**Week #2** (Feb. 4 & 9) Cortical maps

The goal for this week is to think about the neocortex at a very high level and to introduce some of the big questions concerning its function, development, and evolution. Is there any reason to think that the cortex might be, in some sense, a uniform structure? If so, what is its computational goal? Why is the cortex subdivided into many areas instead of just one big one? Why might having more areas be a good thing? During the first part of the lecture, I will give an overview of the multiplicity of cortical areas with an emphasis on the question of *why* there might be so many. A lot of this part of the talk is based on the excellent paper by Horace Barlow (see below). I will work towards the idea that these areas represent highly specialized and abstract maps that are designed to facilitate forming new associations (learning) and rapid search (retrieval). In the second half, I will introduce issues related to the development and evolution of the neocortex. This will include a brief discussion of relevant developmental mechanisms as well as the introduction of concepts from evolutionary theory, such as genetic assimilation. These will help us to think about the papers for Monday's discussion.

Prior to Wednesday's lecture, please read:
Barlow, H. B. (1986) Why have multiple cortical areas? *Vision Res.* **26**:81-90.

On Monday we will discuss two papers that concern development of the neocortex and the mechanisms by which cortical fields are mapped out. Naively, one might think of there being two different kinds of processes that have allowed for the tremendous expansion of the primate cerebral cortex: 1) building a bigger sheet and 2) divvying it up into different cortical areas. The two papers we will discuss offer provocative ways to think about these processes. Your assignment is to pick one of the papers and write a **Commentary**. Based on what you now know about cortical areas, what do you find potentially exciting about the paper? Given the retinotopic organization of successive visual areas, what mechanism(s) can you imagine for creating additional, higher order maps?

1. Chenn, A. and Walsh, C. A. (2002) Regulation of cerebral cortical size by control of cell cycle exit in neural precursors. *Science*. **297**:365-9.

2. Fukuchi-Shimogori, T. and Grove, E. A. (2001) Neocortex patterning by the secreted signaling molecule FGF8. *Science*. **294**:1071-4.