Biology 13
Gene Expression and Inheritance

Professor
Prof. Tom Jack - LSC 331 - Office Hours: Mon. 2-3:30, Thurs. 7-8:30 PM (with Miranda), Fri. 3-4:30.

Biology Teaching Fellow
Miranda Greig '19
Weekly sessions: Sunday and Thursday 7-8:30 in Carson 61.

Graduate Teaching Assistants
Vibhuti Rana, Aparna Ravi, Alex Pastora, Rebecca Valls

Laboratory Instructors
Nick Sylvain (lab director) and Amanda Socha

Undergraduate Learning Fellows
Jenny Chen '21, Brittany Cleary '21, Ethan Ruh '20, Anamika Shah '21

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 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.

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 participation 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).

In class, we will occasionally use an interactive technology that will allow you to respond to a variety of different types of questions posed in class. This interactive technology is embedded into Echo360. In general, to take best advantage of this interactive technology, you should bring your computer to class. Some of the questions are answered individually, some as a group.

Assessment of your academic performance

First Exam	10%
Second Exam	15%
Third Exam	20%
Final Exam	23%
Project/Presentation	5%
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 23% 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. 5% 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. 5% of your grade will be based on class participation, both for or 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 Format

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

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

Exam 1: An individual exam with a retake option. Revised answers will be handed in two days after the original exam.
Exam 2: A take-home group exam worth 10% of the exam 2 total. The remaining 90% is an individual exam with a retake option.
Exam 3: A take-home group exam worth 15% of the exam 3 total. The remaining 85% is an individual exam with a retake option.
Final exam: A 100% individual exam. No retake option.

All individual exams in the course will be open note in that students are allowed to bring into the exam room a single 8.5" x 11" inch paper. You can write on both sides of this handwritten sheet (no typing, no miniaturizing of book or Powerpoint figures). The exams will largely focus on the broad concepts and the application of material. All three exams will be in the evening to allow time to work on more complex genetic problems.

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). 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 component: There will be a group component to exams 2 and 3. The group component of the exam will be handed out on Thursday (at the latest) before a Monday exam and will be turned in at the beginning of the exam on Monday. 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 answering the questions. It will be a considered a violation of the Honor Principle if you put your name on a group exam without having participated in answering the questions. 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 component.

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 http://www.dartmouth.edu/judicialaffairs/honor/index.html. 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 quiz 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 Undergraduate Judicial Affairs Office and can result in a hearing before the Committee on Standards and can result in your suspension for multiple terms or, in the most extreme cases, separation 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. To deter this practice, we routinely photocopy exams after grading them.
- 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.
- We routinely photocopy exams and lab assignments prior to handing them back to students. 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 component to some of the exams in this course. Students are expected to participate in answering the group component of the exam questions, and indicate their participation by placing their names on the answer. 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 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 usually involve suspension for multiple terms or separation of the student from the College.

Student Accessibility

Students with disabilities who may need disability-related academic adjustments and services for this course are encouraged to see me privately as early in the term as possible. Students requiring disability-related academic adjustments and services must consult the Student Accessibility Services office (Carson Hall, Suite 125, 646-9900). Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to their professor. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, 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 the professor 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. 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).

Class Schedule

(check Canvas for revisions during the term)

June 20	Th	Course overview
21	F	DNA as Genetic Material
22	Sat	No Sat. Class
24	M	DNA Structure
26	W	Genomes/Chromosomes/Chromatin
27	Th	DNA Replication
28	F	Transcription I
July 1	M	Transcription II **Exam #1 - 7-8:15 PM, 100 LSC/Oopik Aud. – retake option**
3	W	Transcription III
4	Th	No class – July 4 holiday
5	F	Genetic Code
8	M	Protein Synthesis - Translation
10	W	Mutation, Effects of Mutation
11	Th	Genes and Gene Products
12	F	DNA Repair
15	M	In Class Review **Exam #2 – 7-8:30 PM, 100 LSC/Oopik Aud. – group component (10%), retake option**
17	W	Meiosis
18	Th	Patterns of Inheritance I – Dihybrid Cross
19	F	Patterns of Inheritance II – Deviations
22	M	Patterns of Inheritance III – Sex Linkage
24	W	Sex Determination, Maternal Effect Inheritance
25	Th	Linkage and Mapping I
26	F	Linkage and Mapping II
29	M	Human Genetics I - Mapping with Molecular Markers
31	W	Human Genetics II – BRCA1
August 1	Th	Crispr/Cas9 Genome Editing I
2	F	Crispr/Cas9 Genome Editing II
5	M	In Class Review **Exam #3 – 7-10 PM, 100 LSC/Oopik Aud. – group component (15%), retake option**
7	W	Gene Regulation I
8	Th	Gene Regulation II –Lac Operon
9	F	Gene Regulation III– Trp Operon
12	M	Gene Regulation IV – Gal4/Gal80
14	W	Epigenetics and Imprinting
15	Th	Introduction to Primary Literature Project
16	F	Project – Group Discussions
19	M	Project – Group Discussions
21	W	Project –Individual Presentations
25	Sunday	**Final Exam – 11:30AM-2:30PM**

Lab Schedule

Week June 24
Lab #1: Chromosomal DNA prep and PCR

Week July 1
Lab #2: Gel electrophoresis, DNA sequencing

Week July 8
Lab #3: Analyze DNA sequencing data

Week July 15
Lab #4: Drosophila Genetics, setting up crosses

Week July 22
Lab #5: Yeast one hybrid/two hybrid
Lab Summary #1 is **due on Friday July 26** in class (10:10 AM)

Week July 29
Lab #6 Drosophila Genetics, Scoring crosses

Week August 5
Lab #7 Analyze yeast mating results, larval dissections

Week August 12
TA office hours for Lab Summary #2
Lab Practical – scheduled individually

Lab Summary #2 is **due on Friday August 16** in class (10:10 AM)