

Environmental Studies 15
Spring Term 2017

POLE TO POLE
aka, Environmental Issues of the Earth's Cold Regions

MWF 10:10-11:15, X-Hour Th 12:15-1:05
Carson L02

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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. 2014. The Two-Mile Time Machine: Ice Cores, Abrupt Climate Change, and Our Future. Princeton Univ. Press
- Anthony Brandt. 2011. The Man Who Ate His Boots. Anchor Reprint Edition
- Charles Emmerson. 2010. The Future History of the Arctic. Public Affairs Publisher

Grading:

Students will be evaluated on the following basis:

Ecotour Report	5
Greenland Development Brief	10
Participation in class, on canvas	5
Midterm Exam 1	25
Midterm Exam 2	25
Shackleton Project	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.](#)

Greenland Development Discussion: Greenland has potential resource wealth. They want to retain and invest that wealth and to become financially independent from Denmark, but need the help of other countries such as China to invest in startup, develop the technology, markets, and provide a labor force. Also, they need to consider the fragile and rapidly changing Arctic environment that is a fundamental part of their culture and identity and is the basis of the subsistence economies of small settlements. During class we will introduce this debate and the stakeholders involved. Small groups will then adopt the identity of the main stakeholders. Each stakeholder group will have the unique opportunity to voice your viewpoint and contribute to a discussion about the future of Greenland and its energy and mineral wealth. In addition to actively participating in the class discussion, each student will prepare a short briefing report (1-2 pages) highlighting 3-5 key points they wish to make on behalf of their stakeholder group along with sources supporting these talking points. Each student will also write a short synthesis (1/2 - 1 page) of the activity centered on the following question: which stakeholder group provided the most compelling argument for or against expanding resource development, and why? More information will be provided in class.

The Northwest Passage Exhibit Project: Ernest Shackleton (1874-1922) is a legend among polar explorers. He captured the public imagination during the heroic age of polar exploration and historians, business leaders, and scientists study these expeditions today. This year marks the 100th anniversary of the rescue of the *Endurance* crew from Elephant Island and there are museum exhibitions around the work dedicated to what was Shackleton's third and last expedition to Antarctica. Each expedition had its own fascinating story, unique historical context, and outcomes.

Lady Franklin's Lament (folk ballad ~1850)

<http://www.justanother tune.com/html/ladyfranklin.html>

We were homeward bound one night on the deep
Swinging in my hammock I fell asleep
I dreamed a dream and I thought it true
Concerning Franklin and his gallant crew

With a hundred seamen he sailed away
To the frozen ocean in the month of May
To seek a passage around the pole
Where we poor sailors do sometimes go

Through cruel hardships they vainly strove
Their ships on mountains of ice were drove
Only the Eskimo with his skin canoe

Was the only one that ever came through

In Baffin's Bay where the whale fish blow
The fate of Franklin no man may know
The fate of Franklin no tongue can tell
Lord Franklin alone with his sailors do dwell

And now my burden it gives me pain
For my long-lost Franklin I would cross the main
Ten thousand pounds I would freely give
To know on earth, that my Franklin do live

