

BIOL 309 – Developmental Biology

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

Wet labs: 2:30-5:30, Cunningham 240

Dry labs: Tuesdays: ELL 160; Wednesday afternoon: ELL 162, Wednesday evening: ELL 160

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

Office hours: Cunningham 259c, Thurs 3-4 or by appointment

Lab instructor: Madison Wiebe madisonwiebe@uvic.ca.

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)

(ii) reading material will also be drawn from the primary literature, review articles and other sources, which will be posted on Course Spaces.

Evaluation

(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:

<u>Wet lab</u>	<u>17%</u>	<u>Dry lab (journal article review)</u>	<u>18%</u>
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 exam

The midterm is compulsory and will be held on Monday Feb 24. It will cover material up to Feb 10 (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 – Feb 13” 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. The exams will cover anything presented in the lectures.

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 Techniques folder at bottom of Course Spaces site for additional description of techniques

(Lecture schedule on next page...)

Tentative lecture schedule:

Date	Topics	10th Edition	11th Edition	12th Edition
Jan 6,9	Fertilization/early cleavage	117-151	218-247	216-240
Jan 13-23	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
Jan 27-Feb 10	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 17, 20	Reading break			
Mon Feb 24	Midterm exam			
Feb 13-Mar 5	Fly axis specification and patterning	179-213	277-309	48-50, 273-301
Mar 5-16	Eye development	79-81, 359-367	108-111, 520-527	109-112, 122, 493-497, 745
Mar 19, 23	Neural crest and neuronal development	375-414	413-437, 463-508	401-420, 441-480
Mar 26	Vertebrate limb development	489-517	613-651	571-605
Mar 30	Germ cell determination	591-605	181-193	179-198
Apr 2	(open)			