

**Week #9** (April 1 & 6), Active sensing  
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In Wednesday's lecture, we discuss the idea that sensory and motor processing in neural circuits are tightly linked. Virtually all sensation occurs in the context of active behaviors. These behaviors (which we might call "sensing actions") alter the relationship between the sensory stimulus and sense organs. Sensing actions are generally thought to improve the acuity of sensory perception—for example, by bringing the stimulus into contact with a region of high sensitivity on the sensory epithelium—but the specific function of these behaviors is not always obvious. Remarkably, sensing actions can be very rapid compared the speed of sensory transduction itself. Sensing actions can create large changes in neural responses to sensory stimuli, and yet perception is nonetheless seamless. Moreover, knowledge of sensing actions can be critical to the proper interpretation of sensory signals in the brain, and yet the way that neural circuits account for sensing actions is poorly understood. We will explore these concepts in the context of various sensory circuits and model organisms.

On Monday we will discuss the following paper in class:

N. Urbain and M. Deschênes (2007) "Motor cortex gates vibrissal responses in a thalamocortical projection pathway", *Neuron* 56:714-25.

Your assignment this week is to write a referee's report on this paper.

As you are reading, please consider the following.

- What are the major relevant functional connections in this circuit that were already known prior to this study? You may find it useful to draw a diagram. How do the conclusions of this study change this picture?
- What techniques does this study use to map functional connectivity? What alternate techniques are available? What might be the advantages and disadvantages of these techniques?
- Given infinite time and resources, what additional experiments might it be interesting to see pertaining to these questions? In general, if you mention additional experiments in your referee's report, you should make clear whether you consider these experiments to be critical (i.e., the paper's conclusions are not well-supported in their absence) versus merely interesting potential additions.
- How do the functional connections described here modify our overall picture of somatosensory processing? Why do the authors propose these functional connections might be useful? What is your critical assessment of these ideas?

(Note: You do not necessarily need to address all of these issues in your written assignment. As always, for guidelines about what we'd like to see in your referee's report, consult the syllabus:

[www.hms.harvard.edu/bss/neuro/bornlab/nb204/writing-curriculum.htm](http://www.hms.harvard.edu/bss/neuro/bornlab/nb204/writing-curriculum.htm))