

Curriculum vitae

Eric Stephen Boyd

*Assistant Professor, Department of Microbiology and Immunology &
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Academic Appointments

- 2014-present Assistant Professor, Department of Microbiology and Immunology, Montana State University, Bozeman, Montana, USA.
- 2012-present NASA Early Career Fellow, Montana State University, Bozeman, Montana, USA.
- 2011-2013 Assistant Research Professor, Department of Chemistry and Biochemistry, Montana State University, Bozeman, Montana, USA
- 2009-2011 NASA Astrobiology Institute Postdoctoral Research Fellow, Department of Chemistry and Biochemistry, Montana State University, Bozeman, Montana, USA. Advisor: John W. Peters
- 2007-2009 Postdoctoral Research Fellow, Department of Chemistry and Biochemistry, Montana State University, Bozeman, Montana, USA. Advisor: John W. Peters
- 2002-2003 Laboratory Technician, Department of Microbiology, Iowa State University, Ames, Iowa, USA. Advisor: Alan A. DiSpirito

Education

- 2003-2007 Ph.D., Microbiology, Montana State University, Bozeman, Montana, USA. Advisor: Gill G. Geesey
- 1998-2002 B.S., Biology, Iowa State University, Ames, Iowa, USA. Advisor: Alan A. DiSpirito

Awards, Honors, and Service

- 2018 Department of Microbiology and Immunology Faculty Collegiality Award
- 2017 MSU Provost's Fox Faculty Award for Accomplishments in Teaching, Research/Creative Activity, and Mentorship
- 2017-present Guest Review Editor, *Frontiers in Microbial Physiology and Metabolism*
- 2015 NASA Astrobiology Strategy 2015, Lead Author

2015-2021 Editorial Board, Applied and Environmental Microbiology
 2015-2016 Associate Director, Thermal Biology Institute, Montana State University
 2014-present Deputy Director, Rock Powered Life NASA Astrobiology Institute
 2014 *Living Colors: Microbes of Yellowstone National Park* received a gold award from the University Professional and Continuing Education Association.
 2014 *Living Colors: Microbes of Yellowstone National Park* received honorable mention in the Visitors Guide category of the Media & Partnership Awards for the Association of Partners for Public Lands.
 2013-present Guest Review Editor, Frontiers in Extreme Microbiology
 2013-present Editorial Board, Geobiology
 2013-present Editorial Board, Geomicrobiology Journal
 2012-present NASA Early Career Fellow
 2012-present Member of the National Association of Biological Teachers Committee on Global Perspectives
 2012 Guest Review Editor, Frontiers in Terrestrial Microbiology
 2012-2017 Editorial Board, Scientifica
 2011-2015 Editorial Board, Frontiers in Microbiological Chemistry
 2011-2015 Editorial Board, Frontiers in Terrestrial Microbiology
 2011 Montana State University Vice President for Research Postdoctoral Scholar Excellence Award
 2009-2011 NASA Astrobiology Institute Postdoctoral Fellowship
 2006-2007 Montana University System Water Center Fellowship for outstanding research directed at water resource issues in the state or region
 2006-2007 Department of Microbiology Fergusson Graduate Fellowship for outstanding contributions both in research and in teaching
 2004-2006 Inland Northwest Research Alliance Graduate Fellowship for exceptional research in subsurface microbiology
 2005 International Society for Subsurface Microbiology Travel Award

Peer Reviewed Publications or Book Chapters (In Press/Published): Total Citations = 3576, H index = 34 (Google Scholar). Undergraduate author.

Fortney, N.W., B.L. Beard, **E.S. Boyd**, C.M. Johnson, and E.E. Roden. Evaluation of stable Fe isotopic biosignatures within Fe/Si oxide sediments at Chocolate Pots hot springs, Yellowstone National Park. *In review.*

Fortney, N.W., S. He, B.J. Converse, **E.S. Boyd**, E.E. Roden. Investigating the composition and metabolic potential of *in situ* microbial communities in Chocolate Pots hot springs. *In review.*

Poudel, S., E.C. Dunham, M.R. Lindsay, M.J. Amenabar, E. Fones, D.R. Colman, and **E.S. Boyd**. The natural history of flavin-based electron bifurcation. *In review.*

Fecteau, K.M., **E.S. Boyd**, M.R. Lindsay, M.J. Amenabar, K.J. Robinson, R.V. Debes, and E.L. Shock. Phototrophy in mildly acidic hot springs: Where eukaryotic and bacterial phototrophs meet at the limits of photosynthesis. *In review.*

106. Lindsay, M.R., M.J. Amenabar, K.M. Fecteau, R.V. Debes II, M.C.F. 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*. *In press*.
*Corresponding author.
105. Amenabar, M.J., D.R. Colman, S. Poudel, E.E. Roden, and **E.S. Boyd***. 2018. Electron acceptor availability alters carbon and energy metabolism in a thermoacidophile. *Environ. Microbiol.* *In press*. doi.org/10.1111/1462-2920.14270. *Corresponding author.
104. Amenabar, M.J. and **E.S. Boyd***. 2018. Mechanisms of mineral substrate acquisition in a thermoacidophile. *Appl. Environ. Microbiol.* 84: e00334-18. doi:10.1128/AEM.00334-18.
*Corresponding author. Cover image.
103. Fixen, K.R., N.P. Chowdury, M. Martinez, S. Poudel, **E.S. Boyd**, and C.S. Harwood. 2018. Electron transfer to nitrogenase in a phototrophic alpha-proteobacterium. *Environ. Microbiol.* *In press*.
102. Fortney, N.W., S. He, A. Kulkarni, M.W. Friedrich, **E.S. Boyd**, E.E. Roden. 2018. Stable isotope probing of the active iron cycling community at Chocolate Pots Hot Springs, Yellowstone National Park. *Appl. Environ. Microbiol.* 84: e02894-17. doi:10.1128/AEM.02894-17.
101. Poudel, S., D.R. Colman, K.R. Fixen, R.N. Ledbetter, Y. Zheng, N. Pence, L.C. Seefeldt, J.W. Peters, C.S. Harwood, and **E.S. Boyd***. 2018. Electron transfer to nitrogenase in different genomic and metabolic backgrounds. *J. Bact.* *In press*. doi: 10.1128/JB.00757-17. *Corresponding author. Chosen as a "Spotlight" article by Journal Editors.
100. Zheng, Y., D.F. Harris, Z. Yu, Y. Fu, R. Ledbetter, K.R. Fixen, S. Poudel, Z.-Y. Yang, **E.S. Boyd**, M.E. Lidstrom, L.C. Seefeldt, and C.S. Harwood. 2018. Iron-only nitrogenase catalyzes microbial production of methane. *Nature Microbiol.* 3: 281–286. doi: 10.1038/s41564-017-0091-5.
99. Berry, L., S. Poudel, M. Tokmina-Lukaszewska, D.R. Colman, G.J. Schut, M.W.W. Adams, J.W. Peters, **E.S. Boyd**, and B. Bothner. 2018. H/D exchange mass spectrometry and statistical coupling analysis reveal a role for allostery in a ferredoxin-dependent transhydrogenase catalytic cycle. 2017. *Biochim. Biophys. Acta-General Subjects*. 1862: 9-17. doi: 10.1016/j.bbagen.2017.10.002.
98. Price, R.E., **E.S. Boyd**, T.M. Hoehler, L.M. Wehrmann, E. Bogason, H. Valtýsson, J. Örlýgsson, B. Gautason, and J.P. Amend. 2017. Alkaline vents and steep Na⁺ gradients from ridge-flank basalts—Implications for the origin and evolution of life. *Geology*. 45: 1135–1138. doi: 10.1130/G39474.1.
97. Garcia Costas A.M., S. Poudel, A.-F. Miller, G.J. Schut, R. Ledbetter, K.R. Fixen, L.C. Seefeldt, M.W.W Adams, C.S. Harwood, **E.S. Boyd***, and J.W. Peters. 2017. Defining electron bifurcation in the electron transferring flavoprotein family. *J. Bact.* 199: e00440-17. doi: 10.1128/JB.00440-17.
*Co-corresponding author.
96. Nguyen, D.M.N., G. Schut, S. Poudel, O.A. Zadvornyy, M. Tokmina-Lukaszewska, G.L. Lipscomb, L.A. Adams, J. Dimsmore, W. Nixon, B. Bothner, **E.S. Boyd**, J.W. Peters, and M.W.W. Adams. 2017. Two functionally distinct NADP-dependent ferredoxin oxidoreductases maintain the primary redox balance of *Pyrococcus furiosus*. *J. Biol. Chem.* 292: 14603-14616. doi: 10.1074/jbc.M117.794172.

