

The human brain

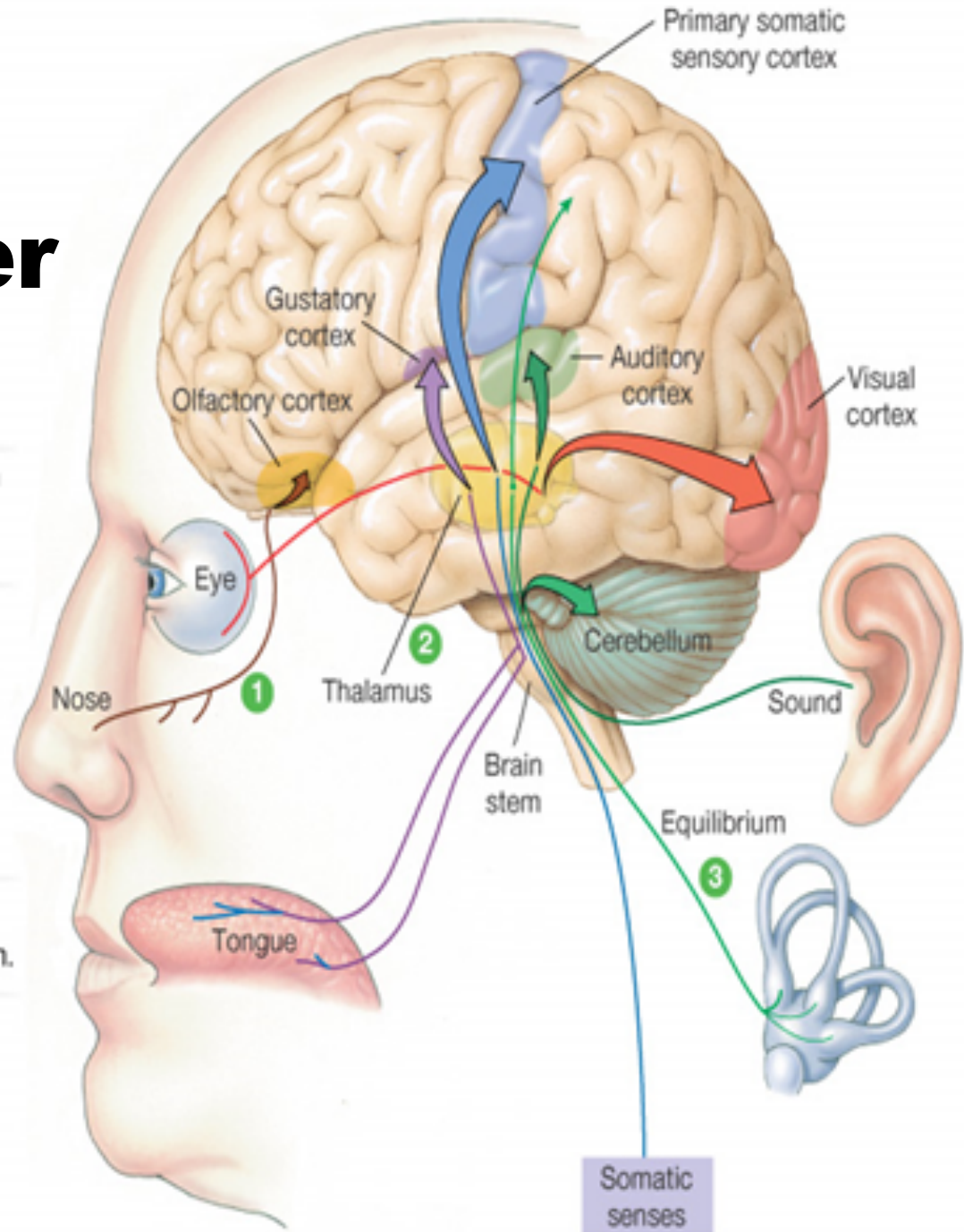


The head: your body's control center

1 Olfactory pathways from the nose project to the olfactory cortex.

2 Most sensory pathways project to the thalamus. The thalamus modifies and relays information to cortical centers.

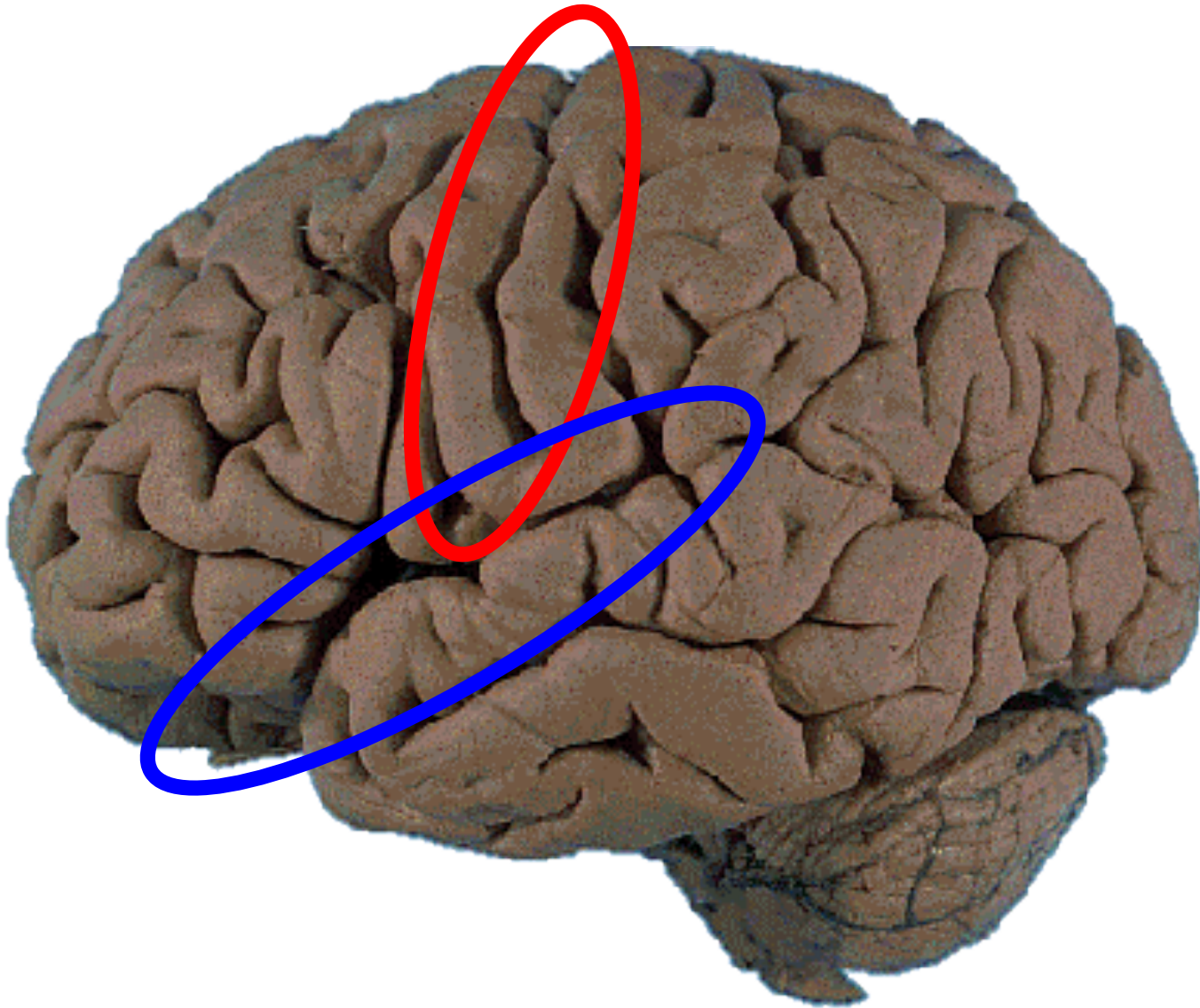
3 Equilibrium pathways project to the cerebellum.





