General Course Information for BIMM 194/BGGN 283 A CRISPR Perspective on Gene Editing

Class meeting information: Fridays at 3-4:20 PM, Tata Hall Room 3201 If we switch to virtual learning, we will meet via zoom at: https://ucsd.zoom.us/j/4932723724

Instructor: Jill Wildonger

Contact: jwildonger@health.ucsd.edu

*Please include "BISP 194" or "BGGN 285" in the subject line of your email.

Office Hours: Tuesdays, 3-4 PM, held via zoom: https://ucsd.zoom.us/j/4932723724

Course Website: https://canvas.ucsd.edu/courses/35339

Course Description: CRISPR has revolutionized gene editing and opened up new possibilities in research, disease treatment, food production, and disease detection, to name a few. We will discuss the emergence of gene editing technologies, and the expansion of approaches made possible by CRISPR-Cas9 and other CRISPR-based systems. Throughout the course, you will also acquire the skills to interpret, evaluate, and present primary literature.

Prerequisite: BIMM100 (Molecular Biology). Success in the course will aided by a strong foundation in molecular biology fundamentals.

Health and Safety: It is important for all of us to work together to protect our health and the health of those around us. Thanks to vaccination, masking, ventilation, screening, and testing, we should all be able to be safe while participating in in-person classes. In our classes, we will always carefully follow the UCSD health and safety guidelines.

- If you have symptoms, please do not attend class.
- Everyone will complete a daily symptom survey on every day that they come to class.
- Everyone will participate in COVID-19 testing as required by their vaccination status.
- If you receive a positive test result, do not attend class until cleared by campus health.
- Everyone will wear a mask that covers their nose and mouth while in the classroom.
- Eating in class is not allowed. Quick sips of beverages are okay.
- If you cannot attend class, please email Prof. Wildonger.

Course Format: Each class is centered on a topic and will include a presentation and discussion of a primary literature paper (~45 minutes) as well a short discussion of a related topic and paper (~20 minutes). Prof. Wildonger will provide brief introductions to topics as needed. In the first two classes everyone will have an opportunity to practice presenting a figure from a paper as part of a small group. Starting in week 3 (April 15), classes will be led by student groups presenting a primary literature paper and leading a discussion of a related topic.

Course Assignments (description, dates & deadlines, and points awarded)

Multiple-choice quizzes on Canvas (20 points total)

There will be a quiz each week on the material covered in each class. <u>Each quiz will be</u> <u>available the Monday before class and should be completed by the following Monday</u> (e.g., the quiz for the first class will be available on Monday March 28 and should be completed by the end of the day Monday April 4). Each quiz has four questions, and you will have two chances to answer each question correctly. Some questions are openended, and any response to these open-ended questions will be marked as "correct." You are welcome to work on the quizzes together in a small group. Your answers should reflect your individual effort or your contribution to an interactive small-group effort. <u>Points awarded for</u> correctly answered questions (incorrect answers receive no points).

Small-group breakout presentations (10 points each; 20 points total)

During the first two classes (April 1 and April 8), the class will be split into small groups to present different figures in the primary literature paper for that week (e.g. one group will present Figure 1, another group will present Figure 2, etc.). Class time will be set aside for the small groups to discuss their figure and determine how to present it. Points awarded for succinctly and clearly summarizing the experimental goals and approach (3 points), results (2 points), interpretation of the results (2 points), and conclusion (3 points).

Group presentation (20 points)

The class will be divided into seven groups, and each group will be assigned to present a primary literature paper and to lead a discussion of the related general interest paper for a class. <u>Group presentations will be the basis of classes 3-10, April 15-June 3</u>. Presentation guidelines are described below (see "Group Presentation Guidelines"). Following the presentation, your group will receive anonymous feedback from your class peers (see "Peer feedback" section below).

<u>Primary Literature Paper Presentation Points awarded for</u> succinctly and clearly summarizing the overall significance of the project and motivation (4 points); when presenting the figures, the experimental goals and approach (2 points), results (2 points), interpretation of the results (2 points), and conclusion (2 points); and your opinion on whether the data in the paper support the authors' conclusions (4 points). <u>General Interest Paper Discussion Points awarded for</u> identifying a topic(s) for discussion and leading a discussion of the topic(s) (4 points).

