Meeting #1: Class Overview

Ross Salawitch & Walt Tribett

rjs@atmos.umd.edu  wtribett@umd.edu

Class Web Site: http://www.atmos.umd.edu/~rjs/class/honr229L

ELMS Page: https://myelms.umd.edu/courses/1229919

28 August 2017
HONR 229L: Climate Change: Science, Economics, and Governance

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Welcome !

28 August 2017
Climate Change: Science, Economics, and Governance

Course theme: how should society address global warming?
– history
– science
– economics

Today’s goals:
1) Description of how course will be run
2) Brief discussion about climate change
Climate Change: Science, Economics, and Governance

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- history
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- economics

- Progress, far from consisting in change, depends on retentiveness. When change is absolute there remains no being to improve and no direction is set for possible improvement: and when experience is not retained, as among savages, infancy is perpetual. Those who cannot remember the past are condemned to repeat it.

- This famous statement has produced many paraphrases and variants:
  - Those who cannot learn from history are doomed to repeat it.
  - Those who do not remember their past are condemned to repeat their mistakes.
  - Those who do not read history are doomed to repeat it.
  - Those who fail to learn from the mistakes of their predecessors are destined to repeat them.
  - Those who do not know history’s mistakes are doomed to repeat them.

- There is a similar quote by Edmund Burke that often leads to misattribution, “People will not look forward to posterity, who never look backward to their ancestors.”
Climate Change: Science, Economics, and Governance

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- economics

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[https://en.wikiquote.org/wiki/George_Santayana](https://en.wikiquote.org/wiki/George_Santayana)
Climate Change: Science, Economics, and Governance

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- economics

George Santayana: Philosopher, essayist, poet and novelist.
Born 16 December 1863, Madrid, Spain
Died 26 September 1952, Rome, Italy

https://en.wikiquote.org/wiki/George_Santayana
Climate Change: Science, Economics, and Governance

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Jared Diamond: Physiologist, biophysicist, ornithologist, environmentalist, historian, ecologist, geographer, evolutionary biologist, anthropologist & UCLA Professor
Born 10 September 1937, Boston, Mass
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PhD dissertation: Concentrating activity of the gall-bladder
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Fred Krupp: market-based environmentalist, president of the Environmental Defense Fund
Born 21 March 1954, Boston, Mass
Instrumental in the successful control of air pollutants in the US using a cap and trade system
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Video: https://www.youtube.com/watch?v=YCMi1xJ30g4
Climate Change: Science, Economics, and Governance

Additional readings:

- The Economics of Renewable Energy
  by David Timmons, Jonathan M. Harris, and Brian Roach

- The Economics of Global Climate Change
  by Jonathan M. Harris, Brian Roach, and Anne-Marie Codur

- Global Warming: The Complete Briefing
  Fifth Edition
  by John Houghton

- Paris Climate Agreement: Beacon of Hope
  December 2015 Publication Date
  by Ross J. Salawitch, Timothy R. Canty, Austin P. Hope, Walter R. Tribett, Brian P. Bennett
  Springer Open

From the report accepted by Working Group I of the Intergovernmental Panel on Climate Change but not approved in detail.

Frequently Asked Questions
Organization Details: Assignments

• Admission Tickets (AT) (40%)
  – short set of questions, related to each reading; *due before the start of each class*
  – posted on web page; straightforward if reading has been done
  – graded on a 10 point basis; *lowest three scores will be dropped*

• First Paper (35%)
  – due 20 Nov (Mon before Thanksgiving) **BUT** can be completed **well** before due date!
  – 6 to 10 pages single spaced; must include references & can include figures, both of
    which are excluded from the page count
  – expands upon the topic of any class meeting, *other than* class meeting you have led

• Discussion Lead & Class Participation (10%)
  – each student will lead an hour long discussion during a specific class meeting
  – recorded (hopefully) w/ link to video posted on class webpage
  – evaluation from your peers and instructor
  – encouraged to meet with me to watch the video 😊
Organization Details: Assignments

