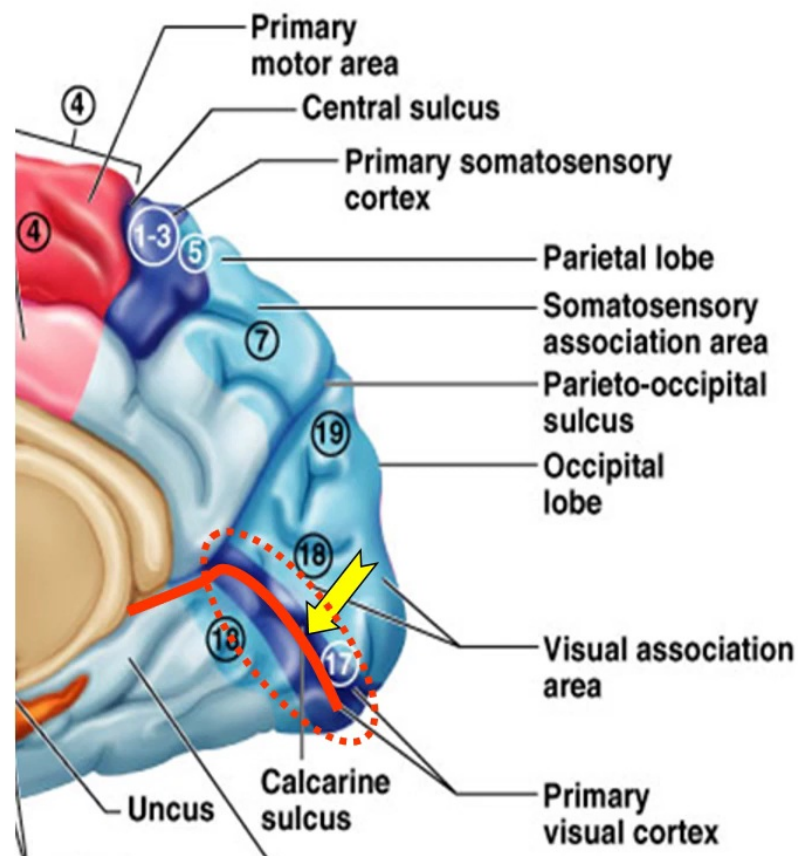
Primary Visual Cortex

- Found in the posterior and medial aspects of the occipital lobe
- Largest of the sensory cortices
- Contralateral input



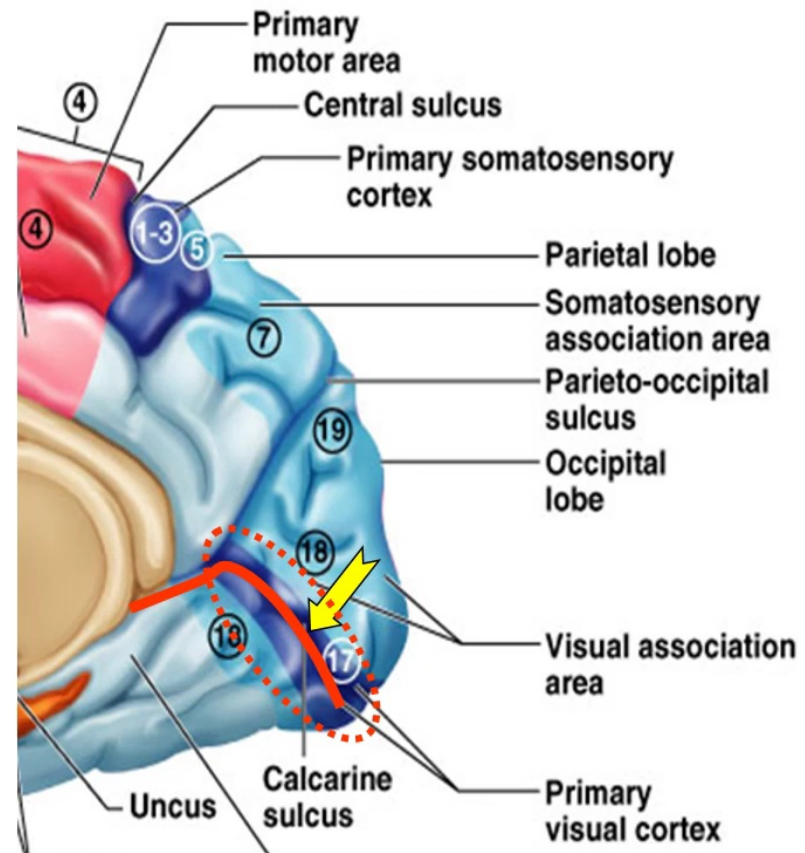
Primary Visual Area

- Area 17
- Lips of the Calcarine sulcus
 - Above & Below
- Mainly at the medial surface
 - Cuneus & Lingual G
- Extends over the Occipital Pole
- → Posterior edge of the Lunate s



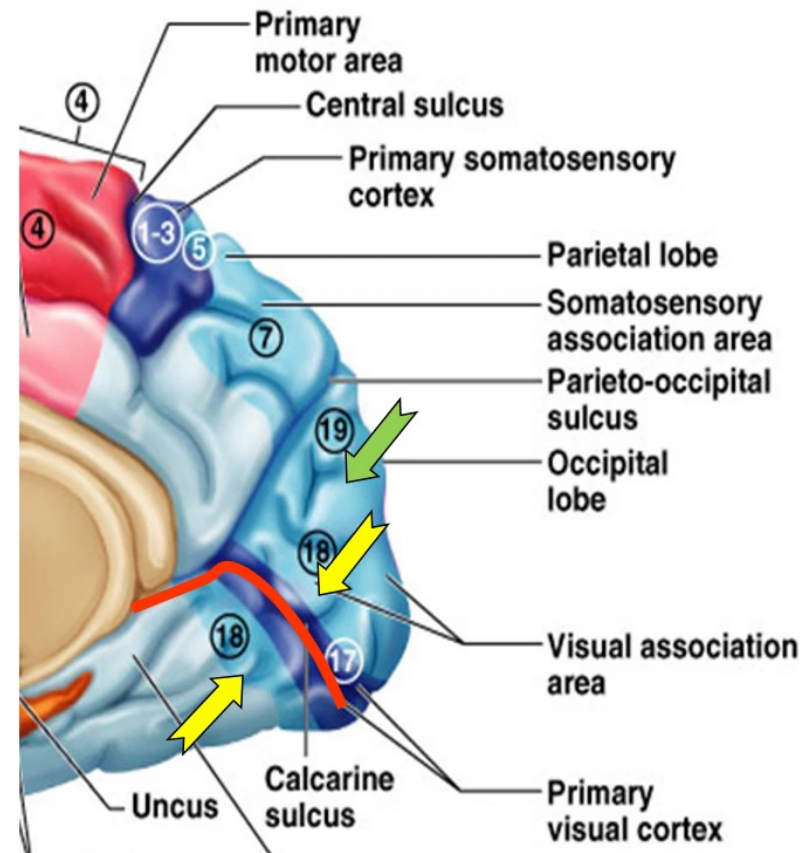
Primary Visual Area

- Input
 - Optic Radiation
 - from LGB of the Thalamus
 - Receives visual sensation
- Output
 - To area 18 & 19



The Visual Association Areas

- Areas 18 & 19
- Site
 - Surrounds the visual sensory area 17
 - Medial & lateral surfaces of the Occipital lobe
 - Nearly all the rest of the occipital lobe



