

# Bio12: Cell Structure and Function

## Spring 2020

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### COURSE GOALS & LEARNING OBJECTIVES

- 1. Become conversant in Cell Biology.** This involves learning vocabulary related to cell biology and using this vocabulary correctly. Developing a complete vocabulary is critical for discussing cellular processes accurately. Moreover, being fluent with this vocabulary is important for quickly making mental connections that lead to new insights and facilitate problem solving.
- 2. Understand the experimental methods used to study cells.** We will discuss a broad range of techniques including different types of microscopy, biochemical and molecular analyses, and genetic approaches—all of which are routinely used by scientists to dissect how cells function. You will develop a thorough understanding of the underlying theory as well as the technical application of these techniques. A solid background in this area will allow you to apply this information to a diverse set of circumstances, including interpretation of experimental data and the ability to propose new experiments to answer specific questions.
- 3. Gain a working knowledge of cellular organization and function.** Our work in this course will allow you to gain a mastery of membrane structure and function and how cellular compartments are formed, how cells generate and utilize energy, how proteins are trafficked to the correct location and/or organelle within the cells, how cells respond to their environment, how signaling pathways within the cell elicit specific cellular responses, how cytoskeletal components are assembled and how they regulate cell shape and motility, how the cell duplicates and divides, how cells are organized into tissues, and how disruption of many of the above cellular processes can lead to cancer.
- 4. Develop the analytical skills of a cell biologist.** Cell biology is a science and we will be asking you to think like scientists, such as applying critical analyses of data and/or interpreting scientific experiments. Furthermore, you will gain experience approaching cell biology as a problem-solving endeavor in which you interpret microscopic images and/or utilize your knowledge of the mechanistic details of cellular processes. Class activity, discussion and weekly Quizzes will give you the opportunity to take what you have learned about a normal cellular process and predict a logical outcome when specific parameters are altered (i.e. by experimental manipulation, mutation, drugs).
- 5. Discover the inner beauty of the cell.** Cells are incredibly complex but also innately beautiful. Throughout the term you will frequently be viewing amazing images (and movies!) generated by diverse microscopy techniques. Even without a molecular understanding of how cells work, one can appreciate their beauty. Learning about their structure and function adds an extra dimension to this beauty.

