

BIOL 71/171 Winter 2021 - Current Topics in Cell Biology - Wei-Lih Lee

This course will examine how cells use microtubules to establish cell shape, move organelles, and segregate chromosomes during cell division. We will also cover current techniques employed for studying microtubules, microtubule-associated proteins (MAPs), and microtubule-dependent motor proteins. Each topic listed will be introduced and explored via lectures, review articles, and discussion of landmark paper(s) or papers from current literature. The overriding goal will be to improve your ability to critically analyze and evaluate original research data presented in the form of papers published in the scientific literature. Student participation during the course is critical to ensure that we have an active and productive discussion of the topics. The course will culminate in students working in small groups on the molecular basis of diseases linked to defects in MAPs or motor proteins.

Discussion and Lecture (zoom): MWF 8:55-10:00 AM

Instructor: Wei-Lih Lee, Life Sciences Center Room 224, Phone: (603) 646-8706
Email: wei.lih.lee@dartmouth.edu
Office hour (= X-hour): Th 9:10-10:00 AM

Textbook: Cell Biology by TD Pollard, WC Earnshaw, and J. Lippincott-Schwartz (3rd edition, 2017). Full text is freely available to you online [here](#) via Elsevier ClinicalKey Books. This text is more reliable and legitimate as a source of information than the sources on the internet. Chapters are posted below as reference, not as required readings.

Available: Powerpoint slides and papers for discussion will be posted to the Canvas site.

Prerequisites: BIOL 12 or 19 (Cell Structure and Function) and BIOL 13 (Gene Expression and Inheritance) and one from among BIOL 40, BIOL 41, BIOL 43, BIOL 45, and CHEM 41.

Class Schedule: Topics that we will discuss are tentatively planned as below.

<u>Date</u>	<u>Week#</u>	<u>Topic</u>	<u>Readings</u>
F Jan 8	1a	Introduction; cell and universal principles	Chapter 1
M Jan 11	1b	Light microscopy	Chapter 6
W Jan 13		Microtubule organizations	Chapter 34
F Jan 15		Microtubule assembly – role of GTP cap	Mitchison and Kirschner
M Jan 18	2	no class, MLK day	
W Jan 20		Microtubule nucleation; pharmacologic tools	Goodson and Jonasson
F Jan 22		Discovery of MAPs	Paschal et al
M Jan 25	3	Kinetochores biology and MAPs	Westerman et al
W Jan 27		Rings on microtubules and chromosome capture	
F Jan 29		Techniques for assaying protein-protein interactions	
M Feb 1	4	Endocytosis	Chapter 22
W Feb 3		Uptake of transferrin receptor and co-IP lesson	Finkel and Cooper
F Feb 5		How should you assess protein-protein interactions?	
M Feb 8	5	Discovery of cytoplasmic dynein	Chapter 36
W Feb 10		Guilty by localization	Steuer et al
F Feb 12		Differences between microtubule motors	Dixit et al, Chapter 36

M Feb 15	6	Centrosome separation and spindle assembly	Tanenbaum and Medema
W Feb 17		RNAi method and forces for spindle bipolarity	
F Feb 19		Chromosome-dependent spindle assembly pathway	Tulu et al; Chapter 44
M Feb 22	7	How and why microtubule branches?	Petry et al
W Feb 24		Comparing microtubule and actin branching	
F Feb 26		Severing to build microtubules	Vemu et al
M Mar 1	8	Post-translational modifications of tubulin	Gadadhar et al
W Mar 3		Breaking the “tubulin code”	Sirajuddin et al
F Mar 5		Student disease presentation	
M Mar 8	9	Student disease presentation	
W Mar 10		Student disease presentation	

Learning Goals:

1. To improve critical reasoning and thinking. The overarching goal for this course is to improve your ability to read, think about, understand the scientific rationale, and critically analyze and evaluate original research data presented in the form of papers published in the scientific literature. During each class period, we will discuss facts and information with the goal of learning how to interpret and think about scientific data.
2. To improve your knowledge of cell biology. While honing your critical thinking skills, I hope to also expose you to a lot of interesting cell biology, some or most of which you have never heard about before. In particular, we will learn about the myriad roles of microtubules during mitosis and the various functions and mechanisms of regulation of microtubule motors during cellular polarization, differentiation, or division. We will explore techniques commonly used for studying microtubules and microtubule associated proteins.

Course Mode:

Using Zoom, we will meet synchronously for lectures and discussions on MWF at the normal meeting times for the Period BL timeslot. The X-hour will be used as office hour. All synchronous Zoom class meetings will be recorded and posted on Canvas. Be sure to read the “Consent to Record” section, since you are agreeing to this by enrolling in the class.

Discussion and Lectures:

The schedule of class meetings and lecture topics are provided above. Here I would like to explain how I intend to meet the learning goals for BIOL 71/171. For each class meeting there will be a discussion of a paper from recent literature or a landmark paper on the topic listed. The paper and its related references that will form the basis for class discussion will be posted on Canvas several days before the paper will be discussed. During class, we will discuss facts and information with the goal of learning how to think about and interpret scientific data. I will ask you questions in class and expect you to take an active part in the discussion, both by answering questions posed of you, and by asking questions of me when something is not clear to you. It is important that you read the posted paper before class. This is essential in order not only to have an active and productive discussion of the topics during each class meeting but also for you to be successful in the class participation component that will help to determine your grade.

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 me 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; SAS website; 603-646-9900) and to email me 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 the course, please speak with me as soon as possible to discuss appropriate accommodations.

Assignments and Grades:

Grading will be based on 2 written assignments, one disease presentation, plus class participation. The assignments will contain questions for you to answer about a paper (or papers) on a particular class topic.

Assignment #1 (due Jan 22)	graded, but not recorded (i.e., a chance for you to “practice”)
Assignment #2 (due Feb 08)	25%
Assignment #3 (due Mar 1)	25%
Disease presentation	25%
Class participation	25%

Academic Honor Principle:

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".

The Honor Principle (<http://www.dartmouth.edu/judicialaffairs/honor/index.html>) as applied to BIOL 71/171 affects the assignments that you must complete during the course. The completed assignments that you provide must be entirely your own work.

Mental Health:

I recognize that academic terms at Dartmouth are challenging and intensive, and that 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:

- Undergraduate Dean (<http://www.dartmouth.edu/~upperde/>)
- Counseling and Human Development (<http://www.dartmouth.edu/~chd/>)
- Student Wellness Center (<http://www.dartmouth.edu/~healthed/>)

I 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 or the Deputy Title IX Coordinator for the Guarini School. Their contact information can be found on the sexual respect website at: <https://sexual-respect.dartmouth.edu/reporting-support/all-resources/campus-resources>

Consent to Recording:

(1) Consent to recording of lecture and group meetings

- 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.

Remote Learning Plan - 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.

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. If you have any difficulties accessing these technologies or are unsure of how to use their necessary features, please reach out.

Access to Campus Resources:

Many of you may be facing greater challenges than usual given the 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). We want you to be aware of the campus resources available 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.