



Cerebral Hemispheres & Functional Cortical Areas 2

- **Dr Ashraf Sadek** *PhD, MD, MRCPCH*
- Assistant Professor of anatomy and embryology

The parietal lobe

S_I
First
somatosensory
Area A3,1,2

Site → **post. central
gyrus + post. part of
paracentral lobule**

S_{II}
Second
Somatosensory
area

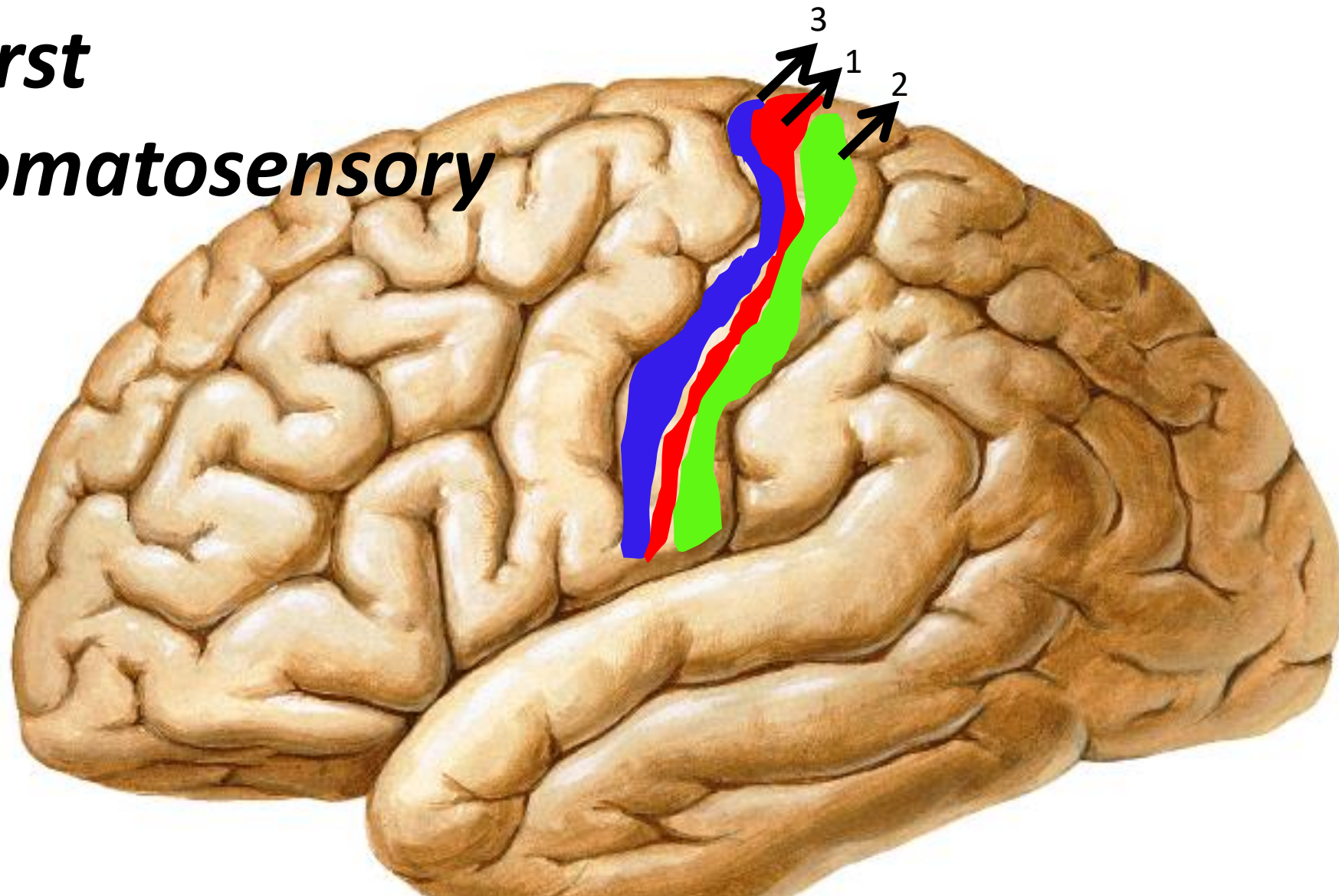
Site → **superior lip of
post. ramus of lat.
sulcus behind central
sulcus**

