Melody R. Lindsay, Ph.D. - Curriculum Vitae
Postdoctoral Researcher

Address: Bigelow Laboratory for Ocean Sciences, East Boothbay, ME 04544
Phone: 808.389.5636 *Email:* mlindsay@bigelow.org *Twitter:* @mrlindsa
Google Scholar, Research Gate

Research Interests: My research interests lie at the intersection of biology and geology, investigating how environments influence microbial community diversity, function, and evolution, and how microbial communities can in turn shape their environments. I primarily do this through analyzing the biology and geochemistry/geology of unique, often "extreme" environments, and track microbial activity and genomic information at the level of broader community ecology, and at the level of a single cell.
Keywords: geomicrobiology, chemosynthetic metabolisms, anaerobic microbiology, astrobiology, deep biosphere, hydrothermal, early Earth

Professional Experience:

2019 – current	*Postdoctoral Researcher*, Bigelow Laboratory for Ocean Sciences Advisors: Dr. Beth Orcutt & Dr. Dave Emerson
2013 – 2019	*Graduate Research Assistant*, Montana State University *NASA Earth and Space Science Fellow* Advisor: Dr. Eric S. Boyd
2011 – 2013	*Undergraduate Researcher*, Princeton University Advisor: Dr. Tullis C. Onstott
2010	*REU*, NASA Astrobiology Institute at the University of Hawaii
2009 – 2010	*Undergraduate Researcher*, Princeton University/Bermuda Institute of Ocean Sciences

Education:

2013 – 2019	Ph.D., Microbiology, Montana State University, Bozeman, MT *Thesis:* "Geomicrobiology of Hydrogen in Yellowstone Hot Springs"
2009 – 2013	A.B., Ecology and Evolutionary Biology; Certificate in Musical Performance; Princeton University, Princeton, NJ *Thesis:* "The Microbes of Moria: Characterization of active microbial members in the subsurface environment of the Witwatersrand Basin"

Publications:

In Review:

(20) J.H. Munson-McGee*, **M.R. Lindsay*,** J.M. Brown, E. Sintes, T. D'Angelo, J. Brown, L.C. Lubelczyk, P. Tomko, D. Emerson, B.N. Orcutt, N.J. Poulton, G.J. Herndl, R. Stepanauskas. Decoupling respiration rates and abundance in marine prokaryoplankton. *In review.* *These authors contributed equally to this project and should be considered co-first authors.

(19) K. Sims, B. Carr, S. Scott, A. Parsekian, **M. Lindsay,** D. Colman, C. Messa, J. Lowenstern, E. Shock, R. McCleskey, M. Charette, H. Heasler, C. Jaworowoski, A. Role, T. Moloney, W. Holbrook, S. Pasquet, E. Boyd. A Tale of Two Pools: The Impact of Phase Separation on the Geohydrobiology of the Yellowstone Hydrothermal System. *In Review.*

In Press/Published:

2021

18. K.M. Fecteau, E.S. Boyd, **M.R. Lindsay**, M.J. Amenabar, K.J. Robinson, R.V. Debes II, E.L. Shock. Cyanobacteria and Algae Meet at the Limits of the Habitat Ranges in Moderately Acidic Hot Springs. *JGR Biogeosciences.* https://doi.org/10.1029/2021JG006446

17. D.R. Colman, **M.R. Lindsay**, A. Harnish, E.M. Bilbrey, M.J. Selensky, M.J. Amenabar, K.M. Fecteau, R.V. Debes II, M.B. Stott, E.L. Shock, E.S. Boyd. Seasonal hydrologic and geologic forcing drive hot spring geochemistry and microbial biodiversity. *Environmental Microbiology.* https://doi.org/10.1111/1462-2920.15617

2020

16. M. Kanik, M. Munro-Ehrlich, M. Fernandes-Martins, D. Payne, K. Gianoulias, L. Keller, A. Kubacki, **M.R. Lindsay**, B. Baxter, M. Vanden Berg, D. Colman, E. Boyd. Unexpected abundance and diversity of phototrophs in mats from morphologically diverse microbialites in Great Salt Lake, Utah. *Applied and Environmental Microbiology.* doi:10.1128/AEM.00165-20

15. **M.R. Lindsay**, E.C. Dunham, and E.S. Boyd. Microbialites of Great Salt Lake. (2020). In Great Salt Lake: Biology of a terminal lake in the age of change. B.K. Baxter and J.K. Butler, Editors. Springer-Verlag. Link.

