

## Biology 380 – Eukaryotic Genetics Fall 2007 Lecture Schedule

**Lecture:** Friday, 2-3:40 PM - MR-622 (Come on time, lecture material missed will not be repeated)

**Instructor:** Professor Shubha Govind ([sgovind@ccny.cuny.edu](mailto:sgovind@ccny.cuny.edu)) 212-650-8476

Office hours: Friday, 1-2 PM (before class) or by appointment

**Pre-requisites:** Biology 22900 and 22800

**Class schedule:** 2 Lect., 4 Lab. Hr./wk; 4 credits

**Course Description:** Classical, molecular, and population genetics of humans and model eukaryotic organisms (corn, yeast, fruit flies, etc.). Recommended for all life science students, especially those with career goals in the health and/or legal professions.

### Course outcomes

Students will learn:

- (1) To rigorously apply genetic vocabulary and concepts in conversation in lab, lab presentations and their writing.
- (2) Concepts in genetics and developmental biology in the context of model organism research and their application to human disease.
- (3) Set up and score genetic crosses to follow chromosomes (with markers) through several generations. Apply these concepts in human pedigrees and disease.
- (4) Understand the genetic and molecular basis of disease such as cancer. Interpret molecular genetic data to individuals in a population.

**Text:** Genetics: From Genes to Genomes, Hartwell et al., 3<sup>rd</sup> Edition

### Required reading (before coming to class)

<b>Week 1</b>	<b>Aug 30</b>	<b>Chapters 2-4 (review of Bio 206) Problem-based</b>
<b>Week 2</b>	September 6	<b>Chapter 5 Linkage, recombination and mapping of genes</b>
	<b>September 13</b>	<b>No class (College open) Take advantage to master the basics of genetics</b>
Week 3	September 20	<b>Chapter 9, Deconstructing the genome: DNA at high resolution</b>
Week 4	September 27	<b>Chapter 9, Deconstructing the genome: DNA at high resolution</b>
<b>Week 5</b>	<b>October 4</b>	<b>Chapter 10, Reconstructing the genome through genetic and molecular analysis</b>
Week 6	October 11	<b>Chapter 11, Detection of genotypes, positional cloning</b>
<b>Week 7</b>	<b>October 18</b>	<b>Midterm (will cover concepts from lecture and lab)</b>
Week 8	<b>October 25</b>	<b>Chapter 12, The eukaryotic chromosome</b>
<b>Week 9</b>	<b>November 1</b>	<b>Chapter 13, Chromosomal rearrangements</b>
<b>Week 10</b>	<b>November 8</b>	<b>Chapter 17, Gene regulation in eukaryotes</b>
<b>Week 11</b>	<b>November 15</b>	<b>Chapter 18, Cell cycle regulation and genetics of cancer</b>
<b>Week 12</b>	<b>November 20 (Tues)</b>	<b>Chapter 19, Using genetics to study development</b>
November 23	No class THANKSGIVING	
<b>Week 13</b>	<b>December 4</b>	<b>Catch-up/Review</b>
<b>Week 14</b>	<b>December 11</b>	<b>Catch-up/Review</b>
<b>December 17</b>		
Finals week		

## Lab schedule for Biology 380, Fall 2007

Tuesdays MR-622 2:00-5:50 PM

For computer labs: MR-819.

Experiment 1: Dihybrid cross *Drosophila* (Lab report 1 = LR1)

Experiment 2: Mapping genes by recombination using *Drosophila* (LR1)

Experiment 3: Spatial and temporal regulation of gene expression *in vivo* (LR3).

Experiment 4: Transposition in *Drosophila* (LR2)

Experiment 5: Selective misexpression of protein in *Drosophila* (LR of labs 3 + 5 = LR3)

Experiment 6: *C. elegans* lab (LR4)

**Week 1**      **August 28** Overview of experiments. Movie on *Drosophila* development. Observe stocks, writing out genotypes, following dominant versus recessive markers.

Setting up a cross (collecting virgins).

Dominant versus recessive mutations, gain-of-function versus loss-of-function mutations, amorph, hypomorph, antimorph and neomorph. See text.

Set up **expt. 1 & 2** (if we are ready).

**Week 2**      **September 4** Introduction to FlyBase. Set **up expts 1 & 2**. HW assignment from FlyBase. Pick a gene for FlyBase research that you can use for over expression experiment using the UAS-GAL4 system (experiment 5).

**Week 3**      **September 11** Short student presentations from FlyBase (will be graded). Discussion on how to make constructs (molecular) and transgenic flies (microinjection). Move parents to new vials for **expts 1 & 2**.  
*September 18 Friday schedule (Self/test crosses—will be done for you).*

**Week 4**      **September 25** Expts. 1, 2, cross 2, transfer parents. Introduction to transgenic flies. Enhancer trap constructs versus reporter gene constructs. Studying gene expression *in vivo*. **Expt. 3.**

**Week 5**      **October 2** Score **expts 1, 2**. Finalize data. Web-based restriction mapping.

**Week 6**      **October 9** **LR1 due. Start expt. 4** Transposition Cross 1. Discussion on P elements and transposition.