***Taste
area
A43***

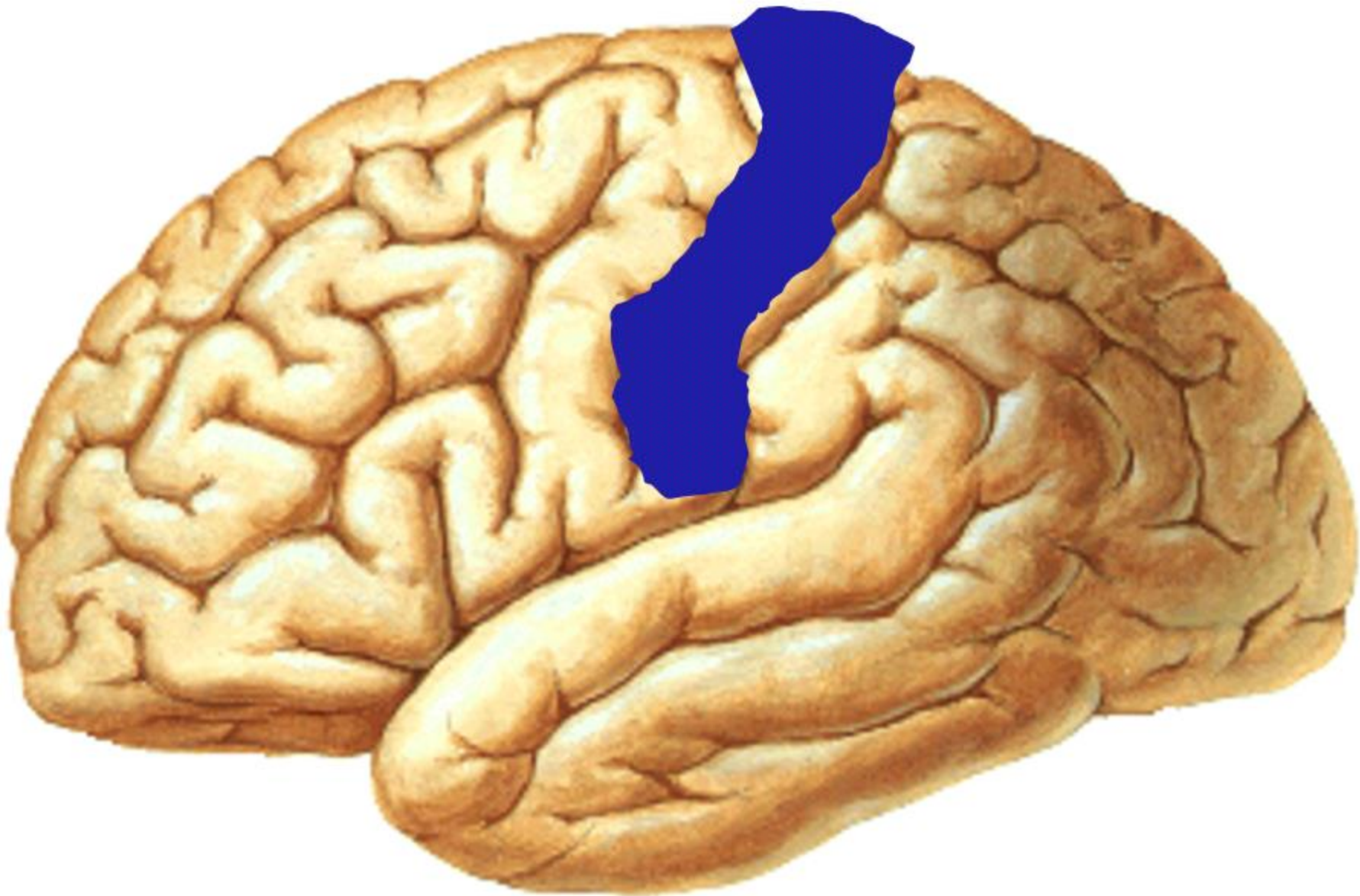
***Superior
parietal
lobule***

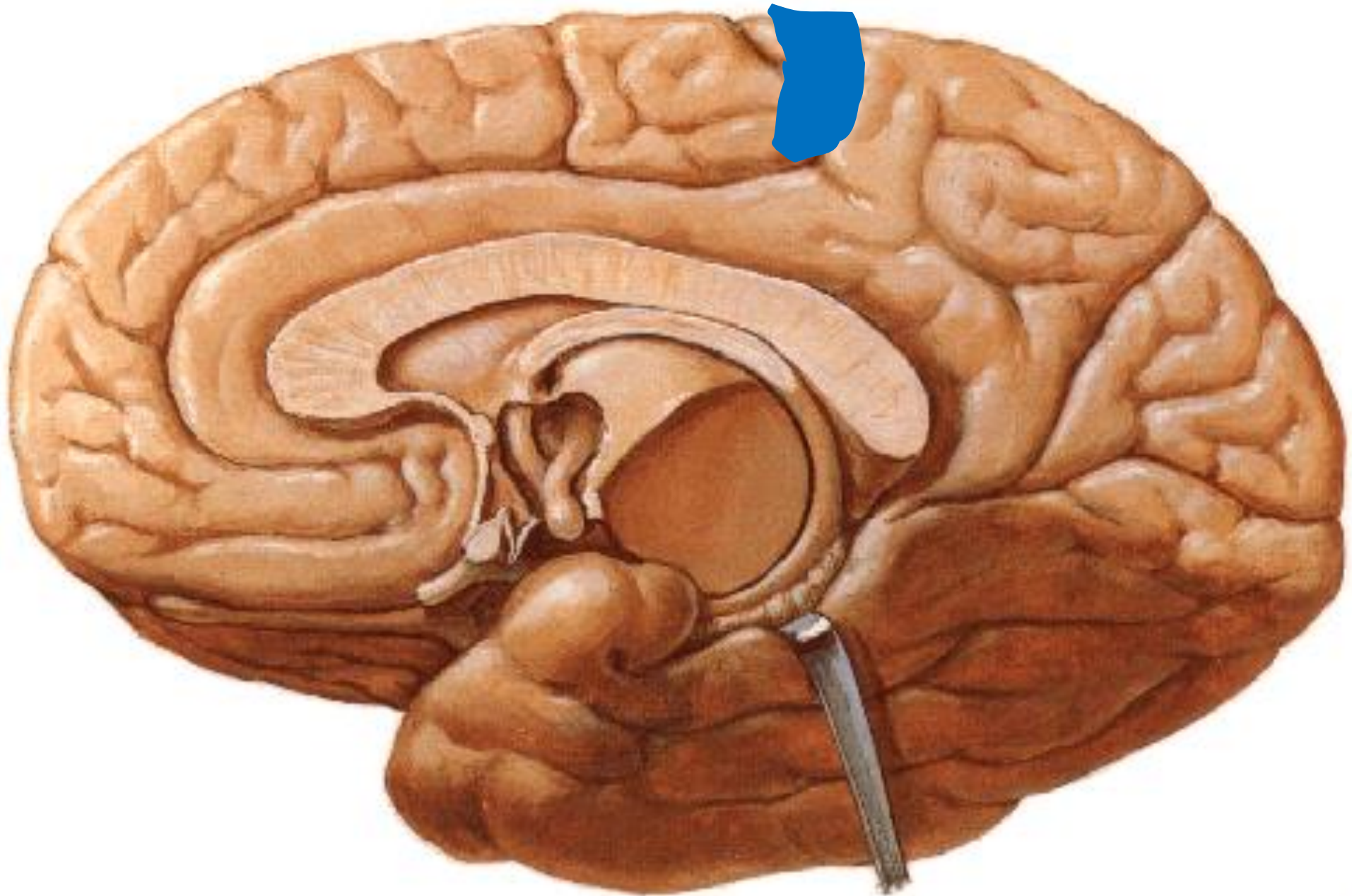
***Inferior
parietal
lobule***

***First
somatosensory***



A3 , A1, A2 → receive cutaneous & proprioceptive stimuli





Function

of S1 area

receives

***sensory stimuli
from thalamus***

Lesion

Contralateral

Hemianesthesia

***(impaired sensation on
opposite side of body)***

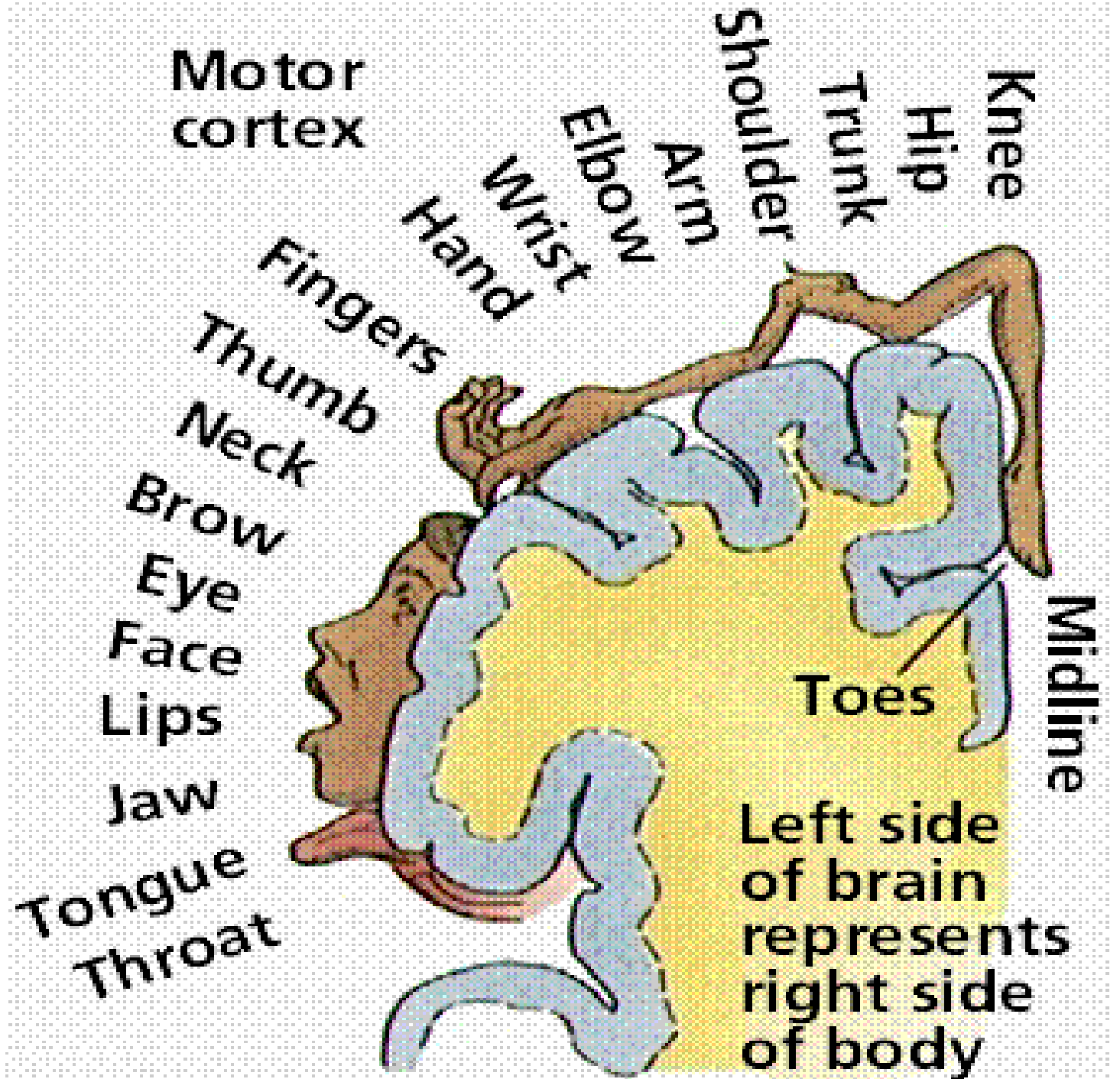
Representation

❑ Up side down

(**sensory homunculus**)

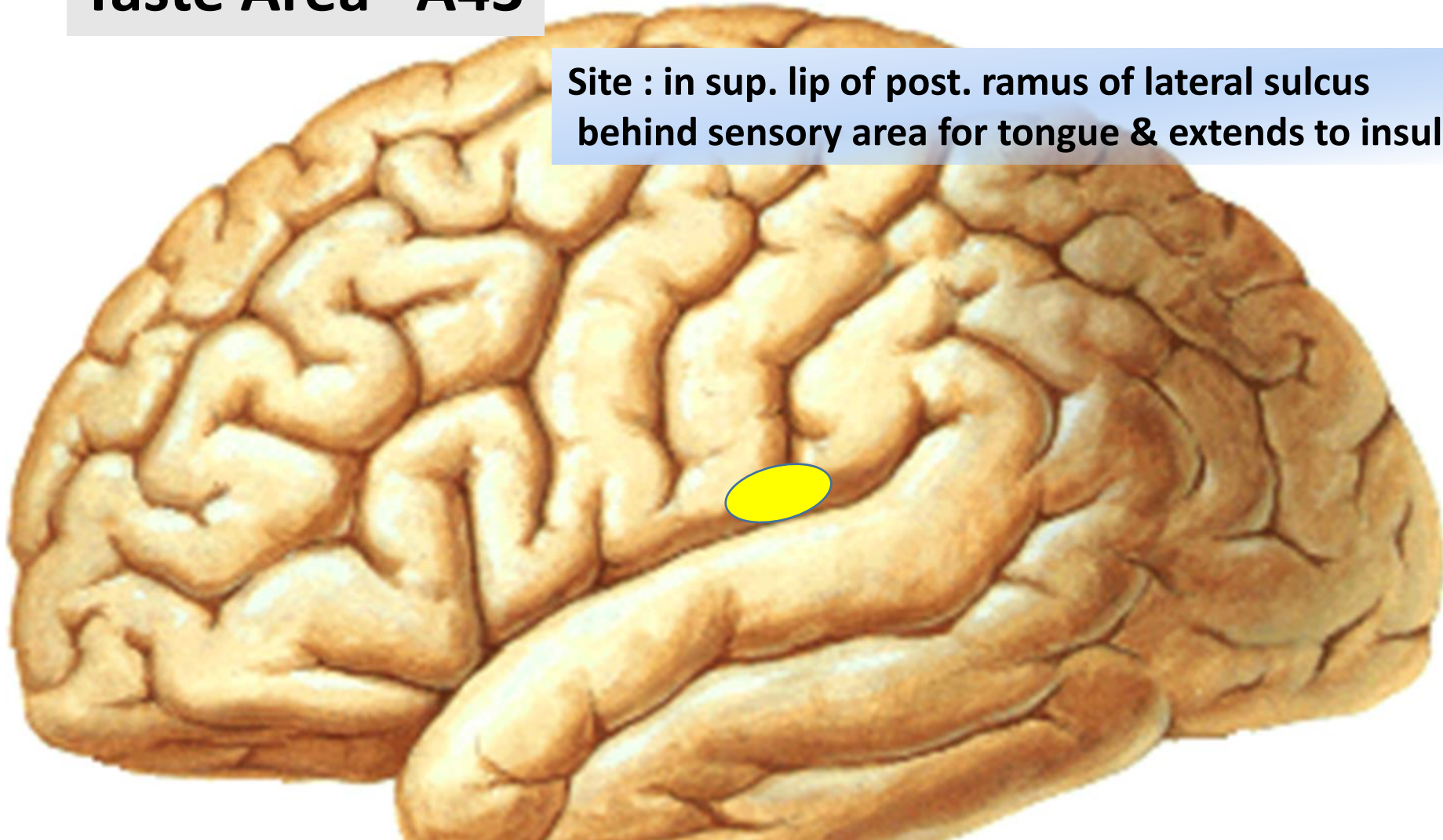
❑ Contralateral

❖ Area of representation is proportionate to sensitivity of the part.



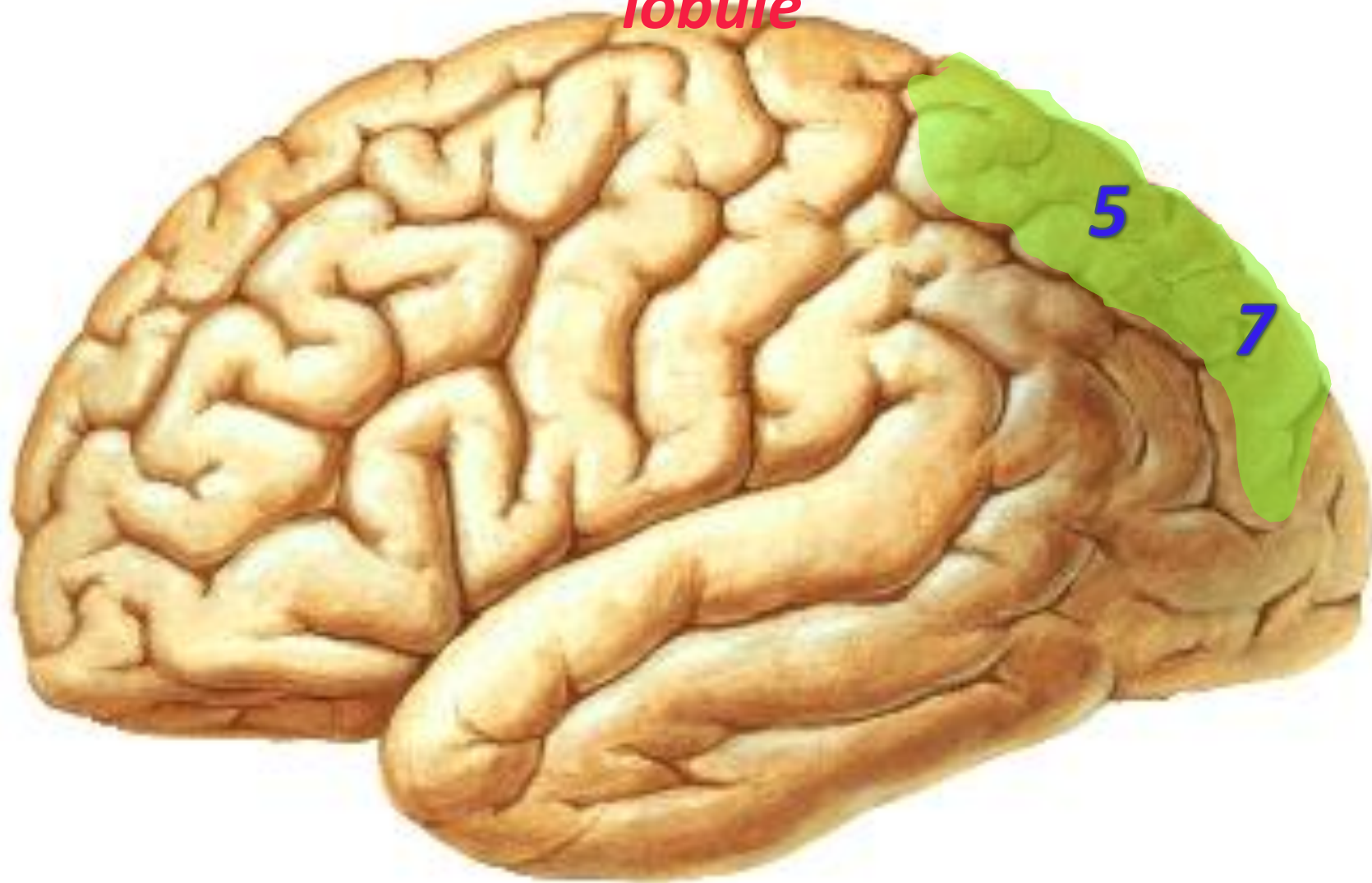
Taste Area A43

Site : in sup. lip of post. ramus of lateral sulcus
behind sensory area for tongue & extends to insula



