

## Curriculum Vitae – Boswell Alan Wing – March 2023

Associate Professor of Geobiology  
Department of Geological Sciences  
University of Colorado Boulder  
Boulder, Colorado 80309 USA

Telephone: (303) 735-6284 (office)  
Fax: (303) 492-2606  
E-mail: boswell.wing@colorado.edu  
WWW www.colorado.edu/geosci/

**Research Interests:** I study the origin of life on early Earth and its evolution to today using techniques from experimental microbial evolution, stable isotope geochemistry, microbiology, metamorphic petrology, and inverse theory.

### Education:

2005 PhD Earth and Planetary Sciences, Johns Hopkins University – Thesis title:  
*Regional patterns of mineralogical and isotopic changes in metamorphic rocks*  
1998 MA Earth and Planetary Sciences, Johns Hopkins University  
1996 AB Earth and Planetary Sciences, cum laude, Harvard College

### Employment:

2016 – present Associate Professor, Department of Geological Sciences, University of Colorado Boulder  
2014 – 2016 Dawson Chair in Geology, Department of Earth and Planetary Sciences, McGill University  
2012 – 2016 Associate Professor, Department of Earth and Planetary Sciences, McGill University  
2006 – 2012 Assistant Professor, Department of Earth and Planetary Sciences, McGill University  
2001 – 2005 Faculty Research Assistant/Research Associate/Assistant Research Scientist, Earth System Science Interdisciplinary Center and Department of Geology, University of Maryland

### Affiliations:

2019 – present Core Faculty, Center for Microbial Exploration, University of Colorado Boulder  
2017 – present Member, Steering Committee, Research Coordination Network for Exploration of Life's Origins  
2017 – present Member, Interdisciplinary Quantitative Biology program, University of Colorado Boulder  
2016 – 2019 Member, Collaborative for Research in Origins, University of Colorado Boulder  
2015 – 2016 Adjunct Associate Professor, University of Western Australia  
2014 – 2016 Executive Board/Steering Committee/Researcher, McGill Space Institute  
2006 – 2015 Executive Committee/Researcher, GEOTOP Research Center

### Honors, Fellowships, Prizes, and Awards:

2023 John M. Hayes Award, Organic Geochemistry Division, Geochemical Society  
2021 – present Co-Editor in Chief, Earth and Planetary Sciences Letters  
2021 – 2022 Faculty Leadership Institute, University of Colorado Boulder  
2020 – 2022 Chair, Gordon Research Conference in Geobiology  
2019 Visiting fellowship, Earth-Life Science Institute, Tokyo Institute of Technology  
2018 – 2020 Co-chair, Gordon Research Conference in Geobiology  
2015 Gladden Fellow, Center for Exploration Targeting, University of Western Australia  
2014 – 2016 Dawson Chair in Geology, Department of Earth and Planetary Sciences, McGill University  
2013 Feinberg Foundation Visiting Fellow, Weizmann Institute of Science  
2012 – 2013 Visiting Scholar, Earth and Space Sciences Department, University of Washington

2006 – 2011 Tier 2 Canada Research Chair in Earth System Science (Geochemistry)

**Publications** (listed since 2006; since 2016 at CU Boulder; advisees - academic in **bold** / research underlined;  $h_{\text{index}} - 44$ ;  $i10_{\text{index}} - 79$ ; total citations: 6568 – from Google Scholar):

**In review/revision:**

**Johanne O. Albrigtsen**, Boswell A. Wing, Rachel C. Glade, Robert. S. Anderson, *in resion*, Stable isotopes constrain water seepage from gnammas into bare granitic bedrock, *Geophys. Res. Lett.*

**In press:**

James Dottin III, Sang-Tae Kim, Boswell Wing, James Farquhar, Charles Shearer, *in review*, Anomalous  $^{33}\text{S}$  in the lunar mantle, *J. Geophys. Res. Planets*

**Published:**

**Benjamin W. Johnson**, Boswell A. Wing, Lon Abbott, 2022, Hydrothermal ore deposits record the oxygen isotope composition of meteoric paleo-waters in the San Juan Volcanic Field, Colorado, USA, *Geophys. Res. Lett.* **49** e2022GL098159.

James Dottin III, James Farquhar, Sang-Tae Kim, Charles Shearer, Boswell Wing, Peng Ni, Jiayang Sun, 2022, Isotopic evidence of sulphur photochemistry during lunar regolith formation, *Geochem. Persp. Lett.* **23**, 1-5.

Andrea Agangi, Axel Hofmann, Benjamin Eickmann, Frantz-Gerhard Ossa Ossa, Perrin Tyler, Boswell Wing, Andrey Bekker, 2022, A multiple sulfur record of super-large volcanic eruptions in Archaean pyrite nodules, *Earth Plan. Sci. Lett.*, **594**, 117737.

Nathan W. Reed, Boswell A. Wing, Margaret A. Tolbert, Eleanor C. Browne, 2022, Trace  $\text{H}_2\text{S}$  promotes organic aerosol production and organosulfur compound formation in Archean analog haze photochemistry experiments, *Geophys. Res. Lett.*, **49**, e2021GL097032.

Long Li, Siwen Wei, Barbara Sherwood Lollar, Boswell Wing, Thi H Bui, Shuhei Ono, Maggie CY Lau Vetter, Tullis C. Onstott, Thomas L. Kieft, Gaetan Borgonie, Borja Linage-Alvarez, Olukayode Kuloyo, Esta van Heerden, 2022, In-situ oxidation of sulfide minerals supports widespread sulfate reducing bacteria in the deep subsurface of the Witwatersrand Basin (South Africa): Insights from multiple sulfur and oxygen isotopes, *Earth Plan. Sci. Lett.*, **577**, 117247.

Clair A. Huffine, Lucas C. Wheeler, Boswell Wing, Jeffrey C. Cameron, 2022, Computational modeling and evolutionary implications of biochemical reactions in bacterial microcompartments, *Curr. Op. Microbiol.*, **67**, 15-23.

Michael D. Wasserman, Boswell Wing, Nathan Bickford, Kimberly Hobbs, Peter Dijkstra, James Carr, 2021, Stress responses across the scales of life: Towards a universal theory of biological stress. *Integrative and Comparative Biol.*, doi: 0.1093/icb/icab113.

**Sarah J. Hurley**, Boswell A. Wing, Claire E. Jasper, Nicholas C. Hill, Jeffrey C. Cameron, 2021, Carbon isotope evidence for the global physiology of Proterozoic Cyanobacteria, *Science Advances*, **7** (2), eabc8998.

Lucas C. Wheeler, Boswell A. Wing, Stacey D. Smith, 2021, Structure and contingency determine mutational hotspots for flower color evolution, *Evolution Lett.*, **5** (1), 61-74.

**Benjamin W. Johnson**, Boswell A. Wing, 2020, Limited Archaean continental emergence reflected in an early Archaean <sup>18</sup>O-enriched ocean, *Nature Geosci.*, **13**, 243-248.

Emma Bertran, Anna Waldeck, Boswell A. Wing, Itay Halevy, William D. Leavitt, Alexander S. Bradley, David T. Johnston, 2020, Oxygen isotope effects during microbial sulfate reduction: applications to sediment cell abundances, *The ISME Journal*, 1-12.

Elisse Magnuson, Nadia C. S. Mykytczuk, **André Pellerin**, Jacqueline Goordial, Susan M. Twine, Boswell Wing, Simon J. Foote, Kelly Fulton, Lyle G. Whyte, 2020, Thiomicrobium streamers and sulfur cycling in perennial hypersaline cold springs in the Canadian high Arctic, *Environ. Microbiol.* <https://doi.org/10.1111/1462-2920.14916>

Antoine Crémière, **André Pellerin**, Boswell A. Wing, Aivo Lepland, 2020, Multiple sulfur isotopes in methane seep carbonates track unsteady sulfur cycling during anaerobic methane oxidation, *Earth Plan. Sci. Lett.*, **532**, 115994.

Anna R. Waldeck, Benjamin R. Cowie, Emma Bertran, Boswell A. Wing, Itay Halevy, David T. Johnston (2019) Deciphering the atmospheric signal in marine sulfate oxygen isotope composition, *Earth Plan. Sci. Lett.*, **522**, 12-19.

Malcolm S. W. Hodgskiss, **Peter W. Crockford**, Yongbo Peng, Boswell A. Wing, Tristan J. Horner, 2019, A productivity collapse to end Earth's Great Oxidation, *Proc. Nat. Acad. Sci.*, **116**, 17207-17212.

**Peter W. Crockford**, Boswell A. Wing, Adina Paytan, Malcolm S.W. Hodgskiss, Kimberley K. Mayfield, Justin A. Hayles, Julia E. Middleton, Anne-Sofie C. Ahm, David T. Johnston, Fabricio Caxito, Gabriel Uhlein, Galen P. Halverson, Benjamin Eickmann, Marta Torres, Tristan J. Horner, 2019, Barium-isotopic constraints on the origin of post-Marinoan barites, *Earth Plan. Sci. Lett.*, **519**, 234-244.