14. D.R. Colman, **M.R. Lindsay**, M.J. Amenabar, M.C. Fernandes Martins*, E.R. Roden, E.S. Boyd. (2020). Phylogenomic analysis of novel Diaforarchaea is consistent with sulfite but not sulfate reduction in volcanic environments on early Earth. *The ISME Journal*. *Mentored undergraduate student. doi:10.1038/s41396-020-0611-9.

2019

13. E.C. Dunham, E.M. Fones, **M.R. Lindsay**, C. Steuer, N. Fox, M. Willis, A. Walsh, D.R. Colman, B.K. Baxter, D. Mogk, D. Bowen, D. Lageson, E.S. Boyd. (2019). An Ecological Perspective on Dolomite Formation in Great Salt Lake, Utah. *Frontiers in Earth Science.* doi: 10.3389/feart.2020.00024.

12. D.R. Colman, **M.R. Lindsay**, M.J. Amenabar, E.S. Boyd (2019). The Intersection of Geology, Geochemistry, and Microbiology in Continental Hydrothermal Systems. *Astrobiology.* doi: 10.1089/ast.2018.2016.

11. D. Payne, E.C. Dunham, E. Mohr, I. Miller, A. Arnold, R. Erickson, E.M. Fones, **M.R. Lindsay**, D.R. Colman, E.S. Boyd. (2019). Geologic legacy spanning >90 years explains unique Yellowstone hot spring geochemistry and biodiversity. *Environmental Microbiology.* doi: 10.1111/1462-2920.14775.

10. **M.R. Lindsay**, D.R. Colman, M.J. Amenabar, K.E. Fristad, K.M. Fecteau, R.V. Debes, J.R. Spear, E.L. Shock, T.M. Hoehler, E.S. Boyd. (2019). Probing the Geological Source and Biological Fate of Hydrogen in Yellowstone Hot Springs. *Environmental Microbiology.* doi:10.1111/1462-2920.14730.

9. D.R. Colman, **M.R. Lindsay**, E.S. Boyd. (2019). Mixing of end-member fluids supports hyperdiverse chemosynthetic hydrothermal communities. *Nature Communications.* doi:10.1038/s41467-019-08499-1.

8. **M.R. Lindsay,** R.E. Johnston*, B.K. Baxter, E.S. Boyd. (2019). Effects of Salinity on Microbialite-Associated Production in Great Salt Lake, Utah. *Ecology.* 100(3):1-14. doi: 10.1002/ecy.2611. *Mentored undergraduate student.

2018 and Prior

7. **M.R. Lindsay**, M.J. Amenabar, K.M. Fecteau, R.V. Debes, M.C. Fernandes-Martins*, K.E. Fristad, H. Xu, T.M. Hoehler, E.L. Shock, and E.S. Boyd. (2018). Subsurface Processes Influence Oxidant Availability and Chemoautotrophic Hydrogen Metabolism in Yellowstone Hot Springs. *Geobiology.* 16:674-692. doi:10.1111/gbi.12308. *Mentored undergraduate student.

6. S. Poudel, E. Dunham, **M.R. Lindsay**, M. Amenabar, E. Fones, D. Colman, E.S. Boyd. (2018). Origin and Evolution of Flavin-Based Electron Bifurcating Enzymes. *Frontiers of Microbiology.* doi: 10.3389/fmicb.2018.01762.

5. R.S. Hindshaw, **M.R. Lindsay**, and E.S. Boyd. (2017). Diversity and abundances of microbial eukaryotes in stream sediments from Svalbard. *Polar Biology.* doi:10.1007/s00300-017-2106-3.

4. **M.R. Lindsay**, C. Anderson, N. Fox, G. Scofield, J. Allen, E. Anderson, L. Bueter, S. Poudel, K. Sutherland, J. H. Munson-McGee, J. van Norstrand, J. Zhou, J.R. Spear, B.K. Baxter, D. Lageson, and E.S. Boyd. (2017). Microbialite response to an anthropogenic salinity gradient in Great Salt Lake, Utah. *Geobiology.* 15(1):131-145. Chosen for cover image. DOI: 10.1111/gbi.12201.