<p>"Lady Franklin's Lament" (folk ballad ~1850) http://www.justanother tune.com/html/ladyfranklin.html</p> <p>We were homeward bound one night on the deep Swinging in my hammock I fell asleep I dreamed a dream and I thought it true Concerning Franklin and his gallant crew</p> <p>With a hundred seamen he sailed away To the frozen ocean in the month of May To seek a passage around the pole Where we poor sailors do sometimes go</p> <p>Through cruel hardships they vainly strove Their ships on mountains of ice were drove Only the Eskimo with his skin canoe Was the only one that ever came through</p> <p>In Baffin's Bay where the whale fish blow The fate of Franklin no man may know The fate of Franklin no tongue can tell Lord Franklin alone with his sailors do dwell</p> <p>And now my burden it gives me pain For my long-lost Franklin I would cross the main Ten thousand pounds I would freely give To know on earth, that my Franklin do live</p>	<p>"Bob Dylan's Dream" (1963)</p> <p>While riding on a train goin' west I feel asleep for take my a rest I dreamed a dream that make me sad Concerning myself and the first few friends I had.</p> <p>With half-damp eyes I stared to the room Where my friends and I spent many an afternoon Where we together weathered many a storm Laughin' and singing 'till the early hours of the morn'.</p> <p>By the old wooden stove where our hats was hung Our words were told, our songs were songs Where we longed for nothin' and were satisfied Joking and talking about the world outside.</p> <p>With haunted hearts through the heat and cold We never thought we could ever get very old We thought we could sit forever in fun Our chances really was a million to one.</p> <p>As easy it was to tell black from white It was all that easy to tell wrong from right And our choices they were few and the thought never hit That the one road we traveled would ever shatter and split.</p>
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	<p>How many a year has passed and gone Many a gamble has been lost and won And many a road taken by many a first friend And each one I've never seen again.</p> <p>I wish, I wish, I wish in vain That we could sit simply in that room again Ten thousand dollars at the drop of a hat I'd give it all gladly if our lives could be like that.</p>
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The class will be divided into 3 groups, one for each expedition: The *Discovery* Expedition led by Robert F. Scott (1901-04); The British Antarctic (*Nimrod*) Expedition (1907-09); and, The Imperial Trans-Antarctic (*Endurance*) Expedition (1914-17). Each group will research an assigned expedition to identify materials from the Rauner Library Stefansson Collection on Polar Exploration for use in an ENVS 15 inspired exhibit that will be on public display in Rauner during the summer term. More detailed information will be given in class and posted on Canvas. We will visit Rauner during the second week of classes to: learn how to access and use archival materials, view exhibits to learn design principles, and how to conduct research using archives and select materials for the exhibit. We will work together to shape a narrative that can engage a public audience interested in the who, why, and what did we learn from the major polar expeditions of the early 1900s.

Each student will propose a contribution to the exhibit. For example, this might be a photograph, a selection of text from a first hand account, a finding from a scientific report linked to the expedition, or a new accounts and other information that provides a context for the expedition and the times during which it was conducted. Your specific research and selected contribution to the exhibit will be described in a short paper (~5 pages), which also explains the proposed significance of your contribution to the exhibit.

Each group will be afforded 30 minutes for an in class presentation and discussion that knits together the individual contributions into a larger narrative about the expedition. Each group will have an X-HR session at the Rauner Library where you will plan out your exhibit presentation and will have the chance to consult with the Rauner staff and the instructors about your project.

Points: Group presentation (5), object (photo, text etc) and its description (10), report placing the object within the overall expedition (15).

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.

