

Neuroanatomy/Neurophysiology Basics

•The Brain [Animation](#)

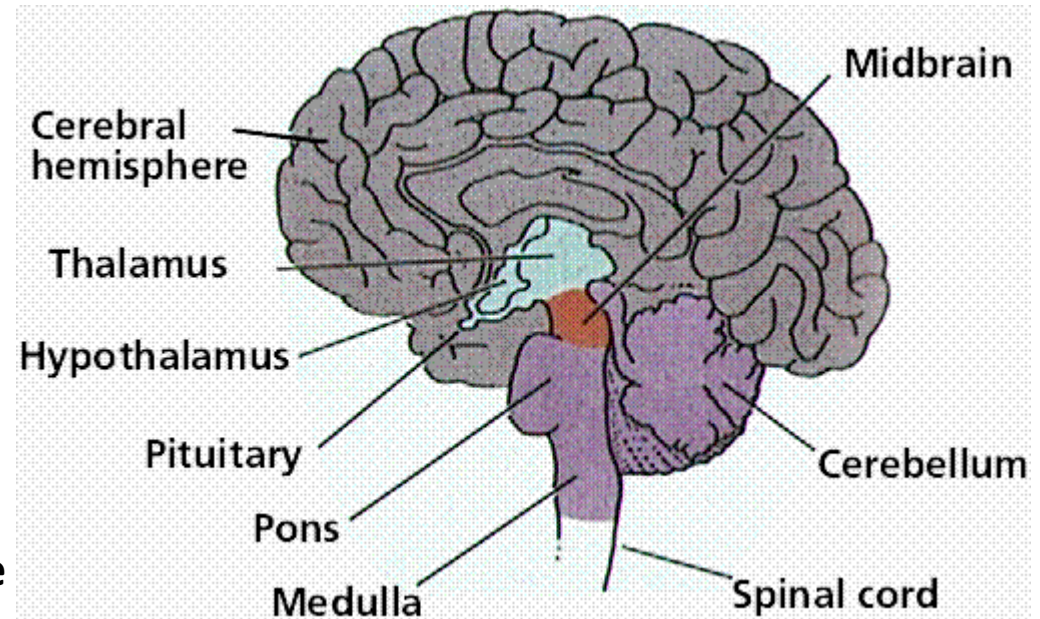
- A. Has a normal volume of approximately **950** to **2,200** cm.
- B. Average of **21,370** cubic centimeters.
- C. Weighs about **1.35** kg (or **3** pounds).
- D. Consists of hundreds of billions of **neurons** and **glial** cells.
 - 1. Maximum number of neurons occurred when you were **born**.
 - 2. Thousands are lost **daily**, never to be replaced and apparently not missed, until the cumulative loss builds up in very old age.
- E. The brain is very **complex**, and is not thoroughly understood



II. The Unconscious Brain

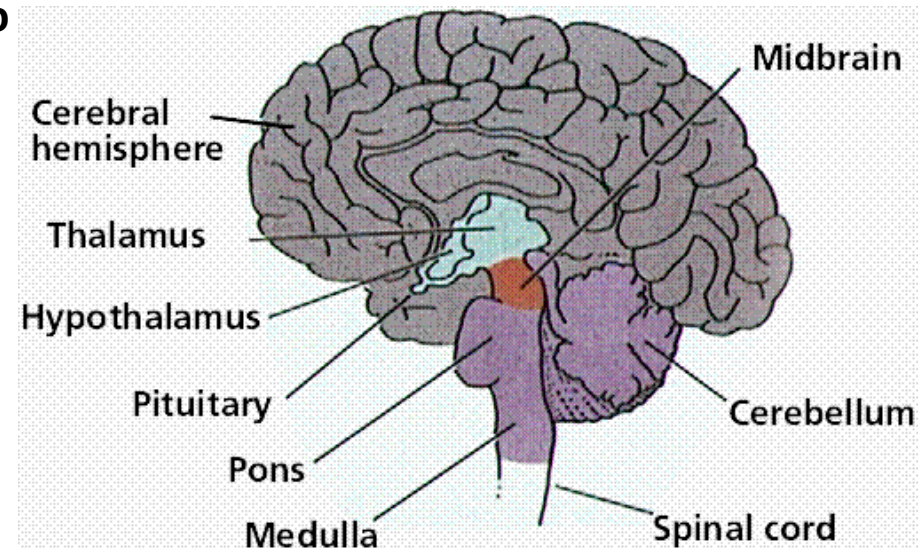
A. **MEDULLA OBLONGATA (X)**

1. Lies closest to **spinal cord**.
2. Controls:
 - a. **Heart** rate
 - b. **Breathing**
 - c. **Blood** pressure
 - d. Reflex reactions like **coughing, sneezing, vomiting, hiccupping, swallowing**.
3. An "**ancient**" part of brain.
4. **Pons** also participates in some of these activities.



