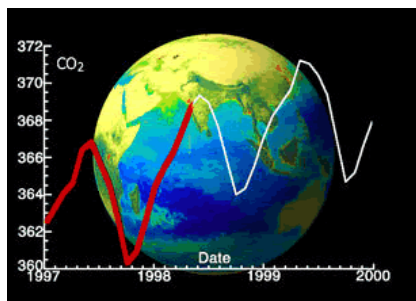




EV 211

Human Impacts on Biogeochemical Cycles

Syllabus

Howard Drossman

Block 3, 2011

[Grading](#)[Home](#)[Projects](#)[References](#)[Syllabus](#)**Reading Key****Course Reader** (available at the CC bookstore as print version or for [purchase online as e-text](#))CC: *Chemistry in Context* (Chs. 1-6)KC: Kauffman-Cleveland, *Environmental Science* (Ch. 6)Serman: *Business Dynamics* (Ch. 4)**PROWL**Richmond: *Introduction to Systems Thinking*

Selected literature papers (listed in the Reference link)

Day	Time	Topic (in class handout)	Reading / Assignments
Week 1: Fundamentals of Chemistry & Modeling Human Population Growth & Ecological Footprints Air Pollution & Ozone Loss			
Mon.	AM	Class Introduction <i>Stocks and Flows</i> <i>Causal loops and feedback</i>	
	PM	Introduction to STELLA: Simple Population Model (PROWL)	POGIL: Nuclear Atom (PROWL)
Tues.	AM	How do models work? <i>Mathematics of modeling</i> <i>Sensitivity analysis</i>	<i>Serman Ch. 4</i> <i>Richmond Ch. 5 (PROWL)</i> <i>CC Ch. 4.1-4.2</i>
	PM	Modeling Project Ia: Logistic Population Model (PROWL)	<i>Paper I: Cohen 1995 (PROWL)</i> POGIL: Types of Matter (PROWL)
Wed.	AM	How many people can our Earth support? Ecological Footprint Basics Quiz: Nuclear Atom & Types of Matter	Excel footprint calculator Online footprint calculator I (GFN) Online footprint calculator II (RP) <i>Paper II: Wackernagel 2002 (PROWL)</i>
	PM	Modeling Project Ib: Logistic Population Model w/ Footprint Considerations	POGIL: Electron Configurations (PROWL)
Thurs.	AM	What's In the Air We Breathe? <i>Unit Analysis & Ideal Gas Law</i> Quiz: Mathematics of Modeling	CC Ch. 1
	PM	Modeling Project II-1a: Global Carbon Cycle (PROWL)	<i>KC Chapter 6</i> POGIL: Lewis Structures I (PROWL) Balanced Chemical Reactions (handout)