• Final Paper / Renewable Energy Plan (15%)
  – last few weeks of class, students will break into three groups representing the Developed World, China, and the Least Developed Nations, with the assignment to formulate an energy plan for each entity that achieves the goal of the Paris Climate Agreement.
  – Energy plans will be presented either on Wed, 7 Dec or Mon, 11 Dec
  – Final paper, due 11 Dec, shall reflect your view of the energy plan, defending or critiquing the plan from your perspective in the framing of the plan. You are welcome to also include commentary on the problems and/or success the real-world is having regarding a transition towards renewable energy.
  • Final paper should draw upon the body of material covered during the class as well as material you read for the project
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• Those who cannot learn from history are doomed to repeat it.
Organization Details, Continued

• Readings
  – All readings are either from one of the two required books or will be posted on class webpage
  – Reading for Wed is the only one available via handout
  – Copyright protected PDF files will be protected using password given out in class

• Additional Readings/Resources
  – Provided for many lectures on class webpage

• Email
  – Please use HONR229L at start of subject line of class-related email and please send emails to both Ross & Walt

• Office hours:
  – Ross (ATL 2403): Tues 3:30 to 4:30 pm & by appointment
  – Walt (ATL 4100): By appointment
  – We strive to be accessible throughout the semester. Please either drop by or contact us via email to set up a time to meet
  – Ross is generally quite busy during the 30 mins just before the start of class
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Electronic devices:
  Cell phones on mute
  Use laptop or iPad for taking notes is fine
  Use of laptop, iPad, or cell phone for non-class purpose prohibited without prior arrangement
Organization Details, Continued

• Class Enrichment #1

http://c2es.us1.list-manage.com/track/click?u=51c9ddbc6717eccd5dc9aad7b&id=4dc16c6097&e=af11e19530
Organization Details, Continued

• Typical class meeting (75 mins)
  – I’ll open with announcements, loose ends, and a motivational slide or two taken from the news, and review of prior Admission Tickets (~15 mins)
  – A student will lead a ~45 min discussion of the reading, using student prepared slides
  – I’ll provide a PowerPoint template *and* will be glad to review a draft prior to class
  – Every student will lead a single discussion: **public speaking is a key element of a college education!**
Organization Details, Continued

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  - I prefer to get student slides an hour before class via email
  - Arriving in this room a few mins early with slides on a memory stick is acceptable, but not preferable
  - We will use the room computer, because each meeting will be recorded
  - I am an easy grader … but completely dropping the ball on your presentation (i.e., arriving late, not showing up, etc) will be taken into consideration for final grade ⇒ we have the 10% participation component
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We are reasonable people … if something “comes up”, we can adjust. If you are having trouble putting your presentation together, Walt and I are here to help.
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Again, we want you to lead a discussion, not lecture for 45 mins!
Assume your classmates have done the reading!!
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In other words, we have 21 “book club” meetings …
I select the readings, each student will lead one discussion.
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  Again, we want you to lead a discussion, not lecture for 45 mins!
  Assume your classmates have done the reading!!
  In other words, we have 21 “book club” meetings …
  I select the readings, each student will lead one discussion.
  I’ll step in and facilitate if (when) appropriate … almost certainly more often than I should 😊
Science of Global Warming

1. The Climate Deniers (these days organized by Heartland Institute)
2. The Believers (these days personified by IPCC)

http://wattsupwiththat.com/2011/06/16/almost-friday-funny-ipccs-renewable-energy-cycle
Science of Global Warming

1. The Climate Deniers (these days organized by Heartland Institute)
2. The Believers (these days personified by IPCC)

http://incandescentplanetreflections.blogspot.com/2010_02_01_archive.html
Global Average Temperature and Carbon Dioxide Concentrations, 1880-2006

CO2 Concentration (ppmv)

Source: Michael Ernst, Woods Hole Research Center, from How We Know What We Know About Our Changing Climate

http://serc.carleton.edu/eslabs/carbon/3c.html
Correlation is not causation

Chapter 1
Earth’s Climate System

Ross J. Salawitch, Brian F. Bennett, Austin P. Hope, Walter R. Tribett, and Timothy P. Canty

