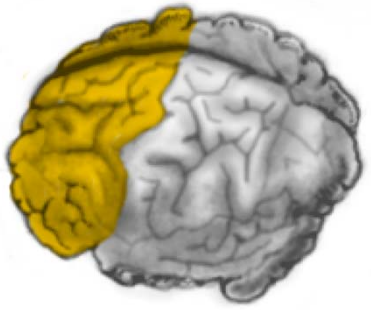
Executive Control

Executive Control

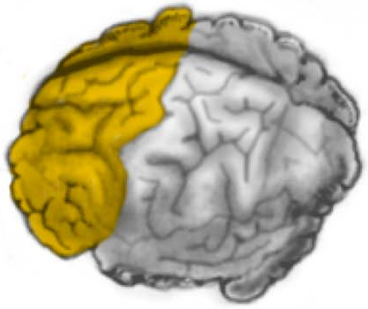
Prefrontal cortex and executive control of behaviour that it enables

Prefrontal Cortex

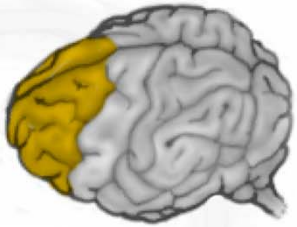
- Plan
- Carry out complex tasks
- Build complex tools and technologies



