

BIO 384C – Subjects and Skills for Graduate Students in the Biological Sciences (aka EEB Core Course)

The goal of this course is to train you in many of the skills require of all research scientists. The class will serve as an general introduction to the writing, presentation and appraisal skills needed to excel in all fields of biological research (and to help prepare graduate students for their qualifying exams). Over the course of the semester, we will focus on four interrelated topics and skills:

1. *How to select a research project*
2. *How to review a manuscript*
3. *How to write a grant proposal*
4. *How to give a seminar*

The course will include lectures and presentations; but note that these skills are gained primarily through practice and perseverance, so you will need to complete (and evaluate and edit and revise) many assignments in order to develop expertise in each area.

Class meets twice per week (TTh 3:30-5 pm) and will be taught by two instructors. The instructors will usually teach on alternate days in order to cover complementary topics and to give you more time to complete their weekly assignments.

Instructors: Howard Ochman	Office: NMS 4.114
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Requirements: In that this class comprises graduate students, everyone is already highly motivated and undoubtedly interested performing and presenting biological research (in the form of grant proposals, publications and seminars). Students are expected to attend all class sessions, read the assigned materials, complete all written assignments, and participate in in-class exercises and discussion. If you must miss a session, please inform the instructors in advance by e-mail.

Completed written assignments must be turned in before the deadline, unless by prior arrangement with the instructors. Several assignments will entail class presentations and/or participation. You will be allowed one unexcused absence and one missed assignment—except the final assignment—without it affecting your final grade. (We will typically send an e-mail query if we did not receive your assignment on time or did not see you in class, but please remember that it is your responsibility to obtain and complete all assignments.) Unless otherwise noted, *all assignments must be solely your own work and performed on your own.*

Grading: Completion of all assignments in a timely and serious manner will earn you an “A”. Lower grades will be assigned as caused by missed classes or unexcused absences, missed, late or low-quality assignments, ill-prepared presentations or lack of participation.

Course Syllabus

Week 1:

Thursday, August 27. Overview of course goals and materials; Students introduce their broad research interest and a possible research topic (expressed as a question); Discussion about how to identify and choose a Research Topic/Project/Question.

Reading Assignment for in-class discussion. Gu & Bourne: 10 simple rules; J. Watson: Advice

Written Assignment 1 (due before September 2 and sent to HO as a pdf or Word document).

(Get started early! Like this weekend!)

1. Select the particular research topic that you found to be interesting and find about 20 to 30 papers from the primary literature that are related to your selected topic.

2. Make a reference list of these papers, formatted in the exact style for submission to PNAS.

(How does one determine the style used in PNAS?)

Written Assignment 2 (bring and hand in written portion during class on September 3)

1. Read the Abstracts of five papers from your list. (Please be certain that one of your selections is from the journal *Science*.)

2. Rank the five Abstracts in order of their written quality (not based on their contents or findings) and justify your rankings. In doing so, print/copy each Abstract, and under it, tell the aspects of the writing that merited your ranking it at a particular level.

(You will be asked to read aloud the first sentence of the best or worst Abstract.)

Week 2:

Tuesday, September 1. Becoming a better writer: The paramedic method.

Reading Assignment for in-class discussion: none

Thursday, September 3. What makes for (good writing and) a good Abstract? In-class discussion of Abstracts and correction of reference-list formatting.

Reading Assignment for in-class discussion

1. Read paper packet from the Chronicle of Higher Education by Pinker *et al.*

Written Assignments (due anytime before September 9, and sent to HO as separate documents.)

1. Edit your Reference list so that each citation is formatted perfectly.

2. Re-write the lowest and highest ranked Abstracts in your list. Your revised Abstracts must be shorter than the original. *(This might/should/will be difficult.)* Send the originals and your revised versions to the instructor.

Week 3:

Tuesday, September 8. Becoming a better writer: Topic and stress position.

Reading Assignment for in-class discussion: COW blog post on topic and stress position.

Thursday, September 10. How to prepare a grant application or research proposal. What are your selected research endeavors in relation the current status of the field? What makes your topic novel and important?

Reading Assignment for in-class discussion. **TBA**

Written Assignments due anytime before September 16. (Send both to HO as separate documents.)

1. Manuscripts published in *Science* previously did not require a full Abstract. Read the following paper (King & Wilson, 1975, *Science* 188, 107) and write an Abstract for this paper (according to the guidelines specified by *Science*.)
2. By convention, most *Specific Aims* pages outline **three** Aims that will be explored by the applicant. Please compose **five** aims, and state each both in terms of an hypothesis and in terms of a question.

Week 4:

Tuesday, September 15. Copy-editing text.

Reading Assignment for in-class discussion: none

Thursday, September 17. 1. The Hook: Setting up the problem. 2. When and who do you cite?

Reading Assignment for in-class discussion. **TBA**

Written Assignments (due anytime before September 23)

1. Read the Introduction to three papers that pertain to your research topic (and that will most likely be cited in your proposal.) After reading the Introduction, write what you-believe-to-be: (1) the most important finding in the field (based to the information in the Introduction) and (2) the single most important question or hypothesis that will to be answered or tested by the paper (based to the information in the Introduction).
2. Write a one-or-two paragraph introduction to your Specific Aims, citing references as/where/when necessary.

Week 5:

Tuesday, September 22. Outline of Specific Aims page; critical need.

