

Tyler J. Mackey

University of New Mexico
221 Yale Boulevard NE
Albuquerque, NM 87131 USA

Email: tjmackey@unm.edu
Website: www.tylermackey.com

EDUCATION

- Ph.D., University of California, Davis 2012–2016
Earth and Planetary Sciences Department
Dissertation: Sand, mud, and calcite: Microbial landscapes on Antarctic lake beds
Advisor: Dawn Sumner
- M.S., University of California, Davis 2009–2012
Geology Department
- B.A., Carleton College *summa cum laude* 2004–2008
Geology Department (honors)

PROFESSIONAL APPOINTMENTS

- Assistant Professor, University of New Mexico Department of Earth and Planetary Sciences Starting Fall 2020
- Adjunct Assistant Professor, University of New Mexico Department of Earth and Planetary Sciences 2019–2020
- Agouron Geobiology Postdoctoral Fellow, Massachusetts Institute of Technology Department of Earth, Atmospheric, and Planetary Sciences 2017–2019
- Postdoctoral Associate, Massachusetts Institute of Technology Department of Earth, Atmospheric, and Planetary Sciences 2016–2017

RESEARCH EXPERIENCE

Field work

- Sedimentology of Neoproterozoic glacial deposits, Garvellach Islands, Scotland 2018
- Neoproterozoic carbonate sedimentology and geomicrobiology in Svalbard investigating habitats for early animal evolution. 2016, 2017
- Sedimentary geomicrobiology of lacustrine microbial mats and scientific diving in ice-covered lakes of the McMurdo Dry Valleys, Antarctica (co-investigator and field team lead 2014, 2015). 2010–2015
- Calcifying microbial communities and scientific diving in temperate lakes, Pavilion Lake Research Project, Pavilion and Kelly Lake, British Columbia, Canada, summer 2010, 2011, 2014, 2015. 2010–2015
- Agouron Field Course, stratigraphy and sedimentology of the Belt Supergroup, Montana and Idaho, USA. 2013
- USC-Caltech International Geobiology course, interdisciplinary investigation of modern and ancient geomicrobiological systems. 2012
- Field assistant for Cambrian carbonate stratigraphy and sedimentology in Nevada, USA for PhD research of Cara Harwood. 2012
- Sedimentology and stratigraphy of Cambrian siliciclastics of southeastern Minnesota, USA and modern winter beach processes. 2007–2009

Lab experience

Clumped isotope analysis using Nu Perspectives Isotope Ratio Mass Spectrometry, Department of Earth, Atmospheric, and Planetary Sciences, MIT.	2016–2019
Carbonate petrography, microprobe analysis, and thin section preparation Department of Earth, Atmospheric, and Planetary Sciences, MIT.	2016–2019
Synchrotron-based X-ray absorption at near edge structure spectra, Stanford Synchrotron Radiation Lightsource.	2017–2019
Biomarker extraction and characterization using GC-MS techniques, Department of Earth, Atmospheric, and Planetary Sciences, MIT.	2017–2019
Vacuum line water CO ₂ extraction and cryogenic purification, Department of Earth and Planetary Sciences, UC-Davis.	2012, 2015
Carbonate petrography and microdrilling for stable isotope geochemistry, Department of Earth and Planetary Sciences, UC-Davis.	2011, 2013–2015
Scanning Electron Microscopy for microfossil analysis, Department of Earth and Planetary Sciences, UC-Davis.	2010–2011

3D Visualization

Developed 3D reconstruction workflow for underwater imagery using Structure from Motion software, Department of Earth and Planetary Sciences, UC-Davis.	2014–2016
3D visualization and documentation of x-ray CT scanned microbial mats and Antarctic stromatolites in UC-Davis KeckCAVES, Department of Earth and Planetary Sciences, UC-Davis.	2010–2012

Scientific diving experience

Active UC-Davis scientific diving certification through Bodega Marine Lab, including >90 Antarctic dives	2010–2016
UC-Davis Diving Control Board Member involved in overseeing projects in the university scientific diving program	2011–2016