95. Colman, D.R., S. Poudel, T.L. Hamilton, J.R. Havig, M.J. Selensky, E.L. Shock, and **E.S. Boyd***. 2018. Geobiological feedbacks and the evolution of thermoacidophiles. *ISME J.* 12, 225–236. doi: 10.1038/ismej.2017.162. *Corresponding author.
94. Amenabar, M.J., E.L. Shock, E.E. Roden, J.W. Peters, and **E.S. Boyd***. 2017. Microbial substrate preference dictated by energy demand, not supply. *Nat. Geosci.* 10: 577-581. doi: 10.1038/ngeo2978. *Corresponding author. Cover image.
93. Therien, J.B., J.H. Artz, S. Poudel, T.L. Hamilton, Z. Liu, S.M. Noone, M.W.W. Adams, P.W. King, D.A. Bryant, **E.S. Boyd**, and J.W. Peters. 2017. The physiological functions and structural determinants of catalytic bias in the [FeFe]-hydrogenases of *Clostridium pasteurianum* strain W5. *Front. Microbiol.* 8: 1305. doi: 10.3389/fmicb.2017.01305.
92. Colman, D.R., S. Poudel, B.W. Stamps, **E.S. Boyd***, and J. R. Spear. 2017. The deep hot biosphere: Twenty-five years of retrospection. *Proc. Natl. Acad. Sci. U.S.A.* 114: 6895–6903. doi: 10.1073/pnas.1701266114 *Co-corresponding author.
91. Carere, C.R., K. Hards, K.M. Houghton, J.F. Power, B. McDonald, C. Collet, D.J. Gapes, R. Sparling, **E.S. Boyd**, G.M. Cook, C. Greening, M.B. Stott. 2017. Mixotrophy drives niche expansion of verrucomicrobial methanotrophs. *ISME J. In press.* doi: 10.1038/ismej.2017.112.
90. Artz, J.H., D.W. Mulder, S. Poudel, D. Colman, G.J. Schut, S.G. Williams, A.K. Jones, M.W.W. Adams, **E.S. Boyd**, P.W. King, and J.W. Peters. Structure-function of [FeFe]- and [NiFe]-hydrogenases: An overview of diversity, mechanism, maturation, and bifurcation. 2017. *In Microalgal Hydrogen Production: Achievements and Perspectives* G. Torzillo and M. Seibert, Editors. Royal Society of Chemistry. *In press.*
89. Percak-Dennett, E., S. He, B. Converse, H. Konishi, H. Xu, A. Corcoran, D. Noguera, C. Chan, A. Bhayyacharyya, T. Borch, **E.S. Boyd**, and E. Roden. 2017. Microbial acceleration of aerobic pyrite oxidation at circumneutral pH. *Geobiology. In press.* doi: 10.1111/gbi.12241.
88. Hindshaw, R.S., M.R. Lindsay, and **E.S. Boyd**. 2017. Diversity and abundance of microbial eukaryotes in stream sediments from Svalbard. *Polar Biology.* 40: 1835–1843. doi: 10.1007/s00300-017-2106-3.
87. **Boyd, E.S.***, R.-Q. Yu, T. Barkay, T.L. Hamilton, B.K. Baxter, D.L. Naftz, and M. Marvin-DiPasquale. 2017. Effect of salinity on mercury methylating benthic microbes and their activities in Great Salt Lake, Utah. *Sci. Tot. Environ.* 581-582: 495-506. doi: 10.1016/j.scitotenv.2016.12.157. *Corresponding author.
86. Lindsay, M.R., 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.R. Lageson, and **E.S. Boyd***. 2017. Microbialite response to an anthropogenic salinity gradient in Great Salt Lake, Utah. *Geobiology.* 15: 131-145. doi: 10.1111/gbi.12201. *Corresponding author. Precambrian Biosphere class project.
85. Feyhl-Buska, J., Y. Chen, C. Jia, J.-X. Wang, C.L. Zhang, and **E.S. Boyd***. 2016. Influence of growth phase, pH, and temperature on the abundance and composition of tetraether lipids in the

thermoacidophile *Picrophilus torridus*. *Front. Microb.* 7: 1323. doi: 10.3389/fmicb.2016.01323.
*Corresponding author.

84. Mashruwala, A., S. Bhatt, S. Poudel, **E.S. Boyd**, and J.M. Boyd. 2016. The Duf59 containing protein SufT is required for iron-sulfur cluster biogenesis under Fe starved conditions. *PLoS Genet.* 12: e1006233 doi: 10.1371/journal.pgen.1006233.
83. Poudel, S., M. Tokmina-Lukaszewska, D.R. Colman, M. Refai, G.J. Schut, P.W. King, P.-C. Maness, M.W.W. Adams, J.W. Peters, B. Bothner and **E.S. Boyd***. 2016. Unification of [FeFe]-hydrogenases into three structural and functional groups. *Biochem. Biophys. Acta.* 1860: 1910-1921. doi: 10.1016/j.bbagen.2016.05.034. *Corresponding author.
82. Colman, D.R., J. Feyhl-Buska, K.J. Robinson, K.M. Fecteau, H. Xu, E.L. Shock, and **E.S. Boyd***. 2016. Ecological differentiation in planktonic and sediment-associated chemotrophic microbial communities in Yellowstone hot springs. *FEMS Microb. Ecol.* 92: fiw137. doi: 10.1093/femsec/fiw137. *Corresponding author. Article denoted as “Editor’s Choice”.
81. Parker, S.R., R.F. West, **E.S. Boyd**, J. Feyhl-Buska, C.H. Gammons, T.B. Johnston, G.P. Williams, S.R. Poulson. 2016. Biogeochemical and microbial seasonal dynamics between water column and sediment processes in a productive mountain lake: Georgetown Lake, MT, USA. *J. Geol. Res. Biogeosci.* 121: 2064–2081. doi: 10.1002/2015JG003309.
80. Urschel, M.R., T.L. Hamilton, E.E. Roden, and **E.S. Boyd***. 2016. Substrate preference, uptake kinetics, and energetics in a facultatively autotrophic, thermoacidiphilic crenarchaeote. *FEMS Microb. Ecol.* 92: fiw069. doi: 10.1093/femsec/fiw069. *Corresponding author.
79. Hindshaw, R.S., S.Q. Lang, M.R. Lindsay, and **E.S. Boyd**. 2016. Origin and temporal variability of unusually low $\delta^{13}\text{C}$ DOC values in two high arctic catchments. *J. Geol. Res. Biogeosci.* 121: 1073–1085. doi: 10.1002/2015JG003303.
78. Schut, G.J., O.A. Zadvornyy, J.W. Peters, **E.S. Boyd**, and M.W.W. Adams. 2016. The role of geochemistry and energetics in the evolution of modern respiratory complexes from a proton-reducing ancestor. *Biochem. Biophys. Acta-Bioenergetics.* 1857: 958-970. doi: 10.1016/j.bbabi.2016.01.010.
77. Hochstein, R., M.J. Amenabar, J. Munson-McGee, **E.S. Boyd**, and M. Young. 2016. *Acidianus* tailed spindle virus: a new large tailed spindle virus discovered by culture-independent methods. *J. Virology.* 13: 3458-6810.1128. doi: 10.1128/JVI.03098-15.
76. Harrold, Z., M.L. Skidmore, T.L. Hamilton, L. Desch, K. Amada, W. van Gelder, K. Glover, E.E. Roden, and **E.S. Boyd***. 2016. Aerobic and anaerobic thiosulfate oxidation by a cold-adapted, subglacial chemoautotroph. *Appl. Environ. Microbiol.* 82: 1486-1495. doi: 10.1128/AEM.03398-15. *Corresponding author. Chosen as a “Spotlight” article by Journal Editors.
75. Fortney, N.W., B.J. Converse, S. He, B.L. Beard, C.M. Johnson, **E.S. Boyd**, and E.E. Roden. 2016. Microbial Fe(III) oxide reduction potential in Chocolate Pots, Yellowstone National Park. *Geobiology.* 14: 255-275. doi: 10.1111/gbi.12173. Cover Image.

