

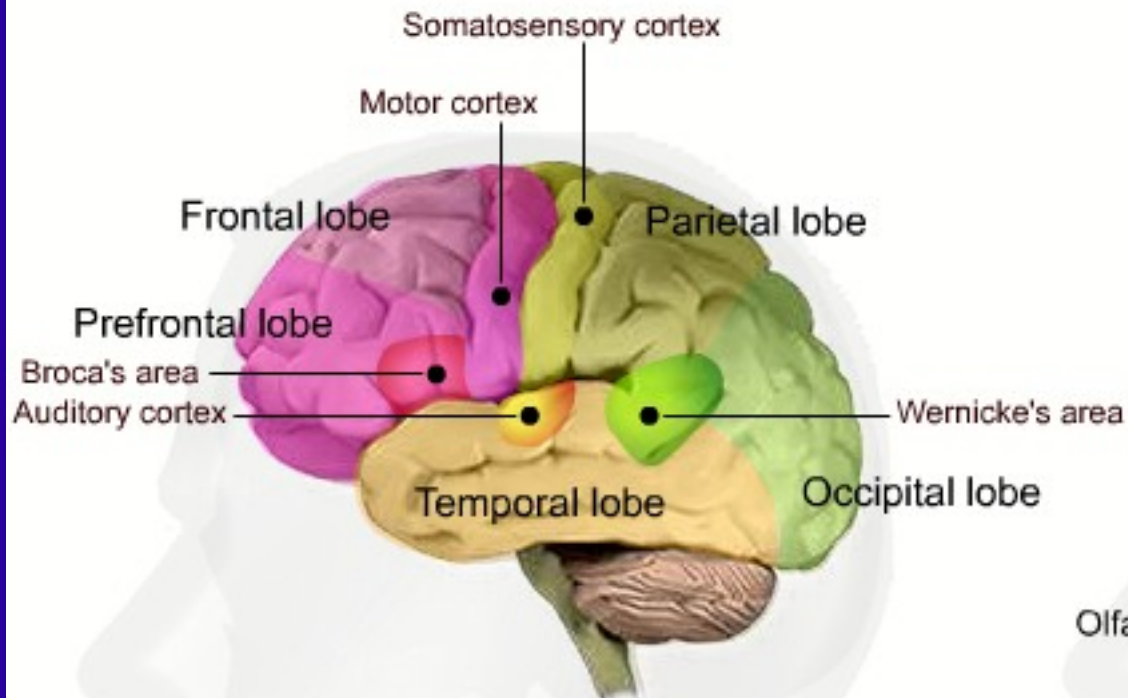
A few notions of brain anatomy

Christophe Pallier

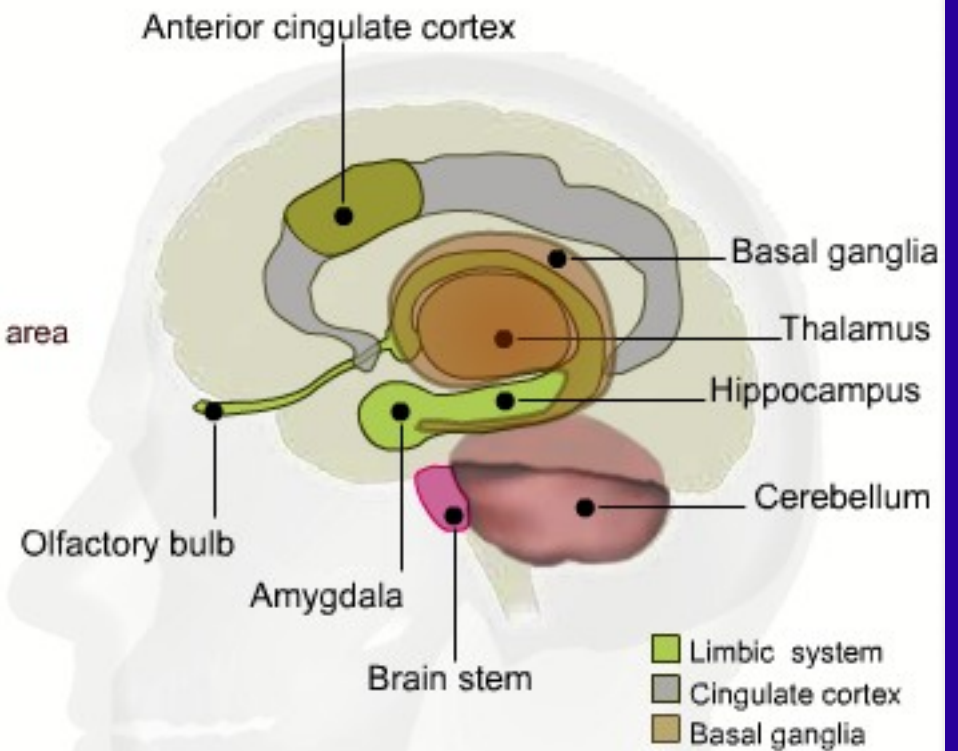
CNRS, INSERM 562, Orsay, France

Note some slides were taken from lectures available from the excellent web site 'fMRI for dummies' by Jody Culham.

The lobes

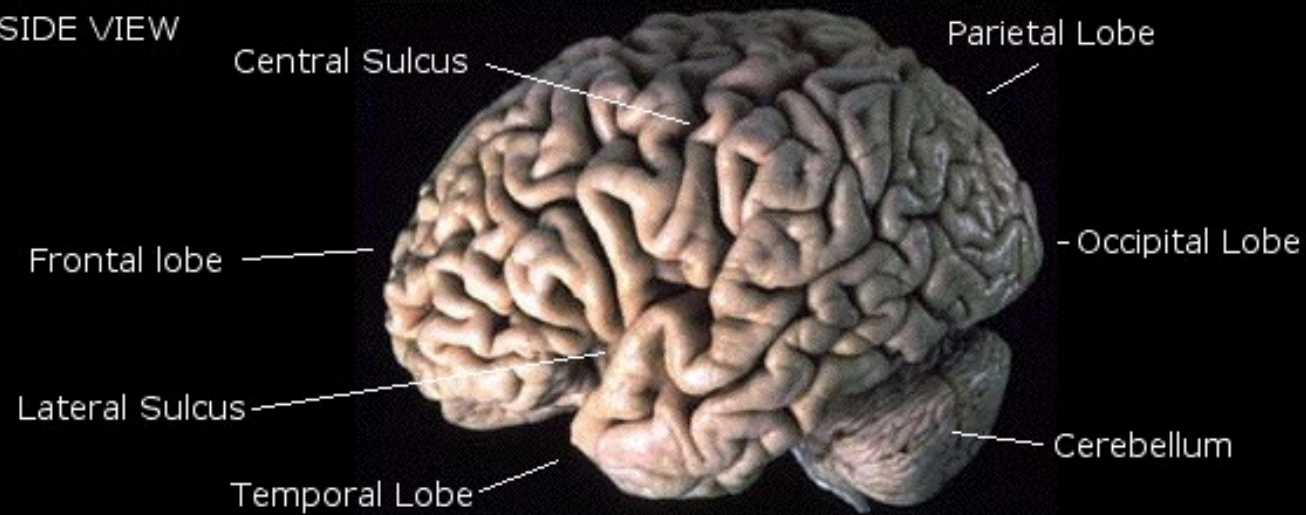


Inside the brain

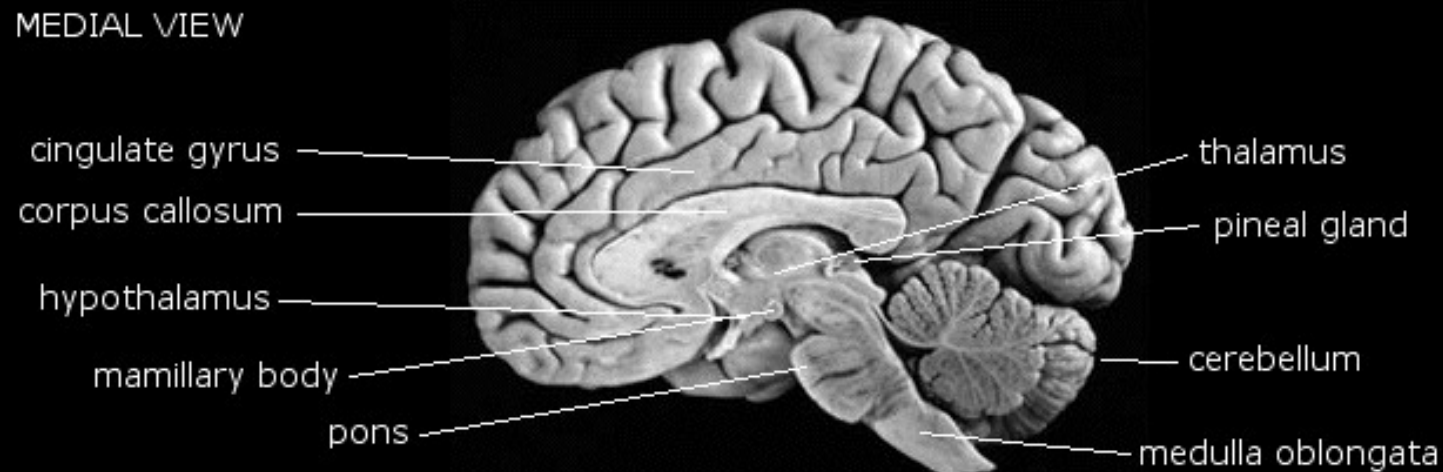


Drawing from H. Phillips & C. Tollet

LEFT SIDE VIEW



MEDIAL VIEW



Images from The Virtual Hospital

(<http://www.vh.org/Providers/Textbooks/BrainAnatomy/BrainAnatomy.html>)