Human



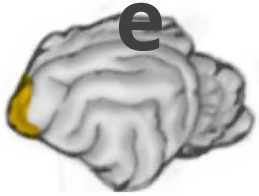
Human



Chimpanzee

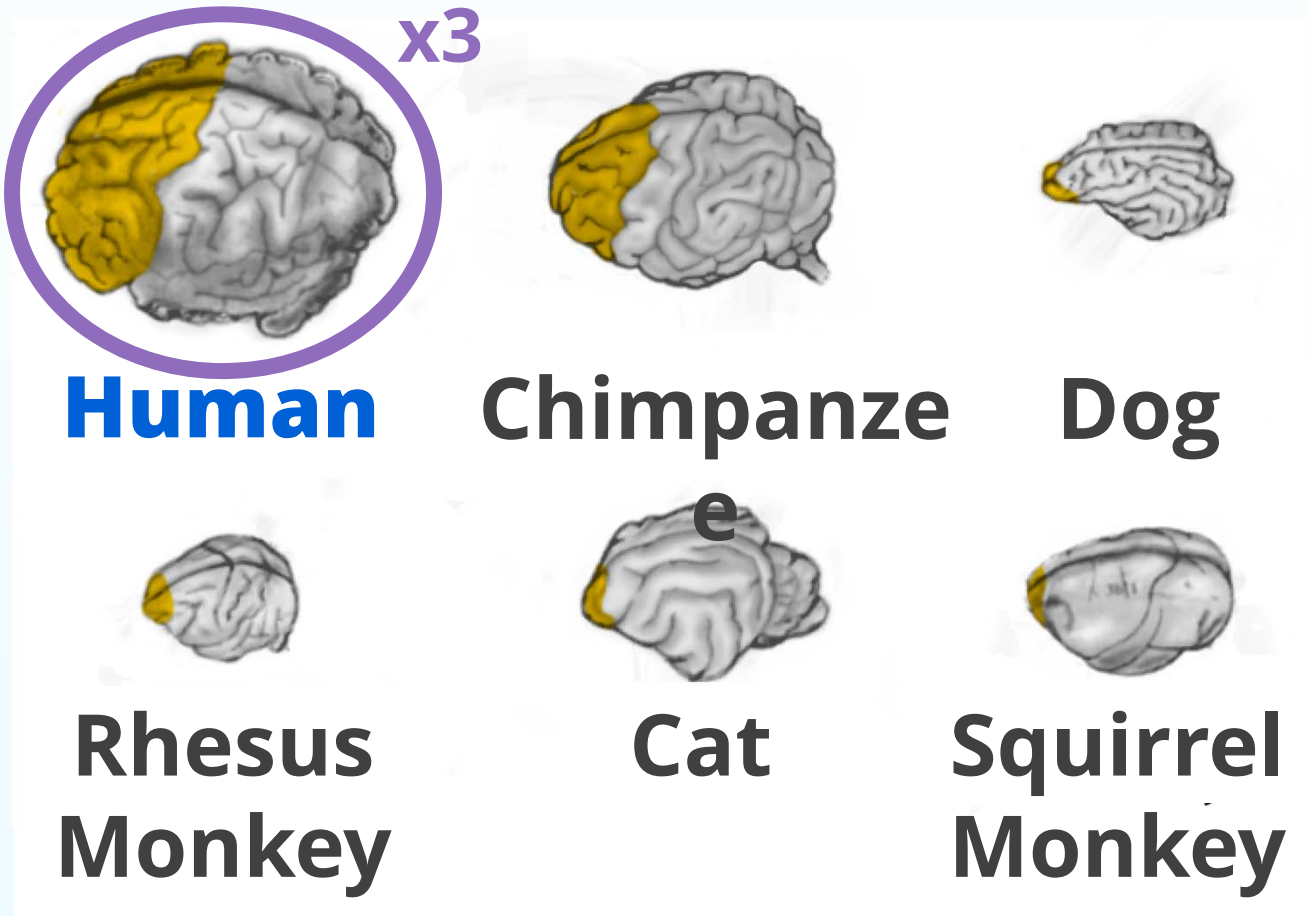
Dog

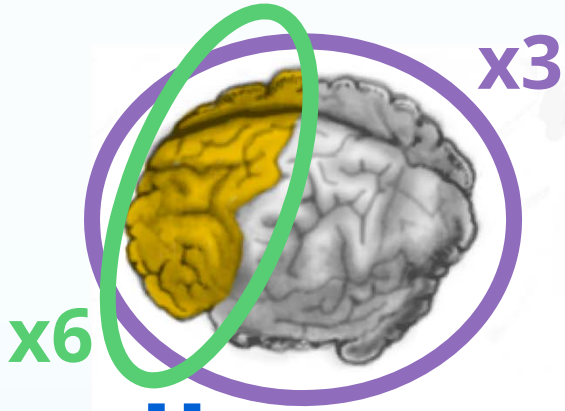
Rhesus Monkey



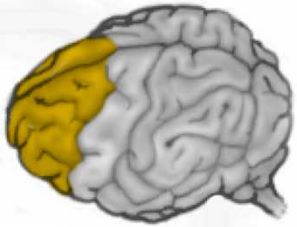
Cat

Squirrel Monkey


x3
Human
Chimpanzee
Dog
Rhesus Monkey
Cat
Squirrel Monkey



Human



Chimpanzee

Dog

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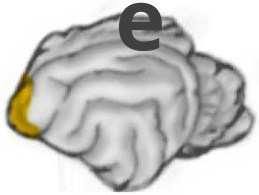
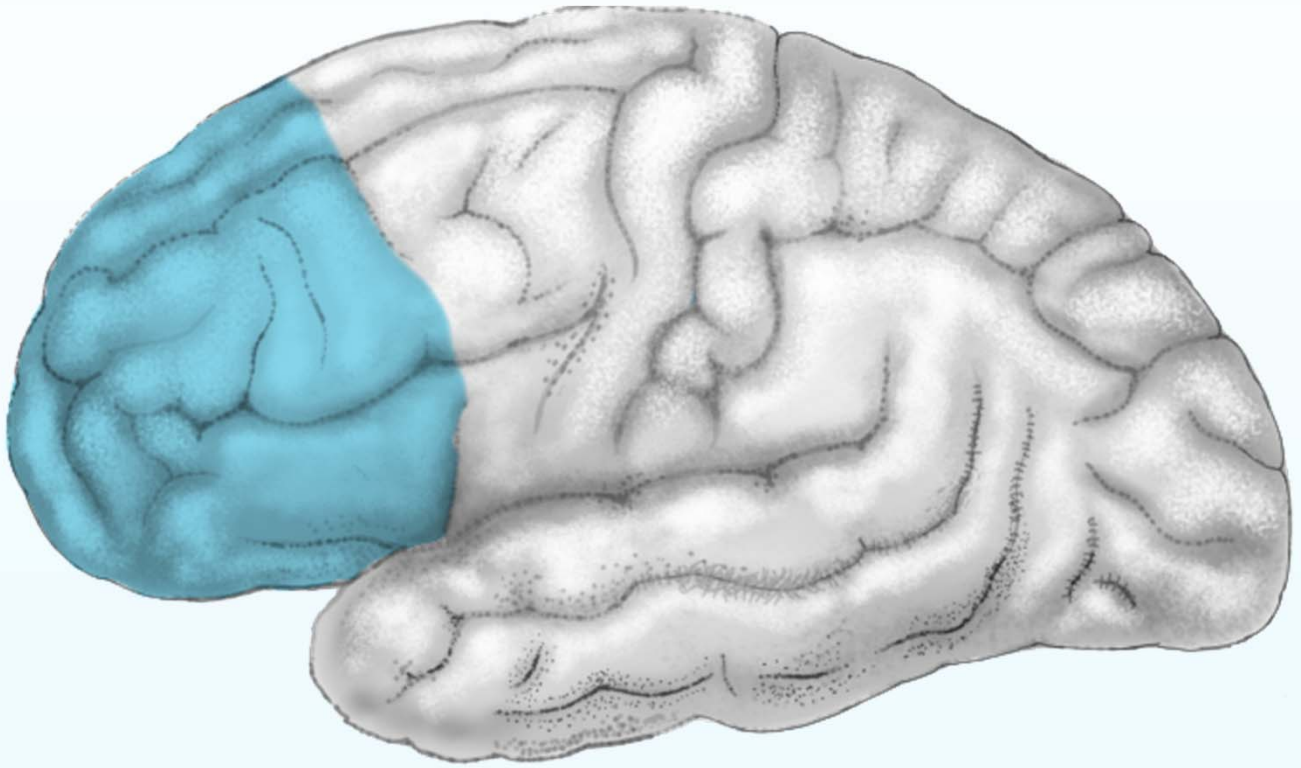