B. THALAMUS (V)

1. Receives **sensory** information from all parts of the body and channels them to the **cerebrum**. [McGurk Effect](#)
2. **Last** portion of the brain for sensory input before the cerebrum.
3. Receives all sensory impulses (except for smell) and sends them to **appropriate** regions of the cortex for **interpretation**.

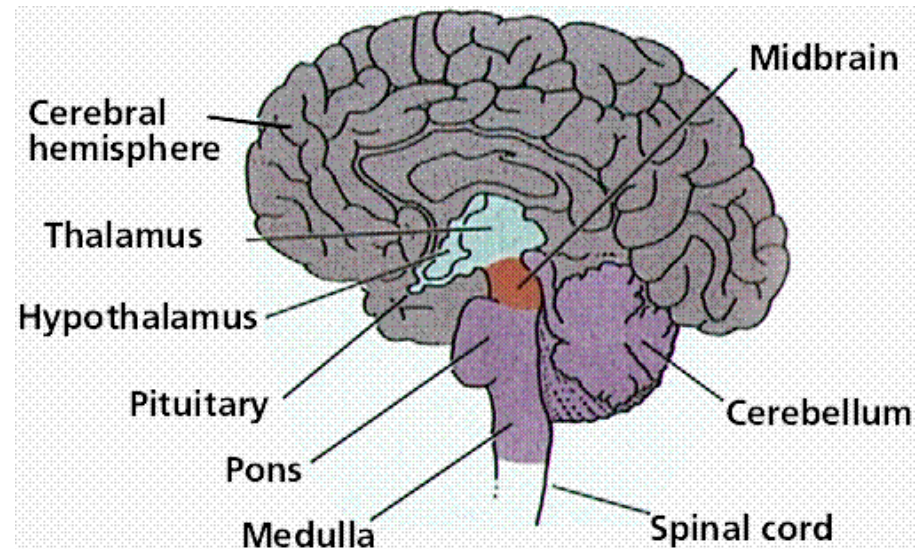


4. "**Gatekeeper**" to cerebrum

5. The thalamus has connections to various parts of the brain, and is part of the **reticular activating system (RAS)**

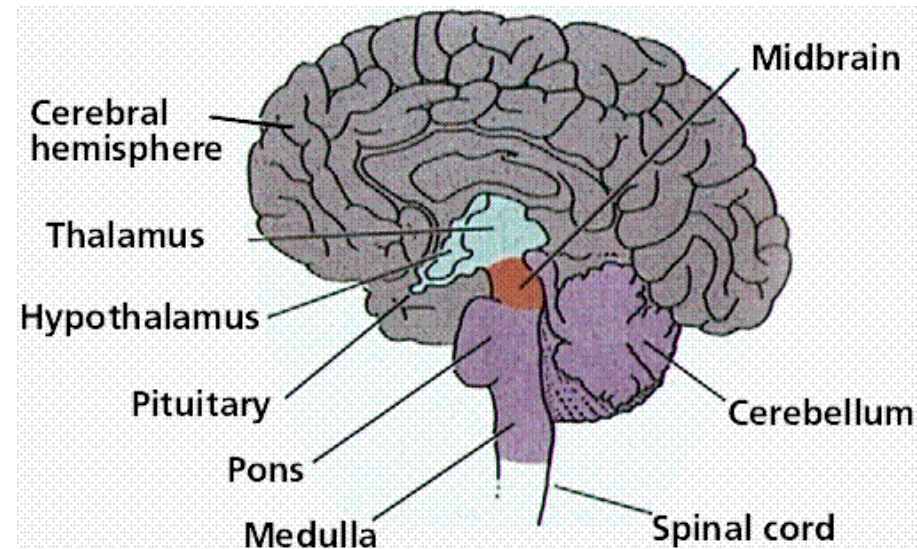
a. RAS sorts out incoming stimuli, passing on to the cerebrum only those that require **immediate** attention. [Ted-ed Misdirection](#)

b. E.g. Lets you ignore input (like your teacher talking) so you can do other things (talk to your friends about Grad).