## CLASS SCHEDULE

### **Week 1: How do we view cells?**

**Topics covered: Microscopy and Chemistry Catch-up (Chapters 1 & 18)**

W 4/1 Introduction  
T 4/2 Zoom Activity Session  
F 4/3 Review Q/A Zoom Session

**M 4/6 Quiz 1 due at 11:59 AM EST**

### **Week 2: How do we analyze cells?**

**Topics covered: Protein Structure and Experimental Approaches (Chapters 2 & 18)**

T 4/9 Zoom Activity Session  
F 4/10 Review Q/A Zoom Session

**M 4/13 Quiz 2 due at 11:59 AM EST**

### **Week 3: How are cell compartments built?**

**Topics covered: Enzymes and Transport Across Membranes (Chapters 3 & 4)**

T 4/16 Zoom Activity Session  
F 4/17 Review Q/A Zoom Session

**M 4/20 Quiz 3 due at 11:59 AM EST**

### **Week 4: How do proteins know where to go in the cell?**

**Topics covered: Protein Sorting (Chapter 8)**

T 4/23 Zoom Activity Session  
F 4/24 Review Q/A Zoom Session

**M 4/27 Quiz 4 due at 11:59 AM EST**

### **Week 5: How do cells generate and utilize energy?**

**Topics covered: Mitochondrion, Chloroplast and Energy Metabolism (Chapters 3, 5, 6 & 8)**

T 4/30 Zoom Activity Session  
F 5/1 Review Q/A Zoom Session

**M 5/4 Quiz 5 due at 11:59 AM EST**

### **Week 6: How do cells receive, integrate and process information?**

**Topics covered: Cell Signaling (Chapter 15)**

T 5/7 Zoom Activity Session  
F 5/8 Review Q/A Zoom Session

**M 5/11 Quiz 6 due at 11:59 AM EST**

### **Week 7: How do cells regulate cell shape and motility?**

**Topics covered: Actin and Intermediate Filaments (Chapter 9)**

T 5/14 Zoom Activity Session  
F 5/15 Review Q/A Zoom Session

**M 5/18 Quiz 7 due at 11:59 AM EST**

## **Week 8: How do cells duplicate and form tissue?**

**Topics covered: Microtubules, Cell Division and Tissues (Chapters 7, 9 & 14)**

T 5/21 Zoom Activity Session  
W 5/22 Review Q/A Zoom Session

**M 5/25 Quiz 8 due at 11:59 AM EST**

## **Week 9: How do cells regulate cell division and what happens when this regulation breaks?**

**Topics covered: Cell Cycle and Cancer (Chapters 14 & 16)**

T 5/28 Zoom Activity Session  
F 5/29 Review Q/A Zoom Session

**M 6/1 Quiz 9 due at 11:59 AM EST**

**Professor Bezanilla's Zoom OFFICE HOURS:** Wed 3:30-4:30pm EST, Friday 3:30-4:30pm EST

**Professor He's Zoom OFFICE HOURS:** Monday 4-5pm EST, Thursday 4-5pm EST

Note that we will be available to answer questions during Zoom activity sessions.  
The scheduled Zoom review sessions are also a good time to have your questions answered.

## **EXPECTATIONS**

*Here's what we expect from you:*

- 1) To take detailed notes while you are listening to the lecture recordings.
- 2) To participate in the Zoom activity sessions, mentally prepared to think about Cell Biology
- 3) To be willing to ask questions and participate in Zoom class activities
- 4) To listen to lecture recordings BEFORE the Zoom activity sessions
- 5) To utilize active learning techniques to master course material
- 6) To complete the online laboratory exercises

*Here's what you can expect from me:*

- 1) To bring expertise and enthusiasm to the class
- 2) To be willing to answer questions and facilitate discussions
- 3) To challenge you to stretch beyond your comfort zone
- 4) To encourage you to try new approaches for studying and learning that are "active"
- 5) To provide opportunities for you to practice problem solving

## **FACILITATING YOUR LEARNING PROCESS**

Several lines of evidence indicate that certain activities promote learning and retention MUCH better than re-reading your notes. If you would like to learn more about the most effective strategies for studying and learning (and the research underlying these recommendations), we highly recommend the book "**Making it Stick: The Science of Successful Learning**" by Brown, Roediger III, and McDaniel.

## **VOCABULARY TERMS**

In order to help you develop the language necessary to accurately discuss experiments and cellular processes, we will be posting a list of important vocabulary terms for each weekly module. We encourage you to use the lecture slides and the textbook to write out definitions, make sure you understand these terms and can use them appropriately. Many students find flashcards a useful strategy. The online resource "Quizlet" <https://quizlet.com/> will let you easily generate electronic flash cards.

## **TEXTBOOK**

### **Karp's Cell and Molecular Biology, by Iwasa and Marshall, 9<sup>th</sup> Edition**

Wiley, the publisher of this textbook, is offering free access through the rest of the Spring 2020. To register for your course simply go to [www.wileyplus.com/go/login](http://www.wileyplus.com/go/login). Click "Sign up now" to create an account. You will be asked to enter your course section ID (**A63650**) for **BIOL.012.01-SP20** to find your course and complete the registration process. If you already have a WileyPLUS account, just log in and click the yellow 'Add more courses' button. You will be asked to enter your course section ID (**A63650**) to find your course and complete the registration process.

**An important note about the textbook:** You are not required to purchase the textbook. Exams will cover material that is presented in recorded lectures or covered in the classroom exercises. The textbook can be used as a reference to help clarify your understanding of this material. In deciding whether or not to purchase the textbook, consider what study strategies are most productive for you. Also, if you intend to apply to med school, vet school or graduate school then you may find having the textbook will be useful as a familiar source of information when you begin to review what you have learned in preparation for the MCAT or GRE exams.

**Additional Textbooks on Reserve:** For those wishing to supplement the lectures with reading from additional textbooks, the following ebooks are also available at the Dartmouth College Library.

<https://www.dartmouth.edu/~library/biomed/resources/ebooks.html>

All reading in the following textbooks is optional.

**Essential Cell Biology**, 5<sup>th</sup> edition (2019) by Alberts et al. This is a more simplified textbook. If you need more background before diving into Karp, try this book.

**Molecular Cell Biology**, 8<sup>th</sup> edition (2016) by Lodish *et al.* This textbook contains more material than Karp. Some students find the additional level of detail in this textbook useful.

## **TEACHING APPROACH**

Professors Bezanilla and He will be co-teaching the course. While there are still two sections, there is one Canvas page that provides all the course material and assignments. All course content will be available asynchronously via recorded lectures accessible on the Canvas page. **As soon as you are enrolled in the class**, you should log onto the Canvas site and begin working on the course content posted there.

