

The Brain Part 2

FOUR LOBES OF THE CEREBRAL CORTEX

- Occipital lobe: Back of the brain
- Temporal lobe: Rostral to the occipital lobe and ventral to the parietal and frontal lobes
- Parietal lobe: Caudal to the frontal lobe and dorsal to the temporal lobe
 - Primary Somatosensory Cortex: Region of the anterior parietal lobe that receives the majority of input from the somatosensory system
- Frontal lobe: Rostral to the parietal lobe, the anterior of the cerebral cortex
 - Primary Motor Cortex: Region of the frontal lobe that lies next to the central fissure and contains neurons, which control movement. Most neurons are responsible for face and hands.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

<http://www.nlm.nih.gov/MEDLINEPLUS/ency/images/ency/fullsize.9549.jpg>

- Convergence: Small pieces come together to form entire picture, the senses in the brain are organized this way
- Beyond Primary Cortices: Complex Integration
 - Primary areas → Association areas → ?? → Motor Areas
- Homunculus: Diagram of neuron distribution in relation to body parts

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http://www.merck.com/media/mmpe/figures/MMPE_16NEU_210_02_eps.gif

Phantom Limb Syndrome: The perception of sensations in an arm or leg after the limb has been amputated. The brain continues to receive messages from the nerves that formerly carried impulses for the missing limb.

- Neurons from missing limb reorganize themselves because they no longer receive inputs.
- For example neurons for hand move to group of neurons for face.
- Causes severe pain in missing limb

Treatments of phantom limb syndrome

- Use of a box with a mirror causes visual resurrection of missing limb
- Suggests pain is a construct of the mind

McClelland Pick's Disease: Degenerative disease that is a form of dementia and includes among other symptoms difficulty associating. For example, problems associating what a person sees with what a person knows.

LIMBIC SYSTEM: MOTIVATION AND EMOTION

- Amygdala, hippocampus, mammillary body, limbic cortex, fornix
- Individually none of these structures will give you motivations and emotions. It is distributed

BASAL GANGLIA: CONTROL OF MOVEMENT

- Caudate, putamen, globus pallidus
- Parkinson's disease is the result of a problem with the basal ganglia

DIENCEPHALON

- Thalamus: Two lobes linked by massa intermedia
- Major sensory relay made of specialized nuclei that project information to specific regions of the cerebral cortex
- Lateral geniculate nucleus: Group of cell bodies within the thalamus that receives fibers from the retina and projects to the primary visual cortex
- Medial geniculate nucleus: Group of cell bodies within the thalamus that receives fibers from the auditory system and projects to the primary motor cortex

- Hypothalamus
- Regulation of the autonomic nervous system
- Control of the anterior and posterior pituitary glands
 - o Posterior pituitary gland: secretion of oxytocin and vasopressin

Hypothalamus → posterior pituitary → hormones in blood

- o Anterior pituitary gland: secretion of prolactin and controls production of other hormones, 'Master' gland

Hypothalamus → anterior pituitary → hormones in blood

- Integration of species specific behavior such as fighting, fleeing, feeding, and reproduction
- The pituitary gland will fail to secrete growth hormones due to emotional deprivation, thus growth is effected by physical as well as emotional factors

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<http://www.geocities.com/HotSprings/3468/9/brain-limbic.jpg>

MIDBRAIN (MESENCEPHALON)

Tectum

- Sensory reflexes (eye movement)
- Colliculli: Superior, part of visual system, Interior, part of the auditory system

Tegmentum

- Reticular formation: Large network of neural tissue. Involved in sleep, movement, and reflexes
- Periaqueductal gray matter: Involved in pain processing and species typical behaviors
- Red nucleus: Receive inputs from the cerebellum and motor cortex and sends axons to motor neurons in the spinal cord
- Substantia nigra: Communicates with the caudate nucleus and putamen in the basal ganglia

HINDBRAIN

- Metencephalon
 - o Cerebellum: Involved in fine motor function
 - o Pons: Contains some nuclei that are important in sleep and arousal and acts as a relay of information from the cerebral cortex to the cerebellum. Vestibular nuclei (balance), facial nucleus (muscle of the face), and the cochlear mass (sound) are a few of the nuclei which reside in the pons
- Myelencephalon: Medulla
 - o Modulating heart and lung functions
 - o Many nuclei

Diencephalon + Midbrain + Hindbrain = Brain Stem

SENSORY-MOTOR FLOW

- In from the back or dorsal side
- Motor signal out front or the ventral side
- Gray matter inside and white matter outside

FLOW OF INFORMATION (INTO SPINAL CORD)

- Afferent: Axons directed into the central nervous system, conveying sensory information
- Efferent: Axon directed away from the central nervous system, conveying motor commands to muscles and glands
- Meninges: Protect the spinal cord, same as those that protect the brain, the dura mater, arachnoid membrane, and pia mater
- Ascending fibers: To the brain

SPINAL CORD

- Controls glands and muscles (low-level reflexes) and collects somatosensory information

- Divided into groups of vertebrae
 - o Cervical Vertebrae: the neck
 - o Thoracic Vertebrae: Middle
 - o Lumbar Vertebrae: Bottom
 - o Sacral Vertebrae: Very bottom
- Cauda equina: Bundle of spinal roots located at the end of the spinal cord

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<http://www.nlm.nih.gov/medlineplus/ency/images/ency/fullsize/19470.jpg>

PERIPHERAL NERVOUS SYSTEM

- Somatic Nervous System: Sensory communication and local control of body skeletal muscles
- Spinal Nerves: Attached to the end of the spinal cord and travel to the muscles or sensory receptors they innervate
- Cranial Nerves: Attached directly to the brain, Twelve total:

1. Olfactory	7. Facial
2. Optic	8. Auditory
3. Oculomotor: Eye movements	9. Glossopharyngeal: Taste
4. Trochlear: Eye movements	10. Vagus: Internal organs
5. Trigeminal: Jaw muscles, touch, pain	11. Spinal Accessory: Neck muscles
6. Abducens: Eye movements	12. Hypoglossal: Tongue movements
- Autonomic Nervous System: Divided into the sympathetic and parasympathetic nervous systems
- Sympathetic Nervous System: Controls functions that accompany arousal and expenditure of energy

- Parasympathetic Nervous System: Controls functions that occur during a relaxed stat

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<http://dearnurses.blogspot.com/2007/10/simplifying-cranial-nerves.htm>