

## EDUCATION

**Massachusetts Institute of Technology - Woods Hole Oceanographic Institution,**  
Cambridge/Woods Hole, Massachusetts, USA

*Ph.D., Biological Oceanography*

2011–2016

- Thesis: [Productivity, Metabolism and Physiology of Free-Living Chemoautotrophic \*Epsilonproteobacteria\*](#)
- Advisor: Dr. Stefan M. Sievert

**Mount Allison University,** Sackville, New Brunswick, Canada

*Bachelor of Science, First Class Honours with Distinction, Biology*

2003–2008

- Honours Thesis: Endophytic Fungi of Liverworts (*Bryophyta*) in a Copper-Contaminated Environment
- Advisors: Dr. Felix J. Bärlocher and Dr. Robert Thompson
- Minor in Chinese Studies

## PROFESSIONAL EXPERIENCE

**University of Southern California, Fuhrman Lab;** Los Angeles, CA, USA

*Postdoctoral Scholar - Research Associate*

January 2018 - present

- Compiling an atlas of microbial biogeography based on existing meta-'omics datasets and newly generated amplicon sequence libraries
- Developing software pipelines for the analysis of amplicon sequences, intercomparison with metagenomes, and *in-silico* evaluation of primer performance
- Working with other CBIOMES investigators to intercompare microbial abundance data with trait-based models and statistically infer microbial interaction networks

**Chinese University of Hong Kong, Luo Lab;** Shatin, New Territories, HK

*Research Assistant*

November 2016 - Nov 2017

- Developed plate-based isolation methods for high-throughput isolation of fastidious chemoautotrophic *Campylobacteria*
- Isolated sulfur-oxidizing microorganisms from hydrothermal vents and coastal sediments for pangenome and population genetic analysis
- Developed a high-throughput isolation system for selective enrichment of roseobacter-group bacteria from local sediments

**Woods Hole Oceanographic Institution, Sievert Lab;** Woods Hole, MA, USA

*Graduate Research Assistant*

2011–2016

- Incubated deep-sea hydrothermal vent chemoautotrophic communities at *in situ* pressure and temperature to infer their ecophysiology and biogeochemical impact
- Cultivated *Sulfurimonas denitrificans* in a custom-built chemostat to validate a theoretical model of energy conservation for this organism

*Guest Investigator*

November 2016 - present

- Studying the population genetics of a collection of 9 *Sulfurovum* single-cell genomes sampled in 2008 and again in 2014 from the same deep-sea study site

- Studying activity and community changes for hydrothermal fluid incubations in collaboration with Stefan Dyksma and Marc Mußmann who developed a [novel method](#) that combines  $^{14}\text{C}$  incubations and CARD-FISH/FACS to quantify activity

**National Research Council of Canada; Halifax, NS, Canada**

*Technical Officer, National Bioproducts Program*

2009-2011

- Cultivated and harvested kilogram quantities of microalgal biomass
- Developed protocols for lipid extraction from microalgae and GC-FID quantification
- Isolated pure cultures of microalgae from environmental samples

**Environment Canada; Moncton, NB, Canada**

*Environmental Technician, Atlantic Lab for Environmental Testing*

2009

- Conducted toxicology assays and counted sea urchin larvae microscopically

**Atlantic Canada Conservation Data Center; Sackville, NB, Canada**

*Assistant Field Botanist*

2008

- Identified native flora in the field, with an emphasis on rare species

**Marine Macroecology and Biogeochemistry Lab; Sackville, NB, Canada**

*Summer Research Student*

2007-2008

- Quantified iron accumulation in *Cyanobacteria* grown under high and low light under the supervision of Dr. Zoe Finkel

TEACHING  
EXPERIENCE

**Woods Hole Oceanographic Institution; Woods Hole, MA, USA**

*Graduate Teaching Assistant*

*Biological Oceanography (Spring 2015)*

**Instructors: Dr. Lauren Mullineaux and Dr. Stace Beaulieu**

- Taught two classes on microbial biogeochemistry and metabolism
- Developed and marked assignments / exam questions; held weekly review sessions

