Basic Neuroanatomy
Overview

• Part I
  – Meninges
  – Vascular System
  – Major Cortical Structures
  – Cranial Nerves

• Part II
  – Ventricular System
  – Major Subcortical Structures
Part I

- Meninges
- Vascular System
- Major Cortical Structures
- Cranial Nerves
Meninges

• **Major Functions:**
  – Outer Covering, CSF circulation, buoyancy of brain

• **Three layers:**
  – Dura mater, arachnoid, pia mater

• **Membrane reflections:**
  – Falx cerebri, tentorium cerebelli

• **Spaces:**
  – Subdural, subarachnoid

• **Vascular System:**
  – Middle meningeal artery
  – Major sinuses: Superior sagittal sinus, transverse sinus, inferior sagittal sinus
FIGURE 3-2
Scanning electron micrograph of the cranial meninges of a young dog. The apparent space between the dura mater and the arachnoid is an artifact of processing and would not normally be present.

Courtesy of Dr. Delmas J. Allen, Medical College of Ohio.
Vascular System

- **Vertebral-basilar system:**
  - Vertebral arteries
  - Basilar artery
  - Posterior cerebral arteries
- **Internal carotid system:**
  - Internal carotid
  - Anterior cerebral arteries
  - Middle cerebral arteries
- **Circle of Willis:**
  - Anterior and posterior communicating arteries
  - Connecting 3 major arteries
  - Anastomosis
- **Note cortical areas served by each cortical artery.**
Some Major Cortical Structures (Lateral)

- **Cerebral Lobes (Cortices):**
  - Frontal, parietal, temporal, occipital, insula

- **Fissures/sulci:**
  - Central (Rolando), lateral (Sylvius)

- **Gyri:**
  - Precentral, postcentral, Broca’s area, angular gyrus
Some Major Cortical Structures (Medial)

- **Gyri:**
  - Cingulate gyrus
- **Fissures/sulci:**
  - Longitudinal, calcarine
- **Tracts**
  - Corpus callosum, anterior commissure
- **Structures**
  - Diencephalon: Thalamus, hypothalamus
  - Mesencephalon: Colliculi (superior, inferior),
  - Metencephalon: Pons, Cerebellum
  - Myelencephalon: Medulla
Major Ventral Surface Structures

• Gyri:
  – Rectus, uncus, parahippocampal

• Structures:
  – Pituitary gland, brain stem, cranial nerves
  – Circle of Willis (vascular)
Cranial Nerves

- Name and function
- Location on brain stem
- Functional Groupings
Figure 1-3, B. The brainstem and the base of the forebrain, shown at about 1.2x actual size.
Cranial Nerves - some functional groupings

- **Sensory:**
  - Olfactory (CN I), visual (CN II), vestibulocochlear (CN VIII)

- **Gustatory:**
  - Facial (CN VII), glossopharyngeal (CN IX), vagus (CN X)

- **Mixed motor and sensory:**
  - Trigeminal (CN V), facial (CN VII), glossopharyngeal (CN IX), vagus (CN X)

- **Eye musculature:**
  - Oculomotor (CN III), trochlear (CN IV), abducent (CN VI)
Cranial Nerves - cont. functional groupings

• **Speech Motor:**
  – Trigeminal (CN V), facial (CN VII), glossopharyngeal (CN IX), vagus (CN X), hypoglossal (CN XII).

• **Primary motor (except eye):**
  – Accessory (CN XI), hypoglossal (CN XII)

• **Parasympathetic:**
  – Oculomotor (CN III), facial (CN VII), glossopharyngeal (CN IX), vagus (CN X)
Part II

• Ventricular System

• Major Subcortical Structures
Ventricular System

- Lateral ventricles:
  - Anterior, posterior, body, atrium (trigone)
- Interventricular foramen
- Third ventricle
- Cerebral aqueduct (Aqueduct of Sylvius)
- Fourth ventricle:
  - Median aperture (foramen of Magendie)
  - Lateral apertures (foramina of Luschka)
  - Central canal (spinal cord)
- Subarachnoid space
- Arachnoid granulations
- Choroid plexus (choroid epithelium), glomus
Major Subcortical Structures

- Basal Ganglia
- Diencephalon
Basal Ganglia

- Part of Forebrain
- Terminology:
  - “Basal Ganglia” includes all of the following -
    - Caudate nucleus
    - Putamen
    - Globus pallidus (palidum) - external, internal
    - Subthalamus
    - Substantia nigra
  - Subgroupings
    - “Lenticular nucleus” = putamen + globus pallidus
    - “Striatum” = caudate nucleus + putamen
    - “Corpus striatum” = caudate n. + lenticular n. + internal capsule
      (cross-hatch of gray and white fibers)
Diencephalon

- **Epithalamus** (includes the pineal gland - the “seat of the soul”)
- **Subthalamus**
- **Hypothalamus**
  - Forms surface of the 3rd ventricle
  - Infundibular stalk connects to pituitary gland
  - Mammillary bodies
- **Thalamus (“Inner chamber”)**
  - Many nuclei
  - Several functional groups: Sensory, associative, nonspecific, subcortical (reticular) n.
  - Massa intermedia
Summary

• We have introduced you to the following principle structures of the brain:
  • Meninges
  • Vascular System
  • Major Cortical Structures
  • Cranial Nerves
  • Ventricular System
  • Major Subcortical Structures

• You should be trying to learn the 3-D anatomy of the brain. Relating this to function will help make it easier to learn.