

Molecular biology of development

Biology 3330 | 2019W

Course outline

This document is available on D2L (a/k/a MyCourseLink).

Course objectives:

During this course, you will

- Develop “hard” scientific skills in developmental biology, molecular biology and comparative biochemistry that logically follow from your previous courses in lab biology, cell biology and biochemistry
- Develop “soft” scientific skills, such as
 - conceiving, writing and delivering oral presentations by applying information obtained in lecture, from your textbook and from other scientific sources
 - developing job-searching techniques and learning what you can do with an undergraduate degree in biology

By the end of this course, you will be comfortable

- Understanding common terms used in developmental biology
- Discussing experimental model organisms amenable to the study of developmental biology
- Discussing common cross-species themes in
 - The regulation of gene expression
 - Biochemical changes during development
 - Adaptive responses to abiotic and biotic stresses
 - Recognizing specific examples of the concepts above using plant and animal models
- Discussing several experimental laboratory methods used to examine the above questions, such as
 - Cell culture
 - Epigenetics
 - Protein:protein interactions

- DNA and protein detection techniques
- Giving oral or poster presentations
- Asking questions based on the scientific content of others' presentations
- Discussing hot topics in molecular biology and biochemistry: genomics, protein structure, array technology, stem cells and genetic diseases

Instructor

Dr. D. Law

- Office: OA 3004 (in Orillia)
- Email: dlaw@lakeheadu.ca
- Office hour: Tuesdays 1:00-2:00 PM, or by email appointment. Orillia students can visit me in person; TB students can phone (705-330-4008, x2646, or dial 2646 from a Lakehead phone), FaceTime (dlaw@lakeheadu.ca) or Skype (dave.law764).

Teaching assistant

Gabrielle Gauthier (PhD student in Biotechnology in Thunder Bay)

- Email: ggauthi@lakeheadu.ca

Lectures

Classes in the 2019W term run from Jan. 7 to Fri. Apr. 5, 2019. Our classes meet Tuesdays and Thursdays, 11:30 am - 1:00 pm, AT 2021 or OA 3041.

Following is a preliminary lecture schedule. Details will be added as the lecture material becomes more finalized. Lectures are generally available for download from D2L on the evening prior to the lecture.

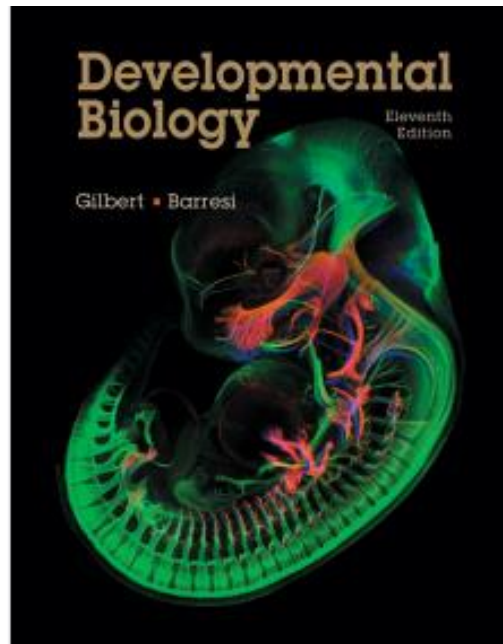
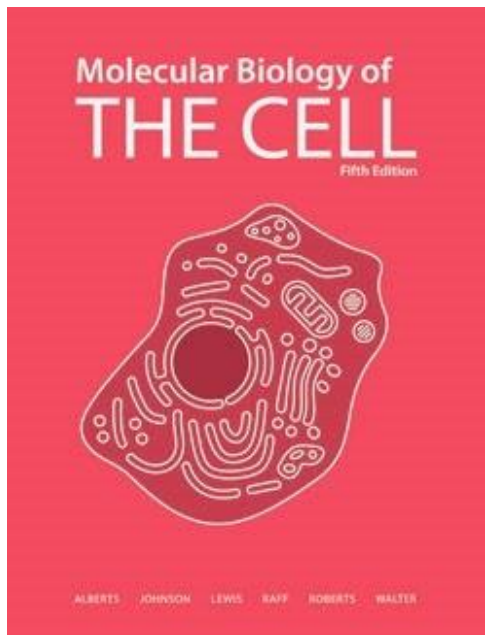
You might also want to take note of the following other [important dates](#), as per the [academic schedule of dates](#):

- Final date to add a course for 2019W: Fri. Jan. 18
- Final date to withdraw from a course without academic penalty (a/k/a drop date): Fri. Feb. 8
 - I aim to provide you with at least 25% of your final mark by this date so that you can make an informed decision about your progress and projected future performance in the course.

Week of	Title
Jan. 7	Introduction Origins of developmental biology I
Jan. 14	Origins of developmental biology II The roles of cells in development (based on pp. 879-903, 1045-1050)
Jan. 21	The development of multicellular organisms (pp. 1305-1320) Model organisms in developmental biology
Jan. 28	Drosophila as a model animal organism (pp. 1328-1341) The regulation of gene expression I (pp. 411-432)
Feb. 4	Midterm exam 1 (Tues. Feb 5, in class) The regulation of gene expression II: epigenetics (pp. 210-218)
Feb. 11	The regulation of gene expression III: genetic switches (pp. 432-453) The regulation of gene expression IV: small RNAs (p. 336: table 6-1)
Feb. 18	Study break
Feb. 25	Control of transcription in eukaryotic cells Arabidopsis as a model plant organism (pp. 1398-1415)
Mar. 4	Midterm exam 2 (Tues. Mar. 4, in class) Oral presentations session 1
Mar. 11	Oral presentations session 2 Oral presentations session 3
Mar. 18	Control of translation in eukaryotic cells Post-translational regulation of gene expression
Mar. 25	Molecular cloning: introduction and uses in molecular biology Principles of metabolic control
Apr. 1	Metabolic evolution and the origin of life Tools for probing gene function

Textbook:

There is no required textbook for this course. You may find that your cell biology textbook is useful as a reference. For TB students, I give page numbers of Alberts et al.'s *Molecular Biology of the Cell* (5th edition) in the lecture list above. Another excellent text is *Developmental Biology* by Scott Gilbert. Both textbooks are on overnight reserve in both the TB and Orillia libraries. See reserve list below for details; see also the Reserves list on D2L.