Receives ipsilateral solitario-thalamo cortical
fibers from VPMN of thalamus

*Superior parietal
lobule*



Function:

- ❖ Integrates sensation received from S1 & stores them as long term memories of past experience
- ❖ Contains Stereognosis center

Lesion:

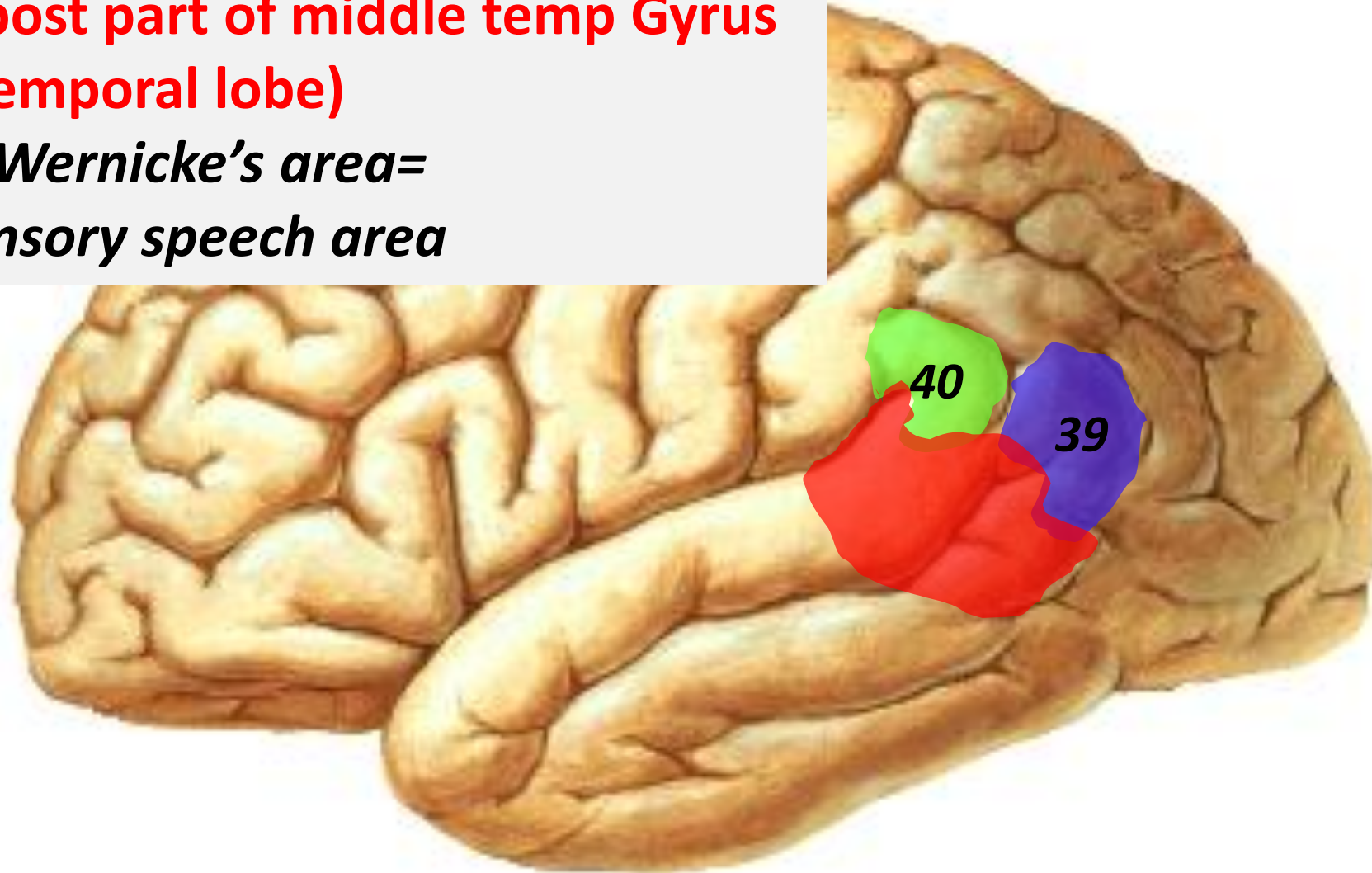
Astereognosis
(inability to recognize familiar objects by touch)

A 40 + A39 (inf parietal lobule)

+post part of sup temp Gyrus

**+ post part of middle temp Gyrus
(temporal lobe)**

***=Wernicke's area=
sensory speech area***



**Wernicke's area is
present only
in the dominant
hemisphere**

Function

Wernicke's area
{sensory speech area}
Responsible for
Understanding speech
(heard or seen)

Lesion

Sensory
(receptive)
Aphasia → patient can
not understand
spoken or written words

Note :

Speech centers are:

**1-Motor (anterior) speech center
{Broca's area → A44,45 }**

**2-Sensory(posterior) speech center
{Wernicke's area → A39,40 }**

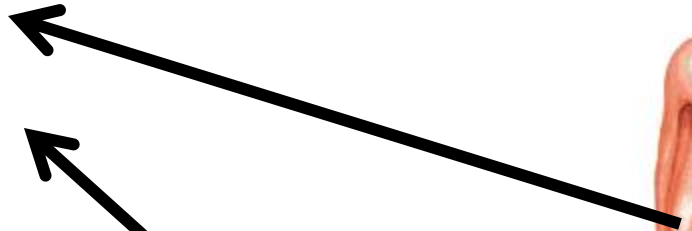
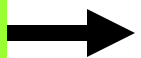
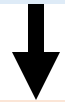
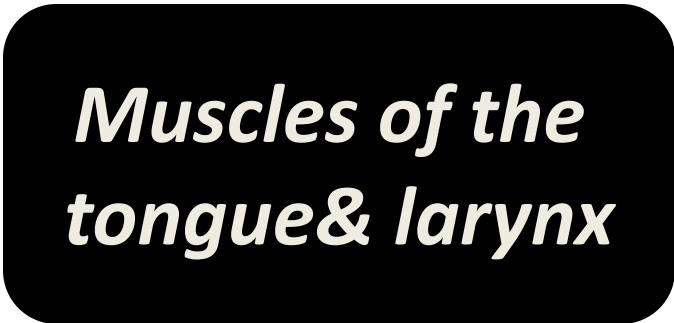
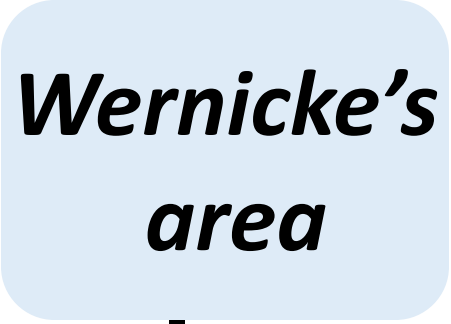
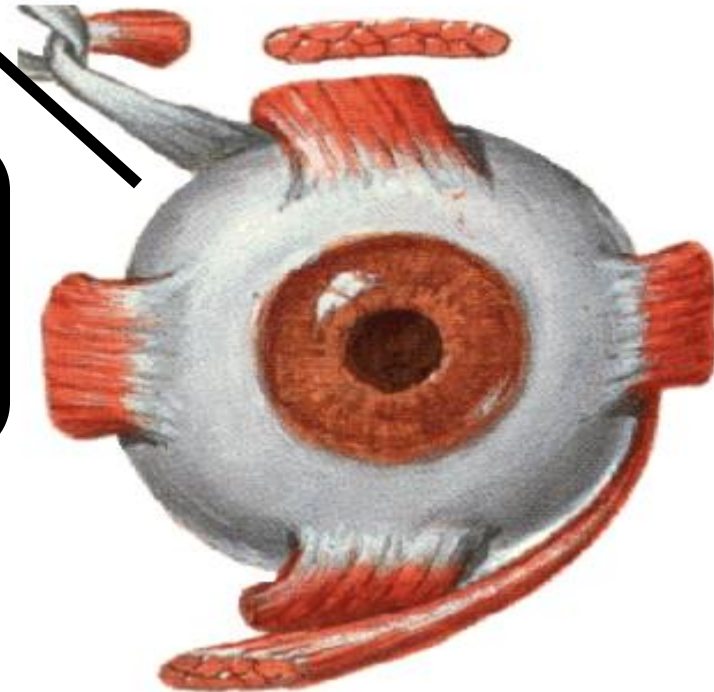
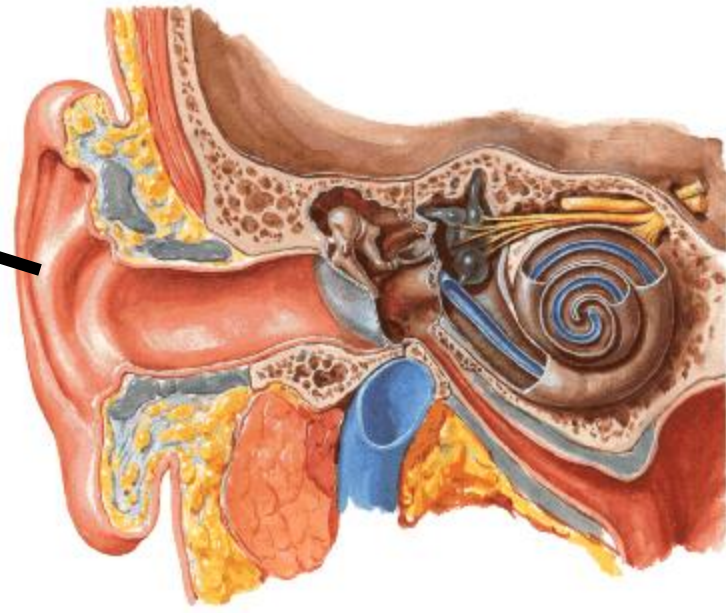
**3-Third (superior) speech center →
{supplementary motor area }**