74. Hindshaw, R.S., T.H.E. Hinton, **E.S. Boyd**, M.R. Lindsay, and E.T. Tipper. 2016. Influence of glaciation on mechanisms of mineral weathering in two high Arctic catchments. *Chem. Geol.* 420: 37-50. doi: [org/10.1016/j.chemgeo.2015.11.004](https://doi.org/10.1016/j.chemgeo.2015.11.004).
73. Telling, J., **E.S. Boyd**, N. Bone, E.L. Jones, M. Tranter, J.W. MacFarlane, P.G. Martin, J.L. Wadham, G. Lamarche-Gagnon, M.L. Skidmore, T.L. Hamilton, E. Hill, M. Jackson and D.A. Hodgson. 2015. Rock comminution as a source of hydrogen for subglacial ecosystems. *Nat. Geosci.* 8: 851-857. doi: [10.1038/ngeo2533](https://doi.org/10.1038/ngeo2533).
72. Artz, J.H., S.N. White, **E.S. Boyd**, O.A. Zadvornyy, C.J. Fugate, M.C. Posewitz, G.H. Gauss, and J.W. Peters. 2015. Expression, purification, and characterization of the thermostable mercuric reductase from *Metallosphaera sedula*. *Front. Bioeng. Biotechnol.* 3: 97. doi: [10.3389/fbioe.2015.00097](https://doi.org/10.3389/fbioe.2015.00097).
71. Shock, E.L. and **E.S. Boyd***. Principles of Geobiochemistry. 2015. *Elements*. 11. 395-401. doi: [10.2113/gselements.11.6.395](https://doi.org/10.2113/gselements.11.6.395). *Co-corresponding author. Cover Image.
70. Zadvornyy, O.A., **E.S. Boyd**, M.C. Posewitz, N.A. Zorin, and J.W. Peters. 2015. Biochemical and structural characterization of enolase from *Chloroflexus aurantiacus*: Evidence for a thermophilic origin. *Front. Microbiol.* 3: 74. doi: [10.3389/fbioe.2015.00074](https://doi.org/10.3389/fbioe.2015.00074).
69. Urschel M., M. Kubo, T. Hoehler, J.W. Peters, and **E.S. Boyd***. 2015. Carbon source preference in chemosynthetic hot spring communities. *Appl. Environ. Microbiol.* 81: 3834-3847. doi: [10.1128/AEM.00511-15](https://doi.org/10.1128/AEM.00511-15). *Corresponding author.
68. **Boyd***, **E.S.** Archaea on the move. 2015. *Environ. Microbiol.* 7: 385–387. doi: [10.1111/1758-2229.12281](https://doi.org/10.1111/1758-2229.12281). *Corresponding author.
67. **Boyd, E.S.**, A.M. Garcia Costas, F. Mus, T.L. Hamilton, and J.W. Peters. 2015. Evolution of molybdenum nitrogenase during the transition from anaerobic to aerobic metabolism. *J. Bact.* 197: 1690-1699. doi: [10.1128/JB.02611-14](https://doi.org/10.1128/JB.02611-14). *Chosen as a “Spotlight” article by Journal Editors.
66. Peters, J.W., G.J. Schut, **E.S. Boyd**, D.W. Mulder, E.S. Shepard, J.B. Broderick, P.W. King, M.W.W. Adams. 2015. [FeFe]- and [NiFe]-hydrogenase diversity, mechanism, and maturation. *Biochim. Biophys. Acta - Molecular Cell Research*. 1853: 1350-69. doi: [10.1016/j.bbamcr.2014.11.021](https://doi.org/10.1016/j.bbamcr.2014.11.021).
65. Amenabar, M., M.R. Urschel, and **E.S. Boyd***. 2015. Metabolic and taxonomic diversification in continental magmatic hydrothermal systems. *In* *Microbial Evolution under Extreme Conditions* ed. Corien Bakermans, De Gruyter. ISBN: 978-3-11-033506-4. *Corresponding author.
64. **Boyd***, **E.S.**, T.L. Hamilton, J.R. Havig, R.K. Lange, J.W. Peters, M.L. Skidmore and E.L. Shock. 2014. Chemolithotrophic primary production in a subglacial ecosystem. *Appl. Environ. Microbiol.* 80: 6146–6153. doi: [10.1128/AEM.01956-14](https://doi.org/10.1128/AEM.01956-14). *Corresponding author. Chosen for a “Cover Image”.
63. **Boyd, E.S.**, K. Thomas, Y. Dai, J.M. Boyd, and F.W. Outten. 2014. The interplay between oxygen and Fe-S cluster biogenesis: Insights from the Suf pathway. *Biochemistry*. 53: 5834–5847. doi: [10.1021/bi500488r](https://doi.org/10.1021/bi500488r).

