David Emerson - Curriculum Vitae

Senior Research Scientist:
Bigelow Laboratory for Ocean Sciences
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Education:

1981 B.A. Human Ecology, College of the Atlantic, Bar Harbor, ME.

1989 Ph.D, Microbiology, Cornell University, Ithaca NY
Minors: Biochemistry & Genetics
Advisor: William C. Ghiorse

Thesis Title: Ultrastructural organization, chemical composition, and manganese-oxidizing properties of the sheath of Leptothrix *discophora* SP-6.

Professional Experience:

1984-89 Teaching & Research assistant, Cornell University, Ithaca, NY.

1989-1991 Research Associate, Center for Microbial Ecology, Michigan State University, East Lansing, MI

1991-1992 Visiting Research Associate, Dept of Microbial Ecology, Institute of Biological Sciences, Aarhus University, Aarhus, Denmark, worked in the group of Niels Peter Revsbech, learning microelectrode construction and studying a microbial iron oxidizing community.

1992-96 Research Associate, Center for Microbial Ecology, MSU

1996-2007 Research Scientist, American Type Culture Collection, Manassas, VA.
1996-2008 Affiliate Faculty, Biological Sciences, George Mason University

2007- Senior Research Scientist, Bigelow Laboratory
2010- Research Scientist, Colby College, Waterville, ME

Professional Societies:

American Society for Microbiology
American Association for the Advancement of Science
American Geophysical Union

Expeditions:

Sept., 1988, Investigation of iron bacteria at hydrothermal vents, Loihi Seamount, HI. R/V *Moana Wave*; DSV *Pisces* V.

April, 1998, Investigation of iron bacteria at hydrothermal vents, Guaymas Basin, Gulf of California and 21°N, Pacific Ocean, R/V *Atlantis*, DSV *Alvin*, operated by Woods Hole Oceanographic Institution.

October, 1998, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. DSV *Pisces V*

December, 2003, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. DSV *Pisces V*

June, 2004, Investigation of Soufriere hotsprings, St. Lucia, W.I. Collected samples of various hydrothermal fluids and high temperature microbial Fe-mat samples.

October, 2004 , Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. DSV *Pisces*

September, 2005. An exploration of Banded Iron Formations in South Africa, with Dr. Nic Beukes, University of Johannesburg.

October-November, 2006, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. RV*Melville*/ ROV *Jason2*.

October, 2007, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. RV *Kilo Moana*/ ROV *Jason2*

September - October, 2008, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. RV *Thomas T Thompson*/ ROV *Jason2*

September - October, 2009, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents, Loihi Seamount, HI. RV *Kilo Moana*/ ROV *Jason2*. Co-chief scientist.

October – November, 2012, Investigation of lithotrophic iron-oxidizing bacteria at hydrothermal vents & testing a new microbial mat sampler, Mid-Atlantic Ridge, RV *Knorr*/ROV *Jason2*.

March, 2013, Investigation of lithotrophic iron-oxidizing communities at Loihi Seamount, HI. RV *Thomas T Thompson*/ROV *Jason2*/AUV *Sentry*

July, 2014, Nine day visit to the Toolik Field Station NSF Long-Term Ecological Research Station, 69°75' N on the North Slope of the Brooks Range, Alaska to investigate iron-cycling microbes.

November, 2014, Ring of Fire – Ironman, 22 day research cruise to investigate submarine volcanos along the Mariana Forearc, Guam. RV *Roger Revelle*/ROV *Jason 2*

May, 2015, Visiting scientist IPGP, Paris France, month-long visit to work with colleagues on a project related to the discovery of Fe-oxidizing bacteria at the Mid-Atlantic Ridge.

Publications:

Chan, C.S., S.M. McAllister, A.H. Leavitt, Glazer, B.T., and D. Emerson. 2016. The architecture of iron microbial mats reflects the adaptation of chemolithotrophic iron oxidation in freshwater and marine environments. Frontiers in Microbiology 7:796. Doi: 10.3389/fmicb.2016.00796

Chan, C.S., D. Emerson, and G.W. Luther III. 2016. The role of microaerophilic Fe-oxidizing microorganisms in producing banded iron formations. Geobiology. Doi: 10.111/gbi.12192

McBeth, J.M., and D. Emerson. 2016. In situ microbial community succession on mild steel in estuarine and marine environments: exploring the role of iron-oxidizing bacteria. Frontiers in Microbiology. 7:767. Doi: 10.3389/fmicb.2016.00767.

Henri, P., C. Rommevaux-Jestin, A. Godfroy, F. Lesongeur, A. Mumford, D. Emerson, B. Menez. 2016. Structural iron(II) of basaltic glass as an energy source for Zetaproteobacteria in an abyssal plain environment off the Mid-Atlantic Ridge. Frontiers in Microbiology. 6:1518 doi: 10.3389/fmicb.2015.01518

Emerson, D. 2016. The irony of iron – biogenic iron oxides as an iron source to the ocean. Frontiers in Microbiology. 6:1502 doi: 10.3389/fmicb.2015.01502

Emerson, D., J. Scott, J. Benes, and W.B. Bowden. 2015. Microbial iron oxidation in the Arctic tundra and the implications for biogeochemical cycling. Applied and Environmental Microbiology. 81:8066-8075. DOI:10.1128/AEM.02832-15

