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Smithsonian Environmental Research Center

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EDUCATION

2017 Ph.D. School of Earth Sciences, The University of Melbourne, Australia

Thesis: Biogeochemical mercury cycling in sea ice and geothermal springs

2012 M.Sci. (Distinction) School of Earth Sciences, The University of Melbourne, Australia

2010 B.Sci. in Chemistry (with Honors), The University of South Carolina, USA

PROFESSIONAL APPOINTMENTS

2020–present Biologist, Secretary’s Scholar, Trace Metals/Microbial Ecology Group, Smithsonian Environmental Research Center, Edgewater, MD, USA

2017–2020 Postdoctoral Research Associate, Biosciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA

PUBLICATIONS

Peer-Reviewed Journal Articles (*contributed equally)

2020 Gionfriddo, C. M., A. M. Wymore, D. S. Jones, M. M. Lynes, G. A. Christensen, R. L. Wilpiseski, A. Soren, C. C. Gilmour, M. Podar, D. A. Elias, An improved *hgcAB* primer set and direct high throughput sequencing expand Hg-methylator diversity in nature. *Frontiers in Microbiology* (In press)

2020 Wilpiseski, R. L.*, C.M. Gionfriddo*, A. M. Wymore, J. Moon, K. A. Lowe, M. Podar, S. Elorfi, D. Joyner, A. V. Palumbo, M. W. Fields, T. C. Hazen, M. W. W. Adams, F. Poole, R. Chakraborty, Y. Fan, J. Nostrand, J. Zhou, A.P. Arkin, D.A. Elias, Using in-field bioreactors to monitor microbial community dynamic shifts with geochemical perturbations. *PLOS ONE* (In press)

2020 Gionfriddo, C. M. M. B. Stott, J. F. Power, J. M. Ogorek, D. P. Krabbenhoft, R. R. Wick, K. E. Holt, L.-X. Chen, B. C. Thomas, J. F. Banfield, J. W. Moreau, Genome-resolved metagenomics and detailed geochemical speciation analyses yield new insights into microbial mercury cycling in geothermal springs. *Applied and Environmental Microbiology* 86(15).

2019 Christensen, G. A., C. M. Gionfriddo, A. J. King, J. G. Moberly, C. L. Miller, A. C. Somenahally, S. J. Callister, H. Brewer, M. Podar, S. D. Brown, A. V. Palumbo, C. C. Brandt, A. M. Wymore, S. C. Brooks, C. Hwang, M. W. Fields, J. D. Wall, C. C. Gilmour, D. A. Elias, Determining the reliability of measuring mercury cycling gene abundance with correlations with mercury and methylmercury concentrations. *Environmental Science & Technology*, 53(15).

2018 Ndu, U., G.A. Christensen, N.A Rivera, **C.M. Gionfriddo**, M.A. Deshusses, D.A. Elias, and H. Hsu-Kim, Quantification of mercury bioavailability for methylation using diffusive gradient in thin-film samplers. *Environmental Science & Technology*, 52(15).

2016 Gionfriddo, C.M., M.T. Tate, R.R. Wick, M.B. Schultz, A. Zemla, M.P. Thelen, R. Schofield, D.P. Krabbenhoft, K.E. Holt, and J.W. Moreau, Microbial mercury methylation in Antarctic sea ice. *Nature Microbiology*, 1, 16127.

2015 Gionfriddo, C. M., J. Ogorek, M. Butcher, D. P. Krabbenhoft, and J. W. Moreau, Mercury distribution and mobility at the abandoned Puhipuhi mercury mine, Northland, New Zealand, *New Zealand Journal of Geology and Geophysics*, 58(1). .

2015 Moreau, J. W., **C. M. Gionfriddo**, D. P. Krabbenhoft, J. M. Ogorek, J. F. DeWild, G. R. Aiken, and E. E. Roden, The effect of natural organic matter on mercury methylation by *Desulfobulbus propionicus* 1pr3, *Frontiers in Microbiology*, 6.