2016 CLASS SCHEDULE (subject to revision)

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

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

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

http://researchguides.dartmouth.edu/polar_studies

WK 1		
3/27	Introduction: What happens in the Arctic doesn't stay in the Arctic.	Baskin 2006, IPY: http://www.arctic.noaa.gov/ipy.html , Emmerson- Video clip, Our Shared Arctic Future: https://www.youtube.com/watch?v=9GjRBpu6nzI
3/29	Arctic and Antarctic: VIDEO, Passport Travel Guide Series	Lonely Planet- The Arctic; Lonely Planet- Antarctica
3/30X		
3/31	The Heroic Age of Polar Exploration: Shackleton, Scott and Stefansson	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
WK 2		
4/2	Stefansson Special Collection with Dr. Jay Satterfield . Meet at RAUNER LIBRARY	https://www.dartmouth.edu/~library/rauner/manuscripts/stefansson_guide.html
4/5	Earth's Climate System ECOTOUR REPORT DUE	Alley Part III and IV, Weart 2013
4/6X		
4/7	Climate and Ice Cores	Alley Part I and II, Emmerson Ch 6
WK 3		
4/10	Ice Cores and Abrupt Climate Change	Alley Part I and II
4/12	Sea Ice Change	Pfirman 2009, Serreze et al. 2007, Alley Part V
4/13X		
4/14	Glaciers and Ice Sheets	Bamber and Aspinall 2013, Favier et al. 2014
WK 4		
4/17	The Cold/ Polar Comparisons	Alley Ch 13, 14; Marchand 1996, Chapin et al. 2005, Emmerson Ch 1, 2;
4/19	Arctic Ecosystems and Responses to Warming	Post et al.2013, Post and Pedersen 2008, Virginia and Wall 2013
4/20X		
4/21	MIDTERM EXAM 1	
WK5		
4/24	Antarctica is Cooling?	Doran et al. 2002, Virginia and Wall 1999, Doran 2006 editorial
4/26	Polar Politics and Governance EMMA DEFENSE	Antarctic Treaty System , Arctic Council , Collins et al. 2013 (Arctic Security Report and Hands

		Across the Melting Ice OP-ED), Emmerson Ch 12
4/27X		
4/28	Traditional Ecological Knowledge (TEK), Dr. Lauren Culler	Nadasdy 1999, others to be assigned
WK6		
5/1	Lost Vikings and Collapse	Diamond 2005, Ch. Intro, Ch. 5 and 8. VIEW <i>Secrets of the Dead: The Lost Vikings in Greenland</i> , VIDEO (supplement, Vikings Unearthed, 2016 NOVA episode, http://www.pbs.org/wgbh/nova/ancient/vikings-unearthed.html)
5/3	A Changing Greenlandic Society Gretel Ehrlich, author	Selections from This Cold Heaven, Gretel Ehrlich, 2001
5/4X	Discovery Group	Rauner, Byrant Room
5/5 Alaska	Greenland Future and Simulation Exercise Planning	Watch Melting Point Greenland https://www.youtube.com/watch?v=qgnvbMwRaf8 ; Emmerson Ch 12
WK 7	ALASKA MEETINGS	
5/8	Greenland Development Simulation: A Hearing of Interested Parties Greenland Report Due	Background readings
5/10	Polar Perceptions- Project Chariot	O'Neill 1994; Emmerson Ch 5; Glasberg 2008
5/11 X	Nimrod Group	Rauner, Bryant Room
5/12	Arctic Resilience: People, Development and Climate Change. Dr. Bruce Forbes , Arctic Centre, Univ. of Lapland	Readings to be assigned
WK 8		
5/15	MIDTERM EXAM 2	
5/17	Prof. Bill Roebuck: Oil, Spills and Polar Environments	Emmerson Ch 8, 9; Peterson 2003 Oil on Ice, VIDEO
5/18X	Endurance Group	Rauner, Bryant Room
5/19	Prof. Bill Roebuck: Arctic Health- Mercury and Subsistence Foods	Dartmouth Conference Report
WK 9		
5/22	Presentations: Discovery and Nimrod Expeditions	
5/24	Presentations: Endurance Expedition and Shackleton overview	
5/25X		

5/26	Stefansson's Lessons and Jerry Reflections Shackleton Project Due 5/31	
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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.

Sgubin, G, et al. 2017. Abrupt cooling over the North Atlantic in modern climate models, 2017, *Nature Communications* (2017) 8 doi:10.1038/ncomms14375

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 penguins. *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.
- Ehrlich, Gretel. 2001. *This Cold Heaven. Seven Seasons in Greenland*. Pantheon Book, New York
- Favier, L., G. Durand et al. 2014. Pine Island Glacier controlled by marine ice-sheet instability. 2014. *Nature Climate Change*, PUBLISHED ONLINE: 12 JANUARY 2014 DOI: 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 emperor 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 Gaiacier 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/NCEO2071
- 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 Hydroelectric 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 fractionated 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.