

BIOL 470 – Developmental Neurobiology

Lectures: Mondays and Thursdays from 8:30-9:50, ELL 162

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”) that will be examined in detail (quiz, group assignments and in-class discussion,). A solid understanding of basic principles in molecular and cellular biology is required. A major goal of the course is to help students acquire skills to critically evaluate the primary scientific literature, and develop their own hypotheses and experimental approaches to test them.

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	20%
(2) Discussion paper quizzes	20%
(3) Midterm exam	30%
(4) Final exam	30%

Discussion paper assignments (20%)

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, 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 (20%)

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.

Exams (60%)

There are two exams: a midterm on Monday Feb 22 and a final during the exam period. Both are required to pass the course. The midterm will cover material up to and including Feb 15. 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 from Feb 25.

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 4 **Overview of neural development and early vertebrate development**
- Jan 7, 11 **Neural induction**
Discussion paper (Jan 11): “*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 14, 18 **Patterning of the nervous system: morphogen gradients**
Discussion paper (Jan 18): “*Specified Neural Progenitors Sort to Form Sharp Domains after Noisy Shh Signaling*”
<http://www.sciencedirect.com/science/article/pii/S0092867413003450>
- Jan 21, 25 **Transcriptional control of neuronal organization**
Discussion paper (Jan 25): “*Motor neuron columnar fate imposed by sequential phases of Hox-c activity*”
<http://www.nature.com/nature/journal/v425/n6961/full/nature02051.html>
- Jan 28, Feb 1 **Neural progenitors, asymmetric cell divisions and fate choice**
Discussion paper (Feb 1): “*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 4, 15 **Cell cycle exit and post-mitotic neuronal differentiation**
Discussion paper (Feb 15): “*MicroRNA-mediated switching of chromatin-remodelling complexes in neural development*”
<http://www.nature.com/nature/journal/v460/n7255/full/nature08139.html>
- Feb 18 Q&A
- Feb 22 Midterm exam
- Feb 25 29 **Axon guidance**
Discussion paper (Feb 29): “*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 3, 7 **Dendrite branching and morphogenesis**
Discussion paper (Mar 7): “*An Extracellular Adhesion Molecule Complex Patterns Dendritic Branching and Morphogenesis*”
<http://www.cell.com/abstract/S0092-8674%2813%2901090-8>

- Mar 10, 14 **Synapse Development**
Discussion paper (Mar 14): “*NAB-1 instructs synapse assembly by linking adhesion molecules and F-actin to active zone proteins*”
<http://www.nature.com/neuro/journal/v15/n2/full/nn.2991.html>
- Mar 17, 21 **Circuit formation in the developing cortex**
Discussion paper (Mar 21) “*The emergence of functional microcircuits in visual cortex*”
<http://www.nature.com/nature/journal/v496/n7443/full/nature12015.html>
- Mar 24, 31 **Adult neurogenesis**
Discussion paper (Mar 31) “*Live imaging of adult neural stem cell behavior in the intact and injured zebrafish brain*”
<http://www.sciencemag.org/content/348/6236/789.short>
- April 4 Q&A