Cat

Squirrel Monkey



Prefrontal Cortex

- Abstract thought
- Decision making
- Conflict analysis
- Social behaviour

Executive Control

Allows information processing and behaviour to adapt from moment to moment depending on our current goals

Executive Control Functions

- Goal maintenance
- Conflict recognition
- Inhibition
- Task-switching

Organization of Prefrontal Cortex

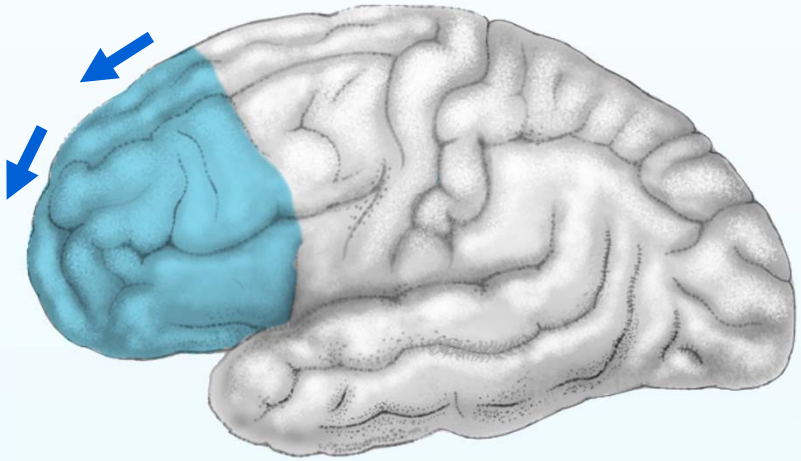
- The PFC is highly interconnected with other brain areas
- Action, attention, perception

Organization of Prefrontal Cortex

- Dorsolateral prefrontal cortex
- Ventrolateral prefrontal cortex
- Orbitofrontal cortex
- Anterior cingulate cortex