**Jesse Colangelo-Lillis**, Claus Pelikan, Craig W. Herbold, Ianina Altshuler, Alexander Loy, Lyle G. Whyte, Boswell A. Wing, 2019, Diversity decoupled from sulfur isotope fractionation in a sulfate-reducing microbial community, *Geobiology*, doi:10.1111/gbi.12356

**Peter W. Crockford**, Marcus Kunzmann, Andrey Bekker, Justin Hayles, Huiming Bao, Galen P. Halverson, Yongbo Peng, **Thi H. Bui**, Grant M. Cox, Timothy M. Gibson, Sarah Wörndle, Robert Rainbird, Aivo Lepland, Nicholas L. Swanson-Hysell, Sharad Master, Bulusu Sreenivas, Anton Kuznetsov, Valery Krupenik, Boswell A. Wing, 2019, Claypool continued: Extending the isotopic record of sedimentary sulfate, *Chem. Geol.*, **513**, 200-225.

John K.G. Prince, Robert H. Rainbird, Boswell A. Wing, 2019, Evaporite deposition in the mid-Neoproterozoic as a driver for changes in seawater chemistry and the biogeochemical cycle of sulfur, *Geology*, **47**, 375-379.

Patrick Beaudry, Marc-Antoine Longpré, Rita Economos, Boswell A. Wing, **Thi Hao Bui**, John Stix, 2018, Degassing-induced fractionation of multiple sulphur isotopes unveils post-Archaean recycled oceanic crust signal in hotspot lava, *Nature Comm.*, 9:5093.

**Peter W. Crockford**, Justin A. Hayles, Huiming Bao, Noah J. Planavsky, Andrey Bekker, Philip W. Fralick, Galen P. Halverson, **Thi Hao Bui**, Yongbo Peng, Boswell A. Wing, 2018, Triple oxygen isotope evidence for limited mid-Proterozoic primary productivity, *Nature*, **559**, 613.

**André Pellerin**, Christine B. Wenk, Itay Halevy, Boswell A. Wing, 2018, Sulfur isotope fractionation by sulfate-reducing microbes can reflect past physiology, *Env. Sci & Tech.*, 4013-4022.

**Emma Bertran**, William D. Leavitt, **André Pellerin**, Grant Zane, Judy D. Wall, Itay Halevy, Boswell A. Wing, David T. Johnston, 2018, Deconstructing the dissimilatory sulfate reduction pathway: Isotope fractionation of a mutant unable of growth on sulfate, *Front. Microbio.*, **9**, 3110.

Maryam Shahabi Far, Iain M. Samson, Joel E. Gagnon, David J. Good, Robert L. Linnen, Graham D. Layne, Boswell A. Wing, 2018, Identifying externally derived sulfur in conduit-type Cu–platinum-group element deposits: The importance of multiple sulfur isotope studies, *Geology*, **46**, 235-238.

Benjamin Eickmann, Axel Hofmann, Martin Wille, **Thi Hao Bui**, Boswell A. Wing, Ronny Schoenberg, 2018, Isotopic evidence for oxygenated Mesoarchean shallow oceans, *Nature Geosci.*, **11**, 133-138.

Christine B. Wenk, Boswell A. Wing, Itay Halevy, 2018, Electron carriers in microbial sulfate reduction inferred from experimental and environmental sulfur isotope fractionations, *The ISME Journal*, **12**, 495-507.

Tristan J. Horner, Helena V. Pryer, Sune G. Nielsen, **Peter W. Crockford**, Julia M. Gauglitz, Boswell A. Wing, Richard D. Ricketts, 2017, Pelagic barite precipitation at micromolar ambient sulfate, *Nature Comm.*, 8:1342.

Marcus Kunzmann, Timothy M. Gibson, Galen P. Halverson, Malcolm S.W. Hodgskiss, **Thi Hao Bui**, David A. Carozza, Erik A. Sperling, André Poirier, Grant M. Cox, Boswell A. Wing, 2017, Iron isotope biogeochemistry of Neoproterozoic marine shales, *Geochim. Cosmochim. Acta*, **209**, 85-105.

Vikraman Selvaraja, Marco L. Fiorentini, Crystal K. LaFlamme, Boswell A. Wing, **Thi Hao Bui**, 2017, Anomalous sulfur isotopes trace volatile pathways in magmatic arcs, *Geology*, **45**, 419-422.  
Johannes Hammerli, Anthony I.S. Kemp, Natasha Barrett, Boswell A. Wing, Malcolm Roberts, Richard J. Arculus, Pierre Boivin, Prosper M. Nade, Kai Rankenburg, 2017, Sulfur isotope signatures in the lower crust: A SIMS study on S-rich scapolite of granulites, *Chem. Geol.*, **454**, 54-66.

Marcus Kunzmann, **Thi Hao Bui**, **Peter W. Crockford**, Galen P. Halverson, **Clint Scott**, Timothy W. Lyons, Boswell A. Wing, 2017, Bacterial sulfur disproportionation constrains timing of Neoproterozoic oxygenation, *Geology*, **45**, 207-210.

**Jesse Colangelo-Lillis**, Boswell A. Wing, Isabelle Raymond-Bouchard, Lyle G. Whyte, 2017, Viral induced microbial mortality in Arctic hypersaline spring sediments, *Front. Microbiol.* 7:2158

Crystal LaFlamme, Laure Martin, Heejin Jeon, Steven M. Reddy, Vikraman Selvaraja, Stefano Caruso, **Thi Hao Bui**, Malcolm P. Roberts, Francois Voute, Steffen Hagemann, David Wacey, Sten Littman, Boswell Wing, Marco Fiorentini, Matthew R. Kilburn, 2016, In situ multiple sulfur isotope analysis by SIMS of pyrite, chalcopyrite, pyrrhotite, and pentlandite to refine magmatic ore genetic models, *Chem. Geol.*, **444**, 1-15.

Andrey Bekker, T.L. Grokhovskaya, Russel Hiebert, E.V. Sharkov, **Thi Hao Bui**, K.R. Stadnek, V.V. Chashchin, Boswell A. Wing, 2016, Multiple sulfur isotope and mineralogical constraints on the genesis of Ni-Cu-PGE magmatic sulfide mineralization of the Monchegorsk Igneous Complex, Kola Peninsula, Russia, *Mineral. Deposita*, **51**, 1035-1053.

Long Li, Boswell A. Wing, **Thi Hao Bui**, Jill M. McDermott, Gregory F. Slater, Siwen Wei, Georges Lacrampe-Couloume, and Barbara Sherwood Lollar, 2016, Sulfur mass-independent fractionation in subsurface fracture waters indicates a long-standing sulfur cycle in Precambrian rocks, *Nature Comm.*, 7:13252.

Russel S. Hiebert, Andrey Bekker, Michel G. Houlié, Boswell A. Wing, Olivier J. Rouxel, 2016, Tracing sources of crustal contamination using multiple S and Fe isotopes in the Hart komatiite-associated Ni-Cu-(PGE) sulfide deposit, Abitibi greenstone belt, Ontario, Canada, *Mineral. Deposita*, **51**, 1035-1053.

Andrew L. Masterson, Boswell A. Wing, Adina Paytan, James Farquhar, David T. Johnston, 2016, The minor sulfur isotope composition of Cretaceous and Cenozoic seawater sulfate *Paleoceanography*, **31**, 779-788.

**Jesse Colangelo-Lillis**, Boswell A. Wing, Lyle G. Whyte, 2016, Low viral predation pressure in cold hypersaline Arctic sediments and limits on lytic replication, *Environ. Microbiol. Lett.*, **8**, 250-260.

**Peter W. Crockford**, Benjamin R. Cowie, David T. Johnston, Paul F. Hoffman, **Ichiko Sugiyama**, **André Pellerin**, **Thi Hao Bui**, Justin Hayles, Galen P. Halverson, Francis A. Macdonald, Boswell A. Wing, 2016, Triple oxygen and multiple sulfur isotope constraints on the evolution of the post-Marinoan sulfur cycle, *Earth Plan. Sci. Lett.*, **435**, 74-83.

Jean H. Bédard, Benjamin Hayes, **Matthew Hryciuk**, Charles Beard, Nicole Williamson, Trent A. Dell’Oro, Robert H. Rainbird, **John Prince**, W. Robert A. Baragar, Peter I. Nabelek, Dominique Weis, Boswell Wing, James Scoates, H. Richard Naslund, Brian Cousens, Marie-Claude Williamson, LJ Hulbert, R. Montjoie, Étienne Girard, Richard Ernst, C. Johan Lissenberg, 2016, Geochemical database of Neoproterozoic Franklin intrusions, Natkusiak Basalts and Shaler Supergroup rocks, Arctic Canada. Geological Survey of Canada Open File 8009, doi:10.4095/297842

Leonid Shumlyansky, Richard E. Ernst, Kjell Billström, Boswell Wing, Andrey Bekker, 2016, Age and sulfur isotope composition of the Prutivka intrusion (the 1.78 Ga Prutivka-Novogol large igneous province in Sarmatia), *Мінералогічний журнал [Mineralogy Magazine]*, **38**, 91-101.

Jukka P. Konnunaho, Eero J. Hanski, Boswell A. Wing, Andrey Bekker, Sari Lukkari, Tapio A.A. Halkoaho, 2016, The Hietaharju PGE-enriched komatiite-hosted sulfide deposit in the Archean Suomussalmi greenstone belt, eastern Finland, *Ore Geol. Rev.*, **72**, 641-658.