2015 Humphries, R., R. Schofield, M. Keywood, J. Ward, J. Pierce, **C. M. Gionfriddo**, M. Tate, D. Krabbenhoft, I. Galbally, and S. Molloy, Boundary layer new particle formation over East Antarctic sea ice—Possible Hg driven nucleation? *Atmospheric Chemistry and Physics*, 15(23).

Manuscripts in advanced preparation

2020 Lin, H., D.B. Ascher, Y. Myung, C.H. Lamborg, S.J. Hallam, C.M. Gionfriddo, K.E. Holt, and J.W. Moreau, Mercury methylation by metabolically versatile and cosmopolitan marine bacteria. *bioRxiv*.

Schofield R., S. Utembe, **C.M. Gionfriddo**, M.T. Tate, D.P. Krabbenhoft, S. Adeloju, M. Dundek, M. Keywood, R. Dargaville, and M. Sandiford, Atmospheric mercury in the LaTrobe Valley, Australia: case study June 2013. *Elementa: Science of the Anthropocene* (In revision).

AWARDS AND HONORS

2015 Royal Society of Victoria Young Scientist Research Prize, Earth Sciences (Runner-Up)

2015 Silver Award in Student Poster Presentation, International Conference on Mercury as a Global Pollutant (ICMGP)

2013 Student Award, Best Overall Poster, Victorian Universities Earth and Environmental Science Conference (VUEESC)

2012 Dean's Honor List in Earth Sciences, The University of Melbourne

GRANTS AND SCHOLARSHIPS

2018–2019 EMSL User Proposal 50174 (Co-Investigator, \$61,000)

2012–2013 Australian Antarctic Science Grant 4032 (Participant, \$74,000)

Scholarships

2016 Albert Shimmings Award, The University of Melbourne (\$3000)

2013–2016 Melbourne International Research Scholarship & Fee Remission (\$58,000)

- 2015 The University of Melbourne Faculty of Science Travelling Scholarship (\$1000)
2015 Travel Grant, Victorian Life Sciences (VLSCI) (\$500)
2015 Travel Grant, ICMGP (\$500)
2013 Baragwanath Geology Research Scholarship, The University of Melbourne (\$1000)
2013 Geology Research Scholarship Victoria, Geological Society of Australia (\$500)
2011 CM Tattam Scholarship, The University of Melbourne (\$1000)
2011 Student Travel Grant, American Geophysical Union (AGU) (\$1000)

CONFERENCE ACTIVITY (*presenter)

2013 Convener of the 26th Victorian Universities Earth and Environmental Science Conference (VUEESC), Melbourne, Australia. October 31

Keynote Presentations

2018 **C.M. Gionfriddo***, J.W. Moon, A.M. Wymore, M. Podar, C.C. Brandt, J.D. Wall, C.C. Gilmour, R. Wilpiseski, D.A. Elias. A systems biology approach to identifying the native function of Hg methylation proteins in *Desulfovibrio desulfuricans* ND132. Goldschmidt Conference, Boston, MA. August 12–17

Virtual Presentations

2020 **C.M. Gionfriddo***, A.M. Wymore, R.L. Wilpiseski, Schwartz, G.E., C.C. Gilmour, D.A. Elias. Resolving the molecular mechanisms essential to expression of *hgcA* by mercury methylators. Goldschmidt Conference, Virtual. June 21–26

Podium Presentations

2019 **C.M. Gionfriddo***, A.M. Wymore, M. Podar, C.C. Brandt, J.D. Wall, C.C. Gilmour, R.L. Wilpiseski, D.A. Elias. A multi-omics view of the native biochemical function of Hg methylation proteins in *Desulfovibrio desulfuricans* ND132. ICMGP, Krakow, Poland. September 8–13

2019 J. Moreau*, H. Lin, A. Focardi, **C. Gionfriddo**, R. Wick, K. Holt, M. Ostrowski, I. Paulsen. Coupled metagenomic and proteomic analyses reveal new marine mercury methylating bacterial phyla. ICMGP, Krakow, Poland. September 8–13

2018 D. Elias, **C. Gionfriddo**, A. Wymore, A. Soren, M. Podar, A. Palumbo, R. Wilpiseski*, C. Brandt, C. Gilmour. Advancing accessible methods for Hg-methylating gene abundance and diversity in the environment. Goldschmidt Conference, Boston, MA. August 12–17

