Readings in Neurobiology: Neural processing in sensory systems

In the animal world there are a huge variety of neural sensory systems. From one system to the next, the physical stimuli being encoded and the biological circuits doing the encoding are never quite the same. Nevertheless, across many sensory circuits, the same processing principles show up again and again. This course will explore some of these motifs in sensory physiology by looking for parallels across species, sense organs, and sensory modalities.

Course: NBIO 450 A

Instructor: Max Turner, mhturner@uw.edu
Office hours by appointment.

Time/place: Thursdays, 3:30pm-5:20pm; Hitchcock 312

Course goals:
By the end of this course students will be able to:

- Effectively read and understand primary scientific literature
- Identify and evaluate the major findings and concepts presented in scientific papers
- Become comfortable discussing the literature with your peers
- Better understand some basic principles of sensory neurophysiology

Course organization:
This is a discussion-based seminar course. We will read and discuss a variety of papers from sensory neuroscience. Some papers will be old “classics” but we will also discuss more recent papers. The course will proceed through four broad concepts/motifs in sensory physiology, with a few papers on each topic. The papers we will discuss, listed below, will be posted to the course Canvas website. For some weeks I have also provided a recommended reading to accompany the main paper. These readings are typically review articles related to the general issue or sensory system in the main paper and can be helpful, especially since we’ll be jumping around from system-to-system a bit in this course.

Coursework:
Each week there will be one assigned paper that we will all read and come to class prepared to discuss. For each paper you will write up answers to the following questions:

1) What questions does the paper address?
2) What are the conclusions of the paper?
3) What evidence supports these conclusions?
4) What is the quality of the evidence?
5) Why are the findings interesting or important?

Please print your answers to these questions and bring them to each class for me to collect. This writeup should be brief, 1 page total should do it. Our in class discussions will generally follow the organization of the above questions, so it’s important that you have thought about these things before coming to class. This weekly assignment is the only assigned coursework, and there will be no exams or presentations.

Grading:
This is a credit/no-credit course (2 credits). You will pass if you show up to class prepared, turn in your weekly assignments, and participate in the discussion.

Schedule & reading list:

Date	Topic: Paper	Suggested reading
October 1	**Transduction:** Hudspeth & Corey, 1977 *Sensitivity, polarity and conductance change in the response of vertebrate hair cells to controlled mechanical stimuli*	
October 8	**Transduction:** Baylor, Lamb & Yau, 1979 *The membrane current of single rod outer segments*	
October 15	**Receptive fields**: Field *et al*., 2010 *Functional connectivity in the retina at the resolution of photoreceptors*	Masland, 2001 *The fundamental plan of the retina*
October 22	**Receptive fields**: Hubel & Wiesel, 1959 *Receptive fields of single neurones in the cat's striate cortex*	
October 29	**Receptive fields**: Talbot *et al*., 1968 *The sense of flutter-vibration: Comparison of the human capacity with response patterns of mechanoreceptive afferents from the monkey hand*	http://sickpapes.tumblr.com/post/26462829880/talbot-wh-darian-smith-i-kornhuber-hh
November 5	**Adaptation**: Eatock, Corey & Hudspeth, 1987 *Adaptation of mechanoelectrical transduction in hair cells of the bullfrog's sacculus*	
November 12	**Adaptation**: Dean *et al*., 2008 *Rapid neural adaptation to sound level statistics*	
November 19	**Adaptation**: Olsen & Wilson, 2008 *Lateral presynaptic inhibition mediates gain control in an olfactory circuit*	Wilson, 2013 *Early olfactory processing in drosophila: mechanisms and principles*
December 3	**Neural maps:** McLaughlin *et al*., 2003 *Retinotopic map refinement requires spontaneous retinal waves during a brief critical period of development*	
December 10	**Neural maps**: Knudsen & Brainard, 1991 *Visual instruction of the neural map of auditory space in the developing optic tectum*	