INSIDE THE RIGHT HEMISPHERE

Corona Radiata

Caudate Nucleus

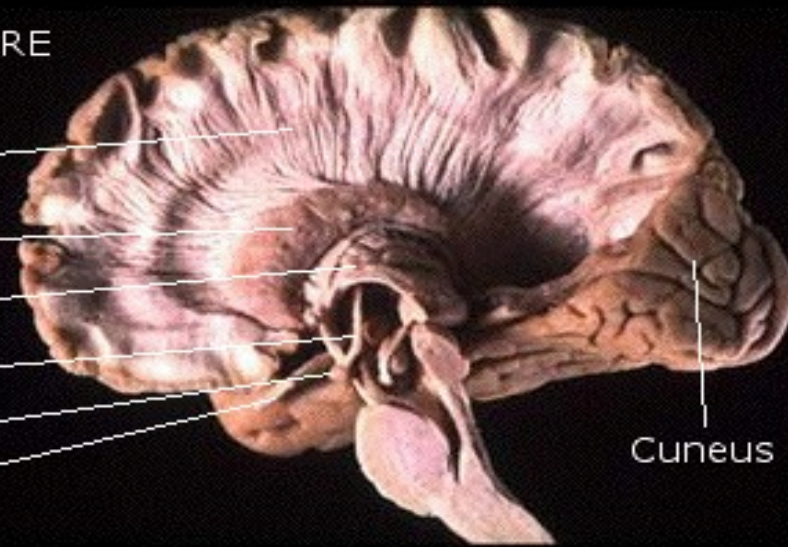
Thalamus

Hypothalamus

Mamillary Body

Optic Tract

Cuneus



BOTTOM OF BRAIN

Brainstem and
Cerebellum removed

Amygdaloid Body

Mamillary Body

Olfactory Bulb

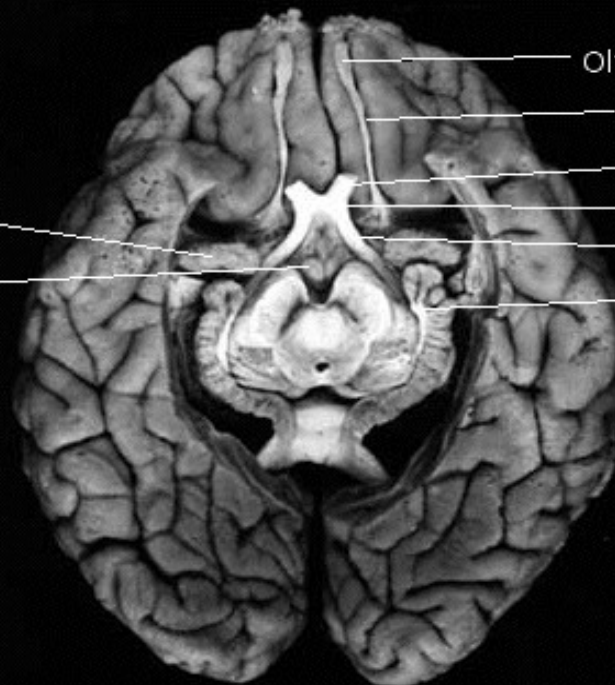
Olfactory Tract

Optic Nerve

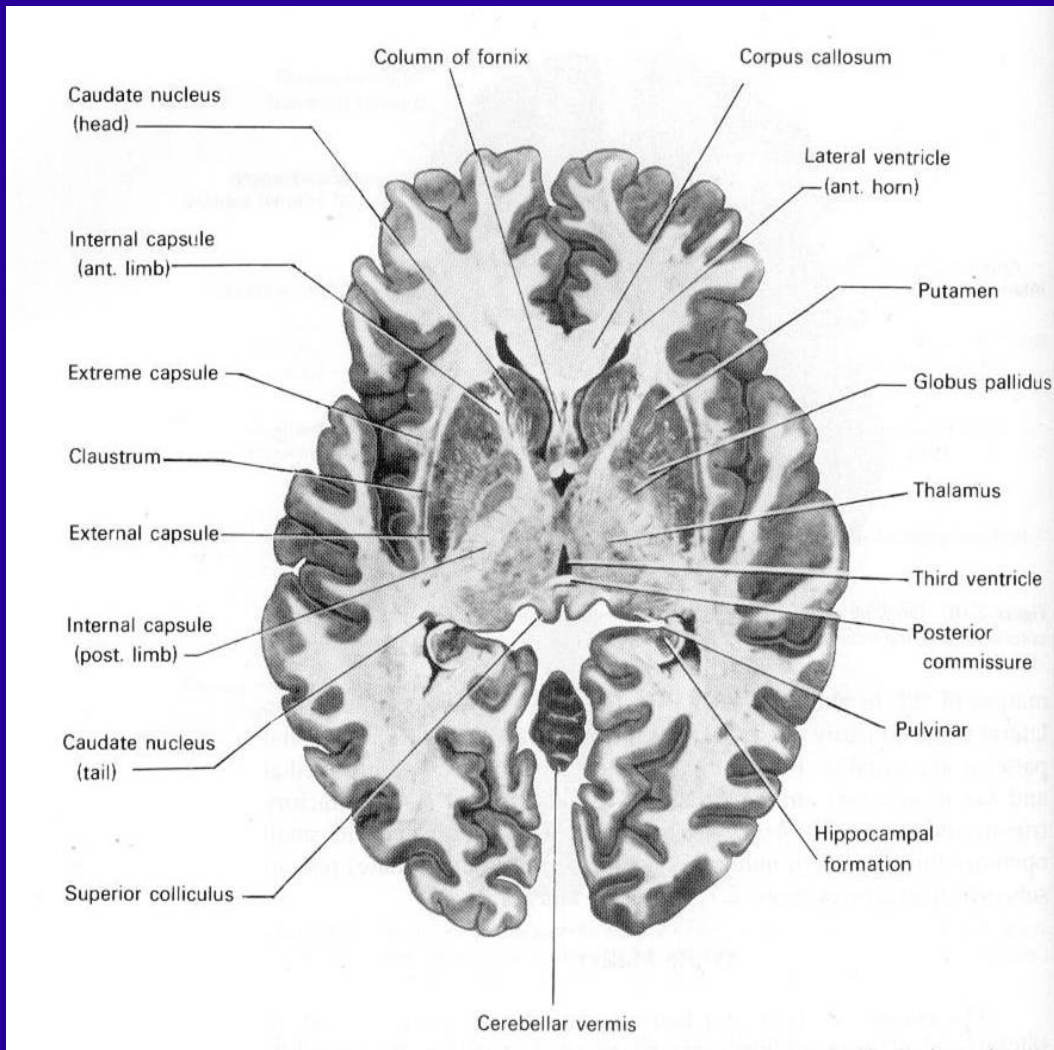
Optic Chiasma

Optic Tract

Hippocampus



Cortex (vs. subcortical structures)

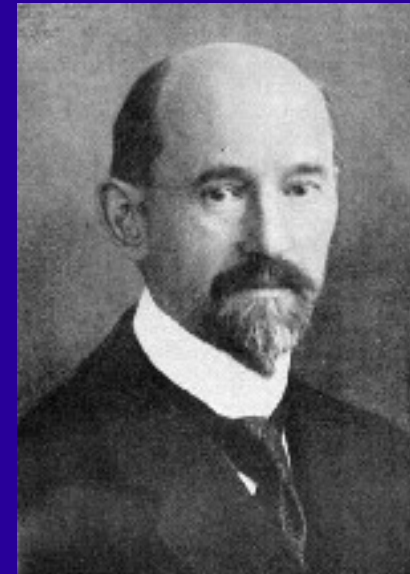
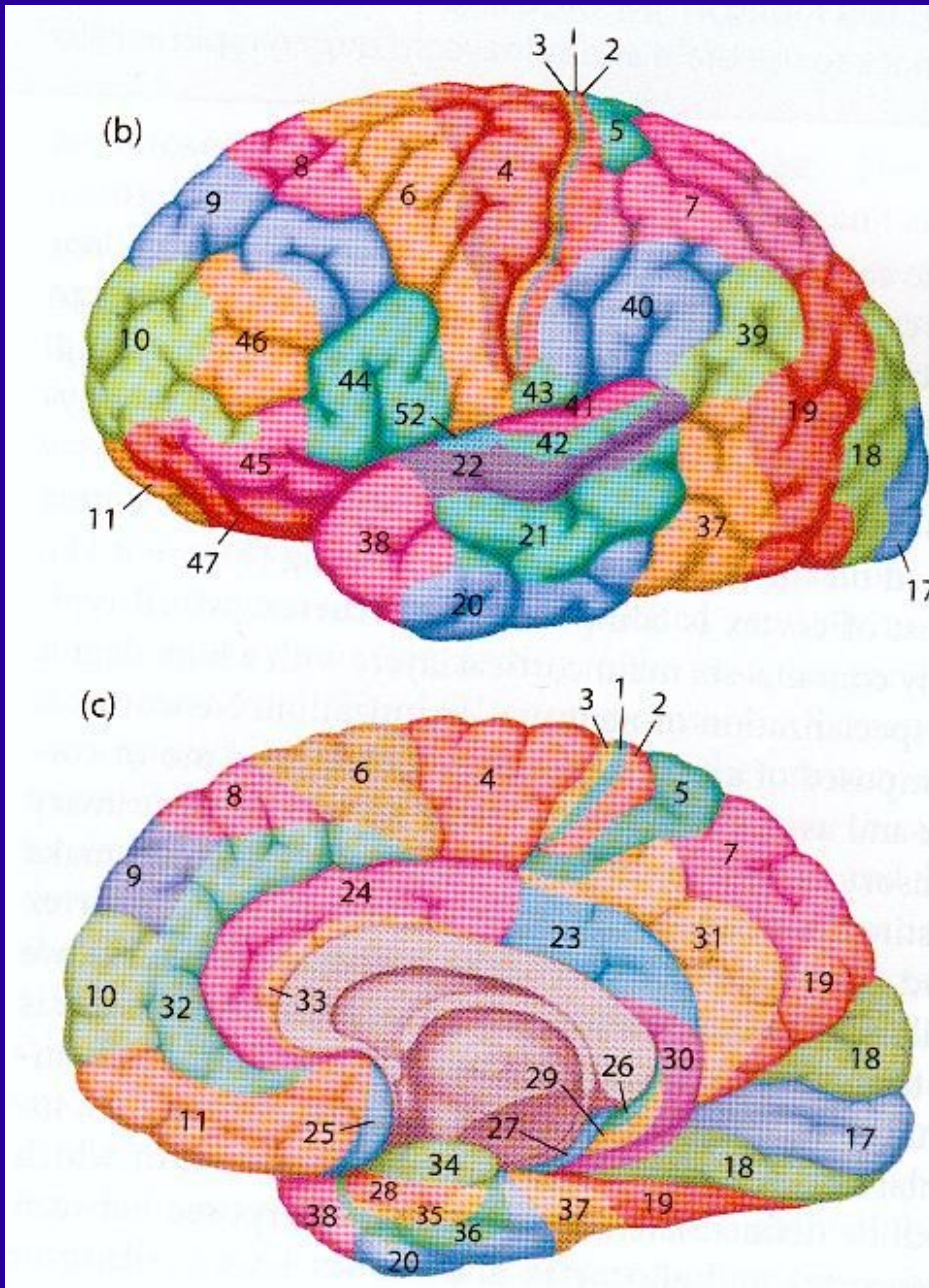