TEACHING AND MENTORING EXPERIENCE

Teaching

Production assistant for MITx course materials and virtual field trip to Northern Minnesota	2018
Teaching assistant for sedimentology field course to Death Valley region, Department of Earth, Atmospheric, and Planetary Sciences, MIT	2017
Guest lecturer for Introduction to Geobiology, Department of Earth, Atmospheric and Planetary Sciences, MIT	2017
Teaching Assistant for Sedimentology and Stratigraphy, Department of Earth and Planetary Sciences, UC-Davis	2011, 2013–2015
Guest lecturer for Sedimentology and Stratigraphy of Glacial and Periglacial Processes, Department of Earth and Planetary Sciences, UC-Davis	2013–2015
Teaching Assistant for Solar System discussion group, Department of Earth and Planetary Sciences, UC-Davis	2012
Teaching Assistant for geology term-abroad field course in New Zealand, Carleton College Geology Department	2012
Educational Associate post-baccalaureate intern and teaching assistant for Sedimentology and Stratigraphy, Carleton College Geology Department	2008–2009
Teaching Assistant for Sedimentology and Stratigraphy, Carleton College Geology Department	2007–2008
Teaching Assistant for Introductory Geology, Carleton College Geology Department	2007

Mentoring

Advisor to three undergraduate students for independent research through the Earth, Atmospheric, and Planetary Sciences Department, MIT 2017–2018

Advised four undergraduate research students for independent research through the Department of Earth and Planetary Sciences, UC Davis 2011, 2013–2015

GRANTS, FELLOWSHIPS AND AWARDS

Grants

Co-authored NASA Astrobiology proposal with Kristin Bergmann: “The Thermal Maturity of Neoproterozoic Strata: Carbonate Clumped Isotope Thermometry and Biomarker Analyses” (\$403,448) 2019–2021

Co-authored proposal for beam time on the Stanford Synchrotron Radiation Lightsource in collaboration with Kristin Bergmann: “Constraining Neoproterozoic Climate and Snowball Earth Habitats for Early Animals through Clumped Isotope Paleothermometry and Redox Mapping” 2018–2019

Wrote rapid access proposal for beam time on the Stanford Synchrotron Radiation Lightsource in collaboration with Kristin Bergmann: “Oxygenation of Neoproterozoic Snowball Earth Habitats for Early Animal Evolution” 2017

Co-authored NASA Astrobiology: Exobiology and Evolutionary Biology proposal with Dawn Sumner: “Microbialite Morphology in Lake Joyce, Antarctica” (\$495,739) 2013–2016

Fellowships and Awards

Agouron Institute Postdoctoral Fellowship in Geobiology 2017–2019
University of California, Davis Durrell Funds for dissertation/thesis research support: 2010–2011 (\$800), 2012–2013 (\$1,200), 2013–2014 (\$2,500), 2014–2015 (\$1,800), 2015–2016 (\$1,000)

NASA Ames Honor Award to Pavilion Lake Research Program for excellence in Group/Team 2014

National Science Foundation Graduate Research Fellowship Honorable Mention 2010, 2011

Carleton College Geology Department Duncan Stewart Fellow 2007–2008

PUBLICATIONS

Matys, ED, **Mackey, TJ**, Grettenberger, C, Mueller, E, Jungblut, A, Sumner, DY, Hawes, I, Summons, RE (*in press*) Environmental controls on bacteriohopanepolyol profiles of benthic microbial mats from Lake Fryxell, Antarctica. *Geobiology*.

Matys, ED, **Mackey, TJ**, Sumner, DY, Hawes, I, Grettenberger, C, Mueller, E, Summons, RE (2019) Bacteriohopanepolyols across environmental gradients in Lake Vanda, Antarctica. *Geobiology*. 17(3): 308-3019. DOI:10.1111/gbi.12335

Rivera-Hernandez, F, Sumner, DY, **Mackey, TJ**, Hawes, I, Andersen, DT (2019) In a PICL: The sedimentary deposits and facies of perennially ice-covered lakes. *Sedimentology*. 66(3): 917-939. DOI:10.1111/sed.12522

Bergmann, KD, Al Balushi, SAK, **Mackey, TJ**, Grotzinger, JP, Eiler, JM (2018) A 600 million year carbonate clumped isotopic record from Oman. *Journal of Sedimentary Research*. 88(8): 960-979. DOI:10.2110/jsr.2018.51

Mackey, TJ, Sumner, DY, Hawes, I, Leidman, S, Andersen, DT, Jungblut, AD (2018) Stromatolite records of changing primary productivity in perennially ice-covered Lake

