Environmental Studies 15
Spring Term 2014

POLE TO POLE
aka, Environmental Issues of the Earth's Cold Regions
MWF 10:00-11:05, X-Hour Th 12:00-12:50
B03 Moore

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ORC Description: The Earth's high northern and southern latitudes share an extreme climate, but are vastly different in their histories, ecological systems and human cultures. Polar regions are increasingly under threat from climate change, resource extraction, and the loss of indigenous cultures. This course examines the major physical, ecological and human systems of high latitudes, including the circumpolar northern Arctic regions and the continent of Antarctica. Using an interdisciplinary perspective the course examines the science of polar regions and applies this information to understand the human dimensions of major environmental issues facing cold regions. The connections of the polar regions to global processes and international issues (climate change, biodiversity, cultural preservation) will be emphasized.

Prerequisite: Environmental Studies 2 or 3 or permission of the instructor. *Dist: TAS*

Course Objectives: "Pole to Pole" seeks to:

- provide an introduction to the major physical, biological, and human systems of the Earth's high latitudes,
- introduce techniques for pooling the resources of a number of distinct disciplines in order to understand human/environment interactions in the cold regions,
- showcase members of the Dartmouth community and their colleagues working on high-latitude concerns, and
- serve as a point of entry for students interested in pursuing additional course work and research related to environmental studies of the polar regions.

Guiding Principles: The Earth's cold regions exhibit a number of physical features that set them apart from other regions. Among these are extreme photoperiodicity, low temperatures, limited precipitation, permafrost, and the presence of glaciers and ice sheets. As a result, the polar regions experience short but intense growing seasons, limited species diversity, and slow regeneration in the wake of both natural and human disturbances. Human adaptations in these regions have featured social practices involving hunting and gathering and herding in contrast to farming or industrial development.

Under these circumstances, efforts to understand human-environment interactions in the high latitudes as an extension of similar interactions in more familiar areas are likely to fail. The cold regions have emerged as arenas in which issues of global importance are being played out early and dramatically. The impacts of global environmental changes, such as the depletion of stratospheric ozone and climate change, are facts of life in the high latitudes, and human systems are already facing the need to adapt to these large-scale biogeophysical forces. Issues involving the collective rights of minority populations and the sharing of responsibility for managing renewable resources between users and public authorities are central concerns in these regions. The polar regions are at the center for a variety of experiments in international cooperation. Finally they are among the most beautiful and least explored regions on earth, deserving our understanding and our respect.

Academic Honor Principle: Students are expected to be fully aware of The Academic Honor Principle, that is, "all academic activities will be based on student honor. Each Dartmouth student accepts the responsibility to be honorable in the student's own academic affairs as well as to support the Principle as it applies to others." You should consult with the instructor if you are not clear about your responsibilities or expected conduct during any assignment or activity in this course. Visit the Dartmouth WEB site to be sure that you understand the proper use of Sources in preparing your term paper. http://www.dartmouth.edu/~sources/

Students with Disabilities: I encourage students with disabilities, including "invisible" disabilities like chronic diseases, learning disabilities and psychiatric disabilities to discuss with me after class or during office hours appropriate accommodations that might be helpful to you. If you have a documented disability needing academic adjustments or accommodations please see me by the end of the second week of the term. All discussions will remain confidential.

Religious Observances: I realize that some students may wish to take part in religious observances that fall during this academic term. Should you have a religious observance that conflicts with your participation in the course, please come speak with me before the end of the second week of the term to discuss appropriate accommodations.

Core Readings:

Richard N. Alley. 2000. The Two-Mile Time Machine: Ice Cores, Abrupt Climate Change, and Our Future. Princeton Univ. Press.

Charles Emmerson. 2010. The Future History of the Arctic. Public Affairs Publ.

Grading:

Students will be evaluated on the following basis:

Ecotour Report	5
Term paper topic and sources	5
Arctic Ocean Drilling Brief	10
Midterm Exam 1	25
Midterm Exam 2	25
Term paper	30

TOTAL 100

Ecotourism Report: Using the WEB, select a commercially available tour to a high latitude location, Arctic or Antarctic. Briefly describe the reasons why you chose this tour, the potential environmental and social impacts of the tour, and the extent to which the tour operator considers these impacts. See Blackboard for more specific requirements.

