Week 1: Writing Assignment

Answer one of the following questions based on this week's material (one-page typewritten response, double-spaced, due Thursday 04/08/10).

- Do specificity of neural computation and information loss always go hand in hand? Describe three examples in the retina to support your answer.
- Describe two general strategies that retinal neurons employ to reduce noise in processing.
- What is rectification? What is its computational function? Give two specific examples in which it performs important functions in the retina.
- Our interpretation of what neurons care about largely depends on what kind of stimuli are used in the experiment. For example, using point stimuli, it was thought for a long time that most retinal ganglion cells have concentric center-surround receptive fields. Give examples of reginal ganglion cells that appear to have ordinary center-surround responses for point stimuli, but in fact encode more specific information when richer stimuli are used.

Extra credit (one paragraph, due Thursday 04/08/10).

- Why is it important for inhibition to take place postsynaptically in the neural circuitry that computes Approaching Motion (P. 154)? Why is it not as important in the neural circuitry that computes Object Motion?
Beyond the Retina

Polyak, 1957
LGN & Striate Cortex
Figure 20. The unfolded striate cortex has a shape like a pear. It would be a quarter sphere if the visual fields were equally represented everywhere, but instead it is greatly distorted by the disproportionate representation of parts near the center of gaze (fovea), a feature termed "cortical magnification". In contrast, the far periphery is greatly underrepresented.
Laminar Structure of Striate Cortex

- Layer 1: dendrite & axons
- Layer 2/3: proj. to extrastriate cortex
- Layer 4: thalamocortical input, proj. to other layers
- Layer 5/6: feedback proj. to thalamus
Orientation Selectivity

(A) Experimental setup

Light bar stimulus projected on screen

Recording from visual cortex

(B) Stimulus orientation

Stimulus presented

0 1 2 3 Time (s)