MCDB 191
Epigenetics
Winter 2024
Monday 12-1:50     La Kretz 101

Instructor: Steve Jacobsen – Jacobsen@ucla.edu
Office Location: 4028 Terasaki Life Sciences
The best way to contact me is via email

Volunteers in the class:

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
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<tbody>
<tr>
<td>Trevor Weiss</td>
<td><a href="mailto:weiss.trevor.12@gmail.com">weiss.trevor.12@gmail.com</a></td>
</tr>
<tr>
<td>Tyler Buckley</td>
<td><a href="mailto:tylerjbuckley@gmail.com">tylerjbuckley@gmail.com</a></td>
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<tr>
<td>Yuxing Zhou</td>
<td><a href="mailto:yuxingzhou@g.ucla.edu">yuxingzhou@g.ucla.edu</a></td>
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<tr>
<td>Brandon Boone</td>
<td><a href="mailto:boonebrandon25@gmail.com">boonebrandon25@gmail.com</a></td>
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<tr>
<td>Shuya Wang</td>
<td><a href="mailto:shinawsy@g.ucla.edu">shinawsy@g.ucla.edu</a></td>
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Course Materials
1. [https://research.mcdb.ucla.edu/Jacobsen/LabWebSite/P_ClassEpigenetics.php](https://research.mcdb.ucla.edu/Jacobsen/LabWebSite/P_ClassEpigenetics.php) is your home base, with links to everything you need, including papers that can be downloaded.

Course Description
Study of modern topics in epigenetic gene regulation. In recent years the field of epigenetics has exploded, identifying histone modifications and DNA methylation pathways as key regulators of gene expression. Through focus on primary literature, presentations, and group discussion, topics include reversible histone and DNA modifications, small RNA-based gene regulation pathways, 3D architecture of genomes, and phase separation processes and their role in epigenetics. Designed for students who have completed two upper-division biology courses.

Learning Outcomes for this Course
- Understand broad concepts in epigenetic gene regulation in a wide variety of eukaryotic organisms.
- Understand the basic techniques used in epigenetic research.
- Understand how epigenetics plays a role in processes underlying cancer, development and other processes driven by changes in gene expression.
- Understand how bioinformatics analyses are key to epigenetic research.

How to Succeed in this Course (Expectations for Students)
- Attend all classes and participate in discussion.
- Reading assigned papers before class.
- Making your presentation as clear and well thought out as possible.
Helping You Succeed & Creating an Inclusive Classroom Community (Instructor and Community Expectations)

If you need help understanding the material or with preparing your presentation, please contact the volunteer that is listed for the topic being covered. This is highly encouraged!

UCLA’s Office for Equity, Diversity, and Inclusion provides resources, events, and information about current initiatives at UCLA to support equality for all members of the UCLA community. I hope that you will communicate with me or one of the TAs if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the Office of Equity, Diversity, and Inclusion on their website.

How Your Learning Will Be Assessed (Grading Policy)

Grading will be based on participation and your presentation. This will be in five areas:

- **Attendance** (4 points per week).
- **Reading** the papers before the presentation is mandatory. Before the beginning of each class meeting, you must complete an online form in which you will provide a synopsis of the paper and a brief statement of which experiments you think would be the next logical step to take, [https://docs.google.com/forms/d/e/1FAIpQLSddP3DeoS8WGvvG5LvHrdrUVTbHrve1ZxfHrwpz0d5dA__Y5Zg/viewform](https://docs.google.com/forms/d/e/1FAIpQLSddP3DeoS8WGvvG5LvHrdrUVTbHrve1ZxfHrwpz0d5dA__Y5Zg/viewform). This must be turned before the beginning of class on the day the paper is being presented. If you have trouble with the only google form, please e-mail [tylerjbuckley@gmail.com](mailto:tylerjbuckley@gmail.com) (5 points per week).
- **Participation in the discussion of papers.** Asking questions, making comments etc. (25 points total).
- **Completing an evaluation of each presentation in order to provide feedback to the presenter.** You must fill out an online form for each speaker. Ideally you will do this right at the end of class, but the deadline is by the beginning of the next class, [https://docs.google.com/forms/d/e/1FAIpQLSfdI1x5XHoJ1-sVYDQ3z_y0YbtVx05pwcahs8WjD4N8Q/viewform](https://docs.google.com/forms/d/e/1FAIpQLSfdI1x5XHoJ1-sVYDQ3z_y0YbtVx05pwcahs8WjD4N8Q/viewform). Please put your name on the form so we can give you the points, and after grading, we will remove your name and give an anonymous version to the presenter (1 point per week). If you have trouble with the only google form, please e-mail [tylerjbuckley@gmail.com](mailto:tylerjbuckley@gmail.com).
- **Well thought out presentation with sufficient background information, and good visuals.** This will require reading and understanding the paper to be presented in great detail, as well as reading supporting papers and reviews to put the paper into the context of the field as a whole. A volunteer will be available to help you with your presentation, and this is HIGHLY encouraged (25 points).
- **Completing the course and instructor evaluation at the end of the quarter** (20 points).

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<tr>
<th>Grading</th>
<th>Scale:</th>
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<tr>
<td>Letter</td>
<td>Grade Percentage</td>
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<tr>
<td>A+</td>
<td>97%-100%</td>
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<tr>
<td>A</td>
<td>92%-96.9%</td>
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<tr>
<td>A-</td>
<td>88%-91.9%</td>
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<tr>
<td>B+</td>
<td>84%-87.9%</td>
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<tr>
<td>B</td>
<td>80%-83.9%</td>
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<tr>
<td>B-</td>
<td>76%-79.9%</td>
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Historically, most of the class has received a grade of A- or above. If needed, the flat scale may be adjusted in your favor. It is possible (and hoped for!) that everyone in the course receives an A.

Why I do not grade on a curve: In recent years, research has shown that grading on a curve can create unnecessarily competitive environments at UCLA and elsewhere. For this reason, your grade is not based on how you did in comparison to your peers. Scientific understanding and progress advance best through interaction and discussion. Therefore, I hope you will work with your classmates to enhance your own understanding of the material.

What constitutes a good presentation?

- Shoot for a 10-minute introduction and 20-30-minute explanation of the paper. This leaves plenty of time for discussion and questions. You don’t have to explain every figure of the paper in great detail. Best is to spend more time on the figures that really demonstrate the main point of the paper, and spend less time on less important figures. The art is knowing how to convey the main message of the paper concisely, while critically analyzing the validity of the data presented. You should however look carefully at all of the figures, including supplementary figures, during your preparation so that you can field questions about the entire paper. Similarly, try to understand the materials and methods so you can field questions, but you don’t need to get bogged down in presenting every detail of the techniques used.
- Use material from other papers and reviews on the reading list, or other papers that you might find on your own, to provide a summary of the field that you are presenting, and to make it clear how the paper fits into that field.
- Try to end with a statement of the main findings of the paper, and what would be the next logical questions to ask in this field.
- Visuals. Please use Powerpoint (or equivalent software) for presentations.

TOPICS

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<tr>
<th>Week 1 January 8</th>
<th>Introduction and Background Lectures</th>
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<tr>
<td></td>
<td>Epigenetics overview – Steve Jacobsen.</td>
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<td>Preparation of presentations: - an example by Shuya Wang.</td>
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Discussion


Related papers and reviews


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<th>Week 3 January 22</th>
<th>DNA Methylation</th>
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<tr>
<td>Discussion</td>
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**Related papers and reviews**


**Week 4 January 29**

**Histone methylation and demethylation**

**Discussion**


**Related papers and reviews**


**Week 5 Feb 5**

**Polycomb**

**Discussion**


**Related papers and reviews**


### Week 6 February 12

**RNA-directed Silencing + DNA demethylation.**

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<tr>
<th><strong>RNA-directed Silencing - Discussion</strong></th>
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**RNA-directed Silencing - Related papers and reviews**


