

HWR/Geos 107b -- Introduction to Global Change II
Global Biogeochemical Change
Spring 1997 Course Information

SURVEY
UNIVERSITY TO GC2

Purpose

To critically examine important chemical cycles subject to human perturbation and possible consequences for the earth, including: i) the relation of the earth's hydrologic cycle to regional and global changes, and ii) the effects of pollution on the atmosphere, oceans, fresh waters, and global climate.

Approach

The course introduces students to the language and practice of Earth system science, to methods used to pose and test hypotheses, and the logic used in developing conceptual models. The course provides an introduction to Earth system science as it is actually practiced, and is not just a broad survey. We try to stress the basic approach to scientific thinking and procedures, and use Earth system science as an example of the activity of science as a whole. Both the lecture and laboratory components involve quantitative aspects, and demand a level of mathematical competence consistent with the University's Basic Skills requirement in mathematics.

Instructors (office hours):

Roger Bales, Harshbarger 202 (afternoons--sign up on office door)
Phone: 621-7113

Steve Leavitt, West Stadium 218 (MWF 2-3 or by appointment)
Phone: 621-6468

Texts:

Link to the [Bookstore](#) for current prices.

1. Mackenzie & Mackenzie, *Our changing Planet*, Prentice Hall, 1995
2. Graedel & Crutzen, *Atmosphere, Climate and Change*, Scientific American, 1995.

Grades:

Lab 25%, Homework 15%, Tests 1-3 (1-hr each) 45%, Final (2-hr) 15%

Homework:

Will be a combination of weekly essay and problem-solving assignments. The essays will be critiqued and graded for both content and writing. Assignments are to be turned in during class on the specified due date. No credit for late homework.

Labs:

Weekly labs will be largely self contained exercises requiring a lab report to be turned in at the beginning of lab the following week. A few of the labs may require a short, formal report following a scientific outline:

Abstract
Introduction
Methods
Results

Discussion
Conclusions

The formal reports will be critiqued and graded for both content and writing. The other lab reports will ask for answers to specific questions, graphing and interpretation of global or local data sets. Labs will be given out in advance, or other instructions will be given prior to each lab session.

Brent Matson matson@hwr.arizona.edu

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Syllabus

February 4, 1997

Introduction to Global Change II - Global Biogeochemical Cycles
HWR/Geos 107b - Spring 1997

Week	Date	Topic	Text	Professor
1	1-15	Introduction, Big Bang	M1:11-12	Leavitt
	1-17	Origin of earth & elements	M1:11-41	Leavitt
2	1-20	MLK holiday--no class	-	-
	1-22	Distribution of earth's chemicals	M2:42-54 M6:170	Leavitt
	1-24	Sedimentary cycles	M2:55-60	Leavitt
Lab 1	1-23	Introduction to the computer	-	Barbara
3	1-27	Atmospheric composition, origin	M3:67-75	Leavitt
	1-29	Radiation balance	M3:70-73 M10:292-3 G2:17-18	Leavitt
	1-31	Origins of oceans, properties of water	-	Leavitt
Lab 2	1-30	Air pollution meteorology	-	Barbara
4	2-3	Hydrologic cycle, fluxes, residence time	M1:4-5-28	Leavitt
	2-5	Ocean circulation & cycling	M3:80-87 G2:24	Leavitt
	2-7	Ocean circulation & cycling	M3:80-87 G2:24	Leavitt
Lab 3	2-6	Daisyworld & GAIA	G1:1-9 G8:167-171	Barbara
5	2-10	TEST 1	-	Leavitt
	2-12	Atmospheric pollution--historical perspectives	M9:235-237 G5:89-103	Bales
	2-14	Acid precipitation, causes	G3:49-57 M9:237-244	Bales
Lab 4	2-13	pH & acid rain	-	Brent
6	2-17	Acid precipitation effects	M9:244-257	Bales
	2-19	Trace gases, smog, urban climates	G3:42-49 M9:257-264	Bales
	2-21	Air pollution & global health	M9:264-267	Bales
Lab 5	2-20	Case study: California lakes	-	Brent
7	2-24	Earth's self-cleansing ability	G3:42-49	Bales
	2-26	Stratospheric ozone depletion -- historical perspective	M10:315-324	Bales
	2-28	Chemistry in the stratosphere	G3:35-42 G5:104-112	Bales
Lab 6	2-27	Antarctic ozone hole	-	Brent
8	3-3	Antarctic ozone hole, Montreal protocol	handout	Bales
	3-5	TEST 2	-	Bales
	3-7	Water & soil perturbations -- historical perspective	M10:209-211	Leavitt
Lab 7	3-6	Case study: Mono lake diversions	-	Leavitt
9	3-10	Perturbations to Earth's	M8:211-217	Leavitt

		soil resources		
	3-12	Perturbations to Earth's water	M8:217-224	Leavitt
	3-14	Western U.S. water-quality problems	handout	Leavitt
Lab 8	3-13	Case study:salinity in Tucson water	-	Barbara
	3-17	Spring break - no class	-	-
	3-19	Spring break - no class	-	-
	3-21	Spring break - no class	-	-
10	3-24	Biosphere, ecosystems	M4:89-109	Leavitt
	3-26	Biosphere, biomass production	M4:178-184	Leavitt
	3-28	Carbon cycle, natural operations	M5:121-130	Leavitt
Lab 9	3-27	Nutrient cycling in tropical forests	-	Barbara
11	3-31	Excess CO2	M10:290-296 G5:93-98/104-105	Leavitt
	4-2	Changing biosphere,modern forests	M7:178-184	Leavitt
	4-4	Changing biosphere, deforestation	M7:184-199	Leavitt
Lab 10	4-3	Global trends in trace gases	-	Barbara
12	4-7	Biomass burning	G5:97	Leavitt
	4-9	TEST 3	-	Leavitt
	4-11	Detecting global change, paleoclimate records	G4:63-67 G5:89-93 M10:270-280	Bales
Lab 11	4-10	Trends in the chemistry of ice cores	-	Brent
13	4-14	Detecting global change, historical records	G5:95,97-98,105 M10:293-314	Bales
	4-16	Remote sensing of Earth -- principles	handout	Bales
	4-18	Remote sensing -- capabilities	handout	Bales
Lab 12	4-17	Computer: SIR-C mission; remote sensing	-	Brent
14	4-21	Human dimensions of global change -- issues	M10:306-314 M11:326-330	Bales
	4-23	Human dimensions -- policy framework	M11:330-341	Bales
	4-25	U.S. global change research program	handout	Bales
Lab 13	4-24	Greenhouse effect; Planet Earth: climate puzzle	videos	Brent
15	4-28	Simulating Earth's climate	video	Bales
	4-30	Predicting Earth's climat	G6:113-141	Bales
	5-2	Consumption of energy & resources	M6:157-177 M7:200-207	Bales
Lab 14	5-1	Only One Earth -- Road to Ruin	video	Brent
16	5-5	Population growth, food needs	M6:141-157	Bales
	5-7	Sustainability	G8:155-167	Bales
-	5-16	FINAL EXAM (1100-1300)	-	Bales

Key to readings: M1:11-12 is chapter 1, pages 11-12 of Mackenzie & Mackenzie text.

M: F. T. Mackenzie & J. A. Mackenzie, *Our Changing Planet*, Prentice Hall, 1995.

G: T. E. Graedel & P. J. Crutzen, *Atmosphere, Climate, and Change*, Scientific American Library, 1995

Handout: see reading packet, available from Harvill copy center.

Labs: see reading packet, available from Harvill copy center.