2018 R. Wilpiseski*, M. Podar, A. Wymore, J. Wall, C. Gilmour, **C. Gionfriddo**, D. Elias. A systems biology characterization of mercury-methylating synthetic model communities. Goldschmidt Conference, Boston, MA. August 12–17

2018 C.C. Gilmour*, G.E. Schwartz, A. Soren, A.W. McBurney, D.S. Jones, G.A. Christensen, **C.M. Gionfriddo**, M. Podar, D.A. Elias. Abundance and diversity of *hgcA*+ microbes in salt marsh soils-relationships to MeHg and salinity. AGU Fall Meeting, Washington, DC. December 10–14

2017 R. Schofield*, S. Fiddes, R.A. Ryan, C. Vincent, C.M. Gionfriddo, S.R. Utembe, R. Humphries, M.D. Keywood, M. Woodhouse, A.R. Klekociuk, A. Protat, Z. Ristovski, L.T. Cravigan, J. Alroe, T. Naylor, A.G. Williams, C. Paton-Walsh, S.D. Chambers. Recent atmospheric chemistry observations in the Australian region—from the tropics to Antarctica. AGU Fall Meeting, New Orleans, LA. December 11–15

2015 **C.M. Gionfriddo***, D.P. Krabbenhoft, M. Stott, R. R. Wick, M. Schultz, K. Holt, J.W. Moreau. “Mercury Methylation and Detoxification by Novel Microorganisms in Mercury Enriched Mesothermal Springs.” AGU Fall Meeting, San Francisco, USA. December 14–18

2015 **C.M. Gionfriddo***, M. Tate, D.P. Krabbenhoft, R. R. Wick, M. Schultz, K.E. Holt, R. Schofield, J.W. Moreau. “Metagenomic evidence for biotic mercury transformations in Antarctic sea ice.” ICMGP, Jeju, South Korea. June 14–19

2013 **C.M. Gionfriddo***, M. Tate, D. P. Krabbenhoft, R. Humphries, S. Molloy, I. Galbally, A. Klekociuk, K. Kreher, P. Johnston, K. Meiners, A. Bowie, D. Lannuzel, R. Schofield, J. W. Moreau. Mercury Cycling over the Southern Ocean During Polar Spring: Results from SIPEX II. ICMGP, Edinburgh, UK. July 28–August 2

Poster Presentations

2019 G. Schwartz*, **C. Gionfriddo**, D. Elias, A. Soren, C. Gilmour, D. Jones. Abundance and diversity of *hgcAB+* microbes in Chesapeake salt marsh soils – relationships to MeHg and site biogeochemistry. ICMGP, Krakow, Poland. September 8–13

2019 R. Wilpiseski*, M. Podar, G. Schwartz, S. Brooks, A. Wymore, **C. Gionfriddo**, J. Wall, C. Gilmour, D. Elias. Towards a systems biology characterization of mercury-methylating synthetic model communities. ICMGP, Krakow, Poland. September 8–13

2019 C. Gilmour*, **C. Gionfriddo**, R. Wilpiseski, G. Schwartz, S. Brooks, S. Washburn, A. Sorren, T. Bell, D. Elias. A sediment microcosm study to assess how the community structure of hg-methylating microbes impacts mehg accumulation. ICMGP, Krakow, Poland. September 8–13

2019 **C.M. Gionfriddo***, J. Michener, A.M. Wymore, M. Podar, C.C. Brandt, J.D. Wall, C.C. Gilmour, R. Wilpiseski, D.A. Elias. “A multi-pronged approach to identifying the biochemical function of Hg methylation proteins in *Desulfovibrio desulfuricans* ND132” ESS PI meeting, Washington, DC. April 30–May 1

2018 **C.M. Gionfriddo***, G.A. Christensen, A.M. Wymore, M. Podar, A.V. Palumbo, C.C. Brandt, R. Harvey, A. Soren, C.C. Gilmour, J.D. Wall, D.A. Elias. Molecular, Genomic, Physiological Studies of Mercury Methylation. ESS PI Meeting, Washington, DC. May 1–2

