Appendix 32 - Parts of the Brain

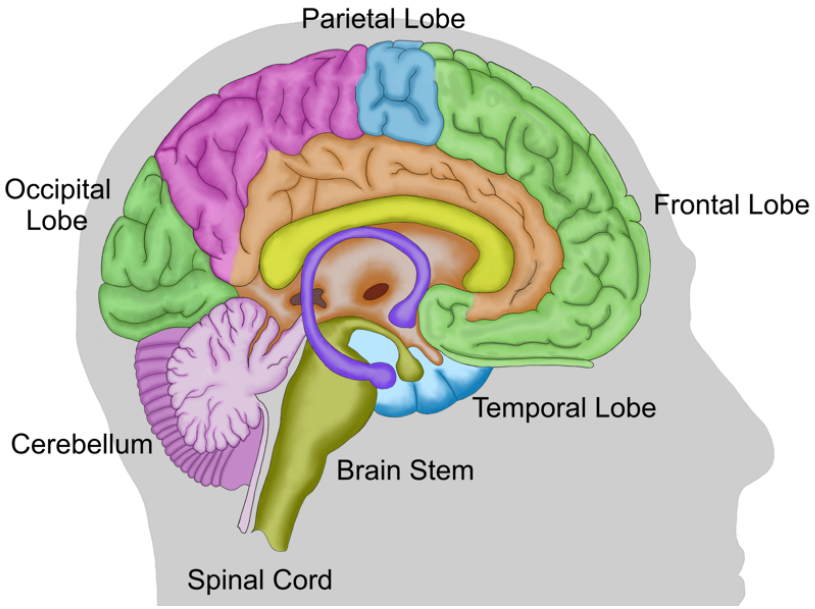
The **cerebral cortex** is made up of tightly packed neurons and is the wrinkly outermost layer that surrounds the brain. It is also responsible for higher thought processes, including speech and decision making. The brain comprises functional and structurally defined areas. These include the cortex containing the frontal, occipital, temporal and parietal lobes.

The **frontal lobe** sits at the front and top of the brain. It is responsible for the highest levels of human thinking and behavior, such as planning, judgment, decision making, impulse control, and attention.

The **parietal lobe** lies behind the frontal lobe. This lobe takes in sensory information and helps an individual understand their position in their environment.

The **temporal lobe** is at the lower front of the brain. This lobe has strong links with visual memory, language, and emotion.

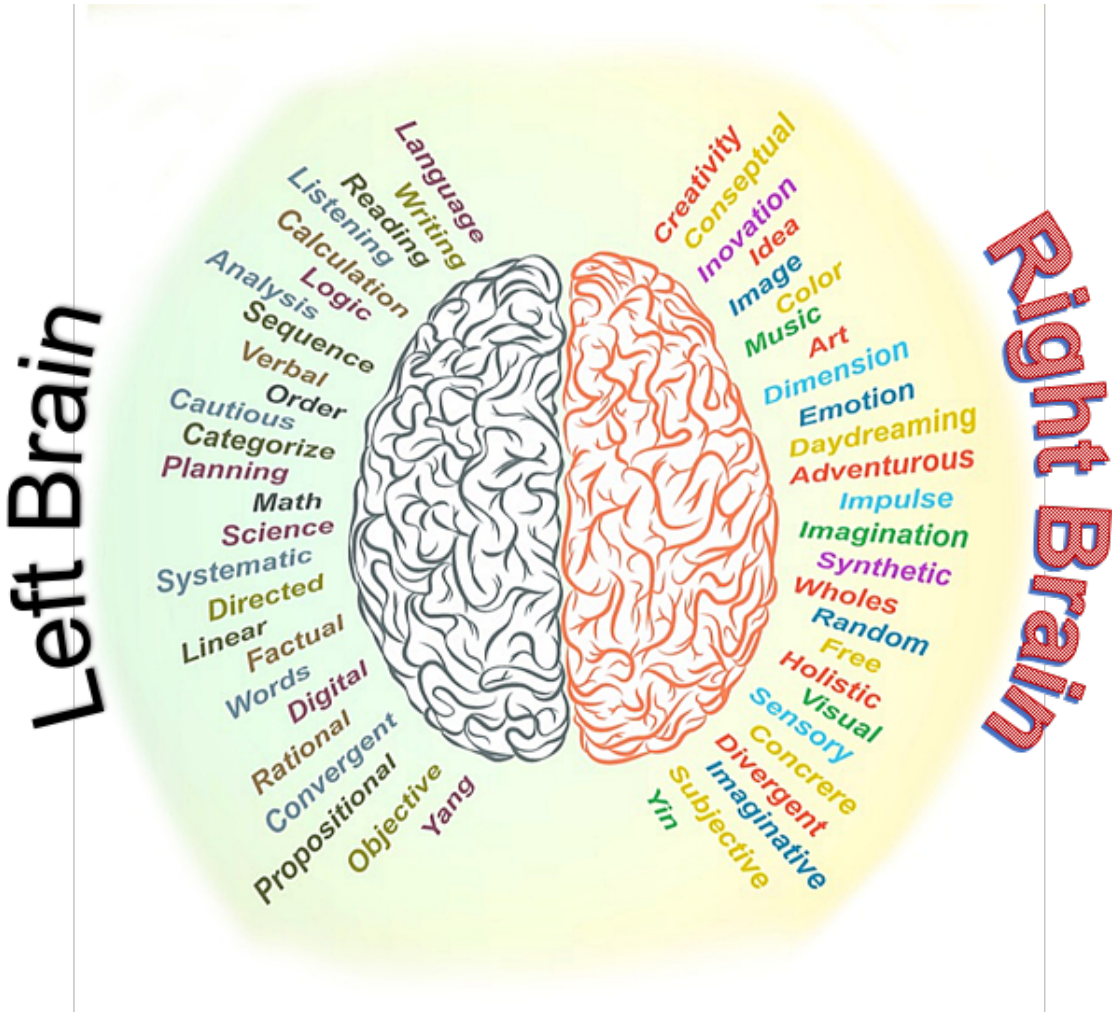
Finally, the **occipital lobe** is located at the back of the brain. The occipital lobe processes visual input from the eyes.