Total surface area of the cerebral cortex = 2,500 cm²
(elephant = 6300; dolphin = 3750)

Number of neurons $\sim 10^{10}$ (glial cells $\sim 10\sim 50$ times more)

Cortex thickness ~ 1.5 to 4 mm

Brodmann's Areas



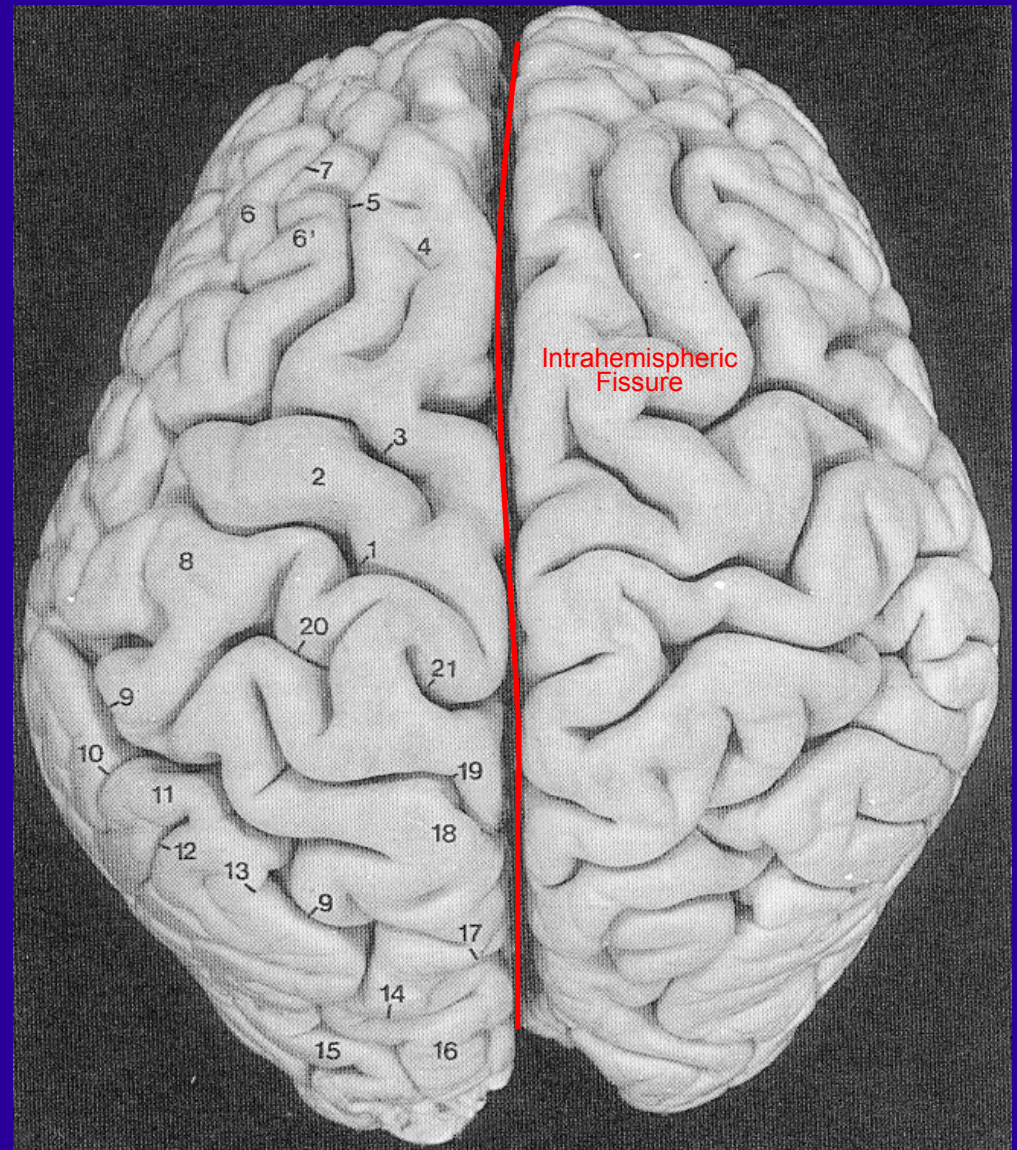
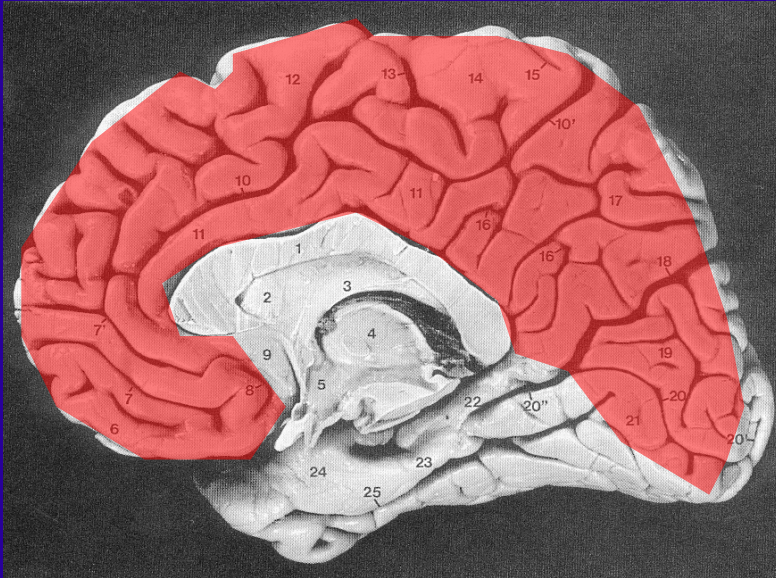
Brodmann (1905):

Based on cytoarchitectonics: study of differences in cortical layers between areas
Most common delineation of cortical areas
More recent schemes subdivide Brodmann's areas into many smaller regions
Monkey and human Brodmann's areas not necessarily homologous



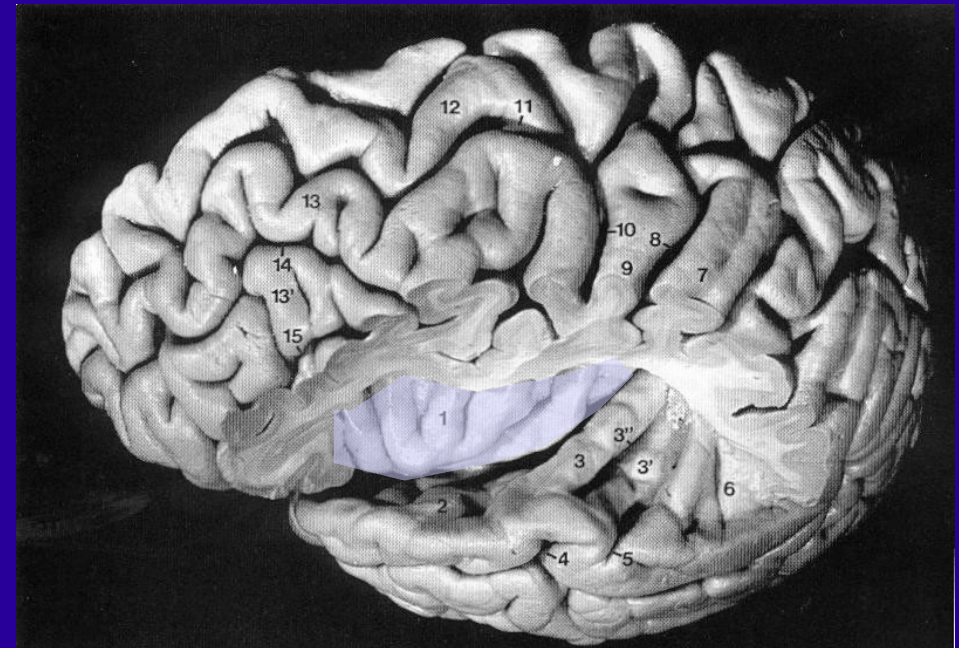
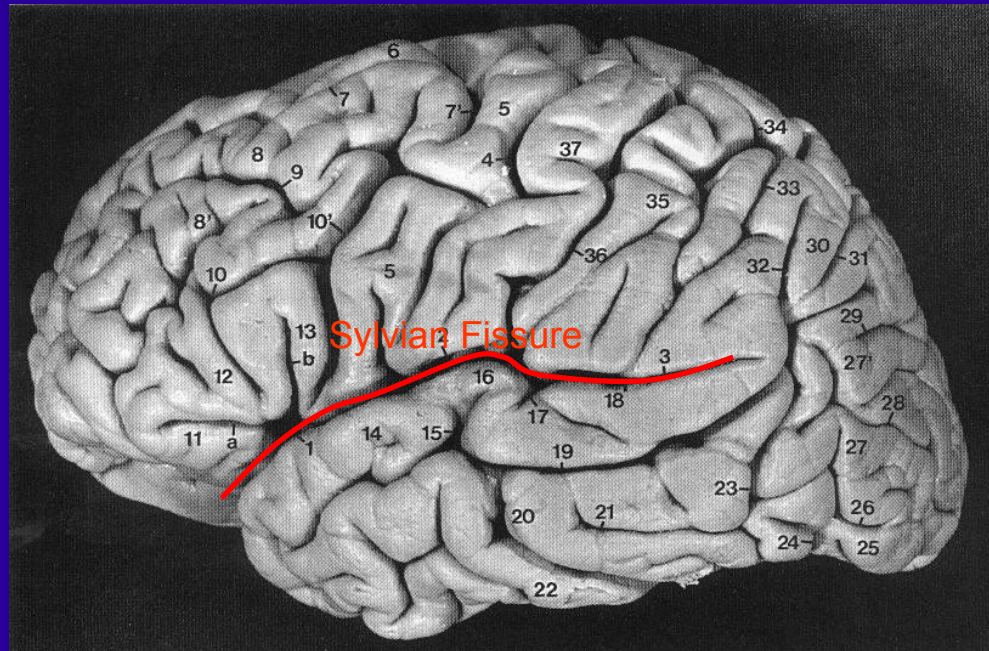
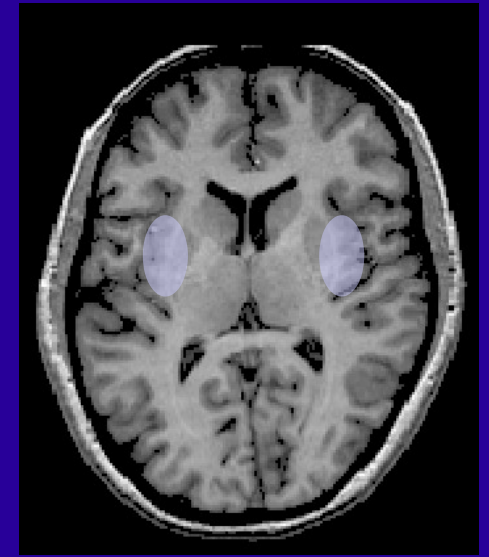
Interhemispheric Fissure