Marcus Kunzmann, Galen P. Halverson, **Clint Scott**, William G. Minarik, Boswell A. Wing, 2015, Geochemistry of Neoproterozoic black shales from Svalbard: Implications for oceanic redox conditions spanning Cryogenian glaciations, *Chem. Geol.* **417**, 383-393.

Boswell A. Wing, James Farquhar, 2015, Sulfur isotope homogeneity of lunar mare basalts, *Geochim. Cosmochim. Acta*, **170**, 266-280.

Andrey Bekker, Tatiana Grokhovskaya, Russel Hiebert, Evgenii V. Sharkov, **Thi Hao Bui**, K.R. Stadnek, V.V Chashchin, Boswell A. Wing, 2015, Multiple sulfur isotope and mineralogical constraints on the genesis of Ni-Cu-PGE magmatic sulfide mineralization of the Monchegorsk Igneous Complex, Kola Peninsula, Russia, *Mineral. Deposita*, <http://dx.doi.org/10.1007/s00126-015-0604-1>

Ben Hayes, Jean H. Bédard, **Matthew J. Hryciuk**, Boswell A. Wing, Peter Nabelek, William MacDonald, C. Johan Lissenberg, 2015, Sulfide immiscibility induced by wallrock assimilation in a

fault-guided Franklin magmatic feeder system on Victoria Island (Arctic Canada), *Econ. Geol.*, **110(7)**, 1697-1717.

Gregor Lucic, John Stix, Boswell Wing, 2015, Structural controls on the emission of magmatic carbon dioxide gas, Long Valley caldera, USA, *J. Geophys. Res. - Solid Earth*, **120(4)**, 2262-2278.

**André Pellerin, Thi Hao Bui, Mikaella Rough**, Alfonso Mucci, Donald E. Canfield, Boswell A. Wing, 2015, Mass-dependent sulfur isotope fractionation during reoxidative sulfur cycling: A case study from Mangrove Lake, Bermuda, *Geochim. Cosmochim. Acta*, **149**, 152-164.

**Émilie Thomassot**, Jonathan O'Neil, Don Francis, Pierre Cartigny, Boswell A. Wing, 2015, Atmospheric record in the Hadean Eon from multiple sulfur isotope measurements in Nuvvuagittuq Greenstone Belt (Nunavik, Quebec), *Proc. Nat. Acad. Sci.*, **112(3)**, 707-712.

**André Pellerin, Luke Anderson-Trocmé**, Lyle Whyte, Grant M. Zane, Judy D. Wall, Boswell A. Wing, 2015, Sulfur isotope fractionation during the evolutionary adaptation of a sulfate reducing bacterium, *Appl. Environ. Microbiol.*, **81(8)**, 2676-2689.

Ali Qadi and 24 others (including Boswell A. Wing), 2015, Mars methane analogue mission: Mission simulation and rover operations at Jeffrey Mine and Norbestos Mine Quebec, Canada, *Adv. Space Res.*, **55(10)**, 2414-2426.

Boswell A. Wing, Itay Halevy, 2014, Intracellular metabolite levels shape sulfur isotope fractionation during microbial sulfate respiration, *Proc. Nat. Acad. Sci.*, **111(51)**, 18116-18125.

Kayla M. Helt, Anthony E. Williams-Jones, James R. Clark, Boswell A. Wing, Robert P. Wares. 2015, Constraints on the Genesis of the Archean Oxidized, Intrusion-Related Canadian Malartic Gold Deposit, Quebec, Canada – A Reply, *Econ. Geol.*, **109(7)**, 2069-2071.

**Elizabeth R. Sharman**, Bruce E. Taylor, William G. Minarik, Benôit Dubé, Boswell A. Wing, 2014, Sulfur isotope and trace element data from ore sulfides in the Noranda district (Abitibi, Canada): implications for volcanogenic massive sulfide deposit genesis, *Mineral. Deposita*, <http://dx.doi.org/10.1007/s00126-014-0559-7>.

W.-Y. Li, F.-Z. Teng, Boswell A. Wing, Y. Xiao, 2014, Limited magnesium isotope fractionation during metamorphic dehydration in metapelites from the Onawa contact aureole, Maine, *Geochem. Geophys. Geosys.*, **15(2)**, 408-415.

**Clint Scott**, Boswell A. Wing, Andrey Bekker, Noah J. Planavsky, Pavel Medvedev, Steven M. Bates, Misuk Yun, Timothy W. Lyons, 2014, Pyrite multiple-sulfur isotope evidence for rapid expansion and contraction of the early Paleoproterozoic seawater sulfate reservoir, *Earth Plan. Sci. Lett.*, **389**, 95-104.

Kayla Helt, Anthony E. Williams-Jones, James R. Clark, Boswell A. Wing, Robert P. Wares, 2014, Constraints on the genesis of the Archean oxidized, intrusion-related Canadian Malartic gold deposit, Quebec, Canada, *Econ. Geol.*, **109(3)**, 713-735.

Heather B. Franz, Sebastian O. Danielache, James Farquhar, Boswell A. Wing, 2013, Mass-independent fractionation of sulfur isotopes during broadband SO<sub>2</sub> photolysis: Comparison between <sup>16</sup>O- and <sup>18</sup>O-rich SO<sub>2</sub>, *Chem. Geol.*, <http://dx.doi.org/10.1016/j.chemgeo.2013.07.021>

Boswell A. Wing, 2013, A Cold Hard Look at Ancient Oxygen, *Proc. Nat. Acad. Sci.*, **110(36)**, 14514-14515. [invited commentary]

Andrea Giuliani, David Phillips, Marco L. Fiorentini, M.A. Kendrick, R. Maas, Boswell A. Wing, Jon D. Woodhead, **Thi Hao Bui**, V.S. Kamenetsky, 2013, Mantle oddities: A sulphate fluid preserved in a MARID xenolith from the Bultfontein kimberlite (Kimberley, South Africa), *Earth Plan. Sci. Lett.*, **376**, 74-86.

Russel S. Hiebert, Andrey Bekker, Boswell A. Wing, Olivier J. Rouxel, 2013, The Role of Paragneiss Assimilation in the Origin of the Voisey's Bay Ni Sulfide Deposit Labrador, Multiple S and Fe Isotope Evidence, *Econ. Geol.*, **108**, 1458-1469.

Jukka P. Konnunaho, Eero J. Hanski, Andrey Bekker, Tapio A.A. Halkoaho, Russel S. Hiebert, Boswell A. Wing, 2013, The Archean komatiite-hosted, PGE-bearing Ni-Cu sulfide deposit at Vaara, eastern Finland: evidence for assimilation of external sulfur and post-depositional desulfurization, *Mineral. Dep.*, **48(8)**, 967-989.

**Elizabeth R. Sharman**, Sarah C. Penniston-Dorland, Judith A. Kinnaird, Paul A. M. Nex, Michael Brown, Boswell A. Wing, B.A., 2013, Primary origin of marginal Ni-Cu-(PGE) mineralization in layered intrusions:  $\Delta^{33}\text{S}$  evidence from the Platreef, Bushveld, South Africa, *Econ. Geol.*, **108(2)**, 365-377.

**Clint Scott**, Noah J. Planavsky, Christopher L. Dupont, Brian Kendall, Benjamin C. Gill, Leslie J. Robbins, Kathryn F. Husband, Gail L. Arnold, Boswell A. Wing, Simon W. Poulton, Andrey Bekker, Ariel D. Anbar, Kurt O. Konhauser, Tim W. Lyons, 2013, Bioavailability of zinc in marine systems through time, *Nature Geoscience*, **6(2)**, 125-128.

John W. Jamieson, Boswell A. Wing, James Farquhar, Mark D. Hannington, 2013, Neoproterozoic seawater sulphate concentrations from sulphur isotopes in massive sulphide ore, *Nature Geoscience*, **6(1)**, 61-64.

Boswell A. Wing, 2012, Unexpectedly abiotic, *Nature Geoscience*, **5**, 598-599. [invited commentary]

**Yumi Kitayama**, **Emilie Thomassot**, Jonathan O'Neil, Boswell A. Wing, 2012, Sulfur- and oxygen-isotope constraints on the sedimentary history of apparent conglomerates from the Nuvvuagittuq greenstone belt (Nunavik, Québec). *Earth Plan. Sci. Lett.*, **355-356**, 271-282.

Sarah C. Penniston-Dorland, Edmond A. Mathez, Boswell A. Wing, James Farquhar, Judith A. Kinnaird, 2012 Multiple sulfur isotope evidence for surface-derived sulfur in the Bushveld Complex. *Earth Plan. Sci. Lett.*, **337**, 236-242.

Marco L. Fiorentini, Andrey Bekker, Olivier Rouxel, Boswell A. Wing, Wolfgang Maier, Douglas Rumble, 2012, Multiple Sulfur and Iron Isotope Composition of Magmatic Ni-Cu-(PGE) Sulfide Mineralization from Eastern Botswana, *Econ. Geol.*, **105**, 107-116.

Andrew L. Masterson, James Farquhar, Boswell A. Wing, 2011, Sulfur mass-independent fractionation patterns in the broadband UV photolysis of sulfur dioxide: Pressure and third body effects, *Earth Plan. Sci. Lett.*, **306**, 253-260.

