Bio 376 - Animal Development Lab Syllabus - Fall 2011

Wednesday, 2:30 - 6:30 PM, SCST 330 [except on dates indicated]

Required texts:
* Animal Development Laboratory Manual. C. Loer, 2011 (individual labs will be provided by email or on the course website).

Introduction - Because of the lab format, one 4 hour section per week, in order to perform experiments, you may need to return to lab outside of regularly scheduled hours to make observations, check embryos, or change a solution. Some of the labs (particulary prior to the first practical exam) are oriented somewhat toward traditional embryology, mainly of vertebrates. Thus, these labs will be somewhat independent of lecture material, although we will attempt wherever possible to link the two. Finally, because availability of living organisms, their gametes and embryos is not absolutely predictable, a scheduled lab may be postponed or changed, even at the last minute. Be sure to check your email regularly, especially the day before lab.

Labs - Lab periods may include any of the following: short lecture by instructor, pop quiz, demonstration by instructor, observation of and experimentation with living material, examination of prepared slides, or viewing videos. (Yes, I know you've heard this before, but...) It is essential that you review the next lab's procedures before coming to lab since time may be short in the lab period, and in the case of living material, a developing organism waits for no one. Be prepared and be on time. To provide additional motivation for reading lab material ahead of time, a short test ("pop quiz") will be given at the beginning of some lab periods.

Whenever possible, given available materials, equipment and organisms, you will be able to do each exercise on your own, rather than having to share with a partner. This should allow you to work at your own pace, your own depth of interest, and with independence. This is not to say that you should not feel free to help one another, discuss one's findings, and, especially, to share viewing of any particularly clear, extraordinary or spectacular sights that appear under your microscope. This is true not only of living organisms, but also of prepared slides in which a given structure is especially obvious. We suggest that whenever possible (time and materials allowing) you make observations more than once. More often than not, you will see things you didn't see the first time around because you are now more familiar with the subject.

Some of the lab experiments we will attempt take some manual dexterity, which most people can learn with instruction, care and some practice. Please don't become frustrated if you can't do something right away. For example, moving a living 1 mm worm from a plate to a slide without killing it takes a little practice. Having accomplished the feat in question, however, allows you to do make interesting observations and in some cases to perform fascinating experiments.

Attendance

Attendance at all lab sessions is required. If you have a legitimate conflict (e.g., college athletics, religious holiday) with a given lab session please let the instructor
know as soon as possible. If you miss a lab unexpectedly for a legitimate reason (e.g., sickness) you may have the opportunity to make it up later; however, if that lab session uses living material, this may be impractical or impossible. Some other form of makeup may be assigned. Missing any lab for an unexcused reason will result in complete loss of lab ‘citizenship’ points as well as any specific points for that lab.

Lab Citizenship: Safety and Courtesy
Strictly following all safety rules is basic to good lab technique.
☞ No eating, drinking, smoking or application of cosmetics in the laboratory. Please do not bring any food or drink containers into the lab.
☞ Close-toed shoes that fully cover the feet must be worn at all times (i.e., no sandals or flip-flops).
☞ Lab coats, protective eyewear (goggles) and/or gloves must be worn at all appropriate times (as instructed).
☞ Contact lenses must not be worn in lab.
☞ No pipetting by mouth.
☞ No unauthorized experiments are to be performed.
☞ No unauthorized use of equipment.
☞ Follow carefully instructions for disposal of glass, living tissue, etc.
☞ Wash hands during lab as necessary, and thoroughly following lab.

Deviation from safety policies will be taken seriously.

In addition, please note that we share the room with other biology laboratory sections. As a courtesy to others, we must diligently clean up after ourselves and put away our equipment at the end of the lab period. Put away your microscope, slides and other equipment, and clean up as necessary. Don't leave it to someone else. Take care of your own mess! Furthermore, please do not disturb ongoing experiments of your classmates or those of other sections that may be in the room. Be a good lab citizen.

When you come to the lab outside of regular lab times, ask permission of the instructor if there is another lab class in session. Try to avoid the first hour of lab classes when the instructor may be lecturing or demonstrating.

Lab Supplies
You are required to have for use in lab the following:
Sharpie extra fine permanent marker (a few different colors may be useful or fun), used for marking slides and plates (they can write on glass or plastic).
Colored pencils or pens (Drawings of embryos should use standard embryological code: red = mesoderm, blue = ectoderm, yellow = endoderm; green is sometimes used for neural crest).
Lab notebook ~8.5 x 11 in.; I prefer a flat notebook to loose-leaf. Example: Bienfang 8.5x11 “NoteSketch” book (R239102) - available for purchase at the first lab.
Lab coat (You should bring this to lab and wear it when so instructed.)
Flash drive for transferring and backing up computer projects or images taken with the microscope camera.