- hugely deep (down to corpus callosum)
- divides brain into 2 hemispheres



Sylvian Fissure

- hugely deep
- mostly horizontal
- insula (purple) is buried within it
- separates temporal lobe from parietal and frontal lobes



Superior and Inferior Temporal Sulci

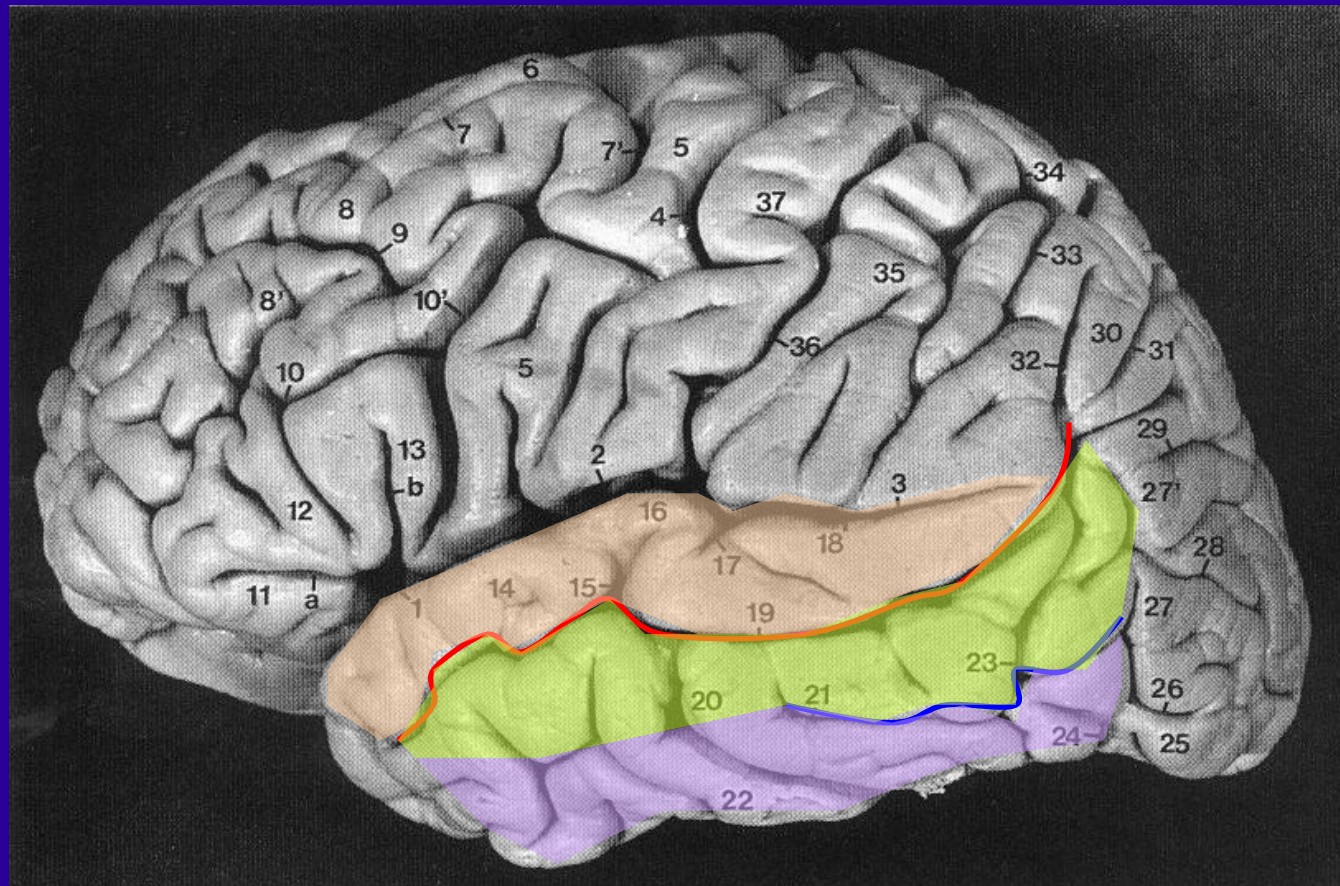
Superior Temporal Sulcus (red)

-divides superior temporal gyrus (peach) from middle temporal gyrus (lime)

Inferior Temporal Sulcus (blue)

-not usually very continuous

-divides middle temporal gyrus from inferior temporal gyrus (lavender)



Central, Postcentral and Precentral Sulci

Central Sulcus (red)

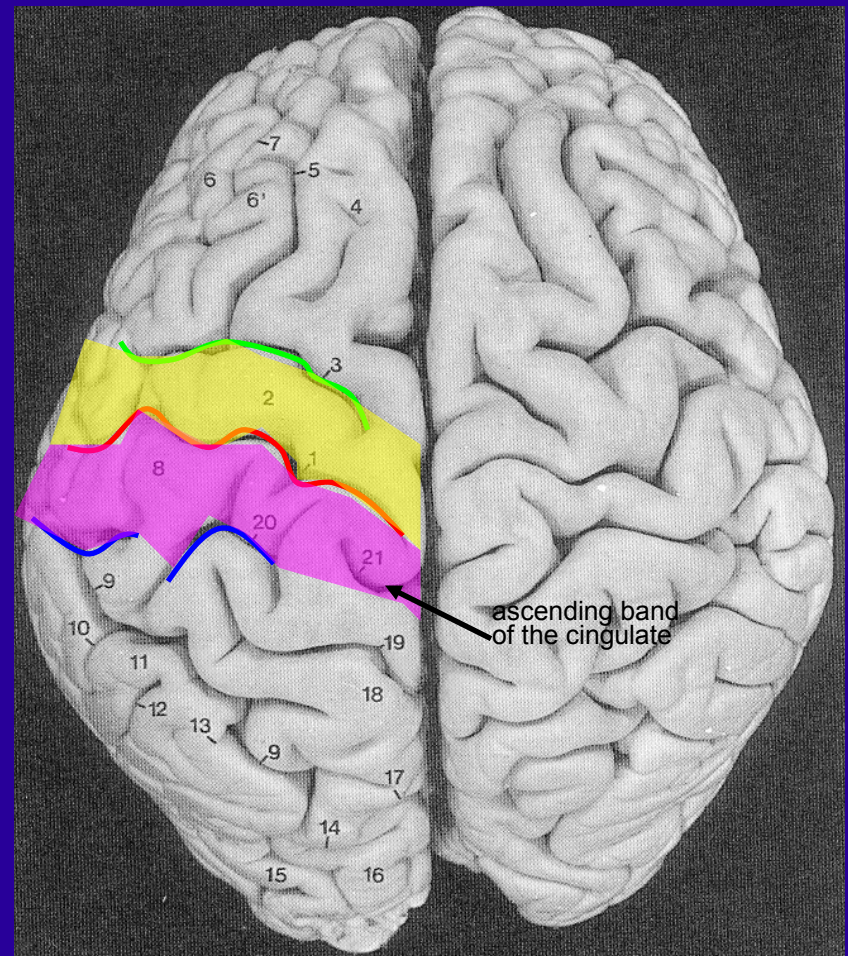
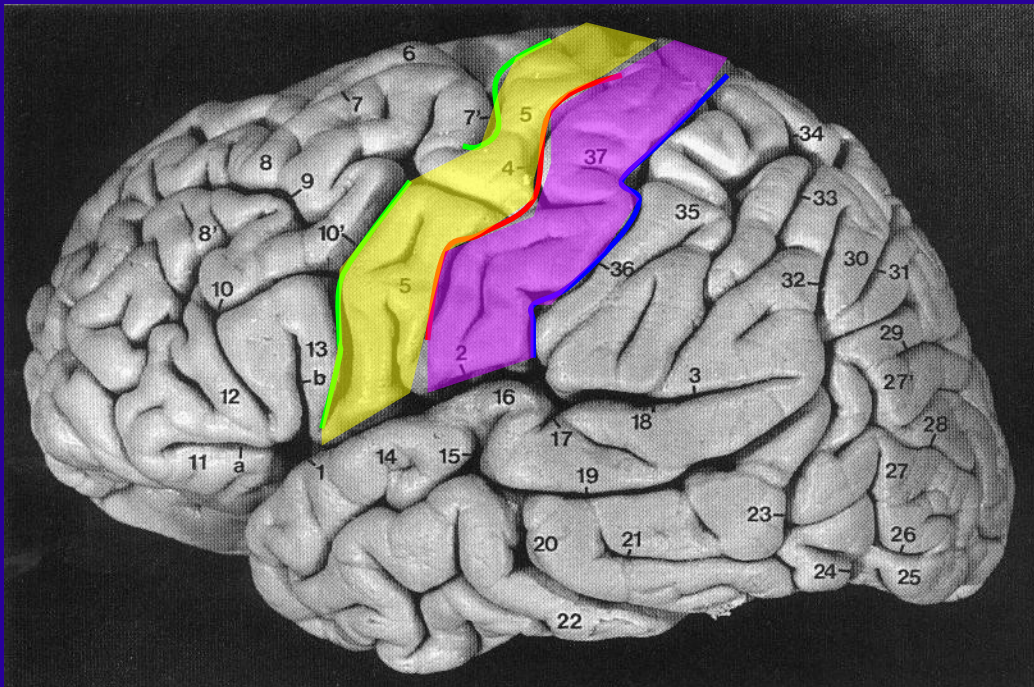
- usually freestanding (no intersections)
- just anterior to ascending cingulate