62. **Boyd, E.S.**, T.L. Hamilton, K.D. Swanson, A.E. Howells, B.K. Baxter, J.M. Meuser, M.C. Posewitz, and J.W. Peters. 2014. [FeFe]-hydrogenase abundance and diversity along a vertical redox gradient in Great Salt Lake, USA. *Int. J. Mol. Sci.* 15: 21947-66. doi: 10.3390/ijms151221947.
61. **Boyd***, **E.S.**, G. Schut, M.W.W. Adams, and J.W. Peters. 2014. Hydrogen metabolism and the evolution of respiration. *Microbe*. 9: 361-367. doi: 10.1128/microbe.9.361.1 *Corresponding author.
60. Jia, J., C.L. Zhang, W. Xie, F. Li, J. Wang, S. Wang, H. Dong, W. Li, and **E.S. Boyd***. 2014. Differential temperature and pH controls on the abundance and composition of H-GDGTs in terrestrial hot springs. *Org. Geochem.* 75: 109–121. doi: 10.1016/j.orggeochem.2014.06.009. *Co-corresponding author.
59. Alsop, E.A., **E.S. Boyd**, and J.A. Raymond. 2014. Merging metagenomics and geochemistry to understand how environment shapes biodiversity. *BMC Ecology*. 14: 16. doi: 10.1186/1472-6785-14-16.
58. Gammons, C.H., W. Henne, S.R. Poulson, S.R. Parker, T.B. Johnston, J.E. Dore, and **E.S. Boyd**. 2014. Stable isotopes of dissolved oxygen and dissolved inorganic carbon track biogeochemical processes under ice cover in a shallow, eutrophic lake. *Biogeochem.* 120: 359-379. doi: 10.1007/s10533-014-0005-z.
57. **Boyd, E.S.**, G.J. Schut, J.B. Broderick, M.W.W. Adams, and J.W. Peters. 2014. Origin and evolution of Fe-S proteins and enzymes. *In Iron-Sulfur Clusters in Chemistry and Biology*. ed. Tracey Rouault, De Gruyter. ISBN: 978-3-11-030842-6
56. Hamilton, T.L., E. Koonce, A. Howells, J.R. Havig, T. Jewell, J.R. de la Torre, J.W. Peters, and **E.S. Boyd***. 2014. Competition for ammonia influences the structure of chemotrophic communities in geothermal springs. *Appl. Environ. Microbiol.* 80: 653-661. doi: 10.1128/AEM.02577-13 *Corresponding author. Chosen as a “Spotlight” article by Journal Editors.
55. Peters, J.W. and **E.S. Boyd**. 2014. Exploring alternative paths for the evolution of biological nitrogen fixation. *In Biological Nitrogen Fixation*. ed. Frans J. de Bruijn, John Wiley & Sons, Inc. ISBN: *In press*.
54. Reardon, C.L., T.S. Magnuson, **E.S. Boyd**, W.D. Leavitt, D.W. Reed, and G.G. Geesey. 2014. Hydrogenase activity of mineral-associated and suspended populations of *Desulfovibrio desulfuricans* Essex 6. *Microb. Ecol.* 67: 318-326. doi: 10.1007/s00248-013-0308-y.
53. Møller, A.K., T. Barkay, M.A. Hansen, A. Norman, L.H. Hansen, S.J. Sørensen, **E.S. Boyd**, and N. Kroer. 2014. Mercuric reductase genes (*merA*) and mercury resistance plasmids in high Arctic snow, freshwater and sea-ice brine. *FEMS Microbiol. Ecol.* 87: 52-63. doi: 10.1111/1574-6941.12189.
52. D’Adamo, S., R.E. Jinkerson, **E.S. Boyd**, S. Brown, B. Baxter, J.W. Peters, and M.C. Posewitz. 2014. Evolutionary and biotechnological implications of robust hydrogenase activity in a halophilic species of *Tetraselmis* from Great Salt Lake. *PLoS One*. 9: e85812. doi: 10.1371/journal.pone.0085812

51. Liu, Z., J. Müller, T. Li, R.M. Alvey, K. Vogl, N.-U. Frigaard, N.C. Rockwell, **E.S. Boyd**, L.P. Tomsho, S.C. Schuster, P. Henke, M. Rohde, J. Overmann, and D.A. Bryant. 2013. Genomic analysis reveals key aspects of prokaryotic symbiosis in the phototrophic consortium "*Chlorochromatium aggregatum*". *Gen. Biol.* 14: R127. doi: 10.1186/gb-2013-14-11-r127.
50. Mitchell, A.C., M. Lafreniere, M.L. Skidmore, and **E.S. Boyd**. 2013. Influence of bedrock mineral composition on microbial diversity in a subglacial environment. *Geology*. 1: 855-858. doi: 10.1130/G34194.1.
49. **Boyd, E.S.** and J.W. Peters. 2013. New insights into the evolutionary history of biological nitrogen fixation. *Front. Microbiol.* 4: 201. doi: 10.3389/fmicb.2013.00201.
48. Inskeep, W.P., Z. Jay, M. Herrgard, M. A. Kozubal, D. B. Rusch, S.G. Tringe, R. E. Macur, R. dem Jennings, **E.S. Boyd**, J. Spear, F. Roberto and M. Young. 2013. Phylogenetic and functional analysis of metagenome sequence from high-temperature archaeal habitats demonstrate linkages between metabolic potential and geochemistry. *Front. Microbiol.* 4: 95. doi: 10.3389/fmicb.2013.00095.
47. **Boyd, E.S.***, T.L. Hamilton, J. Wang, L. He, and C.L. Zhang. 2013. The role of tetraether lipid composition in the adaptation of thermophilic archaea to acidity. *Front. Microbiol.* 4: 62. doi: 10.3389/fmicb.2013.00062. *Corresponding author.
46. Hamilton, T.L., J.W. Peters, M.L. Skidmore, and **E.S. Boyd***. 2013. Molecular evidence for an active endogenous microbiome beneath glacial ice. *ISME J.* 7: 1402-4012. doi: 10.1038/ismej.2013.31. *Corresponding author.
45. **Boyd, E.S*** and G.K. Druschel. 2013. The role of intermediate sulfur compounds during the reduction of elemental sulfur under acidic, hydrothermal conditions. *Appl. Environ. Microbiol.* 79: 2061-2068. doi: 10.1128/AEM.03160-12. *Corresponding author.
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3. Do, Y.S., T.M. Schmidt, J.A. Zahn, **E.S. Boyd**, and A.A. DiSpirito. 2003. Role of *Rhodobacter* sp. PS9, a purple non-sulfur photosynthetic bacterium isolated from an anaerobic swine waste lagoon involved in odor remediation. *Appl. Environ. Microbiol.* 69: 1710-1720. doi: 10.1128/AEM.69.3.1710-1720.2003.
2. Choi, D.-W., R.C. Kunz, **E.S. Boyd**, J.D. Semrau, W.E. Antholine, J.-I. Han, J.A. Zahn, J.M. Boyd, A.M. de la Mora, and A.A. DiSpirito. 2003. Isolation of the membrane-associated methane monoxygenase and the NADH:quinone oxidoreductase complex from *Methylococcus capsulatus* Bath. *J. Bacteriol.* 185: 5755-5764. doi: 10.1128/JB.185.19.5755-5764.2003.
1. Zahn, J.A., J. Anhalt, and **E.S. Boyd**. 2001. Evidence for transfer of tylosin and tylosin-resistant bacteria in air from swine production facilities using sub-therapeutic concentrations of tylan in feed. *J. Anim. Sci.* 79:189.

