

Biochemistry 495: Senior Seminar, Spring 2020

Course Syllabus and Schedule

Tuesdays, 10:20am - 12:20pm. All class sessions will begin in Room 101 Biochemistry Bldg. (BCH).

Course Instructors:

Prof. Carol Wilkins (sect. 1, room 101 BCH)
502B Biochemistry Building
353-4927; mindockc@msu.edu

Prof. Kaillathe (Pappan) Padmanabhan (sect. 2, 111 BCH)
202A Biochemistry Building
353-0814; padmanab@msu.edu

Teaching Assistant (for writing assignments and questions on D2L content):

Elise Rivett
rivettel@msu.edu

Objectives:

This 2-credit seminar course is designed to acquaint senior biochemistry majors with a range of current topics in biochemistry research. Students will become familiar with the scientific method: posing a hypothesis, developing methods or experiments to test the hypothesis, interpreting the results of the experiments, and placing those results in context of current knowledge in the field. Students will also gain experience in invaluable career and public relation skills such as clear and compelling scientific writing, public speaking, career preparation and interviewing.

Prerequisites:

BMB462 taken previously or concurrently with BMB495. Open only to biochemistry majors.

Required text:

None. Materials for the course will be posted on <http://d2l.msu.edu>
Log in using your MSU netID and select BMB495 to access the materials.

Course Summary:

The course begins with workshops on biochemistry career development, identifying well-validated biochemical information online, and communicating effectively in reports and talks. The following weeks of the course are organized as mini-symposia on current research topics spanning the breadth of biochemistry. The first week on each research topic will feature a short (20 minute) introductory talk by a professor who is an expert in that research field, placing the topic into context, followed by a question and answer session with the class members. Students who choose to write a report on that topic may also ask questions about the report paper (provided under the professor's folder on the D2L website). Students who will present talks on the professor's topic the next week are also welcome to ask questions about the papers they will present the following week. Each student presenter will give a 15-minute talk on his or her topic, followed by five minutes of questions and discussion. Later in the semester, students will have an opportunity to prepare and present a poster covering alternative sides to a controversial societal topic involving biochemistry.

Grade Components:

- **An oral presentation** on a research topic each student selects during the first class (which can be a talk prepared on the student's own research for the undergraduate research forum, UURAF; if so, sign up to present during the last week of class); 16% of the grade
- **A poster presentation**, in which each student works with another student to cover both sides of a controversial topic in biochemistry; 16% of grade
- **Resume/cover letter** peer-review assignment; 8% of grade
- **Job interviewing** assignment; 8% of grade
- **5 written reports** on professors' topics other than the topic of your oral presentation (8% of grade for each report); together, they contribute 40% to your course grade. There are 9 topics from which to choose.
- **Class participation**; 12% of grade
 - 6% of grade for turning in 10 evaluations of student oral presentations (one per week), evaluating one poster during the poster session other than the one in which you are presenting, and completing one brief survey during the final class session (12 evaluations in total)
 - 6% of grade for asking at least 6 questions following professor and student talks throughout the semester

- **Peer-review and report improvement bonus:** up to 1 pt bonus per report for having up to 5 of your reports pre-reviewed by peers or Writing Center personnel, followed by your using that feedback to revise and improve your report prior to submitting it in class. Prof. Wilkins will cover the details in class. Learn how to benefit from the Writing Center at <http://writing.msu.edu>.
- The course grading at the end of the semester will be roughly as follows: **90% or better, 4.0; 85-89%, 3.5; 80-84% 3.0; 75-79%, 2.5;** etc. We may do some curving to make grade divisions at natural points in the grade distribution and to reflect that the material varies slightly in difficulty from year to year. We will also normalize scores between the two sections of the class if needed to ensure that the grading scales are consistent. The highlighted ranges above are a good guide on what you can expect.

Reports and oral presentations on research topics

Each research topic led by a professor will have a *particular style* specified for your presentation (which should be 15 minutes long with PowerPoint slides plus 5 minutes for questions) and report writing (no more than 3 pages in length and typed with double spacing). The professor will provide literature for you to review in his or her folder on D2L, with one document designated as the basis for report writing (for debate-style reports, this will involve several documents covering the pro/con sides), and three documents designated for coverage by different students giving oral presentations. Carefully follow each professor's instructions in his or her folder. Students giving oral presentations on the same professor's topic in a given class section (Dr. Padmanabhan's or Dr. Wilkins') should coordinate with one another on which student will cover each paper so that no paper is presented twice in the same classroom. Your presentation grade from Dr. Wilkins or Dr. Padmanabhan will reflect your ability to convey the scientific information accurately and clearly, as well as the logical flow, grammar, formatting, and correct citation of the images/data shown in your slides. When formatting your slides, please include the slide number on the bottom or lower-right corner of each slide after your title slide.

