THE BRAIN, SPINAL CORD, AND CRANIAL NERVES

I. BRAIN ANATOMY

A. Meninges (coverings) of the brain and spinal cord (Fig. [13.120 p. 452 [457]]) Use text illustrations to study these. Note that the singular of "meninges" is "meninx."

- Dura mater
- Arachnoid mater
- Pia mater
- Subarachnoid space

B. Human brain anatomy.

1. Overview (Fig. 13.8) Use the multi-colored human brain models from the torso models.

- Cerebrum
- Left hemisphere
- Right hemisphere
- Frontal lobes
- Parietal lobes
- Occipital lobes
- Temporal lobes
- Central sulcus
- Pre-central gyrus
- Post-central gyrus
- Lateral fissures
- Longitudinal fissure
- Gyri ("jie-ree" pl. of gyrus--ridge)
- Sulci ("soul-sigh” pl. of sulcus “soul-kus" -- valley)
- Cerebellum
- Transverse fissure (shown but not labeled)

2. Functional areas of the cerebral cortex (the surface of the cerebrum) (Fig. 14.11) Learn the following "brain map" on this illustration only (not on models).

- Primary motor cortex
- Premotor area
- Prefrontal area
- Broca's area
- Primary auditory cortex
- Auditory association area
- Primary somatic sensory cortex
- Somatic sensory association area
- Visual cortex
- Visual association area
- Taste area
3. Inferior view of brain (Fig. 13.15) Identify these on brain models.

- Olfactory bulbs
- Olfactory tract
- Optic nerves
- Optic chiasma ("kie-az-ma")
- Pons
- Olive
- Medulla oblongata

4. Midsagittal view of brain (Fig. 13.1) These structures are best seen on the half-head models.

- Cerebrum
- Corpus callosum
- Cerebellum
- Thalamus
- Hypothalamus
- Diencephalon (thalamus and hypothalamus together)
- Midbrain
- Pons
- Medulla oblongata
- Brainstem (midbrain, pons and medulla oblongata)
- Arbor vitae (tree-like pattern of the cerebellum; shown but not labeled).

5. Details of midsagittal view. Continue with half-head models, but see Fig. 13.7) for the following:

- Intermediate mass (Interthalamic adhesion)
- Hypothalamus
- Optic chiasma
- Pituitary gland
- Corpus callosum
- Pineal body
- Infundibulum
6. Flow of **cerebrospinal fluid (CSF)** (Fig. 13.14) Use illustrations and half-head models to identify the structures involved with CSF. The **choroid plexuses** are tufts of blood vessels in the **ventricles** that produce CSF. The structures below are listed in the order that CSF flows through them. Trace the flow of CSF through them as you study. Note that the CSF also flows through the subarachnoid space of the spinal cord, and also is found within the central canal of the spinal cord.

**Choroid plexuses*** in the **lateral ventricles**(2)*; then through the

**Interventricular foramina** (2)* into the

**Third ventricle**; out through the

**Cerebral aqueduct** into the

**Fourth ventricle**; out through the

**Median aperture*** and **lateral apertures*** (2) into the

**Subarachnoid space***; out through the

**Arachnoid granulations** into the

**Superior sagittal sinus** (which is filled with blood)

*Illustration only

Optional notes on brain anatomy


2. Split-brain studies on animals are done by a midsagittal section of the **corpus callosum**, which connects the two cerebral hemispheres.

3. Because the CSF also surrounds and floats the spinal cord, “spinal taps” done in the lumbar region can be used to sample the CSF of the entire central nervous system.

4. A “sinus” is a large vein whose walls are not lined with smooth muscle, as are most veins. The **superior sagittal sinus** is a vein made of **dura mater**.
II. SPINAL CORD

A. General features (Fig 12.1) Use the text illustrations to learn these structures.

   Cervical enlargement
   Lumbar enlargement
   Cauda equina

B. Cross section of spinal cord (Fig. 12.3a) Identify the following structures on spinal cord models. Note that “anterior” is synonymous with “ventral,” and “posterior” is synonymous with “dorsal”; these terms are used interchangeably.

