Location & time: M 10-11, W 10-12, 873 DESE Bldg

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Usually, I will talk for 1 hr/wk, students will review/discuss articles 1 hr/wk, and we will devote 1 hr/wk to work on modeling or hear results from the projects.

Topic and Objectives: The topic of Biogeochemistry is far too broad to cover in a single class. My approach towards narrowing the topic often is to focus on a topic or an environment in which I currently am working or in which the enrolled students are working, and to examine the interplay of biogeochemical processes in that environment. Alternatively, the choice of a text book can impose a structure and limit the scope of class. This year, I have chosen to use the text book listed above; however, should the class have clear and common interests, we can adapt the course content appropriately. We will definitely spend time on carbon and water cycling, and we will likely choose a trace element as well (Hg or Pb).

I have three specific objectives for the class. First, through the class you hopefully will gain a better understanding of some biogeochemical cycles and processes both on global and local scales. Second, you will gain practice in reading the current literature even on topics with which you are not well acquainted. Two skills that we will focus on are (1) understanding the conclusions even when you don't understand all the of the methods or theory, and (2) critically evaluating methods and conclusions. Finally, the class projects are intended to keep your mathematical and modeling skills alive and to show you how to use these to learn about new processes.

Course format and philosophy: Learning consists of asking questions and seeking and evaluating the information that will help us to answer those questions. In most undergraduate courses, the questions are asked for us, and the information required to answer the questions is provided by either the text or the instructor. Once we leave graduate school, we must both ask
the questions ourselves and find and evaluate the required information on our own. Graduate school and graduate courses represent an intermediate step, a step in which we get to assume much more of the responsibility for asking the questions, seeking the information, and evaluating or synthesizing the information to reach an answer. Accordingly, in this course, most of the traditional carrots (graded homework) and sticks (exams) are thrown away, and your own curiosity and peer pressure are the primary motivators.

My main functions are to organize the sequence of topics so as to make them more readily understandable, to direct you to some of the sources of information, to facilitate discussions, and to explain some of the theoretical information. My role as instructor is not as a repository of facts that will be dished out to you each day. I am teaching this course because I am excited about learning the material, not because I feel that I know it all.

In my opinion, reading the scientific literature on current research is one of the most important and effective means of learning. It is inevitable that you will not understand much of what you read when you begin. However, the more literature you read, the more you understand. Science grows by a gradual accumulation of many small facts; major advances are extremely rare. I believe that our understanding of science grows in the same fashion.

The class period is a time to discuss the material that was read and to clarify points that are not understood. I will do some lecturing, especially initially. However, considerable class time will be devoted to discussion of the reading material and projects, and of where we can find answers to questions that remain. Class is not a time to come and sit like sponges absorbing facts.

**Grading:** Grades will be based on contributions to the group learning process (questions, in-class discussion - 17%; presentations of literature - 33%), and projects (50%).

**Useful Reading Material**
Drever, J.I., 1996, *The Geochemistry of Natural Waters*, Prentice Hall, Chap. 4
# Tentative Schedule – valid only through week 7

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<th>Project stage</th>
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<td>Chap. 1</td>
<td>Choose topics, teams</td>
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<td>Origins</td>
<td>Chap. 2</td>
<td>Define problem, scope of project, conceptual model</td>
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<td>Chap. 4</td>
<td>Model construction, calibration</td>
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<td>Biosphere</td>
<td>Chap. 5 (NEP, food webs, competition)</td>
<td>Model construction, calibration</td>
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<td>6</td>
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### Exam

Journal articles by topic:

1. Origins
   
   (MARTIN et al., 2007), (ALEXANDER et al., 2008), (GRIMBERG et al., 2008), (WOMBACHER et al., 2008), (NEMCHIN et al., 2008)


2. Atmosphere
   (MARTIN et al., 2007)

3. Lithosphere
   (EINSIEDL et al., 2007)

4. Biosphere

5. Terrestrial ecosystems
   (SPOELSTRA et al., 2007)

6. Lakes, wetlands

7. Rivers, Estuaries
   (DAHLQVIST et al., 2007)

8. Ocean
   (LEHMANN et al., 2007)

9. Global water

10. Global Carbon

11. Global Nitrogen
    (PERRIN et al., 2008)
    (SPOELSTRA et al., 2007)
    (LEHMANN et al., 2007)

12. Mercury, trace metals
    (KLAMINDER et al., 2008)
    (BORROK et al., 2008)
13. Stable isotopes  
(BORROK et al., 2008)

References


