

Advanced Topics in Modern Biology BISP194 Protein Folding and Human Diseases

**Winter Quarter 2022
Monday 2:00-3:20 pm
Bonner Rm 2310**

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Office Hours: Thursday 4:00-4:50 pm

My office hours for this course will be slightly different set up and I will explain to you more in detail during the first lecture.

Goals: In this class, we will read and discuss research papers together that have brought **breakthrough discoveries** in our understanding of human diseases, with the goal of learning how to read research papers effectively. For each paper, we will discuss how most research papers are structured, how to identify common pit holes, how to read/analyze the data in a paper independent of the authors' arguments, and how to identify new conclusions and contributions in light of our current understanding of the specific diseases caused by misfolding proteins.

Logistics: Students will be asked to read a different research paper each week before coming to class so that everybody can participate in the discussion.

In addition, each student will be assigned to a specific paper as a part of a small group (3 or 4 students) to present to the class.

During the first class on January 3, 2022, students will hear about a list of papers discussed each week. Some papers are relatively old, but are considered very important papers as they changed the course of our thinking. In addition, students will receive a group assignment. Please make sure that you appear in one of the groups, and take note of the date of your presentation.

IMPORTANT: If you are not presenting, you are still required to read the paper and participate in questions and discussion during the class presentation by your fellow students.

Corona Virus Updates:

Due to the current surge of the omicron variant of the SARS-CoV2 virus, UCSD Chancellor's office and UCSD Academic senate made an announcement on December 21, 2021 that all the lectures will be given remotely via zoom during the first 2 weeks of the winter quarter 2022.

The safety of all the UCSD campus community including both students, staff and faculty is very important. Therefore, after the first two weeks, we will continue to follow the campus decisions and make appropriate adjustments to the lectures accordingly. I will make announcements on canvas as I hear from the campus. *Please make sure to check back the course announcements during this quarter.*

I have set up a zoom link for this course and you will find the link on canvas for this course (BISP194/BGGN285).

Course Objectives:

Revealing the sequence of the entire human genome brought excitement in the fields of molecular and cellular biology, medicine, pharmacology, and biotechnology. Rapid advances in technologies and methods also opened possibilities for researchers to undertake previously regarded difficult or impossible questions. Furthermore, there has been an increase in public interest and funding directed towards finding the causes and cures of human diseases and developing more effective diagnoses. Among the areas that have experienced rapid growth are human diseases that are caused by mis-regulation and accumulation of misfolded proteins or by the failure of protein handling in the cell. In this class, we will read and discuss papers that have brought breakthrough discoveries or paradigm shifts in our understanding of human diseases.

Proteins are by far the most abundant class of macromolecules in cells (approximately 50% of dry mass) and are involved in nearly all aspects of cell structure and physiology. Proteins are assembled from a set of 20 different amino acids, each linked to its neighbor through a chemical "peptide" bond. Initially, proteins are translated as linear polypeptide chains. To perform their intended functions, these chains must first fold into precise three-dimensional configurations. The process of protein folding requires assistance from proteins collectively referred to as the "protein folding machinery" and molecular chaperonin. The critical nature of protein folding capacity is underscored by the many different types of human diseases caused by mis-regulation of protein folding events, including cystic fibrosis, type 2 diabetes, and Alzheimer's disease.

Grading Policy:

No midterm and no final exams.

Attendance of each lecture will count as 5% (5% x 8 lectures= 40% total).

Grades will be determined by (1) attendance (40%), (2) participation in discussion including asking questions during the presentation each week and submitting feedback in time (30%), and (3) presentation (30%).

- A:** 90% or higher
- B:** 70-89%
- C:** 50-69%

Presentation:

How to prepare for a presentation:

1. Important technical information:

Using PowerPoint is a good way to put together materials for making a presentation, although you do not necessarily have to use PowerPoint. The classroom (Bonner 2310) is equipped to handle

If your group decides to give a PowerPoint presentation, please bring a laptop. Mac users will need to bring an adaptor for the projector. Note that different Macs use different adaptors.

2. Preparation for presentation:

A. PLEASE read the entire paper and discuss how to divide up the presentation.

Normally, it makes sense to divide the result section by figures. For instance, if the paper has six figures, each student can present the results described in two figures. In addition, divide the introduction, discussion, and future directions among the members. Please see #4 (below) for more specific instructions.

B. I hold office hours every Thursday at 4:00 pm. I would like to meet with all of the members of the presenting group via Zoom to go over any questions you might have on the paper.

Even if you do not have any questions, I would still like to meet with you to discuss the content of the paper in a smaller group setting. I can also talk to you about what makes a good presentation in general and give specific advice for the assigned paper. After graduating from UCSD, all of you will have some opportunities to make presentations to wide ranges of audiences. The ability to communicate science effectively is extremely important, but not necessarily intuitive. More presentations you give, better presenter that you will be able to give.

- 3. Evaluation:** The ability to give constructive criticism is also a very important skill for everybody. Therefore, after each presentation, non-presenting students in the class will be asked to write a short paragraph or two on the presentation, specifically focusing on (1) what was good and (2) what would have improved the presentation.