Abstract This chapter provides an overview of the factors that influence Earth’s climate. The relation between reconstructions of global mean surface temperature and estimates of atmospheric carbon dioxide (CO₂) over the past 500 million years is first described. Vast variations in climate on geologic time scales, driven by natural fluctuations of CO₂, are readily apparent. We then shift attention to the time period 1765 to present, known as the Anthropocene, during which human activity has strongly influenced atmospheric CO₂, other greenhouse gases (GHGs), and Earth’s climate. Two mathematical concepts essential for quantitative understanding of climate change, radiative forcing and global warming potential, are described. Next, fingerprints of the impact of human activity on rising temperature and the abundance of various GHGs over the course of the Anthropocene are presented. We conclude by showing Earth is in the midst of a remarkable transformation. In the past, radiative forcing of climate represented a balance between warming due to rising GHGs and cooling due to the presence of suspended particles (aerosols) in the troposphere. There presently exists considerable uncertainty in the actual magnitude of radiative forcing of climate due to tropospheric aerosols, which has important consequences for our understanding of the climate system. In the future, climate will be driven mainly by GHG warming because aerosol precursors are being effectively removed from pollution sources, due to air quality legislation enacted in response to public health concerns.

Keywords Paleoclimate • Anthropocene • Global warming • Greenhouse gases • Radiative forcing

Can download for free from https://link.springer.com/book/10.1007/978-3-319-46939-3
In the news:

The New York Times

Scientists Fear Trump Will Dismiss Blunt Climate Report

By LISA FRIEDMAN  AUG. 7, 2017

The coal-burning Plant Scherer in Juliette, Ga., is one of the top emitters of carbon dioxide in the United States. A draft report by government scientists concludes that Americans are feeling the effects of climate change right now. Branden Camp/Associated Press
In the news:

U.S. GLOBAL CHANGE RESEARCH PROGRAM
CLIMATE SCIENCE SPECIAL REPORT (CSSR)

Final Clearance
28 June 2017

Fifth-Order Draft (5OD)

COORDINATING LEAD AUTHORS

Donald Wuebbles
National Science Foundation

David Fahey
NOAA Earth System Research Lab

Kathleen Hibbard
NASA Headquarters

LEAD AUTHORS

Jeff Arnold, U.S. Army Corps of Engineers
Benjamin DeAngelo, U.S. Global Change Research Program
Sarah Doherty, University of Washington
David Easterling, NOAA National Centers for Environmental Information
James Edmonds, Pacific Northwest National Laboratory
Timothy Hall, NASA Goddard Institute for Space Studies
Katharine Hayhoe, Texas Tech University
Forrest Hoffman, Oak Ridge National Laboratory
Radley Horton, Columbia University
Deborah Huntzinger, Northern Arizona University
Libby Jewett, NOAA Ocean Acidification Program
Thomas Knutson, NOAA Geophysical Fluid Dynamics Lab
Robert Kopp, Rutgers University
James Kosin, NOAA National Centers for Environmental Information

Kenneth Kunkel, North Carolina State University
Allegria LeGrande, NASA Goddard Institute for Space Studies
L. Ruby Leung, Pacific Northwest National Laboratory
Wieslaw Maslowski, Naval Postgraduate School
Carl Mears, Remote Sensing Systems
Judith Perlwitz, NOAA Earth System Research Laboratory
Anastasia Romanos, Columbia University
Benjamin Sanderson, National Center for Atmospheric Research
William Sweet, NOAA National Ocean Service
Patrick Taylor, NASA Langley Research Center
Robert Trapp, University of Illinois at Urbana-Champaign
Russell Vose, NOAA National Centers for Environmental Information
Duane Walliser, NASA Jet Propulsion Laboratory
Michael Wehner, Lawrence Berkeley National Laboratory
Tristram West, DOE Office of Science

REVIEW EDITORS

Linda Means, National Center for Atmospheric Research
Ross Salawitch, University of Maryland
Chris Weaver, USEPA

CONTRIBUTING AUTHORS

Richard Alley, Penn State University
C. Taylor Armstrong, NOAA Ocean Acidification Program
John Bruno, University of North Carolina
Shallin Busch, NOAA Ocean Acidification Program
Sarah Champion, North Carolina State University
Imke Durre, NOAA National Centers for Environmental Information
Dwight Oledzki, NOAA Ocean Acidification Program
Justin Goldstein, U.S. Global Change Research Program
Boyun Huang, NOAA National Centers for Environmental Information

