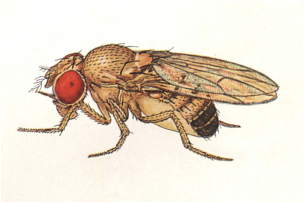
BIOSC 0351: GENETICS LABORATORY
COURSE INFORMATION- SPRING TERM 2022



GENERAL INFORMATION

Time: Mondays, 8:30am – 12:20pm
Location: Class Sessions 1 & 2 on Zoom

Lecture Portion 8:30 – 9:30: Langley A214
Lab Portion 9:30 – 12:20: Langley A148 & A146

INSTRUCTORS:

	Dr. Mark Rebeiz (he/they)	TA Sarah Petrosky (she/her)
Office Location:	Life Sciences Annex 203	Life Sciences Annex 203
Office hours:	By appointment	By appointment
Phone Numbers:	412-624-2261	412-624-2267
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PREREQUISITE
BioSci 0350 (Genetics Lecture) is **a co-requisite** for this course.

INTRODUCTION
Genetics is a broad field dedicated to the study of inheritance. Its scope ranges from the subtle heritable differences in appearance ("traits") between individuals to the molecular underpinnings of how the genome is copied, interpreted and leveraged to build an organism. At its core, genetics is the studied through the characterization of "genes", a concept that has had many meanings over its 150-year history. One of the most popular and powerful model systems in genetics research is the fruit fly, ***Drosophila melanogaster***. Flies are easy to culture, and can easily be mated in a controlled way. Furthermore, they are genetically pliable, and boast a variety of very useful tools for genetics research that reside at the forefront of this field. This course will provide a first-hand genetics research experience by inducing and characterizing targeted mutations in *Drosophila melanogaster* to study how particular *Drosophila* body parts are formed. Specifically, we will employ cutting edge methods of **CRISPR/Cas9 gene editing**. There is currently an explosion of research that uses CRISPR/Cas9 technology in a variety of fascinating ways, that will change the practice of genetics and force us to consider their ethical

implications. Hands on lab activities will be complemented by journal article discussions that will examine the history, and current practices in this exciting field. The lab will provide a first-hand perspective of Mendelian genetics, mutations, chromosomes, and DNA analysis using cutting edge technologies to solve a contemporary research problem.

ORGANIZATION

Pre- and Post- Lab reflections
A one paragraph lab notebook entry that is due before or after class, depending on the activities of the day. Days which include in-lab participation will have a pre-lab reflection. Days that consist of out of lab analysis/research/discussion will include a post-lab reflection.

Lectures
A short 40-50 minute lecture will precede each class. When in person, it will meet in Langley A214 at 8:30 AM (EST).

Experiments
The lab is unique in that your entire semester will focus on accomplishing a unique project. We will be working in small groups. Methods and supplementary information will be available on Canvas before the laboratory. It is your responsibility to read these handouts before class.

Cleanup
At the end of each in-lab session, it is your responsibility to clean up your station. Put away reagents (fly food, etc), organize your fly vials in their holding trays, and throw away trash. Return dissection tools and fly brushes to the front of class and return microscopes to their place in the closet. Wipe down your space and microscope with Ethanol. Your effort in leaving your station the way you found it will weigh on your lab performance grade.

Journal discussions
Throughout the semester, we will talk about several relevant research articles and reviews both in small groups and as a whole class. Your participation and contribution to group discussions will be assessed during these activities.

Poster components:
Over the course of the semester, you will be constructing the components of a poster to present your results to your colleagues in the class. Each component of the poster will be written by each student individually, and graded per individual. Feedback will come in the form of peer review from within your group.

Poster presentation:
The last day of class will be a virtual symposium. Your group will combine and agree upon the text and figures, based on your individual drafts of components written throughout the semester. Participation in the symposium will be graded – there will an

opportunity to read the posters before the symposium and submit questions about the posters.

