



Jesse C. McNichol



Ph.D. Candidate, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution (2011-present)

Supervisor: Dr. Stefan Sievert, Associate Scientist with Tenure, WHOI

+ Contact information

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+ Research Interests

- Microbially-mediated elemental cycling** A quantitative understanding of metabolism at deep sea hydrothermal vents is currently lacking. I am part of a project at the hydrothermal vent field at 9°N, East Pacific Rise, where we are using Dr. Jeff Seewald's isobaric samplers to conduct growth experiments on bacteria from diffuse-flow vent fluids, and quantifying carbon fixation using HISH-SIMS in collaboration with Dr. Niculina Musat (UFZ Leipzig, Germany).
- Biochemical adaptations to chemosynthetic lifestyles** The chemolithoautotrophic *Epsilonproteobacteria* are environmentally important, yet little is known about their physiology. Using a custom-built anaerobic chemostat, I am growing cultures of the autotrophic denitrifier *Sulfurimonas denitrificans*, and using RT-qPCR to monitor the expression of key metabolic genes under aerobic and denitrifying conditions with various inorganic energy sources. This will help to infer the regulation and possible function of these genes in combination with physiological data generated during these experiments.
- Modelling cellular metabolism** *In silico* analyses of sequenced genomes allow us to model microbial metabolism and can offer insight into the evolution and adaptation of different species. I am currently working on constructing a metabolic model of *Sulfurimonas denitrificans* with Dr. Ying Zhang (URI, USA) and using the information gained from this to guide experimental design in the above project.

+ Education

- 2003-2008 **B.Sc. in Biology, First-class Honours with Distinction, minor in Chinese Studies**
- Mount Allison University, Sackville, NB, Canada and Zhejiang University, Hangzhou, Zhejiang, China
- Thesis: *Endophytic fungi of liverworts (Bryophyta) in a copper-contaminated environment.*
Co-advisors: Dr. Felix Baerlocher and Dr. Robert Thompson

+ Publications

1. **McNichol, J.**, McGinn, P., MacDougall, K. and Melanson, J. (2012) *Suitability of Soxhlet Extraction to Quantify Microalgal Fatty Acids as Determined by Comparison with In-Situ Transesterification*. *Lipids*. 47(2): 195-207. DOI 10.1007/s11745-011-3624-3.
2. **McNichol, J.** & Gordon, R. (2012) *Are we from outer space? A critical review of the panspermia hypothesis*. In: *Origins: Genesis, Evolution and Diversity of Life*. Eds.: J. Seckbach & R. Gordon. Dordrecht, Springer.
3. **McNichol, J.** and McGinn, P. (2012) *Adapting mass algaculture for a northern climate*. In: Gordon, R. & J. Seckbach, Eds. *The Science of Algal Fuels: Phycology, Geology, Biophotonics, Genomics and Nanotechnology*. Dordrecht, Springer.
4. MacDougall, K., **McNichol, J.**, McGinn P.J., O'Leary, S.J.B. and Melanson, J. (2011) *Comprehensive lipid profiling of algal strains for biofuel feedstock by high resolution mass spectrometry*. *Analytical and Bioanalytical Chemistry*. 401(8): 2609-2616. DOI 10.1007/s00216-011-5376-6.
5. Park, K.C., Whitney, C., **McNichol J.**, Dickinson, K.E., MacQuarrie, S., Skrupski, B.P., Zou, J.T., Wilson, K.E., O'Leary, S.J.B and 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*. DOI 10.1007/s10811-011-9772-2
6. **McNichol, J.** (2008) *Primordial soup, fool's gold, and spontaneous generation: a brief introduction to the theory, history and philosophy of the search for the origin of life*. *Biochemistry and Molecular Biology Education*. 36(4): 255-261.

