COURSE DESCRIPTION:

Biology 105B (6/12-6/28: Cell Biology and Membrane Physiology

Content, course philosophy and outcome goals:

This module will cover a number of central topics (as detailed below) in cell biology but will not focus on comprehensive coverage of all areas of cell biology and membrane physiology. Most lectures will highlight experimental examples from which the “facts” about a given topic were derived. There will also be discussion of key experimental methods and rationales. The lectures will be a mix of conventional lecture presentation and a variety of in-class discussions and problem solving sessions.

For each topic, there will be a detailed outline of content, but the rate and depth at which topics are discussed will be gauged by my “real time” assessment of understanding based on the in-class problem solving sessions and performance on problem sets. That is, no attempt will be made to cover a set amount of material/lecture. Rather, it is likely that only a subset of topics listed in the syllabus below will be discussed. While increasing your knowledge base of cell biology is a critical goal of the course, equally important will be developing an enhanced skill set in understanding experimental rationales and interpretation of experimental data sets. These critical thinking skills are broadly applicable and are at the core of the skills expected of incoming medical school students (as detailed in the Howard Hughes Medical Institute/ American Association of Medical Colleges revised guidelines for medical school education) and are equally relevant for incoming graduate students.

In addition to lectures, we will also discuss, in round table fashion, a series (4-5) of classic research papers. The methods and each data figure will be discussed in order.

Modes of assessment:

1. There will be several problem sets. Each will be due at the next class session. These will be in the form of typical exam questions, similar to those that will comprise most of the content of the mid-module and final exams. You may collaborate with others on these problems but your responses should be your own. Problem sets will be graded and will constitute 25% of the final grade.

2. There will be a mid-module exam after the first six lectures. This exam will consist of two parts, an overnight take home exam composed of problem set type questions (due in class 6/20). In contrast to the problem sets, you are not permitted to collaborate on the take home exam. The standard Yale College penalties for violating this will be applied. The second part will be a short in class exam on 6/20 consisting of questions about the discussion papers read thus far. Lecture will follow this in class exam.

3. There will be a second exam primarily covering material covered in lectures 7-12, although some questions may integrate information/strategies discussed during the first half of the course. This exam will be given in class on 6/28. The second exam will be similar in format to the mid-module exam except it will not be given in two parts. You will be given the full 10:30-12:15 time period to take this exam. Both exams will consist largely of experimental analyses and not “facts”, and both will also include at least one question based directly on data from one or more of the papers read and discussed in class. Each exam will constitute 30% of the final grade.

4. Preparation for and participation in the paper discussions, as well as participation the in-class exercises will evaluated and will constitute 15% of your grade.

Lecture Topics:
Note that detailed lecture outlines and reading assignments will be posted at the beginning of Biology 105. In addition, most lectures in the first half of the module will include a discussion of relevant experimental methods (e.g. light and electron microscopy, cell fractionation, use of antibodies for immunolocalization and immunochemical analysis, pulse chase labeling). Based on lecture pace in Biol. 102 the following topics will be covered.

1. Structural and functional properties of biological membranes
2. Membrane transport
3. Biosynthesis of secretory and membrane proteins; sorting signals and vesicular traffic
4. Endocytosis
5. The cytoskeleton
6. Cell division

If time permits (I cannot predict the pace of coverage in our small class format) we may also discuss signal transduction and/or intercellular junctions. If so, additional lecture outlines will be posted, with reading assignments

Reading:

The primary reading will be assigned from the text, *Cell and Molecular Biology* by Karp (or Karp et al. Wiley Press). I will list assigned reading for the 6th, 7th and 8th editions. I will place copies of Karp on reserve at Bass. We have ordered a custom (aka cheaper) version of the 8th edition that will be available through the Yale Bookstore. However, to save $$, I recommend purchasing a used copy of either the 6th, 7th or 8th edition on line. Please use the lecture outlines and lecture content to provide the framework for what is important to think about and understand. There will be no questions on the problem sets or exam on content not explicitly discussed in class.