

Biology 13

Gene Expression and Inheritance

Professor

Prof. Tom Jack - LSC 331

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, on different days of the week and via different formats (in person and Zoom) to accommodate varying student schedules and preferences. I likely will add additional office hours during the weeks we have exams.

Office Hours: Mon. 2-3, Fri. 10:15-11:45. Some office hours will be in person and some will be via Zoom. I will announce how they will be held at the beginning of each week.

Biology Teaching Fellow

Miranda Greig '19

Weekly problem sessions: Sunday and Thursday evenings. Time and location TBA.

Graduate Teaching Assistants

Hanna Degefu, Jacob Holt, Hanxu Lu, Ghalia Saad Siddiqui, Evan Winter, Kai Yuan

Laboratory Instructors

Jessica Warren (lab director) and Nick Sylvain

Undergraduate Learning Fellows

Avery Borgmann '24

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

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, class recordings, solutions to problem sets, in class problems, and exams, and information about the laboratory will be posted in Canvas.

We will release 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, you need to 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	25%
Final Exam	25%
Group Assignment	4%
Project/Presentation	4%
Participation (pre-class and in-class)	5%
Group participation/engagement	2%
Laboratory	10%

We will have three exams during the term and in total, these exams will count for 50% of your grade. The final exam will count for 25% 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, based 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 10% 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 average exam scores between 80% and 90% will guarantee some form of a “B” grade.

Exam Format

The exams in Biology 13 are layered exams, meaning that they have more than one component. These components include:

- Individual exam (each individual submits a single exam paper)
- The option to redo exam questions that you may have answered incorrectly.

Exams 1, 2, and 3 (the three midterms): An individual exam with a retake option. Revised answers will be handed in two days after the original exam.

Final exam: A 100% individual exam. No retake option.

Retake option

When students hand in their exam, they will have the option to retake some questions. Students must indicate on the exam they are handing in the questions they would like to retake with a brief explanation. The retake exam is due two days after the initial exam at the beginning of class (i.e. on Wednesday after a Monday exam). Both the original answer and the revised answer will be graded. In most cases, the revised answer will get a higher score than the original answer, but in rare cases the revised answer may receive fewer points. Your score will be adjusted up/down by 25% of the points gained/lost. For example, if your initial score on a 10 point question was 6 points and your retake score was 10 points, then you will get 1 additional point (25% of the 4 additional points earned). You cannot gain/lose more than 5% of the exam total on a retake. For the retakes, you can consult with any of the course materials or with other students, but not with Teaching Assistants, Learning Fellows, or the Teaching Science Fellow.

Group Assignment

There will be a group assignment due between exams 2 and 3. Each group will hand in a single answer and all group members will receive the same grade. All group members are expected to meet and work together on the group exam; if your name is on the answer, you are indicating that you participated in a substantive way to the assignment. It will be considered a violation of the Honor Principle if you put your name on a group exam without having participated in the assignment. On the group assignment, students are not allowed to consult with students outside of their group or with the Teaching Science Fellow, the Learning Fellows or the Graduate TAs. There is no retake option for the group assignment.

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 must be completed without reference to unauthorized written materials or electronically accessed materials other than those provided with the exam paper and must be completed without communication with anyone else (the only permissible exception is that students may request clarification of any exam question from the course faculty and staff who are present expressly for that purpose). The answers that you provide 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 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.

Student Accessibility

Students requesting disability-related accommodations and services for this course are required to register with Student Accessibility Services (SAS; [Getting Started with SAS webpage; student.accessibility.services@dartmouth.edu; 1-603-646-9900](#)) and to request that an accommodation email be sent to me in advance of the need for an accommodation. Then, students should schedule a follow-up meeting with me to determine relevant details such as what role SAS or its [Testing Center](#) may play in accommodation implementation. This process works best for everyone when completed as early in the quarter as possible. If students have questions about whether they are eligible for accommodations or have concerns about the implementation of their 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 as soon as possible, or before the end of the second week of the term—at the latest, to discuss appropriate adjustments. Dartmouth has a deep commitment to support students' religious observances and diverse faith practices.

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).

Note on how to succeed in Bio 13

Having taught Bio 13 many times, I know that everyone in the class has what it takes to be successful in the course. Please know that we (both me and the course staff) are here to help you be successful – and your classmates can help with your success, as well. Reach out anytime you need support.

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 who fail to focus on solving the problems generally are not as successful as they would like.

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 5	W	Course overview
6	Th	DNA as Genetic Material
7	F	DNA Structure
10	M	Genomes/Chromosomes/Chromatin
12	W	DNA Replication
13	Th	Transcription I
14	F	Transcription II
17	M	No class - MLK holiday
19	W	In Class Exam #1 – 1.5 hours –8:30AM-10AM
20	Th	Transcription III
21	F	Genetic Code
24	M	Protein Synthesis - Translation
26	W	Mutation, Effects of Mutation
27	Th	Genes and Gene Products
28	F	DNA Repair
31	M	In class review Exam #2 – 2 hours – 7-9 PM
Feb 2	W	Meiosis
3	Th	Patterns of Inheritance I – Dihybrid Cross
4	F	Patterns of Inheritance II – Deviations
7	M	Patterns of Inheritance III – Sex Linkage
9	W	Sex Determination, Maternal Effect Inheritance
10	Th	Linkage and Mapping I
11	F	Linkage and Mapping II
14	M	Human Genetics I - Mapping with Molecular Markers
15	Tu	Group Assignment due 11 PM Eastern
16	W	Human Genetics II – BRCA1
17	Th	Crispr/Cas9 Genome Editing I
18	F	Crispr/Cas9 Genome Editing II
21	M	In Class Review Exam #3 – 3 hours - 7-10PM
23	W	Gene Regulation I
24	Th	Gene Regulation II –Lac Operon
25	F	Gene Regulation III– Trp Operon
28	M	Gene Regulation IV – Gal4/Gal80
March 2	W	Epigenetics and Imprinting
3	Th	Introduction to Primary Literature Project
4	F	Project – Group Discussions
7	M	Project –Individual Presentations
13	Sunday	Final Exam – 3 hours - 11:30 AM