- Yanan Shen, James Farquhar, Hua Zhang, Andrew Masterson, Tonggang Zhang, Boswell A. Wing, 2011, Multiple S-isotopic evidence for episodic shoaling of anoxic water during Late Permian mass extinction, *Nature Comm.*, **2:210**, doi:10.1038/ncomms1217
- Pierre Cartigny, James Farquhar, **Emilie Thomassot**, Jeffrey W. Harris, Boswell Wing, Andrew Masterson, Kevin McKeegan, Thomas S. Stachel, 2009, A mantle origin for Paleoproterozoic peridotitic diamonds from the Panda kimberlite, Slave craton: evidence from  $^{13}\text{C}$ -,  $^{15}\text{N}$ - and  $^{33,34}\text{S}$ - stable isotope systematics. *Lithos*, **112**, 852-864.
- Qingjun Guo, Harald Strauss, Alan J. Kaufman, Stefan Schröder, Jens Gutzmer, Boswell Wing, Margaret A. Baker, Andrey Bekker, Qusheng Jin, Sang-Tae Kim, James Farquhar, 2009, Reconstructing Earth's surface oxidation across the Archean-Proterozoic transition, *Geology*, **37**, 399-402.
- Sarah C. Penniston-Dorland, Boswell A. Wing, Paul A.M. Nex, Judith A. Kinnaird, James Farquhar, Michael Brown, **Elizabeth R. Sharman**, 2008, Multiple sulfur isotopes reveal a magmatic origin for the Platreef platinum group element deposit, Bushveld Complex, South Africa *Geology*, **36**, 979-982.
- James Farquhar, David T. Johnston, Boswell A. Wing, 2007, Influence of network structure on sulfur isotope phase space of dissimilatory sulfate reduction: Implications of conservation of mass effects on mass-dependent isotope fractionations. *Geochim. Cosmochim. Acta*, **71**, 5862-5875.
- Ilya N. Bindeman, John Eiler, Boswell Wing, James Farquhar, 2007, Rare sulfur and triple oxygen isotope geochemistry of volcanogenic sulfate aerosols. *Geochim. Cosmochim. Acta*, **71**, 2326-2343.
- Fangzhen Teng, William F. McDonough, Roberta L. Rudnick, Boswell A. Wing, 2007, Limited lithium isotopic fractionation during progressive metamorphic dehydration in metapelites: A case study from the Onawa contact aureole, Maine. *Chem. Geol.*, **239**, 1-12.
- Mark A. Tyra, James Farquhar, Boswell A. Wing, Gretchen K. Benedix, A.J. Timothy Jull, Terri Jackson, Mark H. Thiemens, 2007, Terrestrial alteration of carbonate in a suite of Antarctic CM chondrites: Evidence from oxygen and carbon isotopes. *Geochim. Cosmochim. Acta*, **71**, 782-795.
- Boswell A. Wing, John M. Ferry, 2007, Magnitude and geometry of reactive fluid flow from direct inversion of spatial patterns of geochemical alteration. *Am. J. Sci.*, **307**, 793-832.
- David T. Johnston, Simon W. Poulton, Philip W. Fralick, Boswell A. Wing, Donald E. Canfield, James Farquhar, 2006, Evolution of the oceanic sulfur cycle at the end of the Paleoproterozoic. *Geochim. Cosmochim. Acta*, **70**, 5723-5739.
- John W. Jamieson, Boswell A. Wing, Mark D. Hannington, James Farquhar, 2006, Evaluating isotopic equilibrium among sulfide mineral pairs in Archean ore deposits: Case Study from the Kidd Creek VMS deposit, Ontario, Canada. *Economic Geol.*, **101**, 1055-1061.
- Shuhei Ono, Boswell Wing, David Johnston, Doug Rumble, James Farquhar, 2006, Mass-dependent fractionation of quadruple stable sulfur isotope system as a new tracer of sulfur biogeochemical cycles. *Geochim. Cosmochim. Acta*, **70**, 2238-2252.
- Shuhei Ono, Boswell Wing, Doug Rumble, James Farquhar, 2006, High precision analysis of all four stable isotopes of sulfur ( $^{32}\text{S}$ ,  $^{33}\text{S}$ ,  $^{34}\text{S}$  and  $^{36}\text{S}$ ) at nanomole levels using a laser fluorination isotope-ratio-monitoring gas chromatography-mass spectrometry. *Chem. Geol.*, **225**, 30-39.



**Teaching Experience** (since 2006; since 2016 at CU Boulder [GEOL]):

*Classroom:*

GEOL 1020-History of a Habitable Planet (x2)  
GEOL 1180-Our Microbial Planet (x1)  
GEOL 3910-Earth and Planetary Inference (x3)  
GEOL 5101-Parade of Professors (x7-participating faculty member)  
GEOL 5280-Aqueous and Environmental Geochemistry (x1, co-taught w/ Alexis Templeton)  
GEOL 5700-Geobiology by the Numbers (x1)  
GEOL 5700-Precambrian Stable Isotope Geobiology (x1, co-taught w/ David Johnston – Harvard)  
GEOL 5910-Geothermodynamics (x4)

EPSC 182-Astrobiology (x2)  
EPSC 340-Earth and Planetary Inference (x5)  
EPSC 396-Research Project in Earth and Planetary Sciences (x11)  
EPSC 519-Isotope Geology (x4)  
EPSC 550-Isotope Biogeochemistry (x1)  
EPSC 550-Microbial Isotope Effects (x1)  
EPSC 666-Advances in Earth Science (x9-participating faculty member)  
ESYS 200-Earth System Processes (x5)  
ESYS 500-Earth System Applications (x3)  
FIGS 196-Freshman Interest Groups (x4)

*Field:*

GEOL 4755/5755-Field Geobiology (x2, co-taught w/ Lizzy Trower)  
GEOL 4150/5150-Planetary Field Geology (x1, co-taught w/ Steve Mojzsis)

EPSC 341-Field School 3 (x1)  
EPS/ESS First-year field trip (x4)  
EPS Adams Club annual Fall field trip (x1)

*Informal:*

CU Boulder Geobiology Supergroup (biweekly during the academic year since 2016, >5 participating labs, [I am the primary organizer])  
GEOL Earth History/Geobiology/Macroeolution reading Groups ( $\approx$ 1 per semester since 2016)

**Funding** (since 2006; since 2016 at CU Boulder: \$2,017,971 to CU Boulder (\$5,472,142 total):

2022 NSF IOS: Collaborative Research: ORCC: Carbon fixation in future oceans: experimental adaptation of algal and cyanobacterial CO<sub>2</sub>-concentrating mechanisms to a changing climate: \$218,479 to CU Boulder (\$932,430 total) [co-I, Sarah Hurley (Lamont Doherty Earth Observatory) – PI]

2020 NSF: Geobiology and Low-temperature Geochemistry – 2020 Geobiology GRC/GRS: January 12-17, 2020 - Galveston, TX: \$25,000 [Boswell Wing (CU Boulder) – PI]

2020 NASA-TWSC: Topical Workshops, Symposia, and Conferences – 2020 Geobiology Gordon Research Conference and Seminar: \$38,250 [Boswell Wing (CU Boulder) – PI]

2019 – 2022 NASA:Habitable Worlds – Impact of Sulfur on Planetary Haze: Implications for Habitability: \$446,334 [co-I, Eleanor Browne (CU Boulder) – PI]

- 2019 – 2020 University of Colorado Boulder RIO Seed Grant – Can flowers take the heat? Modeling the effects of climate change on flower color: \$49,982 [co-I, Stacey Smith (CU Boulder) – PI]
- 2018 – 2020 Agouron Institute-Postdoctoral Fellowship in Geobiology – Carbon isotope fractionation by extant cyanobacteria and physiological analogs of their ancestors: \$140,000, [co-I, Sarah Hurley (CU Boulder) – PI]
- 2017 – 2019 National Science Foundation-EAR Postdoctoral Fellowship – A new archive of Paleoproterozoic ocean chemistry: the 3.24 Ga Panorama volcanogenic massive sulfide district, Western Australia: \$172,000 [co-I, Benjamin Johnson (CU Boulder) – PI]
- 2017 – 2019 Center for Dark Energy Biosphere Investigations-Postdoctoral Fellowship – A MEGA Analogue for Subsurface Sedimentary In-Vivo Evolution (MASSIVE) Plate: \$226,540 [co-I, Jesse Colangelo-Lillis (CU Boulder) – PI]
- 2017 – 2020 NSF Emerging Frontiers under the Joint NASA-NSF Ideas Lab on the “Origins of Life” – Collaborative Research: Biochemical, Genetic, Metabolic and Isotopic Constraints on an Ancient Thiobiosphere: \$549,317 to CU Boulder (\$2,241,606 total) [Boswell Wing (CU Boulder) – PI]
- 2017 – 2018 NASA Astrobiology Program under the Joint NASA-NSF Ideas Lab on the “Origins of Life” – Understanding Translation through Experimental Evolution: \$152,069 to CU Boulder (\$1,200,000 total) [co-I, Mike Travisano (Minnesota) – PI]
- 2015 McGill Internal Research Tools and Infrastructure Grant – A custom-built chemostat system for high-precision, high-throughput assays of stable isotope fractionation by microbial populations: CDN \$10,000 per year [100% share]
- 2014 – 2019 NSERC Discovery Grant – Microbial evolution and the isotopic record of early life - sulfur isotope constraints: CDN \$43,000 per year (CDN \$215,000 total) [100% share]
- 2012 Natural Sciences and Engineering Research Council of Canada (NSERC) Research Tools and Infrastructure Grant – Ultra high-precision, field-deployable water isotopic analyzer for tracing the water cycle at high spatial and temporal resolution: CDN \$118,065 per year [co-I, 10% share; Tom Gleeson (McGill) – PI]
- 2011 - 2012 Department of Energy Joint Genome Institute Community Sequencing Program (US) – Unraveling the Genetic Basis of an Ancient Geochemical Biomarker [co-PI, Eric Collins (UAlaska) – PI, award goes directly to cover sequencing costs]
- 2011 National Science Foundation (US) – Origins, Carriers, and Implications of Mass-Independent Fractionation of Sulfur Isotopes (S-MIF): \$10,200 per year [co-PI; Bill Poirier (Texas Tech) – PI; 0% share, award goes directly to pay meeting costs]
- 2011 Natural Sciences and Engineering Research Council of Canada (NSERC) Research Tools and Infrastructure Grant – Autoclave and multiport injector for removing experimental bottlenecks in microbial isotopic assays: CDN \$23,589 per year [100% share]

