Global Change
Professor Mick Womersley,
FA 2010

Introduction:

From the Unity College course catalog:

> **GL 4003 Global Change**
> This course covers in depth the science of climate and ecological change. Students learn the geological history of climate and climate change, study the atmospheric, astronomic, geological and anthropogenic processes that lead to change, examine the basics of mathematical climate change modeling, study the predictions that result and their differing basis, and project the results onto the landscape in the form of analysis of potential for future regional and local changes.

From the instructor:

Modern climate science, previously of rather theoretical application or dry interest, if any, and until recently the pursuit of obscure theoreticians and explorers, is only a little over one hundred years old.

Lately it has begun to be politically important and possibly just a tad controversial.

But it remains a science, and despite all the clamoring of the "chattering classes" has science facts to learn, science method to experiment with, and a general theory that is emerging.

The general theory of climate change is not nearly as settled as that of, say evolution in biology or mechanics in physics (the levers and pulleys kind, not the quantum kind). But it exists and can be learned.

What perhaps *is* strange is how few commentators and opinion holders have bothered to learn it.

In this course we will study the general theory of terrestrial climate following the text *Earth's Climate: Past and Future* (by Dr. Ruddiman of the University of Virginia, formerly of the Lamont-Doherty Observatory at Columbia University).

This is a general text for upper level courses, if the quantitative material is emphasized. We will emphasize the quantitative material. In particular, we will emphasize the methods used by climate researchers to establish climate facts (based on the statistical significance of a result), and their use in modeling techniques for climate simulation and prediction. We will also emphasize numerical techniques used in assessing the efficacy of climate mitigation efforts.

Books and other materials:

These are the materials that all students *must* study for this course, and on which the tests are partly based:

1) Ruddiman, William F., *Earth's Climate Past and Future***,** second edition, WH Freeman, 2008
2) Lean, J.L., and D.H. Rind, 2008: How natural and anthropogenic influences alter global and regional surface temperatures: 1889 to 2006. *Geophys. Res. Lett.*, **35**, L18701, doi:10.1029/2008GL034864
   Available at http://pubs.giss.nasa.gov/abstracts/2008/Lean_Rind.html
3) Lean, J.L., and D.H. Rind, 2009: How will Earth's surface temperature change in future decades? *Geophys. Res. Lett.*, **36**, L15708, doi:10.1029/2009GL038932
   Available at http://pubs.giss.nasa.gov/abstracts/2009/Lean_Rind.html

Course Outline **(Readings in Ruddiman unless otherwise noted)**

Week 1: Framework of climate science, archives, data and models:	Chapters 1-2
Week 2: CO_2 and long-term climate	Chapter 3
Week 3: Plate tectonics	Chapter 4
Week 4: The greenhouse effect	Chapter 5-6
Week 5: Insolation (and monsoons and albedo)	Chapters 7-9
Week 6: Orbital variation and feedbacks	Chapters 10-11
Weeks 8 and 9: The climate of the late Pleistocene and Holocene	Chapters 12-15
Weeks 10 and 11: Humans and recent climate (last 1000 years)	Chapters 15-18
Week 12: Future climate change	Chapter 19 & Lean/Rind 2008
Week 13: Parameterization of recent climate	Lean/Rind 2009
Week 14: Emissions reduction efforts	TBA, depending on Congress

Procedures and Grading

Consultation with Instructor: My office is easily located on the second floor of Activities, in the small corridor to the left of the main one. My email address is easy to remember (mwomersley@unity.edu). I am very easy to find just before or after class in the classroom. I growl occasionally, but do not bite. If you are worried about anything at all, please come see me. One-on-one office consultations in particular can be an important part of your academic life. To avoid them is to miss out on part of the service you are paying for at Unity College.

Attendance and Participation: As an active learning class, your regular attendance is expected. A portion of your final grade will be based on the quality of your participation in class activities, as well as for other special efforts in aid of collaborative learning.

Academic Dishonesty: includes plagiarism, cheating, and other actions in violation of the Unity College Honor Code (see Student Handbook for details). Students found to be intentionally engaging in academic dishonesty in this course will receive an "F" (no credit) for the particular assignment, and no higher than a "D" for the course grade, assuming the first attempt to cheat is the last. These consequences will only be entered permanently in your grade record after you have an opportunity to consult with me about the specific dishonest act.

Final Grading: A final course grade of "A" requires 90+ points; "B" requires 80+ points; "C" requires 70+ points; and "D" requires 60+ points. Points will be accumulated as follows:

3 Exams (2 exams plus final):	60 Points
Research paper or project:	30 points
Participation/collaboration:	10 points
Total	**100 points**