The science behind the study of global change is intertwined with the natural chemical cycles of the **atmosphere**, **ocean**, **fresh waters**, **biosphere** and **solid Earth**. Understanding (and therefore wisely reacting to) complex environmental problems such as the greenhouse effect, acid rain, the ozone hole, ecosystem degradation, deforestation, and many others requires knowledge of the underlying chemical processes.

This course will provide an **integrated perspective** on biogeochemical cycles describing the transformation and movement of chemical substances in the natural environment. We will focus specifically on carbon and nutrients in the environment, as these species are deeply integrated into nearly all aspects of regional and global environmental change and provide an intimate link between ecosystems and the physical environment.

**COURSE GOALS**

- Demonstrate an understanding of the linkages between the earth systems (atmosphere/hydrosphere/biosphere)
- Predict the environmental response to perturbation in one of the earth systems (atmosphere/hydrosphere/biosphere)
- Demonstrate an understanding of the linkages between human impacts and environmental problems
GLOBAL BIOGEOCHEMICAL CYCLES
GEOL 234, 3 credits, Spring 2010
Mon 10:40 - 12:35 PM; Fr 11:45 - 12:35 PM; Delehanty Hall 319
Andrea Lini (656-0245, alini@uvm.edu)

Fri Jan 22 : Introductory meeting. Course structure and syllabus

PART 1 PROCESSES AND REACTIONS

Mon Jan 25 : Introduction to Geochemical Cycles. Origins
Fri Jan 29 : Video: Oxygen: The Poison Gas
Mon Feb 1 : The Atmosphere
Fri Feb 5 : Student presentation and discussion (Origins)
Mon Feb 8 : The Lithosphere
Fri Feb 12 : Student presentation and discussion (Atmosphere)

Mon Feb 15 : No Class (President’s Day)

Fri Feb 19 : Student presentation and discussion (Lithosphere)
Mon Feb 22 : The Terrestrial Biosphere
Fri Feb 26 : Video: The Chemistry of a Forest (Take-Home Exam 1)
Mon Mar 1 : Biochemical Cycling on Land
Fri Mar 5 : Student presentation and discussion (Terrestrial Biosphere 1)

Mon Mar 8 : SPRING BREAK
Fri Mar 12 : SPRING BREAK

Mon Mar 15 : Biochemistry in Freshwater Wetlands and Lakes
Fri Mar 19 : Student presentation and discussion (Terrestrial Biosphere 2)
Mon Mar 22 : Rivers and estuaries
Fri Mar 26 : Student presentation and discussion (Wetlands, Lakes, Rivers)
Mon Mar 29 : The Sea
Fri Apr 2 : Student presentation and discussion (The Sea) (Take-Home Exam 2)

PART 2 GLOBAL CYCLES:

Mon Apr 5 : Intro to Modeling with Stella: The Global Water Cycle
Fri Apr 9 : The Global Carbon Cycle (lecture)
Mon Apr 12 : Modeling with Stella: The Water Cycle II. Carbon Cycle I
Fri Apr 16 : The Global Nitrogen Cycle (lecture)
Mon Apr 19 : Modeling with Stella: Carbon Cycle II
Fri Apr 23 : The Global Cycles of Phosphorus and Sulfur (lecture)
Mon Apr 26 : Modeling with Stella: Carbon Cycle III, Phosphorus Cycle I
Fri Apr 30 : Modeling with Stella: Phosphorus Cycle II
TEXT FOR COURSE:


OTHER TEXT BOOKS ON BIOGEOCHEMISTRY AND GLOBAL CHANGE:


GRADING:

Based on performance in class discussion (10%), take-home exams (20% each), final paper (30%) and presentation (20%).

FINAL PAPER AND PRESENTATION:

More-or-less weekly student presentations will give you practice in communicating scientific information and debating science issues. You will be assigned a final short paper on the biogeochemical topic of your choice.
Part of your in-class grade reflects leading and participating in class discussions. I expect the following from the presenters/discussion leaders: a summary of why the topic is important; a coherent presentation of the paper or topic under consideration; a discussion of problems or outstanding issues in the study, and a mention of what is likely to be "next" for this particular issue. The presenters should allow time for questions and discussion after their own presentation. During this time, they should pose specific topics or questions for discussion to the class, and I'll expect participation.

Presentation: approx. 20 minutes. MS Powerpoint.

Term Paper: Length 6-8 double-spaced pages, not including reference list and figures. Use appropriate reference style (will be discussed in class). The topic of the paper will be related to the presentation given previously in class.
Optional draft due Mon April 26. Final version due Wed May 5.