*Marine Microbiology and Biogeochemistry (Fall 2013)*

**Instructors: Dr. Stefan Sievert and Dr. Amy Apprill**

- Taught class on coupling microbial identity to function
- Developed and marked assignments / exam questions; held weekly review sessions

**Mount Allison University; Sackville, NB, Canada**

*Undergraduate Teaching Assistant, Native Flora (Fall 2007)*

**Instructor: Dr. Robert Thompson**

- Assisted students to identify vascular plant species in the field

RESEARCH  
MENTORING  
EXPERIENCE

(Dec 2019 - present, USC): Mentoring undergraduate Bruce Yanpui Chan in bioinformatic analyses and assisted with a successful funding application to the program Student Opportunities for Academic Research ([SOAR](#)).

(Jan 2018 - present, USC): Assisted graduate students Selene Sanchez-Garcia (Technical University Braunschweig) and Felix Milke (University of Oldenburg) with amplicon analysis, data interpretation, and [conference presentations](#).

(Jan 2018 - present, USC): Assisted Fuhrman lab graduate students in implementing a qiime2 workflow for the analysis of PCR amplicon data.

(May 2017 - May 2018, CUHK): Guided the final-year undergraduate project\* of Annie Wing-Yi Lo, which tested the effect of microoxic conditions on the isolation of sulfur-oxidizing microbes from shallow-water hydrothermal vents and local sediments.

\*Equivalent of Honours thesis.

(2015-2016, WHOI): Supervised the independent research project of volunteer Dali Smolsky to isolate novel autotrophic *Campylobacteria* from salt marsh and hydrothermal vent environments.

(2010, NRC): Taught students techniques for lipid extraction and transesterification of microalgal biomass with bio-compatible solvents.

PEDAGOGICAL &  
RESEARCH  
TRAINING

**edX Online Learning Platform**

*Becoming a More Equitable Educator: Mindsets and Practices (Spring 2021)*

- Exploring mindsets and strategies used by effective educators to reflect on and address issues of educational equity in the classroom, with an emphasis on how race, ethnicity and other differences affect student outcomes.

**CyVerse Learning Network**

*Foundational Open Science Skills Online (Spring 2021)*

- Learned technical and pedagogical skills for collaborative data science projects using open-source cyberinfrastructure.

**University of Southern California, Center for Excellence in Teaching**

*Future Faculty Teaching Institute (Spring 2020)*

- Studied paradigms and practical approaches for instructional design in addition to strategies for providing online course offerings.

OTHER  
EDUCATIONAL  
EXPERIENCE

**Marine and Environmental Biology Postdoc Outreach Program (USC) / Los Angeles Public Library (Dec 2020 - present)**

- With 6 fellow postdocs, developing a 4-session curriculum for teaching concepts in marine science to elementary-age students.
- Responsible for teaching a session on microscopy using the [foldscope](#) (low-cost origami microscope) to visualize microalgae and learn about their role in food webs.
- Delivering sessions remotely through Los Angeles Public Library *Neighborhood Science* program, targeting learners historically underrepresented in STEM fields.

**Chinese Summer Language Village, Mount Allison University (2008)**

- Collaboratively developed and taught a language immersion camp for native English speakers ages 8-16 to learn Mandarin Chinese.

**Planet Performers environmental drama, Mount Allison University (2007-2008)**

- Taught and discussed environmental issues (biofuels, global warming) with students in grades 6-8, and created two public performances in collaboration with other undergraduate students.

PREPRINTS &  
IN-REVIEW  
PUBLICATIONS

McNichol, J.<sup>\*</sup>, Sievert, S.M.<sup>\*</sup>, 2019. [Reconciling a Model of Core Metabolism with Growth Yield Predicts Biochemical Mechanisms and Efficiency for a Versatile Chemoautotroph](#). bioRxiv (In revision for *mSystems*). <sup>\*</sup>Co-corresponding authors.