3. M.C.Y. Lau, T.L. Kieft, K. Olukayode, B. Linage-Alvarez, E. van Heerden, **M.R. Lindsay**, C. Magnabosco, W. Wang, J.B. Wiggins, L. Guo, D.H. Perlman, S. Kyin, H.H. Shwe, R.L. Harris, Y. Oh, M.J. Yi, R. Purtschert, G.F. Slater, S. Ono, S. Wei, L. Li, B. Sherwood Lollar, T.C. Onstott. (2016). An oligotrophic deep-subsurface community dependent on syntrophy is dominated by sulfur-driven autotrophic denitrifiers. *Proceedings of the National Academy of Sciences.* 113(49): E7927-E7936. DOI: 10.1073/pnas.16122244113.

2. R.S. Hindshaw, S.Q. Land, **M.R. Lindsay**, and E.S. Boyd. (2016). Origin and temporal variability of unusually low δ^{13}C-DOC values in two high Arctic catchments. *Journal of Geophysical Research: Biogeosciences*. 121: 1073-1085. DOI: 10.1002/2015JG003303.

1. R.S. Hindshaw, T.H.E. Hinton, E.S. Boyd, **M.R. Lindsay**, and E.T. Tipper. (2015). Influence of glaciation on mechanisms of mineral weathering in two high Arctic catchments. *Chemical Geology,* 420: 37-50. DOI: 10.1016/j.chemgeo.2015.11.004.

Other Publications/Products:

M.R. Lindsay, R.E. Johnston, B.K. Baxter, E.S. Boyd. Effects of salinity on microbialite-associated production in Great Salt Lake, Utah: Photo Gallery. *Bulletin of the Ecological Society of America*. April 2019.

M.R. Lindsay. "Great Salt Lake: Productive on Many Levels". *Friends of Great Salt Lake Newsletter.* Summer 2017, volume 25. URL: https://fogsl.org/news-and-archives/newsletter-archive.

"Living Rock from the Great Salt Lake". Part of permanent exhibit at the Natural History Museum of Utah. Salt Lake City, July 2016 to present.

Fellowships, Scholarships and Awards Received:

2021	Rodney L. White Postdoctoral Fellowship - Bigelow Laboratory for Ocean Sciences
2020	Travel Grant - Europa and Ocean World *In Situ* Science Workshop - 2020 (moved to 2021)
2020	Travel Grant - Demystifying the IODP proposal process for early career scientists - 2020.
2016-2019	NASA Earth and Space Science Fellowship – Planetary Science Research
2018	Student Travel Grant – ACA Astrobiology Grand Tour 2018
2017-2018	Doyle W. Stephens Award – Friends of Great Salt Lake
2017	International Society for Subsurface Microbiology Travel Grant
2016-2017	Beverly Ferguson Graduate Student Award – MBI Department
2016	Funding for the 2016 NASA/ESA Astrobiology Summer School
2015	SETI Institute Student Travel Grant (AbSciCon 2015)
2015	Thermal Biology Institute Turner Foundation Student Award
2012-2013	Princeton University ODOC Senior Thesis Award
2012	American Geophysical Union Travel Grant
2012	Princeton University Ecology/Evolutionary Biology Research Grant
2009	Davidson Fellow Laureate Scholarship Award

Research Grants:

2020-2021	National Science Foundation (subaward from OCE-1450528 to Columbia University). PI: Participation of Melody Lindsay as science party member on IODP Expedition 395 (deferred 2020 but completed Summer 2021).
2016-2019	NASA Earth and Space Sciences Graduate Fellowship: Planetary Sciences. Co-PI/Graduate Student: Melody Lindsay, PI: Eric Boyd.

2018 JGI Community Sciences Program, DOE. Co-PI: Melody Lindsay, PI: Daniel Colman.

Research Experience/Cruises:

2021* Science Party - Research Cruise IODP 395, on Joides Resolution
*Deferred to 2021 from 2020, then carried out remotely

2019 Research Cruise AT42-11, on R/V Atlantis with ROV Jason II
Chief Scientist: Dr. Beth Orcutt

2013-2019 Numerous research trips to Yellowstone National Park hot springs

2017 Field work in New Zealand hot springs

2016 Research on/in Alaskan backcountry mud volcanoes

2014-2018 Numerous research trips to Great Salt Lake, Utah

2012 Research in Witwatersrand Basin gold and diamond mines, South Africa

Teaching Experience:

2021 Laboratory Teaching Instructor for CH385B: Ocean Biogeochemistry on a Changing Planet, Colby College.

2018 Co-instructor for BIOM494: Senior Capstone class in Microbiology, Montana State University.

2017 Teaching assistant for BIOM494: Senior Capstone class in Microbiology, Montana State University.

2015 Head Teaching Assistant for BIOM360: General Microbiology. Department of Microbiology and Immunology, Montana State University – Overall Instructor Rating: 4.95/5.00.

