RACHEL WYNDHAM OBBARD, Ph.D.

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APPOINTMENTS

2018-present	Senior Scientist, SETI Institute
2016-present	Adjunct Assistant Professor of Writing, Dartmouth College
2018	Research Associate Professor, Thayer School of Engineering, Dartmouth College
2012-2018	Research Assistant Professor, Thayer School of Engineering, Dartmouth College
2009-2012	Research Scientist and Lecturer, Thayer School of Engineering, Dartmouth College
2007-2009	Postdoctoral Fellow, British Antarctic Survey, Cambridge, UK

EDUCATION

Ph.D., 2006 Engineering - Thayer School of Engineering, Dartmouth College - Hanover, NH, USA
Dissertation: *Microstructural Determinants in Glacial Ice*
Advisor: Professor Ian Baker

M.Sc., 2002 Materials Science and Engineering - University of New Hampshire - Durham, NH, USA
Thesis: *Effect Of Metal Interlayers on The Mechanical Behavior of Titanium Carbide Films*
Advisor: Professor Todd S. Gross

B.Sc., 1985 Engineering Physics - Colorado School of Mines - Golden, CO, USA

AWARDED RESEARCH GRANTS

2018 NASA ROSES 2017 Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO) NNH17ZDA001N *Micro In Situ Tomography (MIST).* **R. Obbard PI**, P. Sarrazin (Co-I, SETI), K. Zacny (Co-I, Honeybee Robotics), S. Byrne (Collaborator, University of Arizona). Ends 9/20/21.

2016 NSF Arctic Natural Sciences: PLR-1603683. *Collaborative Research: Arctic Land Fast Sea Ice Formation in the Presence of Fresh Water Input.* **R. Obbard PI**, X. Feng (Co-PI, Dartmouth), I. Rigor (Co-PI, University of Washington). Ends 8/31/20.

2016 U.S. National Park Service, Department of the Interior: P16AP00359. *3D Analysis and Visualization of Tideline Changes to Cellulosic Structures*. **R. Obbard PI**, S. Centeno (Co-PI, Metropolitan Museum of Art), L. Brostoff (Co-PI, Library of Congress). Ended 12/15/17.

2013 NSF Arctic Natural Sciences: PLR-1304134. *Characterization of Brine Network Microstructure in First Year Arctic Sea Ice.* **R. Obbard Lead PI,** S. Pauls (Co-PI, Dartmouth). Ended 2/28/17.

2012 NSF Antarctic Glaciology: PLR-1142035. *Collaborative Research: Fabric Evolution at WAIS Divide.* E. Pettit (Lead PI, UAF), **R. Obbard Co-PI**. Ended 5/31/16.

2011 NSF Antarctic Ocean and Atmospheric Sciences: ANT-1043145. *Bromide in Snow in the Sea Ice Zone.* **R. Obbard Lead PI**. Ended 7/31/15.

PEER-REVIEWED PUBLICATIONS

26. A Network Model for Characterizing Brine Channels in Sea Ice. R.M. Lieb-Lappen, D.D. Kumar, S.D. Pauls, **R.W. Obbard**. *The Cryosphere*. DOI:10.5194/tc-2017-169

25. Microplastics in Polar Regions: the role of long range transport. **R. W. Obbard**. *Current Opinion in Environmental Science & Health*. Volume 1, February 2018, Pages 24–29 https://doi.org/10.1016/j.coesh.2017.10.004 - **INVITED**

24. The first physical evidence of subglacial volcanism under the West Antarctic Ice Sheet. N. Iverson, R. Lieb-Lappen, N. W. Dunbar, **R. Obbard**, E. Kim, E. Golden. *Scientific Reports 7: 11457 (2017)* DOI: 10.1038/s41598-017-11515-3

23. Synchrotron X-ray Fluorescence Spectroscopy of Salts in Natural Sea Ice. **R.W. Obbard**, R. Lieb-Lappen, K. V. Nordick, E. J. Golden, J. R. Leonard, A. Lanzirotti, M. G. Newville. *Earth and Space Science*. 11/30/16 DOI:10.1002/2016EA000172

22. Metrics for interpreting the microstructure of sea ice using micro-computed tomography. R. M. Lieb-Lappen, E.J. Golden, and **R.W. Obbard**. *Cold Regions Research and Technology,* June 2017, 24-37.