Sanders, J.G., A.C. Beichmann, J. Roman, J.J. Scott, D. Emerson, J.J. McCarthy, and P.R. Girguis. 2015. Baleen whales host a unique gut microbiome with similarities to both carnivores and herbivores. Nature Communications. 6:8285 DOI: 10.1038/nrcommms9285

Barco, R.A, D. Emerson, J.B. Sylvan, B.N. Orcutt, M.E. Jacobson-Meyers, G.A. Ramirez, J. D. Zhong, and K.J. Edwards. 2015. The proteomic profile of an obligate iron-oxidizing chemolithoautotroph reveals new insight into microbial iron oxidation. Applied and Environmental Microbiology. 81:5927-5937. DOI:10.1128/AEM.01374-15

Sanchez-Alberola, N., S. Campoy, D. Emerson, J. Barbe, and I. Erill. 2015. A SOS regulon under control of a non-canonical LexA-binding motif in the Betaproteobacteria. J. Bacteriol. 197:2622-2630.

Scott, J.A., J.A. Brier, G.W. Luther III, and D. Emerson. 2015. Characterization of microbial iron mats at the Mid-Atlantic Ridge and evidence that Zetaproteobacteria are

unique to marine iron-oxidizing habitats. PLoS ONE. 10(3): 30119284. Doi: 10.1371/journal.pone.0119284.

Emerson, D., and de Vet, W. 2015. The role of iron-oxidizing bacteria in engineered water ecosystems. Journal of the American Water Works Association. http://dx.doi.org/10.5942/jawwa.2015.107.0004

Field, E.K., A. Sczyrba, A.E. Lyman, C.C. Harris, T. Woyke, R. Stepanauskas, and D. Emerson. 2015. Single cell genomics reveals metabolic potential of uncultivated marine Zetaproteobacteria at Loihi Seamount. ISME J. 9:857-870.

MacDonald, D.J., A.J. Findlay, P. Hredzak-Showalter, S.M. McAllister, S.T. Krepski, S.G. Cone, J. Scott, S.K. Bennett, C.S. Chan, D. Emerson, and G.W. Luther III. 2014. Using in situ voltammetry as a tool to search for iron oxidizing bacteria: from fresh water wetlands to hydrothermal vent sites. Environmental Science: Processes and Impacts. 16:2117-2126.

Fleming, E.J., I. Cetinic, C.S. Chan, D.W. King, and D. Emerson. 2014. Ecological succession among Fe-oxidizing bacteria. ISME J. 8:804-815.

Lee, J.S., J.M. McBeth, R.I. Ray, B.J. Little, and D. Emerson. 2013. Iron cycling at corroding carbon steel surfaces. Biofouling: The Journal of Bioadhesion and Biofilm Research. 29: 1243-1252.

Emerson, D., E. Field, O. Chertkov, K.W. Davenport, L. Goodwin, C. Munk, M. Nolan, and T. Woyke. 2013. Comparative genomics of freshwater Fe-oxidizing bacteria: Implications for physiology, ecology, and systematics. Frontiers in Microbiology. 4:254. Doi: 10.3389/fmicb.2013.00254 (17 pages)

Krepski, S.T, D. Emerson, P.L. Hredzak-Showalter, G. Luther III, and C.S. Chan. 2013. Morphology of biogenic iron oxides records microbial physiology and environmental conditions: towards interpreting iron microfossils. Geobiology. 11:457-471.

Fleming, E.J., R.E. Davis, S.M. McAllister, C.S. Chan, C.L. Moyer, B.M. Tebo, and D. Emerson. 2013. Hidden in plain sight: discovery of sheath-forming, Fe-oxidizing Zetaproteobacteria at Loihi Seamount. FEMS Microbiological Ecology. 85:116-127. (Selected as Chief Editors Pick for this issue)

McBeth, J.M., E.J. Fleming, and D. Emerson. 2013. The transition from freshwater to marine iron-oxidizing lineages along a salinity gradient on the Sheepscot River, Maine USA. Environ. Microbiol. Reports. 5:453-463.

Emerson, D. W. Bellows, J.K. Keller, A. Sutton_Grier, and P.J. Megonigal. 2013. Anaerobic metabolism in tidal freshwater wetlands: II. Effects of plant removal on Archaeal microbial communities. Estuaries and Coasts. 36:471-481.

Emerson, D. 2012. Biogeochemistry and microbiology of microaerobic Fe(II) oxidation. Biochem. Soc. Trans. 40: 1211-1216.

Brier, J.A., D. Gomez-Ibanez, E. Reddington, J. Huber, and D. Emerson. 2012. A precision multi-sampler for deep-sea hydrothermal microbial mat studies. Deep-Sea Res. Part I. 70:83-90. Doi: 10.1016/j.dsr.2012.10.006

Roden, E.E., J.M. McBeth, M. Blothe, E.M. Percak-Dennett, E.J. Fleming, R.R. Holyoke, G.W. Luther, and D. Emerson. 2012. The microbial ferrous wheel in a neutral-pH groundwater iron seep. Front. Microbiol. 3:172. Doi:10.3389/fmicb.2012.00172. (18 pages)

Singer E, Emerson D, Webb EA, Barco RA, Kuenen JG, et al. 2011. *Mariprofundus ferrooxydans* PV-1 the First Genome of a Marine Fe(II) Oxidizing Zetaproteobacterium. PLoS ONE 6(9): e25386. doi:10.1371/journal.pone.0025386 (48 cites)

