KING'S College LONDON

INSTITUTE OF PSYCHIATRY,
PSYCHOLOGY & NEUROSCIENCE

Module:
Biological foundations of mental health

Week 1:
Introduction to brain anatomy

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Topic 2
Neuroanatomy, neural systems and brain function

Part 3 of 3

CORTICAL CONNECTIONS

There are extensive connections to, from and within the cortex of the forebrain

Ascending connections:

- **Somatosensory from the thalamus**: - (inputs from spinal cord via thalamic nuclei)
- **Auditory**: - from the thalamus (inputs from the cochlea via thalamic nuclei)
- **Visual**: - from the thalamus (inputs from the retina via thalamic nuclei)
- **Smell** (direct into the olfactory cortex)
- **Taste** (inputs from taste buds via thalamic nuclei)

- Complex information from the cerebellum and basal ganglia via thalamic nuclei

CORTICAL CONNECTIONS

There are extensive connections to, from and within the cortex of the forebrain

Descending connections:

- Motor to the spinal cord (corticospinal tract)
- Motor to the brainstem motor nuclei (corticobulbar tract)
- Motor to the motor control centres (targeted to the basal ganglia and cerebellum)
- To the limbic system

Connections within the cerebral cortex:

- On same side: *association fibres* connecting different brain regions
- On opposite sides: *commissures* including the corpus callosum

The diagram shows the location of the principal association, commissural and projection fibres

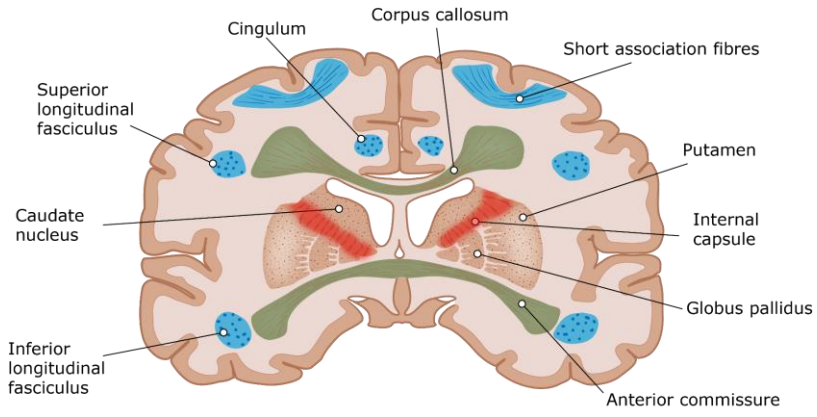
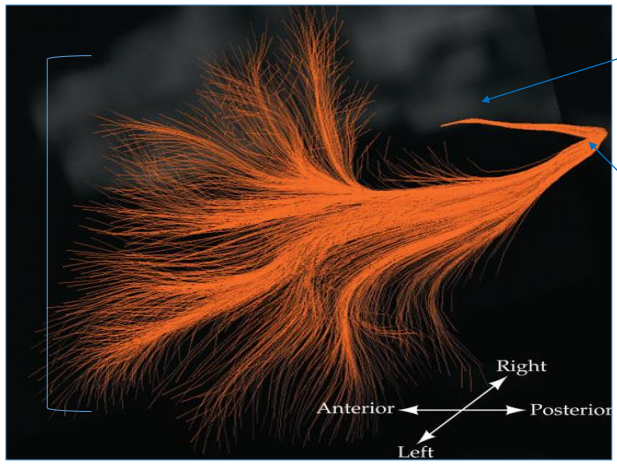


Figure 19: Coronal section of the cerebral hemisphere

Association Commissural Projection

Diffusion Tensor Tractography (DTI)

Projections to widespread areas of the left frontal cortex



"Seed point" in right frontal lobe

Anterior corpus callosum

Figure 20: Diffusion Tensor Tractography (DTI)

Brain connectivity: using computer-enhanced DTI

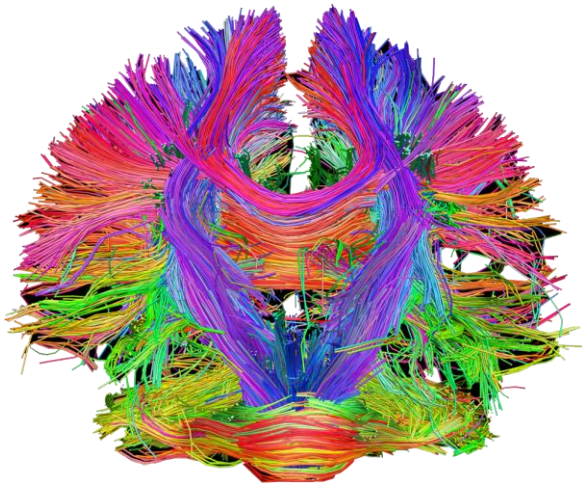


Figure 21: Computer-enhanced DTI

Summary

- The nervous system can be subdivided by functional or anatomical criteria
- The CNS is commonly divided into the hindbrain, midbrain and forebrain
- The phenomena of axonal convergence and divergence contribute to the complexity of neuronal circuitry
- Sophisticated neuroimaging techniques allow us to map the pathways within the brain with increasing precision

Figure references (1)

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10. Figures 20 & 21 curtesy of Dr. John Pizzey