Below the cortex (the thin layer of the brain that covers the outer portion 1.5mm to 5mm) of the cerebrum) lie the basal ganglia, thalamus, hypothalamus, limbic system, cerebellum, and brainstem. While functions may be primarily localized to one part of the brain, most complex functions, like language and sleep, involve neurons in multiple brain area.

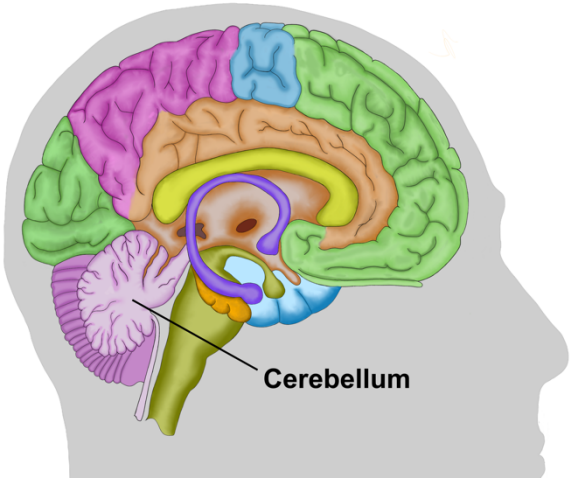
Left and Right Hemispheres –

Our brains have a right and left hemisphere. Although equal in size, these two sides are not the same, and do not carry out the same functions. The left side of the brain is responsible for controlling the right side of the body. It also performs tasks that have to do with logic, such as in science and mathematics. On the other hand, the right hemisphere coordinates the left side of the body, and performs tasks that have do with creativity and the arts. Both hemispheres are connected by the corpus callosum and serve the body in different ways.



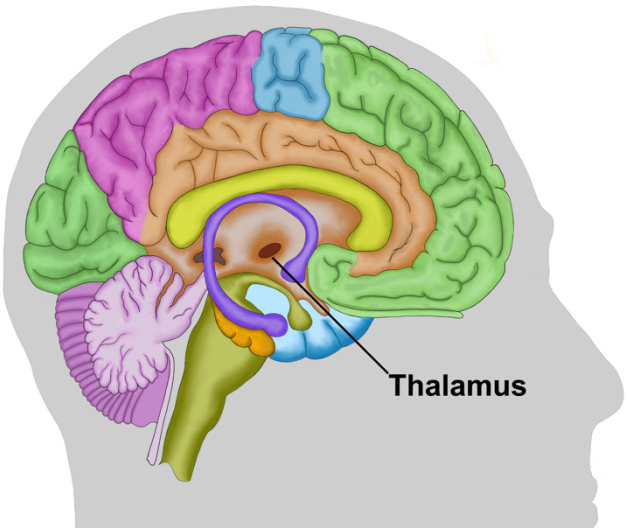
Limbic System – The limbic system, also known as the paleomammalian cortex, is a set of brain structures on both sides of the thalamus, immediately beneath the medial temporal lobe of the cerebrum primarily in the midbrain.

