NERVOUS SYSTEM

The nervous system is composed of several major parts:
- The central nervous system composed of the brain and spinal cord
- The peripheral nervous system made up of myelinated sensory and motor neurons leaving the central nervous system
- The autonomic nervous system composed of non-myelinated nerves that control glands and visceral organs.

We will focus primarily on the central nervous system.

Remove the skin from the region of the skull that extends between the eyes and ears and posteriorly to the back of the skull. Scrape away muscle and connective tissue so you can see the sutures between the bones of the skull (Fig. 7.1). Also remove the muscles that attach the skull to the vertebrae in the occipital region. Using heavy forceps crack the skull along the ridge where the **occipital** *and* **interparietal bones** *meet. Working anteriorly and being careful not to apply pressure to the brain lift away pieces of the bones that cover the brain cavity. Stop just before you reach the* **nasal bones**. *Now bend the head ventrally an carefully cut through the* **axis** *to reveal the spinal cord. Use Figures 7.1-7.3 to locate the following:*

Cerebral hemispheres (1). The large cerebral hemispheres lie under the **frontal** (1a) and **parietal bones** (1b). They are separated by a deep fissure. The cerebral hemispheres are associated with integration.

Olfactory bulb. The small olfactory bulbs lie anterior to the cerebral hemispheres and just caudal to the nasal bones (arrow). This region of the brain is associated with smell.

Cerebellum (2). The cerebellum lies under the **interparietal bone** (2) and posterior to the cerebral hemispheres. It has three lobes: two lateral hemispheres and a medial vermis. The cerebellum controls coordination and equilibrium.
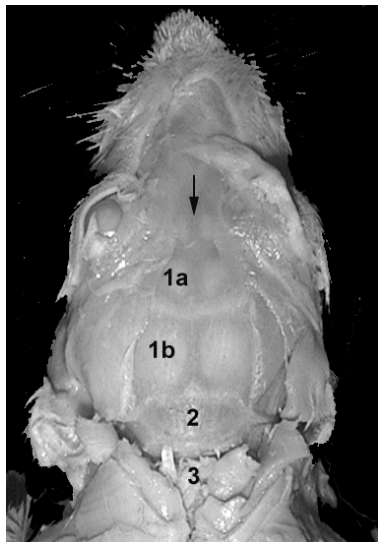
Figure 7.1. Surface of the cranium after removing the skin, muscle and connective tissue. The arrow is pointing to the suture between the nasal bones.

Figure 7.2. Rat brain lying in the cranial cavity and covered with dura mater. The olfactory bulbs appear as light ovals under the nasal bones (arrow).

Medulla oblongata (3). The medulla oblongata lies between the cerebellum and the spinal cord. It regulates heart rate, blood pressure, respiration and hormonal secretions.

Spinal cord. The spinal cord extends from the brain through the canals in the vertebrae. Spinal nerves are given off at each region of the spinal cord.

Brains which have been removed from the cranial cavity are shown in figures 7.3 and 7.4. They illustrate several of the above structures in a slightly different view. If you have time, you may want to remove the brain and try to identify some of the cranial nerves.

Optional - **Removing the brain from the cranial cavity**

Carefully chip away bone on one of the lateral surfaces of the skull and toward the ventral surface. You will need to remove the bone that protects the inner. This bone lies between the cerebellum and the cerebrum. Cut the **medulla oblongata** *below the point that it has become the* **spinal cord**. *Lift the spinal cord and cut the nerves and blood vessels that attach to the brain, leaving them as long as possible.. Remove it from the skull. If time permits you may want to try to identify some of the nerves originating from the ventral surface*:
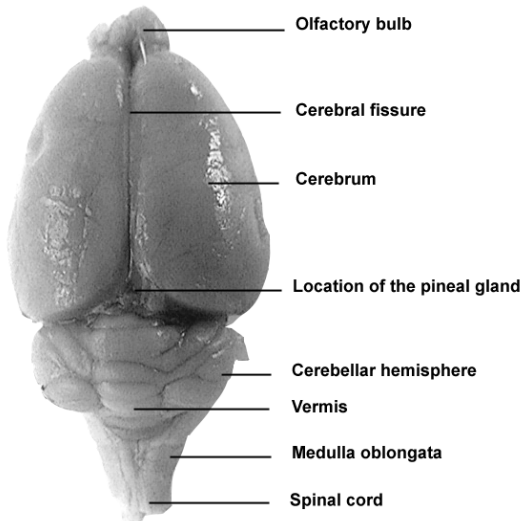

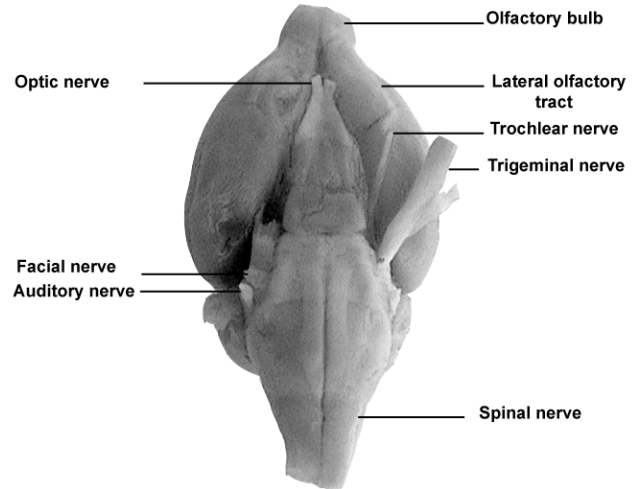**Figure 7.3**. Rat brain in a dorsal view with the protective dura mater removed.

Figure 7.4. Rat brain in ventral view with several of the spinal nerves identified

Once the brain is removed you will see more detail if it is viewed under a dissecting microscope.

Table 7.1. Cranial nerves of the rat.

Nerve	Function(s)	Nerve	Function(s)
I. Olfactory	Smell	VII. Facial*	Jaw muscles
II. Optic	Vision	VIII. Auditory*	Hearing
III. Oculomotor	Eye movement	IX. Glossopharyngeal*	Pharynx and tongue
IV. Trochlear	Eye movement	X. Vagus*	Larynx, heart, lungs, diaphragm, stomach
V. Trigeminal	Skin, jaw muscles, tongue, teeth	XI. Accessory*	Neck muscles, pharyngeal organs
VI. Abducens*	Eye movement	XII. Hypoglossal*	Tongue

* These seven nerves originate from the medulla oblongata