TORI M. HOEHLER

Research Scientist, Space Sciences and Astrobiology Division

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Education

Ph.D. in Marine Chemistry, University of North Carolina at Chapel Hill, 1998

B.S. in Chemistry with Highest Honors and Highest Distinction, University of North Carolina at Chapel Hill, 1992

Awards, Fellowships, and Honorary Societies

Carl Sagan Lecturer, American Geophysical Union, 2009

NASA Ames Honor Award for Excellence in Research, 2009

Editorial Boards: *Astrobiology* (2008-present), *Geobiology* (2006-present), *Environmental Microbiology* (2006-present), *Frontiers in Microbiological Chemistry* (2011-present)

Kavli Frontiers of Science Fellow (National Academy of Sciences), 2007

Fellow of the California Academy of Sciences, 2007

Best First Paper Award, Ames Research Center, 2001

NASA Spotlight Award for Education and Public Outreach, 2001

National Research Council Fellow, 1998 to 2001

Royster Fellow, 1996 to 1997

National Defense Science and Engineering Graduate Fellow, 1993 to 1996

National Science Foundation Graduate Fellow, 1993

Venable Medal in Chemistry, University of North Carolina, 1992

Professional Experience

Europa Science Definition Team, Astrobiology Group Lead (2011-2012)

Mars Science Laboratory mission Collaborating Research Scientist (2010-present)

Research Scientist, NASA Ames Research Center (2001-present)

National Research Council Research Associate (1998 to 2001)

Ocean Drilling Program Participating Scientist, Leg 164 (1995)

Publications

2011

*Burow, LC, D Woebken, B Bebout, P McMurdie, S Singer, J Pett-Ridge, L Prufert-Bebout, A Spormann, P Weber, and TM Hoehler (2011) Hydrogen Production in Photosynthetic Microbial Mats in the Elkhorn Slough Estuary, Monterey Bay, *The ISME Journal*, .

Orphan, VJ and TM Hoehler (2011) Hydrogen for dinner, *Nature*, 476, 154-155.

2010

Hoehler, TM and F Westall (2010) Mars Exploration Program Analysis Group Goal One: Determine if life ever arose on Mars, *Astrobiology*, 10, 859-867.

Alperin, MJ and TM Hoehler (2010) The ongoing mystery of seafloor methane, *Science*, 329, 288-289.

Hoehler, TM (2010) Innumerable globes like this one?, *Nature Geoscience*, 3, 447.

Hoehler, TM, RP Gunsalus, and MJ McInerney (2010) Environmental constraints that limit methanogenesis, in *Handbook of Hydrocarbon and Lipid Microbiology*, KN Timmis (Ed.), Springer-Verlag, Berlin, pp 636-654.

McInerney, MJ, TM Hoehler, and RP Gunsalus (2010) Introduction to hydrocarbon production: Bioenergetics, in *Handbook of Hydrocarbon and Lipid Microbiology*, KN Timmis (Ed.), Springer-Verlag, Berlin, pp 322-335.

*Cardace, D. and T.M. Hoehler. 2010. Extremophiles in serpentinizing systems. In *Serpentine: A Model for Evolution and Ecology*, Harrison and Rajakaruna (Eds.), University of California Press.

Banks, E, N Taylor, J Gulley, B Lubbers, J Giarrizzo, H Bullen, T Hoehler, and H Barton (2010) Bacterial calcium carbonate precipitation in cave environments: A function of calcium homeostasis. *Geomicrobiology Journal*, 27: 444-454.

2009

Alperin, MJ and TM Hoehler (2009) Anaerobic methane oxidation by archaea/sulfate-reducing bacteria aggregates: 2. Isotopic constraints, *American Journal of Science*, 309, 869-957.

Alperin, MJ and TM Hoehler (2009) Anaerobic methane oxidation by archaea/sulfate-reducing bacteria aggregates: 1. Thermodynamic and physical constraints, *American Journal of Science*, 309, 958-984.

*Cardace, D and TM Hoehler (2009) Serpentinizing fluids craft microbial habitat, *Northeastern Naturalist*, 16, 272-284.

Fike, DA, N Finke, G Blake, J Zha, TM Hoehler, and VJ Orphan (2009) The effect of sulfate concentration on (sub)millimeter-scale sulfide δ34S in hypersaline cyanobacterial mats over the diurnal cycle, *Geochimica et Cosmochimica Acta*, 73, 6187-6204.

Hoehler, TM and BB Jørgensen (2009) Energy Emerges, *Environmental Microbiology Reports*, 1, 9-10.