- Joyce, McMurdo Dry Valleys, Antarctica. *Biogeochemistry*. 137(1-2): 73-92
DOI:10.1007/s10533-017-0402-1
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD (2017) Morphological signatures of microbial activity across depositional microenvironments of Lake Vanda, Antarctica. *Sedimentary Geology*. 361: 82-92. DOI:10.1016/j.sedgeo.2017.09.013
- Rankin, AH, Pressel, S, Duckett, J, Remington, W, Hawes, I, Sumner, DY, **Mackey, TJ**, Castendyk, D, Schneider, H, Jungblut, AD (2017) Characterisation of a deep-water moss from the perennially ice-covered Lake Vanda, Antarctica. *Polar Biology*, 40(10): 2063-2076. DOI:10.1007/s00300-017-2127-y
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD, Lawrence, J, Leidman, S, Allen, B (2017) Increased mud deposition reduces stromatolite complexity. *Geology*, 45: 663-666. DOI:10.1130/G38890.1
- Sumner, DY, Jungblut, AD, Hawes, I, Andersen, DT, **Mackey, TJ**, Wall, K (2016) Growth of elaborate microbial pinnacles in Lake Vanda, Antarctica. *Geobiology*, 14(6): 556-574. DOI:10.1111/gbi.12188
- Jungblut, AD, Hawes, I, **Mackey, TJ**, Krusor, M, Doran, P, Sumner, DY, Eisen, J, Hillman, C, Goroncy, A (2016) Microbial mat communities along an oxygen gradient in a perennially ice-covered Antarctic lake. *Applied and Environmental Microbiology*, 82(2): 620-630. DOI:10.1128/AEM.02699-15
- Sumner, DY, Hawes, I, **Mackey, TJ**, Jungblut, AD, Doran, P (2015) Antarctic microbial mats: A modern analog for Archean lacustrine oxygen oases. *Geology*, 43: 887-890. DOI:10.1130/G36966.1
- Zhang, L, Jungblut, AD, Hawes, I, Andersen, DT, Sumner, DY, **Mackey, TJ** (2015) Cyanobacterial diversity in benthic mats of the McMurdo Dry Valley lakes, Antarctica. *Polar Biology*, 38: 1097-1110. DOI:10.1007/s00300-015-1669-0
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD, Andersen, DT, (2015) Growth of modern branched columnar stromatolites in Lake Joyce, Antarctica. *Geobiology*, 13: 373-390. DOI:10.1111/gbi.12138
- Harwood Theisen, C, Sumner, DY, **Mackey, TJ**, Lim, DS, Brady, AL, Slater, GF (2015) Carbonate fabrics in the modern microbialites of Pavilion Lake: two suites of microfibrils that reflect variation in microbial community morphology, growth habit, and lithification. *Geobiology*, 13: 357-372. DOI:10.1111/gbi.12134
- Hawes, I, Sumner, DY, Andersen, DT, Jungblut, AD, **Mackey, TJ** (2013) Timescales of growth response of microbial mats to environmental change in an ice-covered Antarctic lake. *Biology*, 2: 151-176. DOI:10.3390/biology2010151
- Hawes, I, Sumner, DY, Andersen, DT, and **Mackey, TJ** (2011) Legacies of recent environmental change in the benthic communities of Lake Joyce, a perennially ice-covered Antarctic lake. *Geobiology*, 9: 394-410. DOI: 10.1111/j.1472-4669.2011.00289.x
- Runkel, A, **Mackey, TJ**, Cowan, C, and Fox, D (2010) Tropical Shoreline Ice in the Late Cambrian: Implications for Earth's climate between the Cambrian Explosion and the Great Ordovician Biodiversification Event. *GSA Today*, 20: 4-10. DOI: 10.1130/GSATG84A.1

SELECTED PRESENTATIONS (asterisk denotes undergraduate mentee)

- Mackey, TJ**, Bergmann, KD, Summons, RE, Jost, AB, Cantine, M, Wilcots, J (2019) Paired biomarker and carbonate clumped isotope analyses of Neoproterozoic environments, NE Svalbard. Astrobiology Science Conference.