**On reserve:****In Thunder Bay:**

- Molecular biology of the cell / Bruce Alberts ... [et al.]. 5th edition QH 581.2 M64 2008
 - The old (4th edition) of this text is [available free online](#) at the National Center for Biotechnology Information (NCBI) via PubMed. However, accessing the information is difficult as search terms have to be entered; the text cannot be followed page-by-page. The paper copy of the text is therefore recommended. The book's homepage has more information, but little interactive content. The textbook does come with a CD-ROM with learning tools that include supplemental pictures and QuickTime movies designed to clarify concepts. I'll show some of these in class.
- A practical guide to developmental biology / Melissa Gibbs. QH 491 G53 2003
- Developmental biology / Scott F. Gilbert. QL 955 G44 2010. 9th edition.
- Principles of development / Lewis Wolpert ... [et al.]. QH 491 P74 2011. 4th edition.

In Orillia:

- Molecular biology of the cell / Bruce Alberts, Alexander Johnson, Julian Lewis, David

Morgan, Martin Raff, Keith Roberts, Peter Walter; with problems by John Wilson, Tim Hunt. QH 581.2 M64 2015. 6th edition.

- Developmental biology / Scott F. Gilbert, Michael J.F. Barresi. QL 955 G48 2016. 11th edition.

Note also that I own many molecular biology, biochemistry and developmental biology textbooks that I may be willing to lend to you. Ask and you may receive.

Marking scheme (some details below):

- Midterm exam 1 20%
- Midterm exam 2 20
- 4 assignments @ 5% each = 20
- Oral presentation 10
- Course participation 5
- Final exam (date TBA) 25

Assignments:

These are geared towards

- increasing your job-hunting skills through effective CV writing
- finding scientific resources relevant to molecular biology
- researching the scientific background of potential future supervisors (for those of you continuing to graduate school) or companies
- developing your skills in developmental molecular biology

Due dates for these assignments are throughout the term. All assignments are due at the beginning of class. Any assignment submitted after 1 PM on the due date will lose 20% of its value. Every extra day late results in an additional 20% off of its mark. Assignments are available on D2L.

<u>Assignment number</u>	<u>Due date (Thursdays)</u>
1	24-Jan
2	31-Jan
3	28-Feb
4	28-Mar

Oral presentations:

Oral presentations are often the main way you will communicate your ideas to others, both scientists and non-scientists. Your first experience with a wider audience in your field will likely be by one of these communication techniques at a scientific conference. Effectively communicating your ideas to an audience and exciting them with your work are key job skills in

any field (including being a professor). As such, this course places emphasis on these critical aspects of your professional development.

You will want to start thinking about the presentations soon. There will be one oral presentation by each student during the course that will be part of a group effort. These take place during the lecture period during in-class sessions in mid-March.

These documents on D2L are available to help with the oral presentations:

- Oral presentation info and topic list
- Student presentation evaluation form
 - Please bring one of these forms per oral presentation to class and hand it in with your comments.

Student participation:

Much of the participation will be done using a “clicker” system. To receive a participation mark in the course, you need to buy the “iClicker Reef” app for your smartphone, tablet or laptop, and bring your device with the app on it to each class. You will use this app to answer questions in class and thus receive participation marks in the course.

The app is available both for [iOS](#) and [Android](#) devices. To link your app to the course, search for the course under my name at Lakehead-Orillia: “BIOL 3330 2019W”. Then add it to your list of courses. The cost is variable, and you can get subscriptions for periods of 6-mo to 4 years. I will use this app next winter for my BIOL-3470: Biotechnology of Plants course, so if you are planning on taking it, it makes more sense for you to pay for the year subscription. Since students are located on 2 campuses, you cannot use a physical iClicker.

Five percent of your final mark is allocated to participation. This will be based on

- asking relevant, insightful questions at the end of other students' oral presentations, and
- answering questions that are based on the lecture material using the i>clicker during my lectures,

Participation marks are equally allocated for

- attendance, and
- correct answers.

You may miss a maximum of 3 course instructor-led classes without penalty. Additional information on the technology will be given in the first class.

Statement on academic dishonesty:

The full version of Lakehead University's [Academic Dishonesty Regulations](#) is available online. This policy makes up part of the [Code of Student Behaviour and Disciplinary Procedures](#). You should read this policy and become familiar with it.

In summary, the penalty for plagiarism or cheating on any part of this or any other course is zero for the work where the student is caught. Serious or repeated plagiarism, including cheating on an examination or test, will result in a mark of zero for the course and may result in expulsion from the University.

For the purposes of this course, there are in particular several places where cheating may occur, including:

- using written or electronic notes or through conferring with another person in a test or examination;
- voting electronically in place of another person for the participation component of the course;
- handing in written work that is in whole or in part not the student's own.

Academic dishonesty for any of these areas will result in a mark of zero for the work concerned. Note that the presence of a student's iClicker polling device remote in the classroom when the student is not present is considered to be academic misconduct equivalent to cheating on an examination and will result in a mark of zero for the participation component of the course.

Rest assured that the course instructors will take every precaution to ensure that potential cheaters are caught and subjected to the appropriate penalty.