PEER-  
REVIEWED  
PUBLICATIONS

McNichol, J.<sup>1,2</sup>, Dykstra S.<sup>1</sup>, Mußmann M., Seewald, J., Sylva, S., Sievert S.<sup>2</sup>, 2022. [Genus-Specific Carbon Fixation Activity Measurements Reveal Distinct Responses to Oxygen Among Hydrothermal Vent \*Campylobacteria\*](#). Applied and Environmental Microbiology. 88(2), e02083-21. <sup>1</sup>Co-first authors. <sup>2</sup>Co-corresponding authors.

Lin, X.Q., Chu, X., McNichol, J., Qian, Y., Luo, H.W., 2021. [Cryptic Niche Differentiation of Novel Sediment Ecotypes of \*Ruegeria pomeroyi\* Correlates with Nitrate Respiration](#). Accepted (2021-12-18). Environmental Microbiology.

McNichol, J.<sup>\*</sup>, Berube, P., Biller, S., Fuhrman, J., 2021. [Evaluating and Improving SSU rRNA PCR Primer Coverage for Bacteria, Archaea, and Eukaryotes Using Metagenomes from Global Ocean Surveys](#). mSystems. 6(3), e00565-21. <sup>\*</sup>Corresponding author.

Yeh, Y.C., McNichol, J., Needham, D., Fichot, E., Berdjeb, L., Fuhrman, J., 2021. [Comprehensive single-PCR 16S and 18S rRNA community analysis validated with mock communities, and estimation of sequencing bias against 18S](#). Environmental Microbiology. doi: 10.1111/1462-2920.15553.

Götz, F., Pjevac, P., Markert, S., McNichol, J., Becher, D., Schweder, T., Mußmann, M., Sievert, S.M., 2019. [Transcriptomic and proteomic insight into the mechanism of cyclooctasulfur- versus thiosulfate-oxidation by the chemolithoautotroph \*Sulfurimonas denitrificans\*](#). Environmental Microbiology 21, 244–258.

Labonté, J.M., Pachiadaki, M., Fergusson, E., McNichol, J., Grosche, A., Gulmann, L.K., Vetrani, C., Sievert, S.M., Stepanauskas, R., 2019. [Single Cell Genomics-Based Analysis of Gene Content and Expression of Prophages in a Diffuse-Flow Deep-Sea Hydrothermal System](#). Frontiers in Microbiology. 10.

McNichol, J.<sup>\*</sup>, Stryhanyuk, H., Sylva, S.P., Thomas, F., Musat, N., Seewald, J.S., Sievert, S.M.<sup>\*</sup>, 2018. [Primary Productivity Below the Seafloor at Deep-Sea Hot Springs](#). Proceedings of the National Academy of Sciences. 115, 6756-6761. <sup>\*</sup>Co-corresponding authors.

Götz, F., Longnecker, K., Soule, M.C.K., Becker, K.W., McNichol, J., Kujawinski, E.B., Sievert, S.M., 2018. [Targeted metabolomics reveals proline as a major osmolyte in the chemolithoautotroph \*Sulfurimonas denitrificans\*](#). Microbiology Open e586.

McNichol, J., Sylva, S.P., Thomas, F., Taylor, C.D., Sievert, S.M., Seewald, J.S., 2016. [Assessing microbial processes in deep-sea hydrothermal systems by incubation at \*in situ\* temperature and pressure](#). Deep Sea Research Part I: Oceanographic Research Papers 115, 221–232.

McNichol, J., MacDougall, K.M., Melanson, J.E., McGinn, P.J., 2012. [Suitability of soxhlet extraction to quantify microalgal fatty acids as determined by comparison with \*in situ\* transesterification](#). Lipids 47, 1–13.

MacDougall, K.M., McNichol, J., McGinn, P.J., O’Leary, S.J.B., Melanson, J.E., 2011. [Triacylglycerol profiling of microalgae strains for biofuel feedstock by liquid chromatography–high-resolution mass spectrometry](#). Analytical and Bioanalytical Chemistry 401, 2609–2616.