McAllister, S.M., R.E. Davis, B.M. Tebo, J. M. McBeth, D. Emerson, and C.L. Moyer. 2011. Biodiversity and emerging biogeography of the neutrophilic iron-oxidizing *Zetaproteobacteria.* Appl. Environ. Microbiol. 77:5445-5457. (Included Cover Image)

Edwards, K.J., B.T. Glazer, O.J. Rouxel, W. Bach, D. Emerson, R.E. Davis, B.M. Toner, C.S. Chan, B.M. Tebo, H. Staudigel, and C.L. Moyer. 2011. Ultra-diffuse hydrothermal venting supports Fe-oxidizing bacteria and massive umber deposition at 5000m off Hawai'i. ISME J. 5:1748-1758.

Fleming, E.J., A.E. Langdon, M. Martinez-Garcia, R. Stepanauskas, N. Poulton, D. Masland, and D. Emerson. 2011. What's new is old: resolving the identity of Leptothrix ochracea using single cell genomics, pyrosequencing and FISH. PLoS ONE 6(3): e17769. Doi:10.1371/journal.pone.0017769. (10 pages)

Roden, E.E., and D. Emerson. 2011. Crystal Ball – Rust never sleeps: a new wave for neutral-pH Fe redox cycling. Environ. Microbiol. Reports. 3:21-23

McBeth, J.M., B.J. Little, R.I. Ray, K.M. Farrar, and D. Emerson. 2011. Neutrophilic iron-oxidizing "*Zetaproteobacteria*" and mild steel corrosion in nearshore marine environments. Applied and Environmental Microbiology. 77:1405-1412. (Included cover image)

Chan, C. S., S. C. Fakra, D. Emerson, E.J. Fleming, and K.J. Edwards. 2011. Lithotrophic iron-oxidizing bacteria produce organic stalks to control iron mineral growth: implications for biosignature formation, ISME J. 5:717-727.

Emerson, D., E. Fleming, and J. McBeth. 2010. Iron-oxidizing bacteria: an environmental and genomic perspective. Ann. Rev. Microbiol. 64:561-583.

Emerson, D, and C. Moyer. 2010. Microbiology of Seamounts: Common patterns observed in community structure. Oceanography. 23: 148-163.

Emerson, D. 2009. Potential for iron-reduction and iron-cycling in iron oxyhydroxide-rich mats at Loihi Seamount. Geomicrobiology J. 26:639-647.

Chan, C. S., Fakra, S, Edward, D.C., Emerson, D, and Banfield, J.F. 2009. Iron oxyhydroxide mineralization on microbial polymers. Geochimica Cosmochimica Acta. 73:3807-3818.

Emerson, D, H. Liu, L. Agulto, and L. Liu. 2008 Identification and characterization of bacteria in the 21st century. Bioscience. 58: 925-936.

Druschel, G.K., D. Emerson, R. Sutka, P. Suchecki, and G.W. Luther. 2008. Low oxygen and chemical kinetic constraints on the geochemical niche of neutrophilic iron (II) oxidizing microorganisms. Geochemica Cosmochimica Acta. 72:3358-3370.

Cleland, D, P. Krader, and D. Emerson. 2008. Use of the DiversiLab Repetitive Sequence-Based PCR system for Genotyping and Identification of Archaea. J. Microbiol. Meth. 73:172-178.

Ma, S, Luther, G. W. Luther, J. Keller, A.S. Madison, E. Metzger, J.P. Megonigal, and D. Emerson. 2008. Solid-state Au/Hg microelectrode for the investigation of Fe and Mn cycling in freshwater wetland: implications for methane production. Electroanalysis. 20:233-239.

Weiss, J.V., Rentz, J.A., Plaia, T, Neubauer, S.C., Floyd, M.M., Lilburn, T., Bradburne, C. Megonigal, J.P., and D. Emerson. 2007. Identification of diverse neutrophilic Fe(II)-oxidizing bacteria isolated from the rhizosphere of wetland plants and description of *Ferritrophicum radicicola* gen. nov. sp. nov., and *Sideroxydans paludicola* sp. nov. Geomicrobiology J. 24:559-570.

Rentz, J.A., C. Kraiya, G.W. Luther III, and D. Emerson. 2007 Control of ferrous iron oxidation within circumneutral microbial iron mats by cellular activity and autocatalysis. Environ. Sci. Technol. 41:6048-6089.

Emerson, D., J.A. Rentz, T.G. Lilburn, R.E. Davis, H. Aldrich, C. Chan, and C.L. Moyer. 2007. A novel lineage of proteobacteria involved in formation of marine Fe-oxidizing microbial mat communities . PLOSOne. 2(8): e667. doi:10.1371/journal.pone.0000667 (9 pages)

Chan, C.S., D. Emerson, S. Fakra, and K.J. Edwards. Formation of biomineralized stalks by a marine iron-oxidizing bacterium. Geochim. Cosmochim. Acta. 71:A158-A158

Edwards, K.J., C.L. Moyer, C. Chan, D. Emerson, and G. Horn. 2007. The Loihi Seamount microbial observatory: an extremely common deep-sea habitat for Fe-oxidizing bacteria. Geochim. Cosmochim. Acta. 71: A249-A249.