- What is the basic physiology of the brain?
- Understanding the parts of this organ will guide our hypothesis space for its function – perhaps different parts perform different functions?
- Theories of the neurobiology of cognition need to make sense given the structure of the brain (duh).

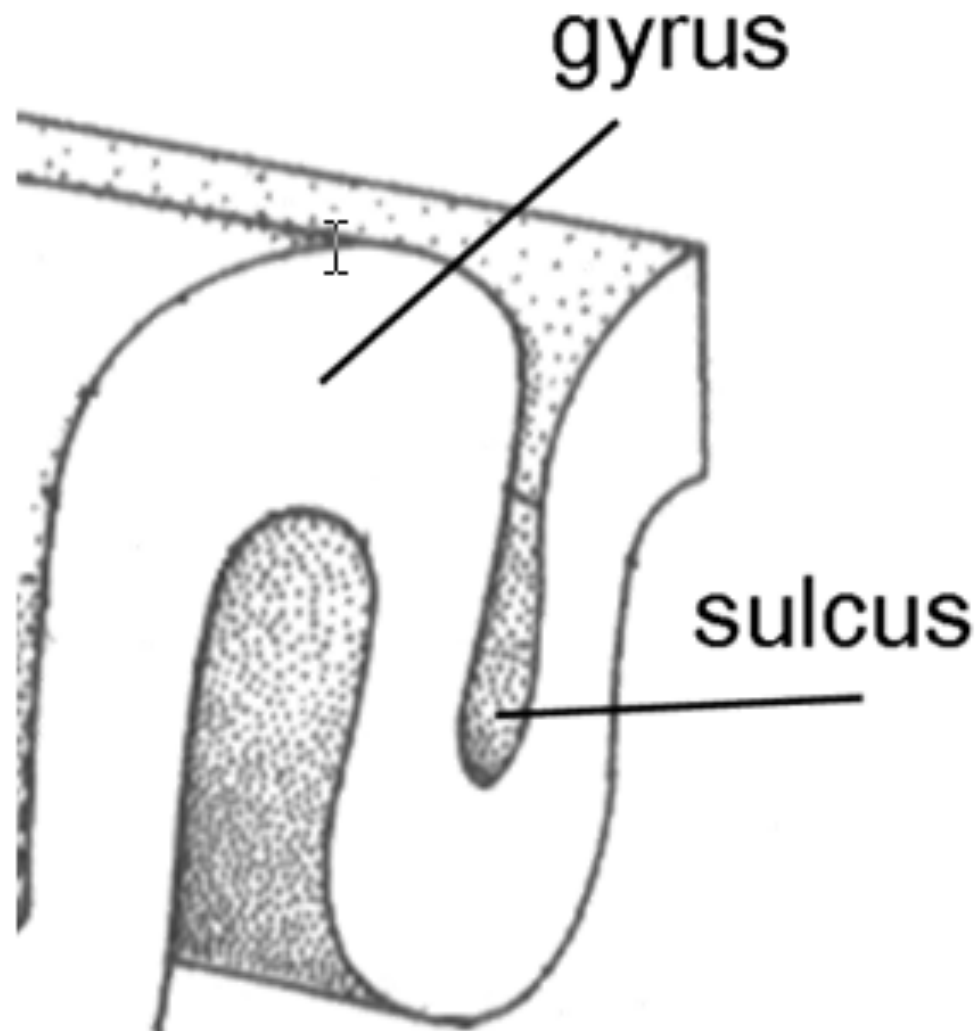
The brain is wrinkled



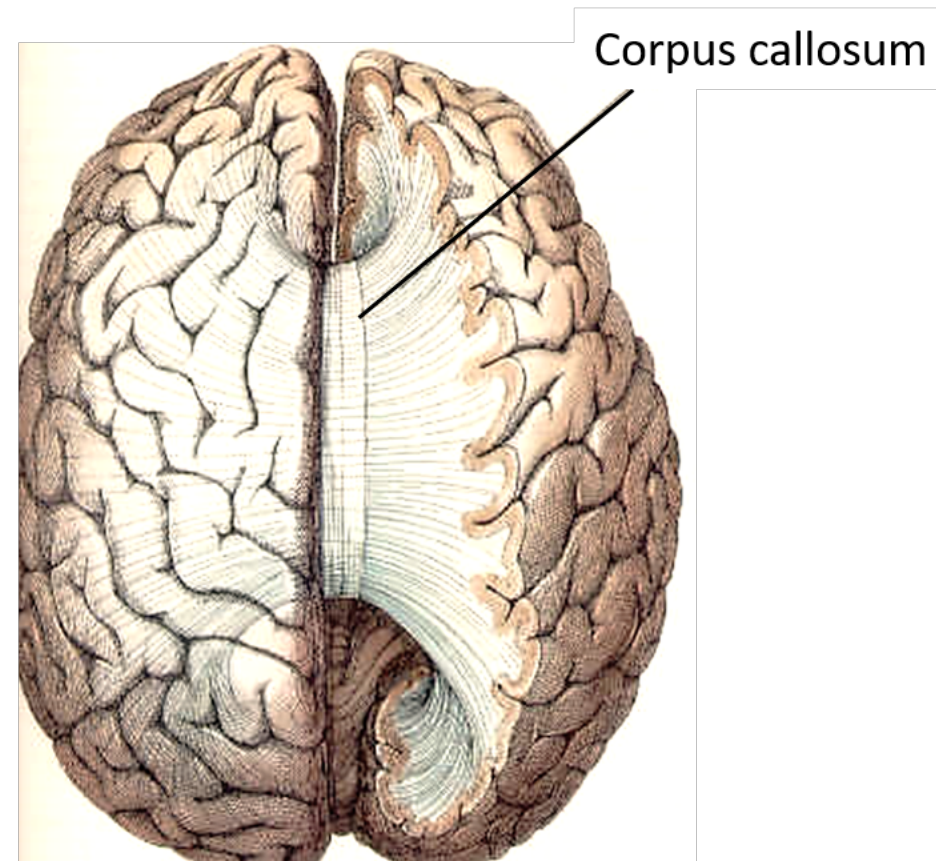
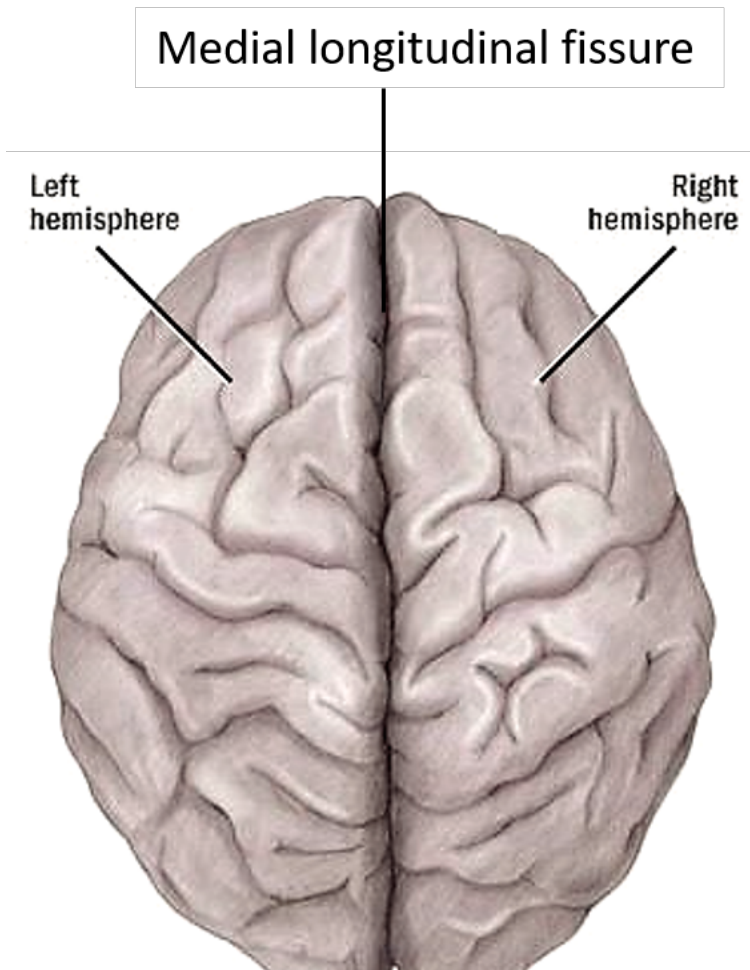
Gyrus: convex part of the wrinkle