Precentral Sulcus (red)

- often in two parts (superior and inferior)
- intersects with superior frontal sulcus (T-junction)
- marks anterior end of precentral gyrus (motor strip, yellow)

Postcentral Sulcus (red)

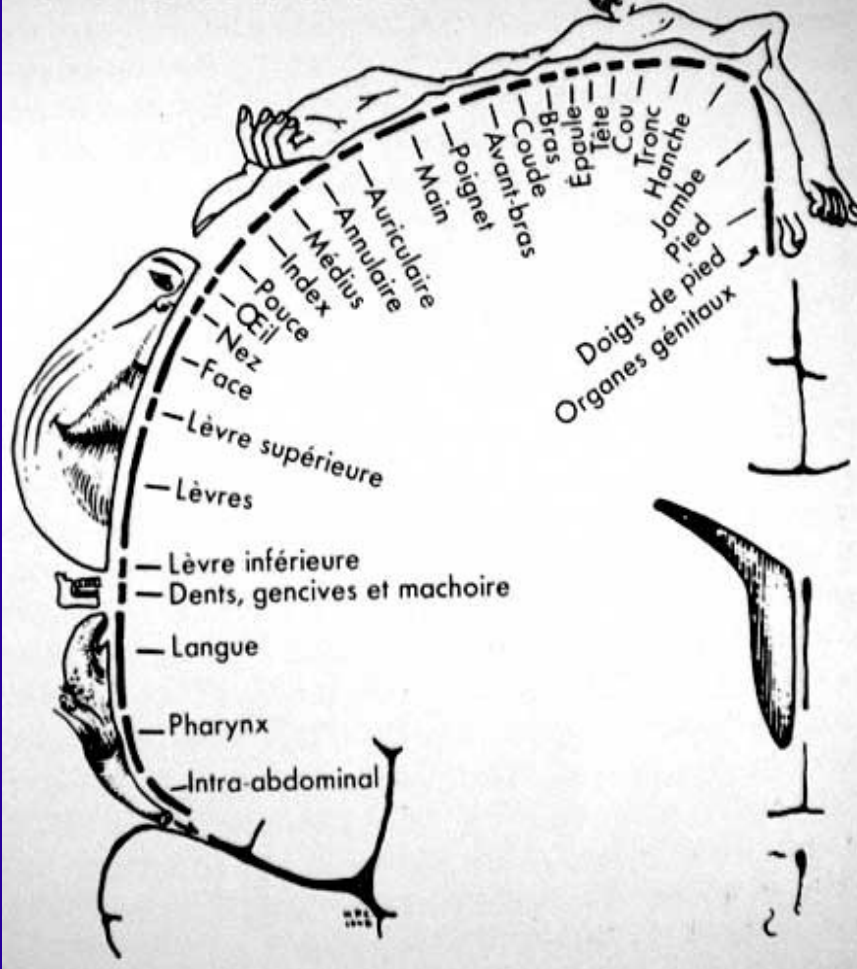
- often in two parts (superior and inferior)
- often intersects with intraparietal sulcus
- marks posterior end of postcentral gyrus (somatosensory strip, purple)



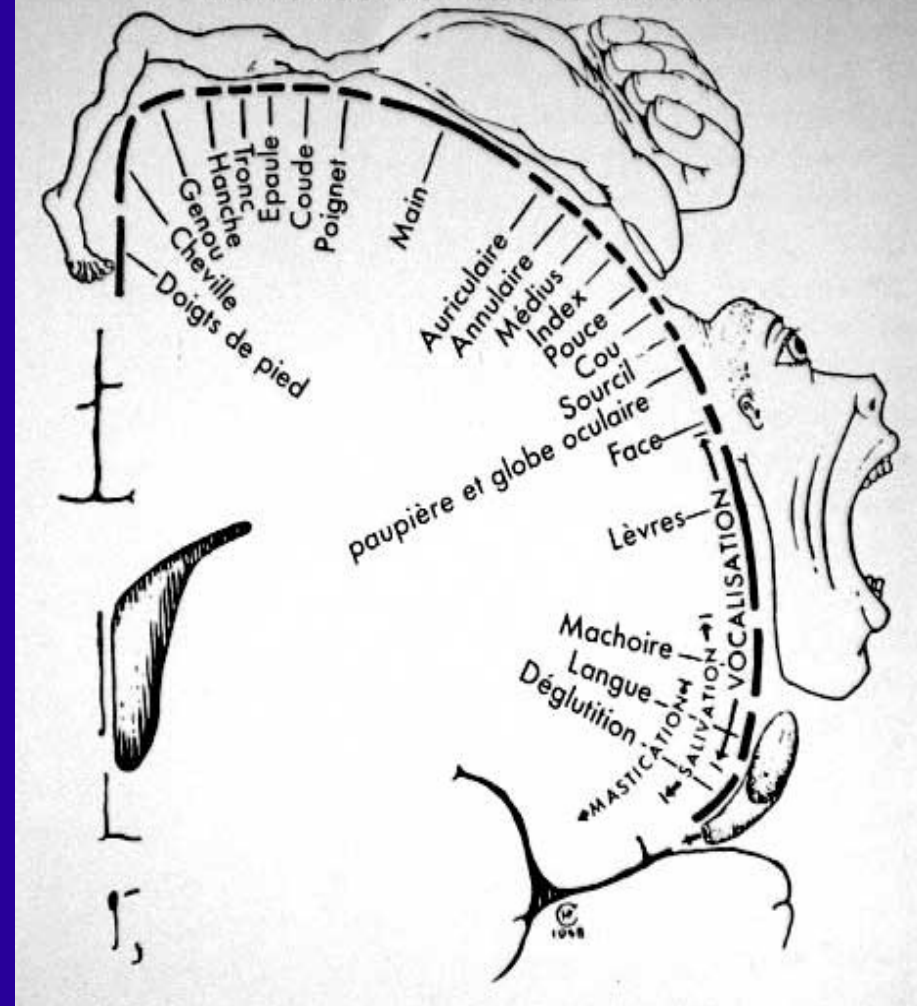
Penfield homonculus



HOMONCULUS sensoriel de PENFIELD



HOMONCULUS moteur de Penfield



Superior and Inferior Frontal Sulci

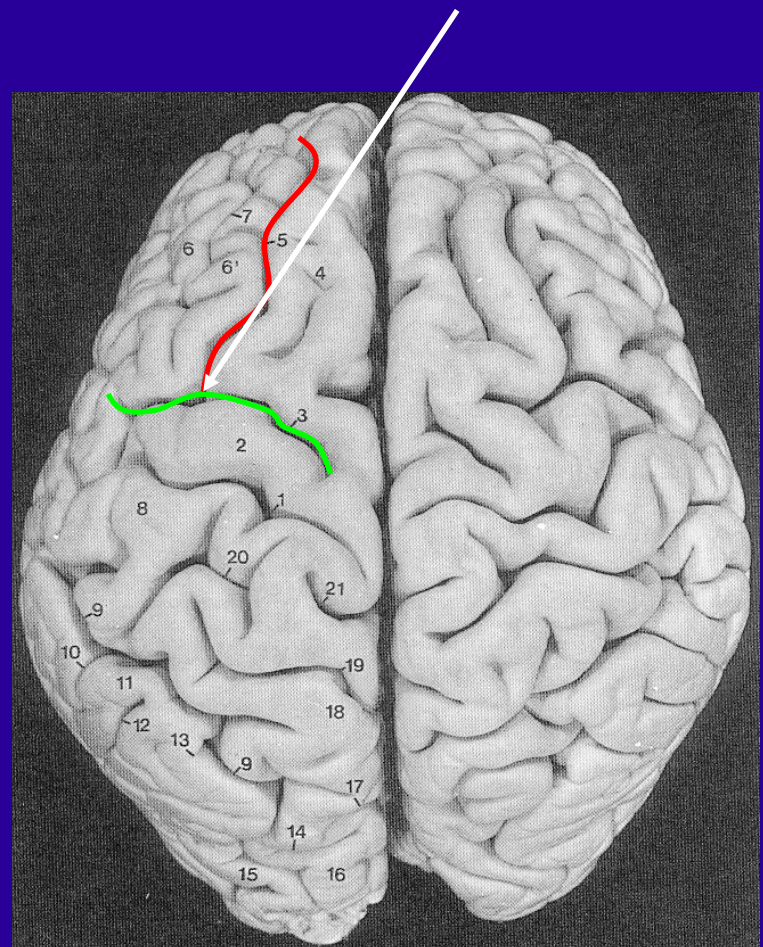
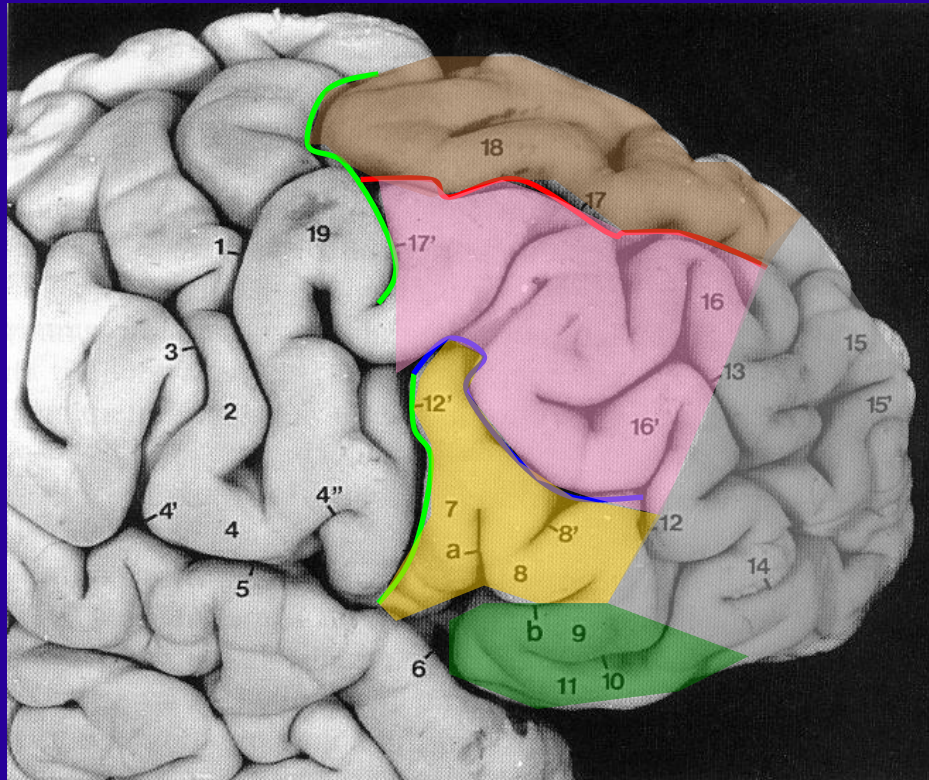
Superior Frontal Sulcus (red)