The Visual Association Areas

- Input

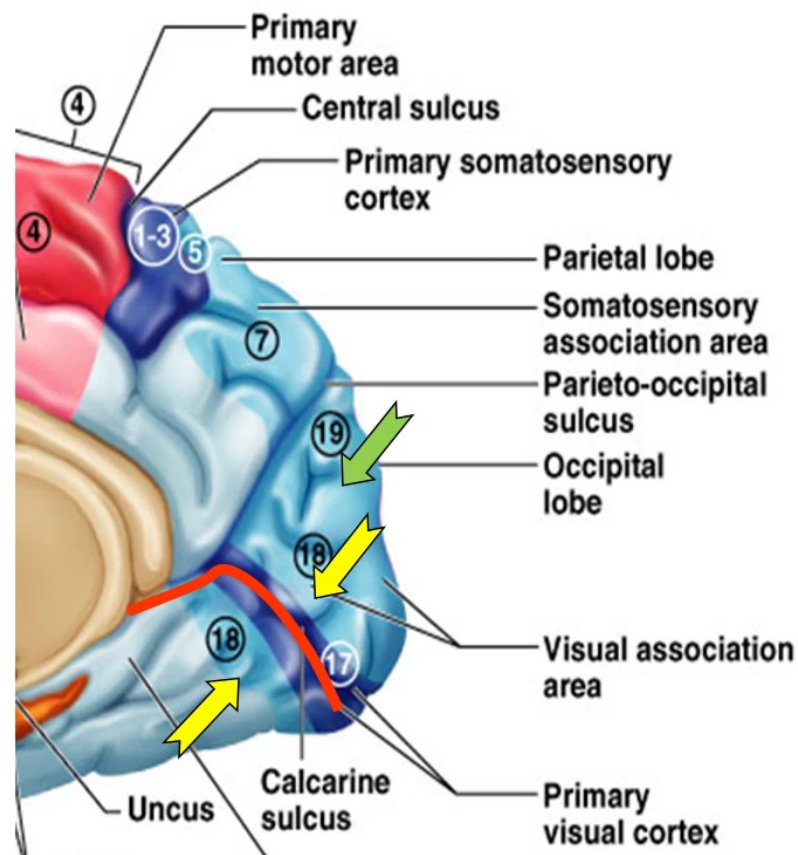
- Area 17
- Pulvinar

- Function

- Knowing the meaning of pictures we see

Damage

- → NO blindness



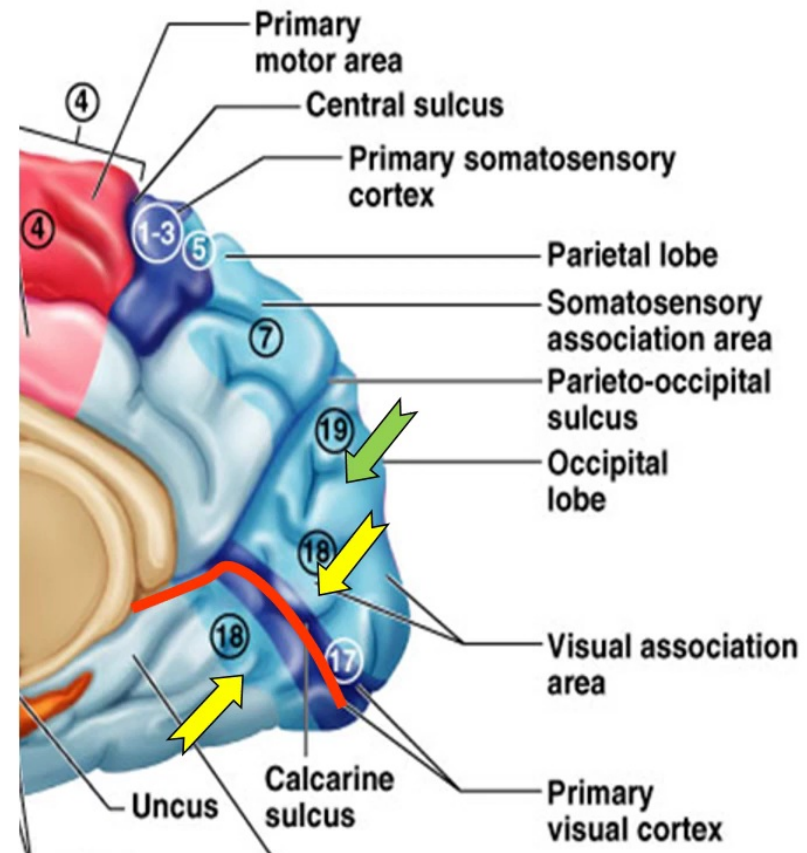
Visual Association Area

- Surrounds the primary visual cortex

Basically

Vision is the

- sensation of
- bars of light on our
- retinal cells



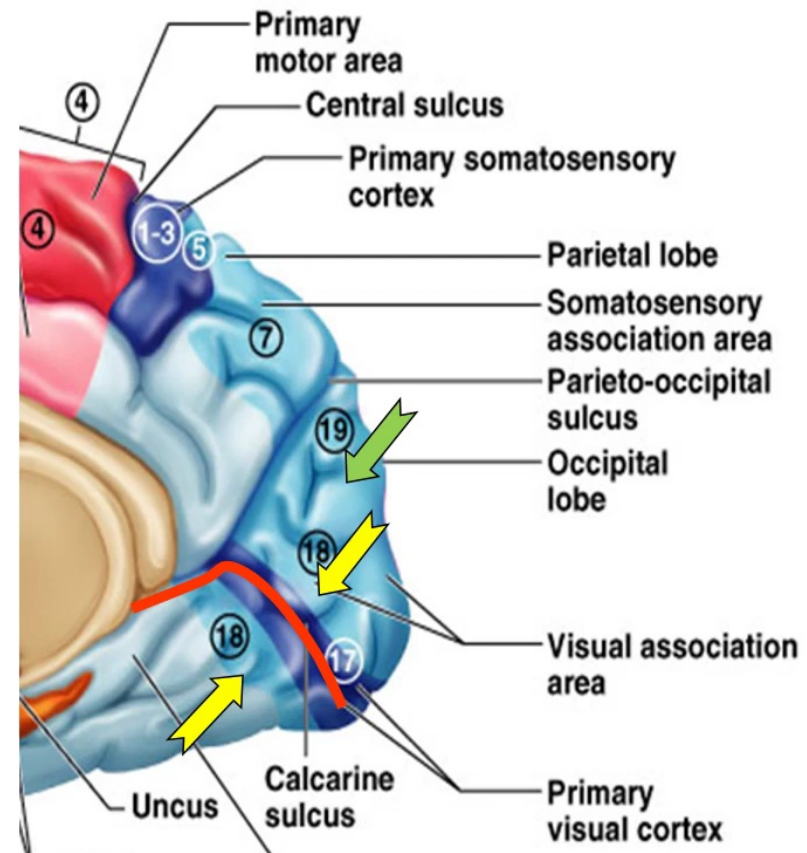
Visual Association Area

The primary visual cortex

- tells which cells are being
- stimulated and
- how

The association area

- lets us “see”
- what we’re looking at

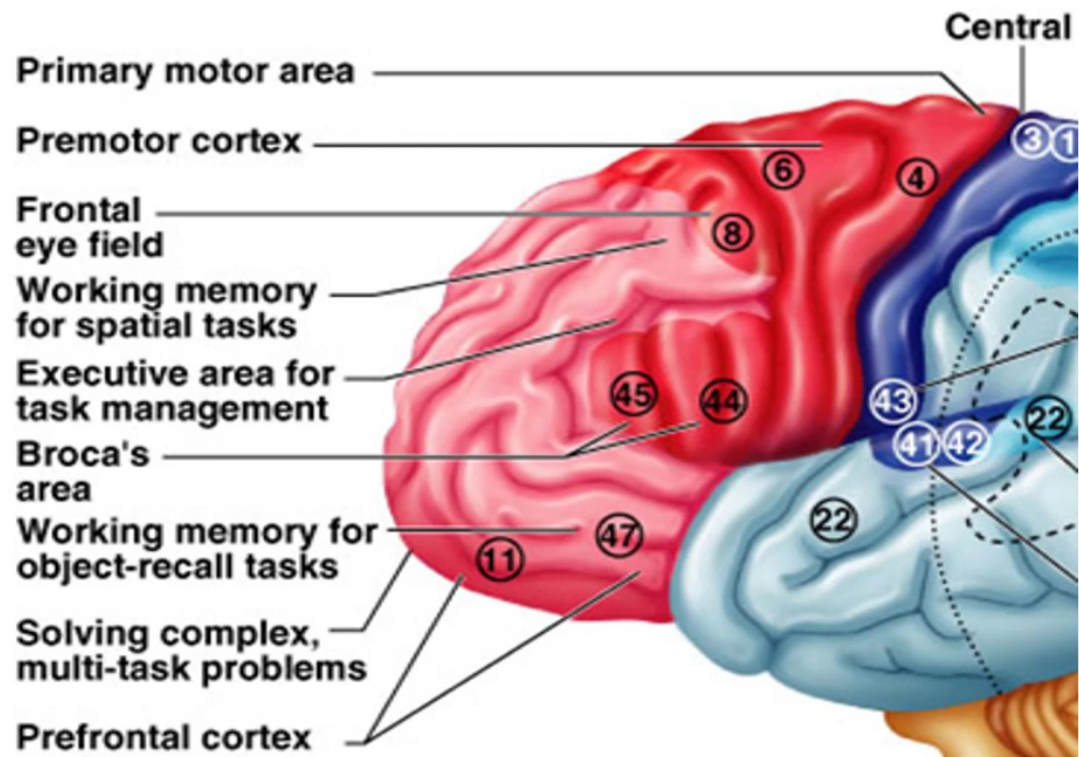


Frontal Eye Field

- Area 8

Site:

- Middle of the
- middle frontal G



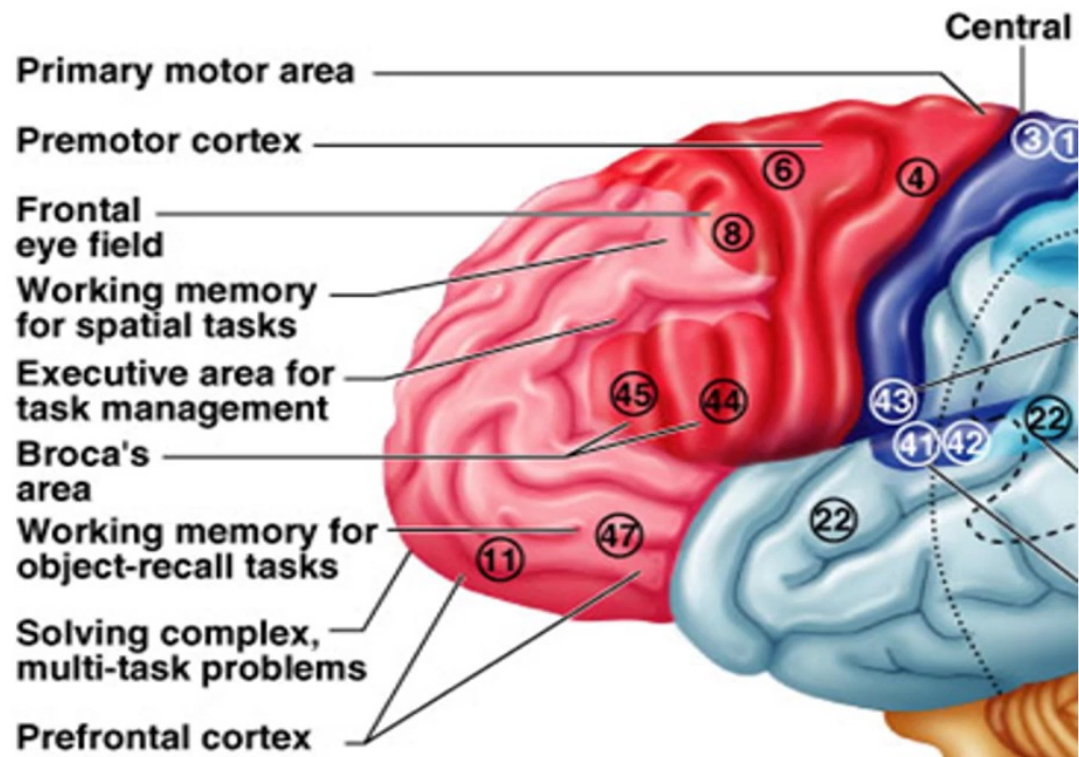
Frontal Eye Field

- **Input**

- Prefrontal Cortex
- (Decision Making)
- Supplementary Eye Field
- (Motor Planning)

