

EARS 06: Environmental Change

Fall 2014

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Instructor: Bob Hawley, 122 Fairchild, robert.l.hawley@dartmouth.edu

Teaching Assistants: Erika Zocher Erika.J.Zocher.GR@dartmouth.edu, Lauren Farnsworth
Lauren.B.Farnsworth.GR@dartmouth.edu

Class Meeting Time: MWF 11:15–12:20, x-hour Tues 12:00–12:50 **NOTE THIS YEAR WE WILL USE ALL X-Hours, finishing class in week 7 of the term; see below**

Office Hours: Bob: TBD. TAs:

Class Web Site: <http://canvas.dartmouth.edu>

Course objectives: The purpose of this course is to introduce you to the science associated with many of the pressing issues that often make headlines today- so many of which are in some way associated with Environmental Change of some kind or another. While any of these individual topics could become a course in itself, we will gain an understanding of the issues through the use of basic scientific principles. We will be reading, over the course of the term, articles that address these issues, and one of our goals will be to discuss these articles, and the science behind them. What is “known” and what is rhetoric? What is “knowable”? Moreover, what does it mean to “know” in a scientific sense?

My hope is that you will come away with a better sense of how the scientific process works, a better understanding of the science surrounding current hotly-debated environmental issues, and some confidence with using simple assumptions and arithmetic to arrive at estimates that would otherwise be challenging.

We will use a variety of methods to achieve these goals. Our class meetings will combine traditional lecture, class discussion, and small group work. Readings will be assigned to be completed before class, and I expect you to arrive in class prepared to participate in the discussion. Sometimes the readings will be nonexistent or only a few pages; other days the readings may be extensive (for example, the days late in the term when we will discuss *The Control of Nature*). Check the syllabus frequently on blackboard, as changes will definitely occur through the term.

To succeed in this class, you will need to show up for class *prepared*, and be *intellectually engaged*. If you do the reading, pay attention in class, and *participate*, you will do fine.

Text: This course will not be built on a classic textbook but will instead explore the issues through a combination of general audience articles, selected readings, and a general-audience book. The readings and articles are all available through Blackboard; most are links to external websites, some are PDF files posted on Blackboard.

In addition, we will read, later in the term, selections from:

McPhee, J. 1990. *The Control of Nature*. This is an excellent and easy-reading book about 3 cases of humans attempting to counteract natural forces on a large scale.

Course Requirements and Grading:

Homework assignments (15% of grade) Homework assignments will be distributed to the class throughout the term.

Reading Response Forum Posts (10%) For our assigned readings, we will create a Discussion Forum in Blackboard. You will be expected to participate in each forum we create for a reading. Forums will be available from two days before each reading is due, until 20 minutes before class begins on the day a reading is due. These forums will be graded on a simple 0 to 2-point scale. You get one point for simply posting to the forum at all, and a second point if your post has substance behind it, and is not trivial- an example of a trivial post would be “I agree with xxx”.

Class participation (10%) What I call your “oomph” grade. This will include attending lectures, participating in class discussion, asking questions, promoting class interaction, and participating in group work.

Midterm Exam (15% of grade) 60-minutes, in-class.

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Term Project (10% of grade) We will be undertaking a term-long experiment to measure environmental change as a class, details to be announced.

Cumulative Final Exam- Monday, 27 October in the normal class period (25% of grade)

Policy regarding late work: It is important to turn in assignments on time. Unless explicitly stated, problem sets and writing assignments will be docked **10% per day** after the due date. Please contact me as soon as possible in the event you need to turn in something late.

Academic Honor Principle: Dartmouth College and your faculty take the Academic Honor Principle very seriously, and so should you. You should be aware of and conform to the Dartmouth Academic Honor Principle as expressed in the ORC. In terms of this course, this means:

Exams or quizzes: All work is your own. You should not assist or receive assistance from any other student. No notes or other materials allowed unless explicitly permitted.

Problems and Projects: All written work that is handed in is your own. You are permitted and encouraged to discuss the problems with your peers and to work together, but you must write up your solutions using your own words. Note that this includes your reading response forum posts.

It all boils down to this- **you must not give the impression that you’ve done work that you haven’t done yourself.** If you are unsure, please ask about how the Honor Principle specifically applies to this course.

Disabilities: Students with disabilities enrolled in this course (including “invisible” disabilities such as learning disabilities) and who may need disability-related classroom accommodations are encouraged to make an appointment to see me before the end of the second week of the term. All discussions will remain confidential although the Student Accessibility Services Office may be consulted to discuss appropriate implementation of any accommodation requested.

