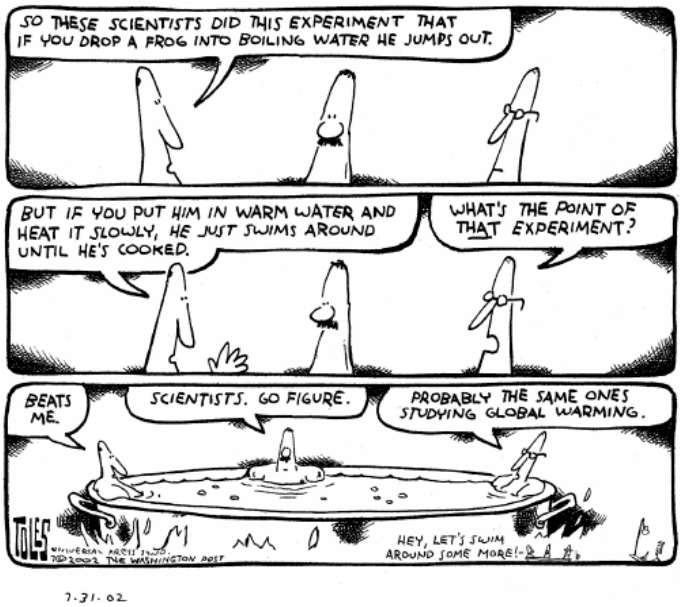
Geology 115: Earth's Climate: Past, Present, and Future
Fall 2010



Instructor:
Dr. Kira Lawrence
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610-330-5194
office hours: M 11am-1pm or by appointment

Lectures: M, W, F 10 – 10:50 am in 108 Van Wickle Hall
Laboratory:
Section 01 Wednesday 1:10 – 4 pm in 105 Van Wickle Hall
Section 02 Thursday 1:10 – 4 pm in 105 Van Wickle Hall

Textbook:
Earth's Climate: Past and Future by William F. Ruddiman, 2nd edition, W.H. Freeman & Co (2008).
Supplementary reading from:

- *Dynamic Earth: An Introduction to Physical Geology* (Fifth Edition) by B.J., Skinner, S.C. Porter and J. Park, John Wiley & Sons, Inc. (2004). **Note:** The readings from this text are available on reserve in Skillman Library.
- TBA supplemental articles will be made available by the instructor.

Course Description:

Earth's climate has changed dramatically over its history moving between completely ice-free intervals to periods of global glaciation. This course will examine how and why these changes occurred by identifying the major components of the Earth's climate system and exploring the factors and processes that influence the system over a variety of timescales. Using the major lessons learned from Earth's history, we will

consider the climatological impact of human activity and examine current ideas about Earth's climatic future.

Learning Outcomes:
After taking Geology 115 you should be able to:

- employ the scientific method;
- make and interpret simple scientific graphs;
- identify different rock types and explain the genesis of each type of rock;
- explain the theory of plate tectonics;
- sketch and explain simple diagrams showing the circulation of the Earth's atmosphere;
- describe the circulation of the ocean;
- explain the greenhouse effect;
- identify and describe factors that control the climate of a planet;
- diagram and explain a climate system feedback;
- use examples from Earth history to explain how Earth's climate changes on a variety of different timescales;
- accurately summarize the issue of anthropogenic climate change.

Exams:

In addition to the final exam, which will be given during final exam period, there will be two mid-term exams scheduled during the semester. Each mid-term will be taken during class time. All exams will be multiple choice questions or short-answer/ short essay questions, which will require written answers, sketching of graphs and/or diagrams, or calculations. I expect you to think critically and actively about the course material. On exams, you will be required to demonstrate your reasoning as well as your recall of facts.

Laboratories and Field Trips:

Lab activities will involve examination of geological and climatological data from a variety of sources. Many of the exercises are designed to be completed during the lab period (~3 hours). However, some lab exercises will require extra time either before or after the lab period to be completed. During a few of the lab sessions, we will take field trips to examine the local geologic record. Tentative dates and destinations are provided in the course schedule. More information will be provided as the dates for the trips approach. Labs provide an opportunity for the hands-on experiences that illustrate the concepts and ideas discussed in lecture. In addition, they provide a chance for small-group collaborative work and individualized help from instructors. Thus, ***attendance at and completion of all labs is mandatory to receive course credit***. You can download each week's lab from the course website. ***You will be required to print, read, and bring with you to lab section a copy of each week's lab. Note that there may be a short quiz at the outset of lab period to ensure that you have properly prepared for lab section by reading through the lab in advance.***

Climate Science in the News Report:

Critical evaluation of scientific information and clear, concise written communication of scientific ideas are two essential skills of scientific investigation. To

help you develop these skills you will be asked to find an article about climate science that has appeared in the News within the past 3 years. You will then be required to write a 2-page paper summarizing the article and the background climate science presented in the piece. In lab 11, you will peer review each other's reports to offer constructive criticism for revision prior to the final submission of your reports during the last week of the semester. You will be evaluated on the basis of your initial report, your reviews of your peer's reports, and your final revised report.