- **Output**

- CorticoNuclear fibres
- Motor Nc III, IV, VI Bilateral

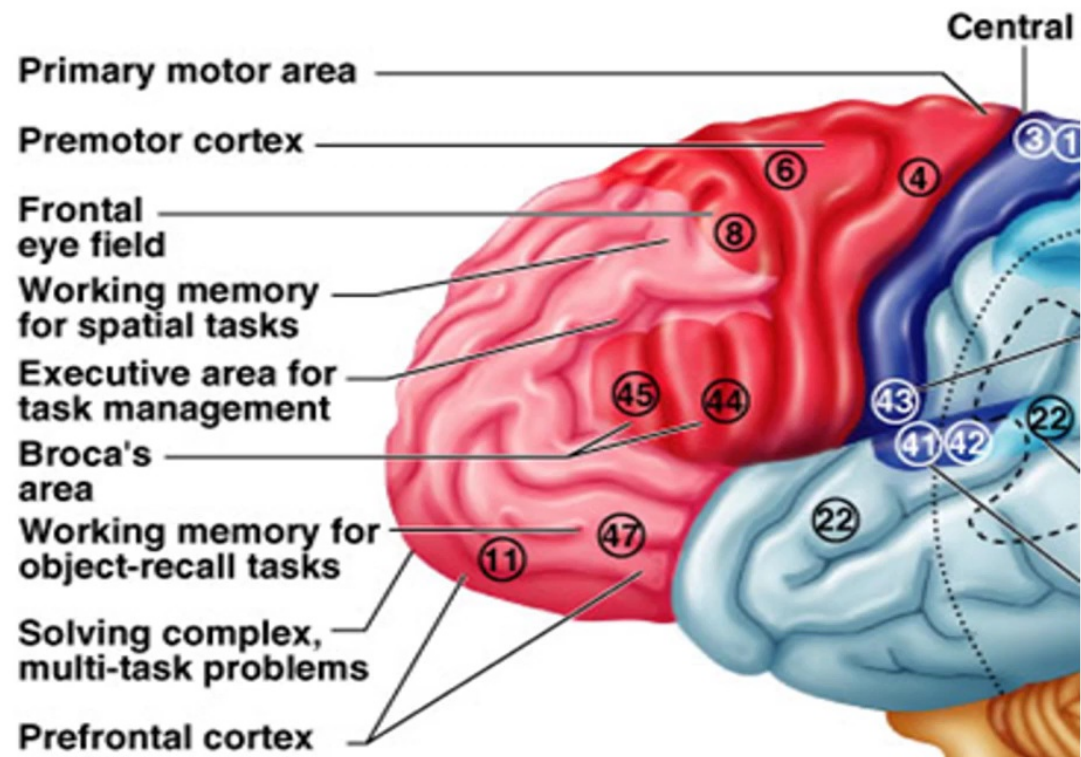


Frontal Eye Field

Function →

- Bilateral Eye Movement

1. Voluntary
2. Conjugate
3. To the contralateral side



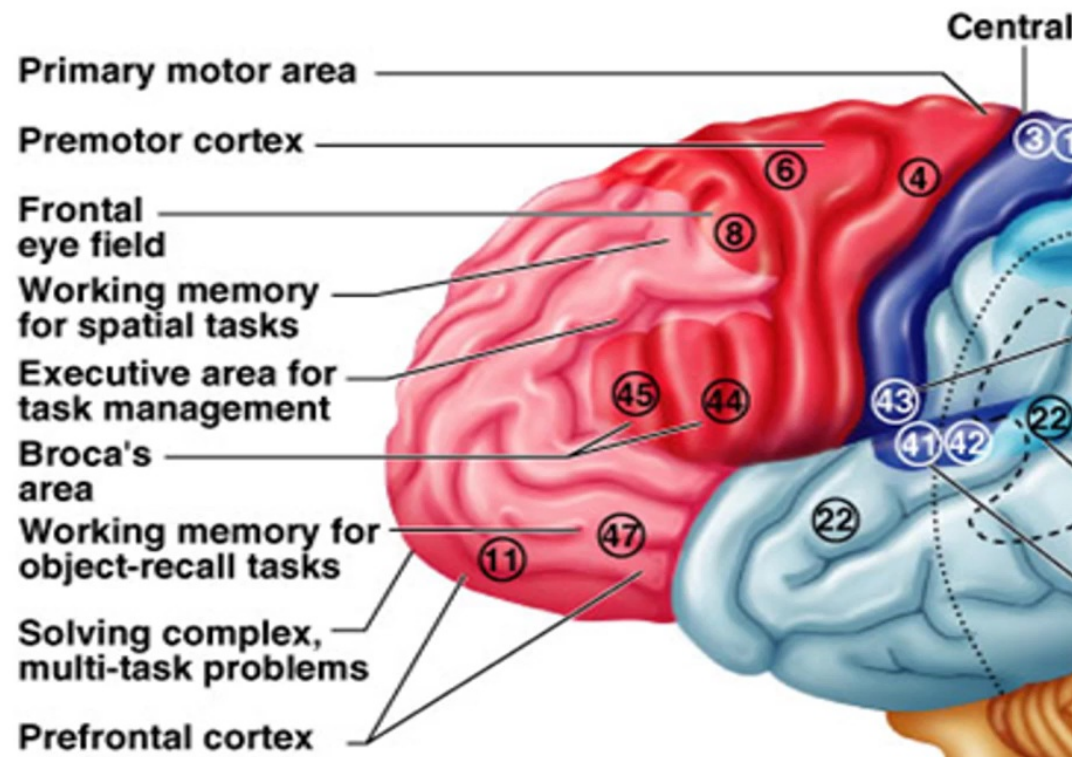
Supplementary Eye Field

- **Site**

- Anterior part of the supplementary Motor area
- Medial Frontal G

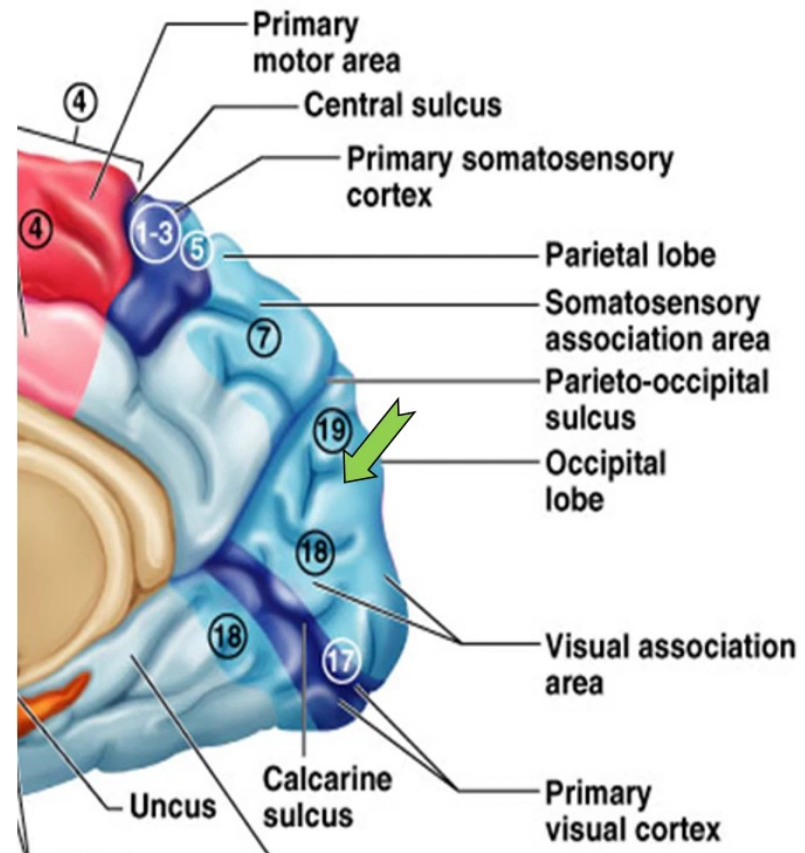
- **Function**

- Motor planning of
- voluntary eye movements



Occipital Eye field

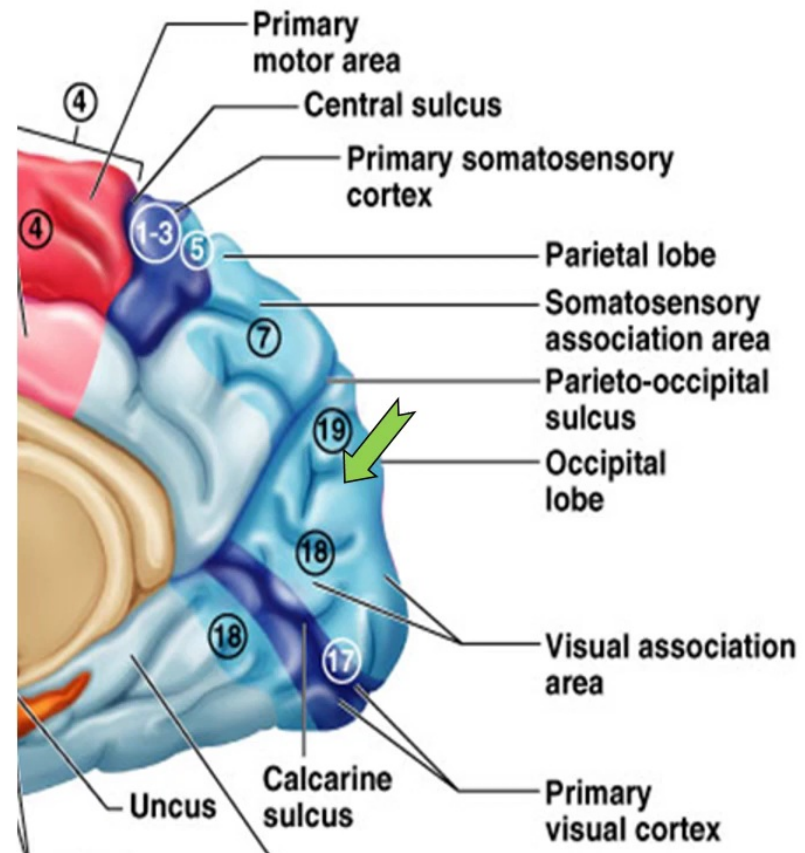
- Site:
- Area 19 Occipital Lobe
- Input
 - Retina →
 - Geniculo-Occipital visual pathway
- Output
 - → III, IV, VI Nc



