

BIOL366 Mechanisms of Development

Course Outline

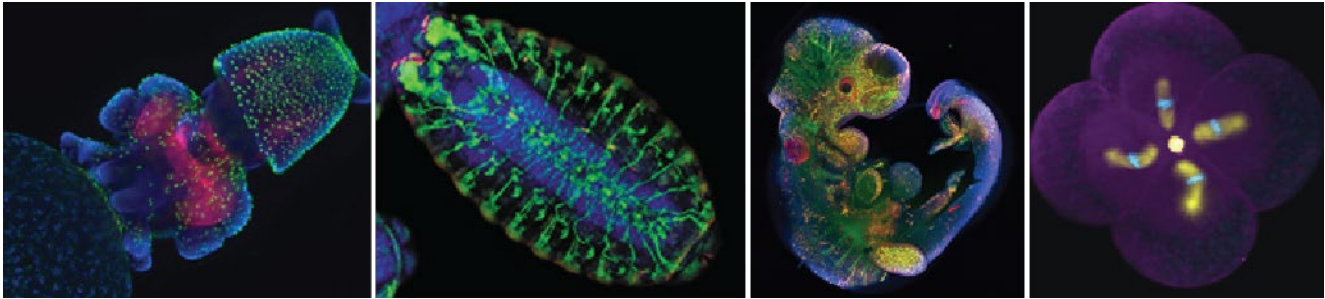


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Year/term: 2019/Winter

Credits: 3

Pre-requisites: Biol 261, Biol 266

Lectures: Monday and Wednesday, 1:15 to 2:30 p.m., HB-130 Loyola campus.

Tutorials: Tutorials will be offered to support student's learning. The TA will revise the materials from the lecture and organize learning activities to support student's learning. For a better personalized experience, students are encouraged to bring questions to the tutorials and to communicate with the TA about what type of activity would help them become more proficient with the material. Dates and times TBA. Attendance is voluntary, yet strongly recommended.

Instructor: Dr. Chiara Gamberi, Affiliate Assistant Professor, Department of Biology, Faculty of Arts and Science, Concordia University, Visiting Professor, Chemistry Department, Faculty of Arts and Science, Université de Montréal.

A molecular developmental biologist, Dr. Gamberi's research interest is to understand the molecular mechanisms regulating gene expression in space and time during development. Expression of genes in the appropriate spatial domains and time frame is fundamental to direct the formation of body features during embryogenesis and in the adult individual to maintain proper tissue polarization and connectivity, respond to changing conditions and remodel tissue. Failure in these processes cause developmental malformations and various pathologies such as infertility, polycystic kidney disease, and cancer. The Gamberi laboratory has established a model of polycystic kidney disease in the developmental model of the fruit fly *Drosophila melanogaster*. Using the fly for classical genetic and molecular developmental biology studies, the Gamberi research group has recently pioneered drug discovery and pharmacological screens in *Drosophila* for polycystic kidney disease and longevity-extending compounds. For more information on Dr. Gamberi's research, please consult the Gamberi Lab website (link to migrate to Concordia domain in January 2019 <https://sites.google.com/view/gamberi-lab/home>)

Contact information: Email: chiara.gamberi@concordia.ca

Office hours: Wednesday: 2.45-4.45 pm. SP. 375.35. **Please take an appointment.**

TA: **Kevin Laroque**

Contact information: Email: (see Moodle course page)

****Please use email for communication whenever possible.****

Course description:

Calendar description: This course examines the cellular interactions and genetic control mechanisms underpinning development and cell differentiation of various animal models; how cells move and recognize each other, how the genome is restricted during differentiation, the cytoplasmic signals influencing differentiation, how morphogenic gradients direct development, the genetic control of segmentation, and the developmental functions of oncogenes, growth factors and hormones. The role of genetic engineering and molecular biology as well as the power of comparative analyses of model organisms in the understanding of developmental processes will be discussed.

