

The Global Environment: a trip from the Big Bang to Climate Change
(BISC 427 or GEOL 427 or ENST 427)

Class Time: MW 2:00-3:20 pm; ZHS 360

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Text: No text required. All readings will be posted on the class web site

We focus on the development of Earth as a habitable planet, from its origin to human impacts on global biogeochemical cycles in the ocean, land and atmosphere. We seek to define the scientific basis for understanding the magnitude and temporal scales of recent global environmental changes. The class is divided into three sections; Section I describes the major processes (from the Big Bang to the Earth's formation) that provided the raw materials for the evolution of life on planet Earth. In this section, we will also study how the different biochemical pathways evolved and how some of them have influenced Earth's climate and chemical composition. Section II describes human impact on the planet. Section III concentrates on potential solutions to human-induced changes.

Class Approach: In this class, we will use a "follow the carbon approach". We are going to learn about how the world functions through the carbon atom because: Life is based on carbon, the availability of carbon to life is maintained by a natural flow among the biosphere, atmosphere, geosphere and hydrosphere, modern civilization is built on carbon (energy, plastics, chemicals, medicines, etc.) and carbon is the basis of some of the major environmental and political problems that we are facing.

Grading:

- 1) Class attendance and participation (3 absences = - 5%)
- 2) Weekly quizzes and homework (25%)
- 3) Student presentation (presentations; 10 minutes long and based on any topic covered in the class; 20 %)
- 4) Exams (15 % each-30%)
- 5) Final exam; cumulative (20 %).

January	11	Introduction and overview
	13	Evolution of the Chemical Elements, Universe, Solar System and Earth
	18	MLK
	20	Evolution of the Chemical Elements, Universe, Solar System and Earth
	25	Functioning of planet Earth (plate tectonics, atmospheric and ocean circulation, long-term elemental cycling)
	27	Origin of life
February		
	1	Carbon fixation, nitrogen fixation and metallo-enzymes evolution
	3	Evolution of metabolic pathways I
	8	Evolution of metabolic pathways II
	10	Co-evolution of Life and atmospheric composition (life in extreme environments, what makes an alien?)
	15	President's day
	17	Key events in biological evolution
	22	Key events in biological evolution
	24	What makes us human?
	29	Exam 1
March		
	2	Climate evolution: The Nature and causes of Climate change (including Human perturbations to global biogeochemical cycles)
	7	Climate transitions and tipping points
	9	Myths and facts about climate change (IPCC reports)
	14	Spring Recess
	16	Spring Recess
	21	Six degrees could change the world (NG movie-part 1)
	23	Historical Perspective: Climate change, societal collapse and human health
	28	Environmental solutions,
	30	Energy wedges and Climate geo-engineering
April		
	4	Exam 2
	6	Presentations
	11	Presentations
	13	Presentations
	18	Presentations
	20	Presentations
	25	Presentations
	27	Final Discussion and "State of the Planet"
Finals		