

Biology 13

Gene Expression and Inheritance

Professor

Prof. Tom Jack - LSC 331 - Office Hours: Mon. 1:45-3, Fri. 3:45-5:00.

Biology Teaching Fellow

Miranda Greig '19

Weekly problem sessions: Sunday and Thursday evenings – 7-8PM.

Graduate Teaching Assistants

Paul Hernandez, Amelia Kim, Somer Mater, Arianna Reuven, Paige Salerno, Amanda Ya

Laboratory Instructors

Amanda Socha (lab director) and Jessica Warren

Undergraduate Learning Fellows

Fatema Begum '22, Maddie Brown '22, June Dong '22, Sophia Koval '21, Dakota Ma '22, Tanner Riley '22

Prerequisites

There are no enforced prerequisites for Biology 13. However, Biology 11 or a strong prior preparation in biology is recommended. The details of Biology Department's recommendations for entry into Biology 13, for those that have not taken Biology 11, can be found at

<https://canvas.dartmouth.edu/courses/5105/pages/how-to-interpret-the-score-on-the-placement-slash-advisory-test>.

Textbook

Required: 1) *iGenetics, A Molecular Approach* by Peter Russell, Third Edition.
2) *iGenetics: Study Guide and Solutions Manual*. Third Edition.

Course Goals

At the end of the course, students will:

- understand the “central dogma” of molecular biology, i.e. the key gene products and molecular mechanisms responsible for the transfer of genetic information from DNA to RNA to protein and ultimately to the expression of a phenotype
- understand how genetic information is recombined and transmitted from one generation to the next
- understand the fundamental concepts that underlie the regulation of the expression of genetic information
- be familiar with specific foundational experiments and well-studied examples in molecular genetics
- be able to think critically and solve problems in genetics and molecular genetics
- be capable of analyzing different types of data (from genetic crosses or genomic analysis) to determine genetic linkage and to create a genetic map
- be able to investigate a current problem in genetics and effectively communicate key scientific information to scientifically literate peers
- be able to work effectively and constructively with peers on group problem solving

Office hours

I will be having several hours of office hours per week. I have tried to schedule office hours at different times of day and different days of the week to accommodate varying student schedules. I likely will add additional office hours during the weeks we have exams.

Special appointments

If you have particular concerns, difficulties or interests that you would like to discuss individually, email to set up an individual appointment.

Canvas

Course materials for Biology 13 will be available in Canvas. The syllabus, announcements, reading assignments, Powerpoint class presentations, pre-class screencasts, solutions to problem sets, in class problems, and exams, and information about the laboratory will be posted in Canvas.

We do enter exam and lab grades into the Canvas gradebook. Canvas automatically calculates an overall percentage score for the course, but keep in mind that this overall percentage does properly weight the scores so you should ignore the overall percentage score that Canvas calculates.

Class participation

Class participation counts for 5% of your overall grade. There are two components to class participation. First, prior to each class, you need to watch one or more short videos and answer several short questions about the video in Canvas. With these questions, the key is to participate; your grade is not dependent on answering questions correctly. To get full credit for pre-class participation, complete a minimum of 90% of the pre-class exercises (you can miss a maximum of three and it will not affect your grade). Second, you need to come to class and participate in the in-class exercises. To get full credit for in-class participation, you need to attend a minimum of 90% of classes (you can miss a maximum of three classes and it will not affect your grade). If you miss more than three classes, your grade will be slowly reduced from the 5%, but you would need to miss the majority of pre-class questions and/or the majority of classes for the participation grade to go to 0%.

Assessment of your academic performance

First Exam	10%
Second Exam	15%
Third Exam	20%
Final Exam	20%
Group Assignment	4%
Project/Presentation	4%
Participation (pre-class and in-class)	5%
Group participation/engagement	2%
Laboratory	20%

We will have three exams during the term and in total, these exams will count for 45% of your grade. The final exam will count for 20% of your final grade and will cover all topic areas (i.e. it is cumulative), but will focus more on material covered since exam #3. 4% of your grade will be based on a project that we will undertake in the last week of the course. This project will involve reading and presenting a paper from the primary literature. 4% of your grade will be based on a group assignment that happen during unit 3. 5% of your grade will be based on class participation, both for coming to class and completing the pre-class material. 2% of your grade will specifically address your participation/engagement in your group. The remaining 20% will be based on performance in the laboratory component of the course.

Historically, the median grade in Biology 13 has been a “B”. However, if you average 90% or above on the exams, you will automatically receive some form of an “A” grade, and exam scores between 80% and 90% will guarantee some form of a “B” grade.

Exam Requirements

For each of the Biology 13 exams, you will be allowed to bring to the exam a single 8.5" x 11" inch paper. On this single page you can hand-write whatever you want on both sides of this single sheet. The sheet must be handwritten - no typing and no miniaturizing of book or Powerpoint figures is allowed. The 8.5" x 11" sheet will be handed in with your exam.