-divides superior frontal gyrus (mocha) from middle frontal gyrus (pink)

Inferior Frontal Sulcus (blue)

-divides middle frontal gyrus from inferior frontal gyrus (gold)

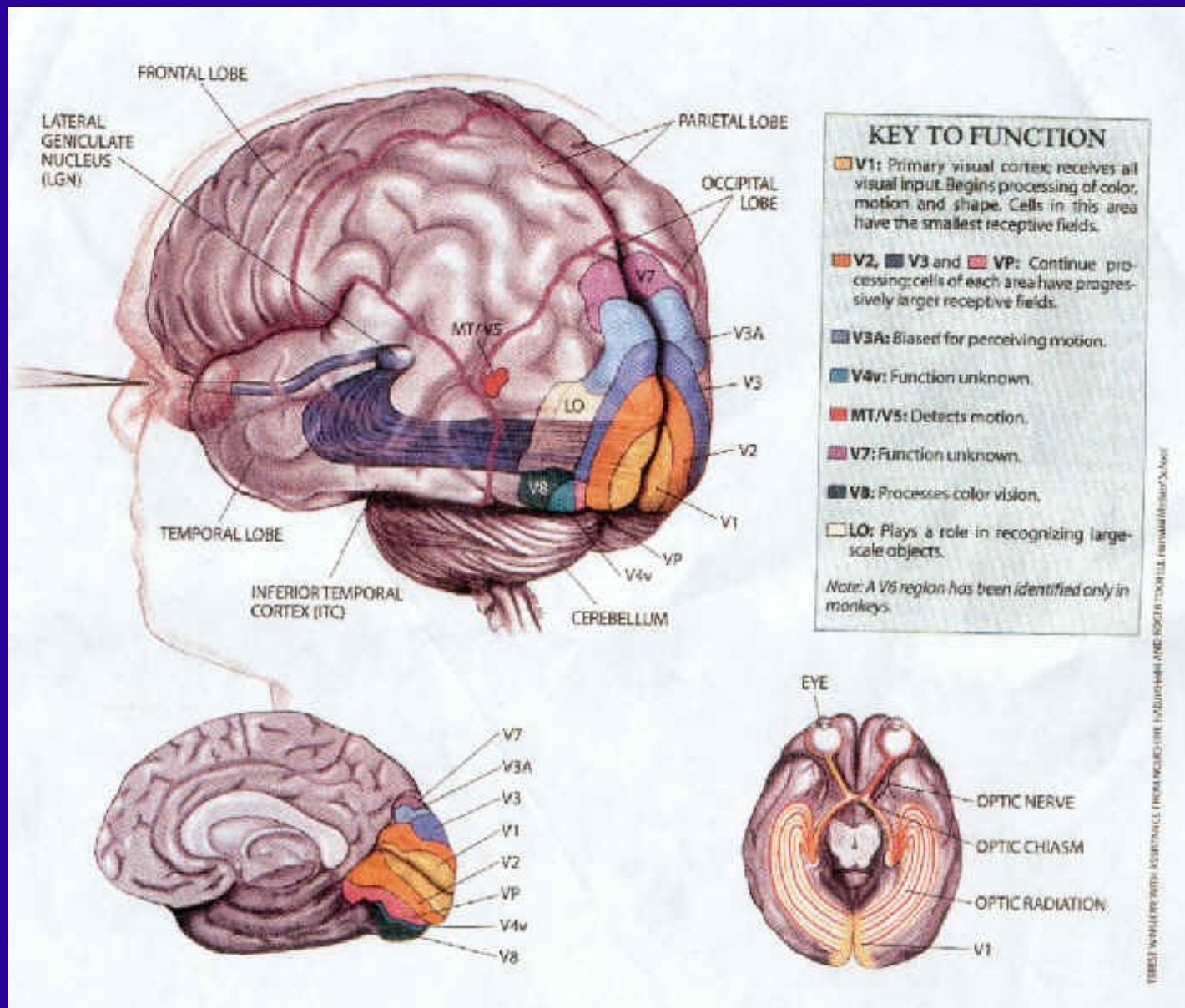
orbital gyrus (green) and frontal pole (gray) also shown



Frontal Eye fields lie at this junction



Early Visual Areas



Parieto-occipital Fissure and Calcarine Sulcus

Parieto-occipital fissure (red)

-very deep

-often Y-shaped from sagittal view, X-shaped in horizontal and coronal views

Calcarine sulcus (blue)

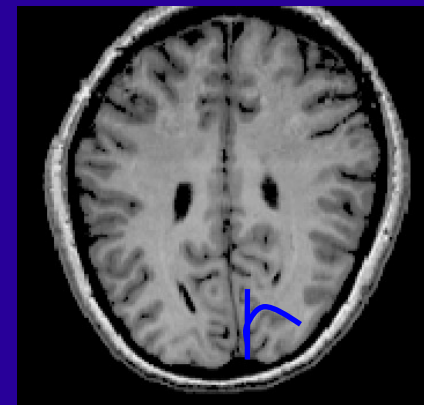
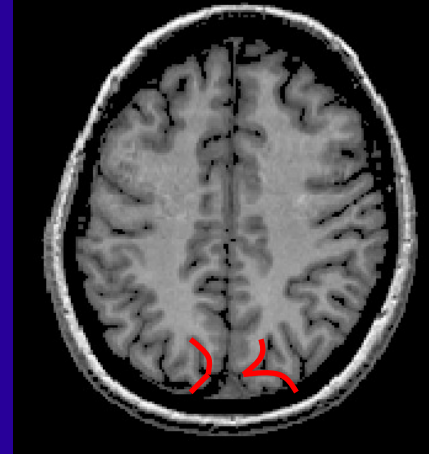
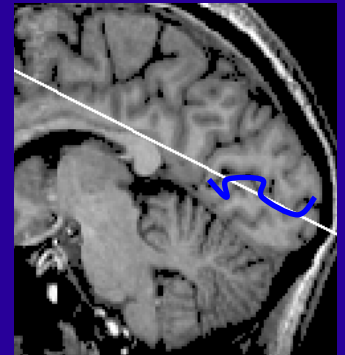
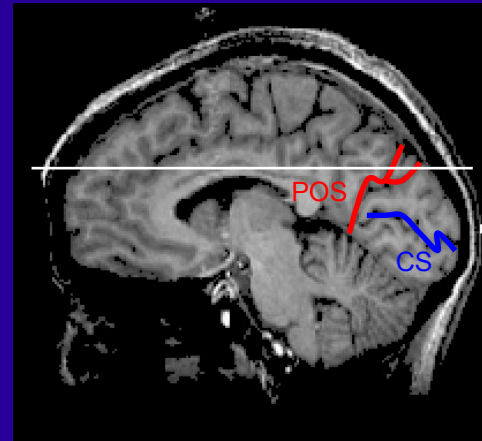
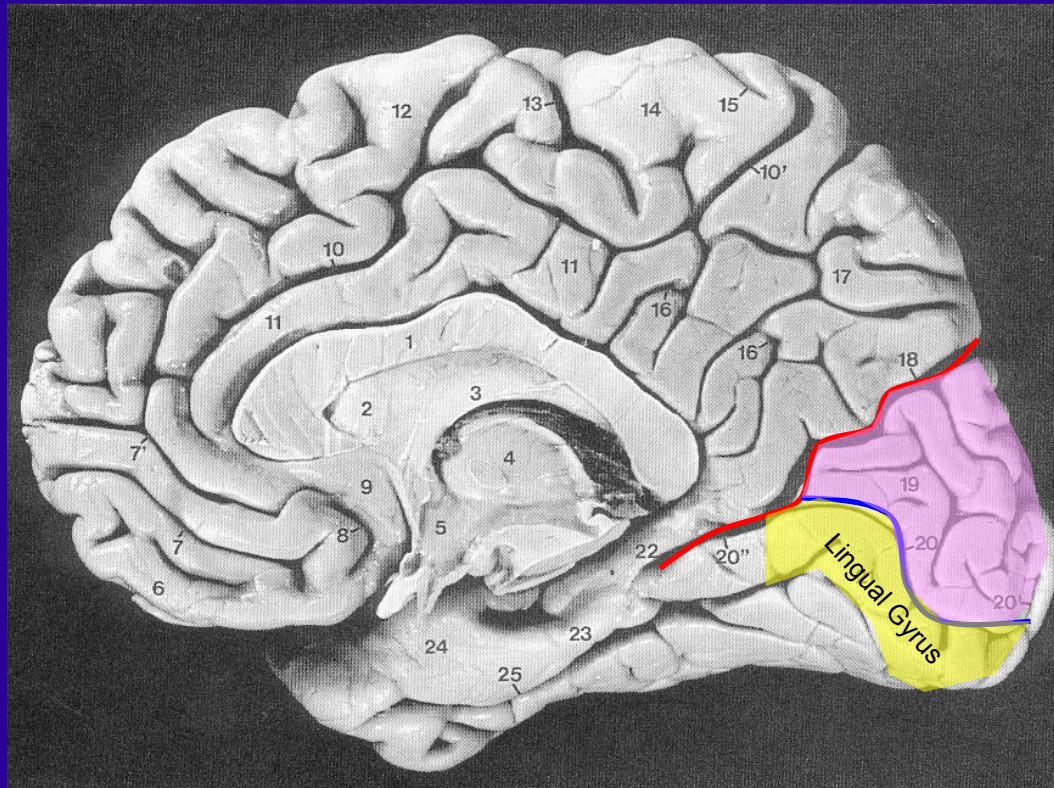
-contains V1