+ Research/Field Experience

- July 2011-present **Graduate Student**, MIT/WHOI Joint Program – Boston/Woods Hole, MA, USA
- Cruises: Deep-Ocean Benthic Sampler Cruise (Summer 2012), Dimensions of Biodiversity Cruise, Atlantis/Jason (January 2014, AT26-10)
 - Lab experience: Anaerobic cultivation, RT-qPCR, genome-scale metabolic modeling
- July 2009 – July 2011 **Technical Officer**, National Bioproducts Program, Algal Biofuels – National Research Council of Canada, Halifax NS, Canada
- Developed lipid-analysis methodology for microalgal strains for the production of biodiesel.
 - In collaboration with Dr. Shabana Bhatti, isolated new microalgal strains by single-cell picking, plate isolation and filtration techniques.
 - Cultured, harvested and lyophilized kilogram quantities of microalgal biomass from photobioreactors.
- Jan 2009– May 2009 **Environmental Technician**, Atlantic Lab for Environmental Testing – Environment Canada, Moncton NB, Canada
- Maintained laboratory cultures of sea urchins, *Hyalella azteca*, *Rana pipiens*, *Oncorhynchus mykiss*, and *Gasterosteus aculeatus*.
 - Used light microscopy to assess the effect of metal toxicity assays on sea urchin embryo development.
- May 2007- May 2008 **Summer Research Assistant**, Marine Macroecology and Biogeochemistry Lab, Sackville NB, Canada
- Conducted a research project on metal accumulation in cyanobacteria under different growth irradiances. Worked under the supervision of Dr. Zoe Finkel, and in collaboration with Dr. Christophe Six.
 - Developed an experimental design for avoiding metal contamination and processing samples with Atomic Absorption Spectroscopy.

July 2008- Sept
2008

Assistant Field Botanist, Atlantic Canada Conservation Data Centre, Sackville NB, Canada

- Identified plant species and recorded population data in the field from the St. John river valley, P.E.I. national park, and southern Nova Scotia.

+ Teaching Experience

- 2013 **Teaching Assistant, Marine Microbiology and Biogeochemistry** - Taught recitation for MIT/WHOI students. Topics included biochemistry, molecular biology, biogeochemistry, biological oceanography and basic computer skills.
- 2010 **Mentor** – Assisted high-school and exchange students with science fair projects on lipid extraction and transesterification of microalgal biomass with bio-compatible solvents (as part of work for NRC).
- 2007 **Teaching Assistant** – Under the supervision of Dr. Robert Thompson, taught plant identification and ecology for *Native Flora* (BIO 3501, Mount Allison).
- 2008 **Invited lecturer** – Presented my first peer-reviewed publication (“Primordial soup, fool’s gold and spontaneous generation”) to Dr. Zoe Finkel’s *Earth Systems Science* class (GENS 3451, Mount Allison).
- 2008 **Chinese Camp Instructor** – In collaboration with Karen Chung, developed and taught a language immersion camp for native English speakers ages 8-16 to learn Mandarin Chinese (As part of *Mount Allison Summer Language Villages*).
- 2007-2008 **Instructor, Planet Performers environmental drama** – Under the direction of Karen Chung, taught and discussed environmental issues (biofuels, global warming) with students (grades 6-8), and created two public performances.

+ Memberships / Affiliations

- Member, American Society of Microbiology (2013-present)
- Member, Canadian Society of Microbiology (2013-present)
- Sponsored member, AAAS (2013-present)
- Member, Canadian Association of Science Writers (2009-2010)

+ Awards

- NASA Earth Systems Science Fellowship (2014-2017), \$90,000 USD
- NSERC PGS D3, Doctoral scholarship award (2013-2016), \$63,000 CAD
- NSERC PGS M, Master’s scholarship (2011), \$17,000 CAD
- CMOS-CNCSCOR NSERC Scholarship Supplement in Ocean Sciences (2013-2015), \$10,000 CAD
- Mount Allison Entrance Scholarship (2003), \$1,000 CAD