

## 9.14

### **Classes #14 - 15: Motor systems**

**Monday March 7; Wednesday March 9, 2005**

#### *Readings*

Swanson (2003), ch 6A, pp 97-122. (Recommended but not assigned: ch. 5; ch 6B, pp 122-138.)

Striedter (2005), ch 7 pp 217-245, (245-253)

Nauta & Feirtag (1986), ch 7 pp 91-107.

#### *Questions on readings:*

*Swanson (2003) chapter 6, pp 97-122*

1. What are the three major divisions of the motor system? How do the motor neurons differ in these three divisions?
2. Where are the rostral-most somatic motor neurons located? Where are the caudal-most somatic motor neurons located?
3. The muscles that move the lips and the muscles that move the jaw are controlled by different groups of motor neurons that send their axons out through two different cranial nerves. What are these motor neuron groups (brainstem nuclei) and cranial nerves?
4. How does Swanson characterize the motor system as a hierarchy? (His theory is characterized in figures which were inspired by the ethologist Niko Tinbergen and by physiological and anatomical studies.)

*Striedter (2005) chapter 7, pp. 217-245*

5. According to Striedter, in a “typical” mammalian brain an “average” neuron is connected to at least how many neurons? What is the current estimate of the number of neurons in a “typical” human brain? (p. 217)
6. What is the “epigenetic population matching” mechanism in neural development? Why is this mechanism described as “epigenetic”? How can such a mechanism facilitate emergence of morphologically diverse brains in evolution? (pp. 220-221) Name two molecules that might be involved in epigenetic population matching (classes 12-13 lectures).
7. Describe Ebbesson’s “parcellation hypothesis” of brain evolution (pp. 228-229). Describe one example supporting this hypothesis (p. 233). How is (the weaker version of) Ebbesson’s theory related to patterns of axonal growth during development? (pp. 233-234)

8. What is the “large-equals-well-connected” rule first proposed by Terrence Deacon (1990)? Why is this rule reasonable judging from the perspective of brain development? (pp. 237-238)
9. Name two structures (in two different animals, respectively) that can serve as test cases of Deacon’s “large equals well-connected” rule (p. 238). Describe a (hypothetical) situation in which Deacon’s rule would fail to explain the observed neuronal projection patterns (you have to synthesize what you have learned from this chapter and classes 12-13).

*Nauta & Feirtag (1986) chapter 7 pp 91-107.* [Note: Some of this material will be dealt with again later in a class session on the corpus striatum.]

10. Name the four major tracts descending from the brainstem to the spinal cord (p. 95).
11. Name the two tracts composing the pyramidal motor system. Why is this system called “pyramidal”? (p. 96)
12. On what type of neurons do most of the axons in the corticospinal tract synapse? (p. 96)
13. Name at least two major structures of the extrapyramidal motor system (pp. 97-101).
14. What are the two structures which are referred to as “satellites” of the striatum and pallidum, respectively? What diseases or clinical symptoms are associated with these “satellites”? (pp. 98-99)
15. The *substantia nigra* is found within the \_\_\_\_\_. (forebrain/midbrain/hindbrain). Many of its neurons contain a black pigment called \_\_\_\_\_. Its major neurotransmitter is \_\_\_\_\_.
16. The cerebellum receives input from primary sensory neurons of which sense organ? Through which cranial nerve? Briefly describe some clinical symptoms caused by cerebellar lesions (pp. 102-103).
17. Which eye muscles are responsible for moving the eyes away from the midline (away from the nose)? And towards the midline (towards the nose)? Name two midbrain structures the stimulation of which can elicit eye movements (pp. 104-105).