Cerebral Cortex

A 6-layer sheet of cells, unfolded = < 1 m square X 3 mm thick
Cortex – 6 layers of cells

Info projected to cortex enters at Level 4

Nissl Stain for Cell Bodies

Weigert Stain for Fibers
Convoluted (folded) Cortex

Each bulge is a **GYRUS**
(Many = "Gyri")

Each fold is a **SULCUS**
(Many = "Sulci")

Central Sulcus

Lateral Fissure
4 Lobes of the Cerebral Cortex

- Frontal
  - Frontal lobe
- Parietal
  - Parietal lobe
  - Precentral gyrus
  - Postcentral gyrus
- Temporal
  - Temporal lobe
- Occipital
  - Occipital lobe
  - Cerebellum

Central sulcus
Occipital Lobe - Vision

V1 Primary Projection Area, from Thalamus
Major Visual Pathways

Dorsal Pathway
"Where/How"
(Motion & Depth)

Ventral Pathway
"Who/What"
(Color & Detail)
MT (Medial Temporal)

Along "Where/How"
Visual pathway to Parietal

(----- = Medial, NOT on outer surface)

Includes Direction-Sensitive Motion Detectors
MST (Medial Superior Temporal)

Includes "Optic Flow" Detectors

FIGURE 8.49 The flow of the environment as seen from a car speeding across a bridge toward point A. The flow, shown by the arrows, is more rapid closer to the car (as indicated by the increased blur) but occurs everywhere except A, the focus of expansion, toward which the car is moving. (Also see Figure 8.48a)
Ventral Visual Pathway

Color and Detail
Ventral Visual Pathway

Terminates at Inferior Temporal (IT) Higher Visual Cortex

includes Face Cells
Temporal Lobe - Audition

A1 Primary Projection Area for Audition, from Thalamus

Medial face of Temporal Lobe
Higher Auditory Cortex

Wernicke's Area for Speech Recognition

Major language areas of cerebral cortex
Emotional Expression & Interpretation

Right Hemisphere dominant
Parietal (Somatosensory) & Frontal (Motor) Cortex

Post-Central Gyrus (S1)
Primary Projection area for Somatosensory info

Pre-Central Gyrus
Primary Motor Cortex
Parietal (Somatosensory) & Frontal (Motor) Cortex

Post-Central Gyrus (S1) Primary Projection area for Somatosensory info
Parietal (Somatosensory) & Frontal (Motor) Cortex

Pre-Central Gyrus
Primary Motor Cortex
Parietal Lobe

Dorsal Visual Pathway "Where/How"
- integrated w/ Tactile & Proprioception

Activity reverberates w/ Premotor Cortex, to shape how hand approaches

Canonical Cells
Respond to "affordances" of objects
Parietal Lobe

Mirror Cell System
Respond to seeing self, or other, perform and action.

Activity reverberates with Mirror Cells in Premotor Cortex

Promotes Imitation
Frontal Lobe

Primary Motor Cortex
Voluntary action
Frontal Lobe

Pre-Motor Cortex
Prepare to act;
Planning

Broca's Area

Mirror Cells

Major language areas of cerebral cortex

Prepare to Speak

Simulation of observed action
Prefrontal Cortex

Oribito-Frontal Cortex

Evaluation behavior of self and other, ToM, Social strategy

Exercising Self Control, delayed gratification, planning, cultural rules, etc.
Corpus callosum
White Matter

The connections between "the little grey cells". Consisting mainly of Myelinated axons.

Brain = \(~66\% \text{ White Matter\), by volume}
Spinal Cord

31 Segments

Like the brain, encased in bone & meninges
Spinal Cord

**Mnemonic:**
In the Door
and out the Vent,
that's how Spinal info's sent!

**Bell-Magendie Law:**
Sensory info enters Dorsal Horn
Motor info exits Ventral Horn
CNS & PNS

**CNS**
Central Nervous System
= Brain & Spinal Cord
Surrounded by bone and meninges

**PNS**
Peripheral Nervous System

**SOMATIC** System
= Interaction w/external env.

**AUTONOMIC** System
= Regulates internal env.
PNS includes **Cranial Nerves**

- **Sensory**
- **Motor**

Involved in **SOMATIC** and **AUTONOMIC** Nervous Systems

The Twelve Pairs of Cranial Nerves and the Regions They Serve
PNS – Spinal Nerves

31 Segments

1 pair of afferent
(in-flowing)
**Dorsal** Root Nerves

...for each...

1 pair of efferent
(out-flowing)
**Ventral** Root Nerves

Many of these play crucial role in
**Autonomic Nervous System**
Sympathetic System

Parasympathetic System

Fight or Flight

Rest & Digest

Autonomic nervous systems
Sympathetic System

**Fight or Flight**
- Pupils dilate
- Mouth dry
- Heart rate increase
- Bronchi expand
- Halt digestion
- Liver release blood-sugar
- Activate adrenal glands and sweat glands
- Constrict blood vessels
- Pilo-erection
- Halt digestive juices
- Halt intestinal motility
- Constrict bladder
- Genitalia inactive (except at orgasm)

Parasympathetic System

**Rest & Digest**
- Pupils constrict
- Produce saliva
- Heart rate decrease
- Bronchi constrict
- Promote digestion
- Produce digestive juices
- Increase intestinal motility
- Release bladder
- Genitalia active
Sympathetic System

When this system gives extreme reaction...

Parasympathetic System

...this system will "Rebound"

Fight or Flight

e.g. Repeated stressors...