Lab Notebooks, Lab Reports
You are required to keep a lab notebook in which you will keep an accurate record of your observations and experiments. Keeping a good notebook will particularly helpful when it comes time to do a lab report. Your notebooks may be collected and evaluated
periodically. Thus, they should be interpretable to someone other than just yourself. We understand, however, that a lab notebook is a working document, so we don't expect them to perfectly neat, just legible. They will be evaluated for thoroughness of recorded observations and usefulness for write-ups. Much of what you will be doing during the "embryology" part of the course will be sketching what you observe through the microscope. If you desire, you may make sketches on loose, unruled sheets, but these must be taped securely into your lab notebook immediately upon completion. Otherwise, taking data on loose sheets is strongly discouraged.

For labs that require a report, you will be given specific instructions on the format. See below for general guidelines. Since the kinds of labs vary through the course, the formats may be somewhat different for each report. The section of the lab manual for labs requiring a report should direct you to collect all the information you need for your lab report. Feel free to ask the instructor and TAs about these issues if you're not sure. Reports must be typed and neat. Lab reports that have excessive typographical errors or are intelligible will be returned immediately for correction. Also, the quality of your writing is an important part of your grade in lab reports.

Each student must prepare a separate report, whether projects are individual, with a partner or a group. If you must use others’ data for your report, be sure to make this clear in your report. (See also Academic Integrity section below.)

Grading Summary

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<th>Practical/Exams: 35%</th>
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<tbody>
<tr>
<td>Quizzes/Notebook checks</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Lab Reports:</td>
<td>36%</td>
<td>Citizenship/Participation: 5%</td>
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Living Organisms

We will be examining and experimenting with some living, developing animals. Students should treat these creatures with appropriate respect. Procedures should be followed as described and no unauthorized experiments or procedures performed. No organisms are allowed to leave the laboratory and all will be humanely destroyed following their prescribed uses. (The South African clawed frog, *Xenopus*, for example, is not native to North America. Since its careless introduction to the wild, it has become a pest in some parts of the country, destroying native species.) Any deviation from these policies by students will be viewed with the utmost seriousness.

Slide Collections

During the semester, you will using microscope slides of prepared organisms and tissues. Although some of these slides may appear old, they are expensive to replace. You will be held fully responsible for any slides broken or lost. Specific slides will be available to you again at the beginning of any lab period when we will use them. Additional slides will be available during specific lab sessions; these are also to be returned to the same location you took them from at the end of lab periods.

Lab Equipment

The most expensive equipment you will use regularly in lab are the dissecting and compound microscopes. All lab equipment, and especially the microscopes, must be treated with appropriate care. The research grade compound scope at the back of the room is worth about $50,000, and many seemingly insignificant parts worth hundreds or
thousands of dollars. Reckless disregard for lab equipment could result in an expensive bill for you. We will discuss microscope use and care in the first lab session.

Some important notes on academic integrity and plagiarism in lab reports:

1. Although in some cases students may be using the same primary data to prepare reports, each student must write a separate report, and prepare separate figures, tables, graphs and data analysis. Students working together must not turn in identical figures, graphs or tables (except perhaps for some primary data), as this calls into question whether one of the students has done the work assigned. On a related note, it is inappropriate and unwise to provide a copy of your lab report, complete or in draft form, to another student — including a lab partner. If the student with whom you share your text copies a portion of your report, then you also will be implicated for having provided prohibited assistance with an assignment, and will also be sanctioned for having violated academic integrity. If you are using the same data, you may of course share copies of data — but (as noted above) each student must perform analyses, and prepare figures and tables separately.

2. It is not appropriate to use direct quotations from a source without placing the material in quotation marks and attributing the source, even if the source is cited. This is plagiarism -- representing to the reader that another's writing is your own. Furthermore, in the context of a lab report, quotations should be used sparingly or not at all, and should never be more than a phrase or sentence long. A paragraph-long quotation means that you are not writing. Paraphrasing can be a bit trickier -- a little harder to draw the line on what is plagiarism -- but if the sentence or sentences is almost identical to the source with a few changed words, or slightly rearranged, then that is likely to be plagiarism as well. A good way to avoid paraphrasing or unambiguous plagiarism from sources is to write without having the source(s) in front of you. This way the writing can only be in your own words, synthesized from your reading.

3. The text of all lab reports and papers may be required to be submitted electronically to Turnitin.com. When required, this should be completed by 5 PM of the day the assignment is due. (Submit a regular paper copy for grading purposes.) Copying of any material from former or students in this class is plagiarism and will not be tolerated. Do your own work and demand that others do theirs. Take similar care in your use of material from the lab manuals and the textbook. All portions of lab reports and papers are expected to reflect ONLY your own work and your own writing. When working in groups, each member of the group is expected to synthesize the information, analyze data and prepare an individual report. If you use literature in your report, cite it appropriately. [For example, copying sentences from the book, followed by a parenthetical citation (Weaver, 2002), is plagiarism.] Be sure you understand what constitutes plagiarism. If you have any questions about this, or any other item related to academic integrity, please ask. USD Academic Integrity policy will be strictly enforced.

The only dumb question is the one you need an answer to that you don't ask.