Arctic Ocean Oil and Gas Development Discussion: Oil prices are rising and oil imports from the Middle East and Africa pose supply risks for Western nations. In developing a long-term energy strategy the US must reach important decisions about off-shore drilling in its Arctic waters, and must also work with member States and indigenous groups of the Arctic Council to protect the environment and fisheries of the Arctic Ocean. On May 5, 2011 the House of Representatives passed a bill to expand off-shore drilling, and President Obama has announced a shift in policy. The contention about off-shore oil drilling dates back to the 1970's and involves myriad of stakeholders with diverse background and interests.

We will bring this debate to class. Small groups will adopt the identity of the main stakeholders. Each stakeholder group will have the unique opportunity to voice your viewpoint to two advisers for the US Department of State, Ross Virginia and Julia Bradley-Cook. The advisors want to know: What are the main geopolitical, economic and environmental issues underlying decisions to expand drilling in the Arctic Ocean? In addition to actively participating in the class discussion each student will prepare a short briefing paper (1-2 pages) highlighting three key points they wish to make on behalf of their stakeholder group along with sources supporting these talking points.

A more detailed description of this in class "hearing" will be distributed well in advance of the assignment.

Term paper: Your topic is expected to focus on an environmental or related social/political/historical issue of the polar regions. Ideally the paper should reflect a genuine interest and I encourage you to be creative by taking an interdisciplinary approach. Consider addressing some aspect of a contemporary human/environment/cultural interaction in the Arctic or Antarctic (think of our simple conceptual model presented at the start of the course). Once you have identified a theme and as your research moves forward, you should incorporate a historical linkage to the topic (for example, via an expedition, explorer, or event). Papers with a focus on polar history, photography, art, gender, etc., are fine, but connect your topic to some aspect of contemporary polar environmental change. Your research must draw from the Stefansson Special Collection in Polar Exploration, located in the Rauner Library. During a class session we will meet Dr. Jay Satterfield (Rauner Special Collections Librarian) to learn about the collection and how to access materials. I will provide examples of possible term paper topics during class and I will post on Blackboard more detailed guidelines for preparing the paper. The target for the paper is ~8-pages (12 point font, Times New Roman, double spaced). At least 2 sources must be from the Stefansson Collection.

The Institute of Arctic Studies (147 Haldeman Center) has a reading library that you are welcome to use. If you want to be added to the Arctic Studies mailing list please blitz the Institute of Arctic Studies. Monitor the Arctic Studies blitz bulletin for announcements about campus speakers, news, and job and internship opportunities related to northern and polar locations.

2014 CLASS SCHEDULE (subject to revision)

Monitor the ENVS 15 Blackboard site regularly for announcements and revisions.

The link to Reserve Readings can be found on the blackboard site.

Polar Studies: A Research Guide **-**Prepared by the Dartmouth Library Staff

WK 1		
3/24	Introduction IPY and Polar Issues	Baskin 2006, IPY: http://www.arctic.noaa.gov/ipy.html, Emmerson- Video clip
3/26	Arctic and Antarctic: VIDEO, Passport Travel Guide Series	Lonely Planet- The Arctic; Lonely Planet- Antarctica
3/28	The Cold/ Polar Comparisons 1	Alley Ch 13, 14; Marchand 1996, Chapin et al. 2005
WK 2		
3/31	Polar Comparisons 2 **ECOTOUR REPORT DUE**	Chapin et al. 2005
4/4	Earth's Climate System	Alley Part III and IV, Weart 2013, **The Day After Tomorrow VIDEO**
4/4	Climate and Ice Cores	Alley Part I and II, Emmerson Ch 6
WK 3		
4/7	Ice Cores and Abrupt Climate Change	Alley Part I and II
4/9	Sea Ice Change	Pfirman 2009, Serreze et al. 2007, Alley Part V
4/11	Glaciers and Ice Sheets	Bamber and Aspinall 2013, Favier et al. 2014
WK 4		
4/14	The Heroic Age of Polar Exploration	Emmerson Ch 1, 2; Worst Journey in the World, Ch VII by Apsley Cherry-Garrard 1922. http://www.gutenberg.org/files/14363/14363-h/i.htm - CHAPTER_VII, **90 South VIDEO**
4/16	Stefansson Special Collection with **Dr. Jay Satterfield**, meet at **RAUNER LIBRARY at your assigned time**	http://ead.dartmouth.edu/html/stem169.html See Blackboard folder: Course Resource > Stefansson's Legacy
4/18	**MIDTERM EXAM 1**	
WK5		
4/21	*Secrets of the Dead: The Lost Vikings in Greenland*, **VIDEO**	Diamond 2005, Intro
4/23	Subhankar Banerjee Arctic activism	Banerjee 2013, McKee 2012
4/24	"Art and Activism" Panel, Discussion- including Subhankar Banerjee	Hood Auditorium, Hood Museum of Art, 4:30-5:30
4/25	Lost Vikings, Collapse, and	Diamond 2005, Ch. 8