21. X-ray computed microtomography of sea ice. **R. Obbard** (2015) *Atmos. Chem. Phys. Discuss.,* 15, 13167-13171. http://www.atmos-chem-phys-discuss.net/15/13167/2015/acpd-15-13167-2015.html

20. The role of blowing snow in the activation of bromine over first-year Antarctic sea ice. R. M. Lieb-Lappen and **R. W. Obbard** (2015) *Atmos. Chem. Phy. Discuss.* 15, 11985–12005.

19. Making EBSD on water ice routine. D. Prior, K. Lilly, M. Seidemann, M. Vaughan, R. Easingwood, S. Diebold, **R. Obbard**, C. Daghlian, I. Baker, T. Caswell, N. Golding, D. Goldsby, W. Durham, S. Piazolo, C. Wilson (2015) *Journal of Microscopy*. doi: 10.1111/jmi.12258.

18. Preface to the 13th Physics and Chemistry of Ice Conference (PCI-2014) Special Section. **R. Obbard** and I. Baker. (2014) *Journal of Physical Chemistry B,* 118(47).

17. Global warming releases microplastic legacy frozen in Arctic Sea Ice. **R. Obbard**, S. Sadri, Y.-Q. Wong, A. A. Khitun, I. Baker and R. C. Thompson (2014) *Earth's Future,* 2 (6), 315-320. doi: 10.1002/2014EF000240

16. Cryogenic EBSD Reveals Structure of Directionally Solidified Ice-polymer Composite. A. Donius, **R. Obbard**, J. Burger, P. Hunger, N. Pashos, M. Wheatley, I. Baker, R. Dogerty, U. Wegst (2014) *Materials Characterization*, 93(214), 184-190.

15. New shortwave infrared albedo measurements for snow specific surface area retrieval. B. Montpetit, A. Royer, A. Langlois, P. Cliche, A. Roy, N. Champollion N, G. Picard, F. Domine and **R. Obbard**. (2012) *Journal of Glaciology*, 58(211). doi: 10.3189/2012JoG11j248.

14. Insight into the phase transformations between Ice Ih and Ice II from EBSD data. D.J. Prior, S. Diebold, **R. Obbard**, C. Daghlian, D.L. Goldsby, W.H. Durham and I. Baker. (2012) *Scripta Materialia*, 66, 69-72.

13. Microstructural evolution in the fine-grained region of the Siple Dome ice core. **R.W. Obbard**, K.E. Sieg, I. Baker, and D. Meese (2011) *Journal of Glaciology,* 57 (206), 1046-1056.

12. A scanning electron microscope technique for identifying the mineralogy of dust in ice cores. **R.W. Obbard**, I. Baker, D. Prior (2011) *Journal of Glaciology,* 57 (203), 511-514.

11. Using borehole logging to orient an ice core from the Upper Fremont Glacier, Wyoming. **R.W. Obbard,** T. Cassano, K. Aho, G. Troderman, I. Baker (2011) *Journal of Glaciology,* 57 (205), 840-846.

10. Energy and ozone fluxes over sea ice. J. Muller, J. Dorsey, M. Flynn, M. Gallagher, C. Percival, D. Shallcross, A. Archibald, H.K. Roscoe, **R.W. Obbard**, H.M. Atkinson, J.D. Lee, S.J. Moller, L.J. Carpenter (2011) *Atmospheric Environment*, November 2011, doi: 10.1016/j.atmosenv.2011.11.013

9. Frost flowers in the laboratory: growth, characteristics, aerosol, and the underlying sea ice. H.K. Roscoe, B. Brooks, A.V. Jackson, M.H. Smith, S.J. Walker, **R.W. Obbard**, E.W. Wolff. (2011) *Journal of Geophysical Research*, 116, D12301, doi:10.1029/2010JD015144.

8. Imaging brine and air inclusions in sea ice using micro X-ray computed tomography. **R.W. Obbard**, G. Troderman, I. Baker (2009) *Journal of Glaciology*, 55 (194), 1113-1115. http://www.igsoc.org/journal/55/194/

7. Frost flower surface area and chemistry as a function of salinity and temperature. **R.W. Obbard**, H.K. Roscoe, E.W. Wolff and H. Atkinson (2009) *Journal of Geophysical Research (Atmospheres) doi:10.1029/2009JD012481*

6. The microstructure of meteoric ice from Vostok, Antarctica, **R. Obbard**, I. Baker and K. Sieg (2007) *Journal of Glaciology,* 53(180), 41-62.

5. Microstructural characterization of firn. I. Baker, **R. Obbard**, D. Iliescu and D. Meese. (2007) *Hydrological Processes,* 21(12), 1624-1629.

4. Using electron backscatter diffraction patterns to examine recrystallization in polar ice sheets. **R. Obbard,** I. Baker and K. Sieg (2006) *Journal of Glaciology,* 52(179), 546-557.

3. Grain boundary grooving in ice in a scanning electron microscope. **R. Obbard**, I. Baker and D. Iliescu (2006) *Journal of Glaciology,* 52(176), 169-172.

2. Microstructural characterization of ice cores. I. Baker, D. Iliescu, **R. Obbard**, H. Chang, B. Bostick and C.P. Daghlian (2005) *Annals of Glaciology,* 42, 441-445.

1. SEM/EDS comparison of polar and seasonal temperate ice. **R. Obbard**, D. Iliescu, D. Cullen, J. Chang and I. Baker (2003) *Microscopy Research and Technique*, 62, 49-61.

MANUSCRIPTS SUBMITTED OR IN PREPARATION

Manuscripts in Preparation:

Diffusion of elements in tidelines. **R. Obbard**, L. Brostoff, S. Centeno, L. Zhang. *Materials Research Letters.*

BOOK CHAPTER

"Firn", **R.W. Obbard**, I. Baker and R.W. Lomonaco, in Encyclopedia of Snow, Ice and Glaciers (2012) V.P. Singh, P. Singh, U.K. Haritashya (eds.), Springer, Germany.

PATENT

Temperature Gradient Storage System and Method. Rachel W. Obbard, Natalie P. Afonina, Ross Lieb-Lappen, Charles G. Pope; New application (30954) filed 12/23/14; Final application filed 12/23/15

TEACHING EXPERIENCE

2011-2018 **ENGS 8, *Materials in Sports Equipment*** - An introductory materials science and engineering course

2016 **ENGS 3, *Materials: The Substance of Civilization*** - An introductory materials science and engineering course

2010, 2017 **ENGS 24, *Science of Materials*** (project advisor) - Undergraduate materials science course for engineers

2010-2017 **ENGS 133/137, *Materials Characterization*** (lectures on X-ray microcomputed tomography) - Graduate materials science course.

2018 **WRIT 5, *Expository Writing: The Machine in the Game*** - A first year writing course

2018 **WRIT 7, *Technology and Sport at the Crossroads*** – A first year writing course

2016-2017 **WRIT 44, *Science and Technology Writing*** - An upper level writing course for science and engineering majors

2009-2012 **BIOL 138, *Introduction to Polar Systems*** (co-taught) - Interdisciplinary graduate level course

2014 **Graduate Ethics Seminar** – Seminar series for graduate students

AWARDS AND HONORS

2015 OpenCon 2015 Scholarship, Brussels, Belgium
2015 Poster Award, Polar Data Forum II, Waterloo, Ontario, Canada
2007 Northern Research Fund Grant, Churchill Northern Studies Centre, Manitoba, Canada
2006 Exploration Grant, Geographical Society of Philadelphia
2006 Invited Participant at the National Science Foundation Office of Polar Program's Antarctic New Investigators Workshop
2006 Firsts (2) and Second (1) Places in the International Metallographic Contest at the 39th Annual
2006 IMS Convention and Technical Meeting, Chicago, Illinois
2000 Society of Women Engineers Scholarship
2000 Business and Professional Women's Association Scholarship

POSTDOCTORAL RESEARCHER MENTORING

Alice Chapman Bradley (2017-2018)

GRADUATE STUDENT MENTORING

Ross Lieb-Lappen (2012-2016)

INVITED LECTURES

2017 *In Situ Studies of Tidelines on Paper*. **R. Obbard**. Topics in Preservation Lecture. Library of Congress, Washington, D.C. December 4, 2017

2017 *Ice Sampling and In Situ Analysis.* R. Obbard. Unlocking the Climate Record Stored within Mars' Polar Layered Deposits Workshop. Keck Institute for Space Studies. California Institute of Technology. August 10, 2017.

2016 *The Material World*. **R. Obbard**. Cold Regions Research and Engineering Laboratory, Hanover, NH. February 16, 2016

2015 *A Krill's Eye View of Sea Ice Microstructure*. **R. Obbard** and R. Lieb-Lappen. AGU Fall Meeting in San Francisco, CA. December 16, 2015

2014 *Sea Ice for Engineers*. **R. Obbard**. Jones College Prep High School, Chicago, IL. December 11, 2014.

2014 *PolarConnect: The West Antarctic Ice Sheet Microstructures Expedition*. **R. Obbard** and E. Pettit. PolarTREC Webinar. December 11, 2014.

2014 *Blowing Its Cover: Redefining the Sea Ice Barrier*. **R. Obbard**. Bigelow Ocean Sciences Laboratory. Boothbay, ME. February 19, 2014

2012 *Bromide in Snow in the Sea Ice Zone*. **R. Obbard** and R. Lieb-Lappen, McMurdo Station, Antarctica. October 28, 2012.

FIELD RESEARCH

2017 Leader of expedition to deploy two custom made buoys in Barrow, Alaska with a postdoc
2015 Co-Leader of expedition to do acoustic borehole logging on the West Antarctic Ice Sheet with a graduate student and two undergraduate students
2015 Leader of expedition to collect sea ice cores from Barrow, Alaska with a graduate student and an undergraduate student
2015 Participant on research and Chief Scientist Training Cruise, UNOLS, Maryland
2014 Co-Leader of expedition to do acoustic borehole logging on the West Antarctic Ice Sheet with a graduate student and a POLARTREC teacher

PROFESSIONAL SERVICE

2017-present	Exhibition Advisory Group, Smithsonian Institution's Lemelson Center for the Study of Invention and Innovation
2017-present	Unlocking the Climate Record Stored within Mars' Polar Layered Deposits Team, Keck Institute for Space Studies, California Institute of Technology
2014-2017	NSF Proposal Review/Panelist (PLR and GRF)
2015-present	Open Dartmouth Faculty Representative
2015-present	Faculty Advisor for Dartmouth Performance Sports and Football Team
2014-present	Director, International Sports Engineering Association
2014	Organizing Committee, 13th International Conference on the Physics and Chemistry of Ice
2012	Adjunct Faculty, Community High School of Vermont at the South East State Correctional Facility, Windsor, VT
2010	Organizer of WISP Evening for Women in the CryoSciences – Dartmouth College
2008-2010	U.S. National Ice Core Working Group
2007	Arctic Science Summit Week, Association of Polar Early Career Scientists Liaison

PROFESSIONAL TRAINING

Chief Scientist Training Cruise – UNOLS (2015)
2012 Presenting Data and Information – Edward Tufte
2011 Best College Teaching Practices – Ken Bain Summer Institute
2011 Ethics Across the Curriculum – Dartmouth College Ethics Institute

2011 Student Views on Technology and Teaching – Dartmouth Center for the Advancement of Learning (DCAL)
2010 Advanced EBSD Workshop for Geoscientists – Oxford Instruments, Concord, MA
2010 Why So Few? (Women in Science, Technology, Engineering, and Math) Dartmouth Center for the Advancement of Learning
2009 Communicating Your Research to Broad Audiences – DCAL
2009 Introduction to Blackboard – Dartmouth Center for the Advancement of Learning
2008 Helicopter Underwater Escape Training (HUET Course AIR 319) Royal Air Force Underwater Escape Training Unit, Devon, England
2008 Personal Survival Techniques – National Sea Training Centre, Gravesend, Kent, England

PROFESSIONAL SOCIETY MEMBERSHIP

Keck Institute for Space Studies Mars' Polar Layered Deposits Workgroup
International Glaciological Society (IGS)
American Geophysical Union (AGU)
Interagency Arctic Research Policy Committee (IARPC)
Materials Research Society (MRS)
Interpore (porous media)
Pacific Institute of Mathematical Sciences (PIMS)
Math & Climate Research Network (MCRN)
International Association for Geoscience Diversity (IAGD)
American Institute for Conservation of Historic and Artistic Works (AIC)
International Sports Engineering Association (ISEA), Secretary

CONFERENCE PAPERS

Microtomography versus Optical Microscopy in the Examination of Interior Features in Ice. **R. W. Obbard** and I. Baker (2009) *Microscopy and Microanalysis,* 15 Suppl. 2, 728-729.

A technique for the scanning electron microscopy and microanalysis of uncoated ice crystals. **R. Obbard**, D. Iliescu, I. Baker and D. Cullen (2003) Electron Microscopy: Its Role in Materials Science. The Mike Meshii Symposium. The Minerals, Metals and Materials Society (TMS). 133-140.

A nanoscratch method for assessing wear of metal carbide-metal nacreous nanostructures, **R.W. Obbard** and T.S. Gross (2002) *Materials Research Society Symposium – Proceedings*, 697. 359-364.

CONFERENCE PRESENTATIONS

Remote in situ Measurements of Sea Ice Evolution. **R. Obbard**, A. Bradley, I. Rigor. Polar 2018. OS-7 Davos, Switzerland. June 15-26, 2018

A Network Model for Characterizing Brine Channels in Arctic Sea Ice. **R. Obbard**. Polar 2018. OS-4 Davos, Switzerland. June 15-26, 2018

Reinforced buoy for in situ microstructure observations during the ice growth season. A. Bradley, **R. Obbard**, I. Rigor, J. Johnson. Arctic Change, Montreal, Quebec, December 10-15, 2018

Small Data in a Big Sea: Planning Data Accessibility and Visualization for a Wider Audience. **R. Obbard**. Polar Data Forum II, Waterloo, Ontario, Canada. October 29, 2015.

Mapping the Microstructural Location of Salts and Metals in Sea Ice with X-Ray Micro-Fluorescence Spectroscopy. R. Lieb-Lappen and **R. Obbard**. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 15, 2015.

Iodocarbons and Bromocarbons Associated with Arctic Sea Ice. **R. Obbard**, H. Roscoe, H. Atkinson, C. Hughes, P. Liss. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 14, 2014.

The role of blowing snow in the activation of bromine over first-year Antarctic sea ice, C31C-0313. R. Lieb-Lappen and **R. Obbard**. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 15, 2014.

Phreatomagmatic eruptions under the West Antarctic Ice Sheet: Potential hazard for ice sheet stability, V11B-4717. N. Iverson, **R. Obbard**, R. Lieb-Lappen, E. Kim, E. Golden, N. Dunbar. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 15, 2014.

Microstructural analysis of first-year and multi-year Antarctic sea ice. R. Lieb-Lappen and **R. Obbard**, Physics and Chemistry of Ice 2014, 3/20/14

Examining the microstructural location of bromide in Arctic and Antarctic sea ice using synchrotron x-ray microfluorescence. R. Lieb-Lappen, **R.W. Obbard**. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 9, 2013.

Seismic anisotropy in ice: numerical modelling, ice core measurements and in-situ observations. J.M. Kendall, A.F. Baird, A. Walker, J.M. Wookey, G.E. Lloyd, G.W. Stuart, S. Harland, **R.W. Obbard**, A. Smith, A. Brisbourne. AGU Fall Meeting, San Francisco, CA, December 13, 2013.

Tilted layers and microstructure: A method for determining core orientation. **R.W. Obbard**, G. Guarino, S. Arora, R. Lieb-Lappen. WAIS Divide Science Meeting, La Jolla, CA, September 25, 2013.

Locating bromide in the sea ice zone using X-ray microfluorescence at Argonne. K. Nordick, R. Lieb-Lappen, **R. Obbard**. Dartmouth College. 2013 Wetterhahn Symposium. Hanover, NH. May 23, 2013.

Microstructure of WAIS Divide: Clues to ice sheet history and core orientation. S. Arora, R. Lieb-Lappen, **R. Obbard**. Dartmouth College. 2013 Wetterhahn Symposium. Hanover, NH. May 23, 2013.

Microstructural effects on albedo in Greenland snow. S. McGowan, R. Lieb-Lappen, Z. Courville, **R. Obbard**, I. Baker. Dartmouth College. 2013 Wetterhahn Symposium. Hanover, NH. May 23, 2013.

Microstructural considerations of transporting sea ice samples from Polar Regions. R. Lieb-Lappen, **R.W. Obbard**. AGU Fall Meeting, San Francisco, CA, December 6, 2012.

Advanced microstructural characterization of firn and ice. I. Baker, **R.W. Obbard**, K. Keegan, R. Lomonaco and M. Albert. The Conference on Ice Deformation: From the Model Material to Ice in Natural Environments, Grenoble, France, November 7-9th, 2011.

Analysis of microplastic particles found in Arctic sea ice. Y.-Q. Wong, A. Khitun, **R. Obbard**, I. Baker. Dartmouth College 2011 Wetterhahn Symposium. Hanover, NH. May 19, 2011

Deformation and microstructure of coarse- and fine-grained pure water ice. S.Diebold, H. de Bresser, W. B. Durham, D. Prior, **R. W. Obbard**, L. Stern, European Geophysical Union (EGU) Spring Meeting 2011. Vienna, Austria.

Microstructural variations in the Siple Dome, Antarctica ice core: Evidence of climate change? **R.W. Obbard**, K.E. Sieg; D. Meese; I. Baker. AGU Fall Meeting 2010. San Francisco, CA. December 14, 2010.

What can seismic anisotropy tell us about ice deformation? G. E. Lloyd; G. W. Stuart; B. Al-Rumaih; **R.W. Obbard**, J.M. Kendall; A. Smith. AGU Fall Meeting 2010. December 16, 2010.

Combining analysis techniques to understand brine channel morphology and chemistry in sea ice. **R.W. Obbard**, G. Troderman, T. Cassano, I. Baker. AGU Fall Meeting 2009. December 17, 2009

Characterization of firn and snow using SEM and Micro CT. **R. Obbard**, I. Baker, S. Chen, R. Lomonaco. Eastern Snow Conference, 2009. Niagara-on-the-Lake, Ontario. June 9-11, 2009.

Microstructure of the Upper Fremont Glacier, Wyoming. T. Cassano, K. Aho, **R. Obbard**, I. Baker. Dartmouth College 2009 Wetterhahn Symposium. Hanover, NH. May 21, 2009.

Frost flower chemistry and physics: a Hudson Bay field study. **R.W. Obbard**, H.K. Roscoe, H.M. Atkinson, E.W. Wolff. AGU Fall Meeting 2008. December 18, 2008.

Variations in microstructure of polycrystalline ice from Vostok, Antarctica. **R. Obbard** and I. Baker. AGU Fall Meeting 2005, December 5-9, 2005.

Microstructural characterization of polycrystalline ice from the East Rongbuk Glacier (Mt. Everest). **R. Obbard**, K. Sieg, I. Baker, P. Mayewski, S. Kang, S. Hou and S. Kaspari. AGU Fall Meeting 2005. December 5-9, 2005.

SEM/EDS studies of the microstructural location of impurities in polar ice. I. Baker, **R. Obbard**, J.M. Chang and D. Cullen. Presented at the 7th International Symposium on Antarctic Glaciology (ISAG 7). Milano, Italy. August 25-29, 2003.

Using the scanning electron microscope to investigate history at GISP2. **R. Obbard** and I. Baker. Poster at the EGS - AGU - EGU Joint Assembly, Nice, France. April 6-11, 2003.

Scanning electron microscopy of natural ice. I. Baker, D. Cullen, D. Iliescu and **R. Obbard**. Annual TMS Meeting, San Diego, CA. March 2-6, 2003.

The microstructural location of impurities in polar ice. I. Baker, D. Cullen and **R. Obbard**. 2002 Fall TMS Meeting, Columbus, OH. October 6-10, 2002.

The microstructural location of impurities in ice from GISP2 and Byrd Station, I. Baker, D. Cullen and **R. Obbard**. 2002 AGU Spring Meeting, Washington, DC. May 28-31 2002.

ADDITIONAL PROFESSIONAL EXPERIENCE

Science Advisor/Consultant **2006 – 2007**
Mercury Policy Project, Montpelier, Vermont, USA
Researched and coauthored the United Nations Environment Program's (UNEP) Guide, "Mercury Awareness Raising Package," a guide to help developing nations to identify and raise awareness in at-risk populations. (http://www.chem.unep.ch/Mercury/awareness_raising_package/default.htm)

Teacher, 7th and 8th Grade Mathematics **1996 – 1999**
Sullivan Middle School, Worcester, Massachusetts, USA
Oyster River Middle School, Durham, New Hampshire, USA

Project Manager, Product Manager, Assistant Program Manager **1987 – 1997**
Bolt Beranek & Newman, Inc., Cambridge, Massachusetts
Oversaw data communications device engineering projects and Government service contract. Developed schedules and budgets, coordinated project meetings, wrote program reports.

Authored successful proposal for a cost savings initiative to the Department of Defense.
Managed group of five software engineers.

Software Engineer **1986 – 1987**
Raytheon Service Company, Burlington, Massachusetts
Trained to maintain software managing phased array radar installations.

Field Engineer, Petroleum Exploration **1985 – 1986**
NL Baroid, Houston, Texas
Offshore real-time well-logging in the Gulf of Mexico. Well log analysis.

IN THE NEWS

http://news.sciencemag.org/earth/2014/05/trillions-plastic-pieces-may-be-trapped-arctic-ice

http://www.alaskadispatch.com/article/20140525/arctic-sea-ice-littered-tiny-bits-microplastic-pollution

http://www.businessweek.com/articles/2014-05-30/how-so-much-plastic-got-into-the-frozen-arctic-sea

http://www.bloomberg.com/news/2014-09-26/ice-research-for-climate-clues-means-watching-for-bears.html

http://www.cbc.ca/news/technology/arctic-sea-ice-polluted-with-microplastics-1.2660021

http://barentsobserver.com/en/nature/2014/05/arctic-melt-can-release-huge-amounts-plastic-pieces-23-05

http://america.aljazeera.com/articles/2014/5/27/arctic-plastics-ice.html

http://news.sciencemag.org/scientific-community/2014/05/podcast-frozen-plastic-big-brains-and-rewiring-male-brain

http://www.cbc.ca/news/technology/billions-of-bits-of-plastic-in-arctic-waters-1.4079765