

McGill University
Department of Geography

GEOG 505 Global Biogeochemistry 2006

Instructor: Nigel Roulet, BH 620, 398-4945, nigel.roulet@mcgill.ca
Class time: Wednesday 9.30 – 11.30 room 614 Burnside Hall
Office hours: Best to book a time through the MSE secretary (398-2827)

Outline and Format

This course will focus on biogeochemistry, with an emphasis on biogeochemical cycling at two different scales: plot to catchment, and the globe. We shall examine the storage and pathways of major elements and chemical species, their role in controlling catchment and global systems and the effect of human activity on these activities.

The course comprises a three lectures leading into a six student-led discussions reviewing recent journal articles, such as those in *Global Biogeochemical Cycles*, *Nature* and *Science*. Over the duration of the course students will be responsible for 3 to 4 papers. Each student will be responsible for leading a 10 to 15 minute discussion of the papers they are assigned. This entails an introduction to the paper and its context, the scientific questions asked, the important findings and conclusions and the points of debate (e.g., contradictions with other results etc.). Students are expected to read all the papers reviewed each week and contribute to the discussion.

There will be a small group project, in which the student groups will attempt to resolve an elemental or chemical species cycle at the global scale, drawing upon the primary literature, and presenting their findings to the class (March 1 - Saint David's Day). Each member of a group will also produce a written report describing their subcomponent of the global cycle and contribute to a collective executive summary where an attempt is made to resolve the global budget. The individual subsections and executive summary should be collated and submitted as a single group report. The subsections should be short and concise (maximum length of six pages, typed, double spaced, excluding tables and diagrams). The executive summary should be a maximum of length of five pages, typed, double spaced, including tables and diagrams. The executive summary should also include a statement on the sources of uncertainty and where biogeochemists should invest their efforts to improve the budget. On March 1, 2006 each group will have 40 minutes to present their major findings (5 minutes for each subsection, 5 minutes for the presentation of the summary, and 10 minutes for questions).

Finally, each student is required to write a major paper (maximum length of 15 pages, typed, double spaced, excluding diagrams and tables) on an aspect of biogeochemistry that is of personal interest. The topic for the paper needs to be approved by the instructor. The paper should be an in-depth, critical, synthesis of the primary literature in the subject area. In the last meeting of the course (April 5) each student will present a short talk (maximum length of 12 minutes with 3 minutes for questions) on the subject of their major paper.

The course is open to graduate and advanced undergraduate students.

Readings

Three books are of value for an overview of the material presented in the course:

- Aber, J. and J. Mellilo 1993. *Terrestrial Ecology*. Saunders College Press.
Jacobson, M. C., R. J. Charlson, et al., Eds. (2003). *Earth System Science: From Biogeochemical Cycles to Global Change*. International Geophysics Series. San Diego, Academic Press.
Schlesinger, W.H. 1997. *Biogeochemistry: an Analysis of Global Change*. Academic Press, 2nd Ed.

The main readings will be a series of papers, one set of which will be provided for the students.

Grading

Class participation	20% (paper summaries and quality of discussion)
Group project	40% (written subsection, executive summary and seminar presentation)
Term paper	40% (paper and seminar presentation)

Schedule and Topics (tentative)

Jan. 4	Overview
Jan. 11	Introduction to global biogeochemical cycles (lecture); allocation of papers
Jan. 18	The 'global' C cycle (lecture) ; assemble budget groups
Jan. 25	Terrestrial sinks for CO ₂ (student discussions); budget groups define compound
Feb. 1	Soil C (student discussions)
Feb. 8	No class (NTR at NSERC Grant Selection Committee meetings)
Feb. 15	C cycling: feedbacks in the global C cycle (student discussions)
Feb. 22	"Reading week" – finish the group projects!
Mar. 1	Group biogeochemical 'budget' presentations [Saint David's Day]
Mar. 8	The 'ecosystem – catchment' N cycle (lecture)
Mar. 15	N cycling: inputs to terrestrial ecosystems (student discussions)
Mar. 22	N cycling: budgets (student discussions)
Mar. 29	N cycling: head water catchments to continental scale (student discussions)
Apr. 5	Student symposium: presentation of term papers

Academic Integrity

Please familiarize yourself with the University's regulations on academic integrity and plagiarism. These can be found at <http://www.mcgill.ca/integrity/studentguide>.

Course Communications

On January 1, 2004, McGill University instituted a policy that e-mail will be the official channel of communication (see <http://www.mcgill.ca/email-policy/>). Each student is assigned a unique e-mail address on registration and the instructors will use this address to periodically communicate important information to students. If you do not use the McGill e-mail either arrange to have your messages forwarded to the address you use or inform the instructors of an alternative e-mail address.