Developmental Biology Syllabus
Biology 4361
Summer 2009

Instructor: Patrick K. Schoff, PhD
offices: campus 253A Swenson Science Building
        726-8122
        NRRI 720-4368
        pschoff@nrri.umn.edu

Lecture: Swenson Science Building, room 115
         M, T, W, Th, 9:00 - 9:50 am

Lab: Swenson Science Building, room 103
     M, T, W, Th, 10:00 - 11:50 am

Office Hours: by appointment

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General Requirements. It is assumed that students enrolled in Biology 4361 have the basic
background and vocabulary provided by introductory courses in biology, chemistry,
mathematics, and physics. Prerequisite biology courses include Cell Biology and Genetics.

Goals and Objectives. This course will provide upper division undergraduate students with an
understanding of the fundamental concepts, principles, and mechanisms of animal development,
as well as a familiarity with basic experimental methods and laboratory models used in
developmental biology research.

Content. Developmental Biology consists of lecture and lab components that will introduce
students to fundamental principles of animal developmental from fertilization to birth, as well as
to basic observational and experimental methods used to study animal models. Lecture material
will cover principles of development, gametogenesis, fertilization, cleavage, gastrulation, cell
fate, differentiation, morphogenesis, and organ formation. Supplemental lecture material may
occasionally be presented during laboratory periods. Laboratory work includes studies and
experiments involving fertilization, mutagenesis, organogenesis, endocrinology, metamorphosis,
and regeneration.

Attendance. Students are expected to attend all scheduled lecture and lab sessions. Material
presented in class may or may not be found in the texts or in supplementary material. Some
material may be presented in the UMD Developmental Biology website, but there should be no
expectation or guarantee that material for which you are responsible will be available from sources other than lecture or lab notes.

**Lab.** Since many experiments in developmental biology involve growing and observing animals, the schedule that we establish at the beginning of the course may be modified later to accommodate timing of developmental events within a given species. The scheduled lab periods will be used to start all experiments, but you can expect to occasionally return to the lab to check on progress, record observations, or complete experiments during non-lab periods.

We use several types of animals as model species to study various aspects of development. The decision to use of animals for study is made only after careful consideration of the value of the scientific information gained, and all animals are cared for following the strictest standards established by the University of Minnesota. All animals will be treated with respect and afforded the dignity due to living organisms. Any breach of behavior in this regard could be considered grounds for dismissal from the class.

**Lab notebooks and reports.** Observation, quantification of experimental results, and accurate reporting are key elements in all fields of science. You will be required to keep a laboratory notebook to record your experimental methods, observations, and data, and that notebook will be turned in at the end of the course for grading. You will also be required to submit lab reports throughout the term for grading. Lab report format, content, and grading will be explained in further detail during the term.

**Exams and grading.** Exams will cover lectures, labs, assigned text readings, and any supplemental material presented during the course. Lab reports will be written in a scientific style documenting the background, methods, results, and interpretations of lab experiments (further explanation and guidance will be provided during the lab). Each student will be required to maintain a lab notebook, which will serve as the basis for written lab reports.

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<thead>
<tr>
<th>Graded Event</th>
<th>Points</th>
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<tbody>
<tr>
<td>Exams (3 @ 3 points each)</td>
<td>300</td>
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<tr>
<td>Quizzes (25 @ 4 points each)</td>
<td>100</td>
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<tr>
<td>Lab reports</td>
<td>170</td>
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<tr>
<td>Lab notebook</td>
<td>30</td>
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<td><strong>Total</strong></td>
<td><strong>600</strong></td>
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Final grades will be based on a percentage scale of total points.
Tentative grading scale: 100 - 93% = A; 92 - 80% = B; 79 - 70% = C; 69 - 60% = D; <60% = F
Plagiarism. Plagiarism is not allowed under any circumstance. Proper use and citation of existing source material (e.g. texts, reference books, or primary research literature), as well as work by colleagues or collaborators will be discussed in class. Any questions about proper referencing and citation should be referred to the instructor or GTA. Plagiarism is considered academic fraud and will be treated accordingly.

University Policies

Access For Student With Disabilities: Individuals with any disability, either temporary or permanent, which might affect their ability to perform in this class, are encouraged to inform the instructor at the start of the semester. Adaptation of methods, materials, and/or testing may be modified as required to provide for equitable participation.

Promotion Of Bias-Free Instruction: The University of Minnesota is committed to the practice that all of its students shall have equal educational opportunities. The University expressly forbids discrimination on the basis of race, color, gender, sexual orientation, disability, veteran’s status, ethnicity, religion, creed, national origin, or marital status. If you believe that your biology instructor has not followed this policy, you are invited to bring this to the attention of the Biology Department Head (207 Swenson Science Building, 726-7263) or to the Associate Dean of the College of Science and Engineering (140 Engineering, 726-7585). Your conference will be kept confidential.
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In the lab portion of Developmental Biology students will learn and practice various experimental approaches for investigating early embryonic development using different model organisms. The lab course will emphasize experimental design, methodology, and writing scientific reports. By the end of the term, Developmental Biology students will be able to plan and execute experiments with living organisms, gather and interpret the results, and present the outcome of these experiments in clear and concise scientific reports. Exercises conducted during Developmental Biology Lab will relate to material covered during lectures, so material presented in lab will be covered in lecture tests. Lab grades will be based on production of reports and the lab notebook (see below).

