

BIOL 71/171 Winter 2020 — 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 (LSC 205): MWF 2:10-3:15 PM

Instructor: Wei-Lih Lee, Life Sciences Center Room 224, Phone: 646-8706
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Office hour: TH 1:20-2:10 PM (X-hour)

Text: 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 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 Canvas site.

Prerequisites: BIOL 12/19 (Cell Structure/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>
M Jan 6	1	Introduction; cell and universal principles	Chapter 1
W Jan 8		no class, attend seminar	
F Jan 10		Microscopy; Microtubule assembly	Chapter 34
M Jan 13	2	Microtubule instability	Mitchison and Kirschner
W Jan 15		Microtubule nucleation; Pharmacologic tools	Goodson and Jonasson
F Jan 17		Discovery of MAPs	Paschal et al
M Jan 20	3	no class, MLK Day	
W Jan 22		Rings on microtubules and chromosome capture	Westerman et al
F Jan 24		Techniques for measuring protein interactions	
M Jan 27	4	Endocytosis	Chapter 22
W Jan 29		Uptake of transferrin receptor and Co-IP	Finkel and Cooper
F Jan 31		How should you assess protein-protein interactions?	
M Feb 3	5	Discovery of cytoplasmic dynein	Chapter 36
W Feb 5		Localization to cytoplasmic dynein	Steuer et al
F Feb 7		How should you interpret localization?	

M Feb 10	6	Spindle assembly	Tanenbaum and Medema
W Feb 12		Chromosome-dependent microtubule nucleation	Tulu et al; Chapter 44
F Feb 14		How and why microtubule branches?	Petry et al
M Feb 17	7	Discovery of kinesin; kinesin versus dynein	Chapter 36
W Feb 19		Tubulin post-translational modifications	Gadadhar et al
F Feb 21		Breaking the “tubulin code”	Sirajuddin et al
M Feb 24	8	Motor regulators: activation by dynactin and BicD	Dwivedi et al
W Feb 26		Motor regulators: inhibition by LIS1	Huang et al
F Feb 28		Severing to build microtubules	Vemu et al
M Mar 2	9	Student disease presentation	
W Mar 4		Student disease presentation	
F Mar 6		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.

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.

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 20)	graded, but not recorded (i.e., a chance for you to “practice”)
Assignment #2 (due Feb 03)	25%
Assignment #3 (due Feb 21)	25%
Disease presentation	25%
Class participation	25%

Accessibility Needs:

I encourage students who may need disability-related academic adjustments to see me privately as early as possible in the term, preferably before the end of the first week. 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 me. 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 me before the end of the first week of the term to discuss appropriate accommodations.

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 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 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/>). I encourage you to use these resources and come speak with me in order to take care of yourself throughout the term.

Sexual Respect, Safety, and Well-Being:

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 that 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>).

Additionally, 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>