GRADES

The total points possible in this class are distributed as follows:

Participation/project advancement	**40%**
Pre- and post-lab reflections in LabArchives	**15%**
Journal Discussion Participation	**10%**
Lab Notebook (Weekly Notebook Entries	**15%**
Final Lab Poster (components and final)	**20%**

ATTENDANCE

Attendance is mandatory for all lab and lecture sessions. Your grade for a day missed will be zero. All absences must be excused directly by the instructors prior to the class meeting. Email to Dr. Rebeiz (rebeiz@pitt.edu) is the best method. All absences must be justified, and we reserve the right to require documentation. When students are unable to attend, we will try to make the lab material and experiments available at alternative times, but this may not always be feasible.

WORKING IN GROUPS

Students in the lab will be working in groups. Each group will be working on a specific gene, performing experiments to manipulate this gene and measure effects on phenotypes. **All presentations, lab notebooks, and performance/attendance grades will be assessed separately**. *The final poster will be graded for the group as a whole.*

OFFICE HOURS

We will normally have time during class to deal with most of the issues that will come up. However, meetings can be scheduled at other times. Questions about anything can be e-mailed at any time to either Instructor or TA. We will respond to electronic correspondence during normal work hours (8AM – 5PM M-F).

RECOMMENDED TEXT

There is no textbook for the course. However, background material for our laboratory practices are well covered in the following:

R.J. Greenspan, Fly Pushing: The Theory and Practice of Drosophila Genetics. Cold Spring Harbor Laboratory Press; 2nd edition (July 1, 2004)

We will draw material for this course from primary research papers (peer reviewed, publications) and expect you to read them and draw relevant information from them. Such materials will be provided to you.

COMPUTER WORK

You will need to use computers during the course to look up web-based material to perform your lab work. You will also be expected to 1) examine DNA sequences, 2) use data management programs, such as Excel, to plot your data & results, & 3) use imaging programs to label digital images you will produce. Finally, your laboratory notebook will be curated through an online system that can be accessed by computer, tablet, or smartphone (see next section)

LABORATORY NOTEBOOK

We will be using electronic lab notebooks (LabArchives) for this course via Assignments in Canvas. If you do not have a laptop or tablet to use in class, please let me know, and we can arrange for an in class computer to be available. Students are welcome to print out protocols and take hand-written notes, but all methods, data, and analysis must be immediately entered into the electronic notebook during or immediately after class (if necessary, students can access computers in any of the Pitt computer labs).

Your laboratory notebook holds the record of everything you did in the lab. It must have as much of your primary data as you can gather during your experiment. Primary data includes the numbers on the spectrophotometer, the hand-written values (and the check marks beside the numbers) for the separate reagent volumes added to a reaction, or a photograph of your gel or from your microscope. Nothing is as valuable as your primary data. Keeping the primary data in your notebook allows later third-party validation of your calculations from the original data.

Weekly Notebook entries – Within LabArchives, there will be a page for every week in the lab (Under “Weekly Notebook Entries”), except for week 1. You should write an entry for each day of class. Each day’s entry should be broken into the following categories: **experimental goal**, **procedure**, **results**, and **conclusions**. Even if very little progress was made during the week, it is important to note what progress was made, and take notes. For example during week 2, we will look at the crosses set up on week 1. Perhaps the cross worked? Perhaps it didn’t. Taking those notes help build a picture for the reader of how each experiment proceeded! Your weekly entries will be graded twice during the semester: half way and at the end.

Follow this outline form of essential features of your lab notebook:

1. Make entries in real-time or within hours after completing your experiment, while your thoughts and memories remain clear.
2. Save as much primary data as possible. Print outs should be scanned and attached to your entries.
3. Notebooks should be conceptually or historically ordered.
4. Number your entries to keep the lab work in order.
5. Organize each experiment with the headings: a) Goal, b) Procedure, c) Results, and d) Conclusions (or some reasonable equivalent).
6. Label data appropriately. For gel photographs and spectrophotometer printouts, label them clearly and upload them in your notebook where they make sense.
7. Produce good quality gel and microscope photographs and other outputs.
8. Include your actions, your observations, your rationale, your thoughts, and your interpretations in the record. Outline the protocols that we gave you.