Other Publications/Products

5. Marvin-DiPasquale, M.C., D.L. Naftz, D.P. Krabbenhoft, M. Anderson, **E.S. Boyd**, G.R. Aiken, C.H. Conaway, J.M. Ogorek, B.A. Poulin, C.C. Fuller, R.C. Antweiler, and C.A. Stricker. 2017. Data for Biogeochemical and Physical Processes Controlling Mercury Methylation and Bioaccumulation in Lake Powell, Glen Canyon National Recreation Area, Utah and Arizona, 2014-2015: U.S. Geological Survey data release (<https://doi.org/10.5066/F74X560J>).
4. Druschel, G., G. Dick, and **E. Boyd**. 2016. *2014 Geomicrobiology and Geochemistry Workshop Report*. doi: 10.6084/m9.figshare.3083524. (https://figshare.com/articles/GMG_final_report_for_distribution_pdf/3083524)
3. Achenbach, L., J. Bailey, R. Barnes, J. Baross, C. Bertka, P. Boston, **E. Boyd**, M. Cable, I. Chen, F. Ciesla, D. Des Marais, S. Domagal-Goldman, J. Elsila Cook, A. Goldman, N. Hud, P. Laine, K. Lloyd, T. Lyons, V. Meadows, L. Mix, S. Mojzsis, U. Muller, M. Pasek, M. Powell, T. Robinson, F. Rosenzweig, B. Schmidt, B. Seelig, G. Springsteen, S. Vance, P. Welander, L. Williams, R. Wordsworth (2015). *NASA Astrobiology Strategy 2015*. (https://nai.nasa.gov/media/medialibrary/2015/10/NASA_Astrobiology_Strategy_2015_151008.pdf).

2. **Boyd, E.,** Cornish, J. et al. (2013) *Living Colors: Microbes of Yellowstone National Park*. Yellowstone Association. (Yellowstone National Park guide book)
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Invited Conference Presentations

Yellowstone Volcano Observatory. Source and Fate of Hydrogen in Yellowstone Hot Springs. Mammoth, Wyoming, May, 2018.

Earth-Life Science Institute (ELSI) International Symposium: Building Bridges from Earth to Life. Electron Bifurcation. Tokyo, Japan, January, 2018.

American Society for Microbiology. Oxygen, Sulfur, and the Evolution of Thermoacidophiles. New Orleans, Louisiana, June, 2017.

International Geobiology School. Oxygen and the Evolution of Acidophiles. Catalina Island, California, July, 2016.

International Geobiology School. New Insights into the Evolutionary History of Nitrogenase. Catalina Island, California, July, 2016.

Federation of American Society for Experimental Biology (FASEB) Trace Elements in Biology and Medicine. Microbial Fe(III) oxide reduction potential in Chocolate Pots, Yellowstone National Park. Big Sky, Montana, June, 2016.

Gordon Research Conference-Geobiology. On the Origin and Evolution of Acidophiles. Galveston, Texas, February, 2016.

Gordon Research Conference-Cell Biology of Metals. New Insights into the Evolutionary History of Nitrogenase. West Dover, Vermont. July, 2015.

Astrobiology Science Conference. Potential Sources of H₂ Supporting Subglacial Hydrogenotrophic Methanogens. Chicago, Illinois. June, 2015.

Astrobiology Science Conference. Hydrogen and the Evolution of Modern Respiration. Chicago, Illinois. June, 2015.

Center for Dark Energy Biosphere Investigations workshop on Marine Sediment. Preliminary Insights into the Interplay Between Oxygen, Organic Carbon, and Metabolism in North Atlantic Subseafloor Sediment Communities. Los Angeles, California. June, 2015.

American Geophysical Union. Coupled Iron and Sulfur Transformations in Hydrothermal Springs. San Francisco, California. December, 2014.

Microseminar Online (www.microseminar.wordpress.com). Between a Rock and a Cold, Dark, Icy Place: Mineralogical Controls on the Assembly of a Subglacial Microbiome. Online. December, 2014.

NASA Astrobiology Institute Executive Council Meeting. On the Origin and Evolution of Acidophiles. Online. October, 2014.

Center for Dark Energy Biosphere Investigations workshop on Biogenergetics and Subsurface Metabolisms. Mineralogical Controls on Subglacial Microbiome Assembly. Los Angeles, California. April, 2014.

University of Hawaii Astrobiology Winter School. The Assembly of a Subglacial Microbiome. Honolulu, Hawaii. January, 2014.

University of Hawaii Astrobiology Winter School. Microbial Diversity of Hot Springs. Honolulu, Hawaii. January, 2014.

Goldschmidt Conference. *Keynote:* Hot Spring Environments as Accessible Portals into the Metabolic Underpinnings of the Deep Hot Biosphere. Florence, Italy. August, 2013.

American Society for Microbiology General Conference. *Young Investigator invited oral presentation.* Phylogenetic Evidence for H₂ Based Electron Bifurcation in Early Life. Denver, Colorado. May, 2013.

NASA Astrobiology Institute Virtual Seminar Series. Integrating Geochemistry and (Meta)Genomics in Geothermal Springs in Yellowstone National Park: Mapping the Functional Limits of Life in Early Earth Analog Environments. October, 2011.

The First International Conference on Geomicrobial Ecotoxicology. Distribution, Diversity, and Activity of Biological Nitrogen Fixation in the Yellowstone Geothermal Complex, Wyoming, USA. Wuhan, China. May, 2011.

NASA Astrobiology Institute Virtual Seminar Series. Nitrogenase Evolution. A Workshop Without Walls on Molecular Paleontology and Resurrection: Rewinding the Tape of Life. November, 2010.

NSF Workshop on Low Temperature Geobiology and Geochemistry. Integrating Geochemistry, Phylogenetics, and Ecological Theory Toward a Predictive Framework Encompassing the Reciprocal Interactions Between Living Organisms and Their Geological Milieu. Washington, D.C., August, 2010.

American Geophysical Union. An Early Origin for Molybdenum-Nitrogenase. San Francisco, CA. December, 2009.

National Academy of Sciences subcommittee on the Origin and Evolution of Life (EOL) meeting. Origin of Biological Nitrogen Fixation. Big Sky, MT, September, 2009.

International Congress on Nitrogen Fixation. Origin and Evolution of Molybdenum-Dependent Nitrogenase. Big Sky, MT, June, 2009.

Joint Air Force Office of Scientific Research/National Renewable Energy Laboratory Biofuels Conference. Bioprospecting for Hydrogenase and Hydrogen-Producing Organisms in Yellowstone National Park. January, 2009.

Invited Institutional Presentations

Arizona State University. High pH environments and the origin of life. April, 2018.

Montana State University. Thermophiles: Windows into life's origins on Earth and elsewhere. April, 2018.

Harvard University. Overcoming Thermodynamic and Biosynthetic Limitations at the Origin of Life. April, 2018.

Dartmouth University. Geobiological Feedbacks and the Evolution of Thermoacidophiles. March, 2018.

Harvard University. New Insights into the Evolution of Nitrogenase. November, 2016.

Arizona State University. Oxygen and the Evolution of Acidophiles. November, 2016.

University of Washington. New Insights into the Evolution of Nitrogenase. December, 2015.

University of Wyoming. Mineralogical Controls on the Assembly of a Subglacial Microbiome. November, 2015.

University of Colorado, Boulder. Mineralogical Controls on the Assembly of a Subglacial Microbiome. March, 2015.

National Renewable Energy Laboratory. New Insights into the Evolutionary History of Nitrogenase. March, 2015.

Colorado School of Mines. On the Origin and Evolution of Acidophily. March, 2015.

Arizona State University. The Origin and Evolution of Acidophily. February, 2015.

Montana State University. Between a Rock and a Cold, Dark, Icy Place: Mineralogical Controls on the Assembly of a Subglacial Microbiome. March, 2014.

Arizona State University. Carbon Transformations in Terrestrial Hydrothermal Ecosystems. March, 2014.