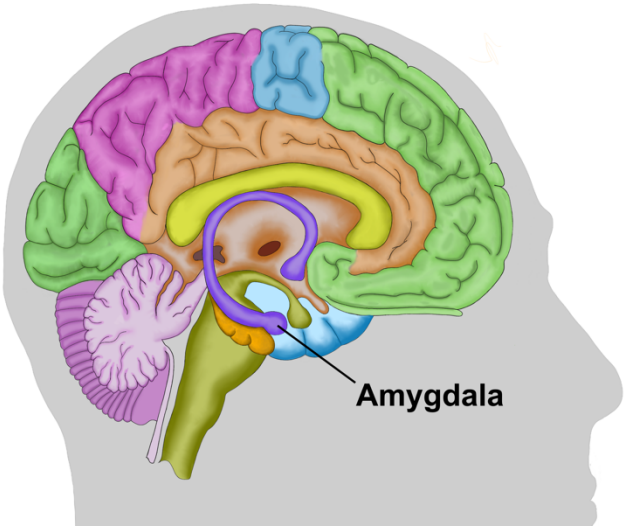
It supports a variety of functions including emotion, behavior, motivation, long-term memory, and olfaction. It houses emotional life in the limbic system, and it critically aids the formation of memories. Its components are listed below.



Cerebellum - The cerebellum plays a vital role in virtually all physical movement. This part of the brain helps a person drive, throw a ball, or walk across the room. The cerebellum also assists with eye movement and vision. Problems with the cerebellum are rare and mostly involve movement and coordination difficulties.

Thalamus - The thalamus analyzes, and processes different sensory information being transmitted to the brain including auditory (relating to hearing or sound), visual, tactile (relating to touch), and gustatory (relating to taste) signals. After that, it directs the sensory information to the different parts and lobes of the cortex. If this part of the brain is damaged, all sensory information would not be processed, and sensory confusion would result.

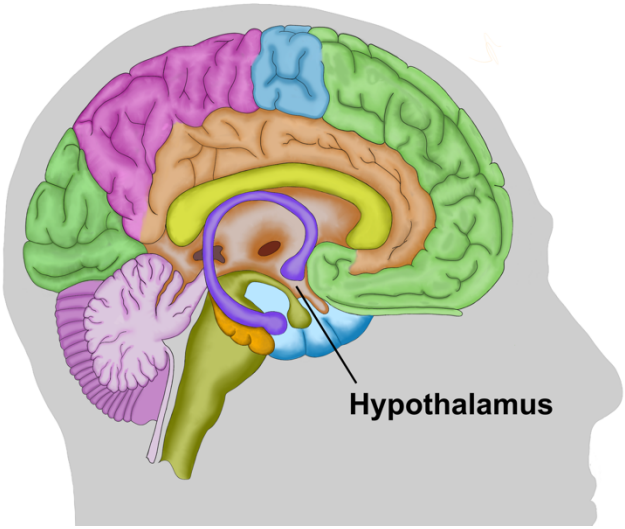


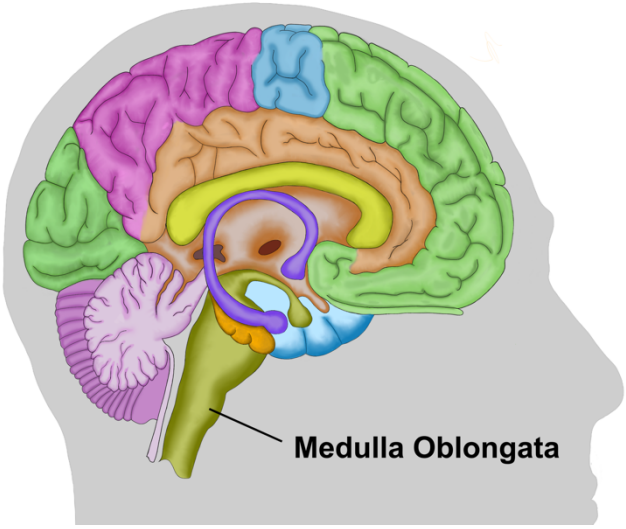


Amygdala —The Amygdala is a part of the Limbic System, at the end of the hippocampus. It is responsible for the response and memory of emotions. When you think of the amygdala, you should think of one word. Fear. The amygdala is the reason we are afraid of things outside our control. It also controls the way we react to certain stimuli or an event that causes an emotion we see as potentially threatening or dangerous. This is important to remember as it weighs heavy in many of the concepts presented.