2014 Co-Teaching Assistant for BIOM360: General Microbiology. Department of Microbiology and Immunology, Montana State University – Overall Instructor Rating: 4.88/5.00.

2014-2016 MAP (Montana Apprenticeship Program). Mentored Native American High School Students in a summer immersion program which aims to increase underrepresented high school students entering STEM fields.

Students Mentored:

2022 Melissa Herring
B.A. student at Northeastern College, Co-op student.
Project: *Utilization of a fluorogenic probe to detect and measure microbial life in a deep subsurface aquifer.*

2021-2022 Elizabeth Baker
B.A. student at Bowdoin College, Bigelow REU.
Project: *Patterns in deep biomass associated with sediment in the Reykjanes Ridge-Plume System*

2021 Eliza Goodell
B.A. student at Oberlin College
Project: *Establishing methods to quantify microbial activity across diverse environments*

2021	Anne Sternberg B.A. student at Colby College Project: *Quantifying microbial activity in Maine Coastal Sediments*
2018-2019	Maria Michelotti B.S. student at Montana State University Project: *Culturing active H_2 oxidizers from Yellowstone hot springs*
2017-2018	Rachel Johnston B.S. student at Montana State University Project: *Effects of Salinity on Microbialite-Associated Production in Great Salt Lake*
2017-2018	Evan Bilbrey B.S. student at Montana State University Project: *Quantifying use of geochemical electron acceptors*
2016-2018	Maria Clara Fernandes Martins B.S. student at Montana State University Currently a Ph.D. student at MSU Project: *Growing chemosynthetic microbes from Yellowstone hot springs*
2014-2016	C. Andrew Dyson B.S. student at Montana State University Project: *Cultivation-based approach to quantifying H_2 metabolizing organisms in Smoke Jumper Hot Springs, Yellowstone*
2015	Kevin Glover B.S. student at Whitworth University Project: *Subglacial microbial iron utilization, Robertson Glacier*
2015	Marjorie Shinn B.S. student at Montana State University Project: *Cultivation-based approach to quantifying H_2 metabolizing organisms in Roadside Hot Springs, Yellowstone*
2014-2015	Cade Comstock B.S. student at Montana State University
2014	Zorah Maserati Masters student from Germany
2014	Joshua Thiel B.S. student at Westminster College Project: *Mercury methylating microbes in Lake Powell*
2014	Heather Rosler High School Student from Flathead Reservation
2013-2015	Jayme Feyhl-Buska Presidential Scholar at Montana State University Currently a Ph.D. student at USC.

Selected Presentations and Abstracts: *presenting author

M.R. Lindsay*. Elizabeth S Baker, Leah LeVay, Vincent Percuoco, Johanna Suhonen, Catherine Smith, Lisa Crowder, Sarah Kachovich, Zenon Mateo, Eric Moortgat, Ionela Samoila, Anne Briais, Ross Parnell-Turner, Justin P. Dodd, Beth N Orcutt, IODP Expedition 395C

Science Party. Tracking hydrothermal alteration and sedimentation in Reykjanes Ridge basement and sediment through geochemical and microbiological proxies. ASLO/OSM, February 2022.

M.R. Lindsay*. Activity detection and measurement in low biomass environments: With applications to numerous metabolisms. Invited talk at C-DEBI 2021 Annual Meeting. November 17th, 2021.

M.R. Lindsay*. Activity detection in low biomass anaerobic environment: Potential applications to life detection? NFoLD Steering Committee. September 17th, 2021.

M.R. Lindsay*. Microbialites of Great Salt Lake. Invited talk and panel member of Salty Science Series, February 2021. Great Salt Lake Institute.
https://www.youtube.com/watch?v=NVyVr2new78

M.R. Lindsay*. Detecting and Quantifying Biological Activity Across Diverse Environments. Bigelow Science Seminar Series, September 2020.

M.R. Lindsay*. Tracking hydrothermal alteration (and ocean circulation) through geochemical and microbiological proxies. IODP Expedition 395 Summer Workshop. July 2020.

M.R. Lindsay*, T. D'Angelo, J. Munson-McGee, L. Lubelczyk, E. Sintes, G. Herndl, N.J. Poulton, R. Stepanauskas, D. Emerson, B.N. Orcutt. Linking Microbial Genomes to Phenomes: Investigating Biogeochemical Processes Across Environments Using Cell Specific Functions. C-DEBI Annual Meeting, November 2019, and EPSCoR National Conference, October 2019.

