

BIOL 309 – Developmental Biology

Lectures: Mondays and Thursdays, 1:00-2:20, Cunningham 146

Labs: Cunningham 240

Course coordinator: Bob Chow bobchow@uvic.ca

Office hours: Mondays/Thursday 2:30-3:30. If you cannot make these times, send me an email and we can set up another time to meet or have a Zoom call.

Lab instructor: Kristin Hackett <kristinhackett@uvic.ca>

Lectures will **not** be recorded or broadcast on Zoom.

Lecture pdf's will be available, but note:

- **before the lecture:** a “pre-lecture pdf” will be posted. It will be missing slides that contain answers to in-class questions
- **after the lecture:** it will be replaced by a “post-lecture pdf” containing all of the slides

Course description

This course examines animal development and will focus on cellular and molecular mechanisms that underlie developmental processes. A solid understanding of basic principles in molecular and cellular biology is required. Effort will be made to highlight relevance of developmental biology to our understanding of disease and lectures will incorporate recent discoveries from the primary literature. A major goal of this course is to help develop skills to: (i) evaluate the primary scientific literature, (ii) develop hypotheses based on pre-existing knowledge and (iii) design experiments to test hypotheses.

Reading material

- (i) Textbook: Gilbert Developmental Biology, 12th edition (lectures draw from, but do not strictly follow text). See last page of course outline for assigned reading schedule.
- (ii) reading material will also be drawn from the primary literature, review articles and other sources, which will be posted on Brightspace.

Evaluation

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|------------------|-----|
| (1) Lab | 40% |
| (2) Midterm exam | 30% |
| (3) Final exam | 30% |

Lab

The lab component is broken down into 2 sections: (i) a practical lab and (ii) a journal article review/“dry” lab (each worth 17% of final grade). There will be 5 practical labs and 4 journal article review/dry labs. Detailed information (including lab schedule) is posted in the **BIOL 309a Lab Manual**, which can be purchased from the UVic Bookstore.

Breakdown of the lab grade:

Wet lab	17%	Dry lab (journal article review)	18%
In class assignments	5%	Pre-lab quizzes	4%
Lab report	12%	Oral presentation	5%
		Paper/mini-proposal	9%

Wet and dry lab participation grade (5 %) - this grade will cover participation in dry lab (brainstorming questions, involvement in class discussion) and wet labs (i.e. complete all procedure steps, make an effort to visualize the specimens provided during the lab period and contribute to laboratory discussions).

Midterm and Final exams

The midterm is compulsory and will be held on Monday Feb 27. It will cover material up to Feb 13 (i.e. including Vertebrate early development). The final exam will be similar in format and length to the midterm exam and will be held during the exam period. The final exam is not cumulative and will cover material starting from “Fly development” through to the end of the course.

Exams will test understanding of fundamentals, concepts and mechanisms underlying developmental systems as well as ability to develop hypotheses and to design experiments to test them. Format for both exams: mostly short answer, I will go over in more detail in class. The exams will cover anything presented in the lectures and may draw from related observations from the wet labs.

Important background reading from the textbook

Basic molecular biology:

pp 56-88 of the textbook (Developmental Biology, 12th edition) covers important basic molecular biology background material that will be referred to through the course. This includes a review of the “central dogma” of gene expression, i.e. gene >> transcription [mRNA] >> translation [protein]

Signal transduction pathways:

pp 115-128 describes the major cell-cell signaling pathways that are discussed in the class (e.g. Hedgehog, Wnt, Notch, TGF-beta, FGF, tyrosine receptor kinase, etc...)

Experimental techniques discussed in the course:

- a good description of some of the techniques that will be referred to in the course can be found on pages 20-25, 50-52, 89-95 in the 12th Edition (85-91 in the 11th Edition)

- in situ hybridization
- chromatin immunoprecipitation/sequencing
- deep sequencing, RNA seq
- forward/reverse genetics
- Crispr/Cas9 gene editing
- Gal4/UAS system
- cre-lox system
- single cell RNA sequencing

Also see Brightspace: see Tools and Techniques module at bottom of page

(Lecture schedule and text reading on next page)

Tentative lecture schedule:

Date	Topics	10th Edition	11th Edition	12th Edition
Jan 9,12	Fertilization/early cleavage	117-151	218-247	216-240
Jan 16-23	Invertebrate early development	31-45, 69-96, 153-161, 170-173,217-239	11-19, 45-65, 95-139, 238-239, 251-254, 265-268, 311-332	14-25, 39-46, 247-250, 303-323
Jan26-Feb13	Vertebrate early development	241-270, 286-318, 319-331	333-364, 380-411, 143-153, 167-179	8-12, 114-115, 263-266, 325-399
Feb 16	No lecture			
Feb 15, 18	Reading break			
Mon Feb 27	Midterm exam			
Mar 2-13	Fly axis specification and patterning	179-213	277-309	48-50, 273-301
Mar 16-23	Eye development	79-81, 359-367	108-111, 520-527	109-112, 122, 493-497, 745
Mar 27-30	Neural crest and neuronal development	375-414	413-437, 463-508	401-420, 441-480
Apr 3	Vertebrate limb development	489-517	613-651	571-605
Apr 6 (last day of class)	Germ cell determination	591-605	181-193	179-198