

Sensory Neurobiology: PCB 4717 and ZOO 6782, Fall 2017, 3 credits

class: Tue, Thur, 12:30-1:45a, RB 140

Jamie Theobald, PhD

prereq: General Biology I & II

Biological Sciences

text 1: *Principles of Neural Science*, 5th ed.

Office: OE 204

Kandel, Schwartz, Jessell, Hudspeth, Siegelbaum

Hours: Tue, Thur, 10:00a-12:00p

McGraw-Hill, New York, 2013

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Description and learning goals

Watching a bee landing on a flower, with her strange, nonblinking eyes, can lead you to wonder, does she really see the world in the same sense that you do? Or hear sounds, or feel pain, or perceive things invisible to you? This course aims to answer these questions, and broadly investigate how we and other animals get, process, and act on information about the world.. To do this we will study some of the variety of senses known so far, including those familiar to humans (touch, smell), outside our normal range (ultrasonic hearing, heat vision), and senses completely unfamiliar to us (electroreception, magnetoreception). By the end of this course you should be able to: identify the major classes of senses and cite specific examples of each, including several not available to humans; explain how physical signals in the environment are transduced into the nervous system; compare sensory systems in animals that may gather different information from similar sources, or alternatively, acquire similar information from different sources; assess an animal's needs and behaviors to predict the mechanisms by which it might gather information.

Grading

3 exams (20, 25, and 30%) + presentations and reading (25%)

The exams will be short answer and plotting. They aren't explicitly cumulative, but understanding previous material is necessary. They will only cover topics that I've done in lecture, but doing well will require you to think through problems you might not have seen before—in other words, rote memorization won't carry you through. The intent is to get you to think hard about the material and ask questions when you don't understand. **Nothing is more important than regular attendance and asking questions.** I'll curve exams by scaling the scores to the top score. For example, if the top score is 90%, I'll divide every score by 0.9 to get the recorded score. You can make up a missed exam only if you provide written documentation of the *emergency* that kept you away. All students will give a presentation on a topic in the sensory neurobiology literature to the class. Meet with me early in the term to discuss. We will also read and discuss papers from the primary literature, to gain experience with critical reading of scientific manuscripts. The subjects of the presentations and papers can appear on the exams.

Finally, grade assignments will follow a simple scale of: 90% or better = A, 80% or better = B, 70% or better = C, 60% or better = D, otherwise fail. Scoring within 1% of 90 or 80 will get you a +, for example 89% will earn a B+. Please make yourself aware of the university policies on academic misconduct and sexual harassment, and then don't do those things.

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week	date	topic	reading
1	22 Aug	Introduction to sensory neurobiology	
	24 Aug	Ion channels	Kandel 5
2	29 Aug	Membrane voltage and electrical signaling	Kandel 6
	31 Aug	Action potentials	Kandel 7
3	5 Sept	Sensory coding	Kandel 21
	7 Sept	Sensory receptors	Kandel 22
4	12 Sept	Article: Hardie and Franze, 2012, Science, 338, 260-263	
	14 Sept	<i>Review</i>	
5	19 Sept	Exam 1 - Structure and coding	
	21 Sept	Mechanoreception	Kandel 22
6	26 Sept	Touch	Kandel 23
	28 Sept	Pain	Kandel 24
7	3 Oct	Hot and cold	
	5 Oct	Balance	Kandel 40
8	10 Oct	Hearing	Kandel 30
	12 Oct	Electric and magnetic	
9	17 Oct	Article: Brainard and Knudsen, 1993, J. Neurosci, 13, 4589-4608	
	19 Oct	<i>Review</i>	
10	24 Oct	Exam 2 – Ionotropic senses	
	26 Oct	Smell	Kandel 32
11	31 Oct	Taste	
	2 Nov	Odor tracking	
12	7 Nov	Photoreception	Kandel 26
	9 Nov	Eye structure	
13	14 Nov	Vision	Kandel 25
	17 Nov	Motion perception	Kandel 27
14	21 Nov	Color perception	Kandel 28
	23 Nov	<i>Thanksgiving</i>	
15	28 Nov	Article: Lu and Sperling, 1995, Vision Res., 35, 2697-722	
	30 Nov	<i>Review</i>	
	5 Dec	Exam 3 – Metabotropic senses	12:00-2:00 RB 140