Park, K.C., Whitney, C., McNichol, J., Dickinson, K.E., MacQuarrie, S., Skrupski, B.P., Zou, J., Wilson, K.E., O’Leary, S.J.B., McGinn, P.J., 2011. [Mixotrophic and photoautotrophic cultivation of 14 microalgae isolates from Saskatchewan, Canada: potential applications for wastewater remediation for biofuel production](#). Journal of Applied Phycology 24, 339–348.

PUBLICATIONS  
IN PREP

Charoenpong, C.N., McNichol, J., Sievert, S.M., Seewald, J., Wankel, S. Subsurface modifications of  $\text{NH}_4^+$  at low-temperature, diffuse vents at 9°50’N East Pacific Rise.

BOOK  
CHAPTERS &  
EDUCATIONAL  
WRITING

Sievert, S.M., McNichol, J., Thomas, F., Panayotova, E., Watson R., 2018. [How Do Deep-Sea Hot Spring Ecosystems Work?](#) Environmental Science Journal for Teens.

McNichol, J., 2017. [Breaking the Oxygen Barrier in Microbial Cultivation](#), Small Things Considered Blog, American Society for Microbiology.

McNichol, J., 2014. [A First-Time Diver’s Experience](#). Blog for research cruise AT26-23 (R/V *Atlantis*).

McNichol, J., 2014. “Mail Buoy” responses to gradeschool student questions about deep-sea hydrothermal vent ecosystems: [Jan 12th](#), [Jan 13th](#), [Jan 20th](#), [Jan 30th](#). Research cruise AT26-10 (R/V *Atlantis*).

McNichol, J., McGinn, P.J., 2012. [Adapting Mass Algaculture for a Northern Climate](#), in: Gordon, R., Seckbach, J. (Eds.), The Science of Algal Fuels, Cellular Origin, Life in Extreme Habitats and Astrobiology. Springer Netherlands, pp. 131–146.

McNichol, J., Gordon, R., 2012. [Are We from Outer Space?: A Critical Review of the Panspermia Hypothesis](#), in: Seckbach, J. (Ed.), Genesis - In The Beginning, Cellular Origin, Life in Extreme Habitats and Astrobiology. Springer Netherlands, pp. 591–619.

McNichol, J., 2008. [Primordial soup, fool’s gold, and spontaneous generation](#). Biochemistry and Molecular Biology Education 36, 255–261.

SCIENTIFIC  
WORKFLOWS  
AND TOOLS

McNichol, J., Yeh Y.C., Aleman, M., Fuhrman J. A custom bash pipeline to process 515Y/926R mixed 16S/18S amplicons with cutadapt/bbsplit/qiime2/DADA2 into ASVs ([protocol link](#)).

McNichol, J. *MGPrimerEval*: A reproducible snakemake pipeline to compare amplicon primer sequences with metagenomes to quantify their *in-silico* coverage and real-world performance by comparing metagenomes with amplicons ([pipeline link](#)).

McNichol, J., Youens-Clark, K. *C-Microbial-MAP*: A tool that takes as input 16S sequences of interest, and generates as output oceanographic section plots of related ASVs ([tool link](#)). Implementation and coding by Ken, concept and ASV generation by Jesse, R “oce” code template provided by Clark Richards.

SELECTED  
DATA  
PRODUCTS

McNichol, J., 2019. [Exact Amplicon Sequence Variant Abundances from the ANT28-5 Latitudinal Transect of the Atlantic Ocean](#), an ASV dataset derived from publicly-accessible amplicon sequence data from the ANT28-5 cruise. This is the first example of amplicon sequence data to be integrated into the Simons Collaborative Marine Atlas (CMAP) project. Scripts to transform ASV tables into CMAP format are available [here](#).

McNichol, J. 2019. [bioGEOTRACES SSU rRNA extracted with phyloFlash, sorted with bbsplit into EUK, BACT, CYANO, and ARCH categories, with 16S additionally subsetted to 515Y/926R amplicon region](#).

McNichol, J., Dyksma S., Mußmann M., and Sievert S., 2020. [CARD-FISH Images from Incubations of Deep-Sea Hydrothermal Vent Fluid and Testing of Novel Probes for Arcobacter, Sulfurimonas, and Sulfurovum](#).