Glazer, B.T., R. A. Briggs, D.B. Nuzzio, Z. Heshiki, K.J. Edwards, C.L. Moyer, D. Emerson, B.M. Tebo, and H. Staudigel. 2007. In situ redox chemistry of hydrothermal fluids at the Loihi Seamount microbial observatory. Geochim. Cosmochim. Acta. 71: A328-A328.

Cleland D., K. Jastrzembski, E. Stamenova, J. Benson, C. Catranis, D. Emerson, and B. Beck. 2007. Growth characteristics of microorganisms on commercially available animal-free alternatives to tryptic soy medium. J. Microbiol. Methods. 69:345-352.

Neubauer, S.C., G. E. Toledo-Durán, D.Emerson, J.P.Megonigal. 2007. Returning to their roots: Iron-oxidizing bacteria enhance short-term plaque formation in the wetland-plant rhizosphere. Geomicrobiol. J. 24:65-73.

Scott, J.H., D.M. O'Brien, D. Emerson, H. Sun, G.D. McDonald, M. L. Fogel. 2006. An examination of the carbon isotope effects associated with amino acid biosynthesis . Astrobiology. 6:867-880

Emerson, D, J. Rentz, R. Davis, and C. Moyer. 2006. Role of a unique population of lithotrophic, Fe-oxidizing bacteria in forming microbial Fe-mats at the Loihi Seamount. Astrobiology. 6:148.

Plaia, T, M. Floyd, and D. Emerson. 2006. That which is most obvious is what we know the least: Investigation of a freshwater Fe-oxidizing microbial mat community. Astrobiology 6:206.

Pignone, M., K. Greth, J. Cooper, D. Emerson, and J Tang. 2006. Identification of Mycobacteria by Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry. Journal of Clinical Microbiology. 44:1963-1970.

Kappler, A., D. Emerson, K. Edwards, J.P. Amend, J.A. Gralnick, P. Grathwohl, T. Hoehler, and K.L. Straub. 2005. Microbial activity in biogeochemical gradients – new aspects of research. Geobiology. 3:229-233.

Weiss, J.V., D. Emerson, and J.P. Megonigal. 2005. Rhizosphere iron(III) deposition and reduction in a *Juncus effuses*-dominated wetland. Soil Biol. Biochem. 69:1861-1870.

Floyd, M.M., J. Tang, M. Kane, and D. Emerson. 2005. Captured diversity in a culture collection: a case study of the geographic and habitat distribution of environmental isolates held at the American Type Culture Collection. Appl. Environ. Microbiol. 71:2813-2823.

Emerson, D. and M.M. Floyd. 2005. Enrichment and isolation of iron-oxidizing bacteria at neutral pH. Methods in Enzymology. 397:112-124

Rentz, J.A., C. Kraiya, G.W. Luther, and D. Emerson. 2005. Measurement of environmental biological Fe^{2+}-oxidizing activity. Astrobiology . 5:292.

Floyd, M.M, and D. Emerson. 2005.FIONA: A laboratory microscosm for investigating natural populations of circumneutral, microaerobic Fe-oxidizing bacteria. Astrobiology. 5:291

Vicenzi, E.P., D. Rost, D. Emerson, M. Fries, A. Steele, J.P. Megonigal. 2005. A microchemical study of iron-oxidizing bacterial mats from differing surface environments. Astrobiology. 5:270

Druschel, G., D. Emerson, B. Glazer, C. Kraiya, R. Sutka and G. W. Luther, III. 2004. Environmental limits of the circumneutral iron-oxidizing bacterial isolate ES-1: Field, culture, and kinetic results from voltammetric analyses. *Geochimica Cosmochimica Acta* Vol. 68 (11S), p. A387.

Emerson, D, and J.V. Weiss. 2004. Bacterial iron oxidation in circumneutral freshwater habitats: findings from the field and the laboratory. Geomicrobiol. J. 21:405-414.

Cleland, D., P. Krader, C. McCree, J. Tang, and D. Emerson. 2004. Glycine betaine as a cryoprotectant for prokaryotes. J. Microbiol. Methods. 58: 31-38.

Weiss, J.V., D. Emerson, and P. Megonigal. 2004. The role of geochemical composition on the microbial reduction potential of Fe(III) pools in wetlands: comparison of the rhizosphere and bulk soil. FEMS Microbiol. Ecol. 48:89-100

Krader, P., and D. Emerson. 2004. Identification of Archaea and other extremophilic bacteria using matrix assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry. Extremophiles. 8:259-268.

Lydell, C., L. Dowell, M. Sikaroodi, P. Gillevet, and D. Emerson. 2004. A population survey of members of the phylum *Bacterodetes* isolated from salt marsh sediments along the East coast of the United States. Microbial Ecology. 28:263-273.

Weiss, J.V., D. Emerson, Backer, S. and J.P. Megonigal. 2003 Enumeration of Fe(II)-oxidizing and Fe(III)-reducing bacteria in the root zone of wetland plants: Implications for a rhizosphere iron cycle. Biogeochemistry. 64:77-96.

Neubauer, S.C., D. Emerson, and J.P. Megonigal. 2002. Life at the energetic edge: Kinetics of circumneutral iron oxidation by lithotrophic iron oxidizing bacteria isolated from the wetland plant rhizosphere. Appl. Environ. Microbiol. 68:3988-3395.