Fri.	AM	How do anthropogenic chemicals contribute to ozone loss? <i>POGIL: Lewis Structures II</i> <i>POGIL: Bond Order</i>	CC Ch. 2
	PM	Office hours (2-3:30 PM)	Population Model I Due (5 PM) Online Quiz Due: CC Ch. 1 (Sunday) POGIL: EM Radiation (PROWL) POGIL: Resonance Structures (PROWL) <i>Richmond, Ch. 6</i>
Week 2: Global Biogeochemical Cycles			
Mon.	AM	Why is there a stratospheric ozone "layer?" TOMS Data <i>Chapman Reactions</i>	
	PM	Modeling Project II-1b: Atmospheric CO₂ Lifetimes <i>Chemical Lifetimes, Pt. 1</i>	<i>Paper III: Archer 2009 (PROWL)</i> POGIL: Molecular Shapes (PROWL)
Tues.	AM	<i>Chemical Lifetimes, Pt. 2</i> Global climate change and the Greenhouse Effect <i>Bond Polarity</i> Quiz: Unit analysis; Electron configurations; Balanced Reactions	CC Ch. 3
	PM	Modeling Project III: Simple Nitrogen Cycle	Project Proposal Task 1 Due (5 PM) Online Quiz Due: CC Ch. 2 (11 PM) POGIL: Mole Concept (PROWL)
Wed.	AM	What makes a greenhouse gas? <i>Dipole Moments & GCC Models</i> Quiz: EM radiation; Gas laws; Lewis structures	CC Ch. 4
	PM	Modeling Project IVa: Global Hydrologic Cycle	<i>Paper IV: Postel 1996</i> Eco Footprint Project Due (5 PM) POGIL: Thermochemistry
Thurs.	AM	How Might Increasing Temperatures Affect the Global Hydrologic Cycle? Physical Properties of Water <i>Thermochemistry of water</i> STELLA Small Climate Model (in class)	
	PM	Modeling Project IVb: Temperature Effects on Western US Snowmelt	<i>Paper V: Barnett 2008</i> Online Quiz Due: CC Ch. 3 C Cycle Model II Due (5 PM) POGIL: Limiting Reagents
Fri.	AM	Can we geo-engineer the climate system? <i>Ocean Geoengineering</i> Quiz: Molecular shapes & Polarity	<i>Paper VI: Buesseler 2003</i>
	PM	Zoe Harrold Seminar: Long-Term Carbon Cycle & Climate Change (1:30 -2:30 PM; TSC 122)	<i>Richmond, Chs. 7-9</i> N Cycle Model III Due (5 PM) POGIL: Redox Reactions Final Project Proposal Due(5 PM Sunday)
Week 3: Aquatic & Terrestrial Biogeochemistry			
Mon.	AM	How do autotrophs make food? <i>Photosynthesis</i> Example STELLA Model: C3-C4 Photosynthesis Model	CC Ch. 5.1-5.6 Hydro Cycle Model IV Due (5 PM)
	PM	Final Project Proposal Meetings (1-4:30 PM)	POGIL: Coulomb's Law
Tues.	AM	What's in the water we drink? <i>Ionic solutions & reactions</i> Quiz: Mole concept, Limiting Reagents & Redox Numbers	CC Ch. 5.7-5.18

	PM	Final Projects Open Hours (1-4 PM)	Online Quiz Due: CC Ch. 4 POGIL: Molarity
Wed.	AM	How does acid deposition affect lake "health"? <i>Acid-base reactions</i> Example STELLA Model: Acid Rain Quiz: Predicting Binary Reactions: Mystery Solutions "Lab"	CC Ch. 6
	PM	Final Projects Open Hours (1-4 PM)	Online Quiz Due: CC Ch. 5
Thurs.	AM	Why are there "dead zones" in many coastal areas? Eutrophication Example STELLA Model: Eutrophication Quiz: Ionic & Covalent Compounds and Acid/Base Reactions	
	PM	Environmental Chemistry & Complexity Exam Review (1-3 PM) Final Projects Open Hours (3-5 PM)	Online Quiz Due: CC Ch. 6
Fri.	AM	Final Projects (open hours 9-noon)	
	PM	Final Projects (open hours 1-3 PM)	
Week 4: Final Projects & Exams			
Mon.	AM	Chemistry & Complexity Exam (8 AM -12 PM)	
	PM	Chemistry & Complexity Exam (1 - 4 PM)	
Tues.	AM		
	PM	Standardized Chemistry Final Exams (1:45 -4 PM)	
Wed.	AM	Final STELLA Model Presentations (8 AM - 10:30 AM) Project Reports Due (noon) Class Evaluation (due Wed Dec. 30)	

Last Updated November 22, 2011

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Earth image from: <http://serc.carleton.edu/images/NAGTWorkshops/visualize04/SeaWiFS.gif>

Supplementary Links

[Ecological Footprint Projects](#)
[ChemLinks site](#)

Paper III: Postel 1996
[Postel paper discussion](#)
[Mountain Simulation](#)

Extra Links:
[Water Treatment and Wastewater Treatment](#) (CC 5.12)
[Nutrient Cycling and Bioenergetics](#)

[NASA TRMM Q&A](#)

CS Steam Hydrographs ([Excel exercise](#))
CS Precipitation Data (Excel exercise)

[Reading science articles](#)

Online Purchase

POGIL: Michael P. Garoutte, *General Organic and Biological Chemistry: A Guided Inquiry*, 1st Edition (Activity numbers in parentheses)