

# Brains

What are they?

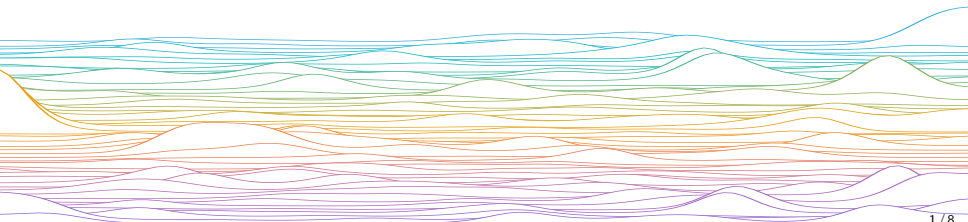
Computational Neuroscience

University of Bristol

M Rule

## Learning outcomes:

- ▶ Recall key facts, figures, statistics, and anatomical terms from these slides
- ▶ Describe some of the specialized, interacting sub-systems that constitute the brain & their function.

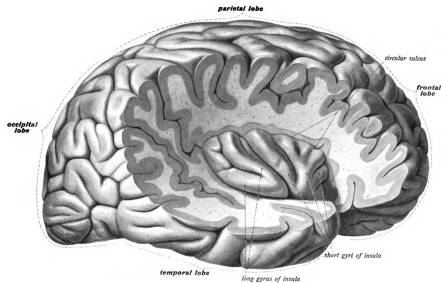


## “Grey” matter

- ▶ Neuron cell bodies, local connections
- ▶ Cortex, nuclei

## “White” matter

- ▶ Long-range electrical wiring (axons)
- ▶ Myelin insulation (oligodendroglia)



*Dr. Johannes Sobotta (c. 1908)*

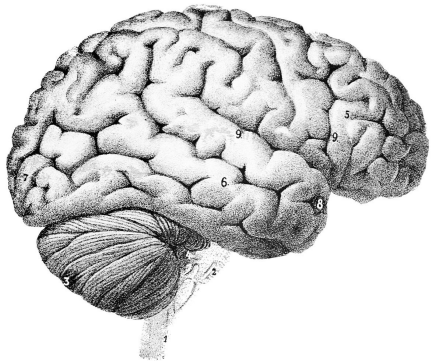
*Textbook and Atlas of Human Anatomy, (via Wikimedia)*

**Cortex** bark/shell

3–6 layers (6 layers ~ neocortex)

Larger brains

- ▶ More functionally specialized
- ▶ Folded:
  - Gyri (hills)
  - Sulci (valleys)
- ▶ Humans:  $\approx 0.25 \text{ m}^2$  total area

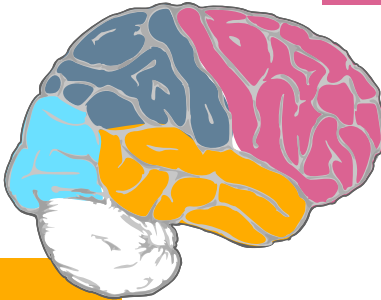


*Outer surface of the human brain,  
Sanger Brown, c. 1894 (via Wikimedia)*

Parietal  
Multisensory Integration  
Abstract workspace  
Somatosensation

Frontal  
Movement (language: Broca's area)  
Executive Function, Planning  
Emotional Regulation

Occipital  
Vision

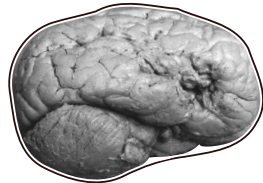
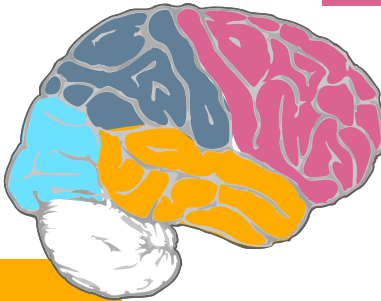


Temporal  
Auditory,  
Semantic Memory  
Language: Wernicke's area

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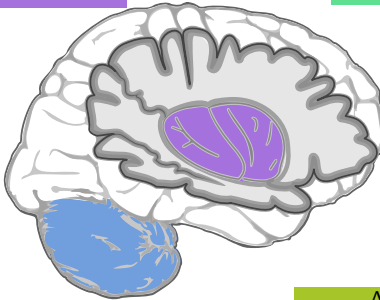


Victor "Tan" Leborgne's brain  
(Paul) Broca's Region  
Expressive aphasia

Temporal  
Auditory,  
Semantic Memory  
Language: Wernicke's area

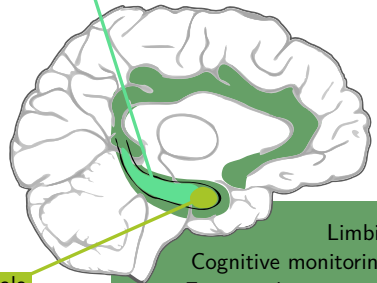
Insula  
Taste, smell, craving  
Interoception, emotion

Hippocampus  
Memory, navigation



Cerebellum  
Skilled movement  
Timing, prediction

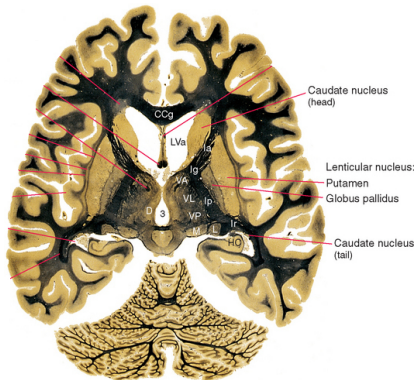
Amygdala  
Fear conditioning



Limbic  
Cognitive monitoring  
Emotional cognition  
Memory encoding/retrieval

# Basal ganglia

- ▶ Deep-brain nuclei
- ▶ Choose/decide/start/stop
- ▶ Reward-based learning

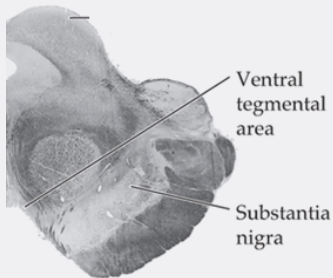


Nolte & Angevine (2007)

## Parkinson's

### **Substantia nigra** degeneration

- ▶ Tremor/rigidity/slowness
- ▶ Cognition/sleep



J. Martin Neuroanatomy Text and Atlas

*end*