Sulcus: concave part of the wrinkle

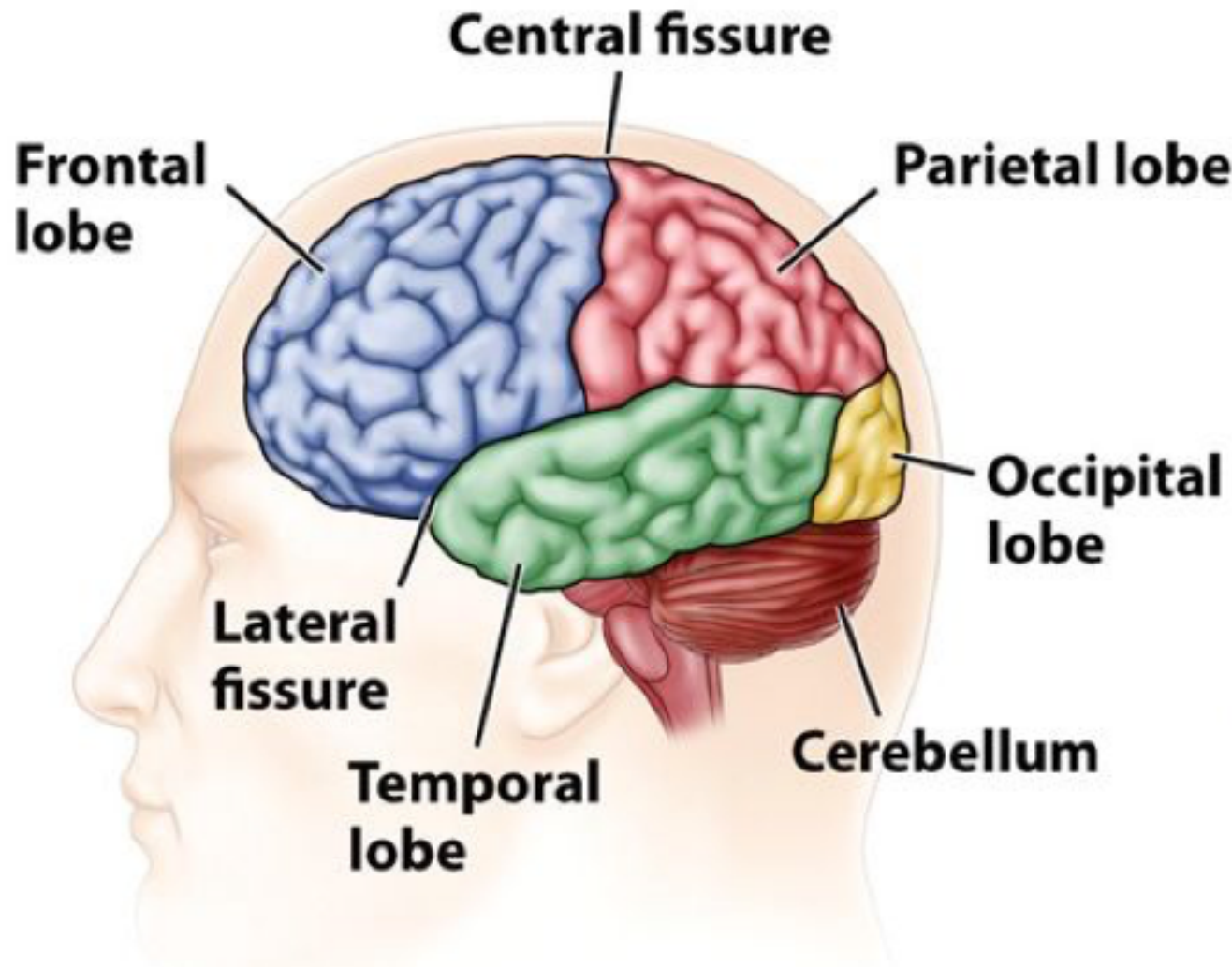
Fissure: large sulcus



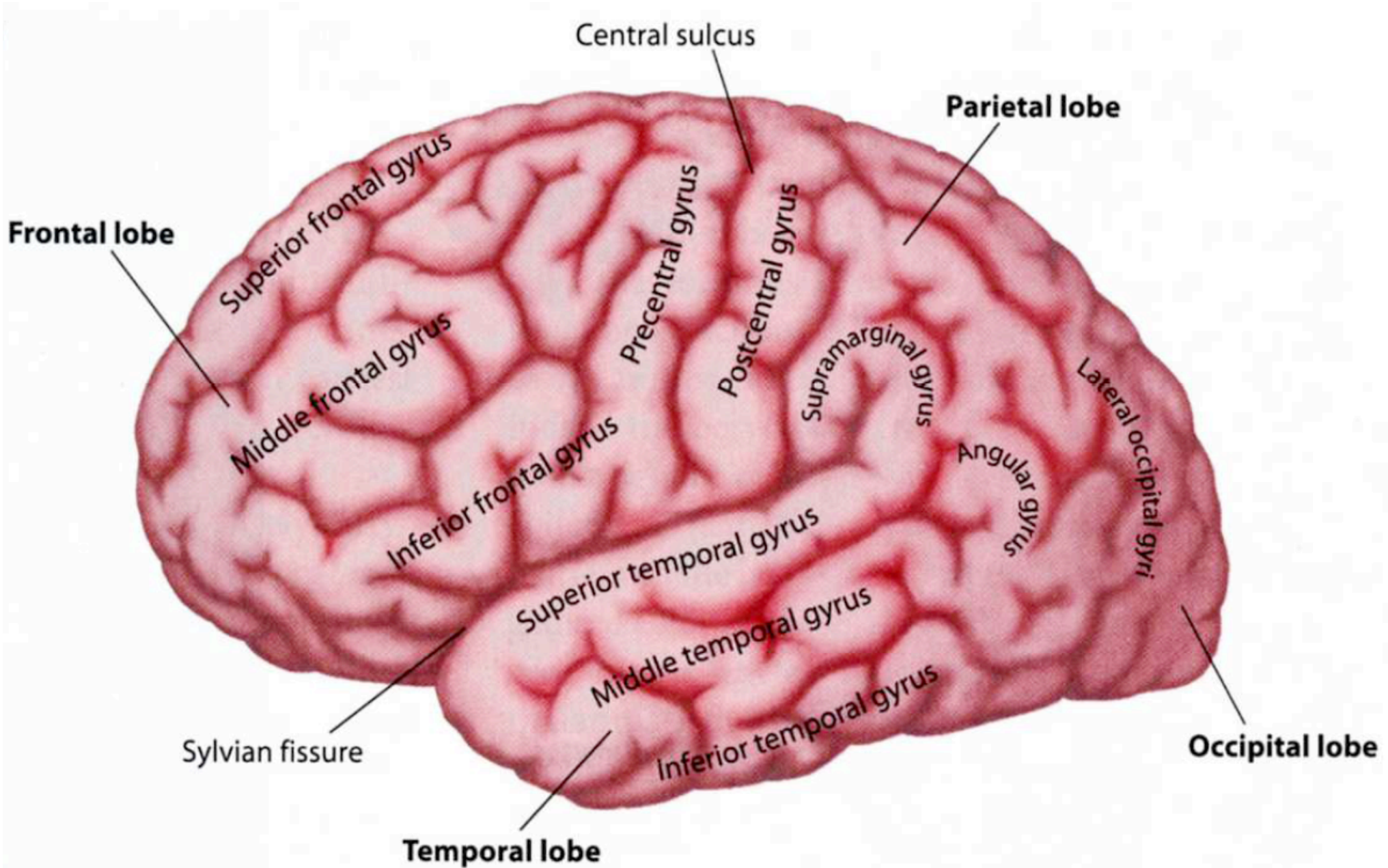
Large fissure in the middle divides the brain into two halves, the HEMISPHERES, which are connected via the CORPUS CALLOSUM