2017 **C.M. Gionfriddo***, M. Schultz, K. Holt, J.W. Moreau. “Microbial Mercury Cycling in the East Antarctic Sea-Ice Environment” AusME Conference, Melbourne, Australia. February 13–15

2015 C.M. Gionfriddo*, D.P. Krabbenhoft, M. Stott, R. R. Wick, M. Schultz, K. Holt, J.W. Moreau. “Mercury methylation and detoxification by novel microorganisms in mercury enriched acidic hot springs” ICMGP, Jeju, South Korea. June 14–19

2014 C.M. Gionfriddo*, M. Tate, D. P. Krabbenhoft, A. Klekociuk, K. Meiners, A. Bowie, D. Lannuzel, R. Schofield, J. W. Moreau. “Mercury Cycling Over the Southern Ocean During Polar Spring: Results from SIPEX II.” International Symposium on Sea Ice in a Changing Environment, Hobart, Australia. March 10–14

2013 C. M. Gionfriddo*, M. Tate, D. P. Krabbenhoft, A. Klekociuk, K. Meiners, A. Bowie, D. Lannuzel, R. Schofield, J. W. Moreau. “Mercury Cycling Over the Southern Ocean During Polar Spring: Results from SIPEX II.” Victorian Universities Earth and Environmental Sciences Conference, Melbourne, Australia. October 31

2013 C.M. Gionfriddo*, J. Power, J.M. Ogorek, D. P. Krabbenhoft, M. B. Stott, J.W. Moreau. “Biogeochemical Controls on Mercury Speciation in Acidic Mesothermic Springs of the Ngawha Geothermal Field” ICMGP, Edinburgh, UK. July 28–August 2

2013 C.M. Gionfriddo*, M. Tate, D. P. Krabbenhoft, A. Klekociuk, K. Meiners, A. Bowie, D. Lannuzel, R. Schofield, J. W. Moreau. “Mercury Cycling Over the Southern Ocean During Polar Spring: Results from SIPEX II.” Strategic Science in Antarctica, Hobart, Australia. June 24–26

2011 C.M. Gionfriddo*, J.M. Ogorek, C. Thompson, J. Power, D.P. Krabbenhoft, M.B. Stott, J.W. Moreau. Microbial mercury methylation in the Ngawha Hot Springs and the abandoned Puhupuhi Mine, New Zealand. AGU Fall Meeting, San Francisco, CA. December 5–9

2010 C.M. Gionfriddo*, M. Bizimis, I. Sen, V. Salters. Chalcophile elements in peridotites as a proxy for sulfide mineralization during serpentinization. Goldschmidt Conference, Knoxville, TN. June 13–18

INVITED TALKS

2015 “Microbes in Antarctic sea ice.” Very Young Scientist Night (public outreach event), Royal Society of Victoria. November 26

2015 “How Antarctic sea-ice microbial communities transform mercury: implications for methylmercury bioaccumulation in marine food webs” Young Scientist Awards Night, Royal Society of Victoria. September 24

2014 “Antarctic sea ice: A source of methylmercury in the Southern Ocean?” Geological Society of Australia, Victoria Division. July 31

DEPARTMENTAL TALKS

2020 “Resolving the molecular mechanisms essential to expression of *hgcA* by mercury methylators” Microbial Ecology and Physiology Group Meeting, Oak Ridge National Laboratory, June 26

2020 “A multi-omics approach to linking microbial community dynamics to mercury biogeochemistry” Biology Department Seminar Series, New Mexico Institute of Mining and Technology, January 13

2019 “A multi-omics view of *hgcAB* deletion in *Desulfovibrio desulfuricans* ND132” Microbial Ecology and Physiology Group Meeting, Oak Ridge National Laboratory, July 25

2018 “A systems biology approach to identifying the native function of mercury methylation proteins in *Desulfovibrio desulfuricans* ND132” Microbial Ecology and Physiology Group Meeting, Oak Ridge National Laboratory, July 20

2017 “Using metagenomics to study microbial transformations of mercury in extreme environments” Seminar, Oak Ridge National Laboratory, March 29