- 2010 – 2012 Canadian Space Agency (CSA) Mars Analogue Mission Proposal - Mars Methane Mission, subcontract award of CDN \$5,000 per year (CDN \$10,000 total) [Isotope Geochemistry co-I; Ed Cloutis (U Winnipeg) – PI]
- 2010 Natural Sciences and Engineering Research Council of Canada (NSERC) Research Tools and Infrastructure Grant – Ultralow temperature freezer for archiving microbial evolution experiments: CDN \$12,197 per year [100% share]
- 2010 Natural Sciences and Engineering Research Council of Canada (NSERC) Research Tools and Infrastructure Grant – Portable, low-cost carbon dioxide isotope analyzer for field-based earth science applications: CDN \$72,531 per year [co-I, 20% share; John Stix (McGill) – PI]
- 2009 – 2015 NSERC Collaborative Research and Training Experience (CREATE) Grant – NSERC CREATE Training Program in Canadian Astrobiology: CDN \$149,526 per year for year 1, CDN \$299,992 per year for years 2 through 5, CDN \$297,252 for year 6 (CDN \$1,646,746 total) [co-I, 9% share; Lyle Whyte (McGill) – PI]
- 2009 – 2014 NSERC Discovery Grant – Isotopic Interconnections in the Earth System: \$33,000 per year (CDN \$165,000 total) [100% share]
- 2009 CSA Canadian Astrobiology Research Network – Targeted in-situ cavity ring-down spectroscopy for C isotopic biosignatures: Deployment and validation in Earth's oldest rocks (Nuvvuagittuq Greenstone Belt, N Quebec): CDN \$30,000 per year [100% share]
- 2009 NSERC Research Tools and Infrastructure Grant – A Dual Laser Micro-fluorination System for Total S and O Stable Isotopic Analyses: CDN \$81,087 per year [PI - 20% share]
- 2009 NSERC Research Tools and Infrastructure Grant – Software and hardware upgrades to the JEOL 8900 electron microprobe: CDN \$75,771 per year [co-I, 16% share; Don Baker (McGill) – PI]
- 2006 – 2011 Canada Research Chairs (CRC) Program – Tier 2 CRC in Earth System Science (Geochemistry): CDN \$100,000 per year (CDN \$500,000 total) [100% share]
- 2006 – 2009 NSERC Discovery Grant – Interconnecting the Earth System with Sulfur and Oxygen Multiple Isotopes: CDN \$29,800 per year (CDN \$89,400 total) [100% share]
- 2006 – 2007 Fonds Québécois de la Recherche sur la Nature et les Technologies (FQRNT) Établissement de nouveaux chercheurs – Sur de Nouvelles Contraintes Isotopiques a Notre Compréhension du Cycle Biogéochimique Global du Soufre: CDN \$20,000 per year (CDN \$20,000 total) [100% share]
- 2006 – 2008 CSA Astrobiology Discipline Working Group (Prof. Lyle Whyte, McGill Department of Natural Resource Sciences, and 19 others): CDN \$10,000 per year (CDN \$20,000 total) [0% share, award goes directly to support yearly workshops]
- 2006 Canada Foundation for Innovation CRC-Leaders Opportunity Fund – Acquisition of an ultraprecise state-of-the-art gas source stable isotope-ratio mass spectrometry system to support research in Earth System Geochemistry: CDN \$532,978 total [100% share]

2006 FQRNT Établissement de nouveaux chercheurs – Sur de Nouvelles Contraintes Isotopiques a Notre Comprehension du Cycle Biogeochimique Global du Soufre: Equipment Grant: CDN \$35,400 total [100% share]

**Invited Presentations** (since 2006; since 2016 at CU Boulder):

*Research:*

- 2023 Earth History and Geobiology Seminar, Harvard University, *'The isotopic consequences of living large'*
- 2023 Earth Sciences Colloquium, Denver Museum of Nature and Science, *'Living large in the Neoproterozoic: Diving into snowball oceans with the funky fossil Bavlinella'*
- 2023 Symposium on New horizons in linking microbial mechanisms and biogeochemical processes, Weizmann Institute of Science, *'Formate, freezing, and ferns'* and *'Little things make big things move'*
- 2023 Department of Earth and Planetary Sciences, Weizmann Institute of Science, *'Precambrian Photoautotrophy: from ancient organelles to environmentally modulated multicellularity'*
- 2022 Agouron International Geobiology Course, California Institute of Technology, *'Metabolic evolution after the origin of life: Sulfur isotope evidence for a thiobiosphere on a young Earth?'*
- 2021 Annual Meeting of the Chinese Geobiology Society, *'Carbon fixation in deep time - the activity and identity of the primary primary producers in the Proterozoic Eon'*
- 2021 Department of Geosciences, Colorado State University, *'Sulfur isotopes distinguish Deccan volcanic eruptions and impact at the Cretaceous–Paleogene boundary'*
- 2021 Analytical Chemistry Program, CU Boulder, *'Sulfur isotopes distinguish Deccan volcanic eruptions and impact at the Cretaceous–Paleogene boundary'*
- 2020 Division Seminar, Geological and Planetary Sciences, Caltech, *'The activity, identity, and fate of the primary primary producers in the Proterozoic Eon'*
- 2019 Departmental Seminar, Earth-Life Science Institute, Tokyo Institute of Technology, *'Carbon fixation in deep time - the activity and identity of the primary primary producers in the Proterozoic Eon'*
- 2019 Origins Meeting, Earth-Life Science Institute, Tokyo Institute of Technology, *'Isotopic signatures of the early expansion of a thioester-driven metabolism'*
- 2019 2019 Astrobiology Conference, Session 309 - Evolution of life's complexity on a habitable planet I, *'Carbon fixation in deep time'*
- 2019 2019 Astrobiology Conference, Plenary Session: Unresolved Issues in the Origins of Life: Multidisciplinary Perspectives, *'The ABCs (and Ds and Es) of Origins of Life Research: a newbie's perspective'*

- 2019 Earth Sciences Colloquium, Denver Museum of Nature and Science, '*Sulfur isotopes distinguish Deccan volcanic eruptions and impact at the Cretaceous–Paleogene boundary*'
- 2018 Integrated Bioscience Program, University of Akron, '*Biochemistry in Deep Time: what enzymatic isotope effects can (and can't) tell us about the geological evolution of life on early Earth*'
- 2018 Department of Biochemistry, Case Western School of Medicine, '*Biochemistry in Deep Time: what enzymatic isotope effects can (and can't) tell us about the geological evolution of life on early Earth*'
- 2018 5th International Symposium on Microbial Sulfur Metabolism in Vienna, '*Evolution of control within the dissimilatory sulfate reduction pathway: adaptive predictions and isotopic consequences*'
- 2018 INSTAAR, University of Colorado Boulder, '*Primary productivity of the biosphere in deep time*'
- 2018 Gordon Research Conference in Geobiology, Discussion Leader, '*Records of Biological Processes in Sediments*'
- 2018 Department of Geological Sciences, University of Colorado Boulder, '*Snowball Earth, Sulfur Isotopes, and a Suspect Device: a personal reflection on the joys and disappointments of scientific discovery*'
- 2017 Environmental Seminar, Department of Civil & Environmental Engineering, Colorado School of Mines, '*The ins and outs of sulfur isotope fractionation during dissimilatory sulfate reduction*'
- 2016 26<sup>th</sup> annual Goldschmidt conference, '*Majority Views on Planetary Oxygenation during the Middle Chapters of Earth History: Constraints from the Isotopic Minority*', Keynote presentation in 12g: Alternative Earths: The Co-evolution of Life and its Environments during the Middle Chapters of Earth History
- 2015 Department of Geological Sciences, University of Colorado Boulder, '*Oxygen tension in deep time: a close reading of the rock record of sulfur isotope geobiology*'
- 2015 Commonwealth Scientific and Industrial Research Organisation, Perth WA, MRF Discovery Seminar, '*Sulfur isotopes and magmatic sulfide mineralization: a process perspective*'
- 2015 Centre for Exploration Targeting, University of Western Australia, '*Sulfur isotopography of sulfide mineralization: precedents, pitfalls, and prospects*'
- 2015 Department of Applied Geology, Curtin University, '*Deccan volcanic eruptions coincident with impact at the Cretaceous–Paleogene boundary*'
- 2014 Agouron Institute Symposium on the Sulfur Cycle, '*Sulfur isotope fractionation during microbial sulfate respiration: intracellular influences, environmental controls, and evolutionary responses*'

