

BIOL 467 – Developmental Neurobiology

Lectures: Mondays and Thursdays from 8:30-9:50, Clearihue Building A302

Office hours: Cunningham 259c, Thurs 3-4

Course coordinator: Bob Chow (250-472-5658), bobchow@uvic.ca

Course description

This course is focused on the development of the nervous system, from the early induction of neural progenitors to circuit development. Ten topics will be covered (see next page), with each topic revolving around a research paper (“Discussion paper”). The first lecture of a topic will be an overview of that topic and the second lecture will examine the Discussion paper in detail (quiz, group assignments and in-class discussion). The course requires a solid understanding of basic principles in molecular and cellular biology. A major goal of the course is to help students acquire skills to think critically, evaluate primary literature, and develop their own hypotheses and experimental approaches to test these hypotheses.

Reading material

Reading material will be drawn from review articles, primary literature and other sources, which will be linked on Course Spaces or through email. If you have any difficulty in accessing any of the papers, please contact me.

Evaluation

(1) Discussion paper assignments	15%
(2) Discussion paper quizzes	15%
(3) In-class assignments	10%
(3) Midterm exam	30%
(4) Final exam	30%

Discussion paper assignments (15%)

An assignment consisting of a few questions will be given for each Discussion paper. Assignments are to be handed in at the beginning of the Discussion paper lecture (preferred), or sent by email before class if you are not present. Late assignments will not be accepted as assignments will be discussed in class.

Discussion paper quizzes (15%)

A short quiz (6 marks) will be given at the beginning of each Discussion paper lecture with questions based on the paper. Scores from your best 8 (of 10) quizzes will be used for the final grade.

In-class assignments (10%)

The class will be broken into groups assigned by the instructor and given a few questions related a specific figure(s) in the Discussion Paper. Answers will be handed in for grading and discussed in lecture.

Exams (60%)

There are two exams: a midterm on Thursday Feb 23 and a final during the exam period. Both are required to pass the course. The midterm will cover material up to and including Feb 9. The final exam will be similar in format and length to the midterm exam, and will be held during the exam period. It is not cumulative and will cover material starting Feb 27. Exams will test understanding of fundamentals, concepts and mechanisms as well as ability to develop hypotheses and to design experiments to test them. Exams will cover the Discussion papers and any material that is covered in lecture. Format for both exams is mostly short answer.

Tentative lecture schedule:

- Jan 5 **Overview of neural development and early vertebrate development**
- Jan 9, 12 **Neural induction**
Discussion paper: “*Depletion of three BMP antagonists from Spemann's organizer leads to a catastrophic loss of dorsal structures*”
http://www.cell.com/developmental-cell/abstract/S1534-5807%2805%2900017-1?_returnURL=http%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS1534580705000171%3Fshowall%3Dtrue
- Jan 16, 19 **Patterning of the nervous system: morphogen gradients**
Discussion paper: “*Specified Neural Progenitors Sort to Form Sharp Domains after Noisy Shh Signaling*”
<http://www.sciencedirect.com/science/article/pii/S0092867413003450>
- Jan 23, 26 **Transcriptional control of neuronal organization**
Discussion paper: “*Motor neuron columnar fate imposed by sequential phases of Hox-c activity*”
<http://www.nature.com/nature/journal/v425/n6961/full/nature02051.html>
- Jan 30, Feb 2 **Neural progenitors, asymmetric cell divisions and fate choice**
Discussion paper: “*Notch signaling acts before cell division to promote asymmetric cleavage and cell fate of neural precursor cells*”
<http://stke.sciencemag.org/content/7/348/ra101.long>
- Feb 6, 9 **Gene regulatory networks and cell fate determination**
Discussion paper: “*A Gene Regulatory Network Controls the Binary Fate Decision of Rod and Bipolar Cells in the Vertebrate Retina*”
<http://www.cell.com/developmental-cell/abstract/S1534-5807%2814%2900484-5>
- Feb 20 Q&A
- Feb 23 Midterm exam
- Feb 27, Mar2 **Axon guidance**
Discussion paper: “*Topographic Mapping from the Retina to the Midbrain Is Controlled by Relative but Not Absolute Levels of EphA Receptor Signaling*”
<http://www.sciencedirect.com/science/article/pii/S009286740000012X>
- Mar 6, 9 **Dendrite branching and morphogenesis**
Discussion paper: “*An Extracellular Adhesion Molecule Complex Patterns Dendritic Branching and Morphogenesis*”
<http://www.cell.com/abstract/S0092-8674%2813%2901090-8>

- Mar 13, 16 **Synaptogenesis**
Discussion paper: “*Trans-synaptic Teneurin signalling in neuromuscular synapse organization and target choice*”
<http://www.nature.com/nature/journal/v484/n7393/full/nature10923.html>
- Mar 20, 23 **Maturation**
Discussion paper: “*Synaptic Pruning by Microglia Is Necessary for Normal Brain Development*”
<http://science.sciencemag.org/content/333/6048/1456>
- Mar 27, 30 **Adult neurogenesis**
Discussion paper: “*Roles of continuous neurogenesis in the structural and functional integrity of the adult forebrain*”
<http://www.nature.com/neuro/journal/v11/n10/abs/nn.2185.html>
- April 3 Q&A