

DR. NAGISSA MAHMOUDI

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PROFESSIONAL EXPERIENCE

- 2018 - present | **Assistant Professor**, Department of Earth & Planetary Sciences, McGill University
- 2014 - 2018 | **Postdoctoral Research Fellow**, Advisor: Ann Pearson
Department of Earth & Planetary Sciences, Harvard University
- 2013 - 2014 | **Postdoctoral Research Associate**, Advisor: Terry C. Hazen
Department of Civil and Environmental Engineering, University of Tennessee, Knoxville

EDUCATION

- 2008 - 2013 | McMaster University, Hamilton, ON, Canada
Ph.D., Environmental Geochemistry
Dissertation Advisor: Greg F. Slater
- 2003 - 2007 | University of Toronto, Toronto, ON, Canada
B.Sc., Integrative Biology

RESEARCH GRANTS

- 2023 - 2026 | **NOVA - FRQNT-NSERC program for early-career researchers**
Role: Lead PI; Co-Is: Maya Bhatia (UAlberta), Roxane Maranger (UMontreal)
Title: The fate of marine carbon in the changing Arctic coastal ocean
Total: \$225,000
- 2021 - 2025 | **Genome Canada Large-Scale Applied Research Project (LSARP)**
Title: GENICE II – Reimagining monitored natural attenuation as an oil spill response plan in the Arctic
Role: Co-Investigator; Lead PIs: Gary Stern (UManitoba), Eric Collins (UManitoba)
Total: \$6,740,151 (\$1,026,167 to N. Mahmoudi)
- 2020 - 2023 | **U.S. National Science Foundation (NSF) Chemical Oceanography**
Title: Hydrothermal and microbial controls on organic carbon mobilization from Guaymas Basin sediments
Role: International Co-Investigator; Lead PI: Suni Shah Walter (UDelaware)
Total: \$538,390 USD (\$75,000 USD to N. Mahmoudi)
- 2020 - 2023 | **New Frontiers in Research Fund (NFRF) Exploration Grant**
Title: Resolving microbial carbon transformations in a warming world
Role: Lead PI; Co-Is: Brett Walker (UOttawa), Joelle Pelletier (UMontreal)
Total: \$250,000 (\$160,000 to N. Mahmoudi)
- 2020 - 2022 | **Fonds de recherche du Québec - Nature et technologies (FRQNT) New Researchers Grant**
Title: Microbial carbon cycling in coastal ecosystems
Role: Lead/Sole PI
Total: \$90,000 (\$20,000/year operational, \$50,000 equipment grant)
- 2019 - 2024 | **Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery**

Grant

Title: Microbial carbon cycling in marine environments: linking micro-scale processes to global carbon dynamics

Role: Lead/Sole PI

Total: \$137,500

2019 - 2023 **Canada Foundation for Innovation (CFI) - John R. Evans Leaders Fund**

Title: Microbial carbon cycling in marine environments: linking micro-scale processes to global carbon dynamics

Role: Lead/Sole PI

Total: \$600,000

2019 - 2020 **McGill Sustainability Systems Initiative**

Title: Microbial controls on carbon sequestration in urban salt marshes sediments

Role: Lead PI; Co-I: Gail Chmura (McGill)

Total: \$9800 (\$9000 to N. Mahmoudi)

FELLOWSHIPS AND AWARDS

2022	SiYuan-Ocean Emerging Leaders, International Center of Deep-Life Investigation (IC-DLI)
2019	Kavli Frontiers of Science Fellow, bestowed by U.S. National Academy of Sciences
2016 - 2018	National Science Foundation (NSF) - Center for Dark Energy Biosphere Investigations (C-DEBI), Postdoctoral Fellowship, \$220,000 USD
2014 - 2016	Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship (PDF), \$90,000
2011 - 2013	Natural Sciences and Engineering Research Council of Canada (NSERC) Graduate Fellowship (CGS D), \$70,000
2012	Dr. Dennis Shaw Memorial Award, \$500
2011 - 2012	L'Oreal-UNESCO for Women in Science Fellowship, \$5000
2011 - 2012	Natural Sciences and Engineering Research Council of Canada (NSERC) Michael Smith Foreign Study Supplement to visit University of South Australia, \$6000
2011	Ontario Graduate Scholarship, \$15,000
2011	Graduate Student Associate Travel Assistance Grant, \$500
2010	Ontario Graduate Scholarship, \$15,000
2008 - 2010	Natural Sciences and Engineering Research Council of Canada (NSERC) Graduate Scholarship (PSG M), \$34,600
2008	Ontario Graduate Scholarship, \$15,000
2007	NSERC Undergraduate Research Award, \$5700