Hari Krishnan, Lawrence Berkeley National Laboratory
Lisa Levin, University of California – San Diego
Frank Mueller-Karpe, NOAA Ocean Acidification Program
Alan Rhoades, University of California – Davis
Liqiang Sun, NOAA National Centers for Environmental Information
Eugene Taule, Iowa State
Paul Ullrich, University of California – Davis
Eugene Wahl, NOAA National Centers for Environmental Information
John Walsh, University of Alaska Fairbanks
Figure 3.3: Estimates of the contributions of several forcing factors and internal variability to global mean temperature change since 1870, based on an empirical approach using multiple linear regression and energy balance models. The top panel shows global temperature anomalies (°F) from the observations (Morie et al. 2012) in black with the multiple linear regression result in red (1901-1960 base period). The lower four panels show the estimated contribution to global mean temperature anomalies from four factors: solar variability, volcanic eruptions, internal variability related to El Nino/Southern Oscillation; and anthropogenic forcing. The anthropogenic contribution includes a warming component from greenhouse gases concentrations and a cooling component from anthropogenic aerosols. (Figure source: adapted from Canty et al. 2013.)
In the news:

Dear SGCR members:

This memo requests your final agency clearance by Friday, August 18, 2017 at 5:00 PM EDT of the final draft of USGCRP’s Climate Science Special Report (CSSR). The second page of this memo provides background information on SGCR, USGCRP and the CSSR/NCA process.

Your clearance: OSTP has determined that SGCR is the appropriate vehicle for final Federal clearance of CSSR. Given the extensive, multiple internal and external reviews to date, we are expecting high-level, showstopper review from SGCR. We suggest your particular attention to the following, including proposed solutions to any issues you identify:

- The adequacy of changes implemented in response to your reviews of the Fourth Order Draft
- Presentation of scientific findings in ways that are policy neutral

To reiterate, the SGCR clearance process runs from 21 July – 18 August 2017. Thanks for your continued support as the USGCRP addresses its commitments under the Global Change Research Act.

With Best Regards,

Ted Wackler
Acting Director, Office of Science and Technology Policy
Houston Flooding

In the news:

Role of climate change

a) Sea Level Rise

b) Clausius-Clapeyron relation (warmer air holds more water)

c) Warmer conditions in Gulf of Mexico provide more energy

d) Global warming induced changes in meteorological patterns lead to more persistent storm systems

https://www.facebook.com/MichaelMannScientist/posts/1515449771844553

Houston Flooding

Role of climate change

Michael Mann posted this image:
Houston Flooding

In the news:

Role of climate change

Michael Mann posted this image:

What is 20 cm in more common units?

![Recent Sea Level Rise Graph]

- 23 Annual Tide Gauge Records
- Three Year Average
- Satellite Altimetry
In the news:

Role of climate change

Michael Mann posted this image:

20 cm = 7.9 inches or 0.65 feet
Houston Flooding

In the news:

Role of climate change

Michael Mann posted this image:

20 cm = 7.9 inches or 0.65 feet ⇒ Global

http://blogs.agu.org/wildwildscience/2008/09/13/all-this-on-a-cat-2-houston-was-just-another-warning/
Role of climate change

Here is a more appropriate record of sea level, from Galveston Pier

\[ 6.47 \text{ mm/yr} \times 120 \text{ years} = 0.78 \text{ meters} \Rightarrow 2.6 \text{ feet} ! \]

In the news:

Harris County / Galveston subsidence map; the Galveston Island tide gauge station are between the 1’ & 2’ contours. Parts of Houston have sunk up to 10 feet in the last 100 years because of all the water, gas, and oil pumped from the ground beneath the city!

http://blogs.agu.org/wildwildscience/2008/09/13/all-this-on-a-cat-2-houston-was-just-another-warning/
Houston Flooding

North Houston

When land is covered by concrete surfaces it loses ability to act like a sponge and absorb water. The GIFs show how much Houston has grown from 1984 to 2012. (John D. Harden/Houston Chronicle).

When land is covered by concrete surfaces it loses ability to act like a sponge and absorb water. The GIFs show how much Houston has grown from 1984 to 2012. (John D. Harden/Houston Chronicle).

Next Meeting: Wednesday

Reading:

None!