Pennsylvania State University-Lehigh Valley. Yellowstone Through Space and Time: A Guided Tour Through the Evolution of Life. March, 2013.

Arizona State University. The Role of Intermediate Sulfur Species in the Reduction of Elemental Sulfur Under Acidic Hydrothermal Conditions. February, 2013.

Westminster Collage. Identifying Populations Putatively Involved in Hg Biogeochemical Cycling. October, 2012

Arizona State University. Assessing the Relative Importance of Autotrophic and Heterotrophic Metabolisms in High Temperature Ecosystems. February, 2012

Rutgers University. Pattern and Prediction: Integrating Geochemistry and (Meta)genomics in the Geothermal Springs of Yellowstone National Park. December, 2011.

Yunnan University. Examining Microorganisms and Microbial Processes Within a Geochemical Matrix. June, 2011.

Arizona State University. Ecology of Chlorophototrophs in Yellowstone National Park, Wyoming. February, 2011.

University of Free State. Environmental Constraints on Hydrogen (H₂)-Based Metabolisms in Geothermal Springs in Yellowstone National Park (YNP), Wyoming, USA. January, 2011.

Arizona State University. Merging Geochemistry and Phylogenetics Across the Yellowstone Geothermal Complex. Arizona State University School of Earth and Space Exploration. February, 2010.

Montana State University. Subglacial Methanogenesis. January, 2010.

Montana State University. An Early Origin for Molybdenum-Nitrogenase. October, 2009.

East Carolina University. An Early Origin for Molybdenum-Nitrogenase and Implications for Biospheric Redox Evolution. October, 2009.

Arizona State University. Evolutionary Origin and History of the Mo-Dependent Nitrogenase. January, 2009.

Research Grants

Pending Awards (does not include preproposals)

Reductive dissolution of iron sulfides by primitive Archaea. NASA Exobiology and Evolutionary Biology. PI: Eric Boyd. \$564,529 in total funding. 2019-2021.

Influence of tectonics and the habitability of subterranean hydrothermal biospheres. NASA Exobiology and Evolutionary Biology. Co-PI: Eric Boyd, PI: Daniel Colman. \$1,072,048 in total funding. 2019-2021.

Investigating geobiological feedbacks during the evolution of acidophilic microorganisms. National Science Foundation. PI: Eric Boyd. \$372,000 in total funding. 2018-2021.

Current Awards

Linking hydrogen metabolism with primary production in early Earth analogue mineral-supported ecosystems. NASA Earth and Planetary Sciences Graduate Fellowship. PI: Eric Boyd, Co-PI: Melody Lindsay. \$110,000 in total funding. 2016-2018.

The weathering microbiome. University of Wisconsin Microbiome Initiative. Collaborator: Eric Boyd, PI: Eric Roden. \$225,000 in total funding. 2017-2019.

Microbial anabolism in seafloor sediments of the North Atlantic subtropical gyre: carbon vs. phosphorus limitation. NSF Center for Dark Energy Biosphere Investigations (OCE-0939564). Co-PI: Eric Boyd, PI: John Dore. \$69,811 in total funding. 2017-2018.

Assessing a subsurface hydrothermal biosphere in Yellowstone National Park. Montana Space Grant Consortium. PI: Eric Boyd. \$49,752 in total funding. 2017-2018.

The development of a stable isotope probing facility at Montana State University. NASA Early Career Fellowship (15-ECF15-0002). 2016-2017. PI: Eric Boyd. \$98,443 in total funding.

Differentiating Yellowstone's surface and subsurface hydrothermal biospheres using comparative metagenomics. Deep Carbon Observatory's Census of Deep Life. PI: Eric Boyd. \$10,000 in funding for metagenomics sequencing. 2016-2017.

Assessing the abundance and diversity of life in the subsurface hydrothermal biosphere in Yellowstone National Park. American Geophysical Institute-Deep Carbon Observatory. 2016 to 2017. PI: Eric Boyd, \$4,895 in funding for metagenomics sequencing.

Microbe-mineral interactions in glaciated basaltic terrains. NASA Exobiology and Evolutionary Biology (NNX16AJ64G). 2016-2019. Co-I: Eric Boyd, PI: Mark Skidmore. \$467,000 in total funding.

Discovering alkaliphilic hyperthermophilic Archaea: Novel organisms and molecules. Keck Foundation. 2016-2018. Co-PI: Eric Boyd, PI: Brent Peyton. \$2,000,000 in total funding.

Rock-powered life. NASA Astrobiology Institute (NNA15BB02A). 2014-2019. Co-I: Eric Boyd, PI: Alexis Templeton. \$6,952,420 in total funding.

Biological Electron Transfer and Catalysis (BETCY) Energy Frontier Research Center. DOE Basic Energy Sciences. (DE-SC0012518). 2014-2018. Co-PI: Eric Boyd, PI: John Peters. \$10,000,000 in total funding.

Habitability, life detection, and the signatures of life on the terrestrial planets. NASA Astrobiology Institute (NNA13AA94A). 2012-2017. Co-I: Eric Boyd, PI: Clark Johnson. \$9,013,828 in total funding.

Past Awards

Linking bioenergetics and physicochemical environment with the distribution and diversity of hydrogenases in microbial communities supported by geothermally-sourced hydrogen. NASA Exobiology and Evolutionary Biology (NNX13AI11G). 2013-2016. PI: Boyd, Co-I: Tori Hoehler. \$610,695 in total funding.

Biogeochemical and physical processes controlling mercury methylation and bioaccumulation in Lake Powell, Glen Canyon National Recreation Area, Utah. NPS/USGS Water Quality Partnership Program. 2014-2017. Co-PI: Eric Boyd, PI: David Naftz. \$300,000 in total funding.

NEEM basal ice: Assessing the attributes of a cold, deep, dark ecosystem. NSF Office of Polar Programs Arctic Natural Sciences (ARC – 1204223). 2012-2017. Co-PI: Eric Boyd; PI: Mark Skidmore, \$333,341 in total funding.

Primary productivity in Great Salt Lake stromatolites. Utah Division of Forestry, Fire and State Lands.

2014-2015. Co-PI: Eric Boyd, PI: Bonnie Baxter. \$28,357 in total funding.

Defining the interplay between oxygen, organic carbon, and metabolism in subseafloor sediment communities. NSF Center for Dark Energy Biosphere Investigations (OCE-0939564). 2015-2016. PI: Eric Boyd. \$99,360 in total funding.

Mechanistic basis for biological polymer stability, electron transfer and molecular sensing in extreme Environments. Air Force Office of Scientific Research (FA9550-14-1-0147). 2014-2016. Co-I: Eric Boyd, PI: Matthew Posewitz. \$1,500,000 in total funding.

Collaborative research: Combining methods from geochemistry and molecular biology to predict the functions of microbial communities. NSF Low Temperature Geobiology and Geochemistry (EAR – 1123689). 2011-2014. PI: Eric Boyd. \$554,815 in total funding.

Methane cycling in subglacial sediments. NASA Exobiology and Evolutionary Biology Award (NNX10AT31G). 2010-2014. Co-I: Eric Boyd, PI: Mark Skidmore. \$598,000 in total funding.

Toward a holistic and global understanding of hot spring ecosystems: A US-China based international collaboration. NSF Partnerships in International Research and Education (PIRE-0968421). 2010-2015. Named Postdoc: Eric Boyd, PI-Brian Hedlund, \$3,750,000 in total funding.