Occipital Eye field

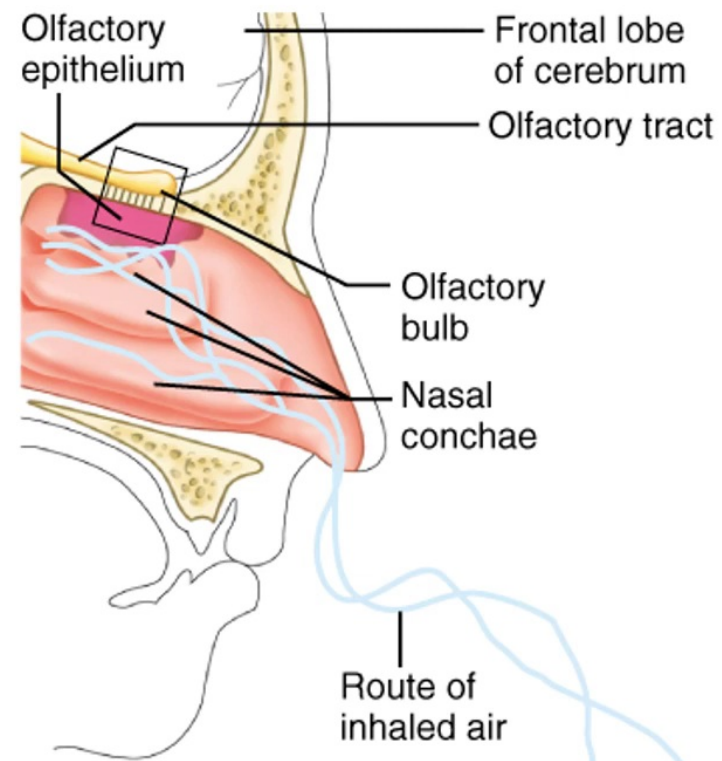
- Function

1. → Eye Movement
 1. (Bil)
 2. Involuntary
 3. Conjugate
2. Cortical reflex
 - → tracking of
 - moving objects
 - In the visual field



Olfactory Cortex

- Found in the frontal lobe
- Just above the orbits
- Receptors in the olfactory epithelium
- Extend through the cribriform plate



Olfactory Cortex

Excited by the

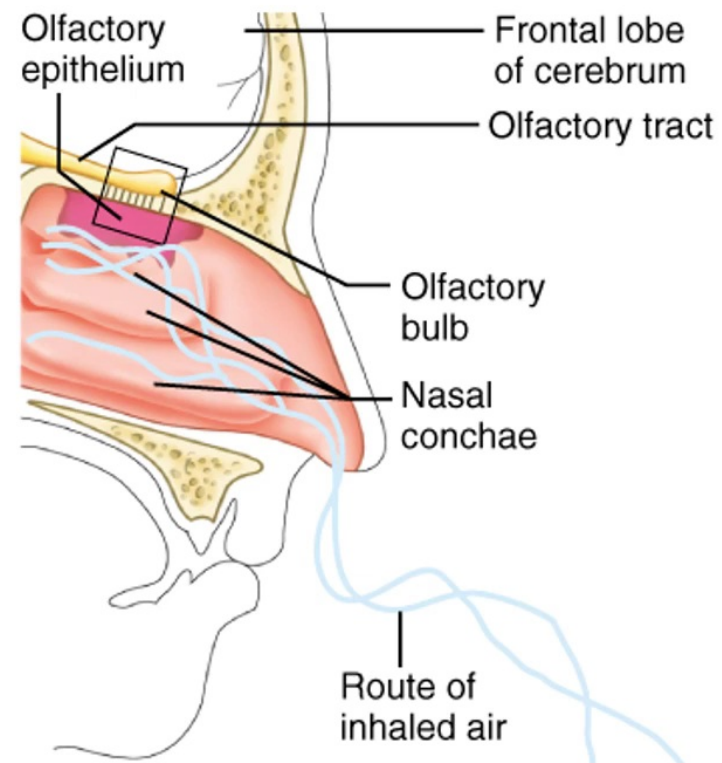
- Binding of odorants

Send their info to the

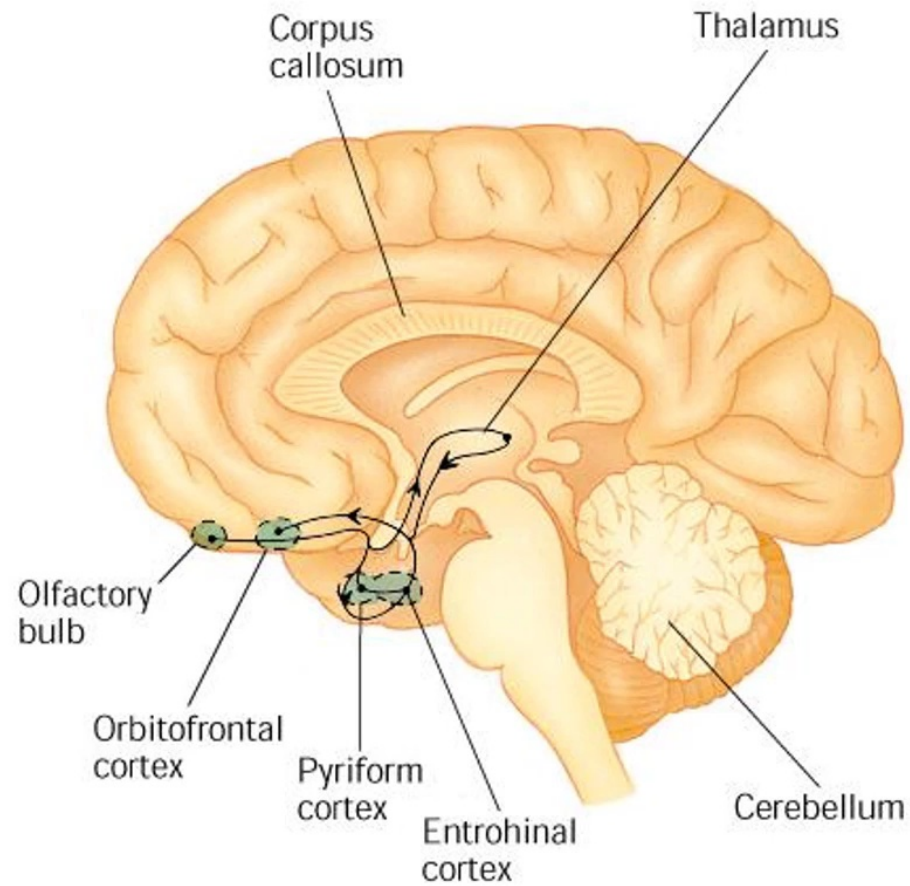
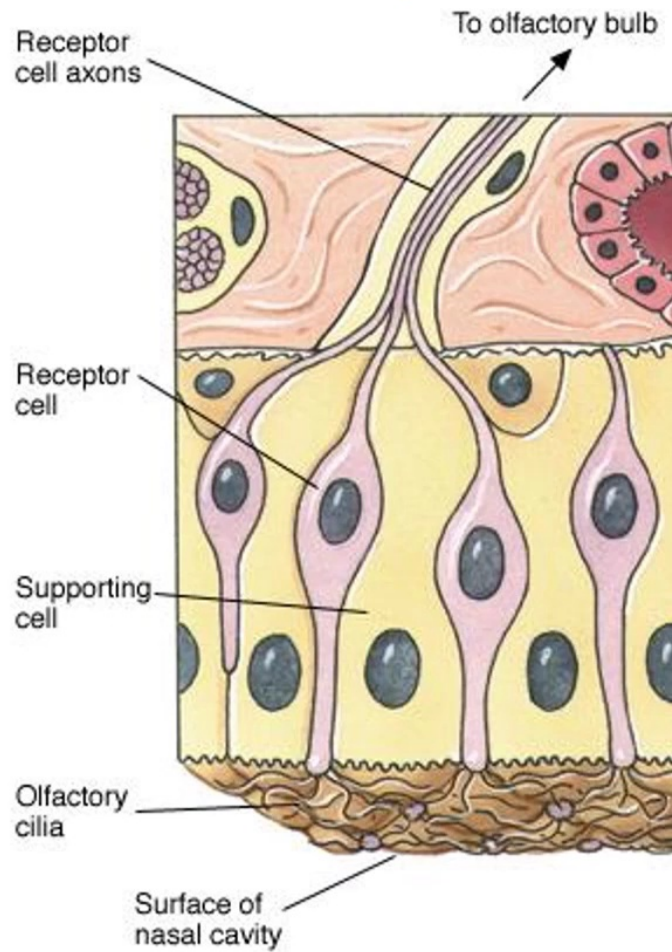
- Olfactory cortex