Each hemisphere divides into four sections, separated by big sulci/fissures: **LOBES**



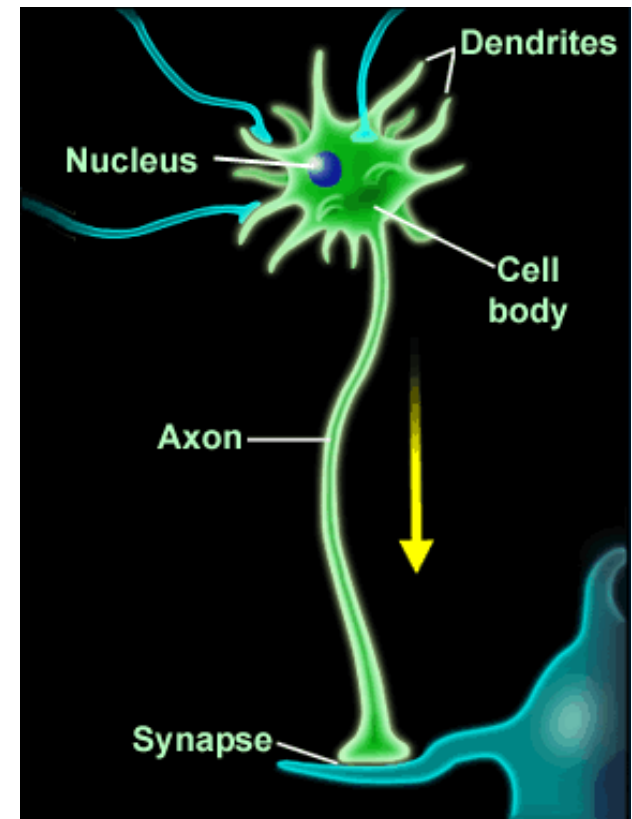
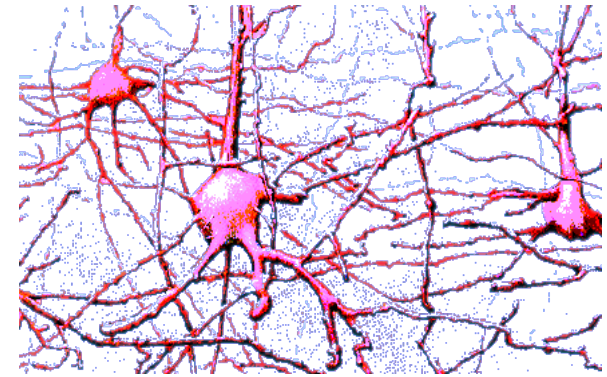
Consistent gyri and sulci across individuals within the lobes



What is the brain made of?

NEURONS

- Central nervous system is made up of about 86 billion neurons.
- Unlike other cells in that they can both receive and send out signals to neighboring neurons in the form of electrical pulses.
- Typically a given neuron is connected to about ten thousand other neurons.
- The specific point of contact between the axon of one cell and a dendrite of another is called a synapse.