***Wernicke's
area***

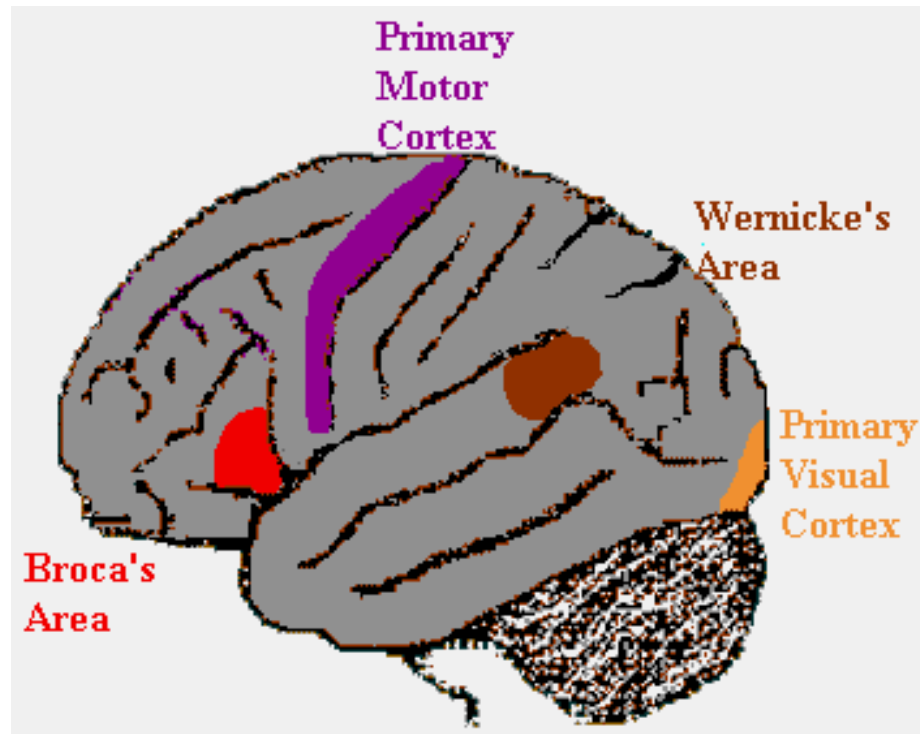
***Broca's
area***

Area 4

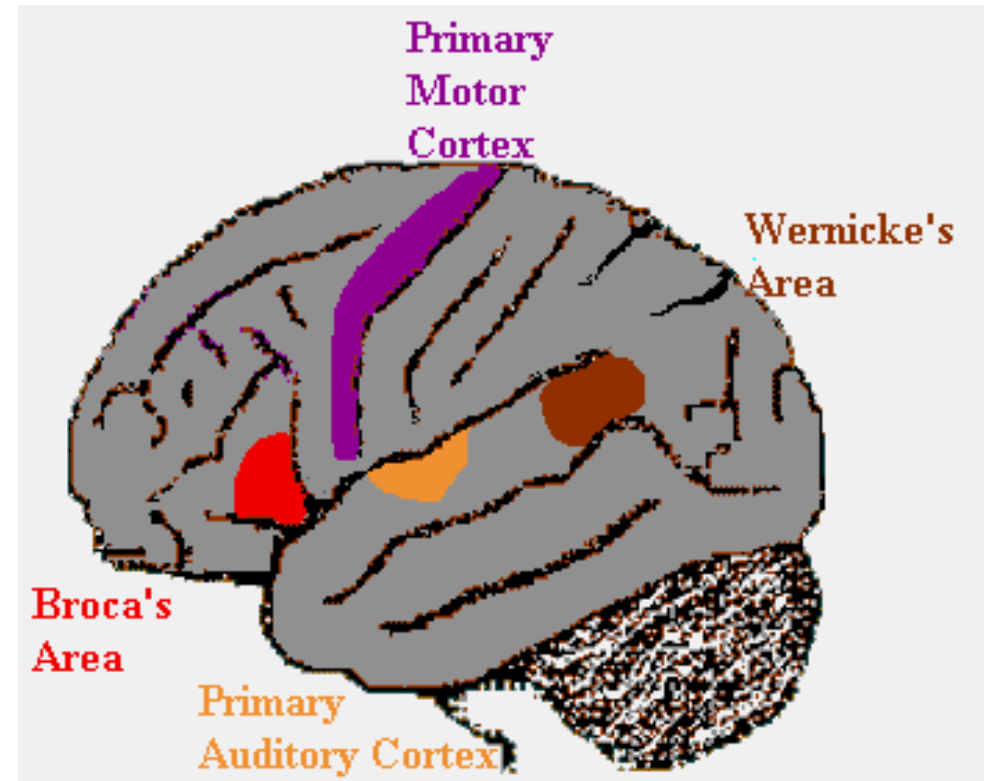
***Muscles of the
tongue & larynx***



Speaking the seen word

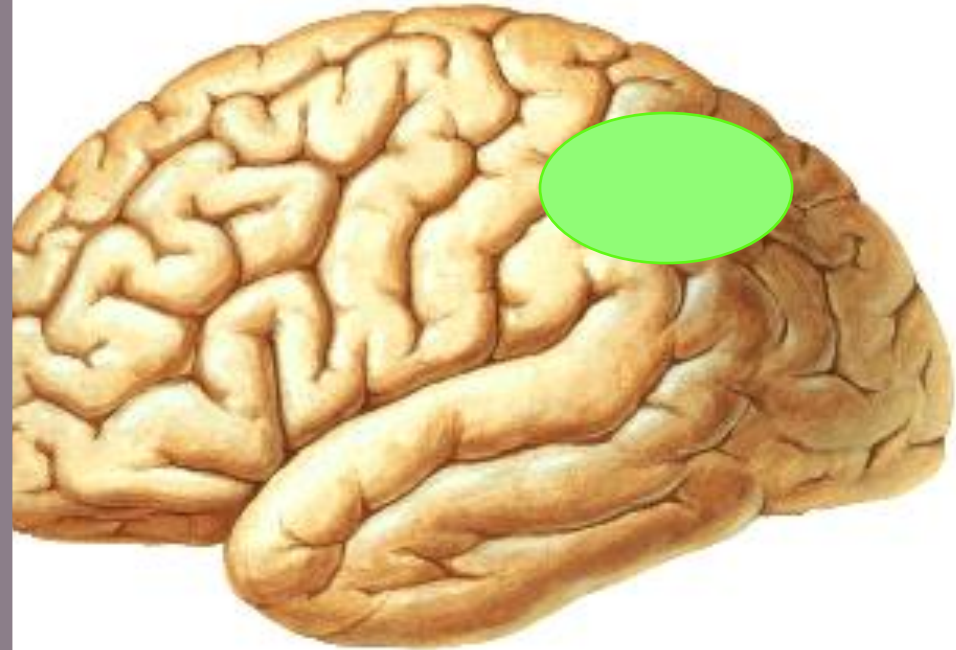


Speaking the heard word



Parietal lobe recognizes orientation of contralateral half of body (awareness of body parts)

Lesion: sensory neglect (contralateral hemineglect) → patient fails to recognize opposite side of body as its own





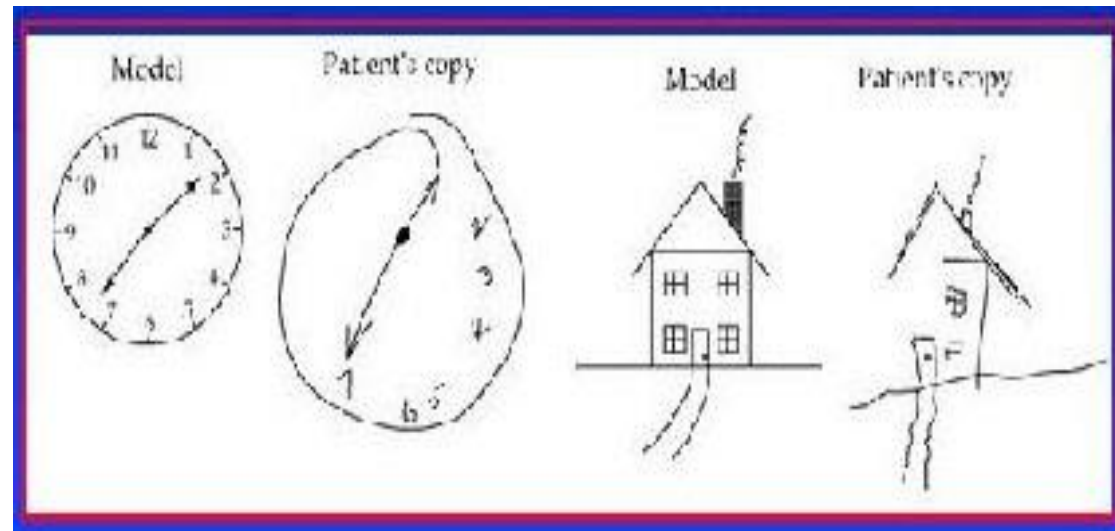
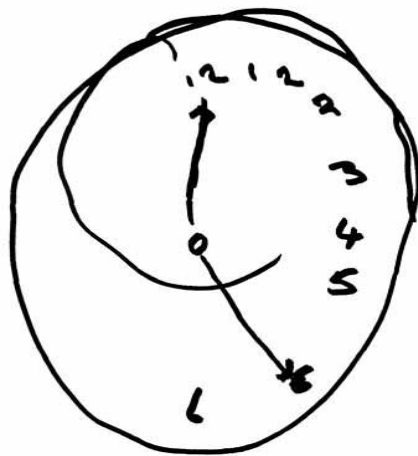
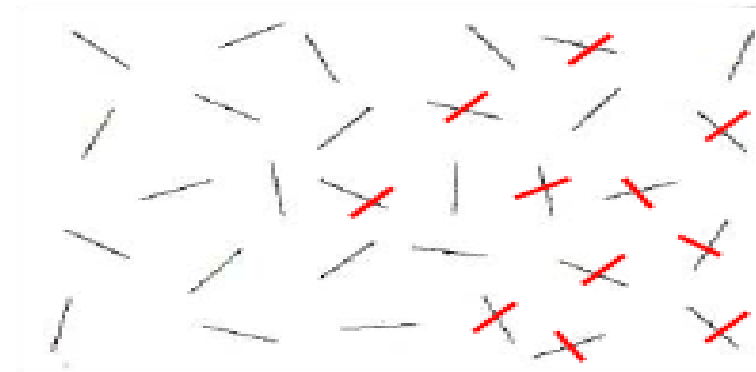
He shaved right side of beard & neglected **left** side



