

## Neurobiology: ZOO 4744 and ZOO 5785, Fall 2015, 3 credits

class: Tue, Thur, 9:30-10:45a, Ryder 120

prereq: General Biology I & II

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

Kandel, Schwartz, Jessell, Hudspeth, Siegelbaum

McGraw-Hill, New York, 2013

text: *An Anthropologist on Mars*

Oliver Sacks, Picador, 1995

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Biological Sciences

OE 204

Tue, Thur, 11:00a-1:00p

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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 science. How does a honeybee land on a flower, or a turtle find the beach of its birth decades later? Why do we sleep and dream? How does a pitcher throw in the strike zone, or a hitter attempt to connect? What are colors, warmth, and flavors? 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 bring 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. 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 by itself. The intent is to get you to think hard about the material and ask questions when something doesn't make sense. 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. Graduate credit requires a presentation on a topic in the neurobiology literature. Meet with me early in the term to discuss a presentation to be given to the whole class.

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	25 Aug	Introduction and structure	
	27 Aug	Ion channels	Kandel 4, 5
2	1 Sept	Membrane potential	Kandel 6
	3 Sept	Passive signaling	Sacks 1
3	8 Sept	Action potential generation	Kandel 7
	10 Sept	Action potential propagation	Sacks 2
4	15 Sept	Synaptic transmission	Kandel 8, 9
	17 Sept	Synaptic integration	Kandel 10
5	22 Sept	Review	
	24 Sept	<b>Exam 1 - Structure and transmission</b>	
6	29 Sept	Sensory coding	Kandel 21
	1 Oct	Touch, temperature, pain	Kandel 23
7	6 Oct	Hair cells, balance, and hearing	Kandel 30
	8 Oct	Smell and Taste	Kandel 32, 26
8	13 Oct	Vision, color, motion detection	Sacks 3
	15 Oct	Motor planning	Kandel 33
9	20 Oct	Motion and motor units	Kandel 34
	22 Oct	Muscles and innervation	Sacks 4
10	27 Oct	Review	
	29 Oct	<b>Exam 2 - Sensory and motor systems</b>	
11	3 Nov	Neurogenesis	Kandel 53
	5 Nov	Axon growth and synapse formation	Kandel 54, 55
12	10 Nov	<i>Veteran's day</i>	
	12 Nov	Synapses and experience	Sacks 5
13	17 Nov	Learning	Kandel 65
	19 Nov	Memory	Sacks 6
14	24 Nov	Sleep and dreams	Kandel 51
	26 Nov	<i>Thanksgiving</i>	Sacks 7
15	1 Dec	Language	Kandel 60
	3 Dec	Review	
	8 Dec	<b>Exam 3 - Development and behavior</b>	9:45-11:45 Ryder 120