The style to use for each professor for his or her reports and the (possibly different) style to use for presentations is defined in the professor's folder on D2L. Which paper to use for reports versus presentations is also noted in the folder. Reports are due at the beginning of class one week after the professor's introductory talk on that subject.

Whether you are submitting a report or presenting a talk, your primary reference should be cited in full detail, including the title, at the *beginning* or your report/talk, using a format such as:

Rasmussen, S.G., Devree, B.T., Zou, Y., Kruse, A.C., Chung, K.Y., Kobilka, T.S., Thian, F.S., Chae, P.S., Pardon, E., Calinski, D., Mathiesen, J.M., Shah, S.T., Lyons, J.A., Caffrey, M., Gellman, S.H., Steyaert, J., Skiniotis, G., Weis, W.I., Sunahara, R.K., and Kobilka, B.K., Crystal structure of the beta2 adrenergic receptor-Gs protein complex. *Nature* 477, 549-555 (2011).

When you cite any other references in your talk (for a figure or data), include the full reference on the slide where you show the figure or data (e.g., as a footnote at the bottom of the slide) rather than putting all the references at the end of your talk. This helps the audience understand who made those contributions.

The three report styles are Debate, Layperson, and Technical, as described below. Talks will either be in Debate or Technical style. For technical talks and papers, keep in mind that your audience consists of your peers, and what you say should be fully comprehensible to them. Unfamiliar terms (jargon and abbreviations) should be kept to a minimum and fully explained. **Copying the wording of the author of a paper or other work should never be done in reports or presentations;** that is plagiarism (making it seem like someone else's work or writing is your own). Our goal is for you to understand and be able to explain the work clearly in your own words. Quotes are also frowned upon in scientific writing, even direct quotes that mention the person who made the statement. For both reasons, including quotes will be penalized in your reports. For instance, instead of saying " 'Obese mice consumed, on average, 43.2% more calories than normal mice,' stated by Dr. Jones [reference]," describe this finding in your own words.

Debate format focuses on controversial issues. Example: "Is it in the public's best interest for a diagnostic test to be patented?" If writing a debate style report, you will primarily address either the *pro* or *con* side of the debate, while mentioning briefly and countering the arguments presented for the other side of the debate. Peer-reviewed or scientifically validated technical reading on both sides of the issue will be provided in the professor's folder on that topic. For oral presentations in debate style, one speaker will present each side of the issue. When there are three speakers, one student will present the background context of the issue at the

beginning of the session. As with the other talk formats, PowerPoint slides with graphics should be designed to accompany your debate. On the title slide, cite the complete primary peer-reviewed reference you are covering. On the other slides, cite the references for all data and figures you include from other sources, using footnotes to give the *complete* literature reference in a consistent format, such as shown in the middle of page 2, above.

Your debate-style report should be 2-3 pages long typewritten and double-spaced. Include the following sections in your report or talk, with the following section headings:

Title. Clearly define the debate topic and your position on the debate with an interesting title.

Introduction and Background: Introduce the topic that is being debated, document how it came to be an important issue, and state the two opposing positions. For talks, provide the full reference for the primary paper(s) you are presenting as part of your title slide.

Pro or Con: Clearly state which side of the debate you are defending, and summarize the key points supporting your position. (Your detailed arguments will be presented in the next section.) Your grade will *not* depend on which side you choose, nor do you have to choose the side of the debate with which you personally agree. It is challenging and interesting to defend the other side just as strongly. You may end up changing your own opinion on the matter or strengthening your ability to defend your position.

Main Points and Scientific Validation: These are the key points that will sway your audience to believe your position. You should support your arguments with scientific examples and data from peer-reviewed/high-quality scientific literature. Also address and try to discredit the opposing view of the debated issue. Your position should be clearly documented by data and figures.

Conclusions: Summarize the arguments used to validate your position on the debated topic. If you are successful, the reader will now be convinced that your position is the correct one to take.