Please complete:

• Admission Ticket #0 (AT 0 on website) prior to 2 pm on Wed

• Discussion leader preference survey and bring to class
Next Meeting: Wednesday

Admission Ticket #0 (AT 0 on website) prior to 2 pm on Wed

1) Where do you stand on the climate change debate? (4 pts)
   In other words, are you a Believer, a Denier, or Unsure? In addition to stating where you stand on the debate, please expound upon your standing in two to three sentences.

2) On a scale of 1 to 10, 1 being least important and 10 being most important, what priority should the United States government give towards curbing our nation’s emissions of fossil fuels over the course of your lifetime, such that by year 2060, half of all energy in the U.S. would be achieved by renewable sources and/or nuclear reactors? (4 pts)
   Please note:
   • such a large scale transition to renewable energy will undoubtedly cause some economic disruption; the amount is hotly debated
   • by renewable source, we mean technologies such as solar, wind, hydro, biofuels, even carbon capture and sequestration
   In addition to stating the priority level, support your reply with two to three additional sentences.

3) Do you consider yourself to be politically liberal or politically conservative? If liberal, how liberal? If conservative, how conservative? A simple phrase will suffice. (2 pts)

Please note the identify of the students providing this reply, as well as all replies to all ATs for his semester, will be held in strict confidence by the instructors. We will share replies to the class, but in a manner that preserves student anonymity.

Please complete on ELMS prior to 2 pm on 30 August or email your reply to rjs@atmos.umd.edu & wtribett@umd.edu by this deadline
HONR 229L: Climate Change: Science, Economics, and Governance

Class Discussion Lead Poll

Please indicate your name ____________________

and the number of the class discussion you’d like to lead:

  First choice:  ___
  Second choice: ___
  Third choice:  ___
  Fourth choice: ___
  Fifth choice:  ___

Please note your paper must be based on a class meeting other than the discussion you lead.

We will make every effort to assign 1 of your top 5 choices.

This is due at start of second class meeting, 30 August
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/28</td>
<td>Class Overview</td>
<td>None</td>
<td>Salawitch A</td>
</tr>
<tr>
<td>08/30</td>
<td>Overview of Climate Change</td>
<td>None, but please complete AT</td>
<td>Salawitch B</td>
</tr>
<tr>
<td>09/06</td>
<td>Past Societies, Failure: Easter Island</td>
<td>Diamond: Ch 2 (41 pages)</td>
<td>Discussion 1</td>
</tr>
<tr>
<td>09/11</td>
<td>Past Societies, Failure: The Maya</td>
<td>Diamond: Prologue (24 pages) &amp; Ch 5 (21 pages)</td>
<td>Discussion 2</td>
</tr>
<tr>
<td>09/13</td>
<td>Past Societies, Success: New Guinea, Tikopia &amp; Japan</td>
<td>Diamond: Ch 9 (32 pages)</td>
<td>Discussion 3</td>
</tr>
<tr>
<td>09/18</td>
<td>Modern Societies: Dominican Republic and Haiti</td>
<td>Diamond: Ch 11 (29 pages)</td>
<td>Discussion 4</td>
</tr>
<tr>
<td>09/20*</td>
<td>Modern Societies: China</td>
<td>Diamond: Ch 12 (20 pages)</td>
<td>Discussion 5</td>
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<td></td>
<td>* Possible change of date due to Rosh Hashanah</td>
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<tr>
<td>09/25</td>
<td>Roadmaps for Success or Failure</td>
<td>Diamond: Ch 14 (22 pages)</td>
<td>Discussion 6</td>
</tr>
<tr>
<td>09/27</td>
<td>Business and the Environment</td>
<td>Diamond: Ch 15 (41 pages)</td>
<td>Discussion 7</td>
</tr>
<tr>
<td>10/02</td>
<td>Introduction to Climate Change</td>
<td>IPCC 2007 FAQ (36 pages)</td>
<td>Discussion 8</td>
</tr>
<tr>
<td>10/04</td>
<td>Climate Models: Perspective of a Physical Scientist</td>
<td>Houghton, Ch 5 (37 pages)</td>
<td>Discussion 9</td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading Material</td>
<td>Discussion</td>
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