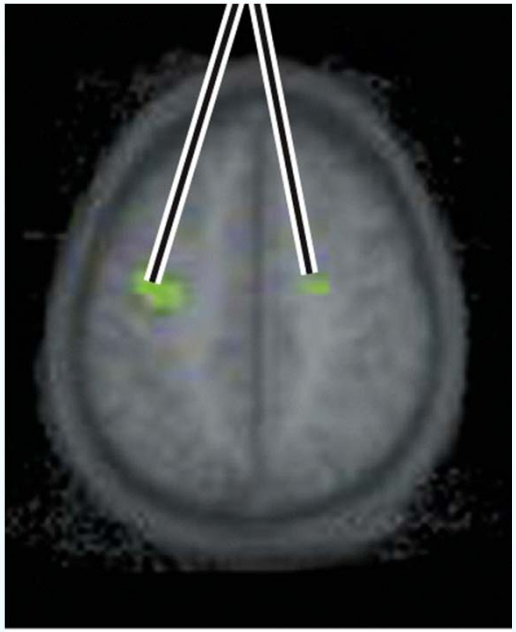
Organization of Prefrontal Cortex

Organized hierarchically from back to front



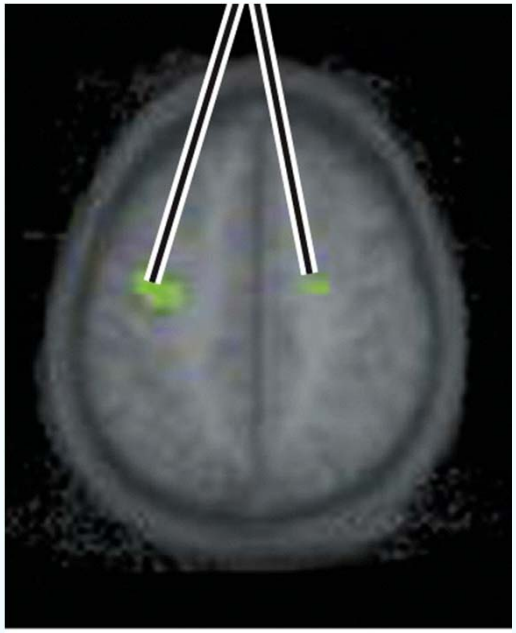
More complex

Premotor



Simple task

Premotor

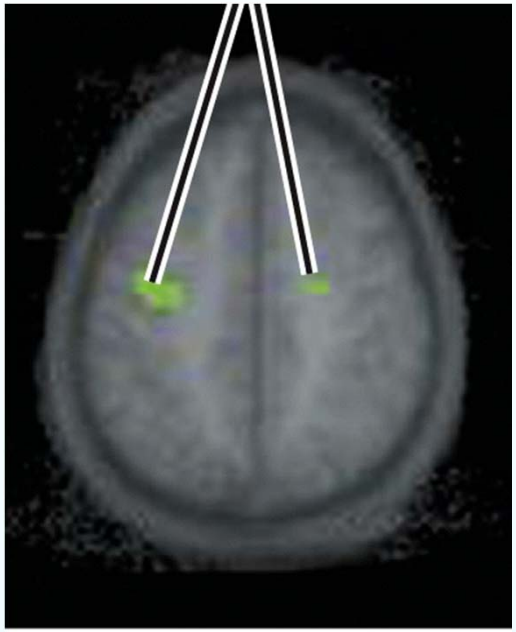


Simple task

Caudal PFC

More complex

Premotor

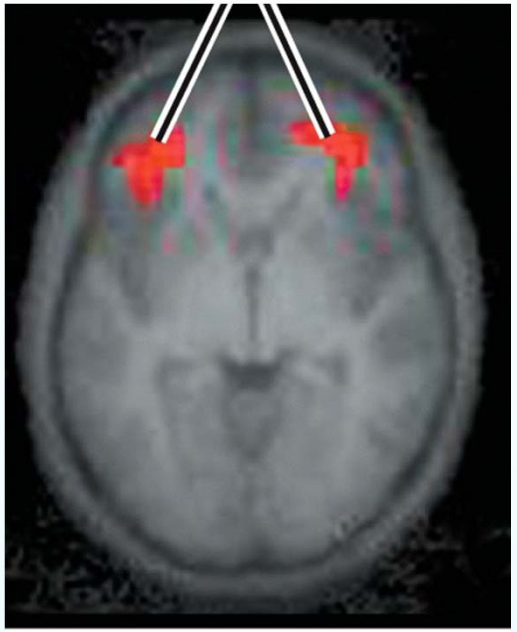


Simple task

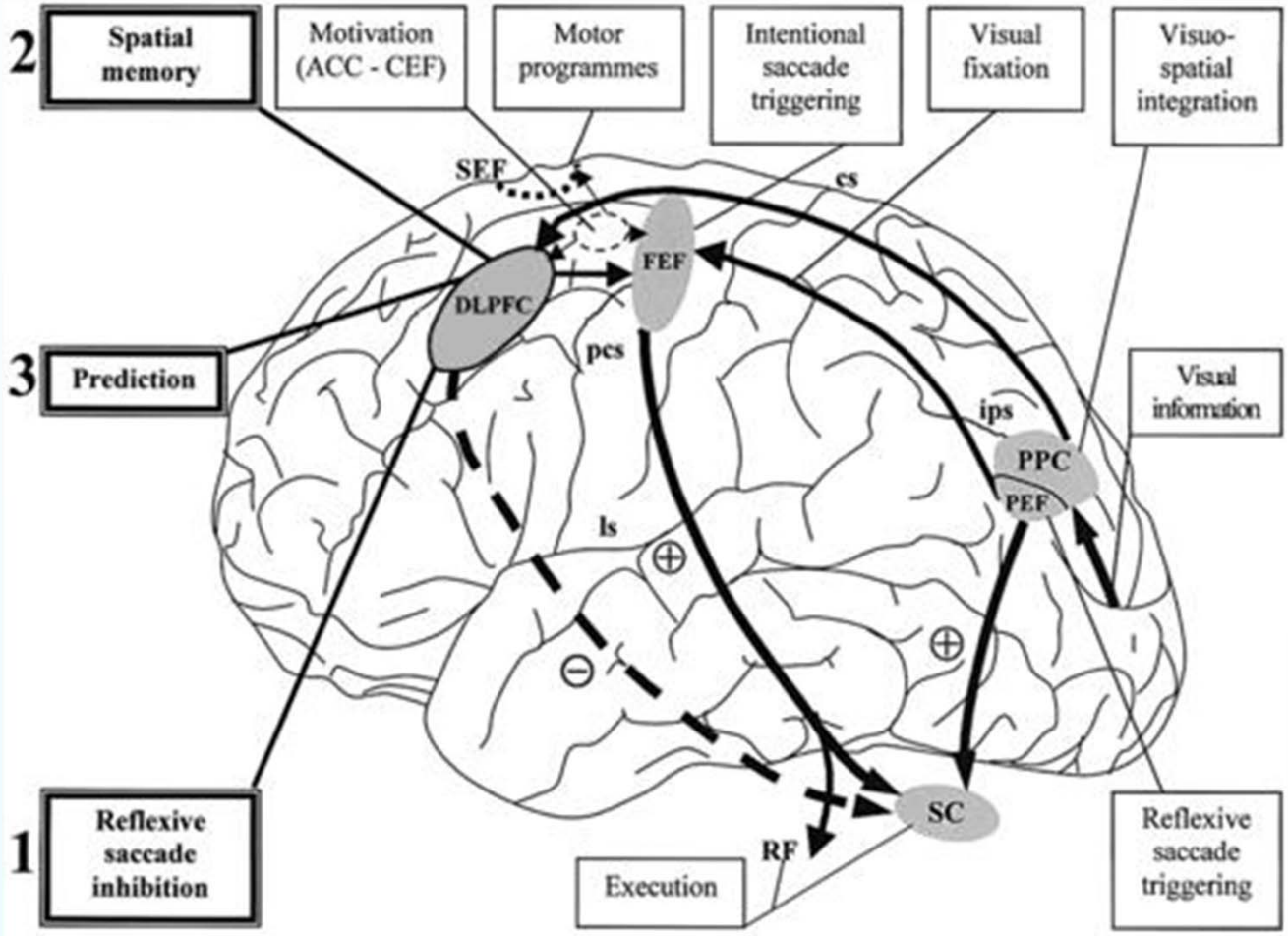
Caudal PFC

More complex

Rostral PFC



Most complex


2
Spatial memory
Motivation (ACC - CEF)
Motor programmes
Intentional saccade triggering
Visual fixation
Visuo-spatial integration
SEF
es
FEF
DLPFC
pcs
3
Prediction
Visual information
ips
PPC
PEF
ls
SC
1
Reflexive saccade inhibition
RF
Execution
Reflexive saccade triggering

Active Control of Tasks

- Inhibition: maintains focus
- Updating: keeps track of task-relevant information
- Switching: flexibly shift between

Driving: Inhibition

Stopping a left turn when you see people on the crosswalk

Driving: Shifting

Stopping the task of tuning the radio to see what is going on the road in front

Driving: Updating

Remembering the instructions from the radio about a blocked road and alternative routes to take

Executive Control Processes

- PFC controls activity in other parts of the brain
- Maintains activation