Layperson, where you explain scientific information in terms that are interesting and clear for a non-scientist. **Layperson style will be designated for reports only (not talks).**

Layperson reports should be 2-3 pages long, follow the style of a *Science News* article, and summarize the assigned research paper. **Include an original, topic-relevant, appealing title for your report.** See <http://www.sciencenews.org/> or access its articles through MSU's subscription at er.lib.msu.edu. A sample *Science News* layperson article is also provided in the Writing Pointers folder on D2L. See another article in the same folder about why writing for the layperson is so important for scientists to make a difference in society! Currently, there is a great divide between scientists' ability to make thoughtful, objective decisions on societal issues, and the public's ability to do the same. This is largely due to our use of highly technical terminology, which hinders non-scientists' understanding of advances or concerns (think climate change!). We have a responsibility to bridge that gap by explaining things clearly and objectively to those with different backgrounds, resulting in better decision-making for all. Using familiar examples can be a very effective approach. In your report, include complete references for the literature you cover in a format such as that shown on the previous page.

Technical format is the standard style for formally presenting a study to other scientists. Here, consider the audience to be senior undergraduate biochemistry students. Your talk or report should be clear to students with no specialized background in the topic you are presenting and explained in your own words. Therefore, avoid unfamiliar technical terminology and minimize the use of abbreviations. Instead, focus on the clarity of your explanation as though you were teaching about the subject, and back up your statements with appropriate data and figures from the paper. Cite peer-reviewed references for the literature you cover and the figures you include. You only need to cite the paper you are summarizing once, at the beginning of the report or talk. Any material (including figures) from other sources should be fully cited where used. For **original research** papers, which present new data and results, include the following, each as a labeled section of your report/talk:

1. **Title and full journal reference** for the paper you are covering, including the authors' names (following the format in the middle of pg. 2, above), on your title slide
2. **Hypothesis** or **Scientific question** being addressed by the research
3. **Background and significance**
4. **Methods**
5. **Experimental results** (summary of the objective data, and observed trends)

6. **Conclusions** (based on interpretation of the results, and relating results back to the original question being addressed, and the prior state of understanding of this question in the literature)
7. **Your perspective** on particular weaknesses or strengths of the paper

Alternatively, if the paper you are reporting on is a *review paper* summarizing several recent advances in the area rather than a paper that is the first publication of new (original) results, cover the following points in separate, labeled sections:

1. **Title and full journal reference** for the paper, including authors' names (see format, mid-pg. 2) Include the main, complete reference for this paper on your title slide
2. **Topic** being reviewed
3. **Background and significance**
4. **Summary of different groups' methods and results** discussed in the paper
5. **Conclusions** (what these approaches and results tell us about the state of the art, and the remaining challenges to be solved)
6. **Your perspective** on particular weaknesses or strengths of the paper

Late work is not accepted. Reports are due in printed form at the beginning of class one week after the professor's overview presentation on this topic. The TA will not accept or grade late reports. Students turning in reports after hearing the student presentations would have an unfair advantage over students who turned in their reports on time. Students have the opportunity to select 5 topics for writing reports out of the 9 topics in the course; therefore, if you miss submitting a report due to a medical or family issue, just submit a total of 5 papers on other topics. Oral presentations will not be rescheduled unless an MSU physician-signed medical excuse has been provided *before* class. Points for class participation cannot be made up since they require interaction with other students, so plan to come to class each week and participate; this includes the peer-review of mock job applications and job interviews, points received in class for asking questions after students' and professors' talks, and your written evaluation of other students' talks.

Poster presentation. During the third week of class, you will sign up with a partner of your choice to present a poster on two sides of a current controversial topic in biochemistry later in the course. The details of this assignment will be handed out in class and will follow the debate format listed above. The information should be presented in debate style while being formatted as a 36" tall X 48" wide conference poster using PowerPoint or a similar tool, with the presenters' names listed on the poster along with the side of the debate each student presents (pro or con). Use large fonts so the poster will be easy to read from a few feet away when printed in full size. An example template with good font sizes is provided online. The poster should be printed on paper the week before it is due to be shown in class by making arrangements several days in advance with computer specialists Dr. Padmanabhan (Pappan) or Steve Lundback in room 202 Biochemistry (Dr. Kaillathe Padmanabhan; padmanab@msu.edu, 353-0814; Steve Lundback, lundback@msu.edu). Posters cannot be printed by Pappan or Steve on the Monday or Tuesday or your poster session week. Bring your poster to class the day you are scheduled to present.

