Organic Structure & Mechanism
BCH 582 – Proteins and Enzymes (3 credits)
Fall 2018

Time:  Monday 2:00-3:20 pm
       Thursday 12:00-1:20 pm
Location: Davidson Honors College (DHC) 119
Instructor: Klara Briknarova
Office: CHEM 111, aka Mouse House (next to Chemistry office)
Phone: 406-243-4408
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Office Hours: arrange

In this class, we will (1) review selected topics in protein biochemistry including protein structure, dynamics, and some of the methods that are used to study proteins, and (2) explore topics in protein science of your choice, in the form of student presentations and student research proposals.

Grading:
Quiz (amino acids)
Homework
Presentation
Participation in class discussions, questions
Research Proposal
Review of other students’ proposals
Revision of the research proposal and response to reviewers’ comments
**Presentation**

Students will identify one or two related original research papers and present a critical review of these papers to the class. At least one of the papers should be recent (published within the last 1-2 years). The topic should not be too closely related to your own research. The presentation should take ~ 60 minutes and include:

1. **Introduction:** What is being investigated and why? Why is it interesting? Why is it important? What is the current state of knowledge?
2. **Methods:** What methods are used to address the research question(s)? If necessary, explain how the methods work.
3. **Results:** Describe the results obtained, and the interpretation of the results.
4. **Discussion:** What are the main conclusions? Are the conclusions justified? Propose additional experiments to address the questions, and to provide additional insight. What is your vision for further research in this area?

**Timeline:**
The topic and the papers should be selected by week 3-4 (2nd year students) or week 4-5 (1st year students). Email me the original research papers that you are considering; additional research articles in the field or recent reviews might also be useful. Once I approve the choice of the topic and papers, your presentation will be scheduled. The presentations will start in Week 6.

At least one week before the presentation, I will distribute the papers (and additional relevant reading, if applicable) to everyone in the class. All students are expected to read the materials and prepare questions and comments for discussion of the paper(s) in class.
Research Proposal (due in Week 12)
Students will submit a written research proposal in which they will identify an open research question (or questions) and present a plan to answer this question. Format of the proposal: maximum 7 pages with 0.5”-1” margins, single-spaced, font size 11 point or larger.

The proposal should contain the following sections:

1. **Title and Abstract.** The abstract (200 words maximum) should describe in general terms the problem, the approach, and the rationale, i.e. why it is important to do this research. This page does not count toward the 7 page limit.

2. **Specific Aims.** State concisely what you plan to do, with the assumption that the reader is somewhat experienced in the field. The Specific Aims should be numbered so that they can be referred to in the rest of the proposal. The Specific Aims section should be self-contained and on exactly one page.

3. **Background and Significance.** The background and significance provides the setting for the problem that you plan to address. It is not necessary to review and cite all of the literature in the field, only the research that has been done that will help the reader to understand the problem and why you need to study it. However, be careful to cite all the literature that is crucial for the evaluation of your ideas. For example, if there are conflicting models, or if there is a research paper out that addressed a similar problem but that you do not believe, you must cite these and explain your position rather than ignore them. If a reviewer realizes that you have not cited all potentially relevant research, he or she may conclude that you have not taken all known data into consideration, and that the proposed strategy may be flawed.

4. **Innovation.** Include a paragraph or two that highlight what is innovative about the research you are proposing.

5. **Preliminary results.** In this section, you can give details of some specific experiments that lead up to your proposed experiments. In a 'real' proposal, these would be details of experiments you (or a collaborator) have performed, which may or may not be published. In the present case, you will use published experiments that you feel are the most immediately relevant to your proposed experiments.

6. **Experimental design.** Explain carefully how you plan to address each of the Specific Aims. You must include enough detail to convince the reader that you know how to use the proposed technology. Discuss what you hope to learn with each experiment, and what difficulties you may experience, either technically with the experimental procedure, or with the interpretation of results.

Figures are helpful, but figures and text for items 2-6 cannot exceed 7 pages. A bibliography of literature cited in the text should be added after the Experimental Design section and does not count towards the page limit. Use full citations including titles of papers.

The proposal should be free of typographical errors, spelling mistakes and grammatical errors. Proofread your proposal carefully, and ask a friend or colleague to read it as well.
Additional guidelines for writing the research proposal:

Choose a title that is descriptive and concise.

Abstract: Identify the problem, state a hypothesis, and indicate how the hypothesis will be tested.

Specific Aims page: Concisely frame the problem, the goal of the research, the hypothesis/hypotheses, and the experimental approaches.

Background/Significance: Provide enough information for a non-expert in the field to understand the context and to convince them that the problem is interesting. Explain where the knowledge gaps are. Provide enough information to make the hypotheses seem well grounded.

Innovation: Include a section that describes what is novel about the research that you propose.