- 2014 Workshop on: The global multiple sulphur isotope record: insights into the evolution of the Early Earth and genesis of mineral systems, Australian Earth Sciences Conference, Newcastle NSW, *'An introduction to the S isotope record through time'*
- 2013 Wilbert Lecturer, Department of Geology and Geophysics, Louisiana State University, *'Archean black smokers and the microbial persistence of isotopic memory'*
- 2013 Institute of Earth Sciences, Hebrew University of Jerusalem, *'An extraterrestrial start and volcanic end to the Cretaceous-Tertiary mass extinction'*
- 2013 Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, *'An extraterrestrial start and volcanic end to the Cretaceous-Tertiary mass extinction'*
- 2013 Gordon Conference on Geobiology, *'Reconstructing Earth's Oxidation State'*
- 2012 Earth and Space Sciences Department, University of Washington, *'Snowball Earth, Sulfur Isotopes, and a Suspect Device: a personal reflection on the joys and disappointments of scientific discovery'*
- 2012 Canadian Institute for Advanced Research, Astrobiology Workshop, *'Through a glass darkly: What can experimental evolution bring to the Astrobiology high table?'*
- 2011 Canadian Institute for Advanced Research, Earth System Evolution Annual Meeting *'A consistent environmental chronology across the Cretaceous-Paleogene boundary'* and *'Ore minerals provide an abiotic constraint on Archean marine sulfate levels'*
- 2010 5<sup>th</sup> International Archean Symposium, *'Mass independent fractionation of sulphur isotopes: implications for Archean to Paleoproterozoic mineral systems'*
- 2010 20<sup>th</sup> annual Goldschmidt conference, *'Is a Biotic Sulfur Cycle Isotopically Necessary Prior to ~2.45 Ga?'* Keynote Presentation in Symposium 02f: The evolutionary history of sulfur metabolisms: innovation, ecology, and their role in Earth's evolving geochemistry
- 2010 3<sup>rd</sup> Northeastern Geobiology Symposium, Harvard University. *'Sulfate O isotope anomalies, biospheric productivity, and atmospheric carbon dioxide in deep time'*
- 2009 Canadian Institute for Advanced Research, Earth System Evolution Annual Meeting, *'An evolutionary perspective on organic carbon burial through time'*
- 2009 Origins Institute, McMaster University, *'Exobiology through the looking glass: Searching for signs of life in Earth's oldest rocks'*
- 2009 McGill University, Earth System Science Program, *'The worst climate disaster in Earth's history: A cautionary tale for geoengineering'* in ESS mini-symposium associated with the Lorne Trottier Public Science Symposium on Geoengineering

- 2009 University of Manitoba, Department of Geological Sciences, *'Looking for signs of life in Earth's oldest rocks'*
- 2009 American Geophysical Union 2009 Joint Assembly with Geological Association of Canada/Mineralogical Association of Canada, *'Early Earth as an Analogue Target for Astrobiology'* in Session B24A: Lessons from Astrobiology and Biogeochemistry: From Deep Biosphere to Ecosystem and Human Health
- 2009 American Geophysical Union 2009 Joint Assembly with Geological Association of Canada/Mineralogical Association of Canada, *'An Early Shelter for Life on Earth? S and O Isotope Evidence From the Nuvvuagittuq Greenstone Belt, Northeastern Superior Province, Canada'* in Session U13B: Precambrian Environments: Controversial Changes and Paleoproterozoic Milestones
- 2009 Canadian Space Agency, Canadian Mars Sample Return Analogue Mission Science Definition Team meeting, *'Lessons learned from ancient rocks'*
- 2008 University of Western Ontario, Department of Earth Sciences, *'Anomalous sulfur isotopes, Paleoproterozoic climate, and the permanent rise of atmospheric O<sub>2</sub>'*
- 2008 18<sup>th</sup> annual Goldschmidt conference, *'Paleorecords of hydrothermal fluid flow and the composition of early Precambrian oceans'* Keynote Presentation in Symposium 03f: Hydrothermal impact on the early Precambrian seawater composition as recorded by banded iron formations, black shales, and other proxies
- 2008 University of Ottawa, Department of Earth Sciences, *'Anomalous sulfur isotopes, Paleoproterozoic climate, and the permanent rise of atmospheric O<sub>2</sub>'*
- 2008 University of Toronto, Department of Geology, *'Anomalous sulfur isotopes, Paleoproterozoic climate, and the permanent rise of atmospheric O<sub>2</sub>'*
- 2007 Astrobiology Program, University of Washington, *'Anomalous sulfur isotopes, Paleoproterozoic climate, and the permanent rise of atmospheric O<sub>2</sub>'*
- 2007 GEOTOP Student Congress, *'L'état d'oxydation de la surface de la Terre entre 2.45 et 2.32 Ga'*
- 2006 Geological Society of America 2006 annual meeting, *'Abrupt rise in Paleoproterozoic O<sub>2</sub> and global microbial sulfate reduction'* in Pardee Symposium on Links Between Geological Processes, Microbial Activities, and Evolution of Life
- 2006 Geological Society of Canada-Quebec, *'Multiple sulfur isotopes and Archean mineralization processes'*
- Outreach:*
- 2014 Faculty of Agricultural and Environmental Sciences, Food for Thought Lecture Series, *'How did we wind up with our carbon-rich biosphere?: A catastrophe in 3 parts'*
- 2014 Roundtable participant for the Lorne Trottier Public Science Symposium, McGill University – *'Are we alone?'*

- 2010 Dawson College, *'Earth's earliest life - where did it come from?'* in First Choice lunch hour seminar series
- 2010 McGill University, Redpath Museum, *'Earth's earliest life - where did it come from?'* in Freaky Friday Series – preparatory talk for screening of *The Day of the Triffids*
- 2009 McGill University, Gairdner Lectures in Science for high schoolers
- 2009 John Abbott College, Geoscience Department, *'The breath of life: Origin and evolution of Earth's oxygen-rich atmosphere'*
- 2007 McGill University, *'Future Directions of Research into the Origins of Life'* - A roundtable discussion associated with the Lorne Trotter Public Science Symposium on the Origin of Life

**Service Activities** (since 2006; since 2016 at CU Boulder):

**Departmental and University:** At McGill, in addition to routine departmental and university duties, I served on the hiring committees for seven new faculty members in the Department of Earth and Planetary Sciences. I was the EPS representative on the Academic Committee for the Faculty of Science for two years and a member of the Earth System Science Program Committee from 2006 to 2012. I served as director of Graduate Admissions for the EPS department for 2010-2012. I served on the Chair's Advisory Committee for EPS department for three terms, and was the chair of the departmental mentoring committee for untenured faculty from 2014-2016. I was a co-I and deputy director of the NSERC CREATE-sponsored Canadian Astrobiology Training Program (2009-2015), and served on the Executive Board for the McGill Space Institute from 2015-2016.

At CU Boulder, my major service has included membership on the Executive Committee for the Geological Sciences Department (2016-2017), on six Primary Unit Evaluation Committees for pre-tenure review, promotion, and tenure (2017-Francis Macdonald [I was PURC chair]; 2018-Alexis Templeton; 2019-Brian Hynek; 2020-Carl Simpson; 2021-Lizzy Trower; 2022-Katie Snell), on four search/hiring committees (2017-spousal accommodation hire for ATOC; 2019-spousal accommodation hire for APS; 2019-INSTAAR stable isotope biogeochemistry; 2019-Benson Chair in Petroleum Geology), the Admissions Committee for the Interdisciplinary Quantitative Biology program (2016-2019), and the College of Arts and Sciences Strategic Planning Committee (2017-2019). I have also served on a number of other committees in the Geological Sciences Department including: the undergraduate Curriculum Committee (2016-2017; 2021-current), the Retreat Planning Committee (2016), the ad-hoc Rock Shop Committee (2017-2020 [Spring]), the Space and Analytical Facilities committee (2017-2022, chair from 2018-2020), the Futures Committee (2017-2018), the GeoColloquium committee (chair, 2020-2021), the interdisciplinary Joint Earth Seminar Series Committee (2020-2021), the Graduate Admissions Committee (2021-2022), the Undergraduate Curriculum Committee (2021-current), and the Salary Equity and Grievance Committee (2021-current [chair]).