The point scale for written reports is below. For poster and oral presentations, the scale is doubled, with 16 reflecting excellent work, 14 very good work, etc.. Roughly equal weight is given for logical, clear presentation of the scientific content and for quality of writing (grammar, organization, and format):

- 8 excellent
- 7 very good
- 6 good
- 5 reasonable
- 4 some effort
- 3 poor
- 0=nothing submitted or evidence of plagiarism

Plagiarism. Copying sentences from a paper, website, or other source, or using another's writing as part of your report or presentation is considered plagiarism and will result in a grade of zero for that assignment. In the real world, plagiarism is a crime, considered to be stealing another's writing/intellectual property. Short phrases (a few words) or quotes (within quotation marks and a full citation of the source) are not illegal; however, our course policy is for you to not include quotes. This is because it is highly unusual in scientific writing to quote others. **The goal is for you to explain others' work in your own words, which is**

important to convey that you understand and can explain the material. Please consult Dr. Wilkins' presentation during the third class session to understand what constitutes plagiarism and how to avoid it. Health Sciences Librarian Susan Kendall will discuss how to correctly cite others' work during the second week.

Ensuring effective talks and posters. Successful presentations emphasize data and figures from the paper (and other peer-reviewed/validated scientific sources), accompanied by clear explanations of how they address the research question. Minimize the number of words and the complexity of your panels/slides; one-line bullet points work well. Presenting the ramifications of those results for science, technology, health, or the environment will make your talk more interesting. Visual aids (images, data, schematic diagrams) are essential. PowerPoint slides shown by a video projector are the standard for professional presentations in all fields.

High quality writing and presentations are important in most scientific careers. For help with writing, make use of the resources on our D2L website, the MSU Writing Center (which will also help with PowerPoint presentations) and:

- Purdue OWL: an online writing resource helpful for all students: <https://owl.english.purdue.edu/owl/>
OWL also has a specific ESL menu for students for whom English is a second language
- Another writing resource particularly useful for ESL students: <http://www.eslcafe.com/>

For your presentation, bring your PowerPoint file on a USB stick drive or download it from your MSU mail or Google Drive account, and then project it from the console computer in your classroom. The console computers have PowerPoint but are unlikely to have other presentation software. So, if necessary, convert your talk to ppt or pptx format beforehand. It is advisable to load and test your talk with the video projector in the room where you will present at least 10 minutes before class and preferably a day or two before to make sure it appears properly. Rooms 101 and 111 are often available late in the day. You can arrange with Profs. Wilkins or Padmanabhan to have early access to 101 BCH, if necessary. You are strongly encouraged to do several practice talks, including once with the session professor (schedule this in advance), and to time your talk to ensure it is 15 minutes in length without rushing. Working with the professor to review and practice your talk will significantly enhance its quality! This is a great opportunity to practice speaking to others about science, which will help with job or graduate school interviews, too.

Student and professor evaluation of presentations. All students, including the speakers, will provide anonymous written feedback for one of the student speakers each week, using an evaluation form provided in class. This counts towards the participation part of the course grade. Talks will be graded by the section instructors, to ensure grading consistency. Each speaker will receive an email from his or her instructor with feedback on strong points and areas that would benefit from improvement, typically a week after the presentation.

Credit for class discussion. Students are encouraged to ask questions after the presentations, as part of their participation points (6 pts for 6 questions). Much of what makes the class successful and fun is active participation by the audience through discussion. As we discuss each topic, consider the following implications:

What is the importance of this topic in biochemistry and technology? What are the ethical or political issues in this area? Are there parts that are confusing, contradictory, error-prone, or incomplete?

Participate vigorously! This makes the class experience much more interesting than being passive and encourages your neurons to keep up the good battle. Discussion strengthens your professional network and provides the speaker with thoughtful feedback and ideas. It's how scientists learn from each other!

BMB495 Session Schedule for 2020

1/7 Orientation and Career Workshop in 101 BCH

(A) Course organization and how it relates to career preparation (10 min, Prof. Carol Wilkins)

(B) Biochemistry career workshop, led by Brian Telfor, Career Services Coordinator (telfor@msu.edu), in 101 BCH (40 min) – Career options for biochemistry graduates

(5-minute break)

(C) Resources for finding appropriate positions; science resume, cover letter, and interview preparation, led by Brian Telfor (35 minutes)

(D) First assignment handed out by Prof. Carol Wilkins: select a job ad and prepare a resume and cover letter to be turned in at the beginning of class next Tuesday for peer review

(E) Sign up for oral presentation topic and date (Profs. Carol Wilkins and Pappan Padmanabhan)

1/14 Writing workshop in 101 BCH

(A) Effective use of online scientific resources, to advance your ability to discern well-validated information on the web and do literature/web research on biochemical topics to enhance your understanding and presentations (50 min, Health Sciences Librarian Susan Kendall (skendall@msu.edu)

(5-minute break)

(B) Peer review workshop on student resumes and cover letters by Prof. Carol Wilkins and Elise Rivett - Students will turn in their resume/cover letter assignments at the beginning of class and then learn how to peer review each other's work. For peer review throughout the course, we will only give you credit if the review includes several specific comments on how to improve the paper (choose a reviewer who can give you serious, constructive feedback!) You will use that feedback to create an improved version of your writing to submit. Every piece of writing can be improved and becoming an effective communicator is an ongoing and gratifying process!