Emerson, D., and C.L. Moyer. 2002 Neutrophilic Fe-oxidizing bacteria are abundant and play a major role in Fe-oxide deposition at the Loihi Seamount hydrothermal vent system. Appl. Environ. Microbiol. 68:3085-3093. (Received a journal highlight in August '02 ASM News.)

Emerson, D., J.V. Weiss, and J.P. Megonigal. 1999. Iron-oxidizing bacteria are associated with ferric hydroxide precipitates (Fe-Plaque) on the roots of wetland plants. Appl. Environ. Microbiol. 65: 2758-2761.

Emerson, D. 1999. Complex pattern formation by an environmental bacterium, *Pseudomonas* KC in response to nitrate and nitrite. Microbiology. 145: 633-641.

Emerson, D., and C. Moyer. 1997. Isolation and characterization of novel iron-oxidizing bacteria that grow at circumneutral pH. Appl. Environ. Microbiol. 63:4784-4792. (Received a journal highlight in Jan. '98 ASM News.)

Emerson, D. and J.A. Breznak. 1997. The response of microbial populations from oil-brine contaminated soil to gradients of NaCl and sodium p-toluate in a diffusion gradient chamber. FEMS Microbiology Ecology. 23:285-300.

Widman, M.T., D. Emerson, C.C.Chiu, & R.M.Worden. 1997. Modeling microbial chemotaxis in a diffusion gradient chamber. Biotechnol. and Bioeng. 55: 191-205

Emerson, D., S.F. Peteu, & R.M. Worden. 1996. A catalase microbiosensor for detecting hydrogen peroxide. Biotechnol. Techniques. 10:673-678.

Peteu, S.F., D. Emerson, R.M. Worden. 1996. A Clark-type enzyme-based amperometric microbiosensor for sensing glucose, galactose, or choline. Biosensors & Bioelectronics, 11:1059-1071.

Brune, A., D. Emerson, and J.A. Breznak. 1995. The termite gut microflora as an oxygen sink: microelectrode determination of gut oxygen status and pH profiles in lower and higher termites. Appl. Environ. Microbiol. 61:2681-2687.

Emerson D., and N.P. Revsbech. 1994. Investigation of an Fe-oxidizing microbial mat community located near Aarhus, Denmark: Field studies. Appl. Environ. Microbiol. 60:4022-4031.

Emerson D., and N.P. Revsbech. 1994. Investigation of an Fe-oxidizing microbial mat community located near Aarhus, Denmark: Laboratory studies. Appl. Environ. Microbiol. 60:4032-4038.

Emerson, D., S. Chaunhan, P. Oriel, and J.A. Breznak. 1994. *Haloferax* sp. D1227, a halophilic archaeon capable of growth on aromatic compounds. Arch. Microbiol. 161:445-452.

Emerson, D., M. Worden, and J.A. Breznak. 1994. A diffusion gradient chamber for studying microbial behavior and separating microorganisms. Appl. Environ. Microbiol. 60: 1269-1278.

Emerson D., and W.C. Ghiorse. 1993. Ultrastructure and composition of the sheath of *Leptothrix discophora* SP-6. J. Bacteriol. 175:7808-7818.

Emerson, D., and W.C. Ghiorse. 1993. Role of disulfide bonds in maintaining the structural integrity of the sheath of *Leptothrix discophora* SP-6. J. Bacteriol. 175:7819-7827.

Emerson, D., and W.C. Ghiorse. 1992. Isolation, cultural maintenance, and taxonomy of sheath-forming strain of *Leptothrix discophora* and characterization of manganese-oxidizing activity associated with the sheath. Appl. Environ. Microbiol. 58: 4001-4010.

Murgel, G.M., L. Lion, C. Acheson, M. Schuler, D. Emerson, and W.C. Ghiorse. 1991. Experimental apparatus for selection of adherent microorganisms under stringent growth conditions. Appl. Environ. Microbiol. 57:1987-1996.

Emerson D., R.E. Garen & W.C. Ghiorse, 1989. Formation of *Metallogenium* - like structures by a Mn-oxidizing fungus. Arch. Microbiol 151:223-231

Pimentel D, W. Dazhong, S. Eigenbrode, H. Lang, D. Emerson, & M. Karasik, 1986. Deforestation: interdependency of fuelwood and agriculture. Oikos 46: 404-412.

Book Chapters, Editorials & Non-peer Reviewed:

Emerson, D., and S. Smith. Submitted. Iron-oxidizing bacteria, In. M7 Problem Organisms in Water: Identification and Treatment. American Water Works Association Manuals of Water Supply Practices.

Emerson, D., and C. Lydell. 2016. Inventory of cultivatable populations of S-cycling, fermentative, Fe-reducing, and aerobic heterotrophic bacteria from saltmarsh sediments. bioRxiv doi: http://dx.doi.org/10.1101/048611

Kappler, A, D. Emerson, J.A. Gralnick, E.E. Roden, and E.M. Muehe. 2016. Geomicrobiology of Iron, In: Ehrlich's Geomicrobiology, 6th edition. H.L. Ehrlich, D.K. Newman, and A. Kappler (editors). 2015. CRC Press, Boca Raton, FL. Pp 343-399.

Emerson, D., E. Roden, B.S. Twining. 2012. The microbial ferrous wheel: iron cycling in terrestrial, freshwater, and marine environments. Special Topics eBook for Frontiers in Microbiology.