Religious Observances: Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your

participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

Course Outline (Approximate- this will almost undoubtedly change so check back as the term progresses!): (Note: find links to all readings except McPhee on Canvas)

NOTE: We will ACCELERATE this class, to be finished by the end of October. This means we will need to use all X-hours, and the class will progress quickly. The benefit is that you will be completely done by November 1.

UNIT 1: Scientific basics

15 Sep (Mo) **1)** Course mechanics, intro to Environmental Change.

16 Sep (Tu) **2)** Evolution of the Earth- Rocks, the rock cycle

17 Sep (We) **3)** Historical geology; The science of stratigraphy.

19 Sep (Fr) **4)** Geologic time.

22 Sep (Mo) **5)** Science: Hypothesis, theory, law, and controversy- what does it all *really* mean?

Reading: Science Controversies, Past and Present (**PDF on canvas** and <http://www.physicstoday.org/resources>
-also- http://en.wikipedia.org/wiki/Peer_review

23 Sep (Tu) **6)** Tools for Science: numeracy.

UNIT 2: Resources

24 Sep (We) **7)** Resources: Energy

Reading: Global Energy- The latest infatuations

(<http://www.americanscientist.org/issues/pub/global-energy-the-latest-infatuations>)

Half a Tank: the Impending Arrival of Peak Oil

(<http://www.multinationalmonitor.org/mm2007/012007/floegel.html>)

26 Sep (Fr) **8)** Energy continued

Reading: Seven Myths about Alternative Energy

(http://www.foreignpolicy.com/articles/2009/08/12/seven_myths_about_alternative_energy)

29 Sep (Mo) **9)** Resources: Finishing up Energy

Reading: How Much is Clean Water Worth? <http://www.nwf.org/News-and-Magazines/National-Wildlife/News-and-Views/Archives/2005/How-Much-Is-Clean-Water-Worth.aspx>

30 Sep (Tu) **10)** Resources: Water, Soil/Land

Reading: Ecosystem Services: How people Benefit from Nature

(on the web at <http://www.environmentmagazine.org/Archives/Back%20Issues/September-October%202010/ecosystem-services-full.html>)

-and- High tech trash: <http://ngm.nationalgeographic.com/2008/01/high-tech-trash/carroll-text>

1 Oct (We) **Midterm 1:** 60 minutes, in-class

UNIT 3: Climate: Changes In The Atmosphere

3 Oct (Fr) **11)** Introduction to the climate system

Reading: IPCC summary for policymakers (**PDF on canvas**).

6 Oct (Mo) **12)** Climate Basics continued

Reading: Global Warming Battlefields (**PDF on canvas**)

7 Oct (Tu) **13)** Climate Forcings, Response -and- Circulation: Atmosphere

Reading: Climate Change: think again

(http://www.foreignpolicy.com/articles/2009/01/05/think_again_climate_change)

8 Oct (We) **14)** Circulation: Oceans

Reading: Landfill on Sea

http://ecologist.testing.net-genie.co.uk/investigations/waste_and_recycling/82888/landfillonsea.html

10 Oct (Fr) **15)** Circulation: Ice

Reading: The Big Melt

(<http://ngm.nationalgeographic.com/2010/04/tibetan-plateau/larmer-text>)

-and- How to stop climate change the easy way

(<http://www.newstatesman.com/environment/2007/11/global-warming-lynas-climate>)

13 Oct (Mo) **16)** Windows into climate: Modeling, Archives, Proxy Records

14 Oct (Tu) **17)** Proxy records

15 Oct (We) **Midterm 2:** 60 minutes, in-class

17 Oct (Fr) **18)** Long term climate change

20 Oct (Mo) **19)** Orbital-scale to Human-scale climate change

Reading: The Myth of the 1970s Global Cooling Scientific Consensus
(**PDF on Canvas**)

UNIT 4: Solutions? Geo-Engineering, mitigation, and related topics

21 Oct (Tu) **20)** Finishing Human-scale climate change - and -

Conservation, biofuels, geoengineering

Reading: How much should a person consume?

(<http://www.worlddialogue.org/content.php?id=180>)

-and- Reversal of Fortune

(<http://www.motherjones.com/politics/2007/03/reversal-fortune>)

22 Oct (We) **21)** Geoengineering: Atchafalaya river control

Reading: McPhee pp 3–92

24 Oct (Fr) **22)** Geoengineering: Los Angeles against the Mountains, course wrap-up

Reading: McPhee pp 183–272

27 Oct (Mo) **Cumulative Final exam- 60 minutes during class period**