

Bio 688/888: Global Biogeochemical Cycles

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Fall 2006

Class time: 5:00pm-5:50pm, Wednesdays

Office hours: 3:00pm-5:00pm, Fridays or by appointment

Textbook: Biogeochemistry, an Analysis of Global Change, 2nd Edition, by William H. Schlesinger, 1997, Academic Press (required)

Literature: Articles from the leading journals will be distributed as PDF documents or in hardcopy format.

Format: Lecture, discussion, term paper writing, and presentation

Description: The interactions of biogeochemical cycles maintain the Earth's surface system. There is increasing evidence indicating that this system is largely affected by life, which appeared ca. 3.8 billion years ago. Today, we see the global cycling rates of many elements on this planet are accelerated due to the severe disturbances by a single species, *Homo sapiens*. In order to understand how the Earth system works and predict where we may be headed, we need to examine several important aspects of the Earth's system, with special emphasis on mechanisms associated with biogeochemical transformation. First, I will introduce you some basic concepts of biogeochemistry, such as origin of elements, chemical composition of atmosphere, ocean, land, river, and lake, and physical processes involved on various spatial and temporal scales. Second, we will discuss biogeochemical cycles and modeling (e.g., H₂O, C, N, P, and S cycles). Third, we will consider current topics on climate change, global warming, biodiversity, and mass extinction.

Leading Discussion:

Each of you will be assigned once as a discussion leader who will be in charge of discussions on an article from the leading journals. You are expected to outline main points of the article through questions including 1) what is the problem addressed, 2) what is the method used, 3) what is the main finding, 4) what is the scientific merit, and 5) what is the broad impact of the finding. More importantly, I would like to see you question the approaches, the results, and interpretations. For example, is the method used adequate to address the problem? What is the uncertain range of the data? Have the data be interpreted properly? Under what circumstance such interpretations would be invalid?

Time Line:

<i>No</i>	<i>Date</i>	<i>Contents</i>	<i>Memo</i>
Week 1	08/30	Overview: Origin of Elements	<i>Discussing basic concepts of biogeochemistry</i>
Week 2	09/06	Atmosphere and Oceans	
Week 3	09/13	Wetlands, Lakes, Rivers, and Estuaries	
Week 4	09/20	Soil-Water-Microbes-Plants Interactions	
<i>Presentation</i>			
Week 5	09/27	Global Water Cycle	<i>Discussing major elements in global cycles</i>
Week 6	10/04	Global Carbon Cycle	
Week 7	10/11	Global Nitrogen & Phosphorus Cycles	
Week 8	10/18	Global Sulfur Cycle	
<i>Discussion</i>			
Week 9	10/25	Earth Climate History	<i>Discussing current Topics [Note that your term paper proposal (one sheet) is due on 10/25/2006]</i>
Week 10	11/01	Global Warming	
Week 11	11/08	Biodiversity	
Week 12	11/15	Mass Extinction	
<i>Presentation of Term Paper</i>			
Week 13	11/22	Topic A	<i>Presenting and discussing materials that will be in your term paper</i>
Week 14	11/29	Topic B	
Week 15	12/06	Topic C	