Smith, S.A, R.F. Unz, D. Emerson, and J.L. Clancy. 2011. Joint Task Group. Section 9240: Iron and Sulfur Bacteria. Standard Methods for the Examination of Water and Wastewater 22nd edition. Available online: www.standardmethods.org

Emerson, D. 2010. Leptothrix. Encyclopedia of Geobiology. (A. Kappler, ed). Springer-Verlag.

Emerson, D, and W. Wilson. 2009. Giving microbial diversity a home. Nature Microbiol. Rev. 7: 758.

Neubauer, S., D Emerson, and P. Megonigal. 2008. Microbial oxidation and reduction of iron in the root zones of wetland plants and mobility of heavy metals. In: Biophysico-Chemical Processes of Heavy Metals and Metalloids in Soil Environments. A. Violante, P.M. Huang and G. Stotzsky (eds). IUPAC. 339-371

Emerson, D., and J. Tang. 2007. Media and Nutrition. In Manual of Methods for General and Molecular Microbiology, 3rd Edition. C.A. Reddy, et al [eds.] American Society of Microbiology Press. Pp 200-214

Roden, E. R. and D. Emerson. 2007. Microbial Metal Cycling in Aquatic Environments. Manual of Environmental Microbiology, 3rd Ed. American Society of Microbiology Press. Washington, D.C. pp, 540-562.

Emerson, D. 2000. Microbial Oxidation of Fe (II) and Mn (II) at Circumneutral pH. In: Enviromental Microbe-Metal Interactions, Derek Lovley (ed.), ASM Press. Washington, D.C. pp, 31-52.

Editorship:

Guest edited September, 2004 issue of Geomicrobiology Journal entitled: Microbial iron oxidation at neutral pH.

Guest editor, December, 2009 issue of Geomicrobiology Journal: Microbiology of Seamounts.

Guest editor, 2012. Special Topics Issue: The microbial ferrous wheel: iron cycling in terrestrial, freshwater, and marine environments. Frontier in Microbiology: Microbiological Chemistry.

Patents:

A Diffusion Gradient Chamber System. Inventors, John Breznak, David Emerson, and John Koh. U.S. Patent # 5,589,352

Needle type Microbiosensor. Inventors, David Emerson, Serban Peteu, and R. Mark Worden. U.S. Patent #5,611,900

Large Scale Biogenic Production of Iron Oxyhydroxides. Inventor, David Emerson, Preliminary Patent, filed November, 2015.

Invited Talks and Symposia.

Emerson, D. Comparative analysis of extracellular electron transfer in neutrophilic iron-oxidizing bacteria. Joint Chinese-American workshop on extracellular electron transfer. Peking University, Beijing China, March, 2015.

Microbial iron oxidation in the Arctic tundra and the implications for biogeochemical cycling. Toolik Field Station, Long-term ecological research meeting, Woods Hole, MA February, 2015.

Microbial strategies for controlling biogenic Fe-oxidation. ACS National Meeting, New Orleans, LA, May 2013.

Gradients within gradients: population and community structure within Fe-oxidizing microbial mats. ISME14, Copenhagen, Denmark, August, 2012

Mild steel corrosion in nearshore marine environments: assessing the presence of iron-oxidizing bacteria and characterizing the overall bacterial community. International Conference on Marine Corrosion and Fouling, Seattle, WA, June, 2012

What can microbial iron oxidation in modern environments tell us about oxygenation events in the past. Astrobiology Science Conference, Atlanta, GA, 2012

Biogeochemistry and microbiology of microaerobic Fe(II) oxidation. Electron transfer at the microbe-mineral interface. University of East Anglia, United Kingdom, April, 2012

Lessons in divergence and convergence in marine and freshwater iron-oxidizing bacteria. Invited talk, American Geophysical Union, San Francisco, CA, December, 2011

Emerging patterns in deep-sea microbial iron mats. Invited talk, Goldschmidt, Knoxville, TN, 2010

The Nexus that Thrives: How Hydrology and Geochemistry at Seamounts Provide Habitats for Microbes. Keynote Talk, SBN Workshop, Scripps Inst. of Oceanography, La Jolla, CA, March, 2009.

Microbes vs minerals: oxygen-dependent microbial iron oxidation at circumneutral pH. American Chemical Society, Fall Meeting, Philadelphia, PA, August, 2008.

Microbial ecology of aerobic, neutrophilic iron oxidation. Biogeochemical Processes of the Iron Cycle: From Microbes to Minerals, Telluride Science Research Center Workshop, July 28-August 1, 2008

The way life should be: using gradients to capture microbes and study their behavior. DOE Genomes to Life Meeting, Bethesda, MD, February, 2008.

Iron cycling at Loihi Seamount. Am. Geophys. Union. Fall Meeting, San Francisco, CA, December, 2007

Letting the microbes do the weaving: understanding the braid of microbiology, mineralogy , and geochemistry. Geobiology Symposium. Yale University, New Haven, CT, April 2007

FeMO A Microbial Observatory for the Study of Neutrophilic Iron Oxidizing Bacteria and the Microbial Iron Cycle. Microbial Observatories Annual Meeting, Washington, D.C., March, 2007.

Role of a unique population of lithotrophic, Fe-oxidizing bacteria in forming microbial Fe-mats at the Loihi Seamount. Astrobiology Science Conference, March 2006, Washington, D.C. Co-convenor of session on Elements of Life.

