Course Syllabus
Developmental Neurobiology BISC 2220
Spring 2014

Course Information
Credits: 3
Lecture location: Monroe Hall 114, Mon & Wed 11.10am-12.25pm
Offered by: Department of Biological Sciences, George Washington University

Professor Contact Information
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Course Pre-requisites, Co-requisites, and/or Other Restrictions
None

Course Description
The course presents a broad description of the fundamental principles of neural development, and is organized by ontogeny starting with early neural development, followed by patterning, axonal targeting, and synapse formation. Throughout the course each section will be placed in a comparative evolutionary framework, with particular emphasis placed upon neural development from Caenorhabditis elegans to Drosophila to vertebrate systems.

Course Objectives
The primary goal of this course is to provide students with a broad understanding of concepts in developmental neurobiology, and to introduce them to the molecular mechanisms that guide neural development. Students will study: (1) the events surrounding the birth of neurons; (2) how specific neurons are determined; (3) how neurons find the correct targets; (4) how cell death guides proper neural development; and (5) how synapses are formed and maintained. Modern neurobiology places genes and proteins into a functional context of neurons, circuits, and behaviors across very divergent taxa, and comparative studies provide a powerful opportunity to engage students in this broad context. This course will detail each topic across evolutionarily divergent systems that introduce students to a comprehensive understanding of modern neural development while raising questions about how model systems serve contemporary developmental neuroscience.

Learning Outcomes
1) Understand the series of events surrounding early neuronal development.
2) Study how neurons differentiate and how this is determined.
3) Understand the molecular mechanisms that guide patterning of the nervous system.
4) Develop an understanding of how synaptic connections are formed and maintained.
5) Develop a firm understanding of the role of model organisms in modern developmental neuroscience, and the logic involved in choosing the correct model system to solve specific problems in neurobiology.
6) Gain exposure to “real world” science and critically think about modern problems in developmental neurobiology, and how they are approached.
**Grading Information**
Open Book Exam: 5 points for each (10 total)
Student Presentations: 5 points
First Exam: 10 points
Midterm Exam: 30 points
Seminar: 5 points
Final Exam: 40 points

**Reading List**
**Text book:** *Development of the Nervous System* 3rd Ed by Dan H. Sanes, Thomas A. Reh, and William A. Harris

**Lecture Topics (note: this schedule may change slightly)**
1/13/14  Topic: Evolution of the nervous system
1/15/14  Topic: Neural Induction (Chapter 1)
1/22/14  Topic: Segmentation of the nervous system (Chapter 2)
1/27/14  Topic: Neural Tube Polarity (Chapter 2)
1/29/14  **FIRST EXAM**
2/03/14  Topic: Neurogenesis (Chapter 3)
2/05/14  Topic: Neuronal Migration (Chapter 3)
2/10/14  Topic: Programmed Cell Death during Neuronal Development (Chapter 7)
2/12/14  Topic: Signaling Pathways of Programmed Cell Death (Chapter 7)
2/19/14  **OPEN BOOK EXAM:** Quiz on information covered since the First Exam
2/24/14  Topic: Specification of Invertebrate Neural Fate (Chapter 4)
2/26/14  Topic: Specification of Vertebrate Neural Fate (Chapter 4)
3/03/14  Review of 1st Term
3/05/14  **MID-TERM EXAM**
3/17/14  Topic: Dendrite formation and Axon Guidance (Chapter 5)
3/19/14  Topic: Targeting of axons
3/24/14  Student Presentations I
3/26/14  Topic: The Olfactory System: *A case study in topographic mapping*
3/31/14  Student Presentations II
4/02/14  Topic: Synapse Formation (Chapter 8)
4/07/14  Seminar Review
4/09/14  Topic: Function of the Synapse (Chapter 8)
4/14/14  Topic: Refining Synaptic Connections (Chapter 9)
4/16/14  **OPEN BOOK EXAM:** Quiz on information covered since the Mid-Term Exam
4/21/14  Seminar Review
4/23/14  Review of 2nd Term
4/28/14  Capstone Lecture
5/05/14  **FINAL EXAM:** Monday 10:20am-12:20pm Monroe 114

*N.B. Students will be given the choice of several seminars to attend so as to fit their schedule. Students are required to attend 1 seminar. These seminars will be located in either Ross Hall or Corcoran Hall. Students will be given the seminar dates and locations at the start of their first *Developmental Neurobiology* lecture.*