He dressed right sleeve of jacket & neglected to dress **left** upper limb

Examples of Neglect

- Line bisection
- Copying task



Temporal lobe



**Primary
Auditory
Area
A 41, 42**

**Secondary
Auditory
Area
A 22**

**Facial
recognition
area**

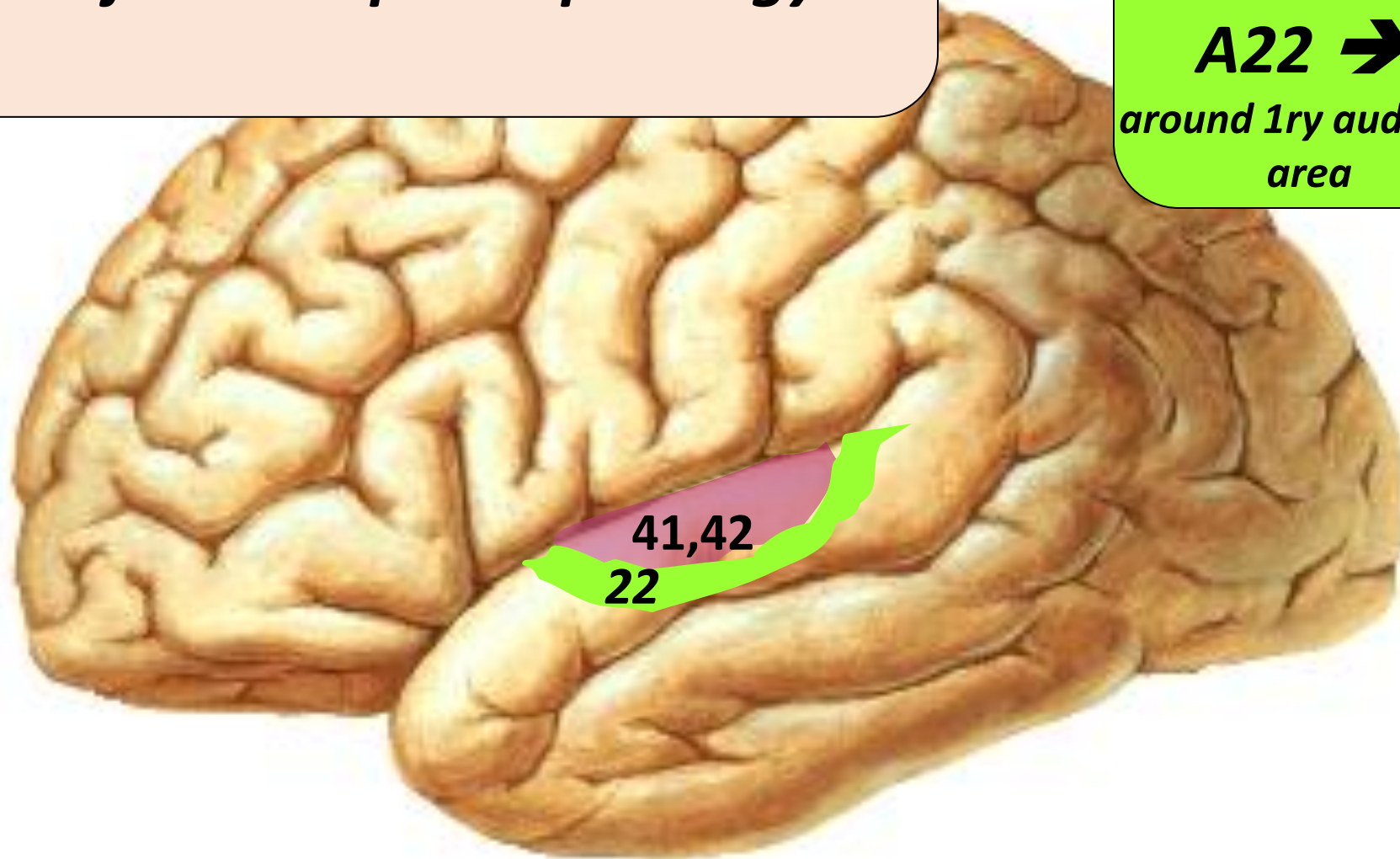
Part of :
-Wernicke's Area
-Vestibular area
-Olfactory areas

Primary Auditory Area:

**Site → inf. lip of lateral sulcus
& adjacent sup. temporal gyrus**

**Secondary
Auditory
Area**

**A22 →
around 1ry auditory
area**



***Primary
Auditory
Area(A41,42)***

Function : perception
of hearing from both ears

Lesion :
impaired hearing
not loss because
cochlea is bilaterally
represented

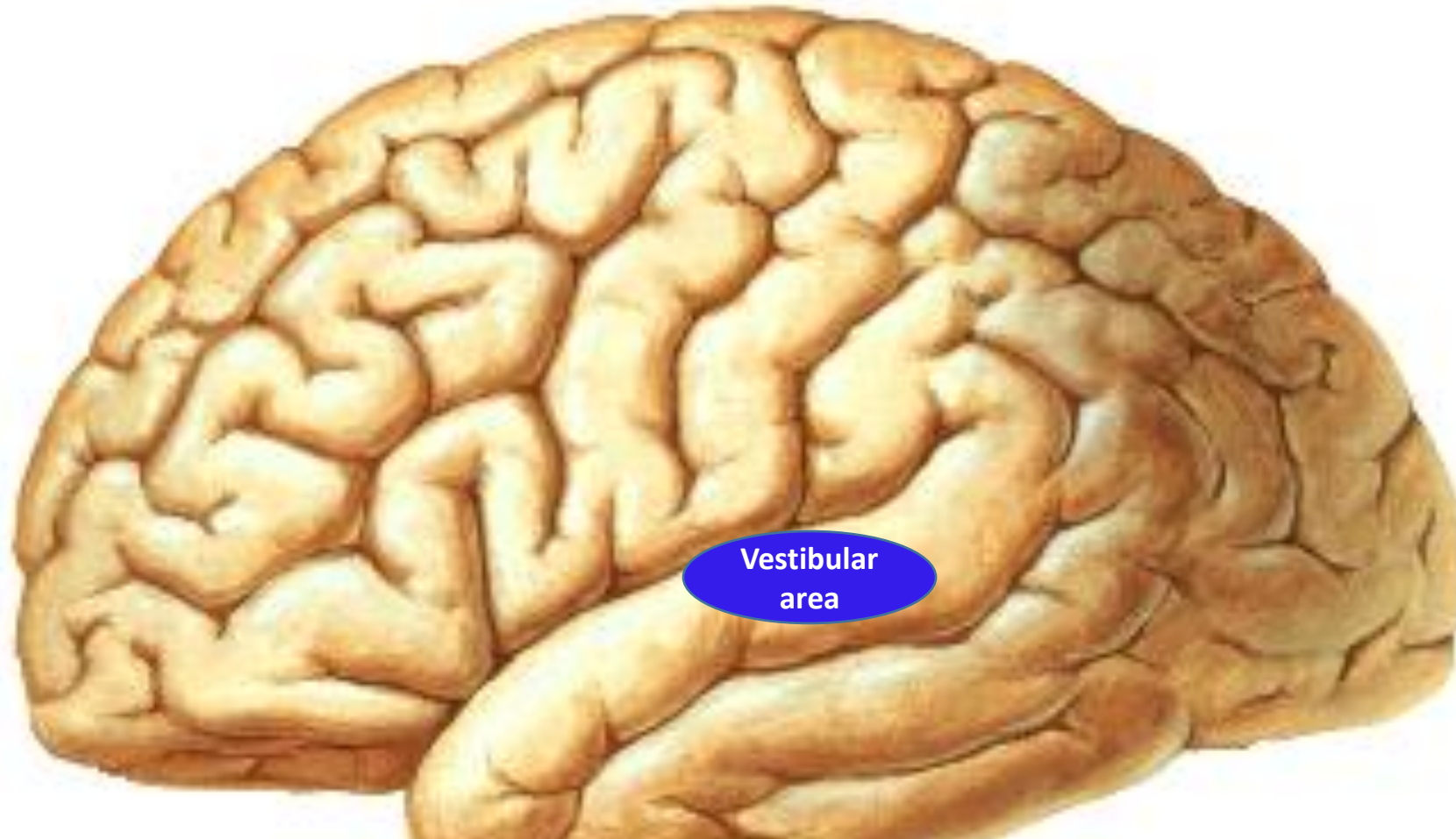


***Secondary
Auditory
Area (A22)***

Function :
understands auditory
stimuli by associating
them with past experience

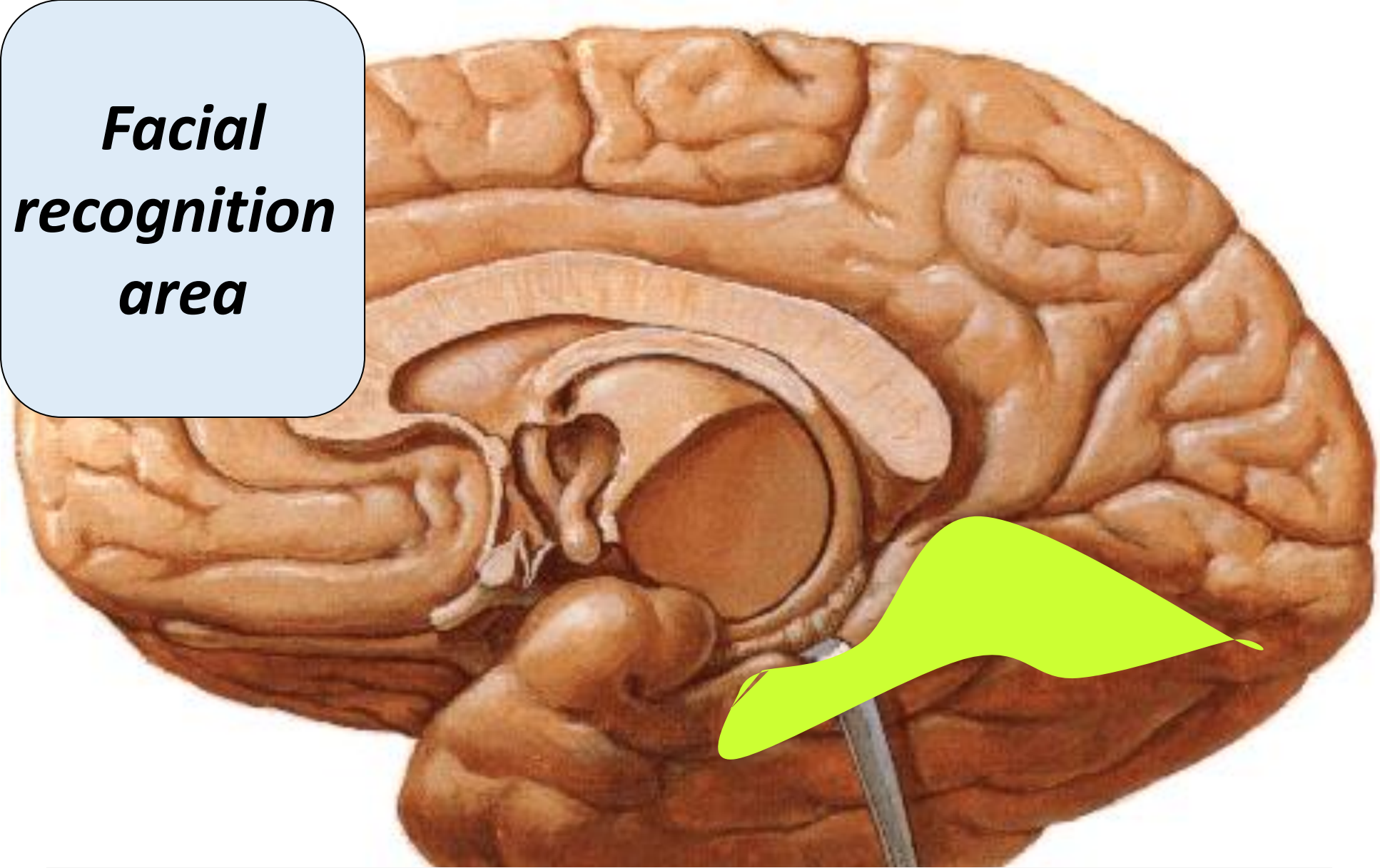
Lesion :
auditory verbal agnosia
(inability to understand sounds)