McNichol, J. 2019. [Curated GTDB ssu\\_r86.1\\_20180911 qiime2 classification artifacts and pipeline](#).

TECHNICAL  
COMMENTS

McNichol, J., Sievert, S.M. Comment on PMID 26929299: Carbon Fixation Driven by Molecular Hydrogen Results in Chemolithoautotrophically Enhanced Growth of *Helicobacter pylori*. In: PubMed Commons [Internet]. Bethesda (MD): National Library of Medicine; 2017 Feb 16. Available from: [Permalink](#).

GRANTS &  
FELLOWSHIPS

**JGI Small-Scale Microbial/Metagenome Program**

*Investigating the Genetic Basis of Differential Oxygen Tolerance in Sulfurimonas Ecotypes from the Subseafloor Biosphere Using Single-Cell Genomics* (502884) 2016

**NASA Earth Systems Science Fellowship**

*Quantifying Energy Metabolism and Associating Function with Taxonomy for Chemosynthetic Microbial Communities at Deep-Sea Hydrothermal Vents* (PLANET14F-0075) 2014-2016

Natural Sciences and Engineering Research Council of Canada, Post-Graduate Scholarship (Doctoral level)



*Quantifying Energy Metabolism and Associating Function with Taxonomy for Chemolithoautotrophic Microbial Communities at Deep-Sea Hydrothermal Vents* (PGSD3-439487-2013)

2013-2016

**Canadian Meteorological and Oceanographic Society Scholarship Supplement**

2013-2014

**Natural Sciences and Engineering Research Council of Canada, Post-Graduate Scholarship (Master's level)**

*Psychrophilic bacteria in the Canadian Arctic* (PGSM-405117-2011)

2011-2012

INVITED  
TALKS

**Institute for Chemistry and Biology of the Marine Environment (ICBM); Oldenburg, Germany (COVID e-seminar).**

*Using Global Metagenomes to Evaluate and Improve PCR Primer Coverage and the Application of 3-Domain Amplicon Data to Trait-Based Models*

Nov 25th, 2020

**Scripps Institution of Oceanography; San Diego, CA (COVID e-seminar).**

*Using Global Metagenomes to Quantify PCR Primer Coverage and Integrating 3-Domain Amplicon Data with Models*

June 17th, 2020

**CBIOMES e-meeting; (online seminar).**

*Biogeography of Exact Amplicon Sequence Variants* ([video link](#))

Dec 12th, 2018

**The Swire Institute of Marine Science; Hong Kong S.A.R., China**

*Brimstone Bacteria: Primary Productivity and Microbial Ecology of Deep-Sea Hydrothermal Vents*

Mar 20th,

2016

**University of Hong Kong, School of Biological Sciences; Hong Kong S.A.R., China**

*Brimstone Bacteria: Primary Productivity and Microbial Ecology of Deep-Sea Hydrothermal Vents*

Jan 29th,

2016

**Max Planck Institute for Marine Microbiology; Bremen, Germany**

*Insights into chemolithoautotrophy at deep-sea hydrothermal vents from in-situ experiments and metabolic modeling*

July 8th, 2014

CONFERENCE  
AND  
WORKSHOP  
ACTIVITY

**Ocean Sciences Meeting (2020) San Diego, CA, USA**

*Testing model predictions and revealing basin-scale biogeography with whole-community PCR amplicons from GEOTRACES* (Oral Presentation; [Abstract](#))

**Ocean Nucleic Acids 'omics Intercalibration and Standardization Workshop (2020)**

UNC Chapel Hill, NC, USA (Participant; [Workshop website](#))

**Gordon Research Conference/Seminar in Marine Molecular Ecology (2017) Hong Kong S.A.R., China**

*Primary Productivity and Ecophysiology of Chemosynthetic Campylobacteria* (Poster Presentation)

**International Society for Microbial Ecology (2016)** Montreal, QC, Canada  
*Primary Productivity and Ecology of the Seafloor Biosphere at Deep-Sea Hydrothermal Vents, 9 °N East Pacific Rise* (Oral Presentation)

