

**9.14****Classes 2 & 3 Basic Subdivisions, cell types; anatomical techniques**

You should know the terms marked on the handouts given in class #1.

*Readings:*

- Brodal, "Chapter 1", pp 3-23; Nauta, "Chapter 1, 2", (pp 1-38).
- Brodal, "Chapter 3", p 71-83; Brodal, "Chapter 5", pp 161-175; [Nauta "Chapter 3", pp 39-49].
- [Brodal, "Chapter 4", pp 123-138 ] *to be covered later.*

*Questions to guide your reading, and for class discussion:***Brodal, Chapter 1, (pp 3-23):**

1. What are the different parts of a neuron?
2. What is being stained with the Nissl stain?
3. Describe the different components of a synapse.
4. What are the major ultrastructural components of the neuron?
5. If the protein synthesis machinery is in the cell body, how do the proteins reach the more distal portions of the neuron?
6. What is the difference between oligodendrocytes and Schwann cells? What are the other types of non-neuronal cells present in the nervous system?
7. Describe the structure of a peripheral nerve. (See also Brodal ch. 15.)

**Nauta, Chapter 1, 2, (pp.1-38):**

1. Describe: gap junctions and synapses as seen in electron microscopy.
  2. What is the Golgi method, and what are its main advantages?
  3. Does the sponge have a nervous system?
  4. How did George Parker at Yale University investigate the origins of the nervous system? (method, species, basic findings)
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1. Define: Nissl substance and Nissl stains
  2. What is the nature of conduction in dendrites? Contrast active and passive conduction.
  3. What did Cajal mean by the phrase "dynamic polarization"? Where are the exceptions?
  4. What is the principle which originated with Henry Dale in the 1930s? How has it been updated?
  5. What is the pial-glial membrane?
  6. Contrast the morphology of astrocytes and oligodendroglia.
  7. What does Nauta mean: microglia are "the only cells in the CNS that can become militant"? (But *cf.* "reactive astrocyte".)
  8. Convergence on motor neurons: how does Nauta express this in terms of numbers? What other numbers would be meaningful?

**Brodal, Chapter 3, (pages 71-83)**

1. Name the major parts of the CNS .
2. Why does the cauda equina form?
3. What is the organization of the afferents to and efferents from the spinal cord.
4. Compare and contrast the sympathetic and parasympathetic autonomic nervous systems.
5. How are the dorsal root ganglion cells different from most neurons of the CNS?
6. If the brain is separated from the spinal cord by damage at the level of the cervical vertebrae, the neurons of the spinal cord are still able to retain some level of activity. Describe the circuitry whereby this comes about.
7. Name the twelve cranial nerves. From which part of the brain do most of them originate? Group them according to the following classification: sensory, motor and mixed.

**Brodal, Chapter 5, (pp 161-175)**

1. Describe anterograde and retrograde degeneration.
2. Describe transneuronal degeneration.
3. Why did the degeneration techniques revolutionize the study of the brain? Name three techniques that utilize the phenomenon of degeneration.
4. In what way are techniques that use axoplasmic transport for tracing connections different from the degeneration techniques?
5. The use of immunohistochemistry was a major breakthrough in the study of neural organization. What are the principles on which this technique works, and what are its major advantages?
6. What are the advantages and some of the drawbacks of the computer-based imaging techniques for the study of the brain?

**Nauta, Chapter 3, (pp. 39-49)**

1. Draw the "primary brain vesicles at the stage when the endbrain and optic vesicles are forming. Name each major subdivision and give the translations of the Latin terms.
2. What is the "chamber" of the caudal part of the forebrain?
3. What are the "geniculate" bodies? How do you think this name arose?
4. Why is the term "pituitary" actually a misnomer? (It means "mucus gland".)
5. What is a "cortex"? What is its nature, and where is it found in the CNS? What major types of cortex are there? (There are only a few, but these, in turn, can be subdivided.)
6. What is a defining feature of "limbic" forebrain structures? Name some.

**[Brodal, Chapter 4, (pp 123-138)] *To be covered later.***

1. What are the three major stages of embryonic development. What are the characteristics of each stage?
2. Describe the process of neurulation
3. How does the neural crest form. What are some n.c. derivatives?

4. Name the 3 primary and 5 secondary vesicles. What are the three flexures in the embryonic brain?
5. How is the segmental division of the brain manifest? The segmental divisions of the hindbrain are called rhombomeres: what is their significance? What are homeotic genes?
6. The \_\_\_\_\_ divides the neural tube into a dorsal \_\_\_\_\_ plate and a ventral \_\_\_\_\_.
7. What are the visceral arches. What is their significance?

### The Cranial Nerves and a Mnemonic to remember them by

Or make up your own!

Cranial Nerve Names	Mnemonic	Sensory/Motor/ Mixed
I. <u>O</u> lfactory	<u>O</u> n	Se
II. <u>O</u> ptic	<u>O</u> ld	Se
III. <u>O</u> culomotor	<u>O</u> lympus's	Mo
IV. <u>T</u> rochlear	<u>T</u> owering	Mo
V. <u>T</u> rigeminal	<u>T</u> op	Mi
VI. <u>A</u> bducens	<u>A</u>	Mo
VII. <u>F</u> acial	<u>F</u> inn	Mi
VIII. <u>A</u> uditory/Vestibular	<u>A</u> nd	Se
IX. <u>G</u> lossopharyngeal	<u>G</u> erman	Mi
X. <u>V</u> agus	<u>V</u> iewed	Mi
XI. <u>S</u> pinal Accessory	<u>S</u> ome	Mo
XII. <u>H</u> ypoglossal	<u>H</u> ops	Mo