BE/APh 161: Physical Biology of the Cell, Winter 2014
Homework #8
Due by 5PM, March 14, 2014.

Please submit this homework both electronically as a PDF (no Word documents or text emails) and as a hard copy. The hard copy may be handed in to either TA or to me. It may be slipped under my office door if I am not in. The electronic copy should be emailed to both TAs and me. It must be submitted by 5PM on Friday, March 14.

This is a special homework in that the questions are very open ended. I find that thinking about how you would teach a class really helps codify the central principles and help you to see the forest through the trees. While different from the other homeworks this term, this homework will certainly be very valuable to both you and me.

Problem 8.1 (Problems for this class, 35 points)**.**
Write a problem (like the 20+ point problems this term) with a complete solution that you think would be enlightening to assign to next year's students. If you like, you may instead write two shorter problems (like the 5 pointers), naturally also with complete solutions. The topic of the problem may be anything covered in lecture or in any of the readings (including chapters of books we did not explicitly go over this term). Explain why you think the problem you came up with will be enlightening to the students who do it.

Problem 8.2 (Your turn, 45 points)**.**
This problem statement is taken essentially verbatim from the last problem Rob Phillips assigned in this course last year. He basically asked exactly what I would like to ask you.

a) Some have argued that only by quantitation will we really be able to come to terms with the complexity of living organisms, with the quantitative approach advocated in this class meant to give you a feel for how such quantitative dissection of biological problems might work. Others have argued that the approach we have taken is a mopping up operation which amounts to dotting the i's and crossing the t's already worked out by biologists. Write one paragraph defending each of these two points of view. One document you might find interesting to look at is Bio2010 from the National Academies of Sciences.

b) Next, make a syllabus for the course. Start with one brief paragraph on the mission of your course. Issues that you might want to consider include:

   i) is it important to do hard calculations, or is that the province of other physics courses and our goal here is to illustrate the style of thinking?
   ii) Are estimates a part of the way you will present the material (if yes, why, if no, why not?).
   iii) How will you organize the material? Note that in typical biology books DNA and actin would never be in the same chapter but for *PBoC2* they are both in Chapter 10 as examples of "beam theory."
   iv) The course is only 10 weeks long. What will you cover, what will you skip and why? How will you balance the desire to cover more topics with the resulting superficiality?

   This is not a look up something in Wikipedia question, nor is it a request to regurgitate what I did in the course. It is asking you how to organize a new and unfinished topic and to present

it to advanced Caltech undergrads and to grad students at the beginning of their grad careers. What are the important points?

c) What subject did you find most interesting from the course? What subject did you find least interesting? Please answer with several sentences only, but justify your outlook and tastes (to the extent possible).