Environmental Geochemistry (GEOL 283)  
Spring 2005 syllabus

Instructor: Peter Ryan, 429 MacBiHall, x2557, pryan@midd…
Office Hours: M 9-10, W 10-11, F 11-12
Lecture: T-Th 11:00 – 12:15, 417 MacBiHall
Lab: T 1:30 – 4:15, MacBiHall 419.

OBJECTIVES
This course is designed to cover the principles of environmental geochemistry through lecture, seminar/discussion, and lab- and field-oriented exercises. We will begin with fundamental concepts in geochemistry and then apply this knowledge to specific topics and case studies in atmospheric and aqueous chemistry, and soil and rock geochemistry. Lecture and lab topics are presented below; in lab we will analyze samples by ICP-AES, XRD, and various field probes (e.g. pH, conductivity).

LECTURE TOPICS
Feb 8  Basic principles
Feb 10: Equilibrium thermodynamics and kinetics
Feb 15: Equilibrium thermodynamics and kinetics
Feb 17: Acid-base equilibria; HW 1 due at beginning of class
Feb 22: Acid-base equilibria
Feb 24: Redox geochemistry
Mar 1: Redox geochemistry; Carbon chemistry, organic compounds
Mar 3: Carbon chemistry, organic compounds; HW 2 due at beginning of class
Mar 8: Isotopes in environmental geochemistry
Mar 10: Isotopes in environmental geochemistry (incl. $^{13}$C/$^{12}$C ratio of CH4 and biological vs inorganic origin and application to Mars).
Mar 15: No Class (PCR at NE GSA)
Mar 17: Low-temperature mineralogy; HW 3 due Friday 3/18 4PM.
BREAT
Mar 29: Low-temperature mineralogy
Mar 31: Atmospheric chemistry
Apr 5, 7: Atm chem., case studies (ozone, smog, C cycle, PAHs, etc)
Apr 12-28: Terrestrial geochem (soils, surface – ground water, metals, organics…)  
May 3, 5: Marine geochemistry, incl. eutrophication, CO2 uptake, toxics in bays e.g. SF.

LAB OUTLINE
LAB 1: Precipitation and stream water cation chemistry, pH, conductivity.
   (Feb 15 field work; Feb 22 lab prep; Feb 22 ICP-AES)
LAB 2: Analysis of standards (accuracy and precision, QA/QC), detection limits.
   (Mar 1, Mar 8)
LAB 3: Soil geochemistry, metal speciation (Mar 29 field work; Apr 5, 12 lab)
LAB 4: Acid mine drainage (Apr 19 field [long lab day], Apr 26, May 3 lab).
ASSIGNMENTS/RESPONSIBILITIES/ASSESSMENT

3 Problem sets ................................................. 20% total

Research Paper (literature + lab work)
- Rough Draft (due 4/8) ............... 5%
- Final Draft (due 4/22) .............. 10%
- Oral presentation (last lab period) .. 5%

Journal article presentations ............ 15%

Final Take-home ................................. 20%

Lab................................................. 25%