M.R. Lindsay*. Influence of salinity on the potential for dolomite formation in Great Salt Lake sediments. Lake Bonneville Geologic Conference, 2018.

M.R. Lindsay*, R. Johnston, B.K. Baxter, E.S. Boyd. Effects of Changing Salinity on Microbialite-Associated Primary Producers and Secondary Consumers in Great Salt Lake. Invited talk at the Great Salt Lake Issues Forum 2018 meeting.

M.R. Lindsay*, K.E. Fristad, D.R. Colman, M.J. Amenabar, M.R. Urschel, K.M. Fecteau, R.V. Debes, J.R. Spear, E.L. Shock, T.M. Hoehler, E.S. Boyd. Subsurface Source and Biological Fate of Hydrogen in the Yellowstone Geothermal Complex. Oral presentation at the Gordon Research Seminar and poster presentation at the Conference in Geobiology, 2018.

M.R. Lindsay*, K.E. Fristad, D.R. Colman, M.J. Amenabar, M.R. Urschel, K.M. Fecteau, R.V. Debes, J.R. Spear, E.L. Shock, T.M. Hoehler, E.S. Boyd. Hydrogen Sourced from Subsurface Processes Supports a Complex Hot Spring Ecosystem. Oral presentation at ISSM, 2017.

M.D Vanden Berg*, **M.R. Lindsay**, E.S. Boyd, T.C. Chidsey Jr., D.E. Eby. The microbialites of Utah's Great Salt Lake: Geology vs. Biology. GSA Annual Meeting 2017.

M.R. Lindsay*, K.E. Fristad, M.J. Amenabar, M.R. Urschel, K.M. Fecteau, R.V. Debes, J.R. Spear, T.M. Hoehler, E.L. Shock, E.S. Boyd. Subsurface Source and Biological Fate of Hydrogen in Hot Spring Ecosystems. Oral presentation at AbSciCon 2017 meeting.

D.R. Colman*, **M.R. Lindsay,** E.R. Roden, E.S. Boyd. Transitioning Metagenomes into Interactomes in a Chemosynthetic Sulfur-Based Hot Spring Community. AbSciCon 2017.

M.R. Lindsay*, B.K. Baxter, E.S. Boyd. Molecular Characterization of Microbialites in Great Salt Lake, Utah. Invited talk at the Great Salt Lake Issues Forum 2016 meeting.

M.R. Lindsay*, M.R. Urschel, K.E. Fristad, K.M Fecteau, E.L. Shock, T.M. Hoehler, E.S. Boyd. Geological Controls on Hydrogen Cycling in Yellowstone National Park Hot Spring Communities. Poster presentation at AbSciCon 2015 meeting.

Lau, M.*, **Lindsay, M.R.**, Kieft, T., Pullin, M., Hendrickson, S., Simkus, D., Slater, G., Sherwood Lollar, B., Li, L., Lacrampe-Couloume, G., van Heerden, E., Erasmus, M., Borgonie, G., Linage, B., Kuloyo, K., Mailloux, B., Heuer, V., Hinricks, K-U., Maphanga, S. & Onstott, T. Active Carbon Cycling in Deep Subsurface Fracture Environments: Insights from RNA, Lipid, and Isotopic Analyses. 23rd V.M. Goldschmidt Conference. August 2013.

M.R. Lindsay*, M.C.Y. Lau, G. Tetteh, L. Snyder, T.L. Kieft, B. Sherwood Lollar, L. Li, S. Maphanga, E. van Heerden and T.C. Onstott (2012). Characterization of active members in C and N cycles in the subsurface environment of the Witwatersrand Basin. Poster presentation at AGU 2012 Fall Meeting.

Service/Synergistic activities:
Recent reviewer for the following journals:
The ISME Journal, Frontiers in Microbiology, Geobiology, mSystems, Geomicrobiology, Ecosphere, Plant Systematics and Evolution.
Recent reviewer for the following proposal reviewer panels:
NASA Planetary Protection (Panelist x1, Reviewer x2), Czech Science Foundation.

Steering Committee Representative (for Dr. Beth Orcutt), NfoLD: NASA's Network for Life Detection

Session Convener for:

2021 (deferred to 2022)	Astrobiology Science Conference (AbSciCon): Life Detection in Deep Biosphere Earth Analog Environments.