

**Environmental Geochemistry (GEOL 283)**  
Spring 2005 syllabus

Instructor: Peter Ryan, 429 MacBiHall, x2557, pryan@mid...

Office Hours: M 9-10, W 10-11, F 11-12

Text: Eby, G.Nelson (2004) *Principles of Environmental Geochemistry*, Thomson Brooks/Cole.

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.  $^{13}\text{C}/^{12}\text{C}$  ratio of  $\text{CH}_4$  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.

### BREAK

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,  $\text{CO}_2$  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%