CAREER INTERRUPTIONS

- (1) Maternity leave: nine months (Sep 2020 – May 2021)
- (2) Covid-19 lab shutdown: four months (March 2020 – June 2020)

REFERRED PUBLICATIONS

Note: underline indicates a student/postdoc under Mahmoudi's supervision

- (21) **Mahmoudi N**, AD Steen, GP Halverson, KO Konhauser. Earth before Exoenzymes. *Nature Geoscience*, in review (Invited Perspective)

- (20) Rico K, M Schad, A Picard, A Kappler, KO Konhauser, **N Mahmoudi**. (2023) Resolving the fate of trace metals during microbial remineralization of phytoplankton biomass in precursor banded iron formation sediments. *Earth and Planetary Science Letters*, 607, 118068.
- (19) Mindorff LM, **N Mahmoudi**, S Hepditch, V Langlois, S Alam, R Martel, JME Ahad. (2023) Biodegradation of diluted bitumen in shallow groundwater systems. *Environmental Pollution*, 322, 121170.
- (18) Stern RA, **N Mahmoudi**, CO Buckee, AT Schartup, P Koutrakis, ST Ferguson, EM Sunderland. (2021). The Microbiome of Size-Fractionated Airborne Particles from the Sahara Region. *Environmental Science & Technology*, 55(3), 1487-1496.
- (17) Miller JI, SM Techtmann, D Joyner, **N Mahmoudi**, JL Fortney, J Fordyce, O Pelz, TC Hazen. (2020) Microbial Communities across Global Marine Basins Show Important Compositional Similarities by Depth. *mBio*, 11(4).
- (16) **Mahmoudi N**, SH Hagen, TC Hazen, AD Steen. Patterns in extracellular enzyme activity and microbial diversity in deep-sea Mediterranean sediments. (2020) *Deep Sea Research Part I*, 103231.
- (15) **Mahmoudi N**, TN Enke, SR Beupre, AP Teske, OX Cordero, A Pearson. (2020) Illuminating microbial species-specific effects on organic matter remineralization in marine sediments. *Environmental Microbiology*. 22(5):1734-1747.
- (14) LaRowe DE, S Arndt, JA Bradley, ER Estes, A Hoarfrost, SQ Lang, KG Lloyd, **N Mahmoudi**, WD Orsi, SR Shah Walter, AD Steen, R Zhao. The fate of organic carbon in marine sediments - new insights from recent data and analysis. (2020) *Earth-Science Reviews*, 103146.
- (13) Orcutt BN, J Bradley, WJ Brazelton, EJ Estes, JM Goordial, JA Huber, RM Jones, **N Mahmoudi**, JJ Marlow, S Murdock, M. Pachiadaki. (2019) Impacts of Deep-Sea Mining on Microbial Ecosystem Services. *Limnology & Oceanography*, 65: 1489-1510.
- (12) Miller JI, SM Techtmann, JL Fortney, **N Mahmoudi**, D Joyner, J Liu, S Olesen, E Alm, A Fernandez, P Gardinali, TC Hazen. (2018) Rapid Anoxic Oil Hydrocarbon Degradation by Caspian Sea Microbial Communities. *Frontiers in Microbiology*, 10, 995.
- (11) **Mahmoudi N**, SR Beupre, AD Steen, A Pearson. (2017) Sequential bioavailability of sedimentary organic matter to heterotrophic bacteria. *Environmental Microbiology*, 19(7): 2626-2644.
- (10) Techtmann SM, **N Mahmoudi**, KT Whitt, MF Campa, JL Fortney, DC Joyner, TC Hazen. (2017) Comparison of Thaumarchaeotal Populations from Four Deep Sea Basins. *FEMS Microbiology Ecology*, 93: 1-10.
- (9) Beupre SR, **N Mahmoudi** & A Pearson. (2016) IsoCaRB: A novel bioreactor system to characterize the lability and natural carbon isotopic (¹⁴C, ¹³C) signatures of microbially-respired organic matter. *Limnology & Oceanography Methods*, 14:10: 668-681.
- (8) Hazen TC, RC Prince, **N Mahmoudi**. (2016) Marine Oil Biodegradation. *Environmental Science & Technology*, 50(5), 2121-2129.
- (7) **Mahmoudi N**, MS Robeson, HF Castro, JL Fortney, SM Techtmann, DC Joyner, CJ Paradis, SM Pfiffner, TC Hazen. (2015) Microbial community composition and diversity in Caspian Sea sediments. *FEMS Microbiology Ecology*, 91: 1-11.
- (6) Brewer S, SM Techtmann, **N Mahmoudi**, D Niang, S Pfiffner, TC Hazen. (2015). Co-extraction of DNA and PLFA from soil samples. *Journal of Microbiological Methods*, 115: 64-66.
- (5) **Mahmoudi N**, TM Porter, AR Zimmerman, RR Fulthorpe, GN Kasozi, BR Silliman, GF Slater. (2013) Rapid degradation of Deepwater Horizon spilled oil by indigenous microbial communities in Louisiana salt marsh sediments. *Environmental Science & Technology*, 47(23): 13303-13312.
- (4) **Mahmoudi N**, L Burns, S Mancini, RR Fulthorpe, GF Slater. (2013) Assessing microbial carbon sources and potential PAH degradation using natural abundance radiocarbon analysis. *Environmental Pollution*, 175: 125-130.