1. Grey matter
   Anterior horn
   Posterior horn

2. White matter
   Ventral column
   Lateral column
   Dorsal column

3. Spinal nerve
   Dorsal root
   Dorsal root ganglion
   Ventral root

4. Central canal (This long, thin tube is filled with CSF and is continuous with the fourth ventricle of the brain.)
### III. CRANIAL NERVES

(Fig. 13.15) The names, numbers and functions of the twelve pairs of cranial nerves: Identify each nerve on a brain model by its Roman numeral. Use more than one brain model, as they are all slightly different.

<table>
<thead>
<tr>
<th>Roman Numeral</th>
<th>Name</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Olfactory</td>
<td>Smell</td>
</tr>
<tr>
<td>II</td>
<td>Optic</td>
<td>Vision</td>
</tr>
<tr>
<td>III</td>
<td>Oculomotor</td>
<td>Eye movement, pupil constriction</td>
</tr>
<tr>
<td>IV</td>
<td>Trochlear</td>
<td>Eye movement</td>
</tr>
<tr>
<td>V</td>
<td>Trigeminal</td>
<td>Sensations from face and mouth; chewing muscles</td>
</tr>
<tr>
<td>VI</td>
<td>Abducens</td>
<td>Eye movement</td>
</tr>
<tr>
<td>VII</td>
<td>Facial</td>
<td>Muscles of facial expression; taste, lacrimal and salivary glands</td>
</tr>
<tr>
<td>VIII</td>
<td>Vestibulocochlear</td>
<td>Hearing and balance</td>
</tr>
<tr>
<td>IX</td>
<td>Glossopharyngeal</td>
<td>Taste, salivation, swallowing</td>
</tr>
<tr>
<td>X</td>
<td>Vagus</td>
<td>Swallowing, speaking, thoracic and abdominal organs</td>
</tr>
<tr>
<td>XI</td>
<td>Accessory</td>
<td>Muscles of sound production and some neck muscles</td>
</tr>
<tr>
<td>XII</td>
<td>Hypoglossal</td>
<td>Tongue movement</td>
</tr>
</tbody>
</table>

Mnemonics to learn the cranial nerves:

1) “On Old Olympus’ Towering Top A Fine Vested German Vaulted and Hopped.”

2) “Oh, Once One Takes The Anatomy Final, Very Good Vacations Are Heavenly.”
Optional Notes on the Cranial Nerves

1. The **olfactory nerves (I)** course through the **cribriform plate** of the skull, from nose to brain.

2. The **optic nerves (II)** cross at the **optic chiasma**. In deep eye infections, this can serve as a route to spread infection from the infected eye to the other.

3. The **oculomotor nerves (III)** have a name, like that of I and II, which indicates the function.

4. The **trochlear nerves (IV)** are named from the Greek word for "pulley." The small eye muscles which they innervate have tendons which go through an anatomical loophole--forming a pulley.

5. The **trigeminal nerves (V)** are the thickest of the cranial nerves. They divide to three branches; thus the term trigeminal, which means "triplet." One branch innervates the area of the eye, one branch the upper jaw, and one the lower jaw. These nerve branches are anesthetized by dentists before oral surgery--but a different injection is needed for upper jaw work than for lower jaw work. The anatomy of the trigeminal explains this. **Trigeminal neuralgia** is pain seemingly in the face that results from inflammation of nerve V.

6. The **abducens nerves (VI)** are thin nerves which innervate the muscles which allow each eye to abduct. Can you abduct the eyes simultaneously?

7. The **facial nerves (VII)** control facial expression. Damage to the facial nerve causes **Bell's palsy**, in which the eye remains open and dries, and the affected half of the mouth droops. They also carry taste sensations to the brain.

8. The **vestibulocochlear nerves (VIII)** actually have a name which reveals the functions: one branch goes to the vestibule, the organ of balance; the other goes to the cochlea, where receptors for hearing are located.

9. The **glossopharyngeal nerves (IX)** also have a descriptive name: "Glosso" means tongue, and "pharyngeal" is the anatomical name for the region of the throat. Hence taste, salivation, and swallowing.

10. "**Vagus** (X)" means "wanderer," and these two nerves ("vagi" [vay-jie] is plural) have branches which wander from the throat to the larynx to the heart and to the stomach, pancreas, and liver. These are the major parasympathetic nerves.

11. The **accessory nerves (XI)** are the only cranial nerves whose name gives no clue to their function. Hum a tune and shake your head to remember their functions.

12. "**Hypoglossal** (XII)" means "under the tongue." They stimulate tongue muscles.