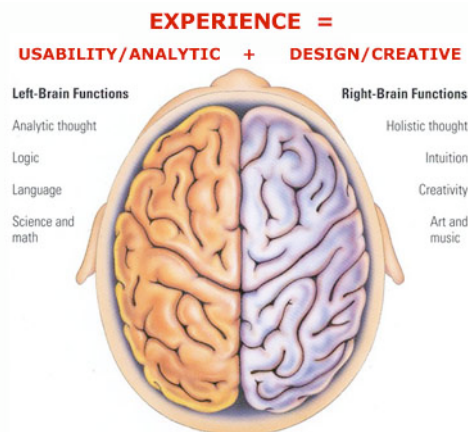


## Brain Science 101: The Anatomy and Function of the Brain

Your brain is an amazing thing! Perhaps the best multi-tasking, data processing, emotional machine on the planet! Although, much like a computer it can't do much on it's own without input and feedback. Its purpose in life is to run the show that is called your body. It is the source of both conscious and unconscious thoughts. Through sensory input and it's capacity to process that information, it allows you to feel happy; smell a wet dog; memorize a poem; teach a child to read; experience cold; skip a rock; recognize a pattern; find your way using a map; remember how you burned your finger on the stove; procrastinate; sing a song; and all the billions of other experiences you have ever had. All that, crammed into approximately three pounds of tissue carried around in your head!

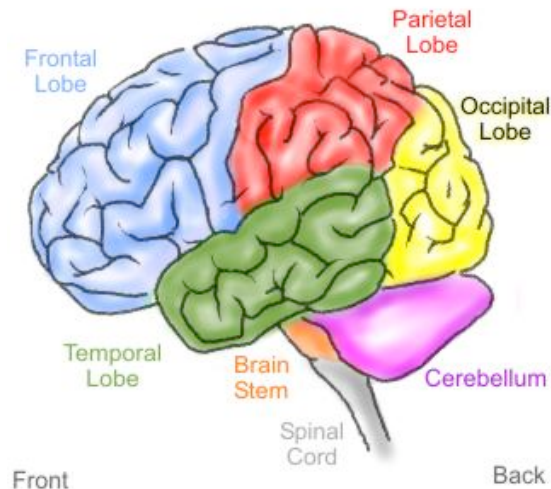


***Here is an overview of the key parts of the brain and their functions:***

**Cerebral Cortex:** “Control Room”. The cerebrum is the top, curvy part of the brain (the part you see from above, that looks like a giant grayish walnut). It is divided into two hemispheres. Each hemisphere operates very differently yet in sync with the other, and each side controls muscles and glands on the opposite side of the body. The cerebrum controls language, conscious thought, voluntary movement, reasoning, perception (senses), memory, personality. Busy place!

- **Left Hemisphere:** (“The Engineer”) The left hemisphere is a very logical, linear place. It works “parts to whole” (it sees the parts of a whole, lines them up and arranges them systematically and logically). *Basically, the left hemisphere is in charge of the spreadsheets, books and calendars.* The left hemisphere can be viewed as verbal, rational, logical, upright, right-handed, and rigid. Thoughts and memories are expressed in words.
- **Right Hemisphere:** (“The Artist”). The right hemisphere is a very visual, dynamic, creative place. It operates with a “whole picture” view – it sees the whole picture first (by taking in and simultaneously processing multi-sensory input) before it notices the details – like a general on the battlefield, planning military strategy. Thoughts and memories are expressed in feelings, pictures and other non-verbal ways. The right hemisphere controls visual and spatial skills (art, dance and other physical activity), music and non-verbal communication. The right hemisphere can be viewed as non-verbal, emotional, empathic, witty, creative, humorous, left-handed, curvy, flexible, playful, complex, diagonal and fanciful. *Note: Nobody is totally left-brained or right-brained, but people do have a dominant side of their brain – and that dominance varies according to the activity.*

Regions of the Human Brain



- **Frontal Lobe (part of cerebral cortex):** (“The Gatekeeper”). Responsible for thought processes and memory. It controls the ability to concentrate, and create/interpret complex thoughts. The “gatekeeper” aspect controls judgment, inhibition and other personality and emotional traits. The frontal lobe controls voluntary motor activity (your ability to jump, swim, chew, etc.). It is also a storehouse for motor patterns (such as putting one leg in front of the other, as in walking – otherwise we would expend a tremendous amount of thought energy just coordinating our limbs in order to move around). The frontal lobe is also responsible for parts of speech, humor, reasoning, planning, emotions and problem solving.
- **Parietal Lobe (part of cerebral cortex):** (“The Map Maker”). Has two regions: one is responsible for sensation and perception and the other integrates sensory input (touch, pressure, temperature, pain, etc.) to create a representation of the world around us. The right lobe is concerned with non-verbal memory, and the left with verbal memory.
- **Occipital Lobe part of cerebral cortex:** (“Reading Glasses”) perception and recognition of visual stimuli.
- **Temporal Lobe part of cerebral cortex:** (“The Hearing Aid”) perception and recognition of auditory stimuli (hearing).

**Limbic System:** (“The Heart”) controls emotions, motivations, formation of memories, and biological rhythms.

- **Amygdala:** (“The Firefighter”). fight or flight or freeze center.
- **Hippocampus:** (“The hard drive”) learning, memory
- **Thalamus:** (“Relay Station”) processes and relays information from nerve impulses (sensory input). Impulses carrying similar messages are grouped in the thalamus, then relayed to appropriate brain areas.

- **Hypothalamus:** (“The Processor”) main neural control center; pleasure center; regulates visceral (organ-related) activities such as hunger and thirst; sleep/wake patterns (circadian rhythms); sex drive; emotional states; production of oxytocin via the pituitary gland. Oxytocin is both a hormone and a neural transmitter. As a hormone, it’s associated w/ love, connectedness, orgasm, maternal behaviors, and anxiety/stress. The hypothalamus is responsible for homeostasis (maintaining internal equilibrium) by regulating body temperature and other physiological processes – the hypothalamus is the body’s thermostat. This is where the yawn happens. There. We said it. Did you yawn yet? ☺. It is only 1/300 of the total brain weight, yet it is responsible for our happiness!

**Cerebellum:** (“The Puppet Master”). controls movement, posture, balance/coordination. Each side of the cerebellum controls the opposite side of body.

**Brain Stem:** (“The Conscious”) Where the spinal cord and the brain meet. It is the center for functions such as breathing, digestion, blood pressure, swallowing, blinking and heartbeat (some of those functions are completely involuntary, and some are semi-voluntary, meaning we can control them but they do not require conscious effort if we don’t provide it, such as blinking). The brain stem controls consciousness and manages messages between the brain and the rest of the body.

- **Midbrain** (doesn’t even get a cool name!): vision, hearing, eye movement, body movement: consciousness, awareness, sleep. Filters sensory input so you can ignore repetitive noises like a refrigerator motor, yet awaken instantly to a baby’s cry.
- **Basal Ganglia:** (“The responder”) responsible for involuntary movement.

**Neurons:** “The Wiring System”: neurons are specialized nervous system cells that receive and deliver information via electro/chemical signals to/from other neurons in muscles and glands – like electric wire. The connection between neurons is called a synapse. The body has 100+ billion neurons that receive, analyze and store information about internal and external conditions.

**Neural Network/Pathways:** “The Information Highway”: neural pathways are an interconnected set of neurons that delivers information in the form of nerve impulses.