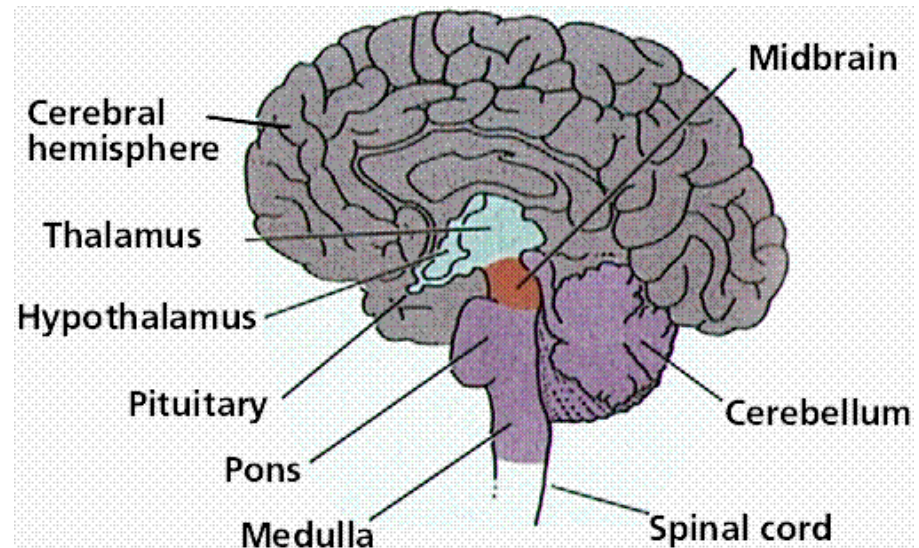
C. CEREBELLUM (Z)

1. Controls **balance** and complex **muscular** movement.
2. **Second** largest portion of the brain.
3. Functions in **muscle coordination** and makes sure skeletal muscles work together **smoothly**.
4. Responsible for maintaining normal **muscle tone, posture, balance**.
5. Receives sensory information from the **inner ear** (which senses balance).



D. HYPOTHALAMUS (W)

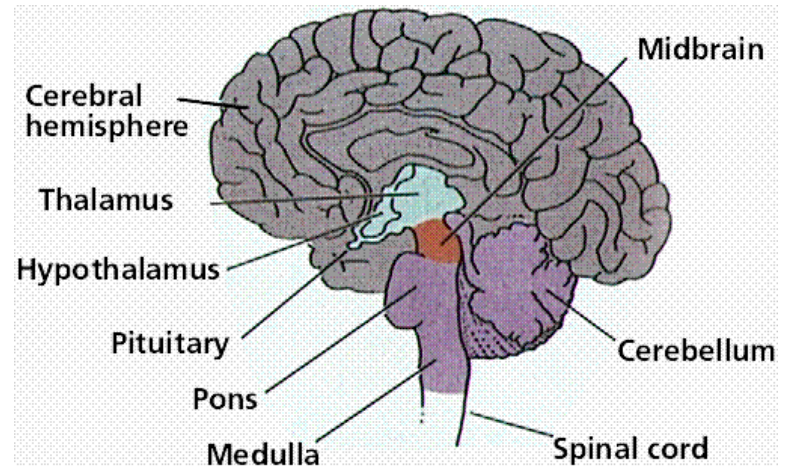
1. Important site for the regulation of **homeostasis**.
2. Maintains internal environment, contains centers for:
 - a. **Hunger**
 - b. **Sleep**
 - c. **Thirst**
 - d. **Body temperature**
 - e. **Water balance**
 - f. **Blood pressure**.
3. Controls **pituitary gland (U)**.
 - a. Serves as a link between the **nervous** system and the **endocrine** systems



