STUDY GUIDE 2002 — QUIZ II

The quiz will cover all of the material we have covered since the last quiz, through the end of biogeochemical cycles, including ocean fertilization.

Text:

Chapter 27. Read the whole chapter. Here are the sections that you should pay particular attention to:
Figures 27.2, 27.3,
Box 27.1
pp. 565-568 (and figures therein) The Hubbard Brook Experimental Forest and results of clear-cutting
pp. 572-581 (and figures therein)

Chapter 28 (pp.590-603) and figures therein.

Articles assigned for this section:

Broad, William J. Too Rich a Soil: Scientists Find the Flaw that Undid the Biosphere. *New York Times* (5 October 1993). (L -- Lexis Nexis). *What coupled biogeochemical cycles were not well understood when Biosphere II was designed?*

Falkowski et al. (2000) The Global Carbon Cycle: A test of our knowledge of Earth as a System. *Science* 290:291-296. (L) *Read the whole article, but focus on the figures and tables, and what their take home message is.*

Kinzig, A.P. and R. H. Socolow (1994) Human Impacts on the Nitrogen cycle. *Physics Today* Nov. 24-31 (W). *What are the "system consequences" of anthropogenic N fixation?*

The following set of articles describes a growing interest in engineering the Earth through ocean fertilization. You should understand the science that has led to this proposition, and what the proposition is. You need not agree with your professor regarding whether this is a reasonable thing to consider! But you should have some understanding of what the potential side effects of such an undertaking would be.

Chisholm, Sallie W. (2001) Dis-Crediting Ocean Fertilization. *Science* 294:309-310. (L)

Johnson, K. and D. Karl (2002) Is Ocean Fertilization Credible and Creditable? *Science* 296:467 (L)

Lawrence, M. (2002) Side Effects of Oceanic Iron Fertilization. *Science* 297:1994 (L)

Schneider, S. H. (2001) Earth Systems: Engineering and Management. *Nature* 409:417-421. (L)

See**:** http://www.planktos.com and http://www.greenseaventure.com for the commercial point of view (you don't need to read the whole thing. Just get a general feel for what they are proposing and how they are marketing it.)

Articles assigned earlier that are relevant to this section:

Chisholm (1992) "What Limits Phytoplankton Growth?" *Oceanus* Magazine. 35:36-46 (H,W)

Falkowski (2002) The Ocean's Invisible Forest. *Scientific American* August 2002. p.38-45 (H,W)

Backup Reading (not required, but is backup for lecture):

Schuler, Gretel (1999) Testing the Waters. *New Scientist* (L – Lexus-Nexus)

Boyd, P.W. et al. (2000) A mesoscale phytoplankton bloom in the polar Southern Ocean stimulated by iron fertilization. *Nature* 407:695-730 (L)

Libes (1992) "Reading the sedimentary record: The use of stable isotopes in the study of paleoceanography" (from Libes 1992, "An Introduction to Marine Biogeochemistry" (W; read for background on stable isotopes)

NOTE: (*Some* key things to study – but there are other things that will be covered)

- The use of stable isotopes to trace biogeochemical cycles
- The coupling between the O and C cycles
- The role of iron in regulating the ocean carbon cycle
- Be able to sketch the biogeochemical cycles of the major elements, and compare their dominant features. For each cycle analyze:
    - What is the largest reservoir?
    - Which reservoir has the shortest residence time and how short is it? Largest?
    - What is the direction of net flux at the present time? Has it always been like this? What role has man played in the changes?

- What fluxes has man influenced the most?