- (3) **Mahmoudi N**, GF Slater, AL Juhasz. (2013) Assessing limitations for PAH biodegradation in long-term contaminated soils using bioavailability assays. *Water, Air, & Soil Pollution*, 224(2): 1411.
- (2) **Mahmoudi N**, GF Slater, RR Fulthorpe. (2011) Comparison of commercial DNA extraction kits for isolation and purification of bacterial and eukaryotic DNA from PAH-contaminated soils. *Canadian Journal of Microbiology*, 57(8):623-8.
- (1) **Mahmoudi N**, M Modanu, Y Brandt, MCB Andrade. (2008) Subtle Pedipalp Dimorphism: A reliable method for Sexing Juvenile Spiders. *Journal of Arachnology*. 36: 513-517.

INVITED SEMINARS (all seminars are in person unless otherwise noted)

upcoming	Stanford University, Earth System Science, Stanford, CA (April 2023)
2022	Dartmouth College, Department of Earth Science, Hanover, NH University of Delaware, School of Marine Science & Policy (<i>virtual</i>)
2020	California Institute of Technology (Caltech), Department of Environmental Science & Engineering, Pasadena, CA University of Nevada, Las Vegas (UNLV), School of Life Sciences, Las Vegas, NV
2019	University of Toronto Mississauga (UTM), Department of Chemical & Physical Sciences, Mississauga, ON Rice University, Department of Earth, Environmental & Planetary Sciences, Houston, TX Cornell University, Department of Ecology & Evolutionary Biology, Ithaca, NY University of Toronto, Department of Earth Sciences, Toronto, ON National Research Council (NRC) of Canada, Montreal, QC
2018	Université du Québec à Montréal, Department of Biological Sciences, Montreal, QC
2017	McGill University, Department of Earth & Planetary Sciences, Montreal, QC
2016	University of Michigan, Department of Earth & Planetary Sciences, Ann Arbor, MI Woods Hole Oceanographic Institute (WHOI), National Ocean Sciences Accelerator Mass Spectrometry (NOSAMS) Facility, Woods Hole, MA
2014	Tulane University, Department of Global Environmental Science, New Orleans, LA
2013	University of Tennessee, Centre for Environmental Biotechnology, Knoxville, TN ExxonMobil Upstream Research Company, Houston, TX
2012	University of South Australia, Center for Environmental Risk Assessment & Remediation, Adelaide, SA

CONFERENCE PRESENTATIONS (*indicates presenter, underline indicates Mahmoudi lab student/postdoc)

- 2022 Sanger A*, Zhong K, Strong K, Chan A, Collins E, Suttle C, **Mahmoudi N**. Picky Eaters: Quantifying taxon-specific viral lysis of marine microorganisms in the Arctic Ocean. *ArcticNet Annual Scientific Meeting*, Toronto, Ontario, Canada. Poster.
- Mahmoudi N**, Investigating the selective diet of microbes in modern and ancient marine sediments. *Gordon Research Conference (GRC) Geobiology*, Oxnard, CA. Invited Speaker.
- McNichol S*, S Shah-Walter, N Mahmoudi. What energy sources support microbial life in the deep, hot, subsurface biosphere? *International Ocean Discovery Program (IODP) Expedition 385 Post-cruise Science Meeting*, San Giovanni Valdarno, Italy. Poster