Vestibular area : close to auditory area



**Receives information about head position & movement
from vestibular nuclei**

***Facial
recognition
area***

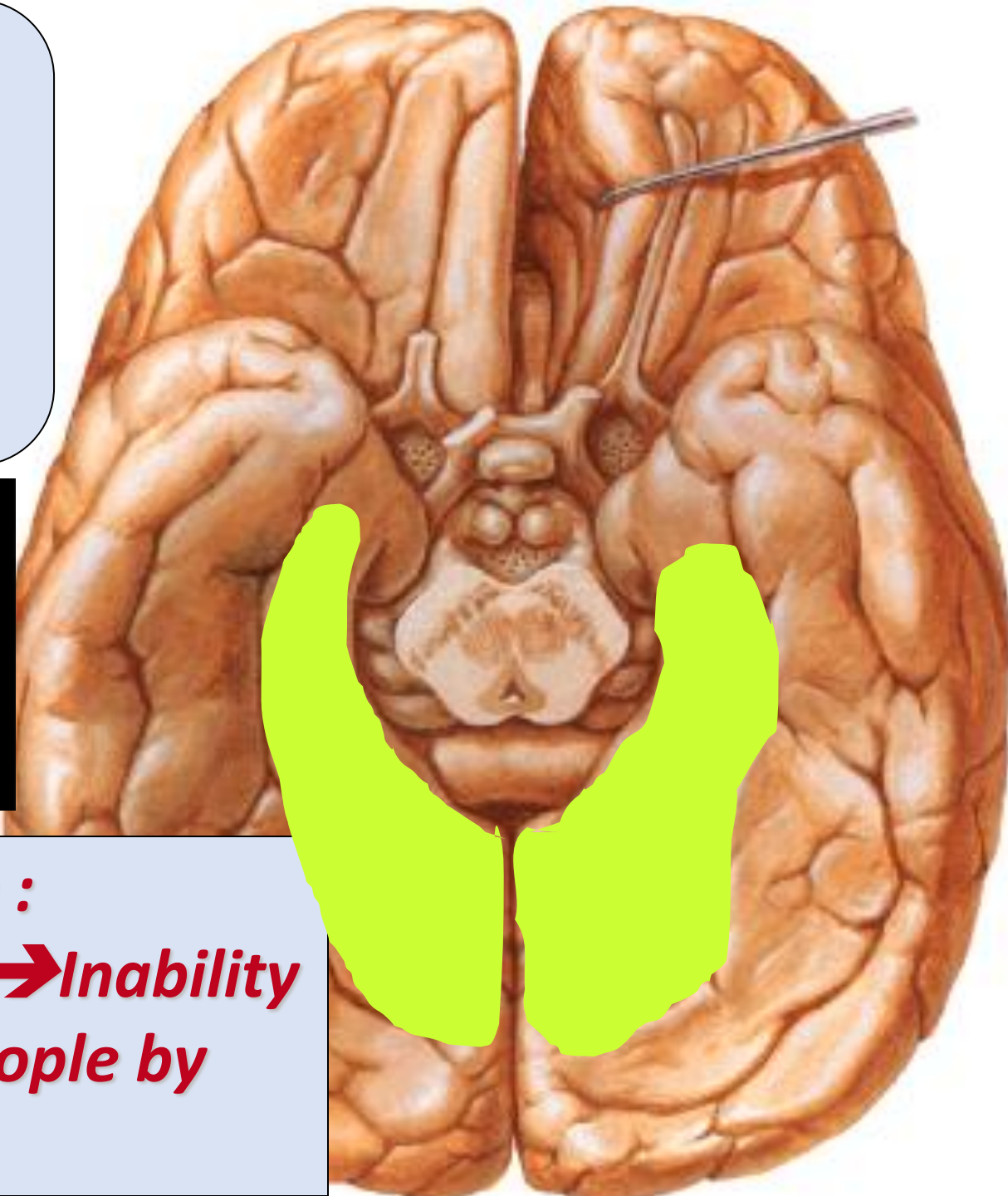


On inf. surface of temporal & occipital lobes

***Facial
recognition
area***



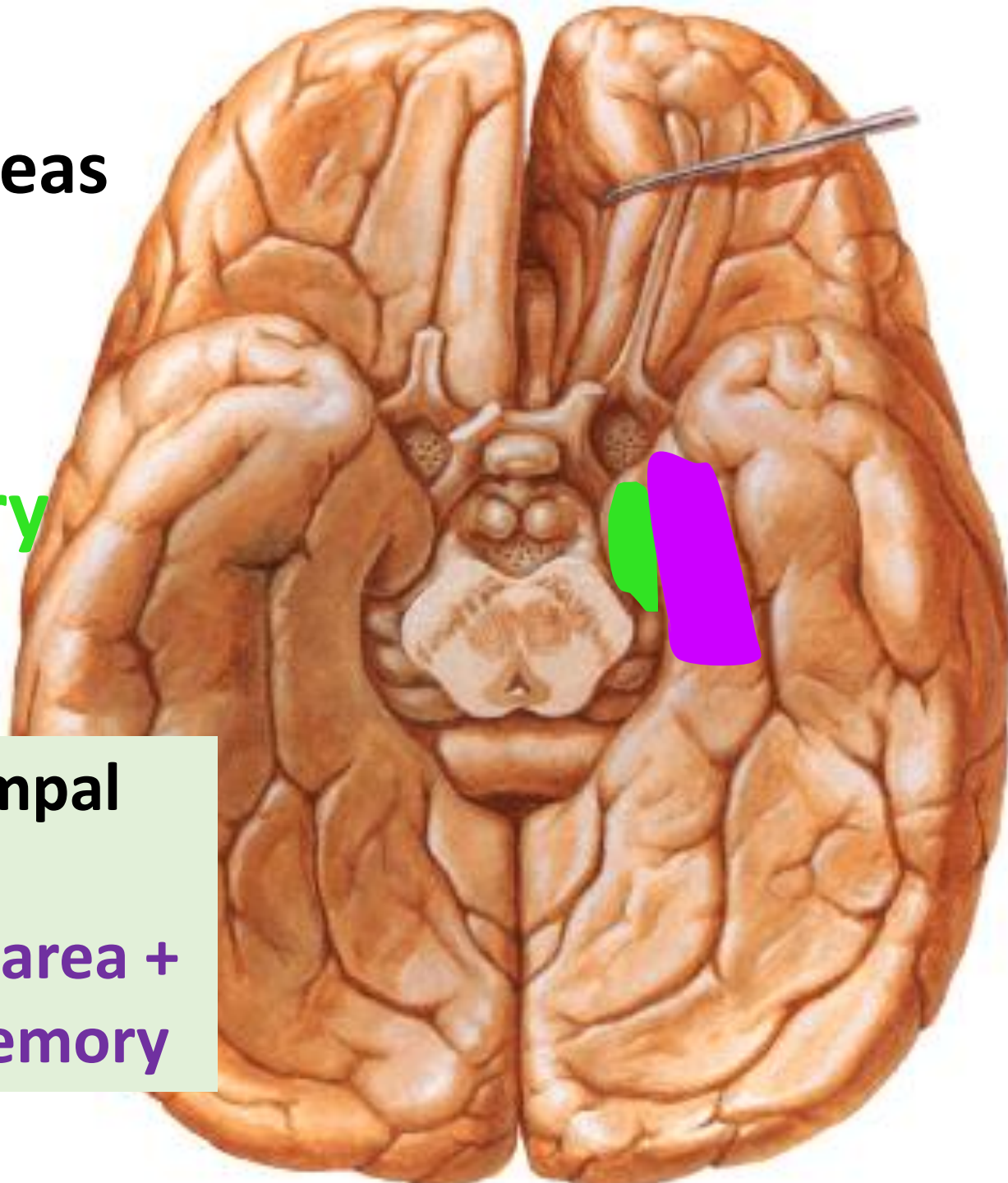
***Bilateral Lesion :
prosopagnosia → Inability
to recognize people by
faces***

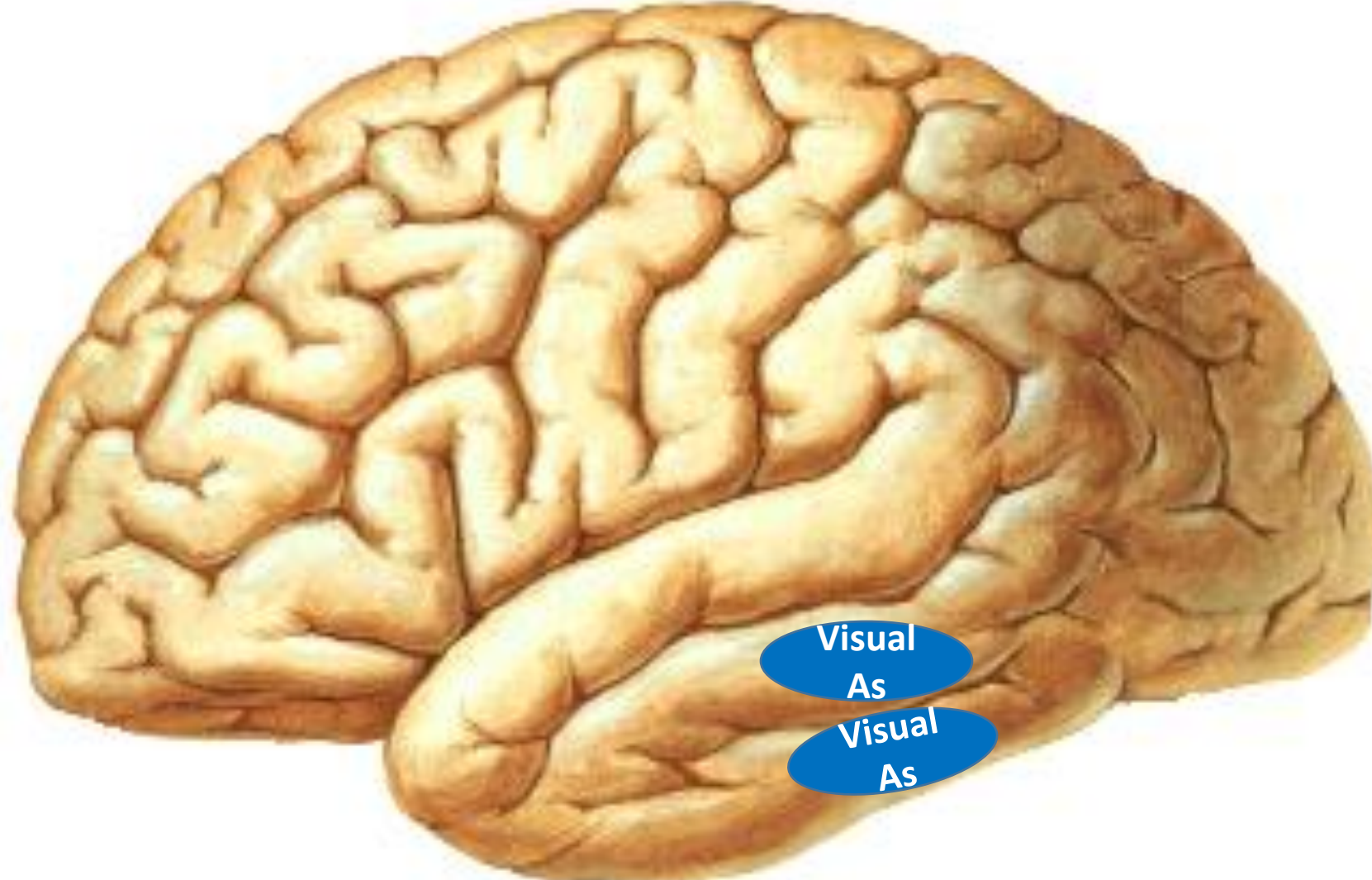


Olfactory areas

Uncus:
1ry olfactory
area

Parahippocampal
Gyrus :
2ry olfactory area +
Center for memory





Visual association areas in middle & inferior temporal gyri

What are you seeing?

Where in the surrounding is it found?

