### Parts of the Brain

The human brain is made up of three main parts:

1) **Hindbrain** (or brainstem)
   - Which is made up of:
     - Myelencephalon
     - Metencephalon

2) **Midbrain**
   - Which is made up of:
     - Mesencephalon

3) **Forebrain** (or cerebrum)
   - Which is made up of:
     - Diencephalon
     - Telencephalon

#### Hindbrain

The *Hindbrain* consists of three major parts:

1. **Myelencephalon**
   - Lower part of hindbrain

#### Myelencephalon

The *Myelencephalon* has one primary part:

- **A. Medulla oblongata**
  - Controls autonomic functions
  - Breathing, Heartbeat, Blood pressure, Swallowing, Vomiting, etc.

#### Metencephalon

The *Metencephalon* has two primary parts:

- **A. Pons**
  - Regulates brain activity during sleep
  - Connects cerebrum & cerebellum
  - Respiration

- **B. Cerebellum**
  - Coordinating muscle action (balance & coordination)
  - Implicit learning/memory
C. Reticular formation

What it is:
• Network of nerves that passes through hindbrain
• Extends from spinal cord to thalamus

What it does:
(a) Alerts cortex to new stimuli
(b) Helps sift incoming stimulus so only important stuff sent to conscious mind
(c) Plays role in arousal (ability to receive stimuli)

Midbrain

The Midbrain is also known as the Mesencephalon.
The Midbrain consists of two main parts:

1. Inferior colliculi
   • Processes auditory information

2. Superior colliculi
   • Processes spatial information
   • Directs eye/head coordination
**The Forebrain**

It is divided into a right and a left hemisphere

The *forebrain* consists of two parts: an inner and an outer region:

- Inner part of the forebrain

1. Diencephalon

The *Diencephalon* consists of five major parts:

- Master gland for endocrine system

A. Pituitary gland

- Brain’s sensory switchboard
- Receives information from all senses (except smell)
- Relay & distribution of many sensory & motor signals to specific parts of cerebral cortex

Both work closely with limbic system
Sometimes considered part of limbic system

B. Thalamus

- Regulation of sympathetic & parasympathetic nervous systems
- Controls pituitary gland
- Releases dopamine

C. Hypothalamus
D. Limbic system

- Emotional center of the brain
- Instinctual motivations (food, drink, sex, etc.)
- Basic emotions (anger, fear, pleasure, etc.)
- Link between hind & forebrain

The **Limbic System** consists of three major parts:

1. Amygdala
   - Influences aggression & fear
   - Formation of long term memories associated with emotional events
   - Emotional responses

2. Hippocampus
   - Formation of explicit memory
   - Consolidates information into long-term memory
   - Decides what information goes into long-term memory
   - Spatial memory & navigation

3. Cingulate gyrus
   - Coordinates sensory input with emotions
   - Emotional responses to pain
   - Regulates aggressive behavior
E. Basal ganglia

<table>
<thead>
<tr>
<th>The Basal Ganglia consists of two major parts:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Amygdala</td>
</tr>
<tr>
<td>- Part of both the limbic system &amp; basal ganglia</td>
</tr>
<tr>
<td>2. Caudate nucleus</td>
</tr>
<tr>
<td>- Learning &amp; memory</td>
</tr>
<tr>
<td>- Comprehension of language</td>
</tr>
<tr>
<td>- Response to visual beauty?</td>
</tr>
</tbody>
</table>

2. Telencephalon

The outer region of the forebrain

The Telecephalon consists of one major part:

<table>
<thead>
<tr>
<th>A. Cerebral Cortex</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Wrinkled outer layer of the brain</td>
</tr>
<tr>
<td>- Controls mostly sense &amp; motor functions</td>
</tr>
<tr>
<td>- Wrinkled - increase surface of the brain (15 square feet)</td>
</tr>
<tr>
<td>- Gyri: ridges</td>
</tr>
<tr>
<td>- Sulci: valleys</td>
</tr>
<tr>
<td>- 2mm to 4mm thick</td>
</tr>
<tr>
<td>- 20-23 billion neurons</td>
</tr>
<tr>
<td>- 2/3 of body’s neurons in cerebral cortex</td>
</tr>
</tbody>
</table>
### Cerebral Cortex, continued

- Divided into two hemispheres
- Each hemisphere divided into four lobes

### Interior:
- Mostly axon connections, glial cells
- Links cerebral cortex with rest of brain

### Glial cells (‘nanny cells’)
- Non-neuron support cells in CNS
- Provides nutrients

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**Cerebrum:** usually categorized as the lobes, and the interior parts of the forebrain

**The four lobes and each one’s function are:**

|-----------------|-----------------|------------------|-----------------|
| • Primary motor cortex (voluntary motion)  
  • Efferent neurons | • Sensory functions (Touch & Taste)  
  • Primary sensory cortex  
  • Afferent neurons | • Sensory functions (visual)  
  • Primary visual cortex  
  • Afferent neurons | • Sensory functions (auditory)  
  • Primary auditory cortex  
  • Afferent neurons |
The Sensory & the Motor Cortexes

**Sensory Cortex**

More sensitive the body region, the more space it takes up in sensory cortex (Tongue, lips, genitals, etc.)

**Motor Cortex**

Areas of the body that require precise control (fingers, mouth) take up more space in the motor cortex

There are two other important parts that are associated with the cerebrum:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Olfactory bulb</td>
</tr>
<tr>
<td></td>
<td>• Receives nerve impulses from olfactory receptors</td>
</tr>
<tr>
<td></td>
<td>• Goes directly to cerebral cortex</td>
</tr>
<tr>
<td></td>
<td>• Bypasses thalamus</td>
</tr>
</tbody>
</table>

| C | Corpus callosum |
|   | • Band of neural fibers      |
|   | • Connects left hemisphere with right hemisphere       |
## Association Areas

- Functions **NOT** sensory nor motor related
- Associates stored memory with sensory inputs
- Integrates information
- Higher mental functions (abstract thinking, etc.)

There are five major Association Areas:

<table>
<thead>
<tr>
<th></th>
<th>Frontal Lobe</th>
<th>Temporal Lobe</th>
<th>Broca’s area</th>
<th>Wernick’s area</th>
<th>Angular gyrus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>• Judgment</td>
<td>• Short term memory</td>
<td>• Controls language expression</td>
<td>• Controls language reception</td>
<td>• Language learning/acquisition</td>
</tr>
<tr>
<td></td>
<td>• Planning (long term)</td>
<td></td>
<td>• Muscle movement - spoken &amp; written language</td>
<td>• Comprehension of spoken &amp; written language</td>
<td>• Object naming</td>
</tr>
<tr>
<td></td>
<td>• Organization</td>
<td></td>
<td></td>
<td></td>
<td>• Making associations (between image &amp; name, image &amp; word, etc.)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Math</td>
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</tbody>
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![Diagram of brain areas](image)