<http://www.dnatube.com/video/1107/Neurons-and-How-They-Work>

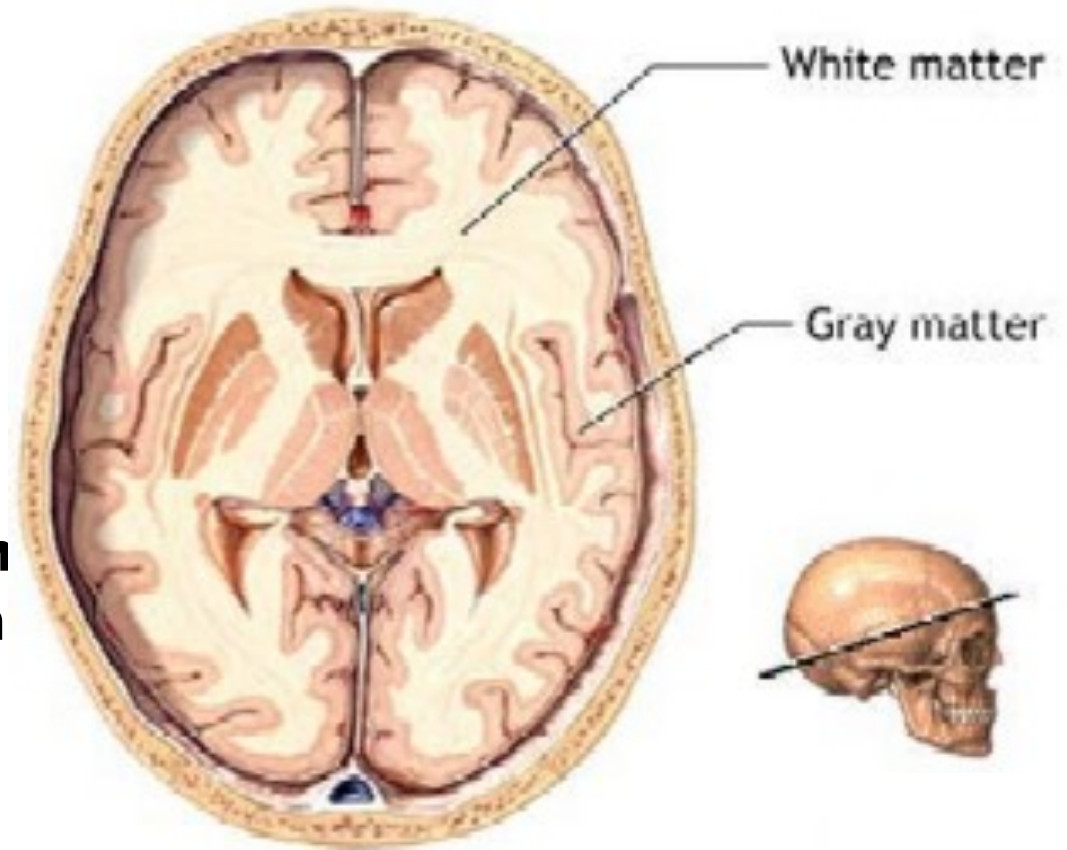
Grey and white matter

■ Grey matter

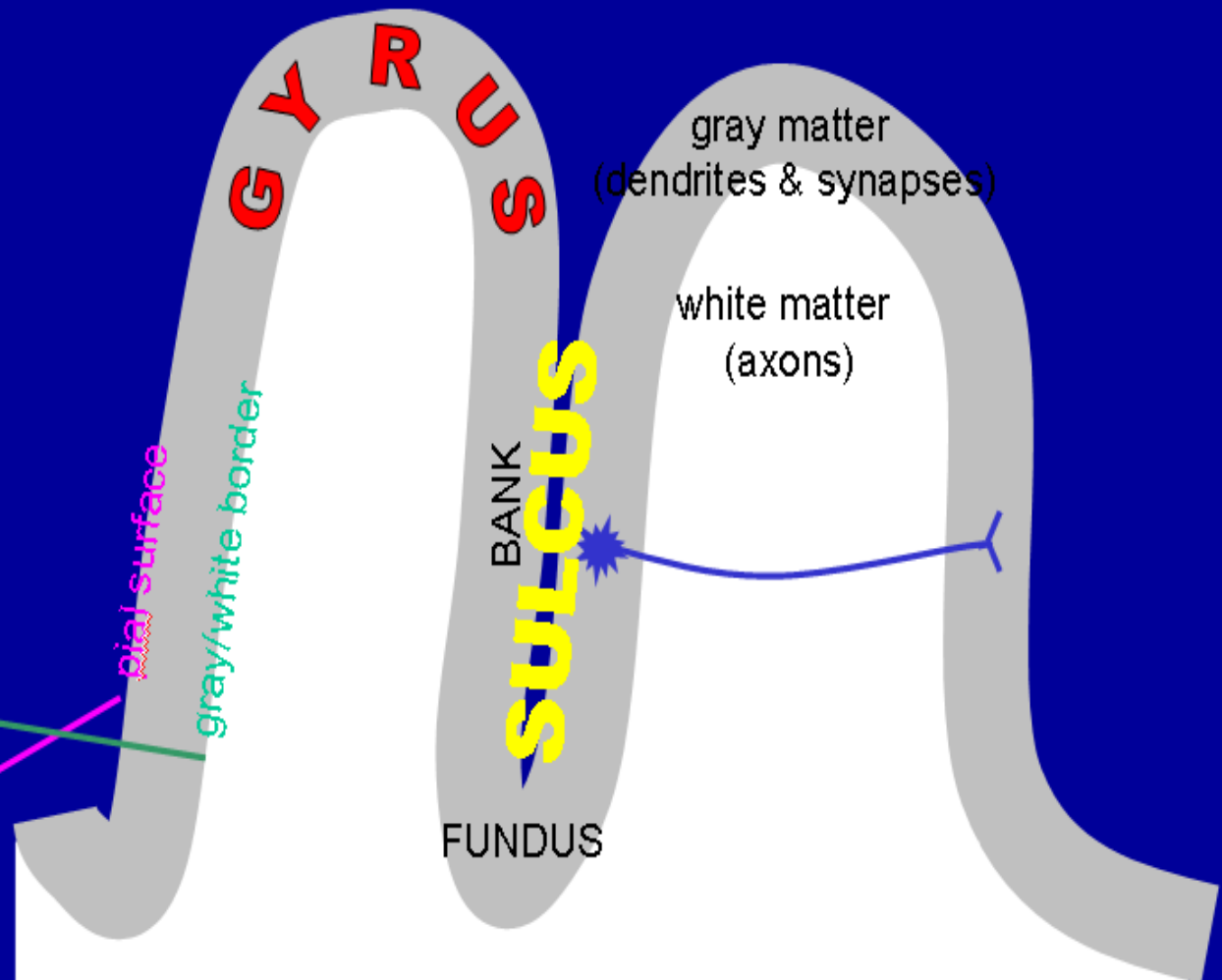
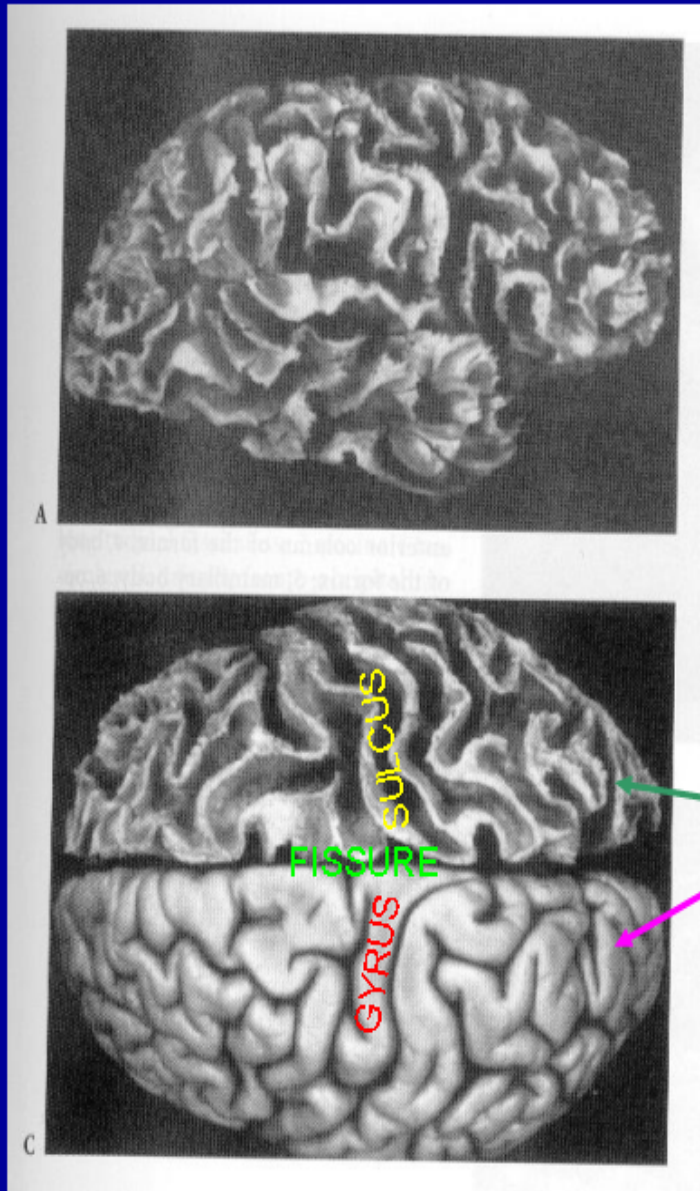
- **cortex**
- **Cell bodies and unmyelinated dendrites**

■ White matter

- **myelinated axons**
- **the tissue through which messages pass between different area of grey matter**