	Greenland Today	
WK6		
4/28	Ecosystem Responses to Warming	Post and Pedersen 2008, McClintock et al. 2008, Ballard et al. 2010, Virginia and Wall 2013
4/30	Polar Amplification: Penguins and Polar Bears	Pithan and Mauritsen 2014, Schaefer et al. 2011, Bromwich et al. 2013, Boersma and Rebsotck 2014
5/2	Antarctica is Cooling? **TERM PAPER TOPIC DUE**	Doran et al. 2002, Virginia and Wall 1999, Doran 2006 editorial
WK 7		
5/5	Polar Perceptions- Project Chariot	O'Neill 1994; Emmerson Ch 5; Glasberg 2008
5/7	Traditional Ecological Knowledge (TEK)	Nadasdy 1999
5/9	Arctic Health and Indigenous Issues	Dartmouth Conference Report
WK 8		
5/12	**Prof. Bill Roebuck**: Oil, Spills and Polar Environments	Emmerson Ch 8, 9; Peterson 2003 **Oil on Ice, VIDEO**
5/14	**MIDTERM EXAM 2**	
5/16	Polar Governance	Antarctic Treaty System, Arctic Council
WK 9		
5/19	Northwest Passage and Oil discussion breakout session	Emmerson Ch 3, 4, 7, **Arctic Passage VIDEO**
5/21	Arctic Ocean Oil Discussion **Oil Briefing Report DUE**	Readings to be assigned, McKee 2010
5/23	Polar Politics and Polar Futures	Collins et al. 2013 (Arctic Security Report and Hands Across the Melting Ice OP-ED), Emmerson Ch 12
WK 10		
5/26	**Memorial Day, No Class**	
5/28	Stefansson's Lessons and Jerry Reflections, **TERM PAPER DUE BY START OF CLASS**	

For more information on pre-lecture music and lyrics I recommend Robert Hunter's, *A Box of Rain*, 1993, Penguin Books. For a history of the band, see *A Long Strange Trip* by Dennis McNally, 2002, Broadway Books and/or *Garcia, An American Life* by Blair Jackson, 1999, Viking Books.

The reading list below includes papers assigned in previous years. They are included as resources for term papers and for additional information if you are so motivated.

Reading List. Additional Readings may be placed on Reserve during the course.

Amstrup, S. C., E. T. DeWeaver, D. C. Douglas, B. G. Marcot, G. M. Durner, C. M. Bitz, and D. A. Bailey. 2010. Greenhouse gas mitigation can reduce sea-ice loss and increase polar bear persistence. Nature 468:955-960

Ballard, G., V. Toniolo, D. G. Ainley, C. L. Parkinson, K. R. Arrigo, and P.N. Trathan. 2010. Responding to climate change: Adelie Penguins confront astronomical and ocean boundaries. Ecology 91:2056-2069

Bamber, J. L. and W. P. Aspinall. 2013. An expert judgment assessment of future sea level rise from ice sheets. Nature Climate Change DOI: 10.1038/NCLIMATE1778 6 Jan 2013

Baskin, Y. 2006. Where nematodes are lions. Pp. 14-37, In: *Under Ground: How Creatures of Mud and Dirt Shape our World.* Island Press

Banerjee, S. 2013. Ought we not to establish 'access to food' as a species right? Third Text, January 2103, Vol 27, Issue 1, 33-43, http://dx.doi.org/10.1080/09528822.2013.752198

Boersma, P. D, and G. A. Rebstock. 2014. Climate change increases reproductive failure in Magellanic penquins. Plos One 2014 | Volume 9 | Issue 1 | e85602