Reflections
To help capture your thoughts before in person lab activities and post-lab group discussions, you will be assigned to write pre-lab or post-lab reflections each week. These paragraphs should be clearly labeled in the "Weekly Notebook Entries", be 5-7 sentences in length, and have a clear topic sentence and conclusion sentence.

- On lab-work days, we will write a **pre-lab reflection paragraph** on what the goals of the day will be. Pre-lab reflections are due at 8:30am on the day of class.
- On completely virtual days, we will write a **post-lab reflection paragraph** to capture group work that was done, in-class discussion, and lecture material. Post-reflections are due at 11:59pm on the day of class.
- Reflections should be written **in addition** to the documentation of all experiments, methods, data and notes that should be entered into your lab notebook.

Academic Integrity:
Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the assignment will be imposed.

COVID-19 safety:
In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. While in class, at a minimum, this means you must wear a face; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most

up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

Disability Resources
If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890/412-624-3346 (Fax), as early as possible in the term. Disability Resources and Services will verify your disability and determine reasonable accommodations for this course. For more information, visit www.studentaffairs.pitt.edu/drsabout.

Email Communication
Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g. gmail). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to http://accounts.pitt.edu, log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished. (For the full E-mail Communication Policy, go to www.bc.pitt.edu/policies/policy/09/09-10-01.html.)

This is an Inclusive Classroom
We are committed to the creation and maintenance of an “inclusive learning” space in this course. The goal is for everyone involved to be treated with respect and dignity and where all individuals are provided equitable opportunities to participate, contribute, and succeed. In BIOSC 0351, all students are welcome regardless of race/ethnicity, gender identities, gender expressions, sexual orientation, socio-economic status, age, disabilities, religion, regional background, Veteran status, citizenship status, nationality and other diverse identities that we each bring to class.
Your success is enhanced by the innovation and creativity of thought that an inclusive classroom facilitates. The success of an inclusive classroom relies on the participation, support, and understanding of you and your peers. We encourage you to speak up and share your views, but also understand that you are doing so in a learning environment in which we all are expected to engage respectfully and with regard to the dignity of all others. Any student who has difficulty affording groceries or who lacks a safe and stable place to live and believes this may affect their performance in the course is urged to contact me or Pitt Student Affairs for support (http://www.studentaffairs.pitt.edu/).
Other resources you may find helpful:

Free food at the Pitt Pantry: www.studentaffairs.pitt.edu/pittserves/the-pitt-pantry/
Student Support Services: www.asundergrad.pitt.edu/academic-experience/student-support-services
Counseling Center: http://www.studentaffairs.pitt.edu/cc/resources/
Student Health Services: http://www.studentaffairs.pitt.edu/shs/