- Mindorff L*, **N Mahmoudi**, JME Ahad. Evaluating the biodegradation of diluted bitumen and heavy conventional crude oil in soil mesocosms. *American Chemical Society (ACS) Spring Meeting*, San Diego, California. Oral presentation.
- 2021 Potts L*, X Xu, B Walker, N Mahmoudi. Investigating the bioavailability of terrestrial carbon to marine microorganisms using stable and radiocarbon isotopes. *American Geophysical Union (AGU) Fall Meeting*, San Francisco, California. Poster.
- 2019 **Mahmoudi N***, Microbial cycling of organic matter in marine sediments. *Geobiology Society Conference*, Banff, Alberta, Canada. Invited Speaker.
- 2018 **Mahmoudi N***, T Enke, SR Beaupre, A Teske, OX Cordero, A Pearson. Elucidating microbial species-specific effects on organic matter transformation in marine sediments, *International Center for Deep Life Investigation (ICDLI) Symposium*, Shanghai, China. Invited Speaker.
- Mahmoudi N***, T Enke, SR Beaupre, A Teske, OX Cordero, A Pearson. Uncovering microbial species-specific effects on organic matter transformation through novel isotopic approaches. *Goldschmidt Geochemistry Conference*, Boston, Massachusetts. Speaker.
- 2017 **Mahmoudi N***, What's on the menu? Investigating the selective diet of heterotrophs using novel isotopic tools. *Center for Dark Energy Biosphere Investigations (CDEBI) Annual Meeting*, Marina, California. Invited Speaker.
- Mahmoudi N***, T Enke, SR Beaupre, A Teske, OX Cordero, A Pearson. Elucidating microbial species-specific effects on organic matter transformation in marine sediments. *American Geophysical Union (AGU) Fall Meeting*, New Orleans, Louisiana. Poster.
- 2016 **Mahmoudi N***, SR Beaupre, AD Steen, A Pearson. IsoCaRB: A novel bioreactor system to characterize microbial carbon cycling and the lability of natural organic matter. *16th International Symposium on Microbial Ecology (ISME)*, Montreal, Canada. Poster.
- Mahmoudi N***, SR Beaupre, AD Steen, A Pearson. Sequential bioavailability of sedimentary organic matter to heterotrophic bacteria. *Gordon Research Conference (GRC) Organic Geochemistry*, Holderness, New Hampshire. Poster.
- Mahmoudi N***, SR Beaupre, AD Steen, A Pearson. Investigating microbial C cycling in sediments using the IsoCaRB system. *American Society for Microbiology (ASM) General Meeting*, Boston, Massachusetts. Poster.
- Mahmoudi N***, SR Beaupre, A Pearson. Microbial cycling of recalcitrant organic matter in marine sediments using natural isotope respirometry in a novel, carbon-free bioreactor. *Ocean Sciences Meeting*, New Orleans, Louisiana. Poster
- 2015 Hagen S, **N Mahmoudi**, AD Steen*, TC Hazen. Quantifying Extracellular Enzyme Activity in Deep-Sea Sediment from the Central Mediterranean Sea Through the Use of Fluorometric Assays. *Southeastern Biogeochemistry Symposium*, Atlanta, Georgia. Poster.
- 2014 **Mahmoudi N***, MS Robeson, SM Pfiffner, SM Techtmann, JL Fortney, DC Joyner, TC Hazen. Sedimentary microbiomes in the Caspian Sea, *15th International Symposium on Microbial Ecology (ISME)*, Seoul, South Korea. Poster.
- Mahmoudi N***, MS Robeson, SM Pfiffner, SM Techtmann, JL Fortney, DC Joyner, TC Hazen. Diversity and function of microbial communities in the Caspian Sea, *American Society for Microbiology (ASM) General Meeting*, Boston, Massachusetts. Poster.

- 2012 **Mahmoudi N***, RR Fulthorpe, AR Zimmerman, BR Silliman, GF Slater. Temporal trends in microbial abundance and biodegradation in Louisiana salt marshes following the Deepwater Horizon oil spill, *American Geophysical Union (AGU) Fall Meeting*, San Francisco, California. Speaker.
- Clay S*, **N Mahmoudi**, AR Zimmerman, BR Silliman, GF Slater. Investigation of petroleum residues and microbial PLFA in Barataria Bay sediments one year after the Deepwater Horizon oil spill. *American Geophysical Union (AGU) Fall Meeting*, San Francisco, California. Poster.
- Mahmoudi N***, GF Slater, AL Juhasz. Assessing limitations for PAH biodegradation in long-term contaminated soils using bioavailability assays, *Goldschmidt Geochemistry Conference*, Montreal, Quebec. Speaker.
- 2011 **Mahmoudi N***, L Burns, S Mancini, RR Fulthorpe, GF Slater. Assessing microbial carbon sources and cycling in soils using natural abundance radiocarbon analysis, *American Geophysical Union (AGU) Fall Meeting*, San Francisco, California. Speaker.
- 2010 **Mahmoudi N***, JME Ahad, L Burns, S Mancini, RR Fulthorpe, GF Slater. Relationship between the extent of contamination and archaeal, eukaryotic and bacterial community complexity and diversity, *13th International Symposium on Microbial Ecology (ISME)*, Seattle, Washington. Speaker.
- Mahmoudi N***, GF Slater, RR Fulthorpe. Comparison of commercial DNA extraction kits for isolation and purification of bacterial and eukaryotic DNA from PAH-contaminated soils, *Canadian Society for Microbiology (CSM)*, Hamilton, Ontario. Poster.

