

Course syllabus: History of Climate Science

Environmental Studies 402/History of Science 350

Topic: History of Climate Science

Mon & Wed 4:00-5:15pm @ Science Hall 360

Instructor: Dr. Wilko Graf von Hardenberg
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Weather and climate influence our lives at many levels, from daily life to apocalyptic visions of the future. In recent years, debates about the role of human agency in climate change have become a central feature in environmental and political discourse. The contested role of humans as a force of global climate change has even led to the classification of a new geological epoch: the Anthropocene. This course explores the history of scientific ideas and practices, beginning in the 18th century, that serve as the foundation for modern conceptions of the weather and climate as a global system. Our aim is to put current scientific debates on climate change into historical and critical perspective as we seek to understand the ways climate has been interpreted and understood over time, both within and outside the scientific community.

Assignments:

Homework: There will be short homework assignments, in particular regarding the analysis of primary sources (marked with a * in the syllabus), the viewing of documentary films, and guest lectures. Some are already listed below, but others may be assigned over the semester. Further details about the due dates, format, and length will be provided in class. These exercises will not be graded but assessed with a check/check-plus/check-minus (or no check) and help to inform your participation grade.

Response papers: Students are required to write three brief essays discussing and contextualising the assigned readings and class discussions. Each paper should be between 1000 and 1500 words. References to assigned readings can be given using Author-Date style (http://www.chicagomanualofstyle.org/tools_citationguide.html).

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Do not forget to give page numbers. No list of references is needed. Papers are due, on Learn@UW, before the beginning of class on **13 Oct** (Weeks 2-6), **12 Nov** (Weeks 7-10), and **8 Dec** (Weeks 11-14) respectively. Late submissions will cause the deduction of one point per day from your participation grade.

Final exam

The final exam will be a take-home exam, covering all topics touched in the course of lectures and requiring the student to make links between its different components, assigned readings, and lecture notes. Details about the format will be provided later in the semester. Questions will be handed out on 10 Dec and answers are due on **15 Dec** at 7.05pm.

Grading

Letter grades will be converted from a 100-point scale. The following conversion chart applies: 93-100 = A; 88-92 = AB; 83-87 = B; 78-82 = BC; 70-77 = C; 60-69 = D; 59- below = F.

Grades per coursework will be broken down as follows:

Participation	–	30 pts
Paper 1	–	15 pts
Paper 2	–	15 pts
Paper 3	–	15 pts
Final exam	–	25 pts

Extra assignments for graduate students

Some departments require graduate students to do extra work to qualify for credit on undergraduate classes. Individual assignments will be developed with each graduate student according to their specific interests, by the end of Week 4. These individual assignments will then be presented in class to your colleagues towards the end of classes.

I have adapted the grading rubric for graduate students as follows:

Participation	–	30 pts
Paper 1	–	10 pts
Paper 2	–	10 pts
Paper 3	–	10 pts
Grad assignment	–	20 pts
Final exam	–	20 pts

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Course policies:

Attendance: Attending classes is the student's responsibility and attendance will not be taken. This class has a strong seminarial character and your involvement is essential for the course to reach its pedagogical goals. As a reminder: just showing up to class is necessary, but not sufficient, to gain grades for participation. According to campus wide rules on religious observance I invite you, nonetheless, to notify me within the first two weeks of class of the specific dates for which you request relief for religious observance, since these may affect your ability to respect the assignments' deadlines.

Reading assignments: Reading the book chapters and articles given in the course schedule before classes is expected. These texts are the core materials of the course and will allow you to participate actively in discussion: their reading will affect your participation grade and is essential for a successful completion of written assignments. Most texts will be available on Learn@UW. If you prefer not to read on screen look for hard copies or print the articles out. I also suggest you to take notes and prepare a brief summary outlining any question or comment you might have regarding the weekly readings. This will help you to be prepared for class discussion, become aware of what aspects of the course are unclear to you, and have material ready for when the *response papers* are due.

