Biology 13
Gene Expression and Inheritance

Professor
Prof. Tom Jack - LSC 331

Office hours
Office Hours: Mon. 2-3:15 (except Jan. 15 - 3:30-5), Tues. 3-4, Fri. 3:30-5 or by appointment. I likely will add additional office hours during the weeks of exams.

Biology Teaching Fellow
Jiaming Ma '22
Weekly problem sessions: Time and location TBA.

Graduate Teaching Assistants
Kate Carango, Barbara Karakyriakou Andrew McCray, Neeti Mittal, Irma Vlasac, Kelly Wan

Laboratory Instructors
Nick Sylvain (lab director)

Undergraduate Learning Fellows
Bryan Akin '26, Julia Picker '24, Liesbeth Verheijen '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 in Gradescope but exam grades will not appear in 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 and does not include exam 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 fall all the way 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 happens during unit 3. 5% of your grade will be based on class participation, based both for coming to class and completing the pre-class assignments. 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.

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.

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 assignment; if you add your name to the submitted group assignment, you are indicating that you participated in in a substantive way to the assignment. It will be a considered a violation of the Honor Principle to put your name on a group assignment 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.

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://policies.dartmouth.edu/policy/academic-honor-principle-1. 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 of your exam work must be 100% your own, and you may not use any unauthorized notes, textbook, electronic resources (smart phones, iPads, laptops, internet, ChatGPT) 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 where a student in Biology 13 might find themselves in a violation of 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.
- 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 signing 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 assignment 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 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's Community Standards and Accountability Office.

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
Dartmouth has a deep commitment to support students' religious observances and diverse faith practices. 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—before the end of the second week of the term at the latest—to discuss appropriate course adjustments.

Mental Health
The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. 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 (https://students.dartmouth.edu/wellness-center/).

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 community members have equal access to Dartmouth's educational and employment opportunities. We strive to promote an environment of sexual respect, safety, and well-being. Through the Sexual and Gender-Based Misconduct Policy (SMP), Dartmouth demonstrates that sex and gender-based discrimination, sex and gender-based harassment, sexual assault, dating violence, domestic violence, stalking, etc., are not tolerated in our community.

For more information regarding Title IX and to access helpful resources, visit Title IX's website (sexual-respect.dartmouth.edu). As a faculty member, I am required to share disclosures of sexual or gender-based misconduct with the Title IX office.

If you have any questions or want to explore support and assistance, please contact the Title IX office at 603-646-0922 or TitleIX@dartmouth.edu. Speaking to Title IX does not automatically initiate a college resolution. Instead, much of their work is around providing supportive measures to ensure you can continue to engage in Dartmouth's programs and activities.

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 (prof, TSF, LFs, TAs) 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 practice problems generally are not as successful as they would like.

Everybody is short on time, so don't waste valuable study time on study strategies that are ineffective for learning. Reading and re-reading slides and study guides over and over again until you have them memorized will be of limited value when it comes to solving the 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 identify their weaknesses and focus their study time on improving those skills instead of re-reviewing what they already know. In our experience, this promises the best chance to maximize your learning.

Class Schedule

(check Canvas for revisions during the term)

Jan 3	W	Course overview
Jan 4	Th	DNA as Genetic Material
Jan 5	F	DNA Structure
Jan 8	M	Genomes/Chromosomes/Chromatin
Jan 10	W	DNA Replication
Jan 11	Th	Transcription I
Jan 12	F	Transcription II
Jan 15	M	no class MLK day
Jan 16	Tu	**Exam #1 – 1.5 hours –7-8:30PM**
Jan 17	W	Transcription III
Jan 18	Th	Genetic Code
Jan 19	F	Protein Synthesis - Translation
Jan 22	M	Mutation, Effects of Mutation
Jan 24	W	Genes and Gene Products
Jan 25	Th	DNA Damage and DNA Repair
Jan 26	F	DNA Repair II
Jan 29	M	In class review **Exam #2 – 2 hours – 7-9 PM**
Jan 31	W	Meiosis
Feb 1	Th	Patterns of Inheritance I – Dihybrid Cross
Feb 2	F	Patterns of Inheritance II – Deviations
Feb 5	M	Patterns of Inheritance III – Sex Linkage
Feb 7	W	Sex Determination, Maternal Effect Inheritance
Feb 8	Th	Linkage and Mapping I
Feb 9	F	Linkage and Mapping II
Feb 12	M	Human Genetics I - Mapping with Molecular Markers
Feb 13	Tu	**Group Assignment due 11 PM Eastern**
Feb 14	W	Human Genetics II – BRCA1
Feb 15	Th	Crispr/Cas9 Genome Editing I
Feb 16	F	Crispr/Cas9 Genome Editing II
Feb 19	M	In Class Review **Exam #3 – 3 hours - 7-10 PM**
Feb 21	W	Gene Regulation I
Feb 22	Th	Gene Regulation II –Lac Operon
Feb 23	F	Gene Regulation III– Trp Operon
Feb 26	M	Gene Regulation IV – Gal4/Gal80
Feb 28	W	Epigenetics and Imprinting
Feb 29	Th	Introduction to Primary Literature Project
March 1	F	Project – Group Discussions
March 4	M	Project –Individual Presentations
March 9	Sat	**Final Exam – 3 hours -11:30 AM - 2:30 PM**