**Gordon Research Conference in Marine Molecular Ecology (2015)** Hong Kong S.A.R., China  
*Bacterial Chemosynthesis at Deep-Sea Hydrothermal Vents Quantified by Cultivation at in-situ Pressure and NanoSIMS Analysis* (Poster Presentation)

**Gordon Research Seminar in Marine Molecular Ecology (2015)** Hong Kong S.A.R., China  
*Incubations of Hydrothermal Vent Communities at In-situ Pressure and Temperature Quantify Community Primary Productivity of the Seafloor Biosphere* (Oral Presentation)

**American Society for Microbiology General Meeting (2015)** New Orleans, LA, USA  
*Simulated Seafloor Conditions Reveal Epsilonproteobacteria as Dominant Chemoautotrophs in Fluids from the Seafloor Biosphere at Deep-Sea Vents* (Young Investigator Oral Presentation)

**American Society for Microbiology General Meeting (2014)** Boston, MA, USA  
*A Genome-Scale Metabolic Model of *Sulfurimonas denitrificans* Provides Insight into the Process of Autotrophic Denitrification* (Young Investigator Oral Presentation)

DEPARTMENTAL  
SEMINARS

**Woods Hole Oceanographic Institution;** Woods Hole, MA, USA  
*Productivity, Metabolism and Physiology of Free-Living Chemoautotrophic Epsilonproteobacteria* (Thesis defense) Aug 1st, 2016

**Woods Hole Oceanographic Institution;** Woods Hole, MA, USA  
*Simulated Seafloor Conditions Reveal Epsilonproteobacteria as Dominant Chemoautotrophs in Fluids from the Seafloor Biosphere at Deep-Sea Vents* Feb 19th, 2015

PROFESSIONAL  
SERVICE

**Reviewer for:** Scientific Reports, PLoS One, Frontiers in Microbiology, International Journal of Systematic and Evolutionary Microbiology, Journal of Open-Source Science, Nature Communications, PeerJ, Molecular Ecology Resources, Environmental Microbiology, ISME Journal, Journal of Geophysical Research - Biogeosciences.

PROFESSIONAL  
AFFILIATIONS

American Society for Microbiology (ASM), Canadian Society for Microbiology (CSM), The Oceanography Society (TOS)

RESEARCH  
CRUISES

**November 2014,** East Pacific Rise 9°N, R/V *Atlantis*: AT26-23, Chemoautotrophic Carbon Production at Deep-Sea Hydrothermal Vents

**January 2014,** East Pacific Rise 9°N, R/V *Atlantis*: AT26-10, Dimensions of Biodiversity, An Integrated Study of Energy Metabolism, Carbon Fixation, and Colonization Mechanisms in Chemosynthetic Microbial Communities at Deep-Sea Vents

**July-Aug 2012,** Rhode Island Continental Shelf, R/V Endeavor: Deep Ocean Benthic Sampler Cruise



LABORATORY  
EXPERIENCE

**Skills I am comfortable teaching / supervising:**

- Aquatic microbial field sampling, preservation, and DNA extraction
- SSU rRNA amplicon / metagenomic / -transcriptomic library preparation
- Microbial pure culture isolation, including for oxygen-sensitive microorganisms
- Physiological growth experiments, including both batch and chemostat methods
- Incubations for measuring biogeochemical rates and microbial growth, including both stable/radioisotope methods
- Microscopic enumeration and identification of environmental microorganisms, including Fluorescence *In Situ* Hybridization methods (e.g. CARD-FISH) and subsequent single-cell activity measurements (e.g. NanoSIMS)

SOFTWARE  
COMPETENCIES

**Scripting and Plotting Languages:** Python, bash, R.

**Selected Bioinformatics Software Experience:** qiime2, jupyter, conda/mamba, snake-make, anvi'o, (meta)SPAdes, look@NanoSIMS, GTDB-tk, phyloFlash, bbtools.

LANGUAGES

Written Chinese (functional with traditional and simplified characters), Mandarin Chinese (conversational), Cantonese (basic spoken), French (conversational), Spanish (functional)