

# **BIOLOGY 3330 WA - MOLECULAR BIOLOGY OF DEVELOPMENT**

## **DR. D. LAW**

Molecular biology of development

Biology 3330

Course outline, Winter 2009

This document is available on WebCT.

Course objectives

During this course, you will...

- develop scientific skills that are of use in the real world
- oral and presentation skills via student classroom and poster presentations
- job-searching techniques and what you can do with a BSc
- apply information obtained in lecture, from your textbook and from other scientific sources to write and present effective oral and poster presentations
- learn how to critically and fairly evaluate oral presentations
- improve and expand your critical understanding of major concepts in developmental and molecular biology

By the end of this course, you will be comfortable in...

- giving oral and poster presentations
- asking questions based on the scientific content of others' presentations
- understanding common terms used in developmental biology
- knowledge of experimental model organisms amenable to the study of developmental biology
- discussing common cross-species themes in
  - DNA repair and recombination
  - the regulation of gene expression
  - biochemical changes during development
  - adaptive responses to abiotic and biotic stresses
- recognizing specific examples of the above with respect to several plant models:
  - potato shoot development
  - maize seed development
  - recovery and response of photosynthesis to stress
  - fruit ripening
- several experimental laboratory methods used to examine the above questions
  - cell culture
  - epigenetics
  - protein:protein interactions
  - DNA and protein detection techniques
- discussing hot topics in molecular biology and biochemistry: genomics, protein structure, array technology, stem cells and genetic diseases

Office hour: Thursdays 9:30 -10:30 AM or by email appointment

Lectures:

Mon. Jan. 5 to Wed. Apr. 1, 2009.  
Mondays and Wednesdays 11:30 AM -1 PM  
AT 2020

Following is a preliminary lecture schedule. Details will be added as the lecture material becomes more finalized.

Lectures are available for download the previous evening on WebCT.

# Day Date Topic

- 1 Mon Jan 5 Introduction; Analysis of development
- 2 Wed Jan 7 The development of multicellular organisms (p. 1157-1163)
- 3 Mon Jan 12 The role of cells in development (based on p. 1163-1170)
- 4 Wed Jan 14 The regulation of gene expression I (pp. 375-395)
- 5 Mon Jan 19 The regulation of gene expression II: small RNAs
- 6 Wed Jan 21 The regulation of gene expression III: genetic switches (pp. 395-415)
- 7 Mon Jan 26 The regulation of gene expression IV: epigenetic mechanisms (pp. 207-216)
- 8 Wed Jan 28 Model organisms in developmental biology

- Mon Feb 2 Midterm exam (covers lectures 1 to 7 inclusive)  
Wed Feb 4 Student presentation 1  
Mon Feb 9 Student presentation 2  
9 Wed Feb 11 Development of the model plant *Arabidopsis thaliana* (pp. 1242-1257)

STUDY BREAK: Feb. 16 to 20

- Mon Feb 23 Student presentation 3  
Wed Feb 25 Student presentation 4  
10 Mon Mar 2 The translational and posttranslational regulation of gene expression  
Wed Mar 4 Student presentation 5

- 11 Mon Mar 9 Molecular cloning: an introduction  
Wed Mar 11 Student presentation 6  
Mon Mar 16 Student presentation 7

12 Wed Mar 18 Molecular cloning: uses of this technology

- 13 Mon Mar 23 Tools for probing gene function  
Wed Mar 25 Student presentation 8  
Mon Mar 30 Student presentation 9  
Wed Apr 1 Student poster presentation in Agora (during regular class time)

Textbook:

"Molecular biology of the cell", 4th ed., Alberts et al. (2002).

Available in bookstore or from amazon.ca. This is the same version as has been used over the last several years for Cell Biology (Biol 2230). Note that the fifth edition of this text was released in early 2008; we will use the fourth edition in this course.

The 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 in the way of 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 in the library on 2-hour reserve.

The course text:

- Molecular biology of the cell / Bruce Alberts ... [et al.]. QH 581.2 M64 2002
  - The new edition of this text (2008) is also on reserve
- These texts may be of supplemental help to the course textbook.
- Developmental biology / Scott F. Gilbert. QL 955 G44 1994
  - The new edition of this text (2007) is also on reserve
  - A practical guide to developmental biology / Melissa Gibbs. QH 491 G53 2003

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

Marking scheme (details below):

- 5 assignments @ 4% each = 20%
- Oral presentation 15%
- Poster presentation 15%
- Course participation 5%
- Midterm exam 15%
- Final exam (date and time TBA) 30%

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

There are also two developmental biology oriented assignments. Due dates for these assignments are throughout the term and are always Wednesdays at the beginning of class.

Assignment Due date  
number (in class)

- 1 21-Jan
- 2 28-Jan
- 3 11-Feb
- 4 25-Feb
- 5 11-Mar

Assignment handout available on WebCT.

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 two presentations by

each student during the course, both of which will be part of a group effort. One will be oral and take place during the lecture period, starting Wednesday, February 4. The other will be a poster presentation at the end of the course.

#### A. Oral presentations

Oral presentation info and topic list available on WebCT.

Student presentation evaluation form available on WebCT. 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 the last class on Wednesday, April 1 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 WebCT.

Student participation:

Much of the participation will be done using the i>clicker electronic survey system, the same as was used in Biochemistry I in the 2008F term. The remotes are available in the bookstore for around \$30 each. They may also be purchased used from several Biochem I students, as detailed in my email.

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 handing in written critiques at the end of student oral presentations (1%), and
- answering questions that are based on the lecture material using the i>clicker during the instructor's lectures (4%), equally allocated for
- attendance (2% of final mark), and
- correct answers (2% of final mark)

The clickers are available in the bookstore. Please register your i>clicker online before the first class. Additional information on the technology will be given in the first class.

Your participation will be noted by the course instructor. You will be able to miss a maximum of 2 course instructor-led classes and 2 student presentation dates without penalty. The mark and comments that you assign to your peers will be used to guide my evaluation of their oral presentation; they may also be included in my emailed comments to the presenters.

In order to provide useful comments, simply showing up for the presentations is not enough. You have to take note of the material being presented, and reduce it down to a short "executive summary" in order to effectively criticize it. Each year a few students played games and/or talked during the presentations... this is very rude and will not be tolerated. Your participation mark will be reduced if this occurs.

Statement on academic dishonesty:

The full version of Lakehead University's policy on academic dishonesty is available here: <http://calendar.lakeheadu.ca/current/contents/regulations/univregslXacdishon.html>. This policy makes up part of the 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 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:

- 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.