E. CORPUS CALLOSUM (Y)

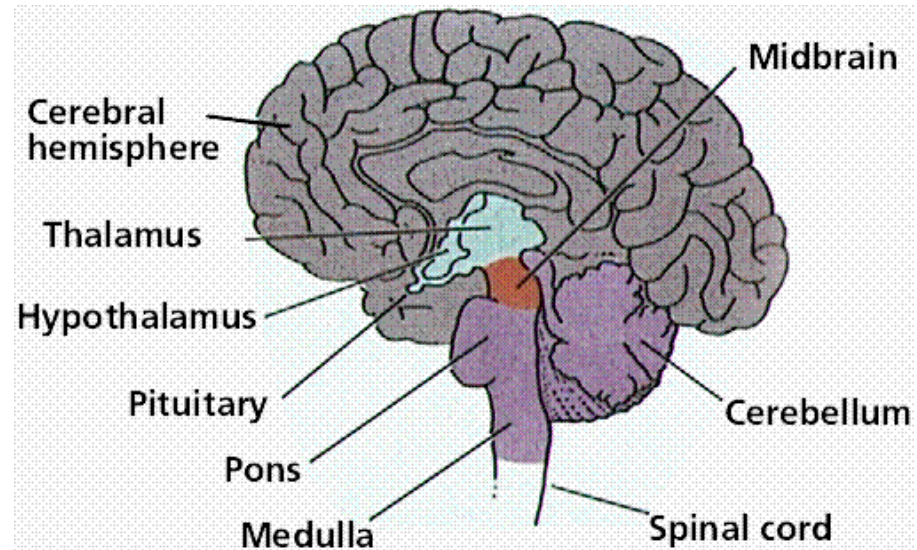
1. Horizontal connecting piece between the **two** hemispheres of the brain.
2. Transmits information between the two **cerebral** hemispheres.
3. Each half has its own memories and “**style**” of thinking

[Animation](#) [Ted-Ed Left/Right Brain](#)



4. **Right** hemisphere of the brain controls the **left** side of the body (except for smell), and vice versa.

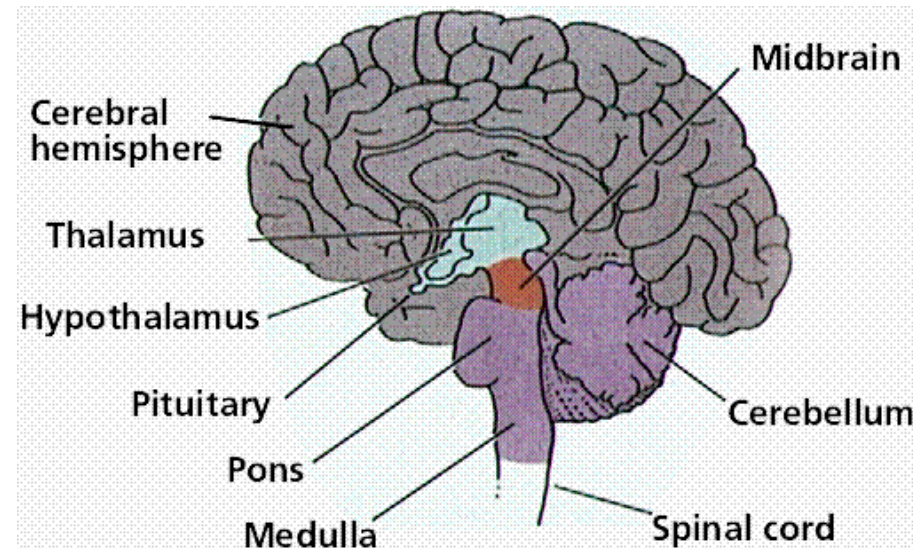
- a. An image viewed with the right eye is actually “seen” with the left occipital lobe.
- b. Left hand is controlled by the right frontal lobe. [Animation Jill Bolte \(Ted Talk\)](#)