Subsurface exploration of the heterotrophic underpinnings in Yellowstone hot springs. NSF Center for Dark Energy Biosphere Investigations at University of Southern California. 2013-2014. Co-I: Eric Boyd, PI: John Spear. \$50,000 in total funding.

ETBC: Lipid biomarkers of Archaea in Great Basin Hot Springs: Environmental and genetic controls and implications for microbial functions. NSF Low Temperature Geobiology and Geochemistry (EAR – 1024614). 2010-2013. Co-PI: Eric Boyd, PI-Chuanlun Zhang. \$300,667 in total funding.

Mercury biogeochemistry in Great Salt Lake: The role of microorganisms in methylation. Utah Department of Natural Resources: Forestry, Fire, and State Lands. 2011-2012. Co-I: Eric Boyd, PI-Bonnie Baxter. \$32,832 in total funding.

The evolution of biological metal utilization: Integration of genomic and geologic knowledge. NASA Astrobiology Institute Director's Discretionary Fund. 2010-2011. Co-I: Eric Boyd, PI: Chris Dupont. \$40,000 in total funding.

Methanogenic activity in subglacial ecosystems: Molecular insight into life-sustaining processes in extraterrestrial environments. NASA Astrobiology Institute Postdoctoral Fellowship. 2009-2010. PI: Eric Boyd. \$130,000 in total funding.

Methanogenesis in subglacial environments – Biosignatures of extraterrestrial life. NASA Montana Space Grant Consortium. 2007-2008. Named Postdoc: Eric Boyd, PI - A. Mitchell. \$46,000 in total funding.

Ad Hoc Journal Reviews

Applied and Environmental Microbiology, Aquatic Geochemistry, Bergey's Manual of Systematics of Archaea and Bacteria, Biogeochemistry, Biogeosciences, Bioresource Technology, Chemical Geology, Chemosphere, Environmental Microbiology, Environmental Research Letters, Environmental Science and Technology, Extremophiles, FEBS Journal, FEMS Microbiology Letters, FEMS Microbiology Ecology, Folia Microbiologica, Frontiers in Microbiology, Geobiology, Geochemica Cosmochemica Acta, Hydrocarbon and Lipid Microbiology Protocols, Journal of Biophysical Research – Biosciences, Journal of Cytometry, Journal of Glaciology, Journal of Marine Science, International Society for Microbial Ecology Journal, Microbial Ecology, Molecular Ecology, Nature Communications, Nature Geoscience, Organic Geochemistry, Polar Research, PLoS One, PLoS Genetics, Proceedings of the National Academy of Sciences, Research in Microbiology, Science, Scientifica, Trends in Microbiology

Ad Hoc Grant Reviews

Breakout Labs, Chilean Antarctic Institute (INACH), Czech Science Foundation, French National Research Agency, Icelandic Research Fund, National Science Foundation, French Aix-Marseille, NASA Exobiology and Evolutionary Biology Program, NASA Habitable Worlds, NASA Planetary Protection Program, Netherlands Space Office, New Zealand Ministry of Business, Innovation & Employment, Norwegian Research Council, University of Nebraska.

Postdoctoral Scientists/Senior Scientists Supervised/Mentored

<i>Name</i>	<i>Current position</i>
Scott Montross (former)	Exxon-Mobil, Houston, Texas
Zoë Harold (former)	Postdoc at University of Nevada-Las Vegas
Luke McKay (former)	Postdoc at Montana State University
Wei Xi (former)	Postdoc at Montana State University
Lewis Ward (former)	Agouron Institute Postdoctoral Fellow at Harvard University
Shaomei He (current)	Postdoc at University of Wisconsin-Madison
John Dore (current)	Assistant Research Professor at Montana State University
Dan Colman (current)	Assistant Research Professor at Montana State University
Maximiliano Amenabar (current)	Postdoc at Montana State University

Graduate Students Supervised/Mentored

<i>Name</i>	<i>Current position</i>
Trinity Hamilton (former; Ph.D.)	Assistant Professor at University of Cincinnati
Matthew Urschel (former; Ph.D.)	Postdoc at Rensselaer Polytechnic Institute
Mary Burgess (former; M.S.)	Staff Scientist at Centers for Disease Control
Maximiliano Amenabar (former; Ph.D.)	Postdoc at Montana State University
Laura Bueter (former)	Currently on a leave of absence Montana State University
Erik Anderson (current)	M.S. student at Montana State University
Melody Lindsay (current)	Ph.D. student at Montana State University
Nathan Fortney (current)	Ph.D. student at University of Wisconsin-Madison
Saroj Poudel (current)	Ph.D. student at Montana State University
Eric Dunham (current)	Ph.D. student at Montana State University
Elizabeth Fones (current)	Ph.D. student at Montana State University

Undergraduate/High School Student Researchers Supervised/Mentored

<i>Name</i>	<i>Current Position/Affiliation</i>
William Leavitt	Assistant Professor at Dartmouth College

Trevor Beard	Brewer at 406 Brewery
Rachel Lange	NSF Graduate Fellow at University of Washington
Alta Howells	Doctoral student at Arizona State University
Laura Bueter	Doctoral student at Montana State University
Ambrien Rising Sun	Unknown
Jade Carter	Bachelor of Science student at Great Falls College
Emma Murter	Medical receptionist
Jayne-Feyhl Buska	NSF Graduate Fellow at University of Southern California
Joshua Thiel	Medical (M.D.) student at University of Washington
Heather Rosler	High school student from Salish-Kootenai Reservation
Katelyn Graham	High school student from Salish-Kootenai Reservation
Rebecca Cook	High School student from Northern Cheyenne Reservation
Marj Shinn	Montana State University Medical Sciences Program
Cade Comstock	Eyecare specialist
Madison Bautista	B.S., Montana State University (current position, unknown)
Libby Desch	B.S., Montana State University (current position, unknown)
William Neo	B.S., Montana State University (current position, unknown)
Ezgi Cetin	Laboratory Technician, Turkey
Jacob Sax	B.S., Montana State University (current position, unknown)
C. Andrew Dyson	B.S., Montana State University (current position, unknown)
Kaitlin Wilkins	Undergraduate student at Montana State University
Ticha Padget-Stewart	Undergraduate student at Montana State University
Annette Harnish	Intern at Cascadia Research Collective
Matthew Selensky	Graduate Student at Northwestern University
Mariah Friedlander	Receptionist at Salish Kootenai College
Evan Bilbery (current)	Undergraduate student at Montana State University
Maria Clara Fernandes (current)	Postbaccalaureate student at Montana State University
Anna Mounsey (current)	Undergraduate student at Montana State University
Rudi Lien (current)	Undergraduate student at Montana State University
Kirina Amada (current)	Undergraduate student at Montana State University

Teaching Experience / Guest Lectures

Scientific Proposal Writing (BIOM 591). Instructor. Montana State University, Bozeman, Montana. 7-11 students. Overall Teaching Evaluation: 4.40/5.00 (Summer 2016), 4.17/5.00 (Summer 2017).

General Microbiology (BIOM 360). Instructor. Montana State University, Bozeman, Montana. 95-120 students. Overall Teaching Evaluation: 4.33/5.00 (Fall, 2014), 4.61/5.00 (Spring, 2015), 4.09/5.00 (Fall, 2015), 4.24/5.00 (Spring, 2016), 4.46/5.00 (Fall, 2016), 4.34/5.00 (Spring, 2017), 4.68/5.00 (Fall, 2017).