Cuneus (pink)

-visual areas on medial side above calcarine (lower visual field)

Lingual gyrus (yellow)

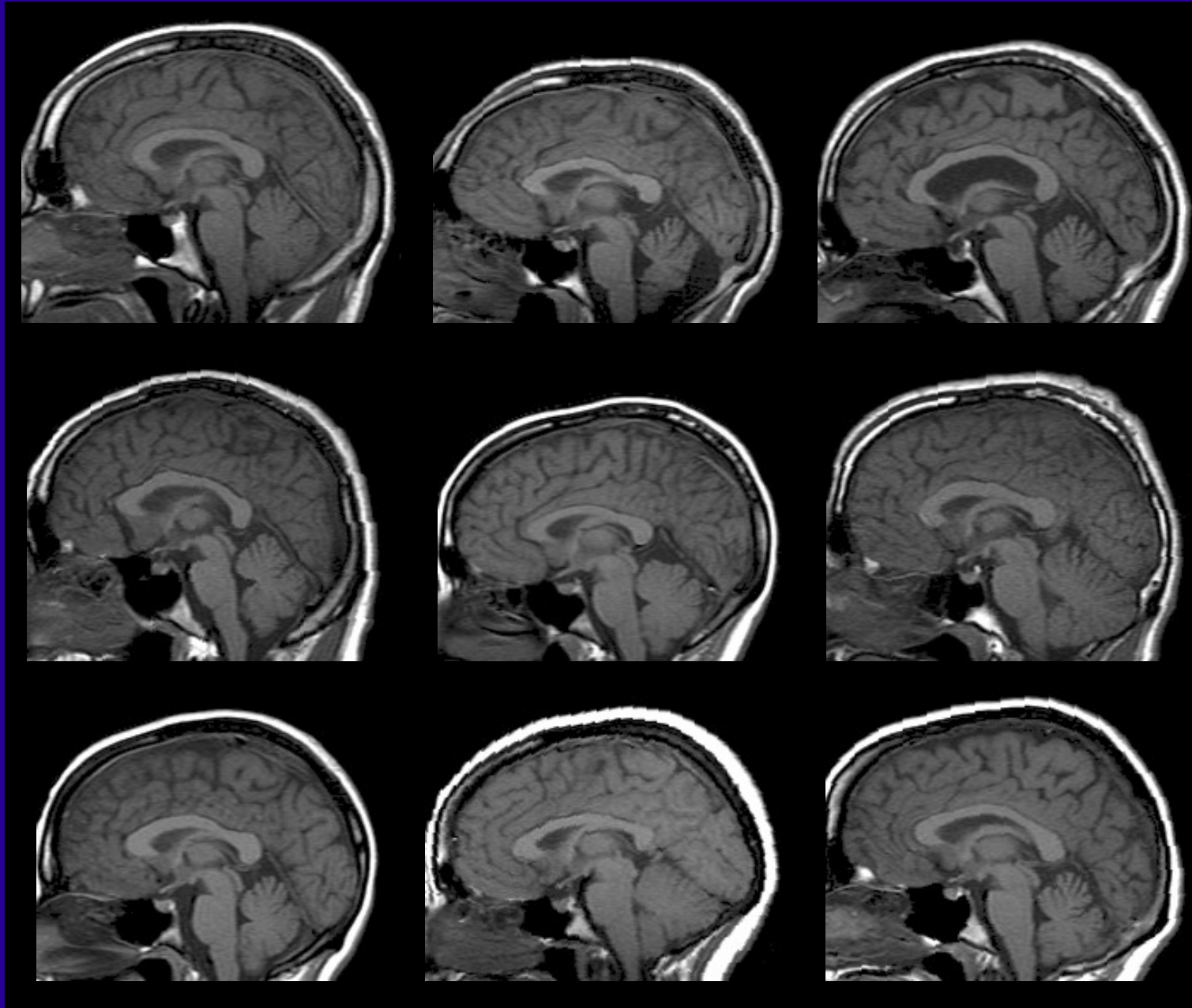
-visual areas on medial side below calcarine and above collateral sulcus (upper visual field)