Bromwich, D. H., J. P. Nicholas, A. J. Monaghan, M. A. Lazzara, L. M. Keller, G. A. Weidner, and A. B. Wilson. 2013. Central West Antarctica among the most rapidly warming regions on earth. Nature Geoscience 6:139-145. doi:10.1038/ngeo1671

Chapin, F. S. III, M. Berman, T. V. Callaghan, P. Convey, A-S Crépin, K. Danell, H. Ducklow, B. Forbes, G. Kofinas, A. D. McGuire, M. Nuttall, R. Virginia, O. Young, and S. A. Zimov. 2005. Polar Systems. Chapter 25, pp. 717-743. In: *Ecosystems and Human Well-Being: Current State and Trends. The Millennium Ecosystem Assessment Series, Vol 1*. R. Hassan, R. Scholes and N. Ash (eds.). Island Press, Washington D.C.

Collins, J. F., M. Sfraga, R. A. Virginia, and K. S. Yalowitz. 2013. *A Euro-Atlantic Action Plan for Cooperation and Enhanced Arctic Security. Conference Report and Recommendations to the Arctic Council and Interested Parties.* February 11-12, 2013, Carnegie Endowment of International Peace, Washington, D. C. and the University of the Arctic Institute for Applied Circumpolar Policy, http://carnegieendowment.org/2013/05/14/euro-atlantic-action-plan-for-cooperation-and-enhanced-arctic-security/g3i8

Couzin. J. 2007. Opening doors to native knowledge. Science Vol. 315. no. 5818, pp. 1518 – 1519 DOI: 10.1126/science.315.5818.1518

Diamond, J. 2005. Collapse. How Societies Choose to Fail or Succeed. Prologue. A Tale of Two Farms. Pp. 1-23. Viking Press.

Diamond, J. 2005. Collapse. How Societies Choose to Fail or Succeed. Chapter 8, Norse Greenland's End. Pp. 248-276. Viking Press.

Doran, P. T. et. al. 2002. Antarctic climate cooling and terrestrial ecosystem response. Nature 415:517-520.

Favier, L., G. Durand et al. 2014. Pine Island Glacier controlled by marine ice-sheet instability. 2014. Nature Climate Change, PUBLISHED ONLINE: 12 JANUARY 2014DOI: 10.1038/NCLIMATE2094

Fitzhugh, W. 2002. Yamal to Greenland: Global connections in circumpolar archaeology. Pp. 91-144, In: Archaeology. The Widening Debate. B. Cunliffe, W. Davies, and C. Renfrew (eds.). Oxford University Press.

Glasberg, E. 2008. Who goes there? Science, fiction, and belonging in Antarctica. J. Historical Geography 34:639-657.

Jenouvrier, S. et al. 2009. Demographic models and IPCC climate projections predict the decline of an emperior penguin population. Proc. Nat. Acad. Sci. www.pnas.org/cgi/doi/10.1073/pnas.0806638106

Law K. S., and A. Stohl. 2007. Arctic air pollution: Origins and impacts. Science 315 (5818), 1537. [DOI: 10.1126/science.1137695]

