

# Senior Project MB&B 490b, 2018

## Faculty:

Mark Solomon (in charge)	(436-9053, Bass 218, <a href="mailto:Mark.Solomon@Yale.edu">Mark.Solomon@Yale.edu</a> )
Matt Simon	(737-3274, MIC 231, Bass 220, <a href="mailto:Matthew.Simon@Yale.edu">Matthew.Simon@Yale.edu</a> )
Dieter Söll	(432-6200, Bass 238A, <a href="mailto:Dieter.Soll@Yale.edu">Dieter.Soll@Yale.edu</a> )
Thomas Steitz	(432-5617, Bass 418A, <a href="mailto:Thomas.Steitz@Yale.edu">Thomas.Steitz@Yale.edu</a> )

## Purpose:

To write a critical research paper and give an oral presentation on a topic of the student's choice. Although the workload for this course is modest, the structure is designed to assist you in your critical analysis by spreading out the project to give time for reflection. The quality of the paper should be suitable for publication. This course is required of and open only to MB&B seniors in the BA and BS (but not BS/MS) tracks. Your grade will be based primarily on your paper (50%) and presentation (30%), with a smaller contribution based on your effort throughout the term (20%). Note: Only students receiving a grade of A or A- in this course are eligible for Distinction in the Major.

## Overview and Deadlines:

**January 17, 5:00 PM in Bass 305:** Mandatory organizational meeting.

**PLEASE NOTE CHANGED DATE.**

**January 26:** Submit general topic for your paper.

**February 9:** Meet with your mentor to discuss your topic.

**March 9:** Meet with your mentor to discuss outline of your paper.

**March 30:** Submit your draft to your faculty mentor.

**April 13:** Receive feedback on your draft.

**April 27:** Submit final version of your paper.

**Week of April 30:** Oral presentation.

## Details:

Organizational meeting (Wednesday, Jan. 17 at 5:00 PM in Bass 305) (PLEASE NOTE CHANGED DATE.): This meeting will summarize the requirements and structure of the course. Prior to this meeting, please spend ten minutes reading and thinking about the structure of the following paper: Yamazaki D, Trigg MA. (2016). Hydrology: The dynamics of Earth's surface water. *Nature* **540**: 348-349 (pdfs with and without comments are available on the Canvas server), which provides a (short) model for your paper. We will briefly discuss the organization of this paper. Entering Bass: Due to construction, the main entrance to Bass is closed. A good route is to enter Science Hill from Prospect Street. Enter SCL and follow the signs to Bass. You will turn right in the main hallway, turn left near the end of the hallway, turn right at the end of this smaller hallway, go up a few steps to exit the building, and then enter Bass on level

3. For the adventurous, there's also an entrance to the right of the loading dock on the Whitney side of the building.

Select a topic (Jan. 26): You can write about any topic within the broad purview of Molecular Biophysics & Biochemistry. The broad area of the topic can be one in which you've done research at Yale or elsewhere, an area from coursework, or an area from your independent reading of the literature. The goal of your paper is to critically review a recent (last year, possibly two) development in your field, represented by at least one but preferably a handful of publications. Although the field can be one in which you've done research, we do not want to hear anything about your own research!

By Jan. 26, go to the Google doc at <http://bit.ly/2jlf1k> and enter your contact information, a one-sentence summary of your proposed topic area, and any lab you've worked in that's related to your proposed topic. We will use the topics to divide you among the four faculty who will serve as your mentors during the writing of your papers. If you're struggling to select a topic area, contact any of the course faculty as early as possible.

First meeting with your faculty mentor: By Feb. 9, you should meet with your faculty mentor to discuss your topic. Be prepared to discuss the field as well as the recent developments on which you'll focus. Your mentor will give you feedback and can help you refine your topic and answer your questions. In this and subsequent interactions with your mentor, you and your mentor have obligations to each other. You should expect to be contacted if you miss a deadline. Conversely, you should contact your mentor if you don't receive feedback when expected. Contact the instructor in charge (Mark Solomon) if you feel your mentor is not meeting his obligations.