Sulci and Gyri



Cortical layers

■ Cytoarchitectonics:
the arrangement of
nerve cells in the
cerebral cortex

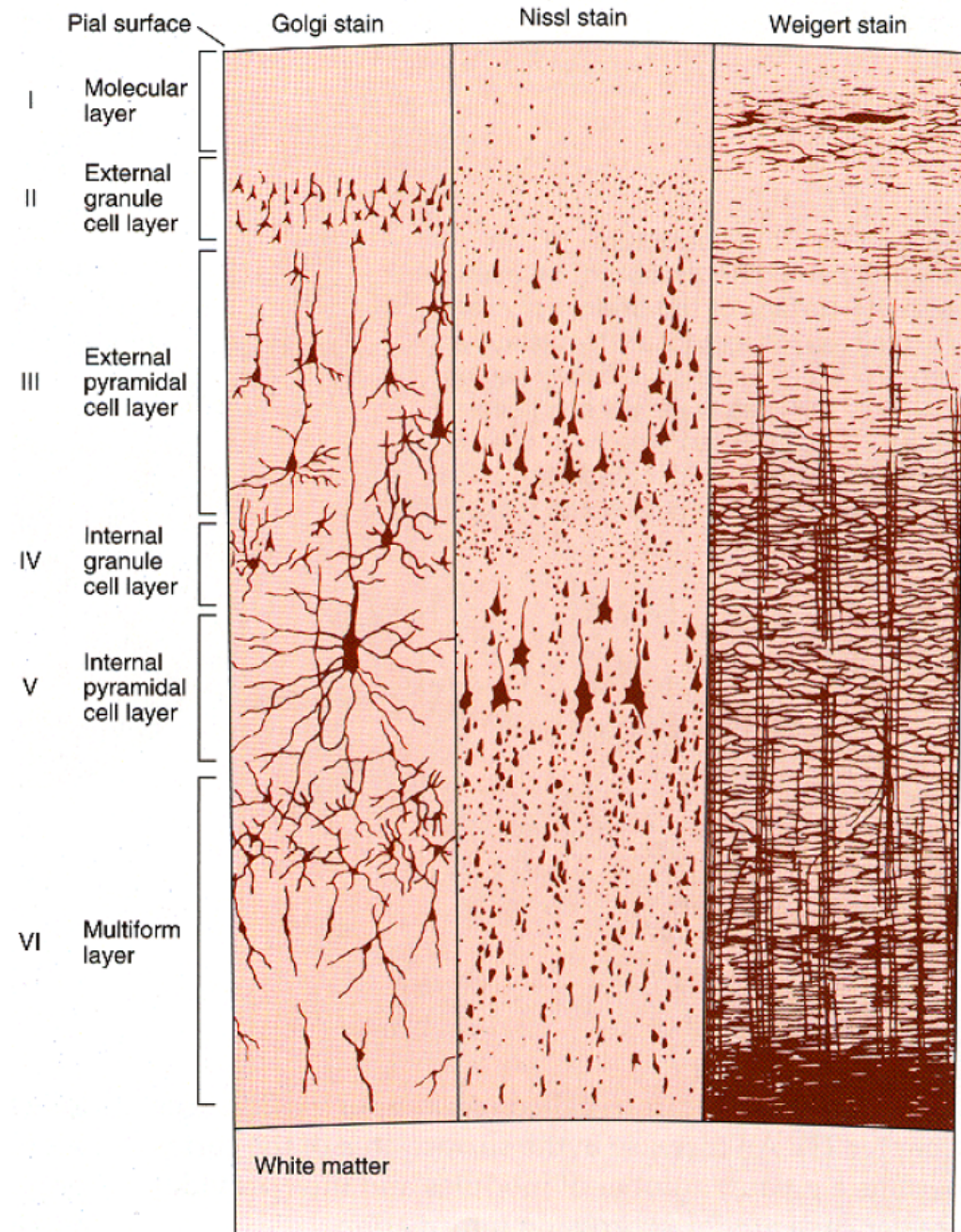
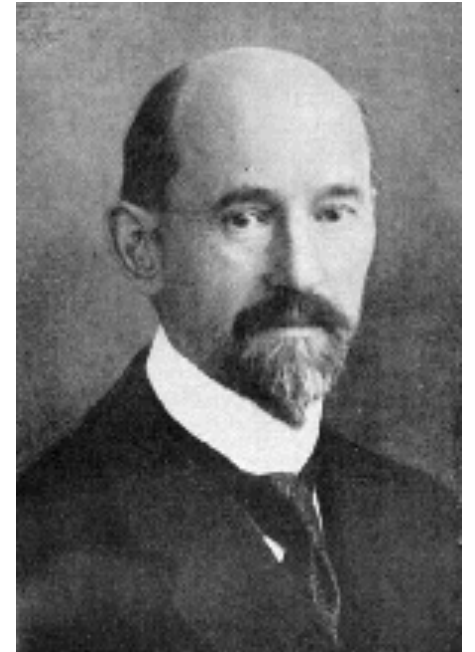


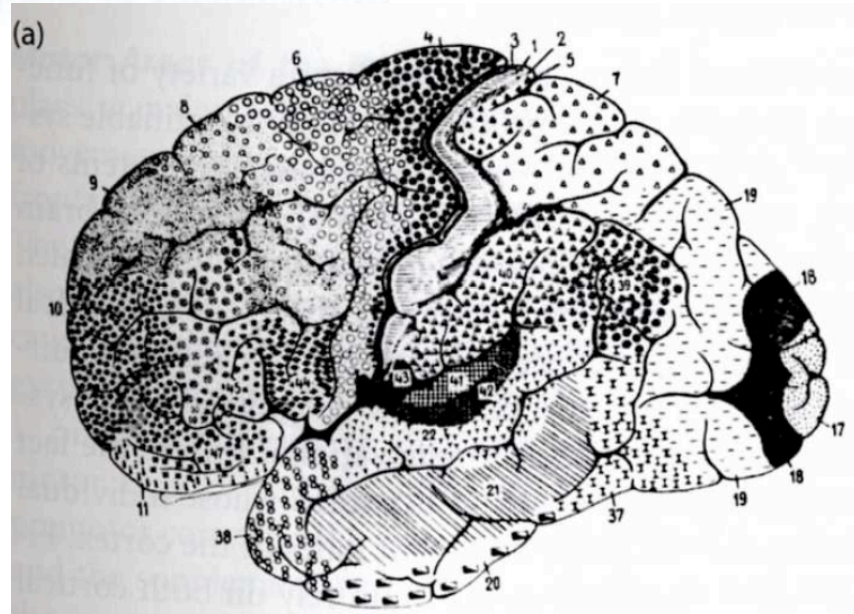
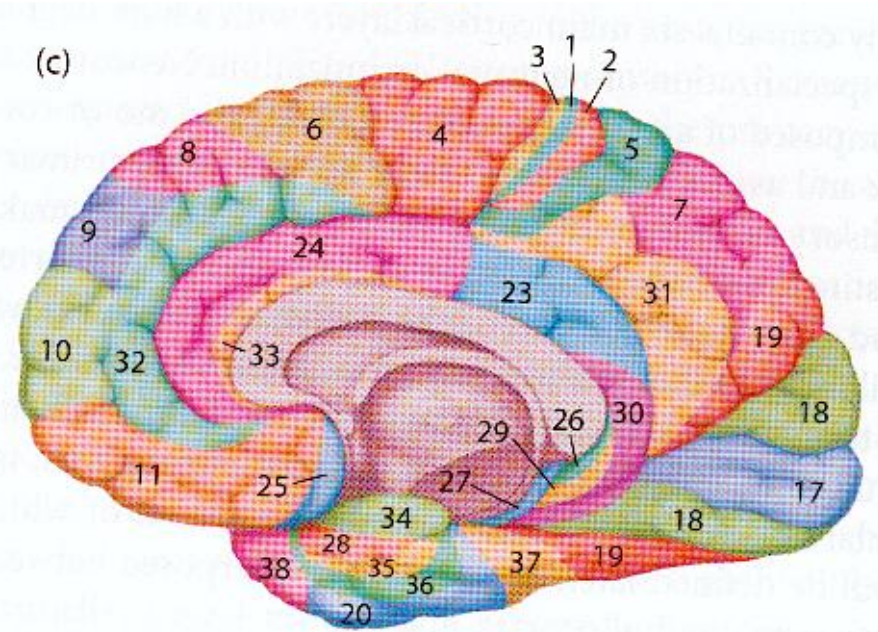
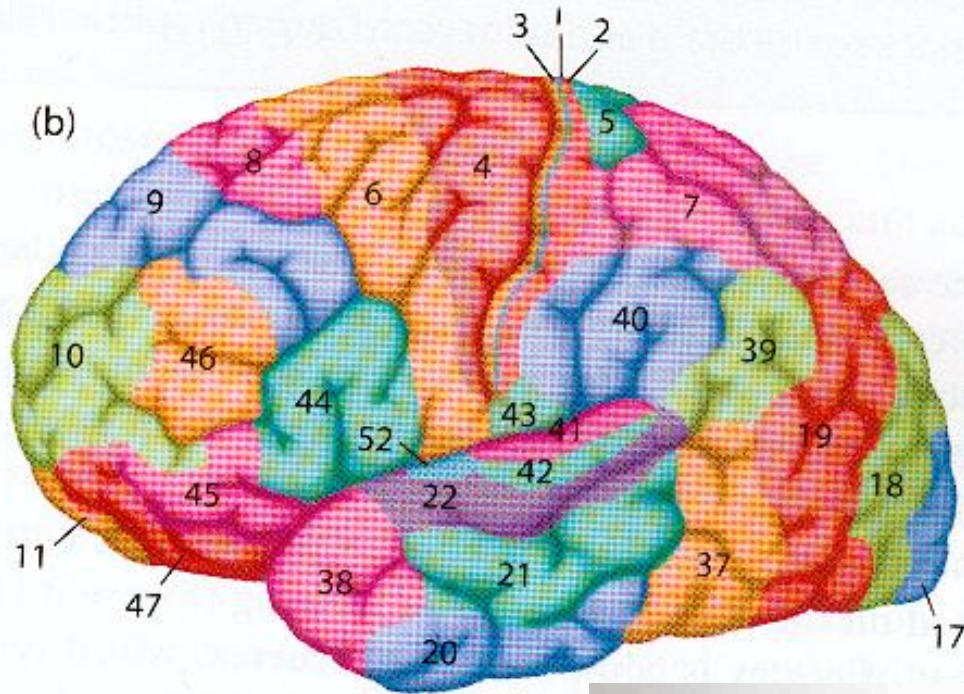
Figure 3. Layers in the neocortex as revealed by different staining methods. The Golgi stain reveals neuronal cell bodies and dendritic trees. The Nissl stain shows cell bodies and proximal dendrites. The Weigert stain reveals patterns of axonal distribution.