**Community:** I convened a special session on the environmental impact of life at the Astrobiology Science Conference in March 2006, and a session on  $M^3$  isotopes (Multiple isotopes of an element, Multiple isotopologues of a molecule, and Multi-elemental isotopes of a compound) at the 2008 Goldschmidt meeting. I convened a Union session on 'Precambrian Environments: Controversial Changes and Paleoproterozoic Milestones' at the Joint Assembly of AGU and GAC/MAC in May 2009, a session on 'Linking Geochemical Tracers and Metabolic Pathways' at the 2009 Goldschmidt meeting, and a session on 'The molecular foundations of geochemical and microbial co-evolution' at the 2012 Goldschmidt meeting. I was a co-convenor of 'Symposium 3. Tectonic processes: a Geoscience Canada symposium to celebrate the career of Andrew Hynes' at the 2014 GAC/MAC annual meeting. I was a team member for



Theme 22: Early Earth: Earth's History before the Phanerozoic at the 2015 Goldschmidt meeting, and also convened a session there (08e: The Present is the Key to the Past: Using Modern Approaches to Understand the Early Earth). I served on the local organizing committee for the 9<sup>th</sup> International Symposium on Isotopomers (ISI 2018), and was elected co-chair of the Gordon Research Conference in Geobiology in 2020 (chair in 2022). I am convening a session on 'Sulfur in the Origin and Early Evolution of Life: Concepts, Constraints, and Contradictions of an Ancient Thiobiosphere' for the upcoming 2022 Astrobiology Science Conference, and was a theme chair for 'Theme 13: Chemistry of the Oceans and Atmosphere: now and through time' for the 2021 Goldschmidt meeting (Lyon-2021).

I am currently a co-Editor-in-Chief for *Earth and Planetary Sciences Letters*. I have reviewed articles for *Chemical Geology*, *Earth and Planetary Sciences Letters*, *Economic Geology*, *Environmental Chemistry*, *Geology*, *Geochimica et Cosmochimica Acta*, *Geobiology*, *Journal of Geophysical Research – Atmospheres*, *Mineralium Deposita*, *Nature*, *Nature Communications*, *Nature Geoscience*, *Precambrian Research*, *Proceedings of the National Academy of Sciences*, and *Science*, as well as proposals for ACS-Petroleum Research Fund, Canadian Foundation for Innovation, European Research Council, Israel Science Foundation, Mathematics of Information Technology and Complex Systems, NASA-Astrobiology: Exobiology and Evolutionary Biology, NASA-Cosmochemistry, NASA Postdoctoral Fellowship Program NSERC Discovery Grants Program, NSF-EAR: Low-Temperature Geochemistry and Geobiology, and NSF-EAR: Petrology and Geochemistry. I have served on four peer review panels for the NASA-Astrobiology: Exobiology and Evolutionary Biology program, one peer review panel for the NASA Astrobiology Institute CAN program, and one peer review panel for NSF-EAR: Low-Temperature Geochemistry and Geobiology program.

I served on the CSA's Canadian Mars Sample Return Analogue Mission Science Definition Team and Astrobiology Working Group in 2009. I co-organized and hosted the first-ever joint NASA-NSF workshop on the origins and carriers of S mass-independent isotope fractionation in June 2011. I was a member of the Canadian Astrobiology Network from 2015-2016, and a co-I on the Canadian Space Agency Space Exploration Topical Team in Astrobiology. In 2017, I served on the Rock-hosted Life working group for the NASA Mars-2020 mission workshop. I am on the Steering Committee for the NASA-NSF Research Coordination Network (RCN) for Exploration of Life's Origins (2017-present).

**Research Advisees** (since 2006; since 2016 at CU Boulder):

*Undergraduate:*

Nader Zaag, Electrical Engineering, (2006)

Hamza Khurshid, Mechanical Engineering, (2006)

Stephanie Mair, EPS, (2006-2007; NSERC USRA)

Robert Gray, EPS, (2006-2007; Honours Thesis)

Mikaella Rough, EPS, (2006-2007) [co-advised w/ Al Mucci]

Benjamin Robledo-Molinares, Physics, (2006-2007)

Alexandre St-Aubin, EPS, (2007; NSERC USRA)

Gilese Turner, Biology, (2007-2008)

Teagan Haggerty, Mathematics and Statistics, (2008)

Marilyn Rousseau, EPS, (2008)

Yumi Kitayama, ESS, (2007-2009; Honours Thesis)

Lorelle Binnion, EPS, (2008-2009) [co-advised with Emilie Thomassot]

Carlo-Jesse Miozzi, EPS, (2008-2009)

Kiril Mugerma, EPS, (2008-2009; Honours Thesis),

Cedrick O'Shaughnessy, EPS, (2008-2009; McGill SURA)

Lawrence Lau, Anatomy, Cell Biology, (2009)

Mary McDonough, EPS, (2009)

Benjamin Webber, Chemistry/EPS, (2009-2011; NSERC USRA; CATP Trainee)

Lena Gayraud, Biology, (2010; CATP Trainee) [co-advised w/ Jay Nadeau]

Eric Zhao, Physics/Anatomy, (2010)

Rebecca Austin, Molecular Biology/French (2010; CATP Trainee)  
 Léa Braschi, ESS, (2010-2011)  
 Emma Bertran, Biology/EPS (2010-2011; CATP Trainee)  
 John Prince, EPS, (2010-2012) [co-advised w/ Rob Rainbird – GSC-Ottawa]  
 Ichiko Sugiyama, EPS, (2010)  
 Charles Cohen, Neuroscience, (2010-2011)  
 Shu Yang Hu, Environment, (2011-2012)  
 Adrien Iredale, EPS, (2011-2012)  
 Charles Kosman, EPS, (2011-2012; McGill SURA, CATP Trainee)  
 Tess Wagner, ESS, (2012-2013)  
 Luke Anderson-Trocmé, Microbiology and Molecular Biotechnology, (2013-2014; NSERC USRA; CATP Trainee)  
 Celina Cheung, Anatomy, Cell Biology, (2013-2014)  
 Emily Griffiths, EPS (2014-2015; NSERC USRA; CATP Trainee)  
 Isabel Fendley, EPS (2014-2015; McGill SURA; CATP Trainee; Honours Thesis)  
 Claire Guimond, ESS (2014-2015; Honours Thesis)  
 Ying Ran Lin, Microbiology and Molecular Biotechnology (2014-2015; McGill SURA)  
 Jyotsana Singh, EPS (2014-2015; CATP Trainee)  
 Denny Costa-Cavalho, EPS (2016)  
 Johanne Albrigtsen, Ecology and Evolutionary Biology/Molecular, Cellular, and Developmental Biology/Biochemistry (2017-2018; UROP Summer 2017; *Summa Cum Laude* Honors Thesis co-supervised with Erin Tripp [I was the primary supervisor])  
 Kunmanee Bubphamanee, Geological Sciences, (2018-2019, Biological Sciences Initiative fellowship, *Summa Cum Laude* Honors Thesis co-supervised with Sarah Hurley)  
 Kasdi Sujono, Geological Sciences, (2018-2019, *Cum Laude* Honors Thesis co-supervised with Jesse Colangelo)  
 Christopher Greidanus, Ecology and Evolutionary Biology, (2019-2020, Biological Sciences Initiative fellowship, *Summa Cum Laude* Honors Thesis co-supervised with Jennifer Reeve)  
 Chloe Huntzinger, Ecology and Evolutionary Biology, (2018-2019, Biological Sciences Initiative fellowship, *Magna Cum Laude* Honors Thesis co-supervised with Sarah Hurley)  
 Anya Sukiennicki, Ecology and Evolutionary Biology, (2021-2022, Biological Sciences Initiative fellowship, co-supervised with Jennifer Reeve)  
 Maxwell Pashayan, Ecology and Evolutionary Biology, (2021-2022, Biological Sciences Initiative fellowship, co-supervised with Jennifer Reeve)  
 Brysyn Goodson, Ecology and Evolutionary Biology, (2021-2023, Biological Sciences Initiative fellowship, co-supervised with Andrea Halling)  
 Anna Hirschmann, Applied Math, (2022-present, Biological Sciences Initiative fellowship, co-supervised with Andrea Halling)  
 Madigan Rumley, Astrophysical & Planetary Sciences (2022-2023)

*Graduate:*

Kathleen Graham (MSc 2007-2009) (co-supervised w/ Don Baker [I was the primary supervisor])  
 Elizabeth Sharman (PhD 2007-2011; GSC RAP; Society for Economic Geology Fellowship)  
 Mélanie Cousineau (PhD 2009-2013; Ottawa U, NSERC CGS-D, co-supervised with Danielle Fortin [I was the primary supervisor])  
 André Pellerin (PhD 2009-2014; NSERC CGS-D; CATP PhD Fellow; EPS Trottier Accelerator)  
 Thi Hao Bui (PhD 2010-2014)  
 Matthew Hryciuk (MSc 2010-2012; GSC RAP; Society for Economic Geology Fellowship; NSERC PGS-M)  
 Kristyn Rodzinyak (MSc 2010-2012; CATP MSc Fellow; EPS Trottier Accelerator; CSA RAP; NSERC PGS-M)