- Salley, SO, Sumner, DY, **Mackey, TJ**, Hawes, I (2019) Nitrogen cycling in perennially ice-covered lakes in Antarctica. Astrobiology Science Conference.
- Mackey, TJ**, Jost, AB, Cantine, MD, Wilcots, J, Summons, RE, Bergmann, KD (2018) Paired carbonate clumped isotope and biomarker records of Neoproterozoic habitats from NE Svalbard. American Geophysical Union, Fall Meeting PP53E-1246.
- Bergmann, KD, Boekelheide, N, Cantine, M, Jost, AB, **Mackey, TJ**, Goldberg, SL, Wilcots, J, Anderson, NT (2018) A 1.2 Billion Year Record of Earth's Temperature History. American Geophysical Union, Fall Meeting PP11F-1321.
- Dillon, M, Hawes, I, Jungblut, AD, **Mackey, TJ**, Eisen, J, Sumner, DY (2018) Niche selection in the benthic microbial communities of Lake Fryxell, Antarctica across space and time. American Geophysical Union, Fall Meeting B43J-2970.
- Sramek, NR, Sumner, DY, **Mackey, TJ** (2018) Quantifying pinnacle morphology using 3-dimensional reconstructions of microbial mats in Lake Vanda, Antarctica. Geological Society of America, Fall Meeting.
- Mackey, TJ**, Jost, AB, Cantine, MD, Wilcots, J, Bergmann, KD (2018) Neoproterozoic carbonate clumped isotope records from the onset of the Sturtian Snowball Earth glaciation. Goldschmidt.
- Jost, AB, **Mackey, TJ**, Bergmann, KD (2018) Interpreting diagenesis in the Marinoan-age Wilsonbreen Fm. using carbonate clumped isotopes. Goldschmidt.
- Bergmann, KD, Jost, AB, Mackey TJ, Goldberg, S, Anderson, N, Cantine, MD, Wilcots, J (2018) Can you reconstruct paleoclimate in carbonate rocks before the advent of biomineralization? Goldschmidt.
- Mackey, TJ**, Bergmann, KD, Summons, RE (2018) Neoproterozoic records of eukaryotic expansion from NE Svalbard. Gordon Organic Geochemistry Conference.
- Mackey, TJ**, Jost, AB, Cantine, M, Wilcots, J, Bergmann, KD (2017) Clumped isotope records of environmental change and diagenesis at the onset of the Cryogenian. American Geophysical Union, Fall Meeting, abstract EP11D-07.
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD, Andersen, DT, Bergmann, KD (2017) Cryogenian Environments through an Antarctic lens. International Astronomical Union Astrobiology Conference, Chile.
- Mackey, TJ**, Bergmann, KD, Fairchild, I (2017) Carbonate clumped isotope temperatures from the onset of the Cryogenian. Goldschmidt, France.
- Bergmann KD, Jost AB, **Mackey TJ**, Goldberg S, Boekelheide N, Finnegan S, Fischer WW, Grotzinger JP, and Eiler JM (2017) Climatic extremes at the dawn of animal life. Goldschmidt, France.
- Jost, AB, **Mackey, TJ**, Bergmann, KD (2017) Preliminary temperature records from Marinoan-age low latitude carbonates. Goldschmidt, France.
- Matys, ED, **Mackey, TJ**, Sumner, DY, Krusor, M, Wall, K, Jungblut, A, Hawes, I, Mueller, E, Summons, RE (2017) Bacteriohopanepolyols across environmental gradients in ice-covered lakes of the McMurdo Dry Valleys, Antarctica. Astrobiology Science Conference.
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD, *Leidman, SZ, Andersen, DT (2016) Stromatolites record changing primary productivity in perennially ice-covered Lake Joyce, McMurdo Dry Valleys, Antarctica. American Geophysical Union, Fall Meeting, abstract B43D-06.
- Mackey, TJ**, *Leidman, S, *Allen, B, Hawes, I, Lawrence, J, Jungblut, AD, Krusor, M, Coleman, L, Sumner, DY (2015) Characterizing microbial mat morphology with Structure from Motion techniques in ice-covered Lake Joyce, McMurdo Dry Valleys,