Very much involved in

- Memory and
- Emotion

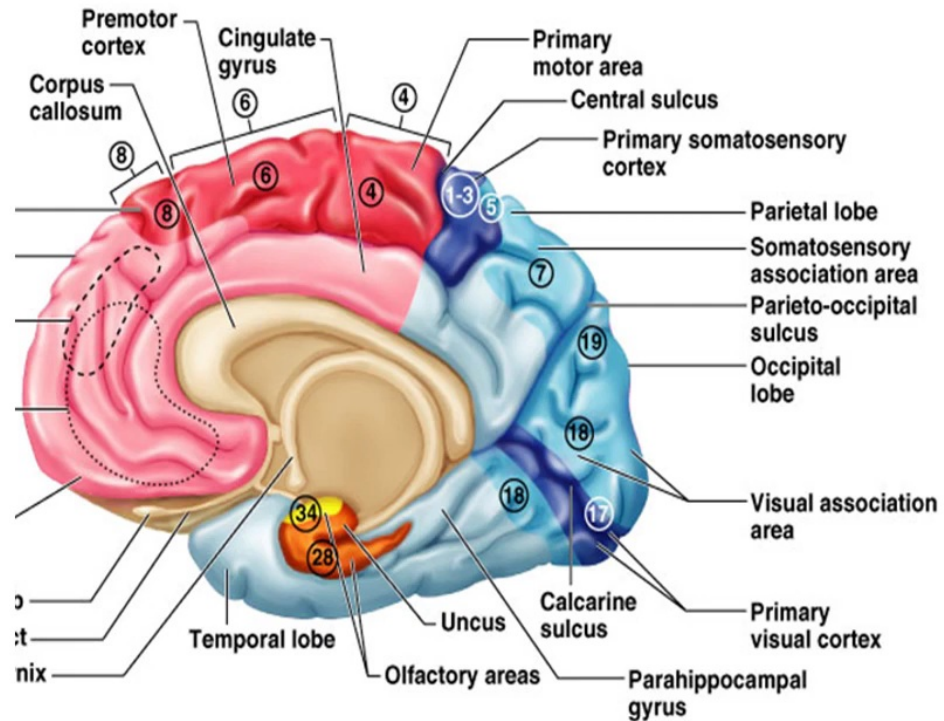


Olfactory Cortex



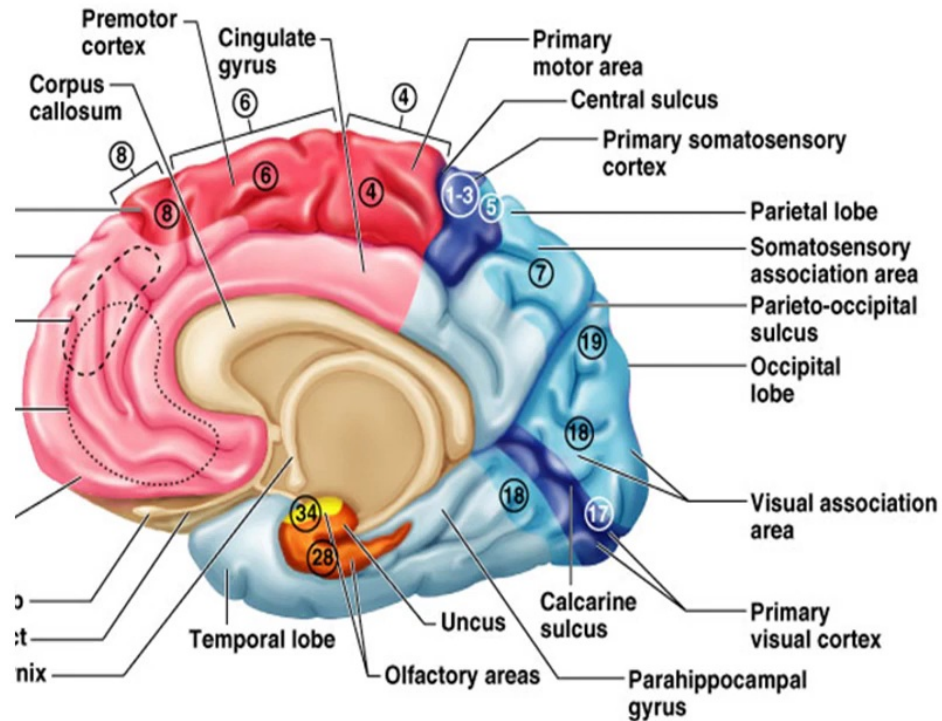
Primary Olfactory Area

- Site
 - Piriform Cortex
 - Uncus
 - Limen Insulae
 - Part of Amygdaloid Nc
- Input
 - Ipsilateral Olfactory Tract
- Output
 - Secondary Olfactory area



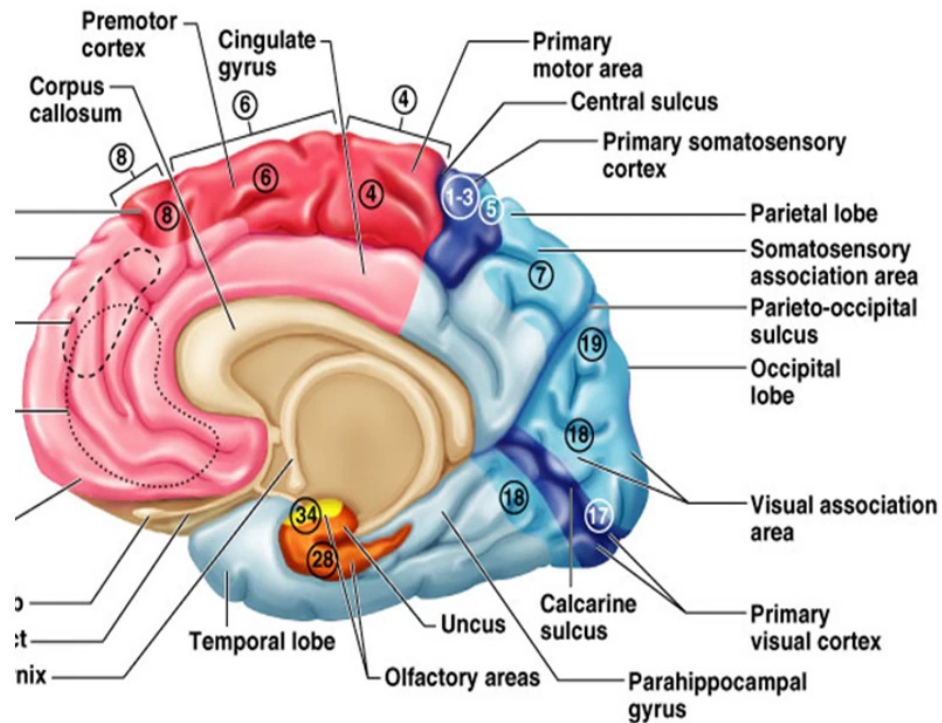
Secondary Olfactory Area

- Site
 - Area 28 entorhinal area
 - Anterior part of Parahippocampal G
- Input
 - Primary Olfactory area
- Output
 - Hippocampus
 - Links Olfaction to the Limbic System



Cortical Gustatory Area

- Taste area
- Close to the Olfactory area
- Site
 - Parietal operculum
 - Anterior part of Insula



