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Engineering & Scientific Consulting

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Professional Profile

Dr. Emily Matys is a geochemist and geobiologist with expertise in applying advanced analytical techniques and data interpretation and management to assess the chemical compositions of complex environmental samples. She has over 7 years of experience in chemical fingerprinting (concentration and isotopic data) and transport and fate analysis of hydrocarbons and biogenic precursors (e.g., hopanoids).

Dr. Matys has collaborated with academic and government groups including NASA, the U.S. Geological Survey, the U.S. Antarctic Program, and the Geological Survey of Canada to evaluate chemical composition of organic matter in microbial biomass, sediments, rocks, and oils. Results informed the interpretation and development of molecular biomarkers, which have been applied to characterizations of the sources, relative ages, and depositional environments of organic matter in studies of the evolution of life on Earth, environmental forensics, and petroleum exploration.

Dr. Matys has also assessed environmental impacts associated with land use practices throughout the United States. She has evaluated the impacts of agriculture, residential development, and weather on the mobility of nutrients and formation and sustainability of harmful algal blooms, including *Microcystis*, in Lake Champlain, Vermont. Dr. Matys has also worked with the U.S. Forest Service to complete preliminary assessments of environmental and fuel loading conditions within experimental watersheds prior to the application of management treatments designed to evaluate the effects of forest fires on alpine hydrology and water resources in California.

Dr. Matys' expertise in field and advanced laboratory and analytical techniques includes experimental design, sample acquisition, curation, preparation, analysis, and data interpretation and management. Her experience includes identification and quantification of organic molecules in complex environmental samples (liquid chromatography tandem mass spectrometry; LC-MS/MS), isotopic analysis of total organic matter (elemental analyzer isotope ratio mass spectrometry; EA-IRMS), and quantitative evaluations of kerogen and fossil carbon chemistry (microRaman spectroscopy).

Academic Credentials & Professional Honors

Ph.D., Geochemistry, Massachusetts Institute of Technology (MIT), 2018

B.S., Environmental Sciences, University of Vermont, 2009

Prior Experience

Postdoctoral Research Associate, Massachusetts Institute of Technology, 2018

Research Associate, Massachusetts Institute of Technology, 2010–2013

Hydrologic Science Technician, U.S. Forest Service, 2009

Professional Affiliations

Geochemical Society

European Association of Organic Geochemists

Publications

Environmental controls on bacteriohopanepolyol profiles of benthic microbial mats from Lake Fryxell, Antarctica. *Geobiology* 2019; DOI: 10.1111/gbi.12353.

Matys ED, Mackey T, Grettenberger C, Mueller E, Sumner DY, Hawes I, Summons RE. Bacteriohopanepolyols across environmental gradients in Lake Vanda, Antarctica. *Geobiology* 2019; DOI: 10.1111/gbi.12335.

Hawes I, Jungblut A, Matys ED, Summons RE. The “Dirty Ice” of the McMurdo Ice Shelf: Analogues for biological oases during the Cryogenian. *Geobiology* 2018; DOI: 10.1111/gbi.12280.

Matys ED, Sepúlveda J, Pantoja S, Lange CB, Maniupán M, Lamy F, Summons RE. Bacteriohopanepolyols along redox gradients in the Humboldt Current System off northern Chile. *Geobiology* 2017; DOI: 10.1111/gbi.12250.

Flannery D, Allwood AC, Summons RE, Williford KH, Abbey W, Matys ED, Ferralis N. Spatially-resolved isotopic study of carbon trapped in ~3.43 Ga Strelley Pool Formation stromatolites. *Geochimica et Cosmochimica Acta* 2017; 223:21–35. DOI: 10.1016/j.gca.2017.11.028.

Garby TJ, Matys ED, Ongley SE, Salih A, Larkum AWD, Walter MR, Summons RE, Neilan BA. Lack of methylated hopanoids renders the cyanobacterium *Nostoc punctiforme* sensitive to osmotic and pH stress. *Applied and Environmental Microbiology* 2017; DOI: 10.1128/AEM.00777-17.

Ferralis N, Matys ED, Knoll AH, Hallmann C, Summons RE. Rapid, direct and non-destructive assessment of fossil organic matter via microRaman spectroscopy. *Carbon* 2016; 108:440–449. DOI: 10.1016/j.carbon.2016.07.039.

Baesman SM, Miller LG, Wei JH, Cho Y, Matys ED, Summons RE, Welander PV, Oremland RS. Methane oxidation and molecular characterization of methanotrophs from a former mercury mine impoundment. *Microorganisms* 2015; 3:290–309. DOI: 10.3390/microorganisms3020290.

Bosak T, Lahr DJ, Pruss SB, Macdonald FA, Gooday AJ, Dalton L, Matys ED. Possible early foraminiferans in post-Sturtian (716– 635 Ma) cap carbonates. *Geology* 2012; 40:67–70. DOI: 10.1130/G32535.1.

Bosak T, Lahr DJG, Pruss SB, Macdonald FA, Dalton L, Matys ED. Agglutinated tests in post-Sturtian cap carbonates of Namibia and Mongolia. *Earth and Planetary Science Letters* 2011; 308:29–40. DOI: 10.1130/G32535.1.

Bosak T, MacDonald F, Lahr D, Matys E. Putative Cryogenian ciliates from Mongolia. *Geology* 2011; 39:1123–1126. DOI: 10.1130/G32384.1.

Presentations

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE.

Bacteriohopanepolyols across PAR gradients in ice-covered lakes of the McMurdo Dry Valleys, Antarctica. Oral presentation, 28th International Meeting in Organic Geochemistry, Florence, Italy, 2017.

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE. Molecular composition of icy worlds in Antarctica. Oral presentation, NASA Astrobiology Executive Council Meeting, Cambridge, MA, 2017.

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE. Bacteriohopanepolyols across environmental gradients in ice-covered lakes of the McMurdo Dry Valleys, Antarctica. Oral presentation, NASA Astrobiology Science Conference, Mesa, AZ, 2017.

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE. Diversity of Bacteriohopanepolyols in Antarctic Lake Microbial Structures. Oral presentation, 27th International Meeting of Organic Geochemistry, Prague, Czech Republic, 2015.

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE. Biological Diversity of Microbial Structures in Antarctic Ice-Covered Lakes. Oral presentation, NASA Astrobiology Science Conference, Chicago, IL, 2015.

Matys ED, Mackey T, Grettenberger C, Mueller E, Jungblut A, Sumner DY, Hawes I, Summons RE. Carbon isotopic composition of organic fossils across isotopic extremes in Cryogenian carbonates. Oral presentation, Geological Society of America Annual Meeting, Vancouver, British Columbia, 2014

Peer Reviews

Geobiology