Academic Honesty

Academic honesty is essential. The following is quoted directly from the Dartmouth College Student Handbook: "Students who submit work that is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth." The complete text of the Academic Honor Principle is available at: <https://students.dartmouth.edu/community-standards/policy/academic-honor-principle>. Please read it carefully; *you* are responsible for it. Please read it carefully; you are responsible for it. In Bio 13, where the majority of assessment is based on in-class exams and a final exam, the application of the Honor Principle is quite simple; all your lab and exam work must be 100% your own, and you may not use any unauthorized notes, textbook, electronic resources (smart phones, iPads, laptops, internet) or other resources during the exams. Accessing the course Canvas site during the exam is a violation of the Academic Honor Principle. Any violations of the Honor Principle within the context of Biology 13 will be referred to the Community Standards and Accountability Office and can result in a hearing before the Committee on Standards. Students found responsible for violating the honor principle can be suspended for multiple terms or, in the most extreme cases, separated from the College.

There are a number of situations in which a student in Biology 13 might find themselves in a situation where they have violated the Academic Honor Principle. These situations include (but are not limited to) the following:

- Examinations in Biology 13 will be administered through Canvas. Exams will be on either Tuesday or Thursday and you will have between 1.5 and 3.5 hours to complete each exam. Exams will be available for 30 hours (from 5PM Monday/Wednesday until 11PM Eastern time on Tuesday/Thursday). The exam must be uploaded to Gradescope/Canvas by 11PM. While you are taking the exam, you can have with you a single 8.5x11" sheet of paper, and on both sides of this sheet, you can handwrite whatever you want, but it must be handwritten. You will hand in a copy of this 8.5x11" sheet with your exam. You cannot consult any other materials during the exam including (not an exclusive list) the course Canvas site, the textbook, other notes, and resources on the internet. Keep in mind that we have a record of the time when you take the exam, as well as all of the times you access the Canvas site. Importantly, you also cannot consult with anyone, including your classmates, by email, text, Zoom, Slack or other forms of communication. The answers that you provide on the exam must be entirely your own work.
- We allow re-submission of exams for potential re-grading by the professor. Any alteration of the answers between the time when the graded papers were returned to the student and the time when the paper was submitted for re-grading constitutes a breach of the Academic Honor Principle.
- Some laboratory exercises are performed in small groups, and we encourage collaborative analysis of the data. However, any work submitted for grading must represent the original words of the student submitting that report. Do not share computer files of work (including text, graphs, tables, etc.) to be submitted for grading! The student misrepresenting the work of another as his or her own is in violation of the Academic Honor Principle and it is quite possible that the Committee on Standards might find the student providing the original file also to be in violation.
- The lab summary assignments are similar from offering to offering. You may not utilize graded lab summary assignments or keys from previous terms. Keep in mind that we have photocopies of previous terms' assignments.
- There is a group assignment in this course. All group members are expected to meet and work together on the group assignment, and indicate their participation by placing their names on the cover page. If a student puts their name on group work that they did not contribute to, the student is considered to have misrepresented the work of another as his or her own and is in violation of the Academic Honor Principle. It is also considered a violation of the Honor Principle for the group exam to consult with students outside of their group or with the Teaching Science Fellow, the Learning Fellows or the Graduate TAs.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the faculty of Biology 13 will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that College Faculty members are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards. Should the Committee on Standards find the student to be in violation of the Academic Honor Principle, punishments often involve suspension for multiple terms and in some cases can lead to separation from the College.

Student Accessibility

Students requesting disability-related accommodations and services for this course are encouraged to schedule a Zoom meeting with me as early in the term as possible. This conversation will help to establish how I can best support student needs. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; [Getting Started with SAS webpage: student.accessibility.services@dartmouth.edu](http://www.dartmouth.edu/~sas); 603-646-9900) and to request an accommodation email be sent to me. We will then work together with SAS if accommodations need to be modified based on the learning environment. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

Religious observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

Mental Health

The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. And then there is the pandemic. There are a number of resources available to you on campus to support your wellness, including your undergraduate dean (<http://www.dartmouth.edu/~upperde/>), Counseling and Human Development (<http://www.dartmouth.edu/~chd/>), and the Student Wellness Center (<http://www.dartmouth.edu/~healthed/>).

Sexual Misconduct and Title IX

At Dartmouth, we value integrity, responsibility, and respect for the rights and interests of others, all central to our Principles of Community. We are dedicated to establishing and maintaining a safe and inclusive campus where all have equal access to the educational and employment opportunities Dartmouth offers. We strive to promote an environment of sexual respect, safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community.

The Sexual Respect Website (<https://sexual-respect.dartmouth.edu>) at Dartmouth provides a wealth of information on your rights with regard to sexual respect and resources that are available to all in our community.

Please note that, as a faculty member, I am obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator. Confidential resources are also available, and include licensed medical or counseling professionals (e.g., a licensed psychologist), staff members of organizations recognized as rape crisis centers under state law (such as WISE), and ordained clergy (see <https://sexual-respect.dartmouth.edu/reporting-support/all-resources/confidential-resources>).

Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator (Kristi.Clemens@Dartmouth.edu) or Title IX Office (TitleIX@Dartmouth.edu).