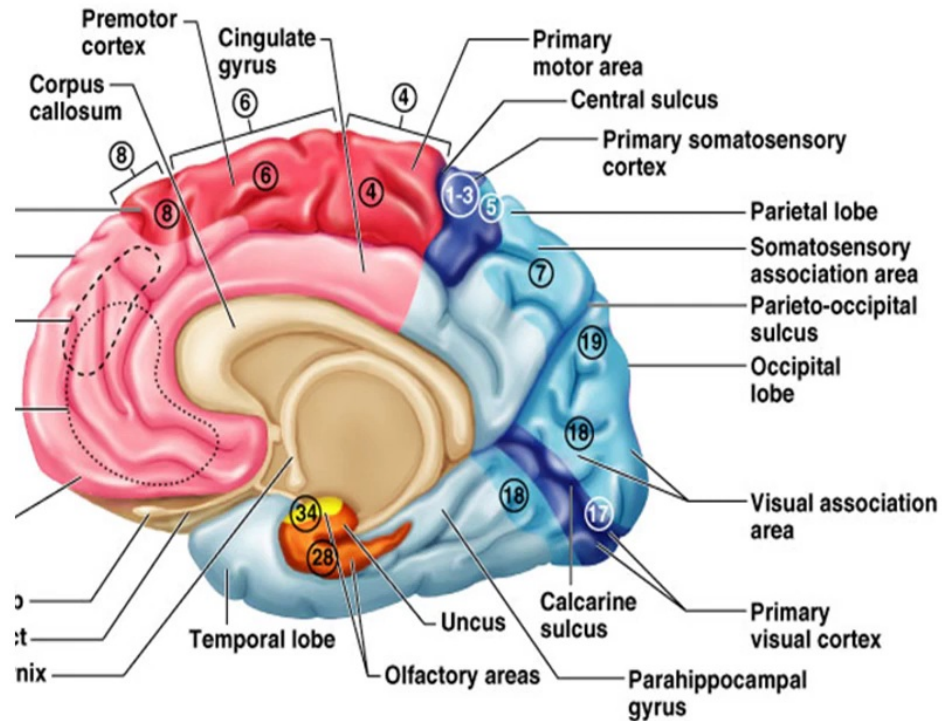
Cortical Gustatory Area

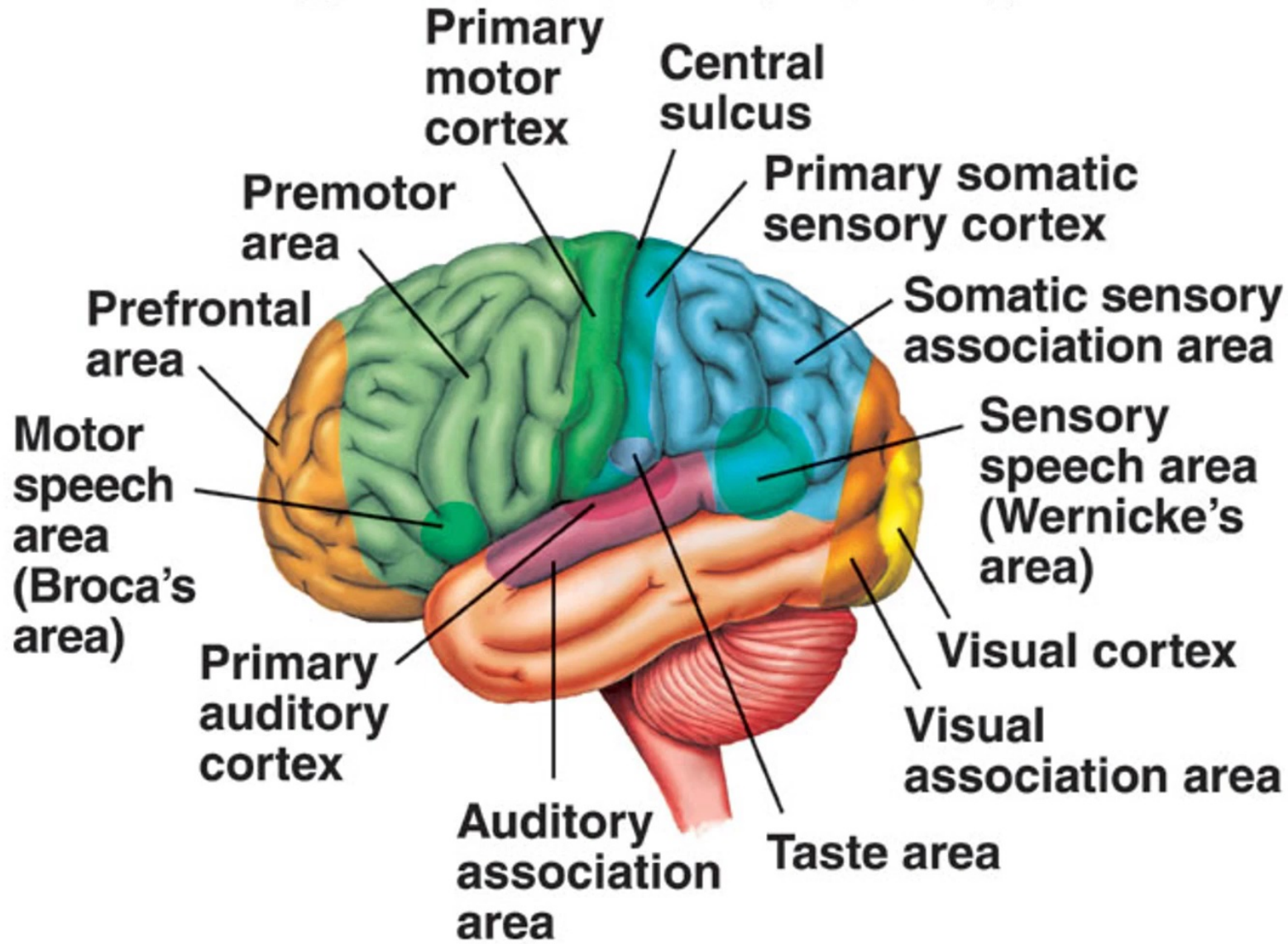
- Input

- Ipsilateral
- Solitario Thalamo Cortical fibres

- Output

- orbitoFrontal g
- Integrates Taste & Olfaction





Cortical Speech Areas

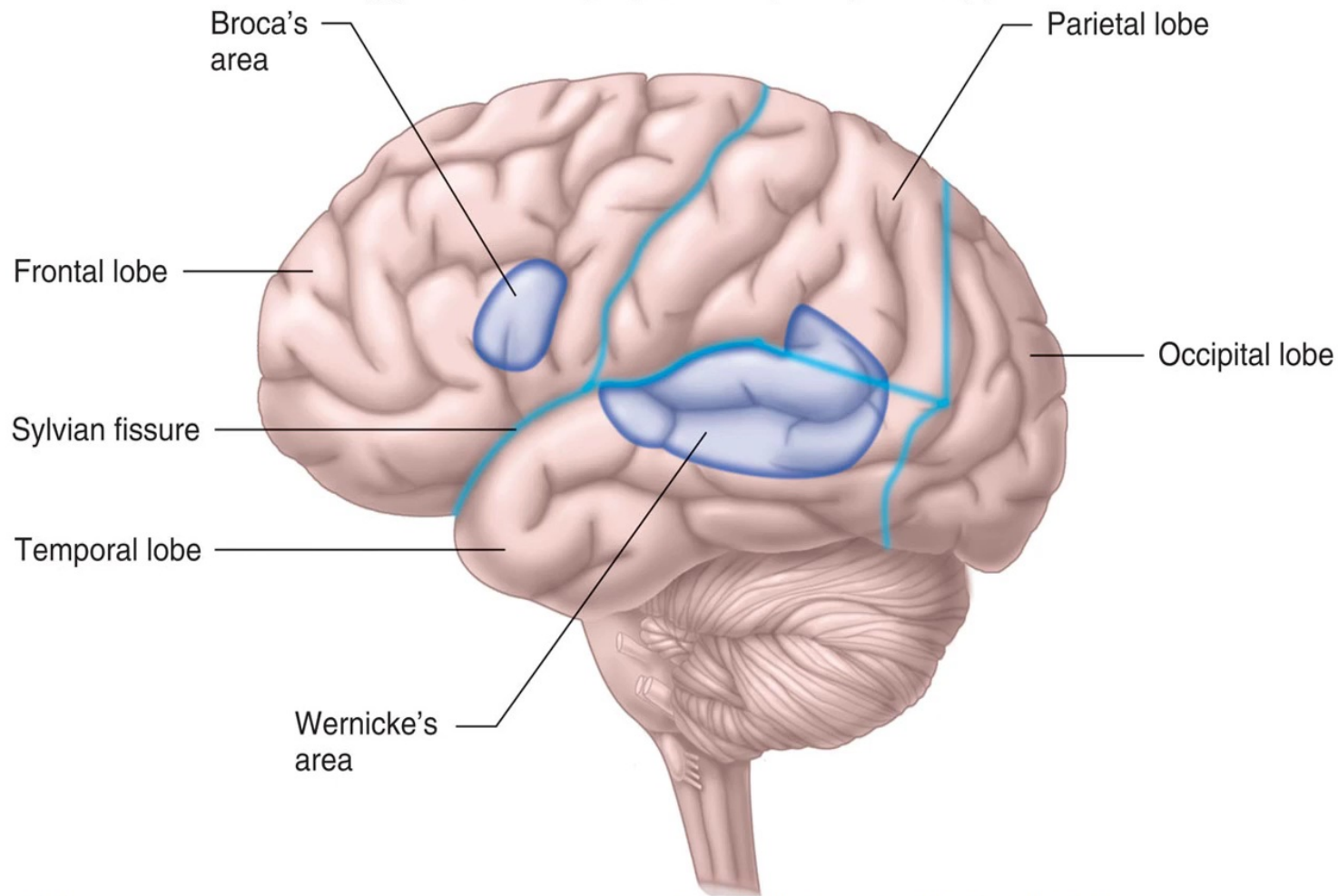
Dominant Cerebral Hemisphere

- Posterior speech area
 - Sensory
 - Wernicks area
- Anterior speech area
 - Motor
 - Brocas area
- Supplementary motor speech area



Cortical Speech Areas

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Language Areas

Large area for

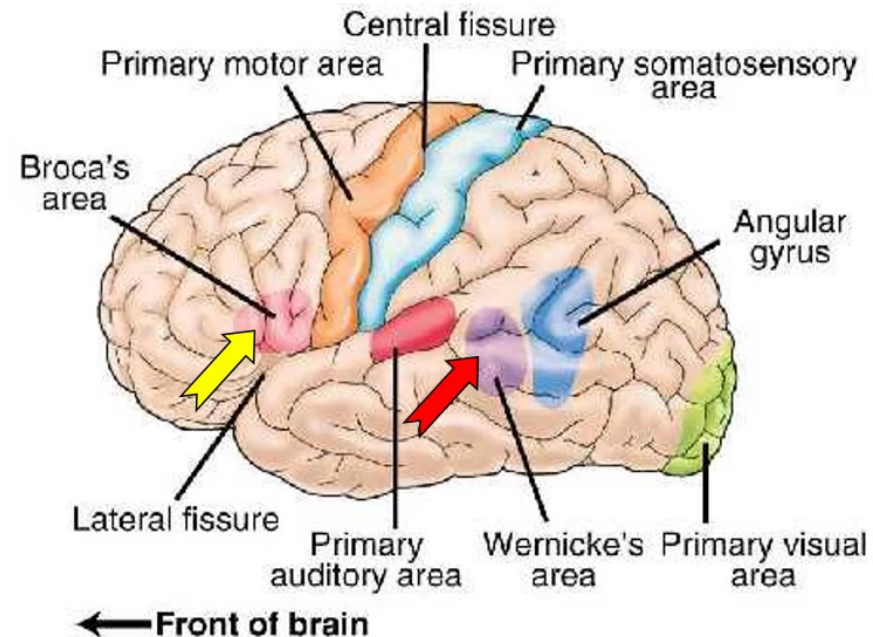
- Language
- understanding and
- production

Surrounding the

- lateral sulcus in the
- left (language-dominant) hemisphere

Includes:

