

# BIOL-3330: Molecular biology of development

## Course outline

### 2015W

This document is available on D2L.

#### Course objectives:

*During this course, you will...*

- improve and expand your critical understanding of major concepts in developmental and molecular biology and comparative biochemistry (“hard” skills)
- develop “soft” scientific skills, such as
  - conceiving, writing and delivering oral and poster 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 in...*

- 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  
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 Office hour: Tuesdays noon to 1 PM, or by email appointment

**Lectures:**

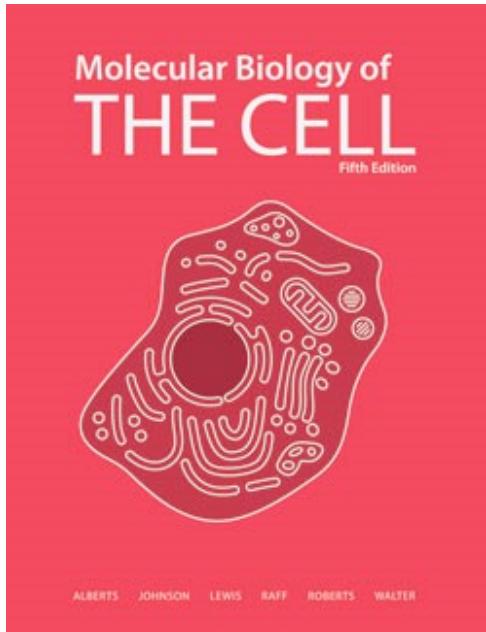
Tues. Jan. 6 to Thurs. Apr. 2, 2015.  
 Tuesdays and Thursdays, 10:00 – 11:30 AM  
 AT 5041 or OA 2020

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.

Note that the 2015W study break is Feb. 16 to 20, 2015. There will thus be no class on Tues. Feb. 17 or Thurs. Feb. 19.

#	Date	Title
1	Jan. 6	Introduction
2	Jan. 8	Origins of developmental biology I
3	Jan. 13	Origins of developmental biology II
4	Jan. 15	The roles of cells in development (based on pp. 879-903, 1045-1050)
5	Jan. 20	The development of multicellular organisms (pp. 1305-1320)
6	Jan. 22	Model organisms in developmental biology
7	Jan. 27	<i>Drosophila</i> as a model animal organism (pp. 1328-1341)
8	Jan. 29	The regulation of gene expression I (pp. 411-432)
	<b>Feb. 3</b>	<b>Midterm exam 1 (covers lectures 1 to 7 inclusive)</b>
9	Feb. 5	The regulation of gene expression II: epigenetics (pp. 210-218)
10	Feb. 10	The regulation of gene expression III: genetic switches (pp. 432-453)
11	Feb. 12	The regulation of gene expression IV: small RNAs (p. 336: table 6-1)
12	Feb. 24	<i>Arabidopsis</i> as a model plant organism (pp. 1398-1415)
13	Feb. 26	Control of transcription in eukaryotic cells
	<b>Mar. 3</b>	<b>Midterm exam 2 (covers lectures 8 to 13 inclusive)</b>
Mar. 5		Oral presentations session 1
Mar. 10		Oral presentations session 2
14	Mar. 12	Control of translation in eukaryotic cells
15	Mar. 17	Post-translational regulation of gene expression
16	Mar. 19	Molecular cloning: introduction and uses in molecular biology
17	Mar. 24	Principles of metabolic control
18	Mar. 26	Metabolic evolution and the origin of life
	Mar. 31	Thunder Bay student poster presentations in Agora (during regular class time)
19	Apr. 2	Tools for probing gene function

## Textbook:



“Molecular biology of the cell”, 5<sup>th</sup> ed., Alberts et al. (2008). Available in bookstore or from [amazon.ca](https://www.amazon.ca). This is the same version used over the last several years for Cell Biology (BIOL-2230).

The old (4<sup>th</sup> 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 textbook [homepage](#) has more information on the book, 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.

## On reserve:

All 5 textbooks below are in the library on 1-day (overnight) reserve.

The course text:

1. Molecular biology of the cell / Bruce Alberts ... [et al.]. QH 581.2 M64 2008
2. The old edition of this text (2002) is also on reserve: QH 581.2 M64 2002

These texts may be of supplemental help to the course textbook:

3. A practical guide to developmental biology / Melissa Gibbs. QH 491 G53 2003
4. [Developmental biology / Scott F. Gilbert](#). QL 955 G44 2010
5. [Principles of development / Lewis Wolpert ... \[et al.\]](#). QH 491 P74 2011

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

## **Marking scheme** (some details below):

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

## **Assignments:**

These are geared towards

- finding scientific resources relevant to molecular biology
- increasing student job-hunting skills through effective CV writing
- researching the scientific background of potential future supervisors (for those 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 assignments submitted after 10 AM on the due date will lose 10% of its value.

Assignment <u>number</u>	Due date <u>(in class)</u>
1	22-Jan
2	10-Feb
3	17-Mar
4	26-Mar

Assignment handout available on D2L.

## **Student presentations:**

Oral and poster presentations are some of the principal means by which ideas are communicated in science. 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 presentation by each student during the course that will be part of a group effort. It will either be

- oral and take place during the lecture period during in-class sessions in early March, or
- poster and take place at the end of the course.

**Orillia students must do an oral presentation.**

### *A. Oral presentations*

Oral presentation info and topic list available on D2L.

Student presentation evaluation form available on D2L. Please bring one of these forms per oral presentation to class and hand it in with your comments.

#### *B. Poster presentations*

The session will take place during class time on **Tuesday, March 31** in the Agora. These presentations will be centered on a recent paper in molecular biology or biochemistry on a developmental theme (suggestions for journals will be given in class; contact me with an idea and I can give you suggestions by email or in person as well). Posters will be judged by faculty volunteers.

More poster info is available on D2L.

#### **Student participation:**

Much of the participation will be done using the [i>clicker](#) electronic survey system. The remotes are available in the bookstore for around \$40 each. Physical clickers may also be purchased used from several Law class alumni. You may also pay for a one-term license to use the smart phone app i>clicker GO. **Orillia students must use i>clicker GO.**

Note that 5% 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, equally allocated for
  - attendance, and
  - correct answers.

You may miss a maximum of 3 course instructor-led classes without penalty.

You may register your new i>clicker [online](#) before the first class without a fee. If you have previously registered your remote, do not re-register. Used i>clickers are assessed a US\$6.99 fee to register online. Registration for used clickers is free in class. You may decide how you want to register your remote. One registration opportunity will occur on Tuesday, January 13 at the beginning of class. If you miss this opportunity, you will have to register your clicker online.

Additional information on the technology will be given in the first class.

#### **Statement on academic dishonesty:**

The full version of Lakehead University's Code of Student Behaviour and Disciplinary Procedures is available here:

<https://www.lakeheadu.ca/faculty-and-staff/policies/student-related/code-of-student-behaviour-and-disciplinary-procedures>

All students in this course 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 exam 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:

- a) using written or electronic notes or through conferring with another person in a test or examination;
- b) voting electronically in place of another person for the participation component of the course;
- c) 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 i>clicker 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 course.

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