Academic integrity: In any written assignment it is necessary to acknowledge and fully quote your sources and references. You should NEVER attribute to yourself, or give the impression that you are attributing to yourself, the words and phrasing of others. Plagiarism is an unacceptable ethical infraction and can lead to serious consequences. For further information on how to avoid plagiarism please refer to the UW-Madison Writing Center webpages:

<http://writing.wisc.edu/Handbook/QuotingSources.html>

Communication: E-mails will be answered only on weekdays 10am-5pm. If you have any questions that require a longer answer please drop by during office hours or arrange a meeting. You may as well use the course hashtag #wischistsci350 for questions of interest to the whole class. In e-mails please always use a subject line and clarify which course you have a question about.

Modifications to Syllabus: The syllabus may be subject to changes (in particular as regards special events). Reasonable notice will be given.

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Course Schedule

Week 1 – 3 Sep 2014 – *Introduction*

Activities

- Presentation of the syllabus
- Definition of the topics discussed in class
- Getting to know each other

Reference

- Rael, Patrick. *Reading, Writing, and Researching for History: A Guide for College Students*. Brunswick, ME: Bowdoin College, 2004
<http://academic.bowdoin.edu/WritingGuides/>

Week 2 – 8 and 10 Sep 2014 – *Pre-histories of climate science*

Homework

- Critical reading of Jefferson's essay. Due on 7 Sep at 10pm on Learn@UW.

Readings

- Fleming, James Rodger. *Historical Perspectives on Climate Change*. New York: Oxford University Press, 1998. Introduction and Ch. 1 to 4, 3-54
- *Jefferson, Thomas. "Climate? A Notice of All What Can Increase the Progress of Human Knowledge?" In *Notes on the State of Virginia*, 201–209, 1781.
<http://is.gd/JeffersonClimate>
- Kendall, Joshua. "America's First Great Global Warming Debate." *Smithsonian*, July 14, 2014. <http://www.smithsonianmag.com/history/americas-first-great-global-warming-debate-31911494/>
- Calel, Raphael. "The Founding Fathers v. The Climate Change Skeptics." *The Public Domain Review*. <http://publicdomainreview.org/2014/02/19/the-founding-fathers-v-the-climate-change-skeptics/>

Week 3 – 15 and 17 Sep 2014 – *Fourier and the temperature of the earth*

Homework

- Critical reading of Fourier's essay. Due on 14 Sep at 10pm on Learn@UW.

Activities

- A documentary film relevant to the course topic will be screened on 17 Sep.

Readings

- Fleming, James Rodger. *Historical Perspectives on Climate Change*. New York:

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Oxford University Press, 1998. Ch. 5, 55-64

- *Fourier, Jean-Baptiste Joseph. "General Remarks on the Temperature of the Earth and Outer Space." Translated by Ebeneser Burgess. *American Journal of Science* 32 (1837): 1–20
- van der Veen, C.J. "Fourier and the 'greenhouse effect.'" *Polar Geography* 24:2(2000): 132-152

Week 4 – 22 and 24 Sep 2014 – *Meteorology*

Homework

- Reaction essay to previous week's film screening. Due on 21 Sep 2014 at 10pm on Learn@UW.

Readings

- Anderson, Katharine. *Predicting the Weather : Victorians and the Science of Meteorology*. Chicago: University of Chicago Press, 2005. Ch. 3 and 4, 83-169

Week 5 – 29 Sep and 1 Oct 2014 – *Tyndall and Arrhenius*

Homework

- Critical reading of Tyndall's and Arrhenius' essays. Due on 28 Sep at 10pm on Learn@UW.