Expanded description: BIOL366 is a survey course dealing with the basic principles and molecular mechanisms of development. This course covers fertilization, cleavage, gastrulation, axis formation, morphogenesis, organogenesis, limb development, sex determination and gametogenesis with a strong emphasis on the experimental research and methodologies underlying our current knowledge in the field. This course will also present examples of medical applications of developmental biology principles. We will discuss how a single cell can originate multiple different cell types and tissues using the same genome and how different organisms develop. We will identify commonalities conserved during evolution and special peculiarities. We will compare different model systems used in developmental biology research with particular attention to their suitability as model organisms to address distinct biological questions. Throughout the course we will study both classic experiments and selected examples of modern strategies to understand the scientific rationale, we will discuss research methodologies (e.g., cell tracking and high-resolution microscopy methods) and learn how to design experiments to address specific developmental questions. This process will be supported by a collaborative group project consisting of researching the scientific literature to write a minireview on contemporary topics. At the end of the course, students will master principles of developmental biology, critical thinking, and scientific discourse. Students will also learn how to conduct efficient bibliographic searches, problem-solve, read primary scientific articles and practice scientific writing with possible contribution to a collaborative publication. Thus, the course is expected to provide students with principles of developmental biology that are foundational for advanced graduate and undergraduate biology courses and medical studies, and with the capacity to think critically, research information and communicate effectively, which are skills transferrable to all disciplines.

Course Objectives:

The course material builds progressively during the entire semester. Students will gain a broad knowledge of basic animal and model system development, descriptive embryology and core developmental mechanisms. Students will also learn how to interpret experimental data and design experiments to test various questions in development. This course will provide foundational knowledge for subsequent advanced courses in development and/or cell/molecular biology and medicine.

Course material:

Textbook: Developmental Biology, Scott F. Gilbert, 11th e edition

Class material is predominantly based on the textbook, but supplementary material from other sources will be included. Slides from the lectures will be available on Moodle after class.

Grading/evaluation:

Course evaluation will be based as per the table below. Mini-quizzes (15 minutes) allow students to practice their knowledge and monitor their progress and their ability to problem solve steadily and in a short format. Midterm exam tests facts knowledge and simple problem-solving abilities. Final exam tests knowledge and advanced problem-solving. Exams and quizzes will be based on the lecture material, any supplementary information given by the instructor during the lectures, the corresponding sections of the textbook and reading assignments. Students will also be tested on their ability to apply the information, and thus will be asked to interpret new data that is similar or related to what was covered in class, as well as design experiments, as discussed during lectures. While the emphasis of each test will be on the most recent material examined in class, the entire course material until that point is necessary for success. The final exam is cumulative.

Mini-quiz 1 (MC): 5 marks	Wednesday January 30, 2019
Midterm (MC, SA): 25 marks	Monday February 18, 2019
Mini-quiz 2 (MC or short problem): 5 marks	Monday March 11, 2019
Written assignment: 20 marks	Monday March 25, 2019
Mini-quiz 3 (MC or short problem): 5 marks	Wednesday April 3, 2019
Final exam (MC, SA, LA, problems): 40 marks	As scheduled by the Exams Office in April

Grade scale: A+: ≥ 90 ; A: 85-89; A-: 80-84; B+: 77-79; B: 74-76; B-: 70-73; C+: 67-69; C: 64-66; C-: 60-63; D+: 57-59; D: 54-56; D-: 50-53; F < 50

Should a student miss a midterm exam for medical or other reasons considered legitimate by the university (consult undergraduate calendar), YOU MUST PROVIDE FORMAL DOCUMENTATION IN PERSON TO THE INSTRUCTOR, NO MORE THAN 1 WEEK FOLLOWING THE MIDTERM, OR YOU WILL AUTOMATICALLY RECEIVE A GRADE OF "0". All documentation will be verified, and if approved, your course mark will be based on the remaining exam and the final grade will be based on the final exam alone. **Under no circumstances will there be any make-up exams for a midterm.** If you miss the FINAL examination, you must contact the Examination Office to apply for and schedule a deferred examination.

*******In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course may be subject to change.*******

Student's Resources:

- Concordia Counseling and Development (<http://cdev.concordia.ca>)
- Concordia Library Citation guide: <http://library.concordia.ca/help/howto/citations.html>)
- Advocacy and Support Services: <http://supportservices.concordia.ca>
- Student transition center: <http://stc.concordia.ca>
- New student program: <http://newstudent.concordia.ca>
- Access center for students with disabilities: <http://supportservices.concordia.ca/disabilities>
- Student success center: <http://studentsuccess.concordia.ca>
- The academic integrity website: <http://provost.concordia.ca/academicintegrity>
- Financial aid and awards: <http://web2.concordia.ca/finacialaid/>
- Health services: <http://www-health.concordia.ca/>