### **Cerebrum**

The cerebrum (front of brain) comprises gray matter (the cerebral cortex) and white matter at its center. The largest part of the brain, the cerebrum initiates and coordinates movement and regulates temperature. Other areas of the cerebrum enable speech, judgment, thinking and reasoning, problem-solving, emotions and learning. Other functions relate to vision, hearing, touch and other senses.

#### **Cerebral Cortex**

Cortex is Latin for “bark,” and describes the outer gray matter covering of the cerebrum. The cortex has a large surface area due to its folds, and comprises about half of the brain’s weight.

The cerebral cortex is divided into two halves, or hemispheres. It is covered with ridges (gyri) and folds (sulci). The two halves join at a large, deep sulcus (the interhemispheric fissure, AKA the medial longitudinal fissure) that runs from the front of the head to the back. The right hemisphere controls the left side of the body, and the left half controls the right side of the body. The two halves communicate with one another through a large, C-shaped structure of white matter and nerve pathways called the corpus callosum. The corpus callosum is in the center of the cerebrum.

### **Brainstem**

The brainstem (middle of brain) connects the cerebrum with the spinal cord. The brainstem includes the midbrain, the pons and the medulla.

* **Midbrain.** The midbrain (or mesencephalon) is a very complex structure with a range of different neuron clusters (nuclei and colliculi), neural pathways and other structures. These features facilitate various functions, from hearing and movement to calculating responses and environmental changes. The midbrain also contains the substantia nigra, an area affected by Parkinson’s disease that is rich in dopamine neurons and part of the basal ganglia, which enables movement and coordination.
* **Pons.**The pons is the origin for four of the 12 cranial nerves, which enable a range of activities such as tear production, chewing, blinking, focusing vision, balance, hearing and facial expression. Named for the Latin word for “bridge,” the pons is the connection between the midbrain and the medulla.
* **Medulla.**At the bottom of the brainstem, the medulla is where the brain meets the spinal cord. The medulla is essential to survival. Functions of the medulla regulate many bodily activities, including heart rhythm, breathing, blood flow, and oxygen and carbon dioxide levels. The medulla produces reflexive activities such as sneezing, vomiting, coughing and swallowing.

The **spinal cord** extends from the bottom of the medulla and through a large opening in the bottom of the skull. Supported by the vertebrae, the spinal cord carries messages to and from the brain and the rest of the body.

### **Cerebellum**

The cerebellum (“little brain”) is a fist-sized portion of the brain located at the back of the head, below the temporal and occipital lobes and above the brainstem. Like the cerebral cortex, it has two hemispheres. The outer portion contains neurons, and the inner area communicates with the cerebral cortex. Its function is to coordinate voluntary muscle movements and to maintain posture, balance and equilibrium. New studies are exploring the cerebellum’s roles in thought, emotions and social behavior, as well as its possible involvement in addiction, autism and schizophrenia.