The occipital lobe



*Primary
visual
Area
A17*

*Visual
association
Areas
A18,19*

*Part of
Facial
recognition
area*

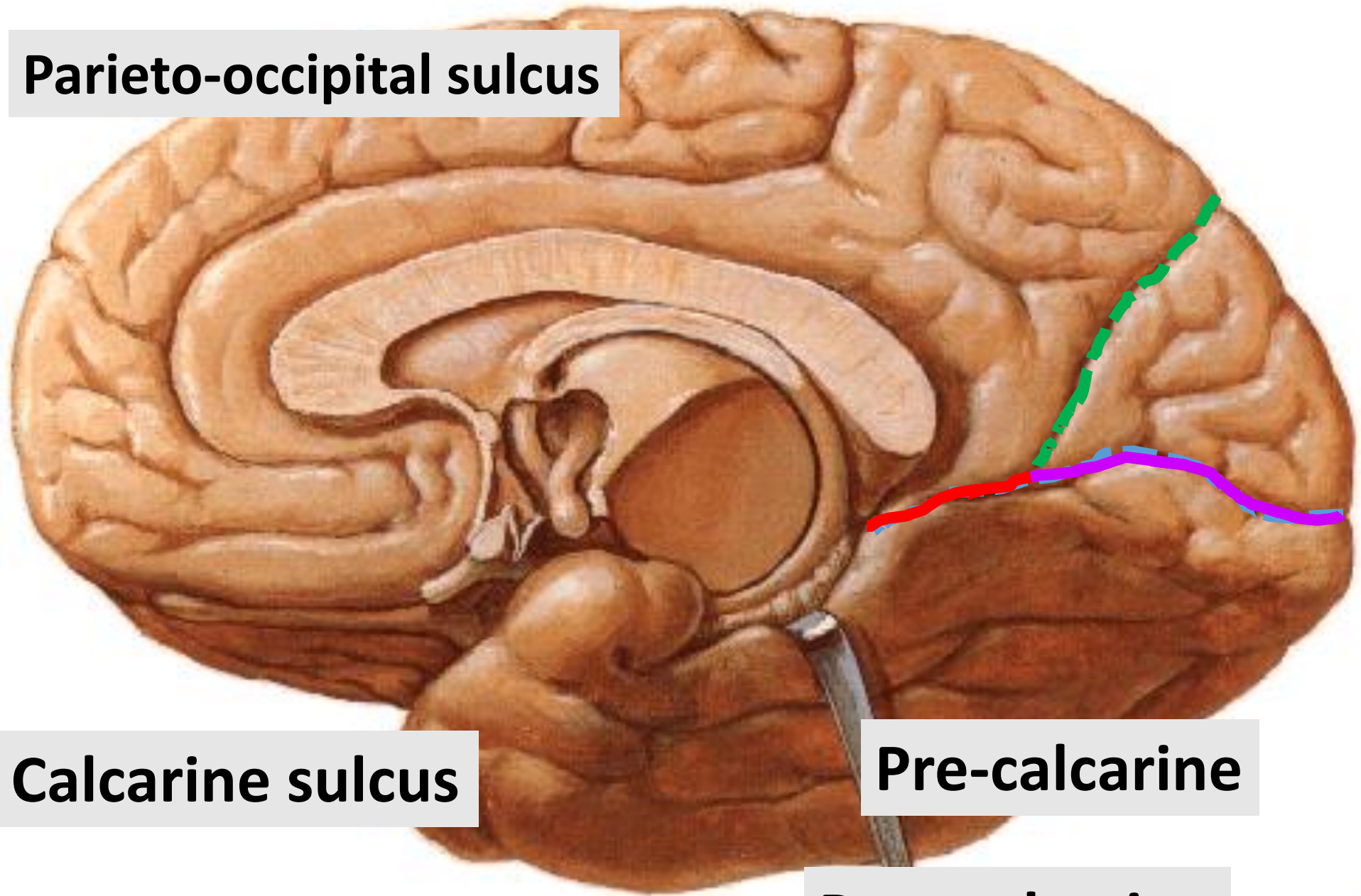
*Occipital
Eye
field*

Parieto-occipital sulcus

Calcarine sulcus

Pre-calcarine

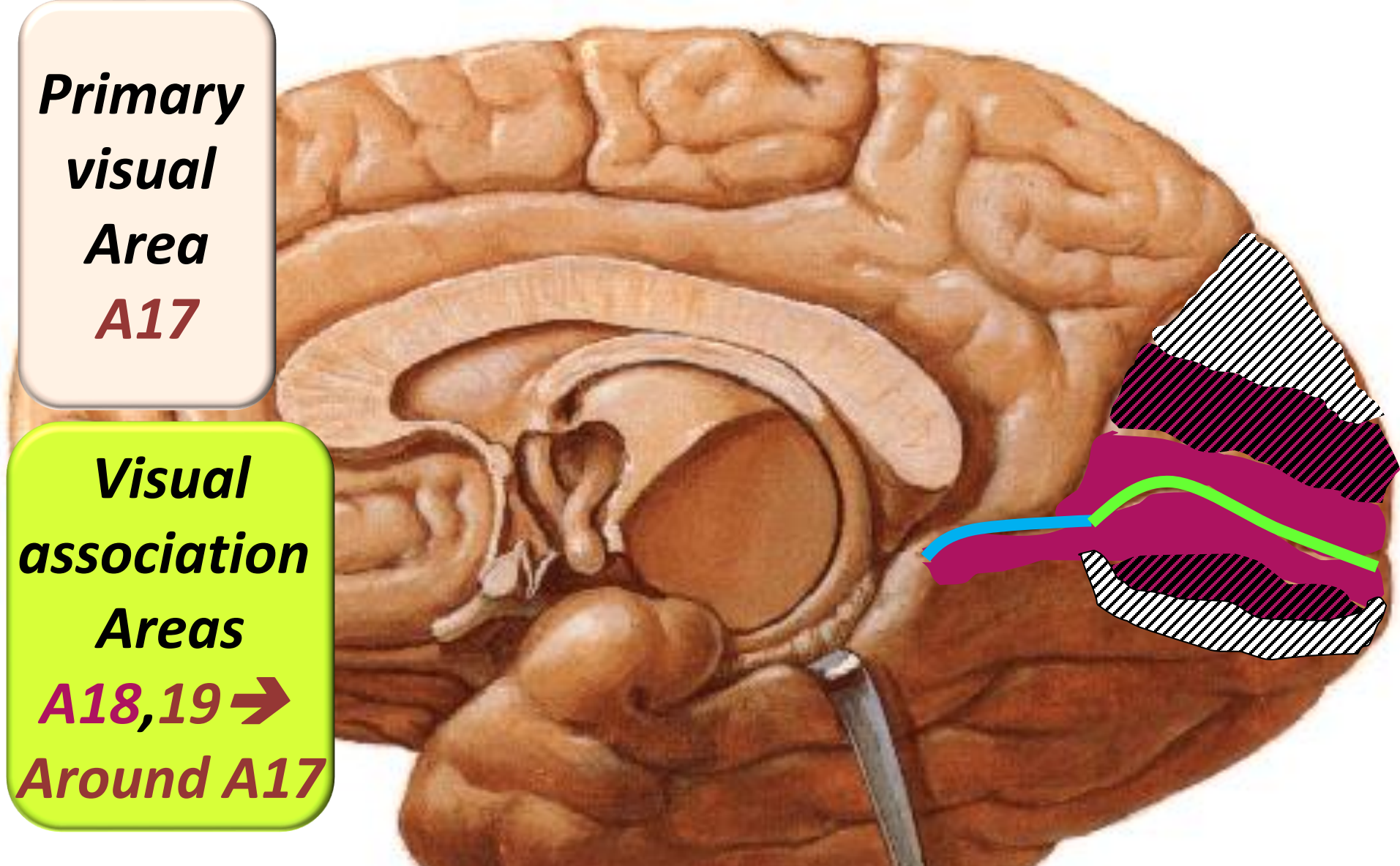
Post-calcarine



**Primary
visual
Area
A17**

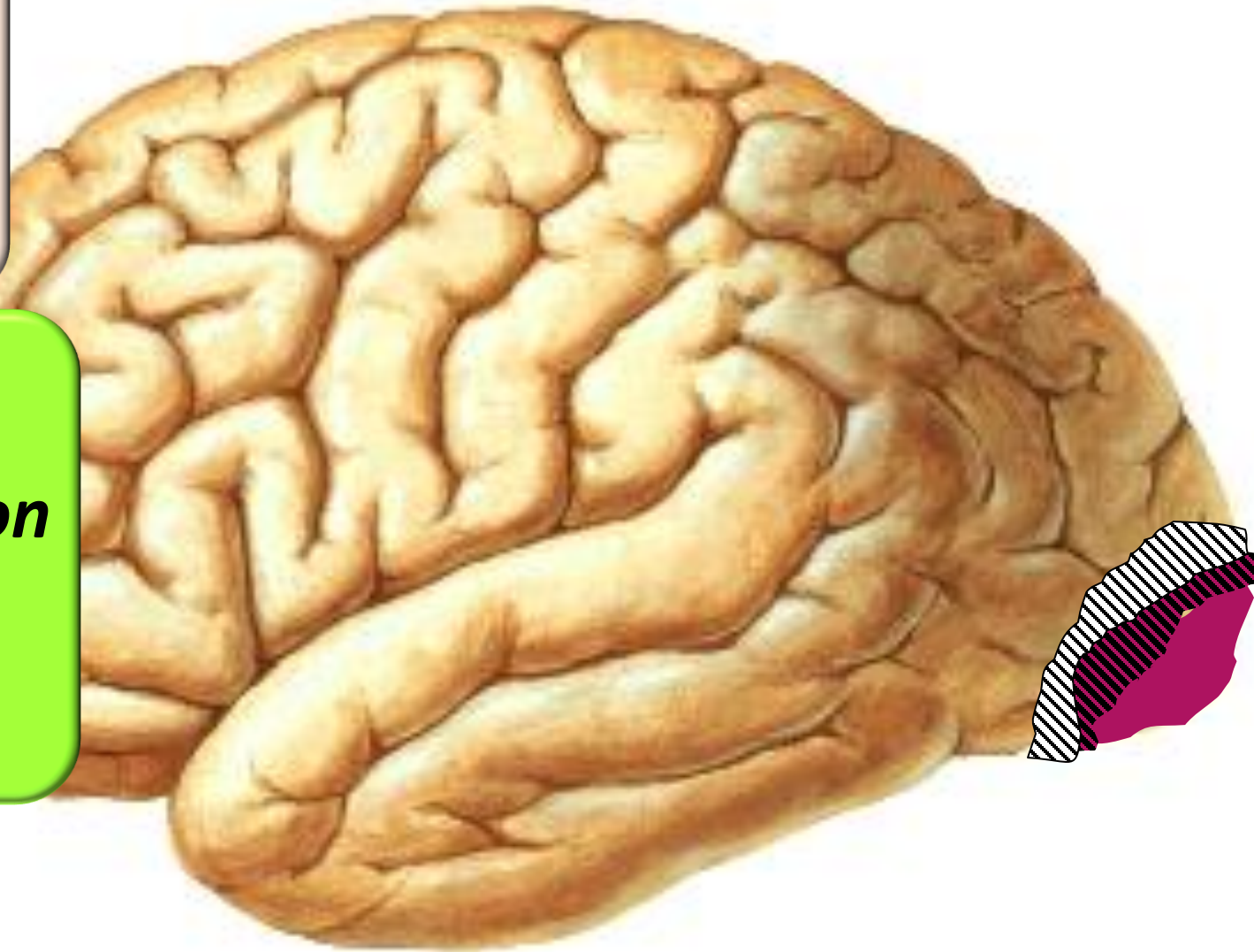
**Visual
association
Areas
A18,19 →
Around A17**

Area 17 → below precalcarine sulcus+ on both sides of postcalcarine sulcus+ extends on lat. surface till lunate sulcus