Using Zoom, we will meet synchronously on Thursdays and Fridays each week in the normal meeting times for the 9L and 10 timeslots. Thursday we are using the X-hour period and Friday we are using the normal time slot. You may attend either the 9L or 10 time slots. All synchronous Zoom sessions will be recorded and posted on Canvas. Be sure to read the "Consent to Record" document (Page 8 on the syllabus, also available on Canvas), since you are agreeing to this by enrolling in the class.

**ONLY for the first week of classes**, we ask that you attend an introductory Zoom session on **WEDNESDAY APRIL 1<sup>st</sup>**. You may attend either the 9L (<https://dartmouth.zoom.us/j/299098447>) or 10 time (<https://dartmouth.zoom.us/j/682456337>) slots. During this Zoom meeting, we will introduce you to the teaching staff and we will practice Zoom break out groups and annotation, which are the methods that we will use to do the Zoom Activities.

**On Thursdays**, we will break out into groups in Zoom to work on Zoom Activities posted on Canvas. The professors and the science teaching fellow will all be present and will visit the Zoom break out rooms. After each problem, the professors will discuss the answer key for that particular problem in the main Zoom meeting room. It is critical that you listen to all lecture recordings posted for that week **BEFORE** the Zoom activity sessions.

**On Fridays**, we will have a Zoom Q&A meeting. We encourage you to come prepared to ask questions about the material covered that week. All class Zoom meetings will be recorded and posted on Canvas.

The professors, the teaching science fellow and the TA will all hold Zoom office hours. The times are posted on Canvas. Zoom office hours will NOT be recorded.

All Zoom meeting IDs will be clearly posted on Canvas.

## **METHODS OF ASSESSMENT AND GRADES**

Bio 12 will be graded credit / no credit similar to all other undergraduate courses at Dartmouth for Spring of 2020. In order to receive credit for this course, you have to:

- Achieve a final grade of 65% or above for the weekly Quizzes for each course module. Your final grade for each module is defined as the average grade you receive for the 3 Quizzes within that module.
- Complete the online laboratory exercises and achieve a final grade of 65% or above for each lab module.

The weekly Quizzes will be a mixture of testing your mastery of the information and applying your knowledge to problem solving. Starting from the first week, the weekly Quiz will be available for you to take on the Bio12 Canvas site from Friday 5:00PM EST to the following Monday at 11:59 AM EST. Once you start to work on the Quiz, it will be timed - you must complete it within 40 minutes.

Barring documented illness, family emergency or academic conflict, **failure to take a weekly Quiz at the scheduled time will result in a grade of zero for that Quiz.** You must alert us in advance if you are unable to take the Quiz at the scheduled time.

## **WEEKLY QUIZZES and GRADING POLICIES**

The following points summarize the grading procedures with respect to weekly Quizzes:

- [1] After the Quiz has been graded, a copy of the answer key will be posted on the Bio12 Canvas site. Review this answer key carefully and be sure to understand the errors in your Quiz and why you made them.
- [2] The number of points given for each answer is final. If, after reviewing your answers and comparing them to the posted answer key before the deadline (see below), you find a scoring error, you must observe the following procedures for error correction:
  - a) Prepare an electronic cover page (file format: Word or PDF) and name the file as "Error correction request-your name".
  - b) If you determine that your answer is consistent with the key, but you did not receive full credit, simply indicate the number of the question to be re-evaluated and state in one or two short, descriptive sentences (typed) what makes your answer correct. The citation of a text page, diagram, or reference to a lecture date/number may also be helpful.

### **Error correction requests for weekly Quizzes:**

must be emailed to Dr. Amanda Socha ([Amanda.L.Socha@dartmouth.edu](mailto:Amanda.L.Socha@dartmouth.edu)) within 7 days after you receive the graded Quiz.

We will not accept questions regarding errors in grading after these deadlines. The error correction process will take a few days. You will be notified through email after the re-evaluation is completed.

## **NOTE TO STUDENTS WITH PHYSICAL OR LEARNING DISABILITIES**

Students requesting disability-related accommodations and services for this course are encouraged to schedule a phone/video meeting with us as early in the term as possible. This conversation will help to establish what supports are built into our online course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; [student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu); SAS website; 603-646-9900) and to email us their SAS accommodation form. We will then work together with SAS if accommodations need to be modified based on the online 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 this course, please speak with us as soon as possible to discuss appropriate accommodations.