In-Class Activities:

Periodically there will be in-class worksheets, discussions, and quizzes. These activities are designed to help you better learn the material and help us assess your comprehension of the concepts and information presented in this course. These activities will be completed during lecture. You will be required to submit your worksheet or quiz at the end of class. ***No worksheets will be accepted after class has ended and there will be no make-up worksheets or quizzes.***

Course Grading:

First Exam:	17.5%
Second Exam:	17.5%
Labs / Climate Science in the News Report:	30%
In-Class Activities (worksheets, participation, quizzes):	10%
Final Exam	25%

Grading and Lateness:

Assignments not turned in by the due date will be penalized by 10% of the score for each day they are late. I can accommodate for truly extenuating circumstances, yet I need to know in advance why a deadline will not be met. Any requests for assignment extensions that occur after an assignment deadline, including extensions requested because of illness, must be accompanied by a Dean's excuse.

Academic Honesty:

In the preparation of work for this course, students are expected to conduct themselves in accordance with the Lafayette College's guidelines and rules for academic honesty (see your student handbook for details).

Please make sure your cell phones, iPods, and other electronic devices are turned off before the start of class and lab!

Geology 115 Earth's Climate: Past, Present, Future
Tentative Schedule
Fall 2010

Textbook Abbreviations: Ruddiman = Rud; Skinner, Porter & Park = S,P&P

Week	Dates	Topics & Assignments	Reading
1	Aug 30, Sept 1, 3	Introduction to Geology and Climate Science	Rud Ch 1
		Climate System Basics	1st ed Ch 2
		NO LAB	on Moodle
2	Sep 6, 8, 10	Climate System Basics Structure of the Earth **Lab 1: Circulation of the Atmosphere and Oceans**	S,P&P Ch 1,2 on Reserve in Skillman
3	Sep 13, 15, 17	Plate Tectonics	S,P&P Ch 3,4
		Minerals and Igneous Rocks	on Reserve
		Lab 2: Plate Tectonics	in Skillman
4	Sep 20, 22, 24	The Rock Cycle Weathering Sedimentary and Metamorphic Rocks **Lab 3: Mineral and Rock Identification** **Quiz #1**	S,P&P Ch 6,7,8 on Reserve in Skillman
5	Sep 27, 29, Oct 1	Geologic Time	S,P&P Ch 11
		Climate Archives	on Reserve
		Lab 4: Rock Identification & Depositional Environments	Rud Ch 2
6	Oct 4, 6, 8	Climate Archives Long-Term Climate Change **Lab 5: Geologic Time Field Trip: Ringing Rocks** **1st Mid-Term Exam Oct 8th**	Rud Ch 2,3
	Oct 11, 12	**FALL BREAK**	
7	Oct 13, 15	Plate Tectonics & Climate	Rud Ch 4
		NO LAB	
8	Oct 18, 20, 22	Greenhouse and Icehouse Climates **Lab 6: Paleotempestology**	Rud Ch 5,6
9	Oct 25, 27, 29	Orbital Scale Climate Change	Rud Ch 7,8
		Astronomical Controls on Solar Radiation	
		Lab 7: Tombstone Field Trip: Chemical Weathering	
		Quiz #2	
10	Nov 1, 3, 5	Orbital Controls on Monsoons, Ice Sheets, and Greenhouse Gases Orbital Interactions in the Climate System **Lab 8: Climate Science in the News - Reference Lesson** **Climate Science in the News Report Assigned**	Rud Ch 9, 10
11	Nov 8, 10, 12	Millennial Scale Climate Changes	Rud Ch 14, 12
		Climate of The Last Glacial Maximum	
		Lab 9: Quaternary Climate: Vostok Ice Core Records	
		2nd Mid-Term Exam Nov 8th	
12	Nov 15, 17, 19	The Last Deglaciation Climate and Humans **Lab 10: Abrupt Climate Change: "The Day After Tomorrow"** **Article for Climate Science in the News Report Due Nov 17th**	Rud Ch 13,15; Additional Reading TBA
13	Nov 22	Humans and Climate	Rud Ch 18
		NO LAB	
	Nov 24-28	**THANKSGIVING HOLIDAY**	
14	Nov 29, Dec 1, 3	Historical Climate Change Modern Climate/Climate Change **Lab 11: Climate Science in the News Peer-Review** **Climate Science in the News Draft Report Due in Lab** **Quiz #3**	Rud Ch 16,17
15	Dec 6, 8, 10	Modern Climate/ Climate Change	Rud Ch 19
		Future Climate	
		Lab 12: Climate of the Future: "An Inconvenient Truth"	
16	**FINAL EXAM - SCHEDULED DURING EXAM PERIOD**		