ADVISING

Postdoctoral	Dr. Kathryn Rico (2019 – 2022) <u>Position/Award</u> : Wares Postdoctoral Fellowship, (\$50K/year for 2 years)
Graduate	Lindsey Potts (2019 – 2021, MSc) <u>Awards</u> : McGill Trotter Accelerator Fellowship (\$5K for 2019-2020), McGill Earth & Planetary Sciences Klein-Panneton Fellowship (\$10K for 2020-2021)
	Leah Mindorff (2019 – 2022, MSc) <u>Awards</u> : David Stewart Memorial Fellowship (\$10K for 2019-2020), Research Affiliate Program (RAP) scholarship by Natural Resources Canada (\$17.5K/year for 2 years)
	Sam McNichol (Sep 2021 – present, PhD Candidate)
	Lea Baumser (Sep 2021 – present, MSc Candidate)
	Alia Sanger (Sep 2022 – present, MSc Candidate)
Undergraduate	Sam Loutet (Sep 2022 – present), Major: Earth System Science Tom Shimkus (Sep 2021 – April 2022), Major: Microbiology Emily Perry (Dec 2019 – March 2020), Major: Earth Sciences Aelicia Schmitt (May 2020 – August 2020), Major: Biochemistry Douglas Szeto (Jan 2020 – May 2020), Majors: Computer Science, Biology Emilie Lafleche (Jan 2020 – May 2020), Major: Planetary Sciences

PROFESSIONAL ENGAGEMENT & SERVICE ACTIVITIES

Chair	Session entitled “Microbial Metabolisms and Biogeochemical Processes in Earth’s Subsurface” at AGU Fall Meeting, December 2019
	Science Organizing Committee member for Lunar and Planetary Institute’s The First Billion

	<p>Years: Habitability conference, Big Sky Montana, September 2019.</p> <p>Session entitled “Reconstructing the Co-evolution of Early Life and its Environment: From Molecules to Models, and Analogues to Isotopes” at Goldschmidt Geochemistry Conference, Aug 2018</p> <p>Session entitled “Old Stuff Doing Good: Soils and Recalcitrant Organic Matter” at Gordon Research Conference (GRC) Organic Geochemistry meeting, July 2016</p>
Workshops	<p>Deep Sea Mining Impacts on Microbial Ecosystem Services, Bigelow Laboratory for Ocean Sciences, East Boothbay, Maine. Apr 18-19, 2018.</p> <p>Microorganisms and Organic Carbon in the Marine Subsurface, Knoxville, Tennessee. March 12-13, 2018.</p> <p>Deep Carbon Observatory (DCO) Early Career Summit, Mt. Etna, Italy. Aug 28-Sep 2, 2017.</p> <p>Moore Foundation Early Career Ocean Summit, Kona, Hawaii. Jan 17-21 2017.</p> <p>Thermal Analysis of Natural Organic Matter workshop, Woods Hole Oceanographic Institute (WHOI). Sep 14-15, 2016. <i>Invited Speaker.</i></p> <p>Radiocarbon short course, Keck Carbon Accelerator Mass Spectrometer facility University of California, Irvine. July 11-15, 2011</p> <p>Argonne Soil Metagenomics Workshop & Meeting, Chicago, Illinois. Oct 3 -5, 2012</p>
Peer Review	<p>Invited as Panel Reviewer for Department of Energy (DOE) Biological and Environmental Research (BER), 2019</p> <p>Invited as Panel Reviewer for NASA Exobiology Program, 2016, 2017, 2018, 2019, 2021</p> <p>Reviewer for Nature Communications, ISME Journal, Marine Chemistry, Proceedings of the Royal Society B, Environmental Science & Technology, Environmental Microbiology, BMC Microbiology, Geochimica et Cosmochimica Acta, Journal of Contaminant Hydrology, Environmental Pollution, Science of the Total Environment, Marine Pollution Bulletin</p>
Editorship	<p>Associate Editor, <i>Geobiology</i></p> <p>Associate Editor, <i>Frontiers in Extreme Microbiology</i></p>
Professional organizations	<p>Member, American Geophysical Union (AGU)</p> <p>Member, International Society for Microbial Ecology (ISME)</p> <p>Member, Geochemical Society (GS)</p>