Readings

- Fleming, James Rodger. *Historical Perspectives on Climate Change*. New York: Oxford University Press, 1998. Ch. 6, pp. 65-82
- *Tyndall, John. "On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connection of Radiation, Absorption, and Conduction." *The London Edinburgh and Dublin Philosophical Magazine and Journal of Science [Fourth Series]* 22 (1861): 169–194, 273–285.
- Hulme, Mike. "Commentary. John Tyndall, 'On the Transmission of Heat' (1859)." In Robin, Libby, Sverker Sörlin, and Paul Warde, eds. *The Future of Nature: Documents of Global Change*. New Haven: Yale University Press, 2013, 299-302.
- *Arrhenius, Svante. "On the Influence of Carbonic Acid in the Air Upon the Temperature." *The London Edinburgh and Dublin Philosophical Magazine and Journal of Science [Fifth Series]* 41 (1896): 237–276.
- Sörlin, Sverker. "Commentary. Svante Arrhenius, 'On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground' (1896)." In Robin, Libby, Sverker Sörlin, and Paul Warde, eds. *The Future of Nature:*

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Documents of Global Change. New Haven: Yale University Press, 2013, 299-302.

Week 6 – 6 and 8 Oct 2014 – *Climate science as an imperial science*

Readings

- Davis, Mike. *Late Victorian Holocausts: El Niño Famines and the Making of the Third World*. New York: Verso, 2002. Part III Deciphering ENSO, 213-276
- Anderson, Katharine. *Predicting the Weather : Victorians and the Science of Meteorology*. Chicago: University of Chicago Press, 2005. Ch. 5 and 6, 171-284

Week 7 – 13 and 15 Oct 2014 - *Fieldworks*

Assignment

- Submit your first *response essay* on [Learn@UW](#) before class on 13 Oct.

Readings

- Vetter, Jeremy. “Lay Observers, Telegraph Lines, and Kansas Weather: The Field Network as a Mode of Knowledge Production.” *Science in Context* 24, no. 02 (April 28, 2011): 259–280.
- Fleming, James Rodger. “Planetary-Scale Fieldwork. Harry Wexler on the Possibilities of Ozone Depletion and Climate Control.” In *Knowing Global Environments: New Historical Perspectives on the Field Sciences*, edited by Jeremy Vetter, 190–211. Rutgers University Press, 2011.
- Sörlin, Sverker. “The Anxieties of a Science Diplomat: Field Coproduction of Climate Knowledge and the Rise and Fall of Hans Ahlmann’s ‘Polar Warming’” *Osiris* 26, no. 1 (January 1, 2011): 66–88.

Week 8 – 20 and 22 Oct 2014 – *The science behind climate reference points*

Readings

- Carey, Mark. “The History of Ice: How Glaciers Became an Endangered Species.” *Environmental History* 12, no. 3 (2007): 497–527.
- Beattie, J. J. “Climate Change, Forest Conservation and Science: A Case Study of New Zealand, 1860s-1920.” *History of Meteorology* no. 5 (2009): 1–18.
- Hannah, John. “The Difficulties in Using Tide Gauges to Monitor Long-Term Sea Level Change.” *FIG Congress 2010 Facing the Challenges - Building the Capacity*, Sydney, Australia, 2010.

Week 9 – 27 and 29 Oct 2014 – *Determinism and global warming*

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Homework

- Critical reading of Callendar's essay. Due on 26 Oct at 10pm on Learn@UW.

Readings

- Weart, Spencer R. "Global Warming, Cold War, and the Evolution of Research Plans." *Historical Studies in the Physical and Biological Sciences* 27, no. 2 (January 1, 1997): 319–356.
- Fleming, James Rodger. *Historical Perspectives on Climate Change*. New York: Oxford University Press, 1998. Chapters 7-10, pp. 83-138
- *Callendar, G.S. "The Artificial Production of Carbon Dioxide and Its Influence on Temperature." *Quarterly Journal Royal Meteorological Society* 64 (1938): 223–240.
- Fleming, James R. "Commentary. G.S. Callendar, 'On the Transmission of Heat' (1859)." In Robin, Libby, Sverker Sörlin, and Paul Warde, eds. *The Future of Nature: Documents of Global Change*. New Haven: Yale University Press, 2013, 299-302.

