Physics 95 (F17) - Models, Physics, and Life Science

due Sunday October 1, at 6pm

1. **Designing a Lecture Hall**
   The purpose of this task is to get you to work through a modeling problem using relatively basic mathematics. The skills you will employ here are the skills people are often referring to when they say "thinking like a physicist".
   ———
   Unless you have been lucky, you have had a large class in a poorly designed lecture hall.

   (a) List some criteria an architect should consider in designing a large lecture hall.

   (b) One criterion is legibility of material written on the boards. Construct a model of legibility as a function of the distance your seat is from the board and the angle at which you look at the board. What will the curves of constant legibility look like on a floor plan? How could one test this prediction? What does this suggest about how the back of the hall should be shaped?

   (c) Can mathematical modeling help with any other criteria besides the one mentioned in (b)? Pick one criteria from those listed in (a) and develop a model for it.

   (Length: No more than two pages)

2. **Physics and Models:**

   (a) What aspects of thinking or working characterize research in physics and distinguish it from research in other disciplines?

   (b) What are the purposes of a model? (i.e., why do physicists/scientists use models in their work?)

   (Length: No more than one page)

3. **Physics Approach in Life Sciences**
   We have posted a paper that pertains to bringing a physics approach to bear on topics in biology

   (a) Skim the paper to get a sense of the questions being addressed, and the methods used. We don't expect for you to understand (or to invest the time to understand) the detailed biology aspects. Think specifically about the problems being addressed, and the tools being brought to bear on them.

   (b) With some perspective given by box 1 of the paper by Jost et al, by the final paragraph in that paper, and by your own experience, **write two outlines (pro and con) that assess the merit and validity of using mathematical models (differential equations of the type shown in Box 1 on page 13) for problems outside the traditional domain of physics.** Assume you are giving an oral presentation, and that your target audience is a skeptical group of traditional wet-bench biology researchers, who will have to sacrifice some of their funding in order for this kind of research to be supported.
   I'm looking for you to construct coherent, persuasive, and logical arguments, both pro and con, in bulleted form. Bring a printout of your outline to class for discussion.
   (Length: No more than two pages)

Submission Guidelines:
For your entire submission, submit a single document (under "<your surname>_models.pdf") where each of the above tasks is given its own page. If you are writing up your thoughts to #1 on paper, you can scan it as its own attachment and have #2 and #3 be together in the second attachment. For #2, write at most two paragraphs, and for #3 have both outlines be at most a page per outline (fitting both outlines onto a single page would be even better!). Submission is due Sunday Oct 1 at 6pm.