

BISP194/BGGN285: Advanced Topics in Modern Biology
Genes as Followers
Winter Quarter 2024
Class: T 3:30-4:50
York 3010
(Syllabus updated 12 Jan 2024)

Professor

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Course overview

In this course, we will dig into some long-standing and controversial questions about the relationship between development and evolution, about genes and environments, and about the structure of evolutionary theory.

Course organization

This is a paper discussion class. There will be two papers assigned for each week. Often, but not always, one will be a review paper while the other will be a research paper. We will use the platform Perusall to read and collaboratively annotate the papers before class and to generate topics for discussion.

Perusall

Perusall is a social annotation platform – think of it like social media for PDFs. You access Perusall and the assignments through the Assignment page on the Canvas page for this course. It's very important to always access Perusall through the Canvas Assignment, otherwise your assignment grades won't transfer properly to Canvas. The goal of using Perusall is to make reading and thinking about these papers a collective activity. If you have questions about a passage you can post your question and someone else may answer it. If you disagree with the authors, let your classmates know – have a discussion about it online. If you think there is a problem with an experiment or you just think a particular finding is really cool, make a note of that, see what your classmates think. And if one of your classmates writes something interesting or illuminating, upvote their comment to let them know. The more everyone engages through Perusall, the more everyone will get out of it. The comments will also be a very useful resource for your presentations...

Perusall annotations are a big part of your grade! So spend time doing, thinking about, and commenting on the reading. Until you get used to it, the annotation grading scheme may seem a little opaque. It boils down to a few key principles:

- Annotate a lot. There are plenty of things worthy of comment on each page of a reading. Perhaps you have an idea or a question, perhaps you are answering a question, perhaps you see a connection to a previous reading or something you know about from another source. Write

down your ideas. If you ordinarily take notes as you read - think about Perusall as a place where you can do active note-taking: not only noting down what you are reading but also responding to it with your own ideas and responding to your fellow students' ideas. If you don't ordinarily take notes as you read, this is a good tool to help you start.

- Annotate throughout the text. If your annotations are clustered in one portion of the assignment, it looks like you didn't read the whole thing.
- Annotate thoughtfully. It is okay to have a few annotations that are simply rephrasing the text or things like "I agree". These can help clarify what the author is saying in your own words or can help further a conversation with another student. However, this kind of annotation isn't scored very highly and so you want most of your annotations to show more thought and more involvement with the text and more involvement in the discussions with other students.
- Engage with your colleagues. When it works, Perusall turns understanding a reading assignment into a collaborative activity. Ask questions of your fellow students. Answer questions that are posed. Respond to other people's ideas.
- Return to the assignment. You are busy, and doing the reading and having to annotate as well is a lot of work. The last thing you probably want to do is reopen the assignment after you have finished it. However, consider doing that, at least occasionally. Perhaps someone has responded to a question you asked or perhaps you can answer a question that someone else asked after you had finished. Perhaps you've had another idea that you can share. This is a way to get more out of the reading.

Perusall has some examples of annotations here that might help (the science and social science examples will be most relevant): <https://support.perusall.com/hc/en-us/sections/16176743952919-Writing-good-comments>

Leading discussions

Starting in Week 3, the class schedule will be approximately:

- 3:35 – 3:55. Discussion of paper #1
- 4:00 – 4:20. Discussion of paper #2
- 4:20 – 4:30. Further discussion of the week's topic.
- 4:30 – 4:50. Introduction to the next week's topic by Prof. Rifkin.

For weeks 3-10, you will divide up into groups of 4 (currently there are 32 students enrolled – this may change). The 4 of you will decide how to divvy up the two papers and how to organize leading the discussion. Each member of the leading group should be prepared to field questions from the audience on both papers and engage in discussion.

One key thing to note is that there are only 40 minutes allocated to both papers, usually 20 for each (the week's organizing group can decide to adjust this a little if they find one paper more interesting). 40 minutes for 2 papers is not a lot of time! Part of the organizers' job is to prioritize and focus the discussion on the key points and results of the papers or the key points of confusion/questions that come out in the Perusall annotations. The annotations will be due Sunday night so that the presenters have a day and half to look through the completed set. I'd recommend each group meet the week before to plan their session and then tweak it on Monday to incorporate new ideas/questions/information from Perusall that they didn't see before.

When discussing the papers and leading the discussion, you should touch on several essential elements. Slides – especially slides with pictures – can be very useful. Bullet point slides and slides that you just read from are usually not useful. Please do not do this. You should think about slides as ways to clearly present data and illustrate your points.

General guidelines for organizing the discussion and for reading the papers

As you read and annotate on Perusall and as you organize the paper discussion, try to follow the following approach:

First, familiarize yourself with the related topics. Read the Abstract (if there is one) and the Introduction. Do background reading on related material (which you can locate via PubMed or Google Scholar). Usually the introduction of the paper will cite relevant background material. You want to become familiar with the subject matter.

As you read, try to answer the following questions:

What questions were addressed in the paper?

The introduction of the paper will frequently present background information and context and the questions that motivate the paper.

What were the main conclusions from the paper?

These are often summarized in the abstract and further discussed towards the end – in a Discussion section in a research paper and in a summary paragraph or two for a review type paper. Why are these conclusions important?