Outline of your paper: In the ~four weeks following your first meeting with your mentor, you should perform the bulk of the reading for your paper and have your thoughts well organized. Your mentor will be available to discuss any ideas or concerns you have (you think your topic may be too broad/narrow, the recent developments don't seem exciting enough, ...). Prepare a detailed outline of your paper, along with a fairly complete list of references. The outline doesn't have to be a formal A1(c)ii-type outline, but it should be comprehensive and well organized. One approach is to present what could be the topic sentences for each of the paragraphs of your paper. Discuss your outline with your faculty mentor during the week of March 5. Ask your mentor whether they want to see your outline in advance.

Draft (Mar. 30): Your draft is intended to be a complete and well-crafted work at the level you would normally consider a finished term paper. We encourage you to share and discuss "pre-drafts" with fellow students from your mentor group. Faculty mentors can only accept one draft for each paper. Ask your faculty mentor if they prefer the draft to be submitted electronically or in hard copy. The effort you put into your draft will factor into the "effort throughout the term" component of your grade.

Content of your paper: Begin with a brief Abstract of your paper to orient us as to where you'll be going. Your paper will necessarily include a significant section bringing the reader up to speed on the field, with an emphasis on background work we

need in order to appreciate the importance of the recent developments on which you will focus. You should critically review this background information (what's known for sure, what's in doubt, what's controversial, what do you think is wrong, what are the gaps in knowledge that will be filled by the recent papers...) as appropriate for your topic. Aim your presentation for a scientifically literate person with no specialized knowledge of your topic (such as your classmates or your faculty mentor). Next, present a major recent development or cluster of recent developments, which have significantly advanced the field, contradicted previous work, etc. Maybe there's a flurry of recent papers that don't all agree. The paper(s) you present should be exciting and important. Discuss why the development is important, given the background you already presented, what gaps it fills and doesn't fill, whether the conclusions have been shown convincingly, how it resolves or introduces controversy.... Finally, discuss what will come next, given this exciting development. What do you see as the exciting follow-up papers for the next couple of years?

This paper is NOT to be a re-write of a previous research paper you've written. Any papers that appear to be minor rewrites of past research reports will be graded accordingly. Also the paper is NOT to be on the same topic as a paper you wrote for another class.

Format of your paper: The paper should be no more than 4,000 words in the main text, excluding references and figure legends. There is no exact lower limit, but fewer than 3,000 words may not be sufficient for a well-crafted and thorough discussion of the chosen topic. The paper should be double-spaced with one-inch margins and a 12 point font. Since we have a word limit rather than a page limit, aim for a pleasing, well-spaced appearance. Figures are useful and are encouraged. There is no set number; five is usually sufficient and more than ten would be excessive. Provide informative figure legends. Figures reproduced from papers are acceptable if they are referenced as such. They may be color or black and white. Reference all sources. The paper is to be in your words: You can quote other sources, but this must be made explicit in the text; the text should not just be a string of quotations and citations. References should be in the style of the journal *Cell*: Names of authors and date appear in the text, all authors and full title appears in the reference list.

Feedback on your draft: By April 13, meet with your faculty mentor to receive feedback on your draft. We anticipate that even strong drafts will benefit from revision.

Final paper: Submit the final version to your faculty mentor by April 27. As with your draft, ask your faculty mentor if they prefer the draft to be submitted electronically or in hard copy.

Presentation (week of April 30): You should plan an oral presentation to your mentor group that will last ~15 minutes, plus an additional 5 minutes for questions. The presentation will be based on your paper, so it is appropriate to use the figures from the paper as slides, with additions as necessary. We encourage students to share and discuss outlines of their talks/potential slides with fellow members of their mentor group. Each mentor group will decide when to have their presentations.