Precambrian Biosphere (BIOM 591). Instructor. Montana State University, Bozeman, Montana. 8 students. Overall Teaching Evaluation: 4.70/5.00 (Fall, 2015), T.B.D./5.00 (Fall, 2017).

Capstone (MB 494). Instructor. Montana State University, Bozeman, Montana. 5-8 students. No Assessment (Spring, 2015; Spring, 2017).

Extreme Microbiology of Yellowstone (HONR 291). Guest lecturer. Montana State University, Bozeman, Montana. 7 students. No Assessment (November, 2016).

Thermal Biology in Yellowstone National Park (LRES 557-MB 547-01). Guest lecturer. Montana State University, Bozeman, Montana. 12-20 students. No Assessment (June, 2014; June, 2015; June, 2016).

Ecosystem Biogeochemistry and Global Change (ENSC 468/568). Guest lecturer. Montana State University, Bozeman, Montana. 25 students. No Assessment (February, 2016. February, 2017).

Introduction to Biotechnology class (BIOB105). Guest lecturer. Montana State University, Bozeman, Montana. 25 students. No Assessment (November, 2015).

Astrobiology Winter School. Guest Lecturer. University of Hawaii, Honolulu, Hawaii. 20 students. No Assessment (January, 2014).

International Geobiology Course. Course lecturer on bioinformatics/phylogenics. University of Southern California/California Institute of Technology, Pasadena, California. 16 students. No Assessment (June 2013).

Astrobiology (CHEM 350). Guest lecturer. Montana State University, Bozeman, Montana. 14-16 students No Assessment (October, 2013; October, 2014; October, 2015; October, 2016).

Introductory Chemistry (CHEM 121). Instructor. Montana State University, Bozeman, Montana. 292 students. Overall Teaching Evaluation: 3.67/5.00 (Spring, 2012).

Introductory Microbiology (MB 101). Laboratory teaching assistant. Montana State University, Bozeman, Montana. 120 students. No Assessment (Spring, 2014).

Microbial Physiology and Genetics (Microbiology 320). Lecture teaching assistant. Iowa State University, Ames, Iowa. 20 students. No Assessment (Spring, 2003).

Community Education and Outreach (Laboratory or Field-Based)

2017-present Partnership with Salish Kootenai College (Pablo, MT) to provide internship opportunities for recent graduates of the tribal college. Contact: Christina Rush

2017 Field trip to Yellowstone for 2017 CRISPR conference attendees. Contact: Blake Wiedenheft

2014-present MSU Office of International Programs Guest Lecturer. Contact: Janelle Rasmussen

2014 BRIDGES Program. Contact: Amy Stix

2012-2017 Montana Apprenticeship Program. Contact: Amy Stix

2012-2014 Ecology Project International Field Science Program. Contact: Erin Clark

2012-2014 Pennsylvania State University CHANCE Conservation and Education Program. Contact: Dr. Jacqueline McLaughlin

2011-2014 Headwaters Academy. Contacts: Amy Williams, Sam Francis

2011-2012 Boy Scouts of America. Contact: Stanley Bates

2011-2012 University of Michigan Summer Geobiology Course. Contact: Dr. Greg Dick

2010-present NASA Astrobiology Institute Executive Council. Contact: Dr. Penny Boston

2010-2012 Princeton University Fall Geobiology Course. Contact: Dr. Tullis Onstott

2009 Clemson University Yellowstone Ecology Course. Contact: Dr. Tamara McNealy

2006-present Montana Science Teachers Association. Contact: Christine Smith

2004-2013 Montana Outdoor Science School. Contact: Joshua Theurer
2004 Teton Outdoor Science School. Out of Business

Professional Development

2017

Participant. Indigenous Mentoring Program training program. Bozeman, Montana, USA. January to August, 2017.

High School Teacher Workshop Organizer. The cryosphere: Ice sheets, glaciers and their ecosystems. Bozeman, Montana, USA. June, 2017.

Conference Session Co-organizer. International Association of Volcanology and Chemistry of the Earth's Interior. Microbial activity at extreme chemical-physical conditions in volcanic-hydrothermal environment: Adaptations and effects on fluid geochemistry. Portland, Oregon, USA. August, 2017.

Conference Session Co-organizer. Astrobiology Science Conference. Life without light: new developments and perspectives in chemolithotrophic metabolism and its geochemical signatures. Phoenix, Arizona, USA. April, 2017.

Conference Session Co-organizer. Astrobiology Science Conference. Life without light: new developments and perspectives in chemolithotrophic metabolism and its geochemical signatures. Phoenix, Arizona, USA. April, 2017.

Conference Session Co-organizer. Astrobiology Science Conference. Reaction kinetics, thermodynamics and habitability. Phoenix, Arizona, USA. April, 2017.

2015

Conference Co-organizer. Astrobiology Science Conference. Chicago, Illinois, USA. June, 2015.

Conference Session Co-organizer. Astrobiology Science Conference. The habitability of water-rock-supported ecosystems. Chicago, Illinois, USA. June, 2015.

2014

Conference Session Co-organizer. American Geophysical Union. (Bio)geochemical cycling in extreme environments (San Francisco, California, USA. December, 2014.

Conference Session Co-organizer. Goldschmidt Conference. From genes to geochemistry: Integrating environmental and biological datasets to unearth novel microbial metabolisms and chemical processes. Sacramento, California, USA. June, 2014.

Participant. NSF C-DEBI Limits to life workshop. Redondo Beach, California, USA. April, 2014.

Participant. NSF C-DEBI Bioenergetics and subsurface metabolism workshop. University of Southern California, Los Angeles, California, USA. April, 2014.

2013

Participant. Astrobiology roadmap strategy document meeting. Wallops Island, Virginia, USA. June, 2013.

Conference Session Co-organizer. American Geophysical Union. Windows into to the deep subsurface biosphere: Coupled geochemical and biological investigations of terrestrial hot spring ecosystems. San Francisco, California, USA. December, 2013.

2012

Participant. Future Directions in Low Temperature Geobiology and Geochemistry workshop. Carnegie Institution of Washington. Washington, District of Columbia, USA. August, 2010.

Conference Session Co-organizer. American Geophysical Union. Integrating geochemical and biological datasets to predict the response of microbial communities to a changing environment. San Francisco, California, USA. December, 2012.

Conference Session Co-organizer. Astrobiology Science Conference. Pattern and prediction: Integrating energetics, geochemistry, and genetics in the investigation of early Earth and extraterrestrial analog environments Atlanta, Georgia, USA. April, 2012.

2011

Conference Co-organizer. Thermophiles. Big Sky, Montana, USA. September, 2011.

Participant. NSF C-DEBI limits to life workshop. Redondo Beach, California, USA. May, 2011.

2010

Conference Session Co-organizer. NASA Astrobiology Science Conference. Signatures of Earth's geologic history in the genomic record: are they there? Houston, Texas, USA. April, 2010.

Conference Co-organizer. NASA Astrobiology Institute Workshop without Walls on Molecular Paleontology and Resurrection: Rewinding the Tape of Life. Virtual. November, 2010.

2008

Participant. Future Directions of NASA Astrobiology Institute Research workshop. Tempe, Arizona, USA. May, 2008.

Professional Affiliations

2013-present Geological Society of America
2012-present National Association of Biological Teachers
2010-present NASA Astrobiology Institute's Origin of Life Focus Group
2009-present American Geophysical Union
2003-present American Society of Microbiology