

## Neurobiology: ZOO 4744 and ZOO 5785, Fall 2019, 3 credits

class: Tue, Thur, 12:30-1:45, RDB 1100

prereq: General Biology I & II

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

Kandel, Schwartz, Jessell, Hudspeth, Siegelbaum  
McGraw-Hill, New York, 2013

text 2: *An Anthropologist on Mars*

Oliver Sacks, Picador, 1995

web: <http://faculty.fiu.edu/~theobald/courses/neurobiology/>

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### Description and learning goals

Neurobiology—the study of what nervous systems do and how they do it—is one of the great frontiers in modern science. How does a honeybee land on a flower, or a turtle find the beach of its birth decades later? Why do you sleep and dream? How does a pitcher throw in the strike zone, or a hitter attempt to connect? Why are things blue, or warm, or bitter? And how is someone suffering from schizophrenia experiencing the world, and is there any way we can help? These questions sample the enormous field of neural science. This course will examine neural function at the levels of molecules and cells, systems and physiology, and finally development and behavior. We will discuss the history of experiments and model organisms that have brought us to our current level of understanding. By the end of this course you should be able to: explain the physical, molecular, and cellular basis of active membranes; predict how molecular changes affect large scale function; compare transduction and encoding in different sensory systems; understand the production of coordinated movement; follow developmental processes that build the nervous system; and assess the role of experience, learning, and other high level processes in shaping behavior. Depending on questions and interest, I may add topics, or drop some that we don't get to. I would rather skip sections than rush through material.

### Grading

ZOO 4744: 3 exams (25, 30, and 35%) + in class written questions (10%)

ZOO 5785: 3 exams (20, 25, and 30%) + in class written questions (10%) + presentation (15%)

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 all 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. Graduate credit requires a presentation on a topic in the neurobiology literature given to the whole class. Meet with me early in the term to discuss.

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.

Most importantly, try to have fun as you study the nervous system, a field that has become the most awe-inspiring scientific endeavor in human history.

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week	date	topic	reading
1	27 Aug	Introduction and structure	
	29 Aug	Ion channels	Kandel 4, 5
2	3 Sept	Membrane potential	Kandel 6
	5 Sept	Passive signaling	Sacks 1
3	10 Sept	Action potential generation	Kandel 7
	12 Sept	Action potential propagation	Sacks 2
4	17 Sept	Synaptic transmission	Kandel 8, 9
	19 Sept	Synaptic integration	Kandel 10
5	24 Sept	Review	
	26 Sept	<b>Exam 1 - Structure and transmission</b>	
6	1 Oct	Sensory coding	Kandel 21
	3 Oct	Touch, temperature, pain	Kandel 23
7	8 Oct	Hair cells, balance, and hearing	Kandel 30
	10 Oct	Smell and Taste	Kandel 32, 26
8	15 Oct	Vision, color, motion detection	Sacks 3
	17 Oct	Muscle contraction and biomechanics	Kandel 34
9	22 Oct	Motor units, force, and fatigue	Kandel 33
	24 Oct	Motor planning and motor learning	Sacks 4
10	29 Oct	Review	
	31 Oct	<b>Exam 2 - Sensory and motor systems</b>	
11	5 Nov	Neurogenesis	Kandel 53
	7 Nov	Axon growth and synapse formation	Kandel 54
12	12 Nov	Synapses and experience	Kandel 55, 65
	14 Nov	Learning and Memory	Sacks 5
13	19 Nov	Sleep and dreams	Kandel 60
	21 Nov	Language	Sacks 6
14	26 Nov	Mental health and disorders	Kandel 51
	28 Nov	<i>Thanksgiving</i>	Sacks 7
15	3 Dec	Review	
	5 Dec	<b>Exam 3 - Development and behavior</b>	