Approach (Preliminary results & Experimental design): Provide enough preliminary data and background information to justify the experiments proposed. Explain what you are going to do and why. Provide enough information about the proposed experiments so that the reviewer has confidence that you know what you are getting into. In addition, describe anticipated outcomes (and data analysis, if applicable), address potential pitfalls, and outline alternative approaches.

Also please make sure that:

- Proposal is clearly written and organized
- Audience is appropriately targeted
- Supporting information is appropriately cited, and bibliography is in standard format
- Proposal has been carefully proofread, and is free of typographical and grammatical errors
- Proposal is submitted on time
Peer Review of Research Proposals (Weeks 14-15)

You will be assigned to be primary reviewer on one proposals and secondary reviewer on 2-3 other proposals.

In an NIH grant review panel, each grant is assigned, upon review, a score in the range 1-9 (1 = exceptional, no weaknesses; 5 = good, medium impact; 9 = poor, no discernible strengths) for Overall Impact, which is the composite score based on the individual scored criteria of Significance, Innovation, Approach, Investigator, and Environment. The Overall Impact should be a measure of the project’s likelihood to have a sustained, powerful influence on the research field(s) involved, and is not a numerical average of the scores given to the individual scored criteria. For example, if the perceived Significance of a project gets a very low score, even if all of the other metrics are very good, it would probably still get a low Overall Impact rating, because the research was not anticipated to make a big impact in the field.

1. All reviewers: Carefully read the proposal and familiarize yourself with literature in the proposed area of research.
2. Primary reviewers: Write a brief summary of the project under consideration. Use your own words, do not copy and paste from the proposal and repeat verbatim the description provided in the proposal.
3. All reviewers: Assign numerical scores and address the strengths and weaknesses for the Significance, Innovation, and Approach review criteria. Will the proposed work fill a knowledge gap (or has it already been done)? Will it make a significant advance in the field? Is it innovative? Are the experiments feasible and are they likely to provide answers to the research question(s) posed? Be brief but make sure to highlight the strengths and identify all weaknesses and possible pitfalls. Your written critiques should be consistent with your numerical scores.
4. All reviewers: Assign a numerical score for the Overall Impact, and write a paragraph that justifies your decision.

Time line: Written reviews will be due on the day of the review of the proposal. Reviewers will also present their review in class during the discussion of the proposal.
**General University policies concerning written assignments**

In working through homework assignments, students are encouraged to work together to solve problems, to share information or resources, and to test each other’s understanding of the material. Those are all acceptable forms of collaboration. However, the written work that each student turns in must be his or her own. Only in this way can faculty judge individual understanding of concepts or information. A good rule of thumb for students to follow is to work together up to the point of committing words to paper. At that stage, each student must work independently. A second key guideline is that once a student has written an out-of-class assignment, it must not be shown to another student in the course. Assignments from two or more students that have significant overlap, in the professional judgment of the faculty member, will be regarded as reflecting a violation of the expectation that students turn in independent assignments. Please note that direct copying of sentences from any published without proper citation is considered plagiarism. THIS INCLUDES THE INTERNET. Be sure to put the information in your own words and be aware that the instructor may check literary and Internet resources. Violations will be dealt with according to the Student Conduct Code.
Tentative schedule:

Week 1  M 8/27 Introduction  
         R 8/30 Pymol (TC)  
Week 2  M 9/3 Labor Day (no class)  
         R 9/6 Quiz (Amino Acids)  
Week 3  Schedule presentation  
         M 9/10  
         R 9/13  
Week 4  Schedule presentation  
         M 9/17  
         R 9/20  
Week 5  Schedule presentation  
         M 9/24  
         R 9/27  
Week 6  M 10/1 Presentation  
         R 10/4 Presentation  
Week 7  M 10/8 Presentation  
         R 10/11 Presentation  
Week 8  M 10/15 Presentation  
         R 10/18 Presentation  
Week 9  M 10/22 Presentation  
         R 10/25 Presentation  
Week 10 M 10/29 Presentation  
         R 11/1 Presentation  
Week 11 M 11/5  
         R 11/8  
Week 12 Research proposals due  
   M 11/12 Veterans Day (no class)  
   R 11/15  
Week 13 M 11/19  
   R 11/22 Thanksgiving (no class)  
Week 14 M 11/26 Review of research proposals  
         R 11/29 Review of research proposals  
Week 15 M 12/3 Review of research proposals  
         R 12/6 Review of research proposals  
Finals Week 12/10-13 Revised proposals due
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Name: _____________________________________

Class (circle one):  
1st Year Graduate   2nd Year Graduate   3rd Year Graduate   Other (please explain): ______________________________

Program: _________________________________

Why are you taking this class?

What do you expect from this class?

Research Group (if known): _________________________________

Research interests:

Protein interests:

Other comments: