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Citizenship: U.S.A., Canada
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Research Interests and Experience

Inspiration: Understanding the roles and importance of marine biogeochemical cycles in global change and planetary evolution

- Marine carbon cycling and transport in Arctic waters and their importance in the global carbon cycle.
- Influence of sea ice and organic microlayers on carbon dioxide transport across the air-sea interface.
- Marine sources of radiatively-active atmospheric aerosols.
- Long-term variability and trends in North Pacific biogeochemistry.
- Marine particle cycling and ^{234}Th : ^{238}U disequilibria in seawater.
- Transport and carbon cycling in mesoscale eddies.
- Chemical environmental effects of deep ocean carbon dioxide sequestration.
- Analytical techniques to determine the extent of transition metal complexation by organics in seawater.

Professional interests: Earth system science research coordination and facilitation.

Education

Ph.D. in Chemistry, University of California, Santa Cruz, California, March 1994.

Thesis title: "Trace metal speciation in marine waters by competitive ligand equilibration/solvent extraction: Theory and practice"

Thesis advisor: Professor Kenneth W. Bruland.

Coursework in geological, physical, and biological oceanography included.

Workshop on the Physics of Equatorial Oceans. University of Rhode Island, Graduate School of Oceanography. June, 1991.

B.S. degree with a major in Chemistry and a minor in Philosophy, Humboldt State University, Arcata, California, May 1988. *summa cum laude*.

Publications

Peer reviewed:

M. Willis, D. Lannuzel, B. Else, H. Angot, K. Campbell, O. Crabeck, B. Delille, H. Hayashida, M. Lizotte, B. Loose, K.M. Meiners, L. Miller, S. Moreau, D. Normura, J. Prytherch, J. Schmale, N. Steiner, L. Tedesco, and J. Thomas, submitted. *Elementa: Science of the Anthropocene*. Polar Oceans and Sea Ice in a Changing Climate.

T. M. Burgers, L. A. Miller, S. Rysgaard, J. Mortensen, B. Else, J.-É. Tremblay, and T. Papakyriakou, 2023. *Journal of Geophysical Research-Oceans* **128**(3): e2022JC019393, doi: 10.1029/2022JC019393. Distinguishing physical and biological controls on the carbon dynamics in a high-Arctic outlet strait.

- F. Bruyant, R. Amiraux, M.-P. Amyot, P. Archambault, L. Artigue, L. Barbedo de Freitas, G. Bécu, S. Bélanger, P. Bourgain, A. Bricaud, E. Brouard, C. Brunet, *T. Burgers*, D. Caleb, K. Chalut, H. Claustre, V. Cornet-Barthaux, P. Coupel, M. Cusa, F. Cusset, L. Dadaglio, M. Davelaar, G. Deslongchamps, C. Dimier, J. Dinasquet, D. Dumont, B. Else, I. Eulaers, J. Ferland, G. Filteau, M.-H. Forget, J. Fort, L. Fortier, M. Galí, M. Gallinari, S.-E. Garbus, N. Garcia, C. Gériques Ribeiro, C. Gombault, P. Gourvil, C. Goyens, C. Grant, P.-L. Grondin, P. Guillot, S. Hillion, R. Hussher, F. Joux, H. Joy-Warren, G. Joyal, D. Kieber, A. Lafond, J. Lagunas, P. Lajeunesse, C. Lalande, J. Larivière, F. Le Gall, K. Leblanc, M. Leblanc, J. Legras, K. Lévesque, K.-M. Lewis, E. Leymarie, A. Leynaert, T. Linkowski, Martine Lizotte, A. Lopes dos Santos, C. Marec, D. Marie, G. Massé, P. Massicotte, A. Matsuoka, L.A. Miller, S. Mirshak, N. Morata, B. Moriceau, P.-I. Morin, S. Morisset, A. Mosbech, A. Mucci, G. Nadaï, C. Nozais, I. Obernosterer, T. Paire, C. Panagiotopoulos, M. Parenteau, N. Pelletier, M. Picheral, B. Quéguiner, P. Raimbault, J. Ras, E. Rehm, L. Ribot Lacosta, J.-F. Rontani, B. Saint-Béat, J. Sansoulet, N. Sardet, C. Schmechtig, A. Sciandra, R. Sempéré, C. Sévigny, J. Toullec, M. Tragin, J.-É. Tremblay, A.-P. Trottier, D. Vaultot, A. Vladoiu, L. Xue, G. Yunda-Guarin, and M. Babin, 2022. *Earth System Science Data* **14**:4607-42, doi: 10.5194/essd-14-4607-2022. The Green Edge cruise: investigating the marginal ice zone processes during late spring and early summer to understand the fate of the Arctic phytoplankton bloom.
- S. Zeidan, J. Walker, B.G.T. Else, L. Miller, K. Azetsu-Scott, and B.D. Walker, 2022. *Frontiers in Marine Science* **9**: 845536, doi: 10.3389/fmars.2022.845536. Using radiocarbon measurements of dissolved inorganic carbon to determine a revised residence time for deep Baffin Bay.
- L.A. Ladino, J. Juaréz-Pérez, Z. Ramirez-Díaz, L.A. Miller, J. Herrera, G.B. Raga, K.G. Simpson, G. Cruz, D.L. Pereira, and F. Córdoba, 2022. *Atmósfera* **35**(1): 127-41, doi: 10.20937/ATM.52938. The UNAM-Droplet Freezing Assay: An Evaluation of the Ice Nucleating Capacity of the Sea-Surface Microlayer and Surface Mixed Layer in Tropical and Subpolar Waters.
- L.A. Miller, F. Domine, M.M. Frey, and D. Trombotto Liaudat, 2021. In: P.B. Shepson and F. Domine, eds., *Advances in Atmospheric Chemistry, Volume 3: Chemistry in the Cryosphere, Part 2*, World Scientific, New Jersey, pp. 831-65, doi: 10.1142/9789811230134_0017. The Future? Big Questions about Feedbacks between Anthropogenic Change in the Cryosphere and Atmospheric Chemistry. *Invited Review*.
- N.S. Steiner, J. Bowman, K. Campbell, M. Chierici, E. Eronen-Rasimus, M. Falardeau, H. Flores, A. Fransson, H. Herr, S.J. Insley, H.M. Kauko, D. Lannuzel, L. Loseto, A. Lynnes, A. Majewski, K.M. Meiners, L.A. Miller, L.N. Michel, S. Moreau, M. Nacke, D. Nomura, L. Tedesco, J.A. van Franeker, M.A. van Leeuwe, P. Wongpan, 2021. *Elementa: Science of the Anthropocene*. **9**(1): 00007, doi: 10.1525/elementa.2021.00007. Climate change impacts on sea-ice ecosystems and associated ecosystem services.
- A.C. Franco, D. Ianson, T. Ross, R.C. Hamme, A.H. Monahan, J.R. Christian, M. Davelaar, W.K. Johnson, L.A. Miller, M. Robert, P.D. Tortell, 2021. *Global Biogeochemical Cycles* **35**: e2020GB006829, doi: 10.1029/2020GB006829. Anthropogenic and climatic contributions to observed carbon system trends in the Northeast Pacific.
- M.M.M. Ahmed, B.G.T. Else, B. Butterworth, D.W. Capelle, C. Guéguen, L.A. Miller, C. Meilleur, T. Papakyriakou, 2021. *Elementa: Science of the Anthropocene*. **9**(1): 00130. doi: 10.1525/elementa.2020.00130. Widespread surface water $p\text{CO}_2$ undersaturation during ice-melt season in an Arctic continental shelf sea (Hudson Bay, Canada).
- P.J. Duke, B.G.T. Else, S.F. Jones, S. Marriot, M.M.M. Ahmed, V. Nandan, B. Butterworth, S.F. Gonski, R. Dewey, A. Sastri, L.A. Miller, K.G. Simpson, H. Thomas, 2021. *Elementa: Science of the Anthropocene*. **9**(1): 00103. doi: 10.1525/elementa.2021.00103. Seasonal marine carbon system processes in an Arctic coastal landfast sea ice environment observed with an innovative underwater sensor platform.

- M.M.M. Ahmed, B.G.T. Else, D. Capelle, L.A. Miller, and T. Papakyriakou, 2020. *Elementa: Science of the Anthropocene* **8**(1):084. doi: 10.1525/elementa.084. Underestimation of surface $p\text{CO}_2$ and air-sea CO_2 fluxes due to freshwater stratification in an Arctic shelf sea, Hudson Bay.
- D. Lannuzel, L. Tedesco, M. van Leeuwe, K. Campbell, H. Flores, B. Delille, L. Miller, J. Stefels, P. Assmy, J. Bowman, K. Brown, G. Castellani, M. Chierici, O. Crabeck, E. Damm, B. Else, A. Fransson, F. Fripiat, N.-X. Geilfus, C. Jacques, E. Jones, H. Kaartokallio, M. Kotovitch, K. Meiners, S. Moreau, D. Nomura, I. Peeken, J.-M. Rintala, N. Steiner, J.-L. Tison, M. Vancoppenolle, F. Van der Linden, M. Vichi, and P. Wongpan, 2020. *Nature Climate Change*, doi: 10.1038/s41558-020-00940-4. The future of Arctic sea-ice biogeochemistry and ice-associated ecosystems.
- D.W. Capelle, Z.Z.A. Kuzyk, T. Papakyriakou, C. Guéguen, L.A. Miller, and R.W. Macdonald, 2020. *Progress in Oceanography* **185**: 102319, doi: 10.1016/j.pocean.2020.102319. Effect of terrestrial organic matter on ocean acidification and CO_2 flux in an Arctic Shelf Sea.
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- V.E. Irish, S. Hanna, Y. Xi, M. Boyer, E. Polishchuk, J. Chen, J. P.D. Abbatt, M. Gosselin, R. Chang, L. Miller, A.K. Bertram, 2019. *Atmos. Chem. Phys.* **19**: 7775–87, doi: 10.5194/acp-19-7775-2019. Revisiting properties and concentrations of ice-nucleating particles in the sea surface microlayer and bulk seawater in the Canadian Arctic during summer.
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- E. Mortenson, N. Steiner, A.H. Monahan, L.A. Miller, N.X. Geilfus, and K. Brown, 2018. *J. Geophys. Res. Oceans* **123**: 7259–49. doi: 10.1029/2018JC014376. A model-based analysis of physical and biogeochemical controls on carbon exchange in the upper water column, sea ice, and atmosphere in a seasonally ice-covered Arctic strait.
- N.-X. Geilfus, M. L. Pind, B. G. T. Else, R. J. Galley, L. A. Miller, H. Thomas, M. Gosselin, S. Rysgaard, F. Wang, and T.N. Papakyriakou, 2018. *Cont. Shelf. Res.* **156**: 1–10, doi: 10.1016/j.csr.2018.01.006. Spatial and temporal variability of seawater $p\text{CO}_2$ within the Canadian Arctic Archipelago and Baffin Bay during the summer and autumn 2011.

- T.M. Burgers, L.A. Miller, H. Thomas, B.G.T. Else, M. Gosselin, and T. Papakyriakou, 2017. *J. Geophys. Res. Oceans* **122**: 9663–78, doi: 10.1002/2017JC013250. Surface water $p\text{CO}_2$ variations and sea-air CO_2 fluxes during summer in the eastern Canadian Arctic.
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- L.A. Ladino, J.D. Yakobi-Hancock, W.P. Kalthau, R.H. Mason, M. Si, J. Li, L.A. Miller, C.L. Schiller, J.A. Huffman, J.Y. Aller, D.A. Knopf, A.K. Bertram, and J.P.D. Abbatt, 2016. *Atmos. Env.* **132**: 1–10, doi: 10.1016/j.atmosenv.2016.02.028. Addressing the ice nucleating abilities of marine aerosol: A combination of deposition mode laboratory and field measurements.
- N. Steiner, C. Deal, D. Lannuzel, D. Lavoie, F. Massonnet, L.A. Miller, S. Moreau, E. Popova, J. Stefels, and L. Tedesco, 2016. *Elementa: Science of the Anthropocene.* **4**: 000084, doi: 10.12952/journal.elementa.000084. What sea-ice biogeochemical modellers need from observers.
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Professional Meetings:

- SOLAS Seminar on *Sulfur Cycling at High Latitudes: New Discoveries and Challenges*, March 13, 2023. Co-convenor (with J. Stefels).
- Gordon Research Conference on Polar Marine Science. Ventura, California, USA, March 5-10, 2023. Discussion Leader: "Crossing Boundaries in Observing Coupled Ocean-Ice-Atmosphere Systems." Desirable Scenarios for Safe Landing Climates Pathways, WCRP webinar series, 27 February, 2023. Discussion moderator.
- The Sixth Xiamen Symposium on Marine Environmental Sciences. Xiamen, China, 9-12 January, 2023. Town Hall co-convenor (with C. Guieu, E. van Doorn, M.T. Latif, L. Li, A. Mahajan, C. Marandino, A. Singh, and G. Zhang): SOLAS in the New Era: Harnessing Partnership and Transforming Science into Solutions.
- 2022 SOLAS Open Science Conference. Cape Town, South Africa, September 25-29. Discussion co-convenor (with N. Harris and E. van Doorn): Crosswinds in Safe Landing Climates; Discussion co-convenor (with N. Steiner, J. Creamean, and J. Thomas): Differences and commonalities in air ice ocean processes in the Antarctic and Arctic.
- 87th International Symposium on Gas Transfer at Water Surfaces. Plymouth, UK, May 17-20, 2022. Poster: Rethinking Arctic Ocean CO₂ Fluxes. Scientific organizing committee.
- Workshop on representing polar air-sea gas exchange in Earth system models. Hosted by CRiceS. March 14 & 17, 2022. Scientific Organizing Committee. Co-convenor, discussion moderator.
- UN Climate Change Conference (COP 26), Side Event on Carbon Conservation and Sequestration in Ocean: Nature-Based And Technology Solutions, November 6, 2021. Invited speaker: Ocean Carbon: The potential for the oceanic carbon sink to mitigate climate change.
- 2021 Biogeochemical Exchanges at Sea-Ice Interfaces general meeting, 20-27, 2021. Co-convenor (with K. Meiners): Session on New Technology.
- Sustainability Research & Innovation Congress 2021. Brisbane, Australia, 12-15 June, 2021. Moderator: Panel discussion: The apparent mismatch between science and policy at the air-sea interface.
- The Fifth Xiamen Symposium on Marine Environmental Sciences. Xiamen, China, 11-14 January, 2021. Scientific Advisory Committee.
- 2020 Fall AGU meeting, December 1-17, 2020. Presenter, Town Hall: Full Steam Ahead: The Surface Ocean-Lower Atmosphere Study (SOLAS) Midterm Course Correction.

- SOLAS Indian Ocean meeting, September 30, 2020. Scientific organizing committee. Moderator, Panel discussion: Where are the gaps that need to be filled and how can we do that?
- 2019 SOLAS Open Science Conference. Sapporo, Japan, April 21-25, 2019. Chair, Scientific Organizing Committee; Workshop rapporteur (conveners: P. Boyd and C. Law): Geoengineering.
- The Fourth Xiamen Symposium on Marine Environmental Sciences. Xiamen, China, 6-9 January, 2019. Scientific Advisory Committee. Poster: New Insights into Carbon Export from Sea Ice. Coauthors: Daniela König, Patrick Duke, Brent Else, Akash Sastri, Kyle Simpson, and Svein Vagle.
- Institute of Low Temperature Science Workshop on biogeochemical Interactions between Ocean and Atmosphere, Sapporo, Japan, 1-2 November, 2018. Invited speaker: Confirming the role of sea-ice brines in carbon sequestration: A cold, dark journey.
- 2018 Ocean Sciences Meeting. Portland, Oregon, USA, 11-16 February, 2018. Presenter, Surface Ocean-Lower Atmosphere Study (SOLAS) Town Hall: Expanding involvement and setting priorities.
- In Situ Sensors for Ocean Acidification Research workshop. Victoria, Canada, 7-8 February, 2018. Invited speaker: "That's Not What It Was Designed For": Learning from failure in the lab, instead of on the ice. Coauthors: Alice Bui, Patrick Duke, Brent Else, Alex Hodge, Ryan Key, Daniela König, Ada Loewen, Craig McNeil, Akash Sastri, and Kyle Simpson.
- 2017 NETCARE Workshop. Toronto, Canada, November 13-14, 2017. Poster: The Arctic Marine Carbon Cycle and the Sea-Surface Microlayer: Have We Learned Anything New? Coauthors: Tonya Burgers, Matt Boyer, Michel Gosselin, Vickie Irish, Martine Lizotte, Tim Papakyriakou, and Oliver Wurl.
- Gordon Research Conference on Polar Marine Science. Ventura, California, USA, March 26-31, 2017. Poster: "That's Not What It Was Designed For": Breaking CO₂ System Sensors in Polar Waters. Coauthors: Alice Bui, Patrick Duke, Brent Else, Alex Hodge, Ryan Key, Daniela König, Ada Loewen, Craig McNeil, Akash Sastri, Kyle Simpson.
- The Impacts of Arctic DMS Emissions on Future Climate. Sidney, Canada, January 17-18, 2017. Invited speaker: The Future of the Arctic Ocean.
- SOLAS in Asia: A Future SOLAS Symposium. Qingdao, China, October 26-28, 2016. Invited speaker: Air-Sea Gas Exchange in Polar Waters: New Ideas in a Changing World.
- Harnessing Remote Sensing to Address Critical Science Questions in the Ocean-Atmosphere Interface. Frascati, Italy, June 13-15, 2016. Invited speaker: SOLAS at High Latitudes: How Sea Ice Impacts Interface Processes.
- 2015 Fall AGU Meeting. San Francisco, USA, December 14-18, 2015. Poster: Effect of Sampling Depth on Air-Sea CO₂ Flux Estimates in River-Stratified Arctic Coastal Waters. Coauthor: Tim N. Papakyriakou.
- 2015 NETCARE Workshop. Toronto, Canada, November 16-17, 2015. Poster: The Relationship between Sea-Surface Microlayer Composition and Air-Sea $p\text{CO}_2$ Disequilibrium. Coauthors: Tonya Burgers, Vickie Irish, Martine Lizotte, and Tim Papakyriakou.
- 2015 SOLAS Open Science Conference. Kiel, Germany, September 7-11, 2015. Workshop co-convenor (with M. Vancoppenolle): Towards Joint SOLAS-CliC Activities on Sea-Ice Biogeochemistry; workshop rapporteur (conveners: C. Law and P. Boyd): SOLAS & Geoengineering.
- 7th International Symposium on Gas Transfer at Water Surfaces. Seattle, Washington, USA, May 18-21, 2015. Keynote lecture: Whiplash on Ice: Shifting Paradigms in Air-Sea Gas Exchange in Polar Seas. Scientific organizing committee; editor of proceedings.
- Gordon Research Conference on Polar Marine Science. Barga, Italy, March 15-20, 2015. Poster: Impacts of Sea-ice Melt Versus River Run-off on Air-Sea CO₂ Fluxes in the Arctic Ocean. Coauthors: Mats Granskog and Tim N. Papakyriakou.

- PICES 2014 Annual Meeting. Yeosu, Korea, October 16-26, 2014. Workshop co-convener (with Y. Nojiri): SOLAS into the Future: Designing the Next Phase of the Surface Ocean-Lower Atmosphere Study within the Context of the FutureEarth Program.
- International Symposium on Sea Ice in a Changing Environment. Hobart, Tas, Australia, March 10-14, 2014. Poster: Methods and Madness in Sea Ice Biogeochemistry.
- 2014 Ocean Sciences Meeting. Honolulu, HI, USA, February 23-28, 2014. Talk: Biogeochemical Adventures on Sea Ice: New ideas about air-sea exchange in polar waters. Coauthors: Kristina Brown, Brent Else, Tim Papakyriakou, and Nes Sutherland.
- Gordon Research Conference on Polar Marine Science. Ventura, USA, March 11-5, 2013. Poster: Changes in the Marine Carbonate System of the Western Arctic: Patterns in a Rescued Data Set. Coauthors: Karina Giesbrecht, Robie Macdonald, Fiona McLaughlin, Al Mucci, Michiyo Yamamoto-Kawai, Bill Williams, and Sara Zimmermann.
- IPY 2012 Conference, From Knowledge to Action. Montreal, QC, Canada, April 22-7, 2012. Poster: Strange Chemistry: Sea Ice Carbon Biogeochemistry and the Search for a Consistent, Simple Model. Coauthors: Kristina Brown (presenter), Brent Else, Gauthier Carnat, Nix Geilfus, Nes Sutherland, Keith Johnson, and Tim Papakyriakou.
- 2012 SOLAS Open Science Conference. Cle Elem, USA, May 7-10, 2012. Workshop co-convener (with E. Saltzman and C. Law): The SOLAS science plan and its relevance to society: SOLAS Plenary Discussion Session Report..
- 2010 Ocean Sciences Meeting. Portland, OR, USA, February 22-6, 2010. Special session co-chair: Observations and Modelling of Air-Sea Biogeochemical Fluxes in Ice-Covered Waters.
- Gordon Research Conference on Polar Marine Science. Barga, Italy, March 15-20, 2009. Poster: Carbon Dynamics in Sea Ice: Towards the CO₂ Flux Annual Cycle.
- Arctic Change 2008, December 9-12, 2008, Quebec City. Speaker: A Winter Carbon Flux Time Series In Land-Fast Sea Ice.
- 2007 SOLAS Open Science Conference. Xiamen, China, March 6-9, 2007. Invited Plenary Speaker: The Solid Air-Sea Interface: CO₂ Transport in Sea Ice.
- 37th International Liège Colloquium on Ocean Dynamics. Liège, Belgium, May 2-6, 2005. Invited speaker: Sea-Ice Carbon Biogeochemistry: Relationship To Atmospheric CO₂ Fluxes. Coauthors: Tim Papakyriakou, Owen Owens, Al Mucci, Nes Sutherland, Jens Ehn, and C.J. Mundy.
- Gordon Research Conference on Polar Marine Science. Ventura, California, March 14-18, 2005. Invited speaker: Ocean-Atmosphere CO₂ exchanges in the polar regions: Popping the sea ice 'cork.' Presented jointly with Jean-Louis Tison. *Outstanding presentation award.*
- SOLAS Science Conference, October 13-16, 2004, Halifax, Nova Scotia. Poster: CO₂ Exchange Over Sea Ice in the Canadian Arctic, T.N. Papakyriakou, L.A. Miller (presenter), A. Langlois, C. Mundy, and O. Owens.
- Bjerknes Seminar Series, Bergen, May 10, 2004. Invited Speaker: Vertical CO₂ Fluxes Over First-Year Sea Ice. Co-authors: T. Papakyriakou, O. Owens, and C.J. Mundy.
- European Geosciences Union General Assembly. Nice, April 25-30, 2004. Speaker: Atmospheric CO₂ Drawdown by First-Year Sea Ice. Co-authors: T. Papakyriakou and C.J. Mundy.
- Gordon Research Conference on Polar Marine Science. Ventura, California, March 16-21, 2003. Poster: CO₂ Sinks in Seasonally Ice-Covered Seas: Now and Later.
- 36th Congress of the Canadian Meteorological and Oceanographic Society. Rimouski, Québec, May 22-25, 2002. Speaker: Carbon Sinks in Seasonally Ice-Covered Seas: Physics and Biogeochemistry. Co-authors: T.T. Noji and P.L. Yager.
- 2001 Aquatic Sciences Meeting. Albuquerque, New Mexico, February 12-6, 2001. Poster: Physical Constraints on Carbon Distributions and Fluxes: The North Water, Northern Baffin Bay, 1998 and

1999. Co-authors: P.L. Yager, K.A. Erickson, J. Bâcle, J.K. Cochran, M.-È. Garneau, M. Gosselin, D.J. Hirschberg, B. Klein, B. LeBlanc, and W.L. Miller.
- Gordon Research Conference on Polar Marine Science. March 7-12, 1999. Poster: Biogeochemical constraints on carbon drawdown and export in the Greenland Sea. Coauthor: T.T. Noji.
- International Symposium on Marine Pollution. Monaco, October 5-9, 1998, Poster: Particle fluxes and contaminants in the Skagerrak, C.I. Noji, T.T. Noji, L.A. Miller (presenter), J. Klungsøyr, and L. Føyn.
- 5th International Carbon Dioxide Conference. Cairns, Australia, September 8-12, 1997. Speaker: Seasonal variability in dissolved inorganic carbon distributions in the Greenland Sea. Co-authors: T. Johannessen, T.T. Noji, F. Rey, and I. Skjelvan.
- The Oceanography Society. Amsterdam, July 8-11, 1996. Poster: Influence of Biological Processes on Dissolved Inorganic Carbon in the Greenland Sea. Co-authors: T. Johannessen, T.T. Noji, and F. Rey.
- 40th International Conference on Analytical Sciences and Spectroscopy. Halifax, Nova Scotia, August 8-10, 1994. Invited speaker: Application of solvent extraction to studies of transition metal speciation in marine waters. Co-author: K.W. Bruland.

Grants

- FoxSIPP: the Foxe Basin Sea-Ice Pump Project, 2022-2024. Fisheries and Oceans Canada Competitive Science Research Fund, \$100,000.
- Coupling of ocean-ice-atmosphere processes: from sea-ice biogeochemistry to aerosols and Clouds (Clce2Clouds), 2022-2025. With N. Steiner, M. Willis, and 17 others. Scientific Committee on Oceanic Research working group, US\$45,000.
- Climate Relevant interactions and feedbacks: the key role of sea ice and Snow in the polar and global climate system (CRiceS), 2021-2025. With J. Thomas, R. Makkonen and many others. European Union Horizon 2020 Framework Programme. €8,000,000. C\$500,000 in support of work overseen by B. Else, N. Steiner, and L. Miller.
- Surface Ocean - Lower Atmosphere Study (SOLAS) South America Community Workshop. With J. Gier and L. Gallardo. IUGG Symposia Support. US\$1500.
- Quantifying and Predicting Canada's Marine Carbon Sink, 2020-2022. With R. Hamme and many others. NSERC Advancing Climate Change Science in Canada Program, approximately \$50,000 in support of work overseen by B. Else and L. Miller.
- A co-operative, multi-platform effort to observe marine biogeochemical processes and address Arctic community research priorities, 2019-2022. With B. Else, P. Tortell, T. Papakyriakou and A. Mucci. ArcticNET. \$100,000/year.
- Scientific Committee on Oceanic Research, 2018-2021. With E. Urban and many others. US National Science Foundation. US\$219,000 in support of work overseen by J. Gier and L. Miller.
- Improving understanding of Ocean Acidification in the Pacific and Arctic Oceans, 2017. With D. Ianson, N. Steiner, W. Williams, and S. Johannessen. DFO Climate Change Adaptation Services Program. \$94,000.
- Measuring Essential Climate Variables in Sea Ice (ECVice), 2017-2020. With F. Fripiat, D. Nomura, B. Else, B. Delille, and 5 others. Scientific Committee on Oceanic Research working group, US\$45,000.
- Preliminary assessment of regional overlap between areas vulnerable to acidification and those with potential for oil and gas development, 2016-17. DFO Arctic Program, \$85,000.
- Quantifying climate-dependent and anthropogenic impacts on ecosystem services in the Subarctic Pacific Ocean: State-of-the-art observational tools to inform policy and management, 2016-19. With P. Tortell and 9 others. NSERC Strategic Grant, approximately \$36,000 in support of work overseen by R. Francois and L. Miller.

- Marine Biogeochemistry and Surface Exchange of Climate Active Gases in a Changing Arctic System, 2015-18. With T. Papakyriakou, B. Else, and 6 others. ArcticNet, \$154,000/year, with \$26,000/year in direct support of work overseen by L. Miller, A. Mucci, and H. Thomas.
- BaySys - Contributions of climate change and hydro-electric regulation to the variability and change of freshwater-marine coupling in the Hudson Bay System, 2015-18. With D. Barber and many others (pan-Canadian research network). NSERC Collaborative Research and Development Grant. \$4,540,000.
- Instrumentation and Methods for Identifying Changes in Arctic Ocean Acidification, 2013-16. Principal applicant, with S. Johannessen, S. Vagle, N. Steiner, and K. Azetsu-Scott. DFO Climate Change Adaptation Services Program, Adaptation Tools Competitive Fund. \$72,882.
- The Canadian Arctic GEOTRACES Program: Biogeochemical and tracer study of a rapidly changing Arctic Ocean, 2013-18. With R. Francois and many others (pan-Canadian research network). NSERC Climate Change and Atmospheric Research Grant. \$4,800,000, with \$55,800 in direct support of work overseen by R. Francois and L. Miller.
- NETCARE - Network on Climate and Aerosols: Addressing Key Uncertainties in Remote Canadian Environments, 2013-18. With J. Abbatt, M. Levasseur and many others (pan-Canadian research network). NSERC Climate Change and Atmospheric Research Grant. \$4,000,000.
- Canada's contribution to the Arctic Council's Arctic Ocean Acidification Assessment Report, 2011-13. With P. Lyon, R. Macdonald, D. Ianson, and K. Azetsu-Scott. International Governance Strategy Science Program, \$55,800, with \$15,000 in direct support of work overseen by L. Miller.
- CO₂ Export from Sea Ice: An Atmospheric Carbon Sequestration Mechanism?, 2011. With R. Francois and S. Vagle. Martha Piper Research Fund, University of British Columbia. \$24,715.
- CO₂ Export from Sea Ice: An Atmospheric Carbon Sequestration Mechanism?, 2010. Principal applicant, with P. Tortell, T.N. Papakyriakou, and R. Francois. The Catlin Arctic Survey, US\$680,000 in logistical support.
- Effects of Climate Change on Carbon Exchange Dynamics in Arctic Coastal and Marine Ecosystems, 2008-13. With T. Papakyriakou, G. Flato, and S. Vagle. ArcticNet, \$217,830, with approximately \$55,000 in direct support of work overseen by L. Miller.
- The Circumpolar Flaw Lead (CFL) System Study, 2007-12. With T. Papakyriakou, D. Barber and many others. Canadian International Polar Year Grant. \$7,716,425, with \$540,175 in direct support of work overseen by T. Papakyriakou and L. Miller.
- The Circumpolar Flaw Lead (CFL) system study, 2007-10. With T. Papakyriakou, D. Barber and many others (pan-Canadian research network). NSERC International Polar Year Grant, \$1,416,000, with \$144,000 in direct support of work overseen jointly by T. Papakyriakou and L. Miller.
- CASES: Canadian Arctic Shelf Exchange Study, 2002-7. With P.R. Hill, R.W. Macdonald, A. Mucci, L. Fortier and many others (pan-Canadian research network). NSERC Research Network Grant, \$10,000,000, with \$144,000 in direct support of work overseen jointly by A. Mucci and L. Miller.
- CASES: Canadian Arctic Shelf Exchange Study (the DFO component), 2001-5. Principal applicant, with P. Galbraith, P. Larouche, R. Macdonald, C. Michel, and G. Stern. DFO Strategic Science Fund, \$865,700.
- SOLAS: Surface Ocean-Lower Atmosphere Study, 2001-6. With S. Vagle, M. Ikonomou, W. Miller and many others (pan-Canadian research network). NSERC Research Network Grant, \$10,000,000, with \$82,500 in direct support of work overseen by L. Miller.
- Line P Time Series Programme, 2001-4. With F. Whitney, H. Freeland, D. Mackas, M. Robert, and C.S. Wong. DFO Strategic Science Fund, \$375,000.
- Eddy transport and biological community structure, 2000-3. With E. Bornhold, W. Crawford, M. Forman, D. Mackas, I. Perry, R. Stanley, F. Whitney, C.S. Wong, K.L. Yamanaka, and D. Yelland. DFO Ocean Climate Program and Strategic Science Fund, \$210,000.

Changing freshwater storage in the Canada Basin, 2000-1. With R. Macdonald. DFO Ocean Climate Program, \$40,000.

Method development for the use of ^{238}U : ^{234}Th disequilibria in routine studies of marine particle fluxes, 1997-8. Principal applicant, with L. Føyn. The Research Council of Norway, 1,200,000 Nkr (approx. \$170,000).

Employment Experience

Climate Geochemist, Institute of Ocean Sciences, Fisheries and Oceans Canada Sidney, BC, Canada. 1999 to present.

-Independent principle investigator and project manager with responsibility for raising research funds. Chair: Centre for Ocean Climate Chemistry, 2006-2018. Research in marine biogeochemistry and climate chemistry. Research in carbon cycling in the North Pacific and Arctic Oceans. Strategic program design and implementation. Analytical method development and quality control. Joint supervisory responsibility for a pool of 4-10 technicians. Consulting role in a variety of oceanographic projects.

Adjunct Professor, Department of Environment and Geography, University of Manitoba, Winnipeg, MB, Canada. 2003 – 2009, 2017-present.

-Graduate student co-supervisor: Owen Owens, M.A. 2003-2008; Tonya Burgers, Ph.D. 2016-present.

-Lecturer: Geography 53.701 L15, *Ocean Geochemistry*, 2003.

Senior Scientist, Institute of Marine Research, Bergen, Norway. 1997 - 1999.

-Independent principle investigator and project manager with responsibility for raising research funds. Research in marine biogeochemistry, focussing on particulate fluxes as sinks for natural and anthropogenic chemical constituents of seawater. Analytical method development. Full supervisory responsibility for 1 part-time technician and assisted with advising for 1 graduate student. Consulting role in a variety of chemical oceanographic projects.

Research Scientist, University of Bergen, Norway. 1994 - 1997.

-Marine carbon cycle research, focussing on the role of North Atlantic Deep Water formation. Seasonal ship-board chemical oceanographic monitoring of the polar North Atlantic. Modification and implementation of analytical methods and quality control. Extensive interdisciplinary cooperation with oceanographers in other countries within the framework of the European Union's Marine Science and Technology Programme. Partial supervisory responsibility for 3 technicians and assisted with advising for 3 graduate students. Principle investigator: Professor E. Jansen.

Graduate Student Researcher, University of California, Santa Cruz, CA, USA. 1989-1994.

-Research in trace metal biogeochemistry, including technique development and clean analytical protocol. Routine nutrient analyses and technical assistance aboard ship. Principal investigator: Professor K.W. Bruland. 1989-1994.

-Conductivity-Temperature-Depth probe and rosette bottle array operation, sample collection, and technical assistance aboard a research ice breaker in Antarctica. Principal investigator: Professor T.D. Foster, 1992.

Teaching assistant, University of California, Santa Cruz, CA, USA. 1988-1993.

-Chemistry/Marine Sciences 120, *Chemical Oceanography*, 1993: Preparation and evaluation of homework assignments, discussion section facilitation, preparation and delivery of lectures, evaluation of student research papers.

-Chemistry 122, *Principles of Instrumental Analysis*, 1988-90: Preparation and delivery of laboratory demonstrations, monitoring of student experiments, and evaluation of research papers.

Summer Research Fellow in physical organic chemistry, University of California, Santa Cruz, CA, USA. 1987.

- Use of relaxation kinetics to study the mechanisms of fundamental organic reactions.
- Urchin keeper, Hopkins Marine Station, Pacific Grove, CA, USA. 1984-1985.
 - Care and feeding of sea urchin colonies for research.
- Waiter, Deli-Icious, Pacific Grove, CA, USA. 1985.
 - Assistance in the kitchen and at the cash register in emergencies, as well as working the floor.
- Shipping Clerk, Social Security Administration, Carmel, CA, USA. 1983-1984.
 - Inspection and organization of defunct files in preparation for long-term storage.
- Billing Clerk, Stoner and Welsh, AAL, Pacific Grove, CA, USA. 1981-1983.
 - Preparation of invoices and library maintenance for a small law firm.
- General Assistant, Copiworks, Pacific Grove, CA, USA. 1980-1981.
 - Organization and quality control for a small printing company.

Teaching and Educational Service

Graduate student committees:

- Johanna Langer (University of Victoria, Ph.D., 2019-present); thesis title: A Model based Evaluation of the Canadian Arctic's Carbon sink.
- Tonya Burgers (University of Manitoba, Ph.D., 2017-present); thesis title: Carbon cycling and ocean acidification studies in Baffin Bay and Nares Strait.
- Eric Mortenson (University of Victoria, Ph.D. 2013-2019); thesis title: Modelling carbon exchange in the air, sea, and ice of the Arctic Ocean.
- Karina Giesbrecht (University of Victoria, Ph.D. 2013-2019); thesis title: Biogenic silica dynamics of Arctic marine ecosystems.
- Daniela Konig (ETH Zurich, M.Sc., 2016-2017); thesis title: Carbon dynamics during the formation of sea ice at different growth rates.
- Kristina Brown (University of British Columbia, Ph.D. 2009-2014); thesis title: A Multi-Tracer Study of the Role of Sea Ice in the Arctic Ocean Carbon Cycle; now at Woods Hole Oceanographic Institution, USA.
- Yiming Luo (University of British Columbia, Ph.D. 2008-2013); thesis title: Applications of U-Decay Series Isotopes to Studying the Meridional Overturning Circulation and Particle Dynamics in the Ocean; now at Dalhousie University, Canada.
- Owen Owens (University of Manitoba, M.S., 2003-2008); thesis title: Wintertime Measurements of ρCO_2 in Arctic Landfast Sea Ice; now at Hydrogen Technology and Energy Corp., Canada.

Post-doctoral supervisor:

- Dr. Oliver Wurl (2008-2010); now at Carl-von-Ossietzky University Oldenburg, Germany.
- Dr. Magnus Wendeberg (2001-2003); now proprietor of the Old School Studio, Germany.
- Dr. Melissa Chierici (2001); now at the Institute of Marine Research, Norway.
- Dr. Agneta Fransson (2001) ; now at the Norwegian Polar Institute, Norway.

Lecturer:

- Arctic Geophysics 352/852, *Chemical Oceanography in the Arctic*, 2015-2023, The University Centre in Svalbard. Lectures on air-sea exchange and sea-ice biogeochemistry.
- Physics 5118, *Ocean-Atmosphere-Climate Interactions and Feedbacks*, 2022, University of Galway. Guest lecturer on climate intervention.
- 2022 SOLAS Summer School. Lecture on SOLAS science and polar systems.
- 2018 SOLAS Summer School. Lectures on SOLAS science and polar systems, and The ocean microlayer; evaluated student written reports.
- 2014 Connaught Summer Institute in Arctic Science: Atmosphere, Cryosphere, and Climate. Lectures on Arctic oceanography, Carbon cycling in the Arctic Ocean, and The Arctic Ocean and climate change feedbacks; conducted workshop on time management.

Geography 53.701 L15, *Ocean Geochemistry*, 2003, University of Manitoba.
 Local and regional student science fairs. Judge. 2000-present.
 Thesis proposal committee: Gina Nickoloff, M.Sc., University of Calgary, 2021-2022.
 Lead opponent: Ylva Ericson, Doctoral Defense, University of Bergen, 2019.
 Intern host: Jonathan Velarde, Linking, Diffusion & University Ext., Universidad Politécnica De Sinaloa. 2016.
 Host employer: Gillian Moody, Career Search Internship Program, University of Victoria. 2000.
 Work experience Host: Gulf Islands Secondary School.
 Examination censor: Marine Analytical Chemistry, University of Bergen. 1998.
 Student mentor: Northern California Scholarship Foundations; the University of Bergen.

Professional Service

Associate editor, *Elementa: Science of the Anthropocene* (2013-present).
 SCOR working group 163, Clce2Clouds; associate member (2022-present).
 Biogeochemical Exchange Processes at Sea Ice Interfaces (BEPsII), steering committee (2016-present), co-leader (with K. Meiners) of Task Group 2 on Methodologies and Data Collation; SCOR working group 140, co-leader (with L. Russell) of Task 1 on Methodologies (2012-2016).
 World Climate Research Programme: member of Working Group on Safe Landing Pathways, Safe Landing Climates Lighthouse Activity (2022-Present); member of Task Team on Climate Intervention (2022-2023).
 Future Earth: Governing Council (2021-present); Reform Implementation Team, chair of working group on Research Networks (2020-2021).
 A.G. Huntsman Foundation, Award Selection Committee (2019-Present); chair (2022).
 Canadian National Committee for SCOR, 2018-present; ex-officio member representing SOLAS, 2018-2021.
 DFO-NOAA Working Group on Monitoring Ocean Acidification (2017-present).
 Canadian delegate, G7 Future of the Seas and Oceans Initiative (2021-present).
 International Commission for Atmospheric Chemistry and Global Pollution (iCACGP), Ex-officio member representing SOLAS (2018-2023).
 SCOR working group 152, Measuring Essential Climate Variables in Sea Ice (ECV-Ice); full member (2016-2022).
 8th International Symposium on Gas Transfer at Water Surfaces, May 2021, 2022, scientific organizing committee.
 Surface Ocean-Lower Atmosphere Study (SOLAS): chair (2018-2020); scientific steering committee (2011-2016), ex-officio past-chair (2021); executive committee (2013-2016); vice-chair (2015-2016); local organizing committee, 2012 SOLAS Open Science Conference; scientific organizing committees, 2012, 2015, and 2019 SOLAS Open Science Conferences.
 North Pacific Marine Science Organization (PICES): member of Section on Carbon and Climate (2005-2019).
 NETCARE - Network on Climate and Aerosols: Addressing Key Uncertainties in Remote Canadian Environments: Executive committee (2013-2018).
 7th International Symposium on Gas Transfer at Water Surfaces, May 18-21, 2015, scientific organizing committee.
 Delegate/contributing author, Arctic Monitoring and Assessment Program (AMAP) Arctic Acidification Assessment.
 Manuscript reviewer: *Biogeosciences*; *Deep-Sea Research*; *Earth System Science Data*; *Estuarine, Coastal and Shelf Science*; *Geophysical Research Letters*; *Journal of Geophysical Research*; *Journal of Marine Systems*; *Limnology and Oceanography*; *Marine Chemistry*; *Polar Biology*; *Progress in Oceanography*; *Quaternary Research*; *Quaternary Science Reviews*; *Tellus*; the Joint Global Ocean Flux Study.

Proposal reviewer: National Oceanographic and Atmospheric Administration, USA; National Aeronautics and Space Administration, USA (panel member); Netherlands Geosciences Foundation; Canadian Foundation for Climate and Atmospheric Sciences; Natural Environment Research Council, UK; Leverhulm Trust, UK; National Science Foundation, USA.

Field Experience

Ucluelet, British Columbia, August 5-9, 2013. Chief Scientist: Prof. Jon Abbatt. Training and supervision of graduate students in small boat handling and sea-surface microlayer sampling for research on atmospheric aerosols.

Hudson Bay, August 27 – September 3, 2012, NGCC Pierre Radisson. Chief Scientist: Prof. Louis Fortier. Sample collection for dissolved inorganic carbon, alkalinity, and air-sea gas exchange; rosette operation.

Hudson Bay, July 21 – August 3, 2010, NGCC Amundsen. Chief Scientist: Dr. Gary Stern. Sample collection for dissolved inorganic carbon, alkalinity, and photochemistry.

Beaufort Sea, June 23 – August 4, 2004, NGCC Amundsen. Chief Scientists: Profs. Louis Fortier and David Scott. Assistant chief scientist for rosette operations. Sample collection and analysis of dissolved inorganic carbon, pH, alkalinity, and dissolved oxygen. Sample collection for dissolved organic carbon.

Beaufort Sea, February 18 – April 1, 2004, NGCC Amundsen. Chief Scientist: Prof. Jody Deming. Water column carbon system sampling and analyses, ice biogeochemistry sampling and analyses.

Beaufort Sea, October 16 - November 26, 2003, NGCC Amundsen. Chief Scientist (November 3-26; Prof. Dave Barber was chief scientist October 16 - November 3). Also specific oversight of rosette operations and water column carbon system sampling and analyses.

Beaufort Sea, September 18 - October 26, 2002, NGCC Pierre Radisson. Chief Scientist: Dr. Martin Fortier. Assistance chief scientist for rosette operations. Sample collection for dissolved organic and inorganic carbon and for seawater alkalinity, dissolved oxygen analyses.