## **MENTAL HEALTH**

We recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding part of your life. There are a number of resources available to you 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/>).

We want you to be aware of these resources and encourage you to use them as needed.

## **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 faculty members, we are 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](mailto:Kristi.Clemens@Dartmouth.edu)) (and deputies if appropriate).

## **PARTICIPATION**

We recognize that we are facing extremely unusual circumstances this term. While we have provided options for synchronous and asynchronous participation, you may find yourself in a situation that makes it challenging to keep up with the course material or participate in any fashion. If such a situation arises, please reach out to us as soon as possible so we can find a solution. We'll be more than happy to work with you to find an avenue for participation that works for your situation if you reach out. If you are already aware of circumstances that will affect your ability to participate in the course regularly or occasionally, please arrange a meeting with us at the start of the term so we can plan ahead.

## **LATE WORK**

Please speak with us at the beginning of the term if you anticipate circumstances that might affect your ability to get your work in on time and reach out if such a situation arises along the way. We recognize we are facing very unusual circumstances this term. Reasonable allowances will be made for students facing time zone differences, work conflicts, and other extenuating circumstances, as long as we connect about these matters at the start of the term or the specific occasions when conflicts arise.

## **REMOTE LEARNING: CANVAS AND ZOOM**

We have created a Remote Learning Plan for this course, available on Canvas. This document outlines the expected changes to our course content and structure this term, describes the methods and technologies we will use to support online learning (and how to get them installed and running on your devices), and explains what good participation looks like in a remote learning context. Please review this document as soon as you can and follow the steps for technological onboarding before our first class meeting, if possible.

Course materials will be made available and assignments will be submitted via [Canvas](#), as usual. Class meetings and office hours will be held via [Zoom](#). You may need to use Dartmouth's [VPN client](#) to access campus resources. A free digital copy of our textbook will be available to all students, but you must establish a remote VPN connection to access these materials. If you have any difficulties accessing these technologies or are unsure of how to use their necessary features, please reach out.

## **REMOTE ACCESS to CAMPUS RESOURCES**

We recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding aspect of your life. Many of you may be facing greater challenges than usual given the sudden changes to your living and learning environment, public health concerns, and a host of other factors (e.g., housing or food insecurity, new or changing caregiving responsibilities, visa and accessibility concerns, access to health and mental health support, and so on). There are a number of campus resources available this term to support your needs. While the situation is constantly evolving, many offices are prepared to meet with you via phone or Zoom. For concerns about health and wellness, you may reach out to the [Dartmouth Health Service](#) (603-646-9400 or Secure Message in DartHub), [Counseling Services](#) (603-646-9442), and the [Student Wellness Center](#). For academic needs, you may contact your [undergraduate dean](#) (603-646-2243), [Student Accessibility Services](#) (603-646-9900), and the [Academic Skills Center](#) (603-646-2014). Students with concerns related to campus employment may connect with the [Student Employment Office](#) (603-646-3641). Those with visa-related concerns may reach out to the [Office of Visa and Immigration Services](#) (603-646-3474). We encourage you to take advantage of these resources, and to speak with us if you need support in the class.

## ACADEMIC HONOR

The Dartmouth College Student Handbook states "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth."

There are a number of situations in which a student in Bio12 might find themselves tempted to violate the Academic Honor Principle. These situations include (but are not limited to) the following:

- a) The weekly Quizzes are open book, but they must be completed independently. The answers that you provide must be entirely your own work.
- b) Science is a collaborative field and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. Do not copy directly from the lab manual, and do not share electronic data, textual or graphical files.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the faculty will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that **College faculty are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards.**

## CONSENT TO RECORDING

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

- a) By enrolling in this course, you affirm your understanding that 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, may be recorded within any digital platform used to offer remote instruction for this course;
- b) You further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and 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;
- c) You authorize Dartmouth and anyone acting on behalf of Dartmouth to record your participation and appearance in any medium, and to use your name, likeness, and voice in connection with such recording; and
- d) You authorize Dartmouth and anyone acting on behalf of Dartmouth to use, reproduce, or distribute such recording without restrictions or limitation for any educational purpose deemed appropriate by Dartmouth and anyone acting on behalf of Dartmouth.

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

By enrolling in this course, you affirm that you 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 you understand that if you violate this prohibition, you will be subject to discipline by Dartmouth up to and including expulsion, as well as any other civil or criminal penalties under applicable law.