Korbinian Brodmann (1868 - 1918)

- Defined the cerebral cortex into 52 distinct regions on the basis of their cytoarchitectonic characteristics.



Brodmann's areas



▼ BRAIN

▼ HEMISPHERES: two halves of the brain

▼ LOBES: four parts of each hemisphere

▼ GYRI & SULCI: consistent “wrinkling” within each lobe

▼ NEURONS: the cell type brains are made of

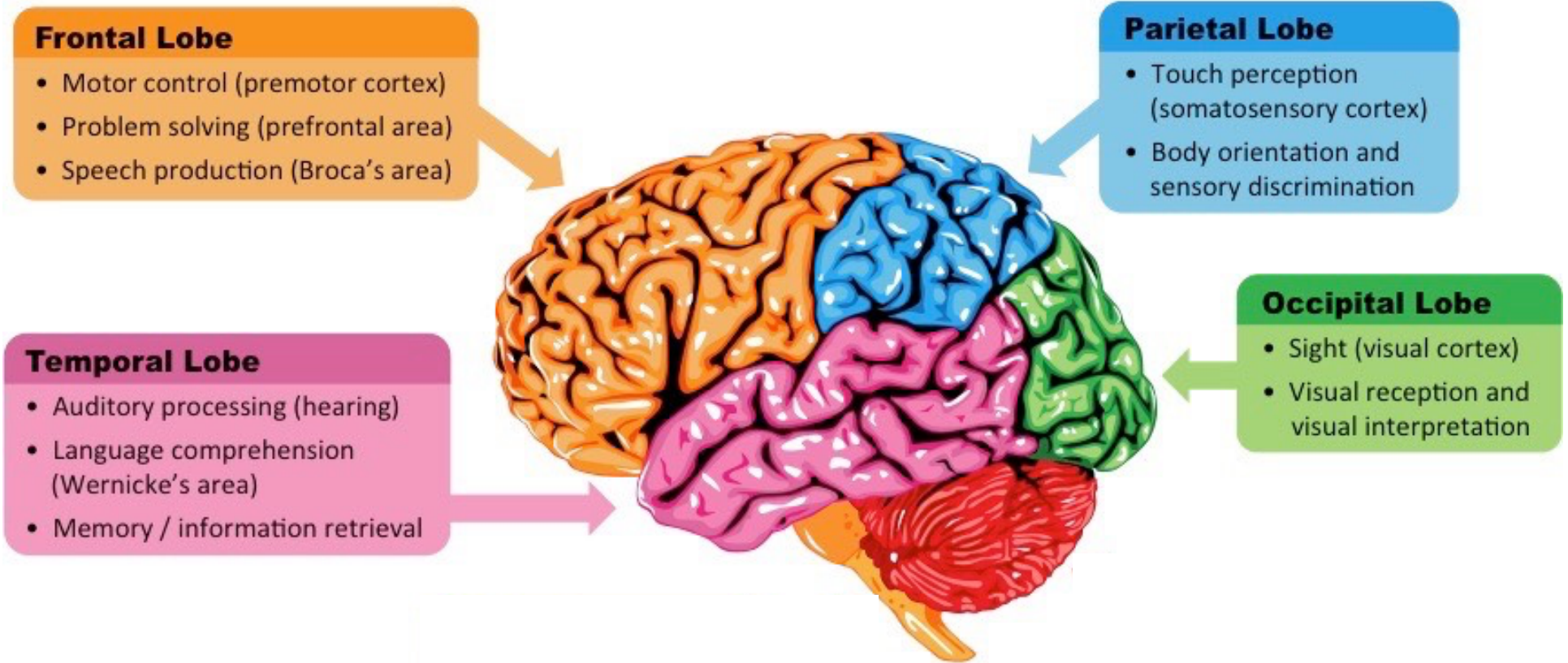
▼ CORTEX/GREY MATTER: outer surface of the brain housing cell bodies and dendrites

▼ WHITE MATTER: inner part of the brain housing axons (the “roads” of the brain)

