

GEOL 300; Earth Systems and Global Change

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Lectures: T, Th 11:00-12:15 PM, PH3-100

Office Hours: T, Th 1:00-4:00PM, or by appointment, PH3-104

Course overview

We will study the interactions between the hydrosphere, atmosphere, biosphere, cryosphere and lithosphere that together make up the Earth System. This new interdisciplinary view of our planet highlights the manner in which all systems of the earth control or regulate each other on time-scales from days to 100's of millions of years. It is now clear that the state of the Earth has dramatically and abruptly changed many times in the past with tremendous environmental repercussions – *why did this happen?* As we humans transform the globe in a myriad of ways, we will address the following questions: How do the Earth's physical, chemical and biological systems interact? What were the controls and effects of past climatic changes and what can we learn from them about the future? What issues of climatic change confront us as we enter the 21st century? How do we predict the effects of our actions on the world ecosystem? This class will explore past, present, and future climatic and oceanographic change, what is clearly known and what is speculated, and how we can attempt to accurately predict our future.

Reading

This is an extremely timely subject with new articles coming out at a rapid rate. Reading will be from a collection of articles assembled from current scientific and popular literature that I will make available for you to copy in batches a few weeks ahead of our discussion. All articles are required reading for the class. It will be beneficial to you if you can read the assigned article before the associated class discussion. Because this class is being offered for the first time this semester, I am still searching for the best articles on any subject. If you come across excellent articles or websites during the course of your research, please let me know.

Grading:

Traditional grading only ($\geq 90\%$ =A, 80-89%=B, 70-79%=C, 60-69%=D, $< 60\%$ =F). Final grades based on the total of the following:

- Three short (3-4 page) papers (10% each).
- Two midterm examinations (20% each).
- Final Examination (30%).

Plagiarism and cheating policy

Your work in this class is expected to be the product of your own efforts. Plagiarism on writing assignments or cheating on exams (e.g., the giving or receiving of aid during an exam) will not be tolerated and may lead to serious consequences, including failing an assignment or an exam. This could result in failing this course, and possibly being expelled from CSULB. Suspected and/or admitted cases of such dishonesty will be treated following official CSULB guidelines (see *CSULB Bulletin*).

Withdrawal policy

The schedule and requirements for withdrawal from this class is the same as the official policy of the College of Natural Sciences & Mathematics which is different from that of the campus in that several of the cut-off dates are earlier.

Tentative topic schedule (papers and exam dates are fixed):

Note that due dates of (⇒) papers and dates of (❖) exams are noted in bold and with bullets.

Week 1: 28 & 30 January

Overview of course; Introduction to Earth Systems Science;

Week 2: 4 & 6 February

Origin of the Solar System and Earth; Earth's Segregation and Structure; Plate Tectonics;
Origin of the Oceans and Atmosphere

Week 3: 11 & 13 February

Earth History and Deep Time; Dating the Past; The Sedimentary Record

Week 4: 18 & 20 February

The Atmosphere; Atmospheric Composition; The Greenhouse Effect; The Hydrosphere;
The Global Water Cycle

Week 5: 25 & 27 February

The Hydrosphere (cont.); Oceanic Circulation; Sea-Level Changes; The Chemistry of the
Ocean;

⇒ **FIRST PAPER DUE 27 February**

Week 6: 4 & 6 March

❖ **MID-TERM EXAMINATION 4 March**

The Biosphere: Major Evolutionary Steps; Mass Extinctions

Week 7: 11 & 13 March

Cybernetics and Systems Theory; Modeling the Earth's System; The Gaia Hypothesis

Week 8: 18 & 20 March

Global Biogeochemistry; Sinks and Sources; The Carbon Cycle; The Phosphorous Cycle

SPRING BREAK: 24-28 MARCH.

Week 9: 1 April & 3 April

Major Steps in Climate Change; The Cretaceous Greenhouse; The Himalayas and Tertiary
Cooling; Eocene Warmth and Atmospheric CO₂

Week 10: 8 & 10 April

Climatic Cycles; Orbital Cycles and Insolation; Cenozoic Ice Ages

⇒ **SECOND PAPER DUE 10 April**

Week 11: 15 & 17 April

❖ **MID-TERM EXAMINATION 15 April**

Abrupt Climate Change; Dansgaard-Oeschger Cycles; Heinrich Events; El Niño and Global
Linkages