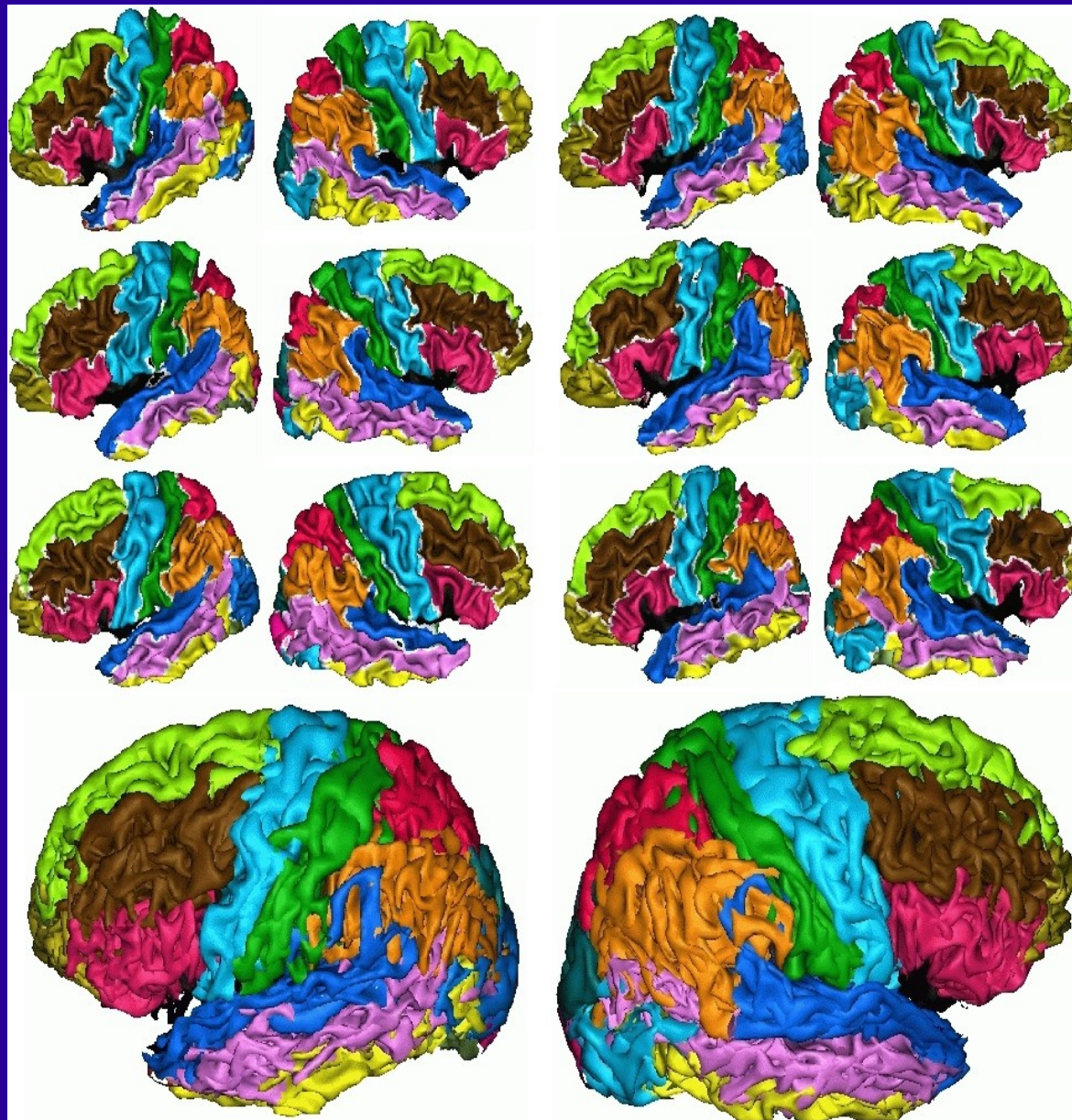
Atlases on the web

<http://www.med.harvard.edu/AANLIB/home.html>

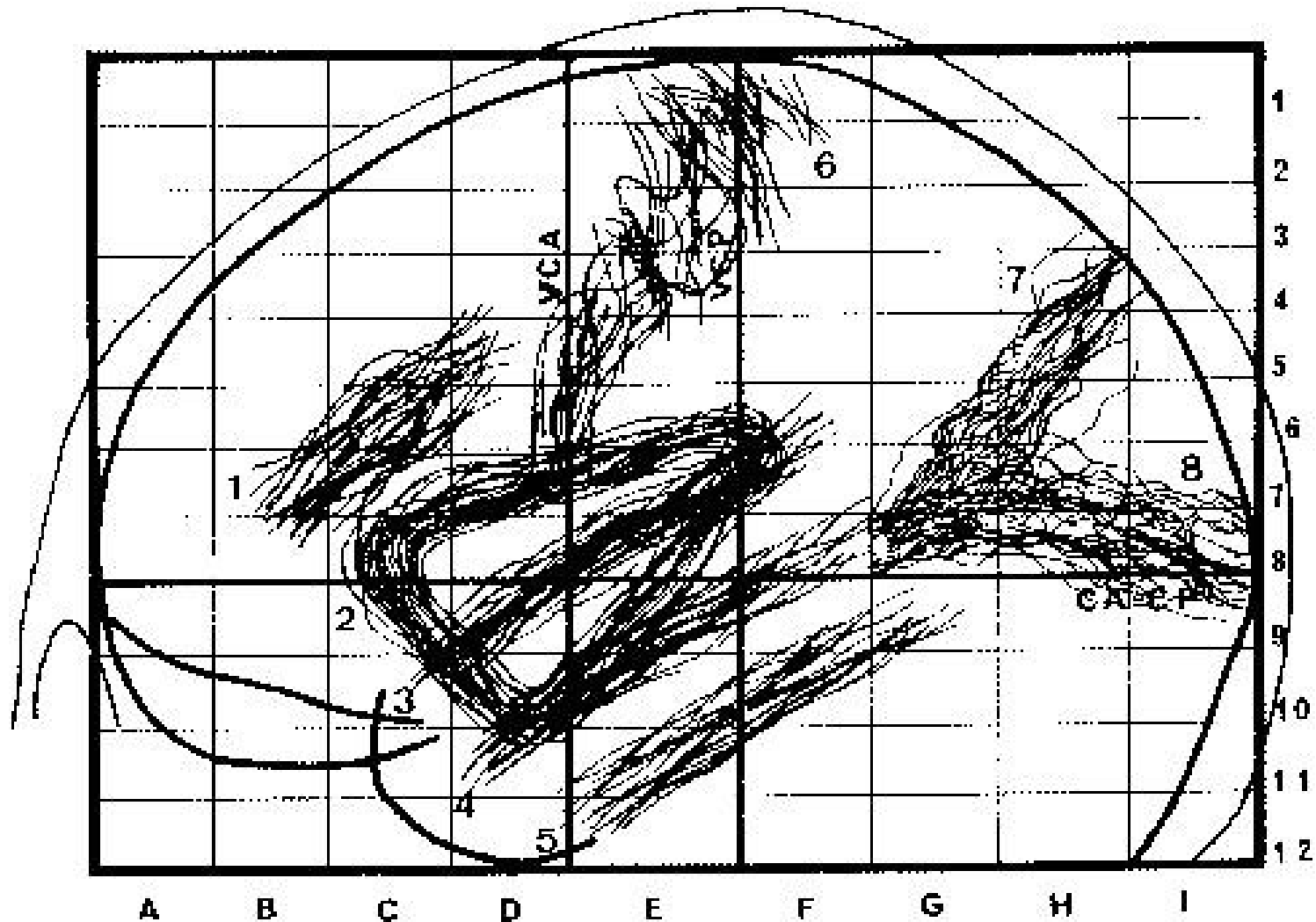
Brains are Heterogeneous



Gyral variability



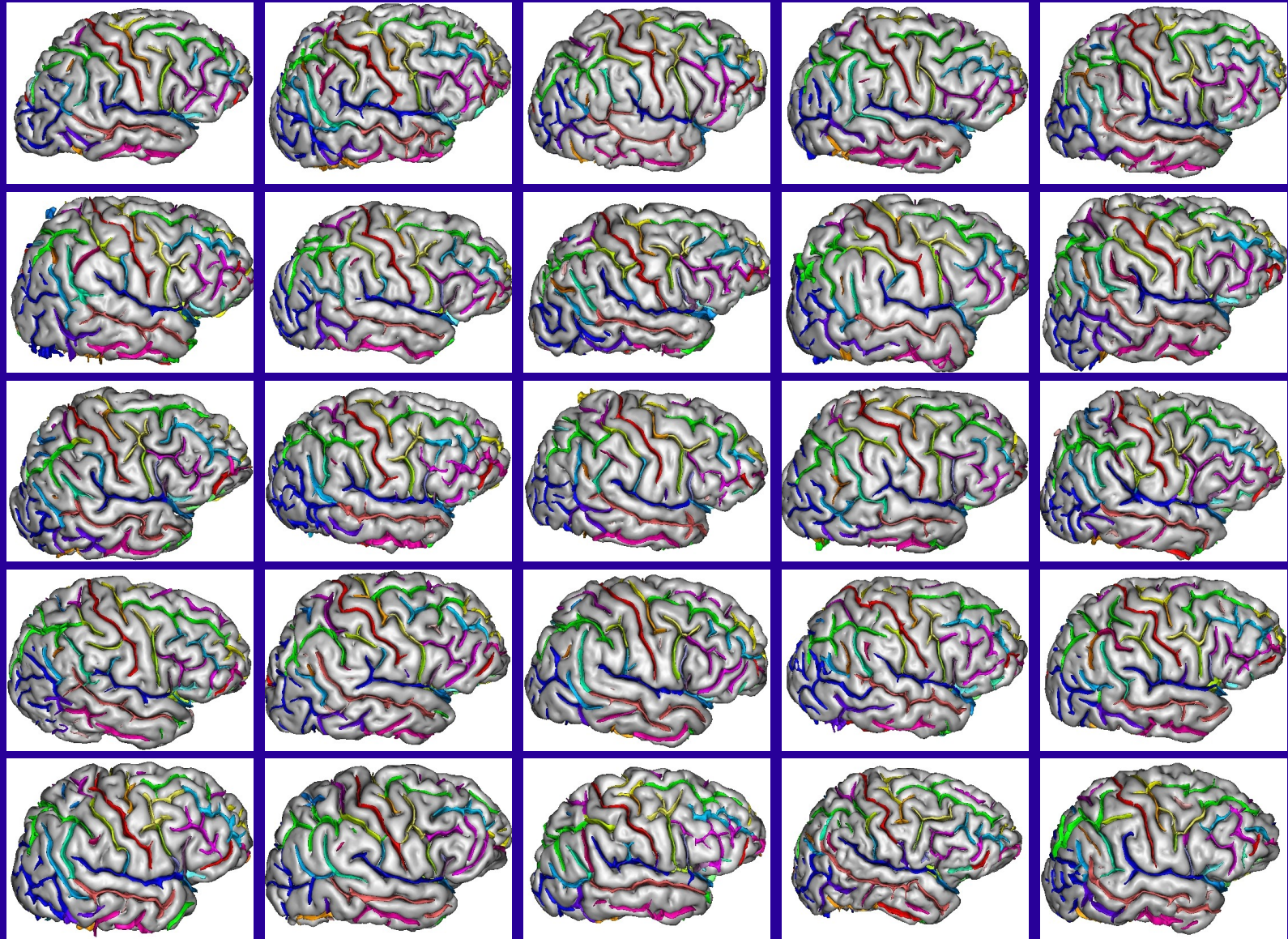
Variability of Sulci



Source: Szikla et al., 1977 in Tamraz & Comair, 2000



A database of manually labelled



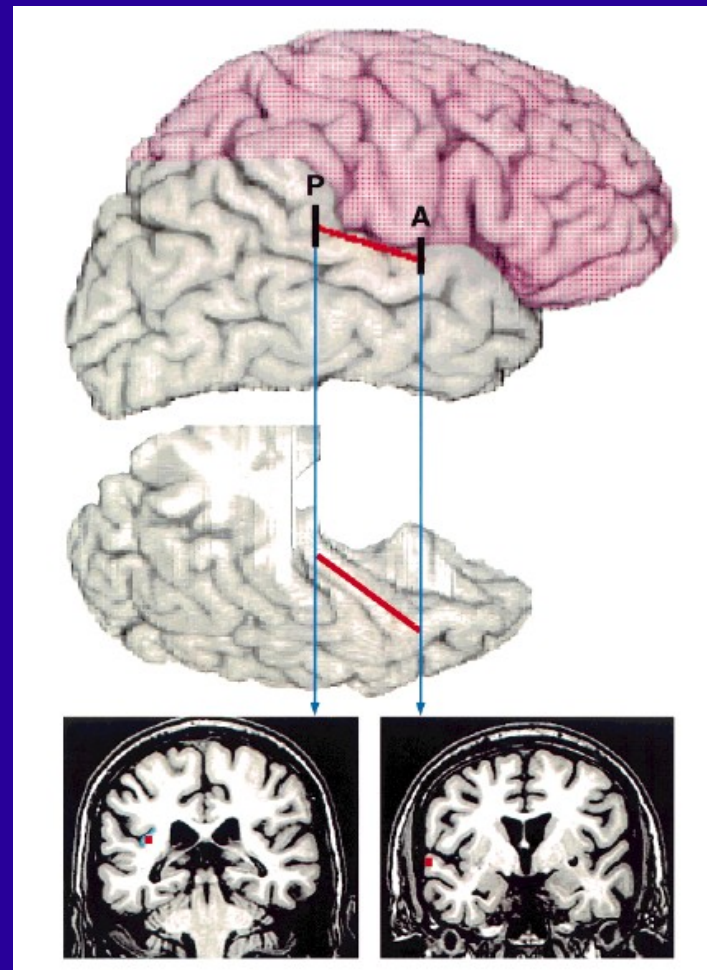
Jean-Francois Mangin & Denis Riviere, SHFJ, Orsay

Exercices

Open an anatomical scan with Anatomist and/or mrico.

Find the corpus callosum, the cerebellum, the thalamus.

Exercise 2: Find heschl gyrus



Exercice: Repérer le sillon central?



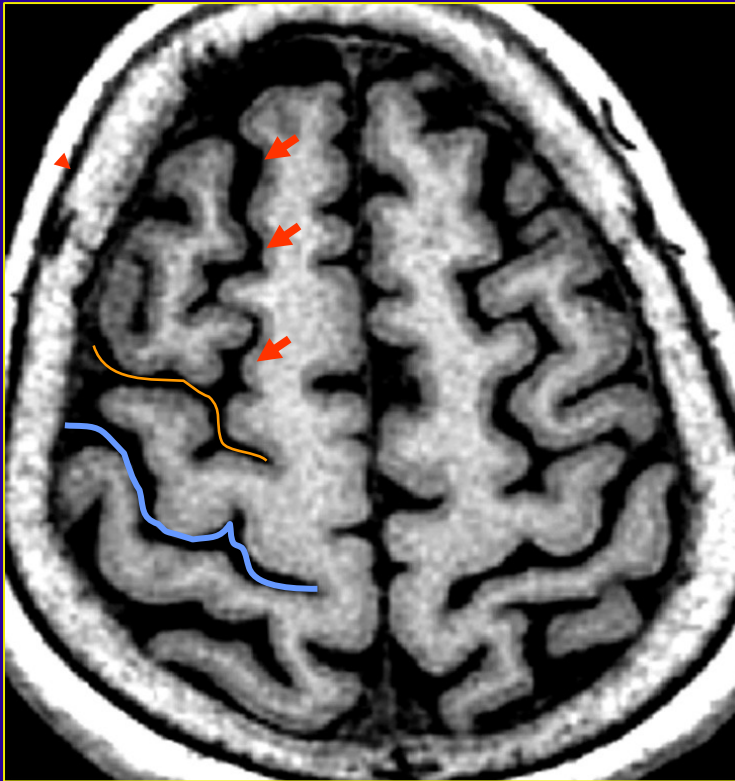
Sur une coupe sagittale

Repérer le sillon calloso-marginal (1):
au dessus du gyrus cingulaire (2),

Encoche en avant : sillon central
(3).

IRM: coupe sagittale

Comment repérer le sillon central?



- repérer le **sillon précentral** qui croise à sa partie supérieure le **sillon frontal supérieur**

sillon central : 1ère scissure verticale située en arrière du sillon pré central.

Sur une coupe axiale

Localiser le cortex moteur primaire