III. The Conscious Brain

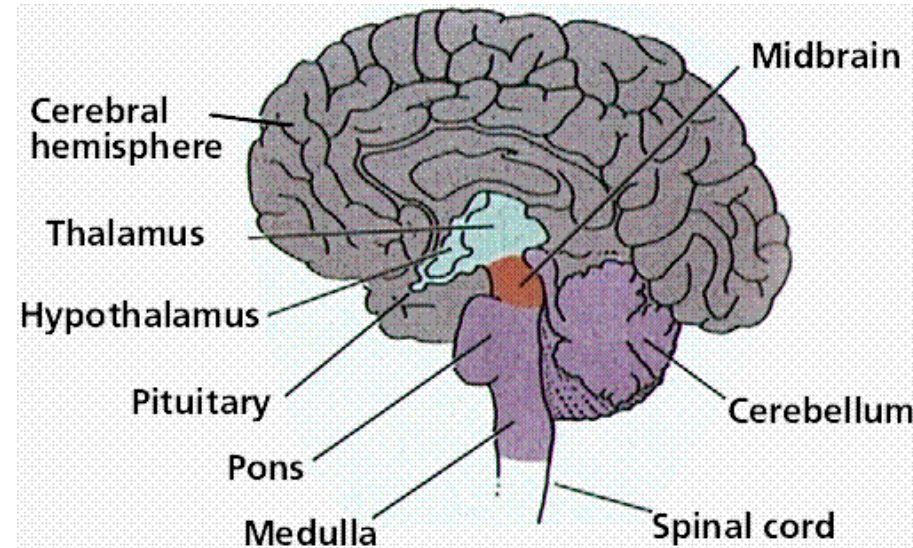
A. CEREBRUM

1. **Largest**, most prominent, most highly developed portion of the brain.
2. **Consciousness** resides only in this part of the brain.
3. **Intellect, learning, memory, sensations** are formed here.
4. Most complex part of the **human** brain.



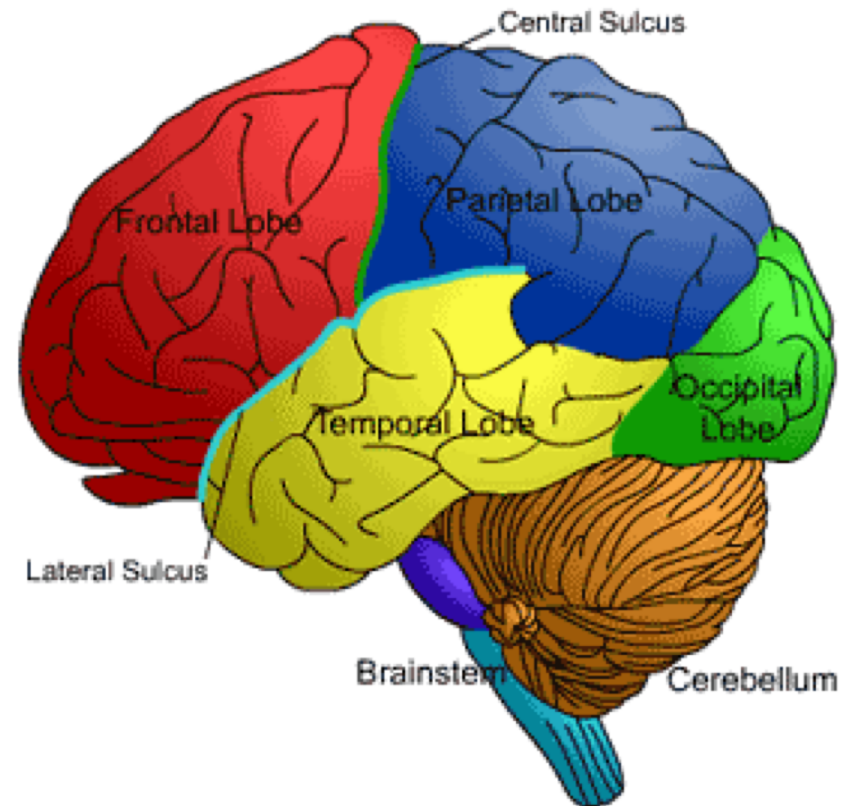
5. Part that has changed the most during vertebrate **evolution**.

6. Outer layer is called the **CORTEX** (gray in colour) and is highly **convoluted** with a surface area of about 0.5 m².



7. Divided into right and left cerebral hemispheres, each consisting of four major lobes:

- a. **Frontal**
- b. **Parietal**
- c. **Temporal**
- d. **Occipital lobes**



8. All the lobes have **association** areas that receive information from other lobes and integrate it into higher, more **complex** levels of consciousness.

