

## 9.14

**Class #17: Somatosensory System**

*For two sessions, we are focused on the somatosensory system. First, we discussed how the trigeminal sensory system is organized in the rodent brain, and how this organization can be exploited for examining pattern formation in the developing nervous system. Now we will discuss the somatosensory system as a whole, focusing on the human brain and spinal cord.*

**Readings:** Brodal Chapter 7. (There is a lot of information in this chapter and I would like you to read through it all once. Some of it is review, and some things are more important than others. Try to target your learning to the following questions:

**Questions:**

1. What are the basic sensory modalities?
2. Name three types of cutaneous receptors found in skin. What sensory modalities do they subserve?
3. Describe two types of axonal endings found in skin. Which receptors are they associated with?
4. What is a nociceptor?
5. Describe three low threshold mechanoreceptors. What information do they signal?
6. What is a cutaneous receptive field?
7. What is two-point discrimination? What does the term “topographic organization” mean?
8. How does lateral inhibition work and how does it help to sharpen discriminative sensation?

*We will not cover the details of muscle and joint receptors. Scan through pages 195-208. You should know that muscles have sensory innervation. You should know the terms muscle spindle and Golgi tendon organ, what they mean and what their basic functions are.*

*Read pages 208 through 233 in detail. We will focus mainly on the anatomy, more than on the physiology. Much of this should be a review from 9.01 and from earlier 9.14 sessions.*

9. What is the pattern of innervation of a single primary sensory afferent in the spinal cord?
10. What is the Law of Magendie? Are there exceptions to this law?
11. How does fiber caliber correlate with the sensory receptor type?
12. How are the different sensory modalities/fiber types organized in the different regions of the cord?
13. What is the difference between fast and slow pain?
14. Name two putative neurotransmitters that are used by DRG afferents in the spinal cord.
15. Name three neuropeptides that are associated with spinal ganglion cells. How might they function, and why?
16. What are dermatomes and how were they determined? Why is it important to know about dermatomes?
17. What is a reflex arc and how do interneurons factor into the reflex arcs?
18. What are the two major sensory pathways that tell the brain about the periphery? Which modalities do they primarily subserve? What are the thalamic sites where these systems terminate? What are the cortical sites where these systems terminate?

19. Describe the dorsal-column-Medial Lemniscal system. What are its functions? How do we know this?
20. Describe the spinothalamic tract. What are its functions? How do we know this?
21. What is referred pain?
22. How can the sensory information be censored before it reaches the cortex?
23. What is the substantia gelatinosa and what is its functional relevance?
24. Discuss acute pain and chronic pain. Why is it important to make this differentiation?
25. Describe some pathways that permit central control of pain sensation.
26. Why divide the primary somatosensory cortical area SI into three regions: areas 3, 1 and 2?
27. What is known about cortical areas that receive from nociceptors?