4. What to present

- a. Brief overview-----What is the point of the paper? Why is the question/topic important? What are the overall conclusions?
- b. Introduction-----
- (1) What was known prior to the study described in the paper? (This is generally considered the background of the study)
 - (2) What is the specific question (or questions) addressed in the paper? Discuss the background information on the specific biological process (or mechanism).

For example, let's say that the paper discusses the discovery that a loss-of-function mutation of a new translation elongation factor causes a specific human disease phenotype. I would expect you to discuss:

- (i) the specific disease,
- (ii) the overall mechanism (or steps) of translation (with a focus on elongation steps).
- (iii) what motivated the authors to set up the experiments that resulted in the discovery of the link between a new elongation factor and human disease?

- (iv) What was the authors' question(s)? Why is this question(s) important?
- (v) What were the approaches used?

- c. Results section----- Discuss the results of the experiments described in each figure. If there are multiple panels, discuss each individually. I will discuss this in detail during the 1st (01/03/2022) lecture.

Important points to consider for each figure panel:

- *What did the authors want to demonstrate?
- *What was the experimental method?
- *What were the results (which band(s) on the gel or which signals in the microscope picture demonstrate their conclusion?)
- *What was the conclusion(s) drawn from each panel?
- *Do you agree with their conclusion? –(Is the data convincingly clear? Can you see the same changes (or no change) that the authors claim?)
- *Is there other experimental method to demonstrate the same issue? If so, why may one be better than the other?

- d. Discussion and future directions-----

- *What were the overall conclusion(s) drawn from the paper?

- *Do you agree with the authors conclusions overall? Why?

- *What future questions need to be addressed?
- *Is there anything missing from the paper?

Communication Guidelines

As we move through the quarter, you might have questions about the course structure, content, or general inquiries for the instructional team.

If the question is related to course structure, please be sure to read the syllabus and look through the course on Canvas before asking the instructional team. If you have a general course question (e.g. not confidential or personal in nature), please post it to the discussion site. We will announce the name of the discussion in the Canvas course site. I or one of the IAs will post answers to all general questions there (typically within 1 business day), so all students can access the response. You are also encouraged to answer each others' questions as well.

For all other questions, please contact me directly via Email. Please be sure to include a descriptive subject, with [BIMM110] at the front of the subject (e.g. [MATH 101] Request for individual meeting). I will attempt respond to inquiries within 1-2 business day.

Netiquette

Netiquette is a set of rules for behaving properly online. Your instructor and fellow students wish to foster a safe online learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea but you are not to attack an individual. Working as a community of learners, we can build a polite and respectful course community. The following netiquette tips will enhance the learning experience for everyone in the course:

- Do not dominate any discussion.
- Give other students the opportunity to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this

suggests shouting.

- Popular emoticons such as or / can be helpful to convey your tone but do not overdo or

overuse them.

- Avoid using vernacular and/or slang language. This could possibly lead to misinterpretation.
- Never make fun of someone's ability to read or write.
- Share tips with other students.
- Keep an "open-mind" and be willing to express even your minority opinion. Minority opinions

have to be respected.

- Think and edit before you push the “Send” button.
- Do not hesitate to ask for feedback.
- Using humor is acceptable

Adapted from:

Mintu-Wimsatt, A., Kernek, C., & Lozada, H. R. (2010). Netiquette: Make it part of your syllabus. Journal of Online Learning and Teaching, 6(1). Retrieved from http://jolt.merlot.org/vol6no1/mintu-wimsatt_0310.htm

Student Resources

Academic Support

UC San Diego Library

- Ask a Librarian: <https://library.ucsd.edu/ask-us/>
- Library Help: <https://library.ucsd.edu/ask-us/triton-ed.html>

Teaching + Learning Commons

- Writing Hub: <https://writinghub.ucsd.edu/>
Improve writing skills and connect with a peer writing mentor
- Academic Achievement Hub: <https://aah.ucsd.edu/>
Supplemental instruction, content tutoring and learning strategy tutoring

Office of Academic Support & Instructional Services (OASIS):
<https://oasis.ucsd.edu/> *Intellectual and personal development support*

Student Success Coaching Program: <https://successcoaching.ucsd.edu/>
Peer mentor program that includes information, resources, and support in meeting your goals

Additional Student Resources for Your Personal Well-Being

The Hub Basic Needs

The Hub addresses basic needs insecurities you might face. They provide necessary resources, break stigma surrounding basic needs, and foster a sense of belonging for every student. The Hub builds community to help one another.
<https://basicneeds.ucsd.edu/> | basicneeds@ucsd.edu | (858) 246-2632

Counseling and Psychological Services (CAPS)

Services and programs that enhance the college experience, promote academic success, and help you develop effective coping skills.

<https://wellness.ucsd.edu/caps/> | (858) 534-3755

CARE at the Sexual Assault Resource Center

<https://care.ucsd.edu> | sarc@ucsd.edu | (858) 534-5793

Office for the Prevention of Harassment & Discrimination (for Students)

https://ophd.ucsd.edu/policies-procedures/polpro_student.html **Undocumented**

Student Services: <https://uss.ucsd.edu/>

Triton Concern Line: (858) 246-1111

<http://blink.ucsd.edu/go/students-of-concern>

Report students of concern