Rust Never Sleeps. Convenor of symposium session at Am. Soc. Microbiol. Ann. Mtg., Washington, D.C. June 2003 (Received a write-up in Biomednet News)

Of Rust and Microbes: Elucidating the Role of Bacteria in Iron Oxidation at Circumneutral pH. NEMPET Lecturer, NEMPET 2002, Blue Mountain Lake, NY, June 2002.

Life at the energetic edge: Kinetics of circumneutral iron oxidation by lithotrophic iron oxidizing bacteria isolated from the wetland plant rhizosphere. Invited Talk, Am. Geophys. Union Spring Meeting, Washington D.C. May, 2002.

Lithotrophic iron oxidation at circumneutral pH. American Geophysical Union Annual Meeting, San Francisco, CA, December, 2000

Lithotrophic iron oxidation at circumneutral pH: From the rhizosphere to the hot hydrosphere and the groundwater in-between. Theis 2000, National Groundwater Association, Jackson Hole, WY, September, 15-18, 2000

Lectures:

Institute Physics of the Globe, Paris (IPGP), May 2015
University of Jena, Jena, Germany, May 2015
CNRS, University of Marseille, May 2015
Delft Technical University, Delft, Netherlands, October, 2014
Tuebingen University, Tuebingen, Germany, October, 2014
Aarhus University, Aarhus, Denmark, August 2012.
Microbial Diversity Course, Marine Biological Laboratory, Wood's Hole, MA, July, 2012
Miami University of Ohio, March, 2012
University of Minnesota, September, 2011
University of Delaware, College of Marine Sciences, September, 2011
Los Alamos National Laboratory, May, 2011
University of Nebraska, Lincoln, Nebraska, October, 2009
Max Planck Institute for Terrestrial Microbiology, Marburg, Germany, August, 2009
Microbial Diversity Course, Marine Biological Laboratory, Wood's Hole MA, July, 2007

Cornell University, September, 2006
Bigelow Laboratory for Ocean Science, Boothbay Harbor, ME, August, 2005
Max Planck Institute for Terrestrial Microbiology, Marburg Germany, May, 2005
Center for Marine Biotechnology, Baltimore, MD, April, 2005
James Madison University, April, 2004
Johns Hopkins University, October, 2001
Smithsonian Environmental Research Center, September, 2001
University of Virginia, June, 2001
California Institute of Technology, May, 2001
University of Maine, September, 2000
Geophysical Laboratory, Carnegie Institute of Washington, December, 2000.
Invited speaker, Microbial Diversity Course, Marine Biological Laboratory, Wood's Hole, MA, July, 1999.

Public Talks:

The Amazing Life of Iron. Midcoast Audobon Society, Camden ME, April 2016.

Zetahunters: Anatomy of an expedition to a league under the sea. Cafe Scientifique, Boothbay Harbor, ME, Summer 2013.

Do you know where the iron for your ships comes from. Bath Iron Works, Bath, ME, May 2013

The Beneficial Microbe in the 21st century. Headtide Pub, Alna, ME, June, 2012

What do Mars and the Sheepscot River have in common? Sheepscot Valley Conservation Association, Sheepscot, ME, February, 2012

The Beneficial Microbe in the 21st century. Colby College, October, 2011

Mountaineering in the ocean: discoveries about the least explored mountain ranges in the solar system. Café Scientifique, Boothbay Harbor, ME, Summer 2010.

From the USS Monitor to Mars – Hunting for novel microbes. Café Scientifique, Boothbay Harbor, ME, Summer 2008.

Scientific Workshops:

Developing Submergence Science for the Next Decade, DESCEND-2 Workshop, Harvard University, Cambridge MA, January 14-15, 2016.

Single Cell Genomics Workshop, Boothbay Harbor, ME, June 14-18, 2015

Limits to Life Workshop, C-DEBI, Redondo Beach, Los Angeles, CA, April 7 & 8, 2014

Bioenergetics and subsurface metabolisms, DEBI RCN Meeting, USC, Los Angeles, CA April 9 & 10, 2014

NSF Earthcube Workshop, Graduate School of Oceanography, University of Rhode Island, June 5 – 7, 2013.

DCO Deep Life Meeting, Portland Oregon, May 13-15, 2013.

C-DEBI First All Hands Mtg, University of Southern California, Los Angeles, CA, May 16-17, 2011

SBN Workshop, Seamounts. Scripps Institute of Oceanography, La Jolla, CA, March 19-21, 2009

DUSEL Workshop. Lead, SD, April 21-24, 2008.

NEON Workshop. Lod Cook Conference Center, Louisana State University, Baton Rouge, LA, Feb 14-16, 2008.

National Culture Collection System workshop, USDA George Washington Carver Center, Beltsville, MD, November 13-14, 2007.

Sequencing Bergey's, DOE workshop, University of Georgia, Athens, GA, March 8-9, 2007

Strategic Impacts Workshop. NASA Astrobiology Institute, Boulder, CO, Jan. 18-19, 2007.

Seamount Biogeosciences Network. Scripps Institute of Oceanography, La Jolla, CA, March 24-25, 2006

Microbial Systems Exploration Initiative. NASA Astrobiology Institute, Chicago, IL, Nov. 18 – 20, 2005

A Tree of Life Workshop, The Institute for Genomic Research, Rockville, MD, Nov 3 – 4, 2005

First American German Workshop in Biogeochemical Gradients. Tuebingen, Germany, May 4-7, 2005

Census of Marine Life Workshop. Sloan Foundation, Philadelphia Academy of Natural Sciences, Philadelphia, PA, September 7-9, 2003.

