Homework Assignment #5 (Extra Credit, Due March 13)

1) As a general rule of thumb, phytoplankton biomass is related to inorganic nitrogen availability at a ratio of 1 µg-at N / L (equivalent to 1 uMol N for single-N compounds, such as nitrate) to 1 µg Chl / L. In other words, a phytoplankton bloom of 10 µg/L would require 10 µM N. Some of the HAB events on the east coast (for example in the Neuse or Chesapeake regions) can have phytoplankton blooms exceeding 100 µg Chl / L (!). Where do you think the nitrogen come from?

2) Assuming there were a bloom of 100 µg/L Chl in Monterey Bay, how much phosphorous would be required? If it were 50% diatoms, and 50% dinoflagellates, how much silica would be required? Based on your understanding of California oceanography, is this likely to occur?

3) Do you think there would ever be (or has ever been) a marine organism significantly larger than a blue whale? Why?

4) You are put in charge of the Monterey Bay National Marine Sanctuary monitoring program, and have been asked to determine the growth rate (productivity) of the Bay’s phytoplankton. What method would you use, and how does it work?

5) Given what you know about what controls primary production, explain why there is a “spring bloom” in the North Atlantic, but no “spring bloom” in the North Pacific.

Alternate Extra Credit: this is separate from the homework, and represents a second opportunity to get extra credit. Read one of the Nature papers (available on the website) referenced in the 3rd exam from 2002 (Essay question, items 2-4) and answer the associated essay question.