How did the authors answer the questions?

For a research paper this will be the experiments. For a review/conceptual type paper it will be the kind of argumentation that they do. Methods are important – what exactly did they do to justify their interpretations and how convincing do you find it?

For each experiment/argument:

What conclusion did the experiment or piece of evidence allow? What are the caveats – are there alternative explanations? Were the experiments or pieces of evidence that rule out these alternatives?

A good way to organize the discussion of research papers is to summarize the questions and context and then go through the figures and tables. Figures and tables are where the data is presented and the argument of the paper is made (sometimes not convincingly). Review and conceptual papers sometimes have figures to organize the thinking, but this is not always the case. Instead, they usually have sections to organize the different parts of the argument or discussion.

For figures, some important points to consider are:

- What did the authors want to demonstrate?
- What was the experimental method (if the figure is about experimental results)?

- What were the results and what was the conclusion drawn from the figure or each panel in the figure? Which specific results support that conclusion?
- Do you agree with the conclusion? Is the data presented in the figure convincing to you, or are the authors stretching their results a bit too far?

For the discussion and future directions part of the paper:

- What were the overall conclusion(s) drawn?
- Do you agree with the authors' conclusions overall? Why or why not?
- What future questions need to be addressed?
- Is there anything missing from the paper?

Take advantage of Perusall! The questions and comments that your colleagues post there will be a great guide to the points of most confusion and to the points of most interest. You can use those to organize the discussion, perhaps even listing on the board or in your slides if you use them what the key points of confusion/controversy/disagreement are and then shaping the discussion around those.

Each group should decide whose laptop they will use – either for the slides or to present figures from the paper or both. Be sure to bring the appropriate adapter if you are using a Mac.

Presentation writeup

The presentation is a group project – you'll work together to present the papers and organize the discussion. A week after your presentation you'll individually submit a 1000 word summary and critique of the papers. By that point you will have had the benefit of looking over the Perusall annotations, discussing the papers as a group, and discussing them in class, so you'll have a lot of food for thought and material to discuss. It shouldn't just be a summary – you'll want to provide context, background and most importantly your own ideas about whether the authors proved their points. This writeup is an individual not a group assignment.

Participation

Students are expected to actively participate in in-class discussions. Just as you will want your fellow students to participate when it is your turn to lead the discussion, you should participate during weeks when you are not leading it. Ask questions; answer questions posed by others or by the leaders; add your own thoughts to the discussion. At a minimum you should be present and attentive during class. You can receive the maximum number of points for discussion participation if you are adequately engaged in at least 8 of our class sessions.

Final Assignment

Find a published research article in the field of developmental evolutionary biology. This must be a primary research article (i.e., not a review article or a commentary) and cannot be one of the assigned course readings.

Record an 8-10 minute PowerPoint-style presentation that shows both slides and your face. The presentation should address the questions mentioned above under the general guidelines section above.

The goal is to demonstrate your understanding of the paper. You should relate it to papers and themes that we discussed in class. The quality of your presentations will also be evaluated as part of the final grade. Do not read from a pre-written script. Use images and diagrams instead of lots of text and bullet points. The presentation should place your selected research article in a broader scientific context that you would illustrate by referring to at least 5 additional articles published in scientific journals. Citations may be in any style, for example: Author (Year) Journal.

You can record your presentation using any software, although Zoom is an easy option. You must decide on a paper by Feb. 16, and the final presentation will be due March 15.

Grading

40% Perusal annotations
20% Leading the discussion
10% Post-presentation writing assignment
10% Class participation
20% Final assignment

Academic misconduct

Students are expected to do their own work, as outlined in the UCSD Policy on Academic Integrity. Academic misconduct is broadly defined as *any prohibited and dishonest means to receive course credit, a higher grade, or avoid a lower grade*. Academic misconduct misrepresents your knowledge and abilities, which undermines the instructor's ability to determine how well you are doing in the course. Please do not risk your future by cheating - you will fail this course and be referred to the UCSD administration for further action. Students suspected of Academic Integrity violations will be invited to Zoom follow-up meetings where they will be asked (in real time, on video) to justify their answers. If the instructor is not convinced during the meeting or if the student refuses to participate they will be referred for Academic Integrity violations.

Missed Assignments

There are no make-up assignments. If you do not submit writing assignments (post-presentation, final paper, peer review) by the assigned date and time, you will receive a 20% deduction for every 24 hours that elapse past the deadline. If you miss a deadline due to an unavoidable emergency (e.g. serious illness, etc.), you must provide valid documentation to avoid these point deductions

Accommodation

Students requesting accommodations and services due to a disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. Please note that instructors are unable to provide accommodations unless they are first authorized by OSD. For more information, contact the OSD at (858) 534-4382 (voice), osd@ucsd.edu, or visit <https://osd.ucsd.edu/>

Topics

Week 2 – Extended evolutionary synthesis

- Week 3 – Variation and landscapes
- Week 4 – Genotype and phenotype and landscapes
- Week 5 – Morphogenesis
- Week 6 – Developmental rules
- Week 7 – Developmental rules, part 2
- Week 8 – Genes as followers
- Week 9 – Phenotypic plasticity
- Week 10 – Stress and novelty