Week 10 – 3 and 5 Nov 2014 – *Predictions and Climate Modeling*

Readings

- Harper, Kristine C. "Research from the Boundary Layer: Civilian Leadership, Military Funding and the Development of Numerical Weather Prediction (1946-55)." *Social Studies of Science* 33, no. 5 (2003): 667–696.
- Lynch, Peter. "The Origins of Computer Weather Prediction and Climate Modeling." *Journal of Computational Physics* 227, no. 7 (March 2008): 3431–3444.

Week 11 – 10 and 12 Nov 2014 – *An epic of climate control*

Assignment

- Submit your second *response essay* on [Learn@UW](#) before class on 12 Nov

Activities

- As a follow up to the Anthropocene Slam, hold in Madison 8-10 Nov, Prof. Christof Mauch (LMU Munich) and Prof. Libby Robin (ANU Canberra) will give quest lectures, respectively on 10 and 12 Nov.

Readings

- Fleming, James Rodger. *Fixing the Sky*. Columbia Studies in International and Global History. New York: Columbia Univ. Press, 2010. Ch. 2, 3 and 5, 49-108, 137-164

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Week 12 – 17 and 19 Nov 2014 – *From climate control to geo-engineering*

Homework

- Reaction essay to Christof Mauch's and Libby Robin's talks. Due on 17 Nov at 10pm on [Learn@UW](#).

Activities

- Guest lecture by Dan Vimont of the UW-Madison Department of Atmospheric and Oceanic Sciences.

Readings

- Fleming, James Rodger. *Fixing the Sky*. Columbia Studies in International and Global History. New York: Columbia Univ. Press, 2010. Ch. 7 and 8, 189-268

Week 13 – 24 and 26 Nov 2014 – *Climate change skepticism*

Readings

- Oreskes, Naomi, and Erik M Conway. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Press, 2010. "The Denial of Global Warming," 169–215
- Howe, Joshua P. "The Stories We Tell. Naomi Oreskes and Erik M. Conway. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*" *Historical Studies in the Natural Sciences* 42, no. 3 (June 2012): 244–254.
- Hamblin, Jacob D. ed., Roundtable Review of *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* by Naomi Oreskes and Erik M. Conway. *H-Environment Roundtable Reviews* 1, no. 2 (July 2011)

Week 14 – 1 and 3 Dec 2014 – *The Intergovernmental Panel on Climate Change*

Activities

- A documentary film relevant to the course topic will be screened on 3 Dec.

Readings

- Le Treut, Hervé et al. "Historical Overview of Climate Change Science." In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge, United Kingdom and New York, USA: Cambridge University Press, 2007, 93-127

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- IPCC. “Climate Change 2007: Synthesis Report” (2007), 26-73
- Agrawala, Shardul. “Structural and Process History of the Intergovernmental Panel on Climate Change.” *Climatic Change* 39, no. 4 (1998): 621–642.
- Hulme, Mike, and Martin Mahony. “Climate Change: What Do We Know About the IPCC?” *Progress in Physical Geography* (June 18, 2010).

Week 15 – 8 and 10 Dec 2014 – *Philosophy, models and the Anthropocene*

Assignment

- Submit your third response essay on Learn@UW before class on 8 Dec.

Activities

- Exam questions and further details will be provided on 10 Dec 2014.

Readings

- Petersen, Arthur C. “Philosophy of Climate Science.” *Bulletin of the American Meteorological Society* 81, no. 2 (February 2000): 265–271.
- Zalasiewicz, Jan, Mark Williams, Alan Smith, Tiffany L. Barry, Angela L. Coe, Paul R. Bown, Patrick Brencley, et al. “Are We Now Living in the Anthropocene.” *GSA Today* 18, no. 2 (2008): 4.
- Steffen, Will, Jacques Grinewald, Paul J. Crutzen, and John R. McNeill. “The Anthropocene: Conceptual and Historical Perspectives.” *Philosophical Transactions of the Royal Society A* no. 369 (2011): 842–867.

Final exam due - 15 Dec 2013

Final exams are expected on Learn@UW by 7.05pm.
No late submissions will be accepted.