**Week 7**      **October 16** Transfer parents. Review for midterm. Transposition cont'd.

**Week 8**      **October 23** **Expt. 4**, Analyze Results of Cross 1. **Set up cross 2.**

**Week 9**      **October 30** **Expt. 4**, Transfer parents, cross 2. Discussion on mosaic techniques to test gene function. Blair 2003 *Development* 130, 5065.

**Week 10**      **November 6** **Expt. 5**, Begin misexpression experiment. The UAS-GAL4 system. Brand and Perrimon, 1998. *Development* 118, 401.

**Week 11**      **November 13** **Expt. 4**, Score second cross, transposition experiment. Evaluate transposition frequency. Set up crosses for mapping the new insertion on the autosome.

**November 20** **Thursday schedule (lecture)** *Finish off transposition experiment.*

**Week 12**      **November 27** **Expt. 5**, Score misexpression experiment. **LR4 due.**

**Week 13**      **December 4** *C. elegans* lab. Introduction to the system (see movies  
<http://www.bio.unc.edu/faculty/goldstein/lab/movies.html>  
[http://130.15.90.245/c\\_elegans.html](http://130.15.90.245/c_elegans.html)

**Week 14**      **December 11** *C. elegans* lab cont'd. **LR3 due.**

**December 18** Finals week. **LR4 due** on the 18th.

See Reference sections at the end of the text book for details on *Drosophila* and *C. elegans* (C and D).  
Additional reading materials will be assigned or given out during the semester.

## Other issues

**Academic integrity:** The CCNY policy on academic integrity will be followed. Document is posted on Blackboard as well as the CCNY website (CUNY policy on academic integrity—link is at the bottom of the home page). Make sure you have read the details regarding plagiarism and cheating, in case you are not clear about the rules of the college. Cases where academic integrity is compromised will be prosecuted according to these rules.

**Lab notebook:** Work in the lab is to be entered into a spiral bound notebook that will be graded after the completion of each exercise. Your lab notebook should contain a record of ALL your work (and not someone else's work) performed during each laboratory session. It should contain your notes, conclusions, references, and calculations. The pages should be numbered at the beginning of the course. Make a TABLE OF CONTENTS (date, name of experiment, page number etc). Pages are not to be inserted or removed. Do not staple or paste together sheets.

Every time you do lab work, make an entry that includes: Date, name of experiment, purpose of lab work, methods, results, remarks. Before starting the experiment, you should be clear about the goals and design of the experiment (make a flowchart if this helps you). Do not include lecture notes in the lab notebook.

**Lab report format:** Your lab report should include purpose, introduction, brief method, results (important to organize them based on prediction), and discussion (if this was expected, chi square analysis to determine deviation from expectation), was it a well-designed experiment (how would you modify the experiment to improve it, if it was not well designed?), conclusions and references. References should be written out continuously (as in a traditional lab report). All other items should be before or during the lab. Typing of lab write-ups is not essential – however, it is important that I be able to read your handwriting. I will be looking through your notebooks frequently—so pay attention to my remarks and incorporate them.

**Attendance:** If you miss 3 or more lectures and labs, you will have missed a substantial portion of the course. If you anticipate personal problems that will affect your ability to complete an assignment on time, be present in a lab or an exam, let me know in advance. If you are absent on the exam without my permission, you will get a zero for the exam. Late lab reports will result in reduction of points. 50% reduction per day!

**Grading:** 2 exams (midterm + final; 100 points each), 4 lab reports (100 points each, due at the end of the lab period specified above). Quizzes and/or homework problems in the lab will be added for additional 100 points. You will be given a study guide every week to prepare for this, so you what terms and concepts are important and you have the time to read up on them before coming to lab. This will be in place of a lab exam. Final grade will be percentage of the grand total of 700 points. Each grade is independent of other grades.

**Grading criteria:** Organization, accuracy, depth of understanding, completeness, neatness and proper use of English. No material will be dropped to calculate final grade.

## **Restriction mapping on the web:**

Molecular tool kit <http://arbl.cvmbs.colostate.edu/molkit/index.html>

Computational Molecular Biology at NIH

<http://molbio.info.nih.gov/molbio/Analysis.html>

CMS Molecular Biology Resource (for both Protein analysis and Biochemistry and DNA analysis and molecular biology)

<http://restools.sdsc.edu/>

Toolbox at the EBI (bioinformatics tools from the European Bioinformatics Institute)

<http://www.ebi.ac.uk.Tool/>

Also Google for FlyBase, Interactive Fly and WormBase.