Microbial Observatories/Life in Extreme Environments Workshop, National Science Foundation, Arlington, VA, September 22-24, 2002.

European Community - United States, Workshop on Biological Infrastructure, sponsored by the EC, NSF, and NIH; Valencia, Spain, May 21-23, 2001.

Microbe-metal interactions. Department of Energy, NABIR Program, Warrenton, VA, Sept. 12-13, 2000.

Biotic Suvey's and Inventories Workshop. Sponsored by the National Science Foundation. Orcas Island, WA, May 18-21, 2000.

Lake Vostock Workshop: A curiosity or a focus for interdisciplinary investigations. American Geophysical Union, Washington, D.C. November 7-8, 1998.

Service.

Committees.

2015- Member, Deep Submergence Science Committee, UNOLs advisory committee for the National Deep Submergence Facility
2009: Chair, Division I, General Microbiology, ASM
2008: Chair-Elect, Division I, General Microbiology, ASM

Bigelow.

Personnel Committee: 2010 – present
Technology Transfer Committee: 2012 – 2015
SRS Search Committee: 2012 – present
Postdoctoral Program coordinator: 2013 – 2015
Institutional Biosafety Committee: 2012- present
Budget Committee: 2011 - 2013

Editorial Boards. Applied and Environmental Microbiology; Geomicrobiology. Frontiers in Microbiological Chemistry (Associate Editor)

Academic Responsibilities.

Courses :

ES 287, The Impact of Climate Change on Ocean Life. Colby College, January, 2014.

ES 281, Marine Microbiology (From the virus to the whale, microbes rule the seas). Colby College, January, 2012.

Biology 515: Soil Science, co-instructed with Dr. Pat Megonigal, George Mason University, Spring 2000.

Biology 695, Seminar course, GMU Spring '97. Molecular ecology: Techniques and applications.

Mentor:

Graduate Students (all GMU):
Melissa Floyd (M.S, 2007.)
Shailaja Rao
Alexander Wooten

Johanna Weiss (Ph.D, 2002)
Stephanie Backer

Postdoctoral:
Jake Beam, Ph.D
Roman Barco, Ph.D (NSF Postdoctoral Fellow)
Jarrod Scott, Ph.D
Erin Field, Ph.D (East Carolina University)
Emily Fleming, Ph.D (Cal State University, Chico)
Adam Mumford, Ph.D (USGS, Reston, VA)
Joyce McBeth (Canadian Light Source, Saskatoon, CAN)
Jeremy Rentz, Ph.D (Assoc. Prof. Trine Univ, IN)
Robin Sutka, Ph.D (at Thermo-Fisher, Billerica, MA.)
Scott Neubauer, Ph.D (Faculty, Virginia Commonweath Univ)
Debra Ellis, Ph.D. Faculty member at U. Mass. -- Dartmouth

Visiting Scientist:
Chun Hou, M.S., Associate Professor, Yunnan University, Kunming, China
Juanjuan Wang, NIOS, Netherlands (2.5 months 2009)
Irini Adaktylou, M.S. student, University of Tuebigen (Nov/Dec 2012)
Pauline Henri, Ph.D student, IGBP, Paris (December, 2013)
Jiro Miro, Ph.D. student, University of Jena (April/July, 2015)

Technicians
David Cleland (ATCC)
Paul Krader (ATCC)
Cyndi Lydell (ATCC)
Mike Peglar (ATCC)
Todd Plaia (ATCC)
Amy Smith (ATCC)
Wendy Bellows (Bigelow)
Mike Preston (Bigelow)
Anna Leavitt (Bigelow)
Sarabeth George (Bigelow)

External Thesis Committees:
Markus Maisch, University of Tuebigen, Germany
Julia Otte, University of Tuebingen, Germany
Sean McAllister, Ph.D, University of Delaware
Roman Barco, Ph.D, University of Southern California, 2014
Sean Krepski, M.S. University of Delaware, 2012
Susan Vollrath, Ph.D, University of Utrecht, The Netherlands, 2012
Ravindra Naraine, M.S. St. Georges University, Grenada, 2010
Dmitri Solobev, Ph.D, University of Alabama, Tuscaloosa, 2006

Undergraduates (only from time at Bigelow):

Davan Khana (NSF REU), University of Georgia (2015)
Mark Ravachandran, Colby College (2014)
Jade Enright, Colby College (2014)
Sara Beth George, Colby College (Fall 2013)
Kimberly Dempsey, Bowdoin College (2013)
Campbell Belisle Haley (NSF REU), University of Maine (2013)
Alyson Lowell (REU), University of Maine (2012)
Anna Leavitt, Colby College (2012)
Audrey Lyman, Colby College (2012, 2013)
Alexandra Lopez (NSF REU), Interamerican University of Puerto Rico (2011)
Eleanor French (HS student) (2011)
Jennifer Fownes (NSF REU), Dartmouth College (2010)
Amy Langdon (NSF REU - 2009), Swarthmore (2009, 2010)
Katherine Farrar, Bowdoin (2009)
Ivan Degroote, Stanford (2008)