Gregor Lucic (PhD 2010-2015; co-supervised with John Stix [Stix was the primary supervisor])  
Emma Bertran (MSc 2011-2013; CATP MSc Fellow)  
John Prince (MSc 2012-2014; Carleton U, co-supervised with Rob Rainbird [Rainbird was primary supervisor])  
Jesse Colangelo-Lillis (PhD 2012-2016, CATP PhD Fellow, co-supervised with Lyle Whyte [I was the primary supervisor])  
Louise-Marie Meunier (PhD 2012-2016, co-supervised with Hans Larsson [Larsson was the primary supervisor])  
Peter Crockford (PhD 2013-2017, CATP PhD Fellow, NSERC PGS-D, co-supervised with Galen Halverson [I was the primary supervisor])  
Ying Ran Lin, (MSc 2016-2017, co-supervised with Peter Douglas, [I was the primary supervisor])  
Jennifer Reeve (PhD 2017-present, GEOL ARCS scholar)  
Geneviève Elsworth (PhD 2018-2019, transferred to project with Nicole Lovenduski ATOC/INSTAAR)  
Andrea Halling (PhD 2019-present, IQBiology, NSF GRFP, co-supervised with Carl Simpson)  
Liam Friar (PhD 2020-present, IQBiology)  
Stephanie Plaza-Torres (PhD 2020-present, NSF GRFP)  
Earl White Jr. (MSc 2022-present, AGU/ACS BRIDGE)

*Post-doctoral:*

Emilie Thomassot (2007-2009; Bourse Lavoisier) – Maître de conférences INPL / Researcher CRPG-Nancy  
Clinton Scott (2010-2012; CATP Postdoctoral Fellow) – Research Scientist at USGS, Reston  
Eric Collins (2013) – was Assistant Professor, University of Alaska, Fairbanks; now Canada Research Chair Tier II in Arctic Marine Microbial Ecosystem Services, University of Manitoba  
Thi Hao Bui (2014-2015) – laboratory manager and research associate in the Stable Isotope Laboratory in the Department of Earth and Planetary Sciences, McGill University  
André Pellerin (2015) – was postdoctoral fellow at the Center for Geomicrobiology, Aarhus University; postdoctoral fellow at Ben-Gurion University of the Negev; now Assistant Professor at Institut des sciences de la mer de Rimouski, QC  
Amanda Bender (2017-2019) – now in private sector  
Peter Crockford (2017) – was postdoctoral fellow at the Weizmann Institute of Science; postdoctoral fellow at Harvard University; postdoctoral fellow at the Woods Hole Institute of Oceanography; now Assistant Professor at Carleton University  
Benjamin Johnson (2017-2019; NSF EAR Postdoctoral Fellow) – now Assistant Professor at Iowa State University  
Jesse Colangelo-Lillis (2016-2020; C-DEBI Postdoctoral Fellow) – was NASA postdoctoral fellow and research affiliate at INSTAAR and Geological Sciences, CU Boulder; now research scientist in private sector  
Sarah Hurley (2017-2021; Agouron Postdoctoral Fellow in Geobiology) – now Faculty at Lamont-Doherty Earth Observatory  
Nathan Reed (2023)

*Research Associate:*

Thi Hao Bui (2009-2010; 2015-2016)  
Michelle Campbell (2010)  
Emma Wall (2012)  
Paul Tomascak (2012)  
John Prince (2013-2014)  
Yiming Guo (2014-2015)  
Jody Donelley (2017-2018; co-supervised with Sebastian Kopf)  
Nabil Chaudhry (2017-2019; co-supervised with Sebastian Kopf)

Adam Younkin (2019-present; co-supervised with Sebastian Kopf)  
Paige Campbell (2019-2022)  
Stephanie Plaza-Torres (2020; co-supervised with Katie Snell and Carl Simpson)

*Research Visitors:*

Eric Collins (2010-2012) [McMaster U, Origins Institute, Origins Postdoctoral Fellow]  
Long Li (2010-2012) [U Toronto, Geology, CATP Postdoctoral Fellow]  
Nadia Mykytczuk (2010-2012) [McGill, Natural Resource Sciences, CATP Postdoctoral Fellow]  
Russel Hiebert (2010-2014) [U Manitoba, Geology, PhD Student]  
Carissa Isaac (2011-2013) [Centre for Exploration Targeting, U Western Australia, PhD student]  
Bulusu Sreenivas (2012-2013) [National Geophysical Research Institute, Hyderabad]  
Simone Sauer (2013-2014) [Geological Survey of Norway, PhD Student]  
Antoine Crémière (2013-2015) [Geological Survey of Norway, Postdoctoral Fellow]  
Benjamin Eickmann (2013-2015) [U Johannesburg, Postdoctoral Fellow]  
Bruce Taylor (2013-2016) [Geological Survey of Canada, Ottawa]  
David Au Yang (2014-2016) [UQAM, IPGP, PhD Student]  
Patrick Beaudry (2014-2015) [Queens College-CUNY, MSc Student]  
Vikraman Selvaraja, (2014-2016) [Exploration Targeting, U Western Australia, PhD student]  
Crystal LaFlamme (2015-2016) [Exploration Targeting, U Western Australia, Postdoctoral Fellow]  
Kärt Paiste (2015-2016, 2017) [Geological Survey of Norway, PhD Student]  
Annemiek Waajen (2015-2016) [U Amsterdam, Undergraduate research trainee]  
Yuyan Zhao (2016) [Department of Geochemistry, Jilin University, Associate Prof]  
Claire Jasper (2017) [Boston College, Undergraduate research trainee]  
Stephanie Plaza-Torres (2017-2018) [UPR-Mayaguez, CU Boulder SMART program, co-supervised with Karen Chin and Brett Davidheiser-Kroll]  
Alexandra Grajales (2019) [UPR-Mayaguez, CU Boulder SMART program, co-supervised with Karen Chin]  
Sierra Jech (2018) [CU Boulder IQBiology research rotation]  
Andrea Halling (2018-2019) [CU Boulder IQBiology research rotation, co-supervised with Carl Simpson]  
Ellen Waddle (2019) [CU Boulder IQBiology research rotation, co-supervised with Sarah Hurley]  
Liam Friar (2019) [CU Boulder IQBiology research rotation]  
Hannah Edstrom (2020) [CU Boulder IQBiology research rotation, co-supervised with Sarah Hurley]  
Clair Huffine (2021) [CU Boulder IQBiology research rotation, co-supervised with Luke Wheeler]  
Clair Huffine, Zachary Maas, Lukas Buecherl (2021) [CU Boulder IQBiology team research rotation, co-supervised with Alexis Templeton]  
Ruth Quispe Pilco (2022) [CU Boulder IQBiology research rotation]  
KeMia Smith (2022) [University of Illinois Urbana-Champaign, CU Boulder SMART program]  
Catherine Fontana (2022) [CU Boulder IQBiology research rotation]

*Internal Committees (at CU Boulder):*

Mike Zawaski (2016-2021) [PhD Geological Sciences, Steve Mojzsis - advisor]  
Tyler Kane (2016-2017) [MSc Geological Sciences, Alexis Templeton - advisor]  
Daniel Nothaft (2017-2020) [PhD Geological Sciences, Alexis Templeton - advisor]  
Ellie Hara (2018-present, committee chair) [PhD Geological Sciences, Alexis Templeton - advisor]  
Jacob Fenster (2018-2022) [PhD Chemical and Biological Engineering, Jeff Cameron - advisor]  
Sarah Leventhal (2019-present) [PhD Geological Sciences, Carl Simpson - advisor]  
Noah Hoffman (2020) [MSc Geography, Suzanne Anderson – advisor]  
Ciara Asamoto (2020-present, committee chair) [PhD Geological Sciences, Sebastian Kopf - advisor]  
Nathan Reed (2020-2023) [PhD Chemistry, Ellie Browne/Maggie Tolbert – co-advisors]  
Ellen Waddle (2020-present) [PhD Ecology and Evolutionary Biology, Dan Doak - advisor]

Harpreet Bather (2021-present, committee chair) [PhD Geological Sciences, Sebastian Kopf - advisor]  
Harry Brodsky (2021-present, committee chair) [PhD Geological Sciences, Alexis Templeton - advisor]  
Toby Halamka (2021-present, committee chair) [PhD Geological Sciences, Sebastian Kopf - advisor]  
Harry Allbrook (2022-present) [PhD Geological Sciences, Julio Sepúlveda - advisor]  
James Gutoski (2022-present) [PhD Geological Sciences, Lizzy Trower - advisor]  
Brianna Hibner (2022-present) [PhD Geological Sciences, Lizzy Trower - advisor]  
Tyler Lincoln (2022-present) [PhD Geological Sciences, Lizzy Trower - advisor]  
Trisia Tellez (2022-present) [MSc Geological Sciences, Tom Marchitto - advisor]

*External Committees:*

Tonggang Zhang (2007-2010) [UQAM PhD committee]  
Geoffrey Baldwin (2010) [Laurentian U MSc thesis examiner]  
Galen MacNamara (2011) [Laurentian U MSc thesis examiner]  
Emily Bamforth (2011-2013) [McGill Redpath Museum PhD committee]  
Stefan Markovic (2014) [U Toronto MSc thesis examiner]  
David Au Yang (2014-2017) [UQAM, IPGP, PhD committee]  
Kärt Paiste (2016-2018) [U Trømsø, PhD committee]  
Weiqi Yao (2019) [U Toronto PhD thesis examiner]

**Refereed conference proceedings** (≈5-10 per year for the last 6 years, list available on request)