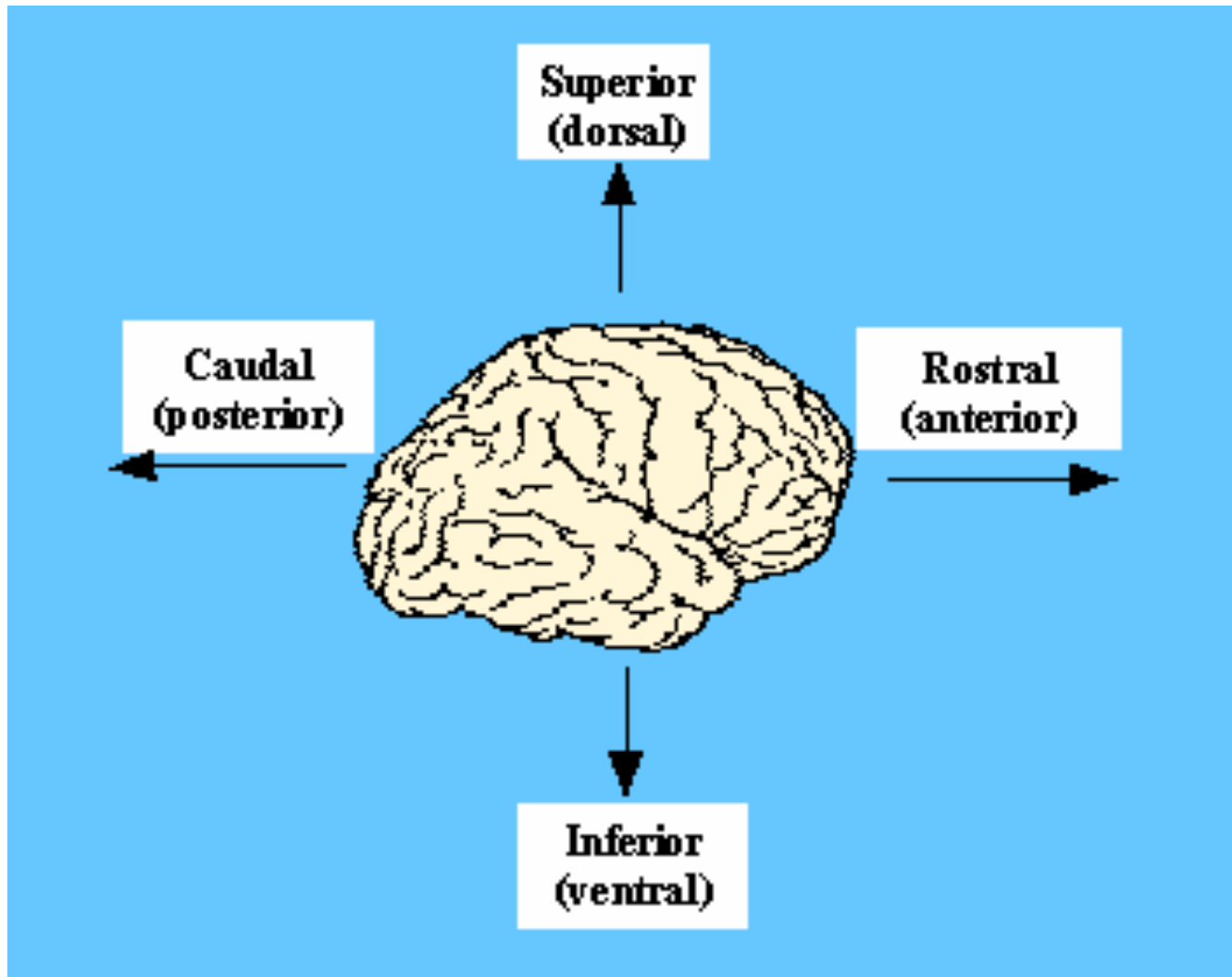
▼ CORTICAL LAYERS: arrangement cell types within the cortex

▼ BRODMANN AREAS: parcellation of the cortex according to cortical layers.

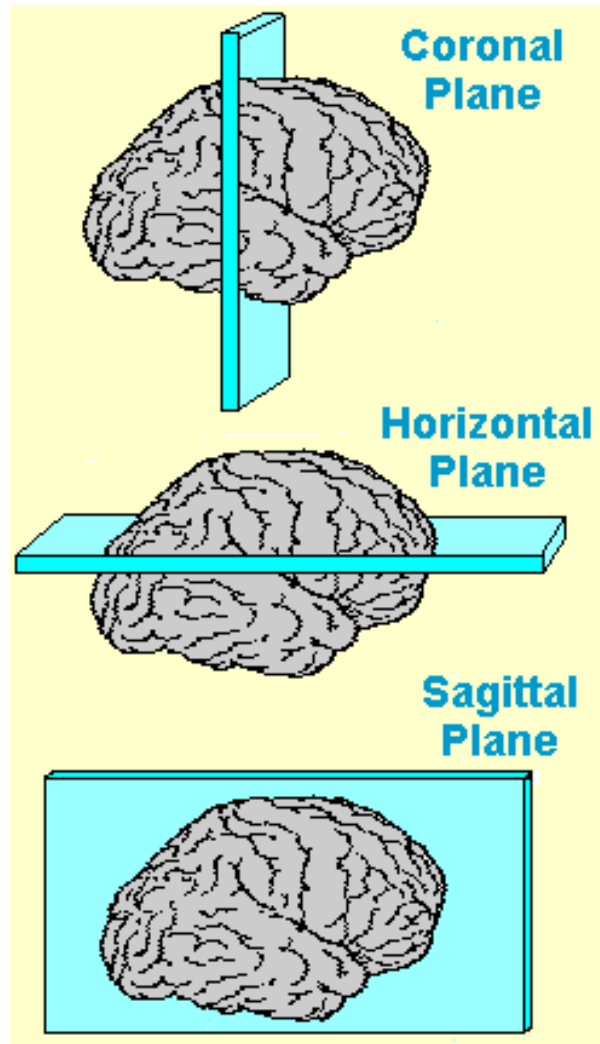
Broad functional generalizations at the lobe level



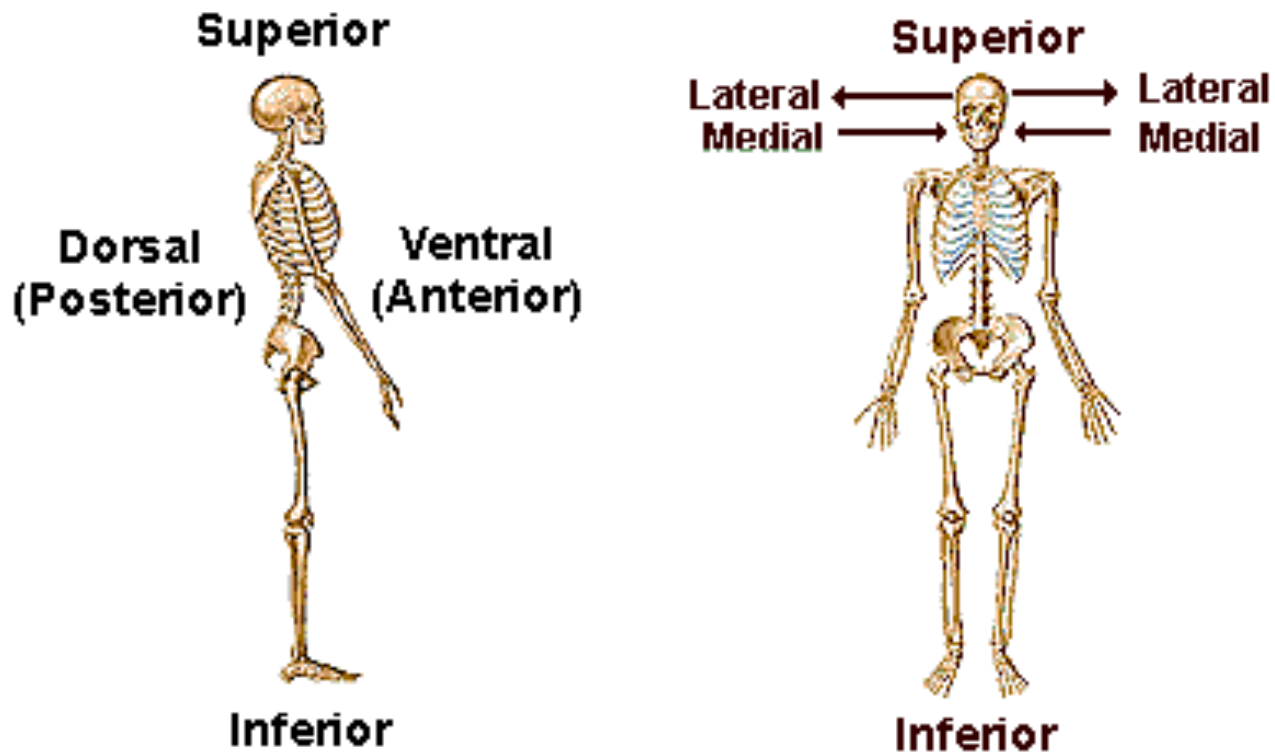
Brain lingua



Brain lingua



Brain lingua



Bilateral - On both sides

Ipsilateral - On the same side

Contralateral - On the opposite side