1/21 Biochemistry communication and research in 101 BCH

(A) Overview on how to read the scientific literature, write good reports without plagiarism, and present effective presentations that engage your audience (50 min), Prof. Carol Wilkins

(5-minute break)

(B) 11:15am in 101 BCH: Prof. Beronda Montgomery (montg133@msu.edu) presents on **Competition and Developmental Plasticity in Photosynthetic Organisms**

(C) 12:10pm in 101 BCH: Your poster assignment and set of pre-approved poster topics are available under "Poster Assignment" folder on D2L. Dr. Wilkins will discuss the assignment and you will **sign up with a poster partner**. Be sure to sign up in the section of the course for which you are registered, since poster partners must be in the same section.

1/28 10:20am in 101 BCH: Prof. Heedeok Hong (honghd@msu.edu) presents on **The Conformational Nature of Denatured States of Proteins**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on the topic of **Competition and Developmental Plasticity in Photosynthetic Organisms**

2/4 10:20am in 101 BCH: Prof. Erich Grotewold (grotewol@msu.edu) presents on **The Protein-DNA Interaction Landscape**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **The Conformational Nature of Denatured States of Proteins**

2/11 10:20am in 101 BCH: **Prof. Rob Quinn** (quinnrob@msu.edu) presents on **Molecular Mechanisms Underlying Mucus Dysfunction in Cystic Fibrosis**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **The Protein-DNA Interaction Landscape**

2/18 10:20am in 101 BCH: **Prof. Michaela TerAvest** (teraves2@msu.edu) presents on **Extracellular Electron Transfer**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **Molecular Mechanisms Underlying Mucus Dysfunction in Cystic Fibrosis**

2/25 10:20am in 101 BCH: **Prof. Jin He** (hejin1@msu.edu) presents on **Targeting Stem Cells for Cancer**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **Extracellular Electron Transfer**

2/26 Deadline to drop the course with no grade reported (8pm online)

3/3 Spring break – no class

3/10 10:20am in 101 BCH: **Prof. John LaPres** (lapres@msu.edu) presents on **The Aryl Hydrocarbon Receptor and Kynurenine Pathway in Regulating Inflammation**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **Targeting Stem Cells for Cancer**

3/17 10:20am in 101 BCH: **Prof. Arjun Krishnan** (arjun@msu.edu) presents on **Machine Learning for Complex Trait Genomics**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **The Aryl Hydrocarbon Receptor and Kynurenine Pathway in Regulating Inflammation**

3/24 10:20am, 101 BCH: **Prof. Polly Hsu** (pollyhsu@msu.edu) presents on **Translational Landscape and Regulation in Plants**

At 11am, class sections will divide between 101 BCH and room 111 for student presentations on **Machine Learning for Complex Trait Genomics**

3/31 10:20am, 101 BCH: Elise Rivett, Dr. Carol Wilkins, and Dr. Pappan Padmanabhan present on **Strategic Career Management** (10 min each plus 15 min for questions afterwards)

Dr. Wilkins will discuss how students should prepare for the **Mock Job Interview** session next week

At 11:10am, class sections will divide between 101 BCH and room 111 for student presentations on **Translational Landscape and Regulation in Plants**

4/7 10:20am, class sections will divide between 101 BCH and room 111 for **Mock Job Interviews** between students, coordinated by Prof. Wilkins and Prof. Padmanabhan

4/14 10:20am **Section 1** (Prof. Wilkins) **Poster Session 1**, inside 101 BCH

10:20am **Section 2** (Prof. Padmanabhan) **Poster Session 1**, in hallway near 111 Biochemistry

All students will participate in the poster session discussions and evaluate a poster the week they are not presenting a poster.

4/21 10:20am Section 1 (Prof. Wilkins) **Poster Session 2**, inside 101 BCH

10:20am **Section 2** (Prof. Padmanabhan) **Poster Session 2**, outside 111 Biochemistry

All students participate in the poster session discussions and evaluate a poster the week they are not presenting a poster.

5/1 Friday, 10 AM to noon in 101 Biochemistry

Student presentations on their undergraduate research, following the same format as other technical presentations in the course. Both sections will meet in 101 Biochemistry.