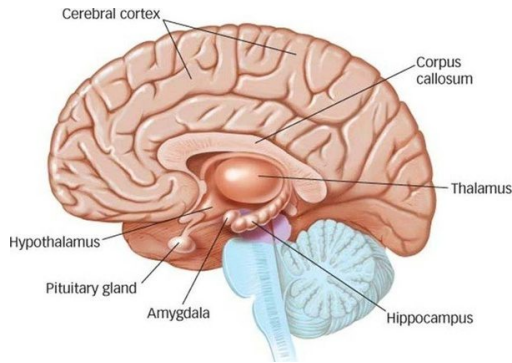


# The Brain, Genetics, and Evolution

## Brain Areas & Associated Functions



<b>Brainstem</b>	<b>Medulla</b> (heart rate & respiration), <b>Reticular Formation</b> (arousal), <b>Pons</b> (“bridge” to cerebellum)
<b>Cerebellum</b>	“little brain”; movement, balance, coordination
<b>Midbrain</b>	<b>Tectum &amp; tegmentum</b> ; arousal, homeostasis
<b>Thalamus</b>	Relay station: sensory info
<b>Basal Ganglia</b>	Voluntary motor control; procedural learning
<b>Limbic system</b>	<b>Amygdala</b> (“almond”, emotion), <b>Hippocampus</b> (“sea horse”, memory), <b>Hypothalamus</b> (motivation; link to <b>pituitary gland</b> ), Cingulate cortex
<b>Cerebral cortex</b>	~2.5mm thick surface; grey matter; divided into 2 <b>hemispheres</b> with <b>contralateral control</b>
<b>Corpus callosum</b>	Bundle of nerve fibers connecting left & right cerebral hemispheres

<b>Frontal lobes</b>	Planning, decision-making, emotional regulation, <b>motor cortex</b> , <b>Broca’s area</b>
<b>Parietal lobes</b>	<b>Somatosensory cortex</b>
<b>Occipital lobes</b>	Visual processing
<b>Temporal lobes</b>	Auditory processing, <b>Wernicke’s area</b>
<b>Association Areas</b>	Cortex for higher functions; integration & interpretation
<b>Neuroplasticity</b>	Brain changes & adapts
<b>Neurogenesis</b>	Growth of new neurons
<b>Split-brain patient</b>	Patient w/ severed corpus callosum disconnecting left & right hemispheres
<b>Roger Sperry &amp; Michael Gazzaniga</b>	Research revealing hemispheric specializations or <b>lateralization</b>

## Brain Scanning & Imaging Techniques

<b>EEG</b> <b>Electroencephalogram</b>	Functional; electrodes detect changes in electrical activity
<b>CAT / CT</b> <b>Computerized Axial Tomography</b>	Structural; X-rays provide images of internal structure
<b>PET</b> <b>Positron Emission Tomography</b>	Functional; radioactive glucose use indicates areas of greater brain activity
<b>MRI</b> <b>Magnetic Resonance Imaging</b>	Structural; response to magnetic pulse reveals internal structure
<b>FMRI</b> <b>functional Magnetic Resonance Imaging</b>	Hemoglobin response to magnetic pulse indicates levels of activity
<b>DTI</b> <b>Diffusion Tensor Imaging</b>	Structural; diffusion of water molecules reveals neural tracts

## Genetics & Evolution

<b>Genes</b>	Units of hereditary info; code for proteins
<b>DNA</b> <b>Deoxyribonucleic acid</b>	Genetic instructions; coiled double-helix structure
<b>Chromosome</b>	Strand of DNA, humans: 46 chromosomes in 23 pairs
<b>Genome</b>	All genetic information
<b>Molecular genetics</b>	Investigates structure and function of specific genes
<b>Behavioral genetics</b>	Investigates role of genes on traits & behaviors
<b>Monozygotic twins</b> Identical twins	One <b>zygote</b> splits; 100% shared genes
<b>Dizygotic twins</b> Fraternal Twins	2 separate <b>zygotes</b> ; 50% shared genes
<b>Heritability score</b> <b>h<sup>2</sup></b>	Indicates proportion of the variation in a trait (within a population) explained by genetic differences; 0 to 1
<b>Epigenetics</b>	Investigates how environmental factors influence gene expression
<b>Natural selection</b>	Survival & reproductive advantages influence which genes are passed on
<b>Sexual selection</b>	Mate choice & competition influence genes passed on
<b>Mutation</b>	Random error in copying genetic information
<b>Charles Darwin</b> 1809-1882	<i>On the Origin of Species by Means of Natural Selection</i> (1859)