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<tr>
<th><strong>DNA demethylation - Discussion</strong></th>
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**DNA demethylation - Related papers and reviews**


### Week 8 February 26

**Enhancers**

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<th><strong>Discussion</strong></th>
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Related papers and reviews

Week 9 March 4
Targeted Epigenetics + 3D chromatin architecture

Targeted Epigenetics - Discussion
Genome-wide programmable transcriptional memory by CRISPR-based epigenome editing. (2021) Nunez, et al., Cell 184, 2503-2519. Trevor

Targeted Epigenetics - Related papers and reviews


3D chromatin architecture - Discussion

3D chromatin architecture - Related papers and reviews


Week 10 March 11
Phase separation and Epigenetics.

Discussion
Student Resources for Support and Learning

Providing feedback to me and to your TAs: I encourage your feedback at any time throughout the quarter about things that are helping you learn, or things that aren’t helping. Please communicate with me or with your TA if there are ways that we can improve the course.

Personal Problems: Sometimes, factors out of our control make it difficult to focus on schoolwork. If you are having a personal problem that affects your participation, please talk to me so we can create a plan. If you are not comfortable speaking with me directly, please utilize the other student resources provided below in order to understand how to best approach success in this course given your personal needs. Please do not wait until the end of the quarter to share any challenges that have negatively impacted you. The sooner we meet, the more options we will have to support your overall academic success.

Academic Accommodations Based on a Disability: Students needing academic accommodations based on a disability should contact the UCLA Center for Accessible Education (CAE) at (310)825-1501 or in person at Murphy Hall A255. When possible, students should contact the CAE within the first two weeks of the term as reasonable notice is needed to coordinate accommodations.

Campus Resources and Support Services around UCLA Available to Students:

- **Students in Crisis**: From the Office of the Dean of Students: Faculty and Staff 911 Guide for Students, commonly known as the “Red Folder.” This tool is intended to provide you with quick access to important resources for assisting students in need.
- **Bruin Resource Center**: Includes services for transfer students, undocumented students, veterans, and students with dependents. [http://www.brc.ucla.edu/](http://www.brc.ucla.edu/)
- **Counseling and Psychological Services Wooden Center West**: (310) 825-0768 [www.caps.ucla.edu](http://www.caps.ucla.edu)
- **Letters & Science Counseling Service**: A316 Murphy Hall: (310) 825-1965 [www.college.ucla.edu](http://www.college.ucla.edu)
- **Academics in the Commons at Covel Commons**: (310) 825-9315 free workshops on a wide variety of issues relating to academic & personal success [www.orl.ucla.edu](http://www.orl.ucla.edu) (click on “academics”)
- **Lesbian, Gay, Bisexual and Transgender Resource Center Student Activities Center, B36**: (310) 206-3628 [www.lgbt.ucla.edu](http://www.lgbt.ucla.edu)
- **Center for Accessible Education (Formerly Office for Students with Disabilities)**: A255 Murphy Hall: (310) 825-1501, TDD (310) 206-6083; [www.cae.ucla.edu](http://www.cae.ucla.edu)
  - **Dashew Center for International Students and Scholars**: 106 Bradley Hall: (310) 825-1681 [www.internationalcenter.ucla.edu](http://www.internationalcenter.ucla.edu)
- **Student Legal Services**: A239 Murphy Hall: (310) 825-9894; [www.studentlegal.ucla.edu](http://www.studentlegal.ucla.edu)
- **Dean of Students Office**: 1206 Murphy Hall: (310) 825-3871; [www.deanofstudents.ucla.edu](http://www.deanofstudents.ucla.edu)

Additional Course Policies and UCLA Policies

Use of Laptops, Tablets or Phones in Class: You can decide if you want to use your laptop, tablet or phone in class. However, research finds that laptop multitasking is likely to hinder not only your own learning, but also the learning of anyone who can see your laptop. For the sake of your peers’ learning, I therefore ask that if you use an electronic device during class, either only have lecture notes showing, or sit in the back row.