1. Wernicke's area
2. Broca's area



Wernicke's area

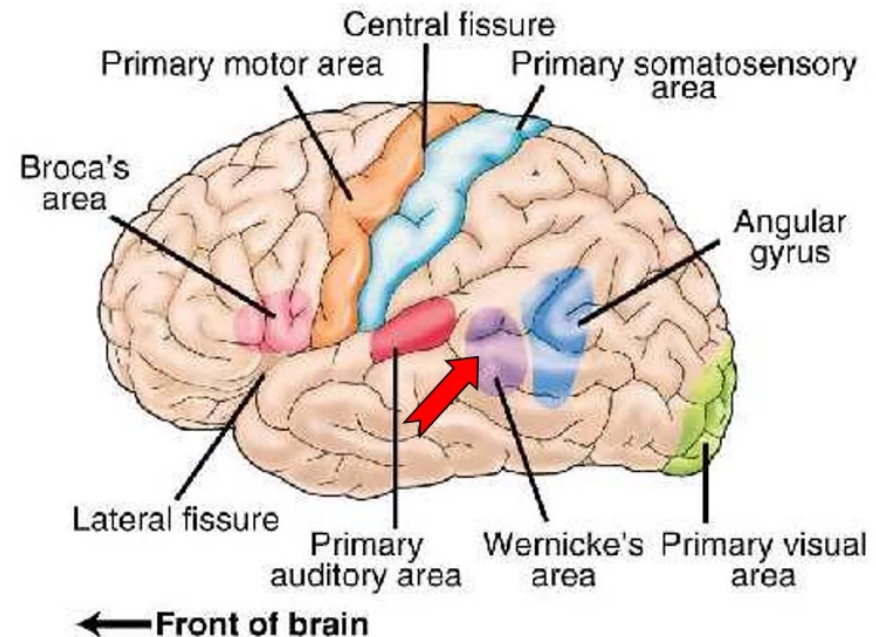
- Sensory in nature

Understanding

- Oral /
- Written words

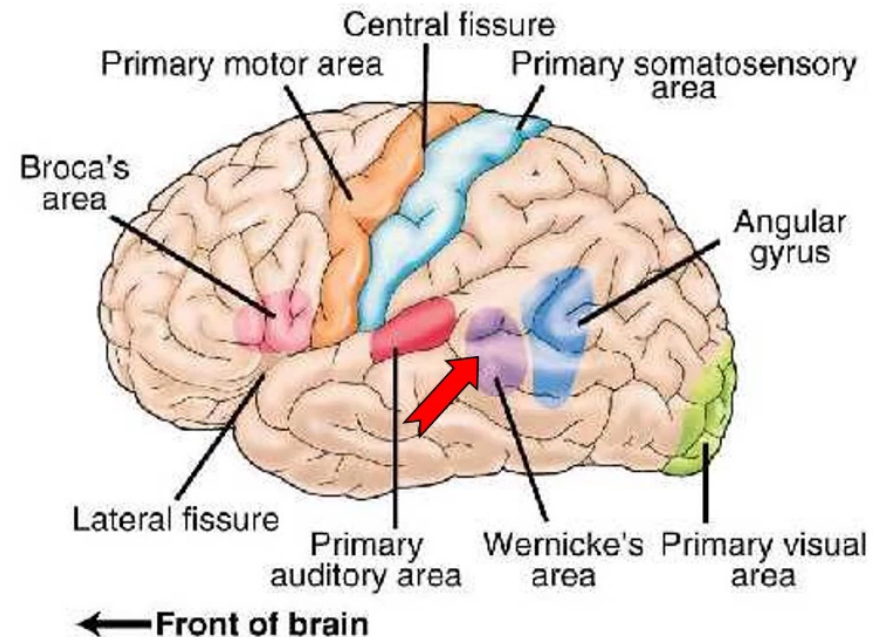
Damage results in

- (sensory)
- Receptive aphasia



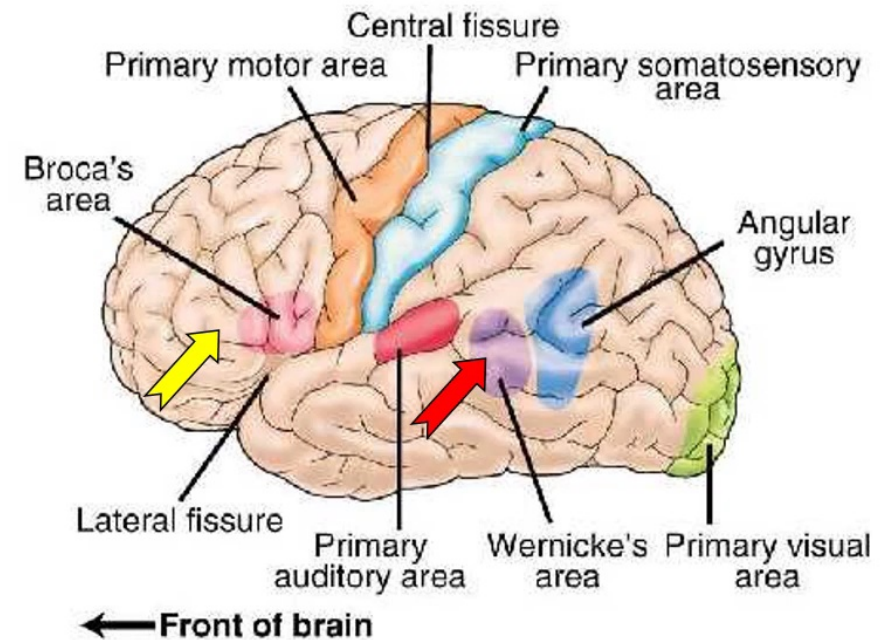
Wernicke's area

- Site
 - 4 adjacent areas in the
 - **left** hemisphere
- 1. Supramarginal G in Inferior Parietal Lobule
- 2. Angular G in Inferior Parietal Lobule
- 3. Superior Temporal g Posterior part
- 4. Middle Temporal g Posterior part



Wernicke's area

- Input
 - Somatosensory association cortex
 - Auditory association cortex
 - Visual association cortex
- Output
 - Arcuate Fasciculus
 - Passes forward
 - Ends at Broca's area in frontal lobe



Broca's area



Motor speech area

- Speech production

Coordinates

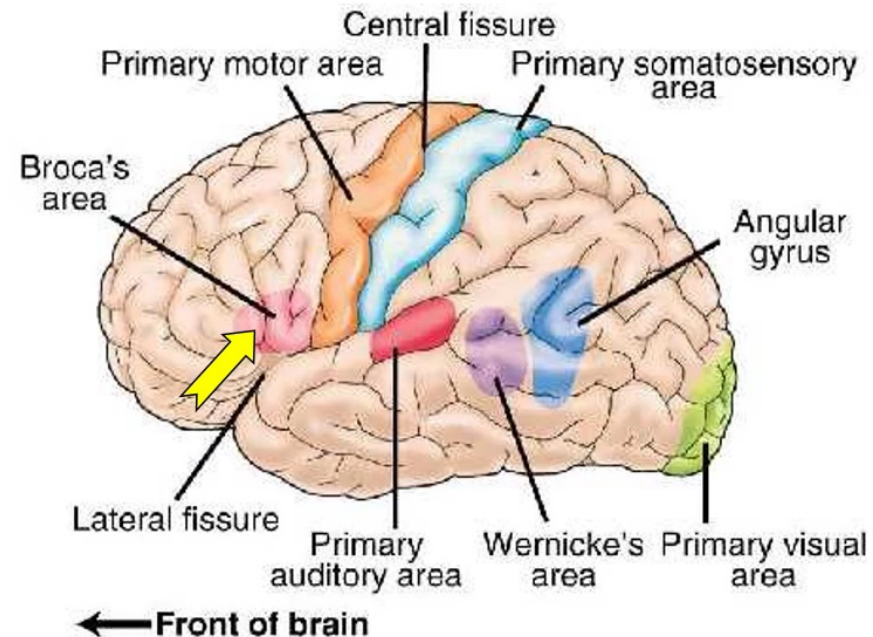
- Respiratory and
- Oral movements

Stores motor programs for

- execution of
- different words and
- phrases

Send them to area 4 →

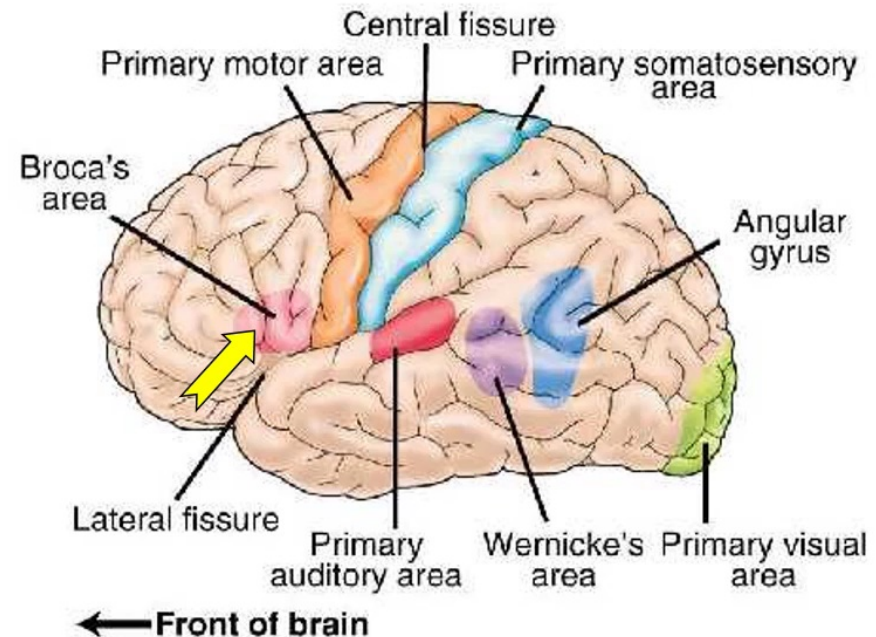
- labial,
- lingual &
- laryngeal Muscles



Broca's area

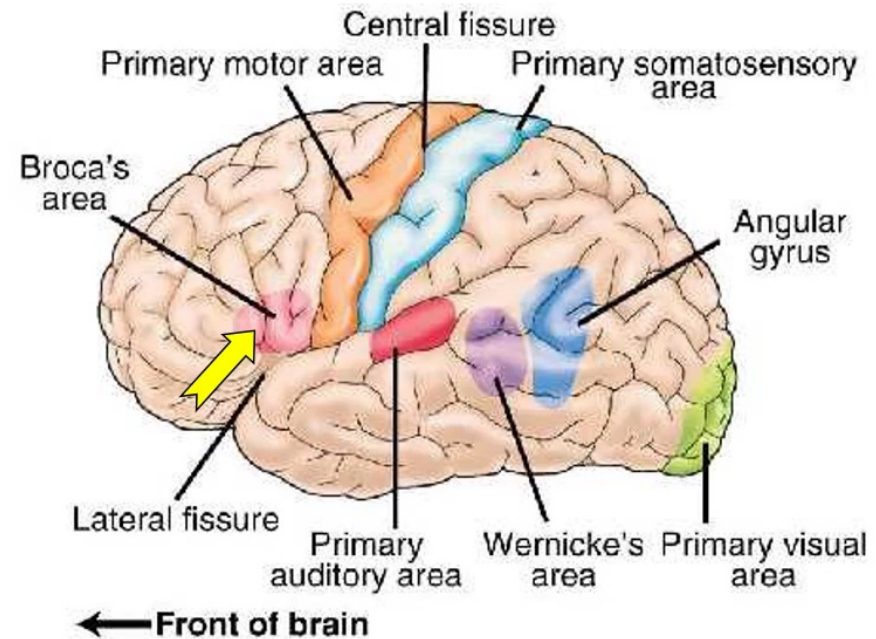
Damage results in

- Expressive aphasia
- (Motor Aphasia)
 - Patient understands spoken words
 - But can not express himself by words
 - Although muscles are not paralysed



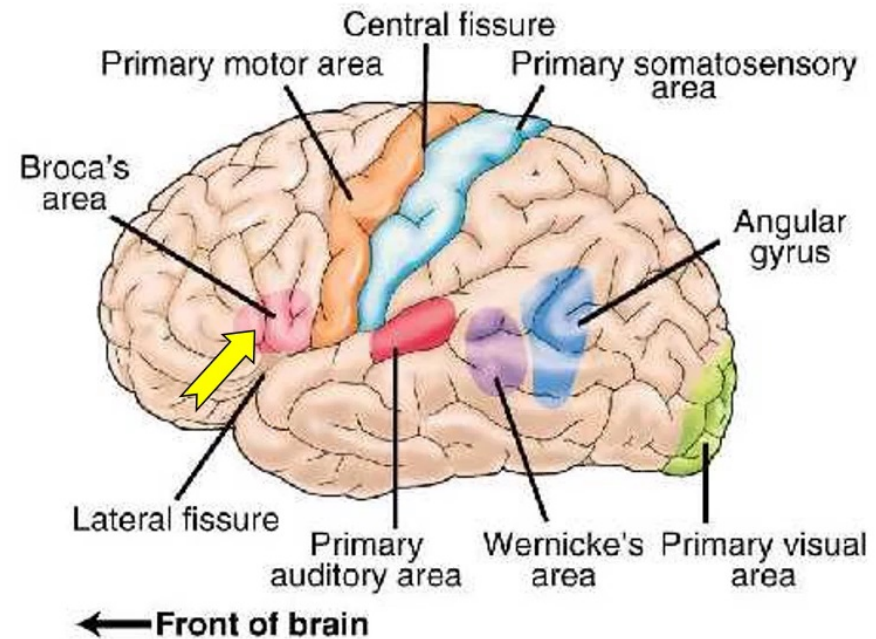
Broca's area

- Site
 - Left Inferior Frontal G
 - Areas 44, 45
 - Pars Triangularis
 - Pars Opercularis