Zoom Consent to Record Class Sessions

NOTIFICATION TO STUDENTS

(1) Consent to recording of course and group office hours

By enrolling in this course,

- a) I affirm my understanding that the instructor may record this course and any associated group meetings involving students and the instructor, including but not limited to scheduled and ad hoc office hours and other consultations, within any digital platform used to offer remote instruction for this course;
- b) I further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and my distribution of any of these recordings in whole or in part without prior written consent of the instructor may be subject to discipline by Dartmouth up to and including expulsion;

(2) Requirement of consent to one-on-one recordings

By enrolling in this course, I hereby affirm that I will not under any circumstance make a recording in any medium of any one-on-one meeting with the instructor without obtaining the prior written consent of all those participating, and I understand that if I violate this prohibition, I will be subject to discipline by Dartmouth up to and including expulsion, as well as any other civil or criminal penalties under applicable law.

NOTIFICATION TO FACULTY

Please be aware that any recording you make within any digital platform used to offer remote course instruction may be regarded as an education record within the meaning of the Family Educational Rights and Privacy Act, which prohibits the disclosure to a third party of any student's personally identifiable information from such records, in the absence of that student's prior written consent, unless a specified exception to prior written consent applies. (For these purposes, third parties are actors beyond the instructor(s) and students participating in the course or other Dartmouth personnel with legitimate educational interest.)

With this in mind, if you are considering recording course sessions with the intent to potentially share them more broadly, you are encouraged to avoid recording anything that might identify a student enrolled in the course. For example, you may record the lecture separately, then host a Zoom (not recorded) with students for a question-and-answer session.

Please also be aware that you are prohibited from making a recording in any medium of any one-on-one meeting with a student without obtaining that student's prior written consent. If you violate that prohibition, please understand that you will be subject to discipline by Dartmouth up to and including dismissal, as well as any other civil or criminal penalties under applicable law. **This prohibition does not apply to recordings of the course and any associated group meetings, to which students are being asked to consent via their enrollment in this course, but which may be subject to the requirements of FERPA for disclosure to third parties, as noted above.**

Finally, please be reminded that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part. Distribution of another instructor's recordings in whole or in part without prior written consent of that instructor may be subject to discipline by Dartmouth up to and including dismissal.

If you have any questions about any of these prohibitions or instructions, please consult your Dean's Office.

Note on how to succeed in Biology 13

The key to success in Biology 13 is practice, practice, practice, and practice some more! You would not expect to be able to score a touchdown or play the violin just by watching someone else do it. Similarly, you can't expect to be able to solve problems in genetics in a timely fashion just from listening and watching. You have to do it yourself and practice! Students fail to focus on solving the problems generally perform poorly in this class.

Everybody is short on time, so don't waste valuable study time on useless activities. Reading and re-reading slides and study guides over and over again until you have them memorized will likely not help you solve the genetics problems that you will encounter on the exams. Students who succeed at a high level in this course use quizzes, exams, and self-assessment to find out their weaknesses and focus their study time on improving those instead of re-reviewing what they already know. This promises the best chances to improve your final grade.

Class Schedule

(check Canvas for revisions during the term)

Jan 7	Th	Course overview
8	F	DNA as Genetic Material
11	M	DNA Structure
13	W	Genomes/Chromosomes/Chromatin
14	Th	DNA Replication
15	F	Transcription I
18	M	No class - MLK holiday
20	W	Transcription II Exam #1 – 2 hours – available 5PM Wed. – due 11PM Thurs.
21	Th	No class due to exam Completed exam #1 must be uploaded by 11PM Eastern.
22	F	Transcription III
25	M	Genetic Code
27	W	Protein Synthesis - Translation
28	Th	Mutation, Effects of Mutation
29	F	Genes and Gene Products
Feb 1	M	DNA Repair Exam #2 – 2 hours – available 5PM Monday – due 11PM Tuesday.
2	Tu	Completed exam #2 must be uploaded by 11PM Eastern.
3	W	Meiosis
4	Th	Patterns of Inheritance I – Dihybrid Cross
5	F	Patterns of Inheritance II – Deviations
8	M	Patterns of Inheritance III – Sex Linkage
10	W	Sex Determination, Maternal Effect Inheritance
11	Th	Linkage and Mapping I
12	F	Linkage and Mapping II
15	M	Human Genetics I - Mapping with Molecular Markers
16	Tu	Group Assignment due 11 PM Eastern
17	W	Human Genetics II – BRCA1
18	Th	Crispr/Cas9 Genome Editing I
19	F	Crispr/Cas9 Genome Editing II
22	M	In Class Review. Exam #3 – 3 hours - available 5PM Monday – 11PM Tuesday.
23	Tu	Completed exam #3 must be uploaded by 11PM Eastern.
24	W	Gene Regulation I
25	Th	Gene Regulation II –Lac Operon
26	F	Gene Regulation III– Trp Operon
March 1	M	Gene Regulation IV – Gal4/Gal80
3	W	Epigenetics and Imprinting
4	Th	Introduction to Primary Literature Project
5	F	Project – Group Discussions
8	M	Project – Group Discussions
10	W	Project –Individual Presentations
15	M	Final Exam – 3 hours