<u>The same number of points will be awarded to all members of the group</u>. Presentations should be the result of collaboration between group members.

Peer feedback on two group presentations (10 points each; 20 points total)

You will provide constructive written feedback on presentations given by two other groups. I will assign the classes that you will cover. Feedback will be provided based on a template (see "Peer Feedback Template" below), and <u>the feedback will be due one</u>

week following the presentation (e.g., if you are assigned to provide feedback on the presentation given on April 15; your feedback is due by April 22). The feedback that you provide will then be shared anonymously with the presenters.

<u>Points awarded for</u> feedback that is clear, descriptive, and includes the reasoning in support of your comments.

Written Assignment (20 points)

You may choose to write about any of the primary literature articles assigned in the course. You can either write a critique of the paper or prepare an explanation of the scientific advance in the paper for a non-scientist audience. Guidelines for the written assignment are below (see "Written Assignment Guidelines"). You may submit your written assignment anytime between April 8-May 20. Written assignments will be graded by the end of the semester.

<u>Points will be awarded for</u> succinctly and clearly summarizing the overall significance of the project, the motivation, and main take-aways (5 points); summary of the data that the authors use to support their conclusion (5 points); your opinion on whether the data support the authors' conclusion (5 points), and your thoughts on a potential future direction or application (5 points).

Grading: Your grade will reflect a combination of your engagement with and participation in the class (80 points) and your performance on a written assignment (20 points). There is no final exam. Points will be awarded as described below. A total of 100 points is achievable.

20 points.....Multiple-choice quizzes on Canvas

- 4 questions per class, 2 chances to answer each question correctly
- Points are only awarded for correctly answered questions
- 10 points.....Small-group breakout presentation in Class 1
- 10 points.....Small-group breakout presentation in Class 2
- 20 points.....Group presentation in class (one presentation)
- 20 points.....Peer feedback on group presentations by other groups
 - Provide written feedback on two group presentations (other than your own)
- 20 points.....Written assignment, choose one from below:
 - Critique of one of the primary literature articles covered in class
 - Describe the scientific advance reported in a primary literature article for a science novice

Letter grades will be assigned as follows based on the points acheived:

87-100: A (A-, A, or A+) 77-86: B (B-, B, or B+) 67-76: C (C-, C, or C+) 57-66: D Below 57: F Academic Integrity: Academic dishonesty will not be tolerated in this course.

- According to UCSD policy, academic dishonesty includes:
- completing assignments for another student
- allowing another student to complete an assignment for you
- copying another student's work on an assignment
- allowing another student to copy your work on an assignment
- incorporating plagiarized material into an assignment

Any issues with academic dishonesty will be reported to the UCSD Academic Integrity Coordinator and the Dean of the student's college. Confirmed cases of academic dishonesty will result in the student receiving an F as their final grade and other disciplinary actions determined appropriate by the Academic Integrity Coordinator.

Group Presentation Guidelines

All members of the group will contribute to the presentation and discussion. All members should participate in either/both the presentation and discussion.

Primary literature presentation

Prepare a ~30 min presentation, which will allow time for questions (total time: ~45 min).

The presentation should cover:

The overall significance of the project and motivation
What is the problem, or what is the unanswered question?
Why is this important? Provide enough background so the class can understand the rationale behind the study. This may require reading additional papers.
What has already been done, and what do the authors hope to accomplish?
What impact will the work have?
The experimental goals and approach
For example, the authors want to determine whether DNA is cleaved by Cas9 (the goal). To do this, they use X assay (approach).
The key results/data* and the authors' interpretation of the results

*Identify the results/data that are most important to the authors' main conclusions.
It is likely that not all the results/data will be included in the presentation.

Conclusions and the authors' main takeaway
Whether you think the data in the paper support the authors' conclusions
What you think would be the future direction(s) for this study

General Interest Paper Discussion

Prepare to lead a ~20 min discussion

Introduce one or two topics for discussion based on the General Interest topic and paper. The paper generally serves as a resource for structuring discussion. The discussion topics covered in the course vary, and they will range from ethical consideration (e.g., editing the human genome) to considering technical strategies. Discussions typically start with questions; plan several questions to stimulate discussion. Additionally, consider what information will be helpful to the discussion.