Lonely Planet Antarctica. 2000 (2nd edition). Jeff Rubin. Lonely Planet Publications, Victoria. Introduction, pgs. 11-63.
Lonely Planet. The Arctic. 1999. Deanna Swaney. Lonely Planet Publications, Victoria. Introduction, pgs. 13-38.
Lopez, Barry. Informed by indifference, a walk in Antarctica. May 1988. Harper's Magazine, pp 66-68.
Lubin, D., and R. Massom. 2007. Remote sensing of Earth's polar regions. Computing Science and Engineering, January/February 2007, pgs 58-71.
Lynge, Finn. 1992. Arctic Wars. Animal Rights and Endangered Peoples. Pgs. 1-8, 36-65, 84-101.
Marchand, P. J. Life in the Cold. 1996 (3rd edition). Chapter 8, Humans in Cold Places. Pgs. 239-254.
McClintock, J., H. Ducklow, and W. Frazier. 2008. Ecological responses to climate change on the Antarctic peninsula. American Scientist 96:302-310
McKee, Yeates. 2012. Of Survival. Climate Change and Uncanny Landscape in the Photography of Subhankar Banerjee. *In:* Henry Sussman (editor), "Impasses of the Post-Global: Theory in the Era of Climate Change" (Open Humanities Press, 2012). http://quod.lib.umich.edu/o/ohp/10803281.0001.001/1:5?rgn=div1;view=fulltext
Milner, A, M. et al. 2000. Colonization and development of stream gradient communities across a 200-year gradient in Galcier National Park, Alaska, U.S.A. Can J Fish Aquat Sci 57:2319-2335.
Nadasdy, P. 1999. The politics of TEK: Power and the "integration" of knowledge. Arctic Anthropology 36:1-18.
O'Neill, D. The Firecracker Boys. 1994. St. Martin's Griffin, New York. Selected passages. 1-30, 75-111, 258-267.
Pennisi E., J Smith, and R Stone. 2007. Momentous changes at the poles. Science 315, 1513.
Pfirman, S., B. Tremblay, and C. Fowler. 2009. Going with the Floe? Amer Scientist 97:484-493
Peterson, C. H. 2003. Long term ecosystem response to the Exxon Valdez oil spill. Science 302:2082-2086.
Pithan, F., and T. Mauritsen. 2014. Arctic amplification dominated by temperature feedbacks in contemporary climate models. Nature Geoscience, PUBLISHED ONLINE: 2 FEBRUARY 2014 |DOI: 10.1038/NGEO2071
Post, E., and C. Pedersen. 2008. Opposing plant community responses to warming with and without herbivores. Proc. Nat. Acad. Sci. 105: 12353-12358. (August 26, 2008)
Roebuck, B. D. 1999. Elevated mercury in fish as a result of the James Bay Hydroelectric development: Perception and reality. Ch 4, In: Social and Environmental Impacts of the James Bay Hyrdoelectric Project. J. F. Hornig (ed.) Pp. 73-92. McGill-Queen's Univ Press.
Schaefer, J. M., G. H. Denton, D. J. A. Barrell et al. 2006. Near-synchronous interhemispheric termination of the last glacial maximum in mid-latitudes. Science 312:1510-1513
Schaefer, K., T. Zhang, L. Bruhwiler, and A. P. Barrett. 2011. Amount and timing of permafrost carbon release in response to climate warming. Tellus 63B: 165-180.
Serreze. M. C., M. M. Holland, and J. Stroeve. 2007. Perspectives on the Arctic's shrinking sea-ice cover. 2007. Science 315 (5818), 1533. [DOI: 10.1126/science.1139426].
Severinghaus, J. P., T. Sowers, E. J. Brook, R. B. Alley, and M. L. Bender. 1998. Timing of abrupt climate change at the end of the Younger Dryas interval from thermally fractionate gases in polar ice. Nature 391:141-146
Shepherd. A. and D. Wingham. 2007. Recent sea-level contributions of the Antarctic and Greenland ice sheets. Science 315 (5818), 1529. [DOI: 10.1126/science.1136776]
Stirling, I. 1998. Polar Bears. Pp. 157-185. Univ. of Michigan Press, Ann Arbor.

Stuckenberger, N. 2007. Thin Ice: Inuit life and climate change. Pgs 29-44, In: *Thin Ice: Inuit Traditions within a Changing Environment.* Univ Press of New England, Hanover & London

Van Oostdam et al. 1999. Human health implications of environmental contaminants in Arctic Canada: a review. The Science of the Total Environment 230: 1-82.

Virginia, R. A., and D. H. Wall. 1999. How soils structure communities in the Antarctic Dry Valleys. BioScience 49:973-983

Virginia, R. A. and D. H. Wall. 2013. Ecosystem Function, Principles of. *In*: Levin, S. A. (ed.) *Encyclopedia of Biodiversity, second edition,* Volume 3, pp. 90-95. Waltham, MA: Academic Press

Weart, S. 2013. Rise of interdisciplinary research on climate. PNAS 110 suppl 1:3657-3664

Yalowitz, K. S., J. F. Collins, and R. A. Virginia. 2009. *The Arctic Climate Change and Security Policy Conference- Final Report and Findings.* Carnegie Endowment for International Peace, Washington D.C., 36 pgs

Young, O. R. 2009. Wither the Arctic? Conflict or cooperation in the circumpolar north. Polar Record 45:73-82

Zimov, S. A., E. A. G. Schuur, and F. S. Chapin III. 2006. Permafrost and the global carbon budget. Science 132:1612-1613.