CBIO 3410 - Laboratory in Cell and Developmental Biology
(Fall 2016)

CBIO 3410 is an intensive laboratory course, consisting of two 4.5-hour laboratories per week. The course consists of a number of laboratory modules that introduce the concepts and techniques of modern cell and developmental biology that are routinely used in research.

We require that students attend each lab except for medical or other emergencies that need to be documented. Every missed exercise will need to be made up at additional time outside of the scheduled lab periods. Lab handouts will be posted on ELC. You must read each handout before coming to lab and have a printed copy with you. The initial portion of each laboratory unit will be devoted to an orientation session, in which the biological question to be investigated and the research tools to be employed will be introduced. The remainder of the lab will be devoted to carrying out the experiments.

Depending on the module, you may work individually, or in groups of 3-5 students. Every student will be expected to maintain a detailed laboratory notebook. A paper notebook is essential to allow for efficient interactions with instructors. A preferred format is a 4x4 quad ruled carbonless notebook. In the notebook, you should record in detailed the experiment: key steps, calculations, observations, drawings, etc. - as you carry it out. In cases where you are working, each individual should keep his or her own set of primary observations. Certain lab modules may require one member of the group to carry out a brief step of procedures between the regular lab periods (this will usually take not more then 30 minutes of your extra time).

A report is due a week after the end of each experiment or module, as specified by the instructor. The report is composed of **1)** a copy of lab your authentic lab notes (do not rewrite your lab notes; rewriting could result in a lower grade) and **2)** a "Results and Discussion" section, in which you: **A)** Present the data or results, often in the form of images, graphs, tables with proper legends; **B)** Perform the analyses; and **C)** discuss the biological significance of your findings, as well as limitation of the experimental approaches, and potential sources of errors. If the handout contains specific instructions about the report (such as calculations, questions to be answered) you need to follow these instructions closely. You are encouraged to discuss experiments with your classmates; however, the calculations, descriptions, etc. in your laboratory notebook should be your own, not copied from your colleagues.

During the final portion of the course, **each group** will perform an independent research project of your own design to answer a scientific question using the cell/developmental biology concepts or tools learnt during this and other relevant classes. Group members should begin discussing about the biological questions and experimental design as early as possible. **On September 21st,** each team will present a preliminary plan for the independent project, which will be evaluated by the instructors and other teams. The team presentation (15 min) should include a brief introduction of the scientific question and description of the experimental design. Each team should also submit a list of materials and reagents that need to be ordered or prepared in advance (e.g. organisms, cells, enzymes and/or chemicals) and submit them to one of the instructors for approval. At the end of the instructor-led lab segments, there will be a total of 9 class periods for your independent research. However, successful projects often require more time and a flexible schedule. Each team will present their findings to all students during the time assigned for the final exam (see schedule below).

Grading on lab module, each worth maximally 30 points, will be based on your experiment results and your report and analysis. In addition, there will be a quiz, worth 20 points, at the end of each module. Finally, your independent project research and final presentation is worth maximally 50 points. This course is not necessarily graded on a curve. Therefore, if every student produced excellent results, every student could get an "A". The guaranteed score to achieve a grade will be as follows: 90% - A, 80-89% - B, 70-79% - C, 60-69% - D. The instructors reserve the right at the end of the course to lower the grade boundaries.

Faculty:

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Date	Exercise	Instructor
8-15	**Tissue-specific gene expression in Drosophila** Collection and fixation of Drosophila embryos	HC
8-17	Whole mount embryo in situ hybridization I	HC
8-22	Whole mount embryo in situ hybridization II	HC
8-24	Preparation and mounting of slides	HC
8-29	Microscopy **Quiz 1 (20 pts.). Lab reports due on 9-7.**	HC
8-31	**Germ line stem cells In Drosophila** Introduction, Ovary Dissection and Fixation	CS
9-5	Holiday, no class	
9-7	Imunohistochemistry-I **Cai Lab report due**	CS
9-12	Imunohistochemistry-II	CS
9-14	Microscopy	CS
9-19	Discussion of results ***Quiz 2 (20 pts.). Lab report due on 9-26.***	CS
9-21	**Independent research projects** **Presentation and peer evaluation of research designs.** **Submission of requests for materials.**	All
9-26	***Molecular Cloning and Gene Expression*** Gel electrophoresis of DNA	PS
9-28	Restriction enzyme digestion and gel electrophoresis, **Schulz lab report due**	PS
10-3	Polymerase chain reactions	PS
10-5	DNA ligation and transformation	PS
10-10	Preparation of plasmid DNA and Diagnostic analysis of plasmids using restriction enzymes ***Quiz 3 (20 pts.). Lab report due on 10-12.***	PS
10-12	**Bioinformatic DNA Sequence Analysis** M-13 phage titration	ETK
10-17	Isolation of single stranded DNA **Shen lab report due**	ETK
10-19	Run agarose gel on ssDNA	ETK
10-24	DNA sequencing	ETK
10-26	Sequence analysis I	ETK
10-31	Sequence analysis II ***Quiz 4 (20 pts.). Lab report due on 11-7.***	ETK
11-2	**Independent projects** Independent projects I	
11-7	Independent projects II **Kipreos lab report due**	
11-9	Independent projects III	
11-14	Independent projects IV	
11-16	Independent projects V	

11-28	Independent projects VI	
11-30	Independent projects VII	
12-5	Independent projects VIII	
TBA	**Final Presentation** (3.30-6.30 PM) 723 Biological Sciences Bldg *(30 pts)*	