- Antarctica. American Geophysical Union, Fall Meeting, abstract C41D-0726.
- Mackey, TJ**, Sumner, DY, Hawes, I, Jungblut, AD, Andersen, DT (2015) Calcification of Modern Stromatolites from Lake Joyce, McMurdo Dry Valleys, Antarctica: Preserved Carbon Pool Modification in a Changing Microbial Ecosystem. Astrobiology Science Conference.
- *Leidman, SZ, **Mackey, TJ**, Sumner, DY (2015) Quantitative Analysis of Microbial Mat Morphologies via Structure from Motion Reconstructions. Astrobiology Science Conference.
- *Allen, B, **Mackey, TJ**, Lawrence, J, *Leidman, S, Hawes, I, Krusor, M, Mowchan, L, Jungblut, AD, Sumner DY (2015) Analysis of Webbed Pinnacle Microbial Mat Variation Along a Decreasing Sediment Gradient in Lake Joyce, Antarctica. Astrobiology Science Conference.
- Mowchan, LE, **Mackey, TJ**, Sumner, DY, Krusor, M (2015) Astrobiology Lessons Comparing Lake Joyce, Antarctica and Mars. Astrobiology Science Conference.
- Mackey, TJ**, *Leidman, S, Sumner, DY, Hawes, I, Jungblut, AD, Castendyk, D (2014) Benthic microbial mat expansion and nutrient uptake during lake level rise in ice-covered Lake Vanda, McMurdo Dry Valleys, Antarctica. Ecological Society of America Annual Meeting.
- Lim, DSS, Hawes, I, **Mackey, TJ**, Brady, AL, Biddle, J, Andersen, DT, Belan, M, Slater, G, Abercromby, A, Squyres, SW, Delaney, M, Haberle, CW, Cardman, Z (2014) The microbial mats of Pavilion Lake microbialites: examining the relationship between photosynthesis and carbonate precipitation. American Geophysical Union, Fall Meeting, abstract #B23A-0183.
- Mackey, TJ**, Sumner, DY, Krusor, M, Wall, K, Hawes, I, Jungblut, AD, Andersen, DT (2013) Microbial mat morphology as a record of environmental change in perennially ice-covered Lake Joyce, Antarctica. Polar and Alpine Microbiology conference.
- Mackey, TJ**, Hawes, I, Forrest, A, Sumner, DY, Jungblut, AD, Doran, P (2013) Environmental influences on microbial mat biogeography in perennially ice-covered Lake Fryxell, Antarctica. Strategic Science in Antarctica Conference.

INVITED AND DEPARTMENTAL PRESENTATIONS

Lamont-Doherty Earth Observatory, Columbia University, USA (scheduled 02/2019)	2019
University of California, Santa Cruz, USA, Department of Earth and Planetary Sciences	2019
St. Andrews University, UK, School of Earth and Environmental Sciences	2018
NASA Ames Research Center, USA, Space Science and Astrobiology Division	2018
University of California, Davis USA, Department of Earth and Planetary Sciences	2018
University of Birmingham, UK, School of Geography, Earth and Environmental Sciences	2017
Massachusetts Institute of Technology, USA, Department of Earth, Atmospheric and Planetary Sciences, COG3 Departmental Seminar	2017
University of Canterbury, NZ, Gateway Antarctica	2014
US Antarctic Program, McMurdo Station Galley Talk	2014
Caltech, USA, Division of Geological and Planetary Sciences, Geology Club Seminar	2014
Antarctica New Zealand, Scott Base Science Talk	2013
Antarctica New Zealand, Scott Base Science Talk	2012

PROFESSIONAL SERVICE AND PUBLIC OUTREACH

Professional Service

Served on review committee for PolarTREC applicants for teacher-researcher collaboration in polar science	2015, 2018
External reviewer for French National Research Agency	2017
Served on NASA Earth and Space Science Fellowship review panel	2017
Served on NASA proposal review panel	2017
Lead for US Antarctic Program event G-063, with duties including coordination of scientific program, logistics, and field operations	2014, 2015

Public outreach

SETI Institute presentation panelist “Antarctica as a Time Machine: Our Portal to Snowball Earth and Faraway Worlds”	2019
Developed activities for local middle school students through MIT Earth, Atmospheric and Planetary Sciences Opportunity Day.	2017–2018
Public presentations to community group and high school students	2018
Introduced principles of chromatography to pre-K children through hands-on activities as part of the Cambridge Science Festival.	2017
Developed and presented public outreach module to demonstrate natural selection for the UC Davis Picnic Day campus open house	2016
Research panelist for PolarTREC at Teacher Research Collaboration Conference	2015
Incorporated PolarTREC teacher Lucy Coleman in Antarctic field season	2014
Presented at Bodega Marine Lab community outreach “Science Uncorked” series	2014
Maintained blog on Antarctic field work: cyanobacterialadventures.blogspot.com	2010–2014
Interviews on Capital Public Radio program <i>Insight</i> related to research in ice-covered Antarctic lakes	2013, 2014
Interviewed and provided media for Antarctica NZ Stuff.co.nz documentary of Antarctic field research	2013
Demonstration and outreach at Angels for Hearts benefit for Sacramento region childhood heart patients	2013
Produced video of field work for Natural History Museum of London Scott Exhibition highlight on modern Antarctic science	2012
Designed hands-on geology and ecology content and presented for elementary school KiDS field adventure day	2011