Reading Assignment for in-class discussion: COW blog post on critical need

Written Assignment (to be brought into class): 1-2 sentences defining the critical need of the research you propose in your assignment for Sep. 23.

Thursday, September 24. In-class evaluations of introductory paragraph(s). Reviewing scientific manuscripts (and grant proposals).

Reading Assignment for in-class discussion. **TBA**

Written Assignment (due anytime before September 30)

1. Rewrite the one-or-two paragraph introduction to your Specific Aims according to the comments and revisions suggested by your classmates.
2. After re-writing your Introduction, list which comments (suggested by your classmates) were the most useful/constructive/valuable/informative/helpful/correct and which one was the most unfounded/trivial/impractical/incomprehensible/offensive.

Week 6:

Tuesday, September 29. Outline of Specific Aims page; the 2nd paragraph.

Reading Assignment for in-class discussion. **TBA**

Written Assignment (to be brought to class): Write one sentence each describing your long-term goals, the objective for your proposal, the central hypothesis, the rationale, and your competitive edge.

Thursday, October 1. Reviewing scientific manuscripts (cont.)

Reading Assignment for in-class discussion. **TBA**

Written Assignment (due anytime before October 7.)

1. Combine the one-or-two paragraph introduction to your Specific Aims to the actual listing of your Aims (from Week 3). After each Aim (or hypothesis that you are testing), write a two sentences: the first describing the rationale of the Aim, the second describing how completion of the Aim will contribute to the field.

Week 7:

Tuesday, October 6. Outline of Specific Aims page; tying it all together; the outcomes paragraph.

Reading Assignment for in-class discussion: COW blog post on fine-grained sectioning

Written Assignment (to be brought into class): Define the outcomes of your proposed work, in 2-3 sentences.

Thursday, October 8. In-class evaluations of Aims rationales. Discussion of readings.

Reading Assignment for in-class discussion. **TBA**

Writing/Research Assignment (due anytime before October 13. *yes. by Sunday midnight!*)

1. You have (hopefully been) reading quite a bit of background literature for possible inclusion in your Specific Aims page. *Now comes the fun part* – select the (1) two best and (2) the two worst figures from this set of pages. Please send these figures to me as a pdf, powerpoint or keynote file, and I will compile them into a single presentation.
2. Draft a figure or table that might accompany each of your Aims. This display item can be an original composition, or it can incorporate (or be derivative of) something already published.

Week 8: The presentation and visualization of scientific information. In-class evaluations of display items.

Tuesday, October 13.

Thursday, October 15.

Reading Assignment for in-class discussion. **TBA**

Writing/Research Assignment (due anytime before October 28. *yes, two weeks for this one!*)

1. Edit, revise, redraw/overhaul each of your figures using the techniques and program package discussed in Week 9. These display items can be an original composition or can incorporate features of something already published.
2. Write a legend for each of your figures. (Before attempting this, read the legends to figures in various journals to diagnose how legends are worded, formatted and constructed.)
3. Write down five rules for writing figure legends. (These can include formatting instructions.)

Week 9:

Tuesday, October 20. Making figures in R and ggplot2, part I

Reading Assignment for in-class discussion. Basic R tutorial (appropriate one to be identified)

Thursday, October 22. Making figures in R and ggplot2, part II

Assignment for in-class discussion. **TBA**

Week 10:

Tuesday, October 27. Common grammar mistakes and how to fix them

Thursday, October 29

Reading Assignment for in-class discussion. **TBA**

Writing/Research Assignment (due anytime before November 4.)

1. You already read the classic article by King & Wilson (1975) about molecular comparisons of chimpanzees and humans. Based on your reading and understanding of this article, write a Specific Aims page for a grant application that builds on the results of this work and is directed towards the resolution and/or deeper understanding of the hypothesis that is presented.

Week 11:

Tuesday, November 3. Dealing with lack of ideas and/or writer's block

Thursday, November 5.

Reading Assignment for in-class discussion. **TBA**

Writing/Research Assignment (due anytime before November 9.)

1. An easy one. Rewrite your *Specific Aims* page from previous week.

Week 12:

Tuesday, November 10. (Claus out of town). Features of good presentations 1. In-class discussion of readings.

Reading Assignment for in-class discussion. **TBA**

Writing/Research Assignment

1. Prepare a five-minute presentation (usually about 6 slides including the title slide) explaining the research described in your specific aims.
(Expect the audience to comment on your presentation – on its contents, on your presentation style, on the quality of your slides – for five minutes.)

Thursday, November 12. Features of good presentations 2. In-class discussion of readings.

Week 13:

Tuesday, November 17. Assertion-evidence format of slide design

Reading Assignment for in-class discussion. **TBA**

Thursday, November 19. Student Presentations

Week 14:

Tuesday, November 24. Student Presentations

Written Assignment due anytime before November 30.

1. Read the five proposals (*i.e.*, Specific Aims pages) that you were assigned, and write summary statements for the two proposals on which you are the primary reviewer. (The panel composition, the review and scoring criteria and the review order for the classes on Dec 1 and 3 will be distributed, so you will know on which day you will need to present each of proposals on which you are serving as the primary reviewer)

Thursday, November 26. **Thanksgiving:** no class

Week 15:

Tuesday, December 1. In-class grant panel and discussion of applications

Thursday, December 3. In-class grant panel and discussion of applications

Final Assignment (due before 5 pm on December 10, 2015): Abstract/Specific Aims page with figures and figure legends (1 per Aim), and formatted references.