-- a Biology Professor
An example of plagiarism by paraphrasing

Each of the two paragraphs in the lab report below takes its organization and logical progression from one of four paragraphs in the two cited sources. Some of the individual phrases are not remarkable in themselves, and could theoretically have been independently coined. Note that the progression of ideas in each paragraph, however, exactly matches that in each of the paragraphs in the source. This makes it clear that these phrases are taken from the source, despite some rewording and re-ordering.

Simply citing the sources does not excuse the wholesale borrowing of ideas and phrases found there.

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From plagiarized lab report introduction:
RNA interference (RNAi) is a method that uses double stranded RNA (dsRNA) to inhibit a gene’s function. This is done in a sequence-dependent manner. Double stranded RNA is able to mimic the loss-of-function phenotypes of a particular gene when the dsRNA related to that particular gene is introduced to C. elegans. This dsRNA is referred to as dsRNA trigger. RNAi has been utilized to assess loss-of-function phenotypic data to construct a functional map of the C. elegans genome that is phenotype-based (Piano and Gunsalus, 2002).

RNA interference is used to regulate transcription, translation, as well as mRNA stability. The mechanism of RNAi is comprised of three steps. To begin, a dsRNA trigger is diced into small fragments in order to form short interfering dsRNAs (siRNAs). Then, these siRNAs are used to locate similar mRNAs and guide the cleavage of mRNA. This mRNA is then cleaved and degraded (Piano and Gunsalus, 2002).

From the Source (Piano & Gunsalus, 2002):
RNAi is a method that can specifically inhibit a gene’s function in a sequence dependent manner using double-stranded RNA (dsRNA). When dsRNA corresponding to a particular gene (referred to as the dsRNA trigger) is introduced in C. elegans, it can mimic loss-of-function phenotypes of that gene. RNAi has been applied as a “functional genomics” approach to obtain loss-of-function phenotypic data associated with about one third of the currently predicted genes (Fig. 1a), allowing an initial assessment of the prospects for using RNAi to build a phenotype-based functional map of the C. elegans genome.

Recent work has shown that RNAi is probably only one facet of several related and ancient phenomena that use small RNAs to regulate transcription, translation and mRNA stability (reviewed in [5, 13-15]; see also [16]). RNAi is thought to have evolved to protect cells from viruses and transposable elements. The RNAi pathway is comprised of at least three separable steps (Fig. 1b). In the first step a dsRNA trigger is cut into small 21-23 nucleotide (nt) fragments to form “short interfering” dsRNAs (siRNAs). In the second step the siRNAs are used to find cognate mRNAs and guide cleavage of the mRNA. Finally, the cleaved mRNA is degraded.
**Provisional Lab Schedule – Fall 2011 – Animal Development**

Preparation for lab always includes reading the appropriate sections of the class lab manual, reviewing the atlas, and (if indicated) viewing sections of *vade mecum* online (access code comes with the main text).

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tr>
<td>Sept. 7</td>
<td><em>C. elegans</em> developmental genetics and reporter gene fusions. Score mutant phenotypes. Discuss <em>C. elegans</em> research project, form research groups, begin literature work. <strong>Group target gene proposals due in lab Wed., Sept. 14</strong></td>
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<tr>
<td>Sept. 21</td>
<td>Frog Embryogenesis (prepared slides &amp; whole embryos). Review <em>vade mecum</em>, section on amphibian early development. (Can also begin chick embryo slides.)</td>
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<tr>
<td>Sept. 28 in ST429</td>
<td>Research project lab: Polymerase Chain Reaction (PCR) amplification of target developmental gene(s) by research group. <strong>Quiz on PCR at beginning of lab.</strong> Begin or continue chick embryo slides (ST330).</td>
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<tr>
<td>Oct. 12</td>
<td>Complete chick slide work, examine live chick embryos, Review <em>vade mecum</em>, section on histotechniques.</td>
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<td>Oct. 19</td>
<td><strong>LAB PRACTICAL/EXAM, turn in lab notebook and chick wholemount slide.</strong></td>
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<tr>
<td>Oct. 26</td>
<td>Begin Chick Teratogenesis experiments – Experimental design, using ANOVA; Inject embryos with teratogens. <strong>ANOVA practice report due Nov. 2 in lab</strong></td>
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<td>Nov. 2</td>
<td>Open eggs (Teratogenesis expt), begin evaluation and staining</td>
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<tr>
<td>Nov. 9</td>
<td>Complete chick embryo histology and evaluation. <strong>Lab report due in lab, Wed., Nov. 16. Discuss/begin <em>C. elegans</em> RNAi research project lab.</strong></td>
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<tr>
<td>Nov. 16</td>
<td><em>C. elegans</em> RNAi research project lab.</td>
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<td>Nov. 24</td>
<td><strong>THANKSGIVING HOLIDAY – NO LAB</strong></td>
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<tr>
<td>Nov. 30</td>
<td><em>C. elegans</em> RNAi research project lab.</td>
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<tr>
<td>Dec. 7</td>
<td><strong>Presentations</strong> on <em>C. elegans</em> RNAi research project lab results.</td>
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