9. The cerebral cortex has been “**mapped**” in some detail.

B. 4 Major Lobes

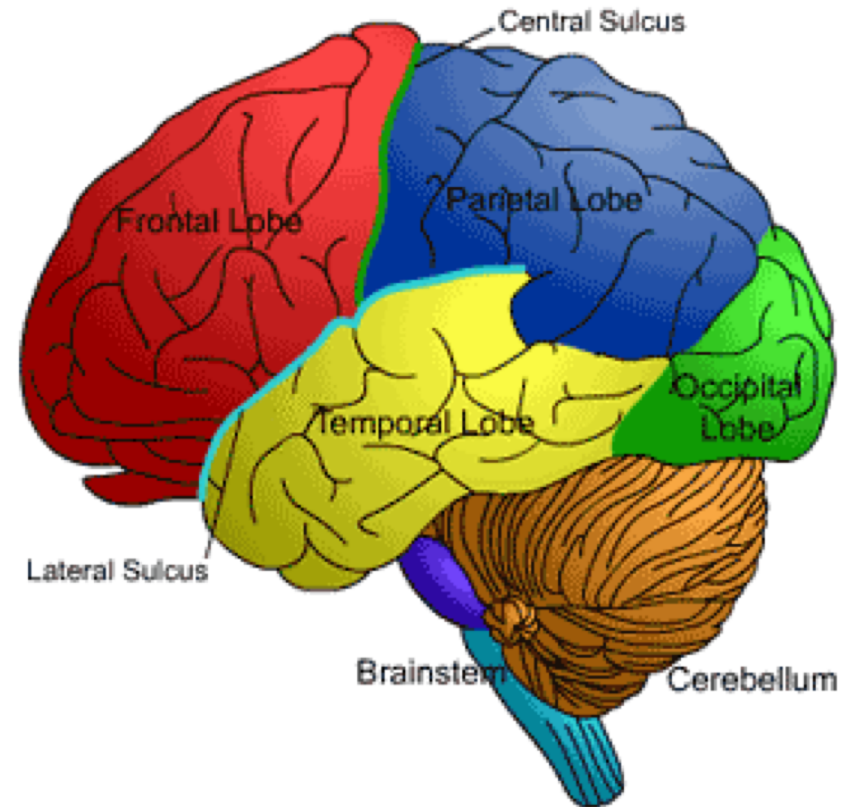
1. **FRONTAL**

- a. **Movement**
- b. Higher **intellectual** processes
- c. E.g. Problem solving, concentration, planning, judging the consequences of behavior. [ASAP Social Media](#)

[TED-Ed Multitasking](#)

2. **PARIETAL**

- a. **Sensations**
- b. E.g. Touch, temperature, pressure, pain. [TED-Ed Pain](#)



3. TEMPORAL

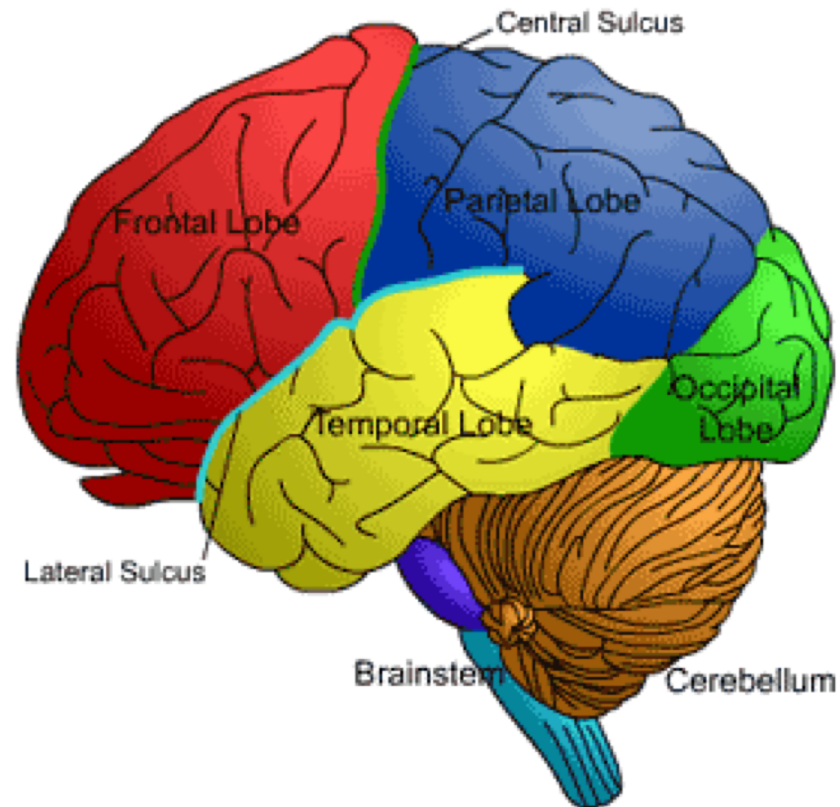
- a. **Hearing**
- b. **Smelling**
- c. **Interpretation** of experiences
- d. **Memory** of visual scenes
- e. **Music**
- f. Complex sensory **patterns**

4. OCCIPITAL

- a. **Vision**
- b. Combining visual experiences with other **sensory** experiences.

