

**Week #4** (Feb. 20 & 25), Somatosensation  
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Wednesday's lecture will focus on the neural coding of somatosensory information. We will quickly review the central pathways of the somatosensory system (from dorsal root ganglia to cortex) and the major types of cutaneous mechanoreceptors. Most of the lecture will focus on (1) receptive fields of cutaneous mechanoreceptors, (2) receptive fields of neurons that form the representation of the digits in monkey primary somatosensory cortex, (3) the concept of somatotopic maps, (4) and the rodent "barrel cortex" as a model system for somatosensation.

There is no assigned reading for Wednesday's lecture.

On Monday we will discuss: J.J. DiCarlo and K.O. Johnson (2000) Spatial and temporal structure of receptive fields in primate somatosensory area 3b: effects of stimulus scanning direction and orientation. *J. Neurosci.* 20:495-510. NOTE: The Methods section of this paper is long; you should definitely read it, but don't get too bogged down if you don't understand everything. In particular, don't worry about the details in the two sub-sections headed "Receptive field estimation" and "Three component RF model". (The details of these two sections are beyond the scope of this course.) This paper is actually the third in a series of three papers by the same authors. Wednesday's lecture will include some material from the first two papers, and will introduce you to the methodology. You're not expected to read these first two papers, but you might want to consult them if you are curious or confused about something:

J.J. DiCarlo, K.O. Johnson, and S.S. Hsiao (1998) Structure of receptive fields in area 3b of primary somatosensory cortex in the alert monkey. *J. Neurosci.* **18**:2626-2645.

J.J. DiCarlo and K.O. Johnson (1999) Velocity invariance of receptive field structure in somatosensory cortical area 3b of the alert monkey. *J. Neurosci.* **19**:401-419.

As you are reading, please think about the following questions:

- The authors propose the receptive fields of these neurons contain both a fixed inhibitory component and a lagged inhibitory component. What do "fixed" and "lagged" mean here? Propose a simple circuit diagram that might produce both a "fixed" and a "lagged" component.
- What makes a neuron like this orientation-selective? What proportion of the neurons in this study are likely to be orientation-selective?
- The authors describe a hypothetical model for the receptive fields of the neurons they're studying (see esp. Fig. 2). In general terms, what features distinguish a "good model" from a "bad model"? Do you think this is a "good model"? Why include a model in a study like this?

The written assignment (due Monday Feb. 25 before class) concerns only the paper published in 2000 (*J. Neurosci.* 20:495-510). This week, I'm asking you to write a "news & views" essay (750-1250 words). Address your commentary to a reader of *J. Neurosci.*, and pretend that your essay is appearing in the same issue as the paper you are discussing. Please see the syllabus for detailed instructions on writing this type of assignment (see "Homework", part B). Two real "News & Views" essays will be provided as examples.