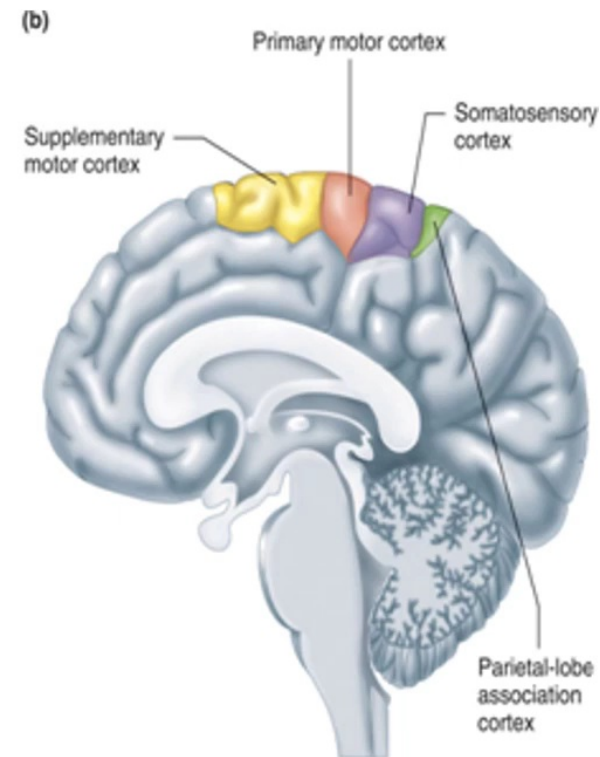
Broca's area

- Input
 - Wernick's area
- Output
 - Area 4 Bilateral
 - Tongue & head area



Supplementary Speech Area

- Site
 - Anterior part of the
 - Supplementary Motor Area
 - Medial surface of
 - cerebral hemisphere
- Function
 - Motor planning of
 - Speech movements
- Damage
 - → some motor aphasia



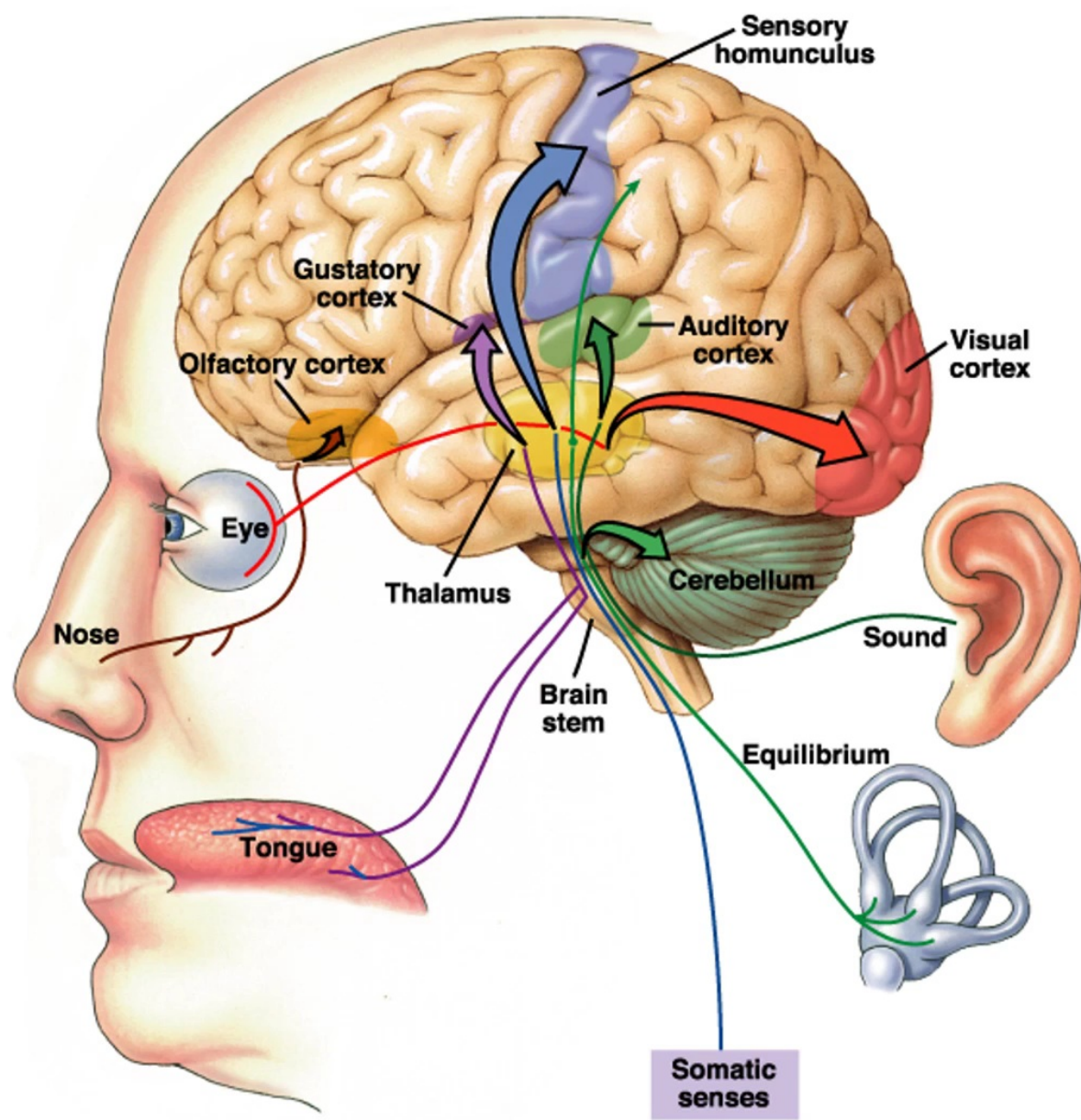
Language Areas

- Lateral prefrontal cortex →
 1. Language comprehension and
 2. Complex word analysis
- Lateral and ventral temporal cortex →

Integrates

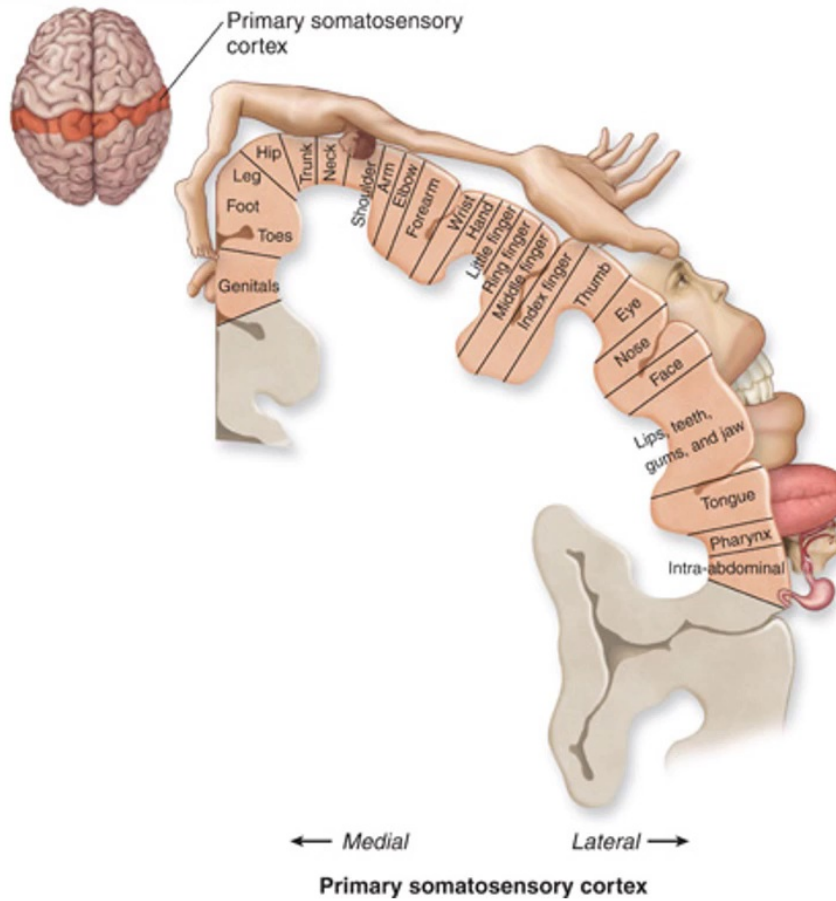
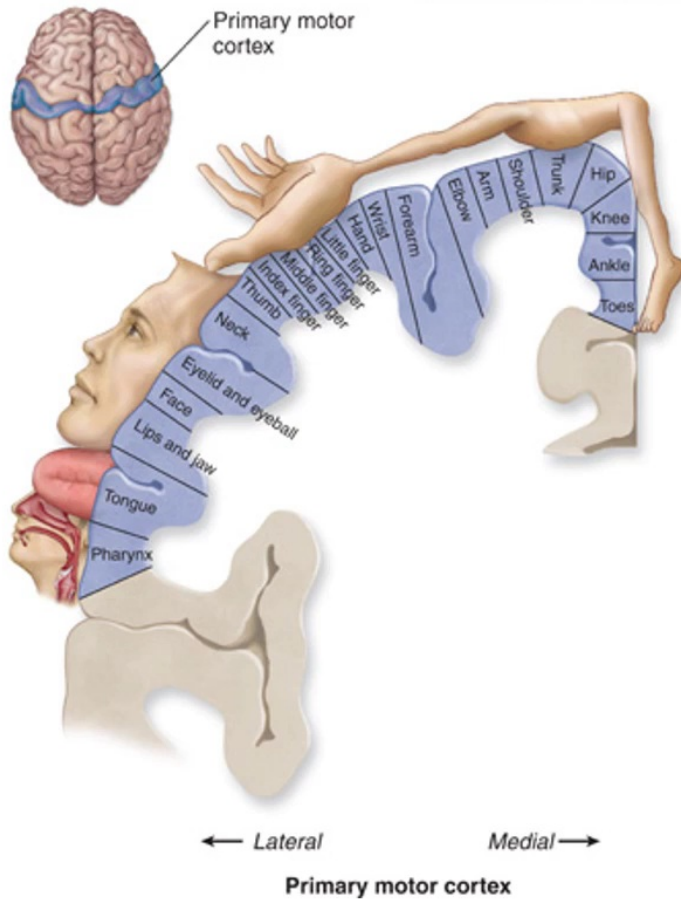
 1. Visual and
 2. Auditory stimulate





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