[Animation 2](#)

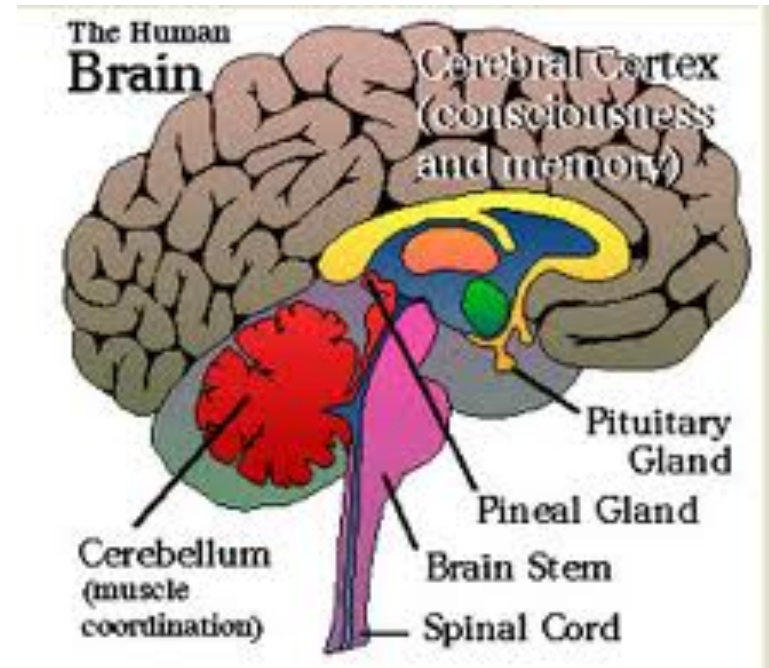
[Jerry Andrus](#)



The Neuroendocrine System

I. Pituitary

- A. Located under and connected to the **Hypothalamus**
- B. Made of 2 parts
 1. **Anterior** pituitary
 2. **Posterior** pituitary
- C. Exerts control over body's **endocrine** system
- D. Produces a large number of **hormones**
- E. Many of these **control** the release of hormones from other glands in the body



II. Posterior Pituitary

A. Releases hormones that are actually **made** in the **hypothalamus**, but are stored here.

B. These hormones are transferred and stored in special hollow nerve **fibres** that run between.

C. Example hormones:

1. **Antidiuretic** hormone (ADH)
2. **Oxytocin**

III. Anterior Pituitary

- A. **Makes** and releases its **own** hormones.

- B. It is stimulated to **release** its hormones by the release of hormones from the **hypothalamus**.

- C. A **portal** blood vessels system connect the hypothalamus and the anterior pituitary.

- D. Example hormones:
 1. **Growth hormone**
 2. **Prolactin**
 3. **Follicle stimulating hormone (FSH)**
 4. **Leutinizing hormone (LH)**
 5. **Thyroid Stimulating Hormone (TSH)**
 6. **Adrenal Cortex Stimulating Hormone (ACTH)**
 7. **Melatonin**

IV. Control Systems

- A. Blood levels of all pituitary hormones are monitored by the **hypothalamus**.

- B. Control is often by “**negative feedback**” so that the levels remain relatively constant.

- C. Specific examples to follow in sections on **Urinary** and **Reproductive** systems.

[Hank Green Endocrine Synopsis](#)

[Neuroendocrine Animation](#)

Links to more Brain animations

Brain Maladies

[TED-ED Dyslexia](#)

[TED-ED Alzheimer's](#)

[TED-ED Sleep Terrors](#)

Study Hard!

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[TED-Ed Percentage of brain use](#)

[TED-Ed Memory](#)

[Male/Female Brain](#)