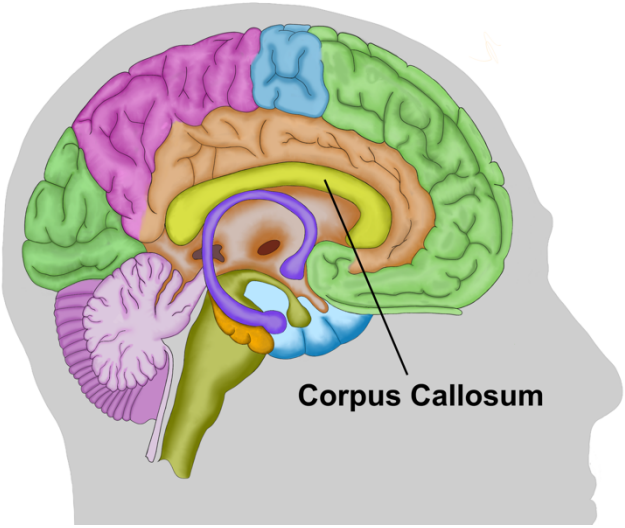
Hypothalamus– The hypothalamus is located just above the pituitary gland and below the thalamus. It is responsible for behaviors such as hunger and thirst and the maintenance of body temperature.

The hypothalamus is mainly responsible for motivational behavior. It is the reason we know when we are hungry or thirsty. The hypothalamus also helps our body maintain a constant temperature. This part of the brain also controls the pituitary gland, which is the master gland that controls all the other endocrine glands in the body. Thus, the hypothalamus plays a key role in connecting the endocrine system with the nervous system.

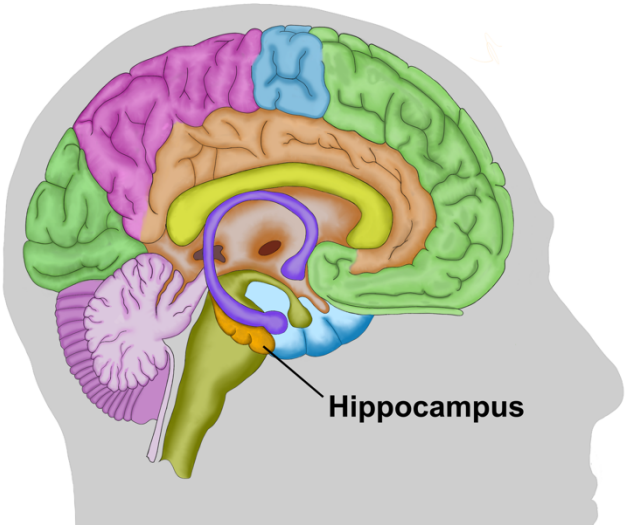




Medulla Oblongata–The Lower part of the brain stem conducting and regulating life-sustaining functions such as breathing, swallowing and heart rate. The medulla is easily the most important part of the brain. Its functions are involuntary, done without thought. We could not live without the medulla because of the myriad of crucial tasks it performs, including regulating blood pressure and breathing. As a part of the brain stem, it also helps transfer neural messages from the brain to the spinal cord.



Corpus Callosum—Is located just above the Thalamus, under the cortex. It connects the right and left hemispheres of the brain. The Corpus Callosum is the part of the mind that allows communication between the two hemispheres of the brain. It transmits neural messages between both the right and left hemispheres, literally the data super-conductor between the two hemispheres of the brain.



Hippocampus—is part of the Limbic system, in each temporal lobe, responsible for processing long term memory and emotional responses. It has a unique shape, similar to that of a horseshoe. It not only assists with the storage of long-term memories but is also responsible for the memory of the location of objects or people. We could not remember where our house is without the work of the hippocampus. Alzheimer's disease (a disease that affects elderly people and often results in loss of memory) has been proven to have affected and damaged this area of the brain.

Pons—Area of the hindbrain that sits directly above the medulla. It connects upper and lower parts of the brain, connecting the cerebral cortex with the medulla oblongata.

It facilitates communications and coordination center between the two hemispheres of the brain. The Pons serves as a message station between several areas of the brain. It helps relay messages from the cortex and the cerebellum. Without the pons, the brain could not function because messages could not be transmitted or passed along. It also plays a key role in sleep and dreaming, where REM sleep, the sleeping state where dreaming is most likely to occur to originate here, in the pons. Its autonomic function is breathing regulation.