Peer Feedback Guidelines

Providing Feedback

Keep in mind that your goal is to provide helpful feedback for the presenters. Your comments should be specific and descriptive (not evaluative). However, it can be useful for a presenter to know your opinion, too. Your comments reflect your perspective, so use "I" phrases, like "I thought..." when providing your opinion. Think about the basis for your comments and provide reasons for your comments. It may be helpful to use "because" to describe your perspective. You are welcome to provide concrete suggestions for improvement.

Do: I really liked your cartoon model of X because it clearly summarized the authors' key findings. But I didn't understand how the authors concluded Y based on Z data. The data presented on the slide were difficult to understand because there were many panels, and I didn't know which panel had the critical results. Perhaps next time don't show all the all the panels, just the panel with the key data, and go slowly through the key data.

Minimize: Your cartoon of X was good. (*This comment is evaluative with no other information; minimize the use of comments that are only evaluative.) But it was hard to understand the data you presented. Your slides were sloppy and crowded. (*Use specific examples, e.g., describe what was hard to understand, what was sloppy or too crowded. Also, keep in mind that *you* found it hard to understand; rephrase this sentence as "I found it hard to understand...")

Your comments will be shared with the presenters anonymously (without your name). A comment on anonymous feedback: When I review manuscripts anonymously, I ask myself whether I would feel reasonably comfortable providing my comments non-anonymously; this serves as a self-check for whether my comments are reasonable and constructive.

Receiving Feedback

Keep in mind that feedback is meant to be constructive and to help in creating effective presentations. This is hopefully an opportunity to evaluate your approach to assembling and giving a presentation. Ways to improve often emerge from similar comments provided by different reviewers. Not all comments, however, may be useful. Consider the suggestions that come up multiple times and identify the suggestions that you feel are useful.

Prof. Wildonger will be glad to go over the feedback during office hours if there are any comments that you would like to discuss.

Peer Feedback Template

Please fill out this form electronically and return to Prof. Wildonger within one week of the presentation that you are evaluating.

Effectiveness of Presentation in Communicating Key Information

Your answers to the questions below will enable the presenters to determine whether they communicated their key points successfully.

Based on the presentation:

1. What would you say is the importance of this work?

2. What would you say is the authors' main takeaway, and was the authors' main conclusion(s) were supported by their work?

Clarity of Presentation in Communicating Key Information

Your answers to the questions below will enable the presenters to determine whether it was easy to follow the presentation, understand the key points, and engage with the material.

For the questions below, consider what worked well, and what didn't. Provide reasoning in support of your comments. You may be tempted to start your response with a yes or no answer, but consider how you could start your comments differently, without using yes or no.

3. Was the information organized in a way that made the story easy to follow?

4. Was it easy to understand the information on the slides?

5. Did the presentation clarify anything that had been confusing when you first read the paper? Did the presentation spark a new idea or question?

Written Assignment Guidelines

The written assignment is due anytime between April 8 and May 20. The assignment will be graded before the end of the semester.

Choose one of the following options:

- Critique a primary literature paper.
- Describe the scientific advance reported in a primary literature paper for a science novice

You may select any of the primary literature papers in course.

Your writing should be in essay form, 4-6 paragraphs (~1.5-2 pages).

Critiques should touch on the following components:

- What is the overall significance of the project and the motivation for doing the work? Consider what you think is significant, not just the significance for the field.

- What are the authors' main take-aways, and how do the authors support their conclusions? Consider whether you feel that the data are presented clearly, and if it is easy to relate the data to the authors' interpretation and conclusions.

- Do you think the data do indeed support the authors' conclusion, why or why not? Consider what you think is needed to do to support the conclusions. Did the authors do this?

- What do you think is a potential future direction or application? If you were one of the authors, what might you do next? Did this work spark any ideas for you?

Reports written for science novices should touch on the following components:

- What is the overall significance of the project and the motivation for doing the work? Consider what you think is generally significant, not just what is significant for a scientist or a scientific field. Consider why a non-scientist would be interested in this study.

- What are the authors' main take-aways, and how do the authors support their conclusions? Describe the experiments and conclusions for a non-expert. Highlight the key experiment(s).

- Do you think the data do indeed support the authors' conclusion, why or why not? Give your opinion on what the authors show and whether you feel the data provide strong evidence for their conclusion.

- What do you think is a potential future direction or application? What would a next step that would be of interest to the general public? To scientists? Why?