2017 “Using metagenomics to study microbial transformations of mercury in extreme environments” Exit Seminar, School of Earth Sciences, The University of Melbourne, March 23

TEACHING EXPERIENCE

Hydrogeology and Environmental Geochemistry

School of Earth Sciences, The University of Melbourne, Australia

Topics covered: microbial metabolisms, bioremediation, biogeochemistry, aquifer properties, groundwater flow equation, hydrological properties, groundwater modelling, contaminant transport, mineral equilibria, water quality, redox equations,

2017 Semester 1 Lecturer, Casual Academic Staff

2011–2015 Semester 1 Demonstrator

Geomicrobiology and Biogeochemistry

School of Earth Sciences, The University of Melbourne, Australia

Topics covered: molecular biology methods (DNA extraction, 16S rRNA sequencing, bioinformatics), Winogradsky columns, microbial redox

2016 Semester 1 Demonstrator

Advanced Field Mapping

School of Earth Sciences, The University of Melbourne, Australia

2013 2-Week Field Camp Demonstrator/Field Hand

RESEARCH AND INDUSTRY EXPERIENCE

2013–2017 Graduate Research Assistant and Demonstrator, School of Earth Sciences, The University of Melbourne, Australia

2012–2013 Mercury Research Assistant, School of Earth Sciences, The University of Melbourne, Australia

2008, 2010 Undergraduate Research Assistant, School of the Earth, Ocean & Environment, The University of South Carolina, Columbia, SC, USA

2009 Environmental Services Intern, CH2M HILL, London, UK

TECHNICAL SKILLS

- **Analytical chemistry techniques:** trace metal ICP-MS, total mercury and methylmercury analysis (CVAAS, GC-ICP-MS), chromatography (ion, gas), UV-Vis spectrophotometry
- **Microbiology techniques:** molecular methods (DNA/RNA extraction, PCR, qPCR, RT-qPCR, FISH, cloning, Sanger sequencing), aerobic/anaerobic culturing (batch, chemostats, bioreactors)
- **Next generation sequencing and omics techniques:** amplicon (Illumina MiSeq, Titanium Roche 454), metagenome (Illumina HiSeq), RNA-seq (Illumina TruSeq, Ion S5), metabolomics (GC-MS), proteomics (MS-MS)
- **Bioinformatic techniques:** programming (C++, R, python), metagenome assembly (e.g. idba-ud, Megahit), genome binning (e.g. MaxBin, ggKbase), functional annotation (RAST, HMMER, BLAST), RNA-seq analysis (e.g. HISAT), statistics (STAMP, R, MATLAB), 16S rRNA analysis (Qiime, MOTHUR), metabolomic analysis (eRah, XCMS), flux balance analysis (ModelSEED, KBase), phylogeny (MEGA, PhyloXML)

SERVICE, OUTREACH, AND MEDIA

Reviewer: *Environmental Science and Technology, Atmospheric Chemistry and Physics, Science of the Total Environment, Geochimica et Cosmochimica Acta, Extremophiles*

Volunteer, Traveling Science Fair Trailer, ORNL Lab Open Day (June 9, 2018), University of Melbourne Year 10 work experience (2016), University of Melbourne Open Day (August 16, 2015), University of Melbourne RHD induction (2015)

Committee Member, Royal Society of Victoria Outreach (2016), the University of Melbourne Earth Sciences Postgrad Group (2013–2015)

Current Member: Geological Society of America, Geological Society of Australia, American Geophysical Union, American Society of Microbiology, Earth Sciences Women's Network, National Postdoctoral Association, ORNL KBase User Group

Featured in news article, “Hiding in plain sight” by Alana Schetzer, Pursuit, The University of Melbourne (August 2, 2016), **radio interview:** “Toxic levels of mercury found in Antarctic sea ice” by Tim Lamacraft, ABC News Radio PM, (August 2, 2016),

Author of blog posts: “Behind the paper: Science on ice: microbes and mercury in Antarctica” Nature Microbiology Community (August 2, 2016), “Follow our journey to Antarctica”, “Journey to Antarctica: Part 2”, and “Journey to Antarctica: Final”, Science Matters, The University of Melbourne (September–November, 2012)