

Syllabus BISP194: Advances in Microscopy Spring 2023

What: This course is designed to introduce students to the fundamentals of microscopy, with an emphasis on how advances in microscopy drive new biological discoveries. Importantly, the course is structured so that you will learn valuable skills, including how to read primary literature and synthesize information in a presentation. Additionally, the course will include a live demonstration in the Nikon Imaging Center and exposure to image analysis techniques.

My goal is not only to provide you with a deeper understanding of how science is done but also to give you additional skills that will be useful to you in your future academic studies and career!

When: Tuesday @ 9:00-10:20 AM

Where: York 3010

Who: Dr. Andrew Muroyama
Assistant Professor
Cell and Developmental Biology
3218 Muir Biology
Email: amuroyama@ucsd.edu
Note: Please include "BISP194" in the subject line to ensure prompt reply.

Office Hours: Thursdays 2:00-4:00 PM (Muir 1138)

Course Materials: All course materials, including the syllabus, lecture slides, and papers will be posted to Canvas.
(<https://canvas.ucsd.edu>)

Prerequisites: BICD110 or BICD100R

Assignments: There will be 3 assessments used to calculate your final grade:

Participation:	50 pts
Team presentation:	50 pts
Written report:	50 pts
Total:	150 pts

145 – 150 pts: A+
138 – 144 pts: A
135 – 137 pts: A-
130 – 134 pts: B+
123 – 129 pts: B
120 – 122 pts: B-
115 – 119 pts: C+
108 – 114 pts: C
105 – 107 pts: C-
91 – 104 pts: D
Below 90 pts: F

Participation (50 pts):

- 5 pts per class attendance (one attendance/week) (50 pts max)

There will be a sign-in sheet at the front of the room before each class. Please ensure that you sign-in **before** each class to receive credit.

Team presentation (15 pts for pre-presentation discussion, 35 pts for presentation):

- Every student will join a team of four students to lead a presentation in class on one primary research paper. All papers are available on Canvas.

1) Please sign-up for teams in the first week (by Friday 10/6). I have provided a summary sheet for the papers to help you find a paper that matches your scientific interests. Having said that, all the papers are interesting, so if you don't get your first choice don't worry. You may fall in love with a new field of biology you didn't even know existed!

2) The week before your team's presentation, please coordinate with your teammates and Prof. Muroyama to find a time (~30 min - 1 hr) to discuss the paper. This is meant to help you work through the material and is worth 15 pts. Depending on the timing and team interest, it may be possible to schedule a second meeting for follow-up discussion.

3) Student presentations will be 20 minutes and should include:

- Relevant background
- Key knowledge gaps and the main question addressed in the study
- Discussion of the main figures
- Discussion of how the key imaging technique was used
- Three potential next experimental steps

Even though it can be intimidating, public speaking is an essential skill in many career paths! Therefore, the presentation should be split approximately equally among teammates so everyone has a chance to speak.

Written report (35 pts for the report, 15 pts for associated elevator pitch):

- Each student will submit a two-page written report and associated slide on a paper of their choosing before the last day of class (**due by 11:59pm on Sunday 12/3**).

1) Choose a paper that utilizes one of the microscopy techniques covered in class **by 11/21** and add your paper to the sign-up sheet in Canvas. No paper duplicates are allowed.

2) The written report (worth 35 pts) should include:

- A) A description of the microscopy technique
- B) A summary of one of the key findings
- C) Two ideas for future experiments based on the results.

3) For the last class (12/5), each student will prepare one slide that shows the title and authors of the paper and one of the beautiful microscopy images from the publication. The slide is due at the same time as the paper (**by 11:59pm on Sunday 12/3**).

Each student will have 1-2 min to give an “elevator pitch” that presents the main conclusion of the paper and describes the image (worth 15 pts).

Important: Writing is an essential skill, and your writing will inevitably improve the more you practice. I expect that all submitted writing will be entirely your own. Therefore, please do not simply rephrase text from the article or use generative AI-based programs like ChatGPT. Any evidence of plagiarism will result in an automatic zero for the assignment with no chance for resubmission.

Extra credit:

If $\geq 90\%$ of the class fills out their end-of-quarter evaluation, everyone will get 5 pts added to their point total for the quarter.

Course topics:

Week	Date	Topic	Papers
1	3-Oct	Class intro, What is microscopy?	NA
2	10-Oct	Light microscopy fundamentals	NA
3	17-Oct	Fluorescence microscopy (Widefield and confocal)	Chalfie et al., 1994 (Prof. Muroyama) Shaner et al., 2004 (Prof. Muroyama)
4	24-Oct	Super-resolution techniques	Gupta & Poss, 2012 (Team 1) Massalha et al., 2017 (Team 2)
5	31-Oct	2-Photon and light-sheet microscopy	Xu et al., 2013 (Team 3) Xu et al., 2020 (Team 4)
6	7-Nov	EM fundamentals, Cryo-ET, FIB-SEM	Rompolas et al., 2012 (Team 5) Ritter et al., 2015 (Team 6)
7	14-Nov	Cryo-EM	Hoffman et al., 2020 (Team 7) Watanabe et al., 2020 (Team 8)
8	21-Nov	Imaging demonstration (<u>Nikon Imaging Center*</u>)	NA
9	28-Nov	Hands-on image analysis workshop	NA
10	5-Dec	Final presentations, class wrap-up	NA

***Important note:** Class on 11/21 will be conducted in small groups in the Nikon Imaging Center with Dr. Peng Guo. Please meet at least 5 minutes before your timeslot in the first-floor lobby of Leichtag Family Foundation Biomedical Research Building.

Inclusion: I am committed to fostering a learning environment where all students are supported and one that embraces diversity of thought, opinion, identity, and experience. As I will highlight in my lectures, our community is made stronger and science advances when as many perspectives as possible are uplifted. Please feel free to reach out to me if you have ideas about inclusion. More resources are also available from the Office of Equity, Diversity, and Inclusion: <https://diversity.ucsd.edu/>

Accessibility: Students requesting accommodations and services due to a disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. **Please note that instructors are unable to provide accommodations unless they are first authorized by OSD.** For more information, contact the OSD at (858) 534-4382 (voice), osd@ucsd.edu, or visit osd.ucsd.edu.

Academic integrity: Please, do not cheat. Students are expected to do their own work, as outlined in the UCSD Policy on Academic Integrity. **Academic misconduct** is broadly defined as any prohibited and dishonest means to receive course credit, a higher grade, or avoid a lower grade. Academic misconduct misrepresents your knowledge and abilities, which undermines the instructor's ability to determine how well you're doing in the course. In this class, use of generative written language programs, such as ChatGPT, is considered cheating. Please do not risk your future by cheating.

Other student resources:

Throughout your time at UC San Diego, you may experience a range of issues that can negatively impact your learning. These may include physical illness, housing or food insecurity, strained relationships, loss of motivation, depression, anxiety, high levels of stress, alcohol and drug problems, feeling down, interpersonal or sexual violence, or grief. These concerns or stressful events may lead to diminished academic performance and affect your ability to participate in day-to-day activities. If there are issues related to coursework that are a source of particular stress or challenge, please speak with us so that we are able to support you. UC San Diego provides a number of resources to all enrolled students, including:

Counseling and Psychological Services (858-534-3755) | caps.ucsd.edu)

Student Health Services (858-534-3300) | studenthealth.ucsd.edu)

CARE at the Sexual Assault Resource Center (858-534-5793 | care.ucsd.edu)

The Hub Basic Needs Center (858-246-2632) | basicneeds.ucsd.edu)