Student responsibilities. As an advanced undergraduate student, I expect you to exercise caution, good judgment and consideration for others while working in the lab. You are responsible for leaving your work area clean and for rinsing out your own glassware and dissecting equipment. You are responsible for maintaining and returning your microscopes and dissecting equipment in good working condition. Shared equipment (microscopes, dissecting kits) should always be left in perfect condition, so that the next person can use it without having to clean it or to fix it. If you have questions about how to use a piece of equipment, do not hesitate to ask the instructor. If you find problems with tools or equipment, or if supplies or equipment are damaged in the course of use, please report the problem to the instructor.

Absolutely no eating or drinking is allowed in the lab.

Since many experiments in Developmental Biology involve culturing and observing growing animals, the schedule that we establish at the beginning of the course may be modified later to accommodate timing of developmental events within a given species. The scheduled lab periods will be used to start all experiments, but you can expect to occasionally return to the lab to check on progress, record observations, or complete experiments during non-lab periods.

Working with living organisms. We use several types of animals as model species to study various aspects of development. The decision to use of animals for study is made only after careful consideration of the value of the scientific information gained, and all animals are cared for following the strictest standards established by the University of Minnesota. All animals will be treated with respect and afforded the dignity due to living organisms. Any breach of behavior in this regard could be considered grounds for dismissal from the class.
Developing organisms are far more sensitive to environmental factors than are adults. This sensitivity to temperature, humidity, light, and common materials may take you by surprise on occasion, and it should cause you to be continually vigilant and thoughtful as you perform your lab work. You should always work with the understanding that living material is sensitive to chemical contamination, temperature fluctuations, osmotic pressure changes, pH, and a variety of other environmental factors. Use ‘common sense’ and watch carefully for potential problems. Here are a few important rules:

1. Soap and other potentially toxic chemicals should be kept away from glassware used for study organisms. To eliminate contamination, rinse glassware very thoroughly with water; final rinses should always be made with deionized water.
2. Use appropriate water sources when dealing with living organisms. Tap water contains chlorine and a variable content of non-volatile chlorine byproducts. In some instances, aged tap water or filtered spring water is suitable. Appropriate water will always be available; it is your responsibility to use it.
3. All solutions should be made with deionized water.
4. Avoid temperature shock. Each organism has a temperature optimum and both cold and heat can have adverse effects, even if the temperature fluctuation is rather small. The lab manual and handouts will provide information about suitable conditions for your organisms. Microscope lamps can produce excessive heat that can damage your organisms; avoid extended exposure of organisms and use fiberoptic illuminators whenever possible.
5. Desiccation is always a concern; be vigilant to keep living specimens hydrated.
6. All experimental animals should be treated with respect. Plan experiments well and take care so that wasting animals is avoided.

Lab notebooks. Each Developmental Biology student is required to maintain a lab notebook. This notebook will be your working record of all activities in the lab, and will be kept according to sound scientific practices. The notebook is used to keep your notes and calculations as you prepare experiments, to record observations as the experiments are performed, and to note additional data and conclusions. You will use the information contained in your notebook to write formal lab reports, so the better and more complete it is, the easier your writing task will be.

Although there is no uniform method for keeping an effective lab notebook and it is not meant for publication, several general rules should be followed:

1. Every entry should be dated, with the time of day included.
2. The lab notebook should be well organized and all data, drawings, and graphics pertaining to a single experiment should be kept together. This means that empty pages should be left for drawings/conclusions when necessary.
3. Use pencil for all notes and drawings, as ink can be smudged with water or other common solvents. It is generally considered good policy not to erase entries for corrections, but to cross them out instead.
4. Lab notebooks should not be recopied.
5. Drawings should be made directly in the notebook; photos or other media can be taped into the notebook.
6. Labels are important! Remember: these notes will be used to inform your formal lab reports, so use proper scientific language, avoid abbreviations and don’t use jargon.
7. Take copious notes. Include details, such as time of day, start and finish times for experiments, ambient temperature, etc. You will seldom find yourself in a situation where you have too many details about a given experiment, but you will often wish you had more.

Microscopes equipped with digital cameras are available in the lab for taking pictures of specimens during experiments. It is your responsibility to choose when to record images to support your data collection; photos are often extremely valuable for reports, and can be used after the fact to gather more data (e.g. measurements of growth, development, etc.). Bring a flash drive to the lab so you can store pictures and use them for your lab reports or notebook documentation. Photos can also be emailed from the lab to your personal account.

Lab books will be turned in periodically during the semester for grading, which will be based on form and completeness. Since lab notebooks are meant to be working documents (i.e. they are always in draft form, never revised), and since it is essential that you bring your lab notebook along with you each time you have a class, **there will be no advance notice of notebook inspections.** Missing notebooks may receive zero credit.

**Lab reports.** Writing and revising lab reports will constitute a critical portion of the course. Reports will be prepared according to standard scientific style and format, with abstract, introduction, materials and methods, results, and conclusion/discussion sections. Writing exercises will include editing and revision of sections and complete reports. Details will be explained by the instructor during the course.

Written assignments must be submitted electronically and will be due according to a specified schedule. Late submissions will result in a reduction in points available for the assignment.

**Grading.**
Lab reports (and components) will be worth 170 points.
Lab notebook reviews will be worth 30 points total.