**Primary
visual
Area
A17**

**Visual
association
Areas
A18,19**



***Visual Association
Areas(A18,19)***

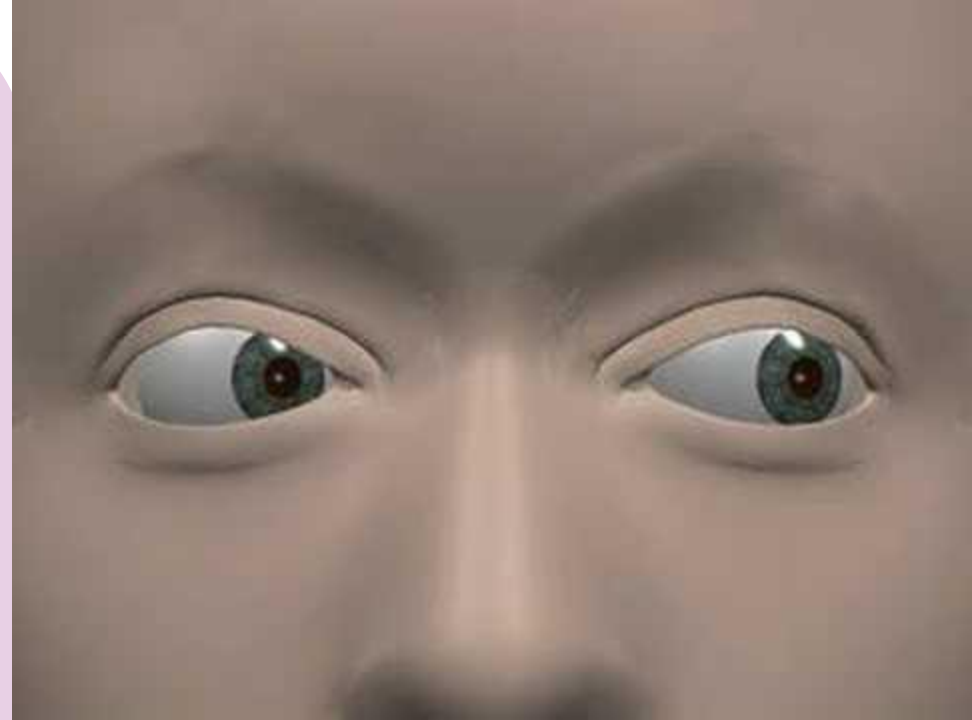
***Function : stores past visual
experience to identify
objects & help
discriminate colors***

***Lesion → visual agnosia
(patient can see BUT
can not identify what
he sees)***

Occipital Eye field

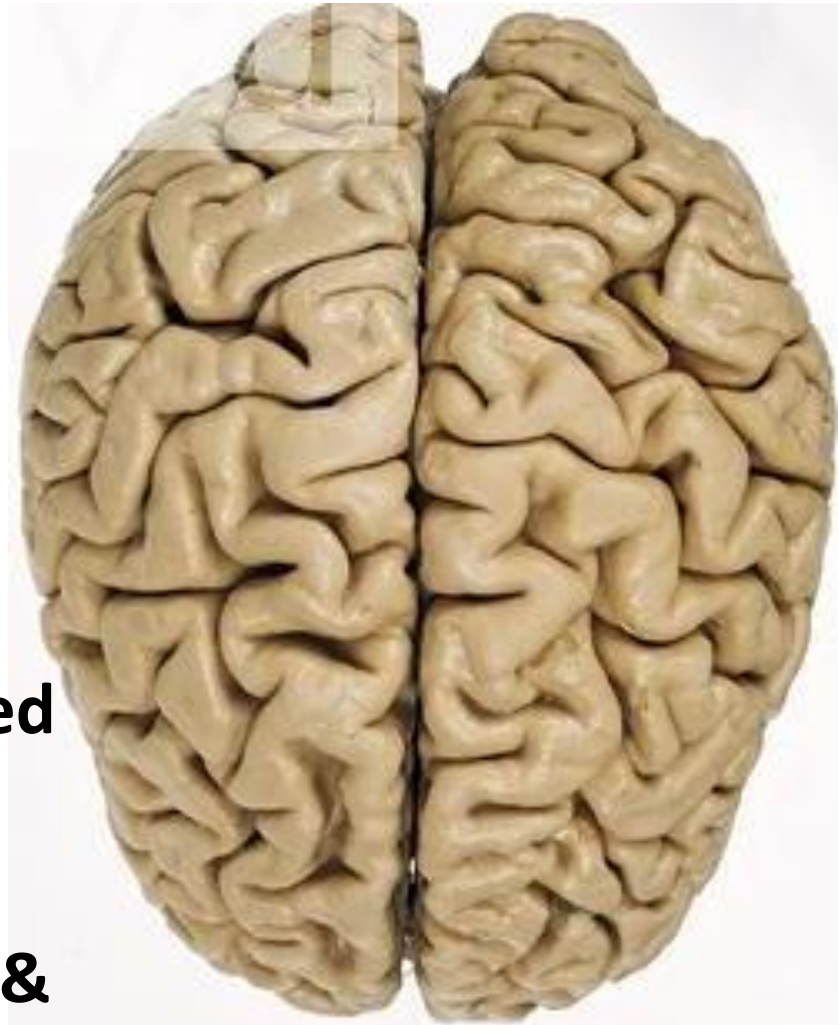
Site : in A18 & A19

***Responsible for
Involuntary (reflex)
Conjugate eye movement***

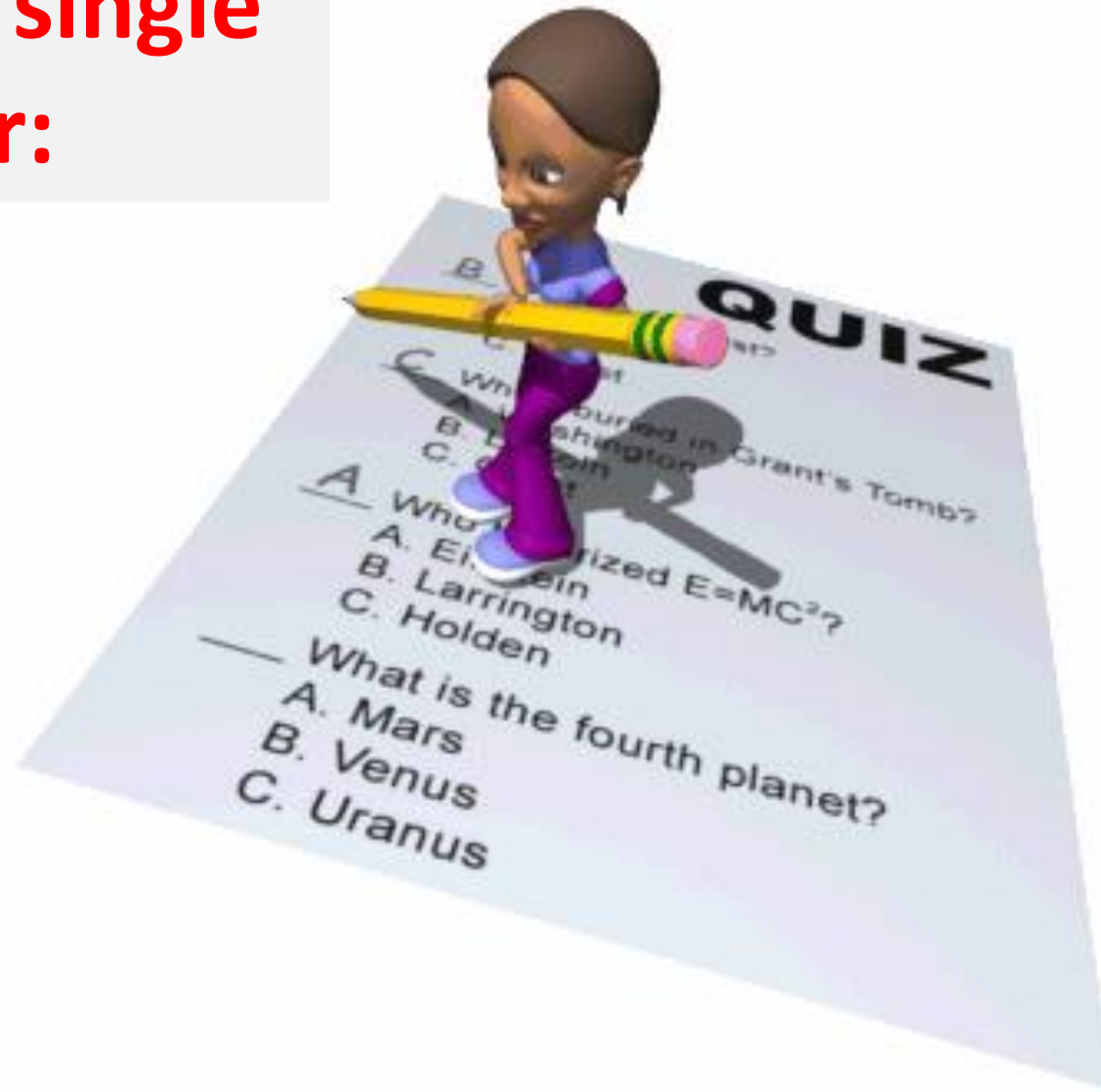


Cerebral Asymmetry

- ♣ Right & left hemispheres are **not identical** as regards sulci & gyri .
- ♣ Speech areas are present in one hemisphere only (Dominant Hemisphere)
- ♣ 80% of people are right -handed & in those ,the left hemisphere is the Dominant hemisphere.
- ♣ 10% of people are left-handed & 10% are mixed -handed and in both , the right or left hemisphere may be dominant.

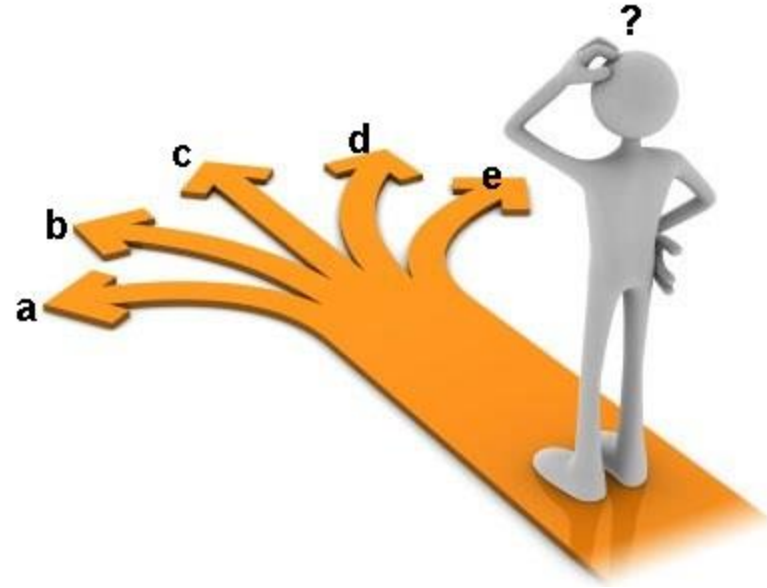


Choose the single
best answer:



Broca's area lies in :

- A. Prefrontal area**
- B. Parietal lobe**
- C. Parietal & temporal lobes**
- D. Inferior frontal gyrus**
- E. Superior temporal gyrus**



**Cortical areas in the temporal lobe
include which of the following?**

A. taste area

B. part of Broca's area

C. second somatosensory area

D. visual association area

E. superior speech center

Answer is D in both questions

**Thank
You**

Reference:

Clinical Neuroanatomy, Richard Snell, 7th edition

Sulci & gyri : Pages 257-262

Functional areas : Pages 288-295