Section 1020

LAB	Date	In Person/ Virtual	Lecture topic	Lab activity (location)	Basic *Drosophila* husbandry	CRISPR CROSS experiment	Journal article presentations	Poster components due	Lab Notebook grading
1	1/10/22	Virtual	Introduction to the course, lab safety	(Zoom)	Set up our first cross (*yw* x wildtype)				
	1/17/22		NO CLASS - MLK						
2	1/24/22	Virtual	DNA Sequence analysis	Learning to use GenePalette (Zoom)	Check on *yw* cross;	Visualize CRISPR targets	CRISPR historical papers		post-reflection
3	1/31/22	In Person	Drosophila cross annotations, Designing CRISPR experiments	Introduction to fly work (Langley A148)	set up yw g2 cross				pre-reflection
4	2/7/22	In Person	Drosophila pigmentation system	researching your group's gene (Langley A146)	Check on *yw g2* cross;			Identify literature on selected gene	post-reflection
5	2/14/22	In Person	Evolutionary Developmental Biology (Evo-Devo)	(Langley A148)	Check on *yw g2* cross;		Drosophila CRISPR papers		post-reflection
6	2/21/22	In Person	The developental and genetic control of gene expression	Setting up CRISPR cross, anaylsis of y and w recombination rate (Langley A148)	analyzing recombination rate between y and w	Crossing Cas9 and sgRNA lines			pre-reflection
7	2/28/22	In Person	The evolution of morphology in *Drosophila*	(Langley A146)		check on CRISPR cross	Applying CRISPR methodology to non-model species	Introduction	post-reflection; Lab Notebook Check
	3/7/22		No Class - SPRING BREAK			check on CRISPR cross			
9	3/14/22	In Person	The evolution of adaptive pigmentation traits in *Drosophila* (Sarah)	Analysis of transgenic CRISPR progeny (Langley A148)		Score progeny			pre - reflection
10	3/21/22	In Person	Analyzing Image data	(Langley A146)			The Ethical considerations of gene editing	Methods	post - reflection
11	3/28/22	In Person	Constructing a poster	(Langley A148)		poster prep	Beyond edits: other applications of CRISPR technology	Results	post - reflection
12	4/4/22	In Person	How to give a scientific presentation	(Langley A148)				Conclusions	
13	4/11/22	In Person	Poster prep	Poster prep (Langley A148)		poster prep		Abstract	post - reflection
14	4/18/22	In Person	Poster Session	Poster Session (Langley A148)		classroom discussion and reflections our collective results			Final Lab Notebook Grading

* Schedule is subject to modification

SECTION 1030

LAB	Date	In Person/ Virtual	Lecture topic	Lab activity (location)	Basic *Drosophila* husbandry	CRISPR CROSS experiment	Journal article presentations	Poster components due	Lab Notebook grading
1	1/10/22	Virtual	Introduction to the course, lab safety	(Zoom)	Set up our first cross (*yw* x wildtype)				
	1/17/22		NO CLASS - MLK						
2	1/24/22	Virtual	DNA Sequence analysis	Learning to use GenePalette (Zoom)	Check on *yw* cross;	Visualize CRISPR targets	CRISPR historical papers		post-reflection
3	1/31/22	In Person	Drosophila cross annotations, Designing CRISPR experiments	researching your group's gene (Langley A146)	Check on *yw* cross;			Identify literature on selected gene	post-reflection
4	2/7/22	In Person	Drosophila pigmentation system	Introduction to fly work (Langley A148)	set up yw g2 cross				pre-reflection
5	2/14/22	In Person	Evolutionary Developmental Biology (Evo-Devo)	(Langley A146)	Check on *yw g2* cross;		Drosophila CRISPR papers		post-reflection
6	2/21/22	In Person	The developental and genetic control of gene expression	(Langley A146)	Check on *yw g2* cross;		Applying CRISPR methodology to non-model species	Introduction	post-reflection
7	2/28/22	In Person	The evolution of morphology in *Drosophila*	Setting up CRISPR cross, anaylsis of y and w recombination rate (Langley A148)	analyzing recombination rate between y and w	Crossing Cas9 and sgRNA lines			pre-reflection; Lab Notebook Check
	3/7/22		Spring Break No Class			check on CRISPR cross			
9	3/14/22	In Person	The evolution of adaptive pigmentation traits in *Drosophila* (Sarah)	(Langley A146)		check on CRISPR cross	The Ethical considerations of gene editing	Methods	post-reflection
10	3/21/22	In Person	Analyzing Image Dafta	Analysis of transgenic CRISPR progeny (Langley A148)		Score progeny			pre-reflection
11	3/28/22	In Person	Constructing a poster	(Langley A146)		poster prep	Beyond edits: other applications of CRISPR technology	Results	post-reflection
12	4/4/22	In Person	How to give a scientific presentation	(Langley A146)		poster prep		Conclusions	post-reflection
13	4/11/22	In Person	4/11/22	Poster prep (Langley A146)		poster prep		Abstract	post-reflection
14	4/18/22	In Person	4/18/22	Poster Session (Langley A146)		classroom discussion and reflections our collective results			Final Lab Notebook Grading

* Schedule is subject to modification