Canadian Archipelago, April 20 - May 11, 2002, C-ICE camp, Truro Island, Nunavut. General assistance with camp preparation and ice sampling, collection of dissolved inorganic carbon and alkalinity samples.

Northeast Pacific, September 17 - October 2, 2001, CCGS J.P. Tully. Chief Scientist: Dr. Dave Mackas. General technical assistance, deployment of CTD/rosette, supervision of carbon system parameters sampling, pH analyses.

Northeast Pacific, May 28 - June 13, 2001, CCGS J.P. Tully. Chief Scientist: Mr. Frank Whitney. General ship-board assistance, supervision of carbon system parameters sampling, pH analyses.

Northeast Pacific, September 22 - October 6, 2000, CCGS J.P. Tully. Chief Scientist: Dr. Dave Mackas. General ship-board assistance and supervision of carbon system parameters sampling.

Northeast Pacific, June 16-24, 2000, CCGS J.P. Tully. Chief Scientist: Mr. Frank Whitney. General ship-board assistance and supervision of carbon system parameters sampling.

Northern Baffin Bay, September 16 – October 12, 1999, NGCC Pierre Radisson. Chief Scientist: Professor Louis Fortier. Sample collection for dissolved organic and inorganic carbon and seawater alkalinity, CTD/rosette deployment.

Kona Coast, Hawaii, August 2-8, 1999, R/V Ka'imikai-O-Kanaloa. Chief Scientist: Professor Eric Adams. Co-chief scientist. Background oceanographic survey in preparation for a deep ocean CO₂ sequestration experiment.

Polar North Atlantic, August 1-23, 1998, F/F Johan Hjort. Chief Scientist: Dr. Francisco Rey. Collection and processing of dissolved and particulate samples for ²³⁴Th analysis.

The Skagerrak, March 19-22, 1998, F/F G.M. Dannevig. Chief Scientist: Ms. Carola Noji. Collection and processing of dissolved and particulate samples for ²³⁴Th analysis.

The Skagerrak, December 12-7, 1997, F/F G.O. Sars. Chief Scientist: Mr. Lars Føyn. Collection and processing of dissolved and particulate samples for ^{234}Th analysis.

Barents Sea, March 4-19, 1997, F/F Johan Hjort. Chief Scientist: Mr. Svein Lygren. Responsibility for deployment of sediment trap mooring.

Polar North Atlantic, November 8-28, 1995, F/F Johan Hjort. Chief Scientist: Dr. Johan Blindheim. Assistant Chief Scientist for inorganic carbon sampling. Collection and analysis of samples for alkalinity, pCO_2 , and total inorganic carbon.

Polar North Atlantic, May 4 - 23, 1995, F/F Johan Hjort. Chief Scientist: Dr. Francisco Rey. Assistant Chief Scientist for inorganic carbon sampling. Collection and analysis of samples for alkalinity, pCO_2 , and total inorganic carbon.

Polar North Atlantic, February 14 - March 18, 1995, M/S Håkon Mosby. Chief Scientist: Dr. Ola M. Johannessen. Assistant Chief Scientist for inorganic carbon sampling. Collection and analysis of samples for alkalinity and total inorganic carbon.

Polar North Atlantic, May 25 - June 5, 1994, F/F Johan Hjort. Chief Scientist: Dr. Francisco Rey. Collection and analysis of samples for alkalinity and total inorganic carbon.

Polar North Atlantic, February 24 - March 17, 1994, M/S Håkon Mosby. Chief Scientist: Dr. Truls Johannessen. Collection of samples for alkalinity and total inorganic carbon, dissolved oxygen analyses.

Weddell Sea, October 22 - December 4, 1992, RVIB Nathaniel B. Palmer. Chief Scientist: Professor Theodore D. Foster. Deployment of CTD/rosette bottle array, collection of stable isotope, gas and trace metal samples, and general technical assistance.

Equatorial Pacific, July 29 - September 2, 1991, RV Moana Wave. Chief Scientist: Professor Kenneth W. Bruland. Nutrient analyses, general technical assistance, trace metal analyses for organic speciation.

Eastern North Pacific, approximately 15 1-day cruises between 1983 and 1988, The Tug. Humboldt State University's Oceanographic Research Program, Chief Scientists: Professors John Pequegnat and Jeffrey Borgeld. Collection of nutrient samples, wet lab organization, collection of box core pore water samples, data logging, sample description, and general technical assistance for a variety of small-scale research projects.

Professional Organizations

American Geophysical Union, 1988-present.
The Oceanography Society, 1989-94, 1996-present.
American Chemical Society, 1987-94.

Awards

Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering, for the NETCARE - Network on Climate and Aerosols: Addressing Key Uncertainties in Remote Canadian Environments project, 2020.
Prix D'Excellence for Excellence in Science, Fisheries and Oceans Canada, 2015.
Antarctic Service Medal, U.S. Navy, 1992.
National Science Foundation Graduate Research Fellowship, 1989-92.
Regents' Fellowship, University of California, 1988-9.
Northern California Society for Applied Spectroscopy Scholarship, 1987-8.
American Chemical Society Analytical Chemistry Award, 1987.
Northern California Scholarship Foundations, Parmalee Scholarship, 1983-1988.

Community Service

Safety and evacuation supervisor, Midlands Condominiums, Victoria, BC. 2011-present.
Amnesty International, Victoria Group. Western European Regional Action Network. 2003-2005.
Amnesty International, Hordaland Branch. English editor. Internet research specialist. 1995-1999.
Women's International League for Peace and Freedom, Santa Cruz branch. Chair, mailing committee, 1992-4. Information tabling committee, 1991.
Citizens for Social Responsibility, Humboldt County Branch. Legislative alert phone tree, 1985-8.
Annual Conference on Women in Science, Humboldt State University. Tour guide, 1984-86. Chemistry demonstrations, 1987.

Additional Skills

Experience with varied analytical instrumentation, including high temperature combustion, β counting, γ spectroscopy, coulometry, graphite furnace and flame atomic absorption and emission spectroscopy, continuous-flow systems, UV/visible spectroscopy, stripping and direct voltammetry and polarography, fluorescence spectroscopy, stopped-flow kinetic analysis, HPLC, infra-red spectroscopy, NMR, gas chromatography.

Second languages: Norwegian and German.

Pianist.

Lay expertise in neurology and managing complex medical care programs.

Dinghy sailing certification, University of California, Santa Cruz.