2008

Hausrath, EM, A Treiman, DL Bish, DF Blake, P Sarrazin, TM Hoehler, E Vicenzi, I Midtkandl, A Steele, and SL Brantley (2008) Short- and long-term olivine weathering on Svalbard, and implications for Mars, *Astrobiology*, 8, 1079-1092.

Des Marais, DJ, JA Nuth, LJ Allamandola, AP Boss, JD Farmer, TM Hoehler, BM Jakosky, VS Meadows, A Pohorille, B Runnegar, and AM Spormann (2008) The NASA Astrobiology Roadmap, *Astrobiology*, 8, 715-730.

2007

Hoehler, TM (2007) An energy balance concept of habitability, *Astrobiology*, 7, 824-838.

Hoehler, TM, JP Amend, and E Shock (2007) A 'follow the energy' approach to astrobiology, *Astrobiology*, 7, 819-823.

*Finke, N, TM Hoehler, and BB Jørgensen, (2007) Hydrogen `leakage' during methanogenesis from methanol and methylamine: implications for anaerobic carbon degradation pathways in aquatic sediments, *Environmental Microbiology*, 9, 1060-1071.

2006

Schulte, MD, DF Blake, TM Hoehler, and TM McCollom (2006), Serpentinization and its implications for life on the early Earth and Mars, *Astrobiology*, 6, 364-376.

2005

Hoehler, TM (2005), Cretaceous park? A commentary on microbial paleomics, *Astrobiology*, 5, 95-99.

Hoehler, TM (2005), Biogeochemistry of H_2, In: *Metal Ions in Biological Systems: Biogeochemical Cycles of Elements (Vol. 43)*, Sigel, A., Sigel, H., and Sigel, R. (eds), pp. 9-48, Marcel Dekker, New York.

Decker, K, C Potter, B Bebout, D Des Marais, S Carpenter, M Discipulo, T Hoehler, S Miller, B Thamdrup, K Turk, and P Visscher (2005), Mathematical simulation of the diel O, S, and C biogeochemistry of a hypersaline microbial mat, *FEMS Microbiology Ecology*, 52, 377-395.

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

2004

Hoehler, TM (2004), Biological energy requirements as quantitative boundary conditions for life in the subsurface, *Geobiology*, 2, 205-215.

Bebout, BM, TM Hoehler, B Thamdrup, DB Albert, S Carpenter, ME Hogan, KA Turk, and DJ Des Marais (2004), Methane Production by Microbial Mats Under Low Sulfate Conditions, *Geobiology*, 2, 87-96.

2002

Hoehler, TM, DB Albert, MJ Alperin, BM Bebout, CS Martens, and DJ Des Marais (2002), Comparative ecology of H_2 cycling in phototrophic and sedimentary ecosystems. *Antonie van Leeuwenhoek*, 81, 575-585.

Bebout, BM, DJ Des Marais, M Discipulo, T Embaye, F Garcia-Pichel, TM Hoehler, ME Hogan, LL Jahnke, RM Keller, SR Miller, LE Prufert-Bebout, C Raleigh, M Rothrock,

KA Turk (2002), Long-term manipulations of intact microbial mat communities in a greenhouse collaboratory: Simulating Earth's present and past field environments, *Astrobiology*, 2, 383-402.

2001

Hoehler, TM, BM Bebout, and DJ Des Marais (2001), The role of microbial mats in the production of reduced gases on the early Earth, *Nature*, 412, 324-327.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2001), Apparent minimum free energy requirements for methanogenic archaea and sulfate-reducing bacteria in an anoxic marine sediment. *FEMS Microbiology Ecology*, 38(1), 33-41.

2000 and Earlier

Hoehler, TM, WS Borowski, MJ Alperin, N Rodriguez, CK Paull (2000), Model, stable isotope, and radio-tracer characterization of anaerobic methane oxidation in gas hydrate-bearing sediments of the Blake Ridge, *Proc. ODP, Sci. Results, 164*, Paull, Matsumoto, Wallace, and Dillon (eds.), pp. 79-85, Ocean Drilling Program, College Station, TX.

Borowski, WS, TM Hoehler, MJ Alperin, N Rodriguez, CK Paull (2000), Significance of anaerobic methane oxidation in methane-rich sediments overlying the Blake Ridge gas hydrates, *Proc. ODP, Sci. Results, 164*, Paull, Matsumoto, Wallace, and Dillon (eds.), pp. 87-99, Ocean Drilling Program, College Station, TX.

Hoehler, TM, DB Albert, MJ Alperin, and CS Martens (1999), Acetogenesis from CO_2 in an anoxic marine sediment, *Limnology and Oceanography*, 44, 662-667.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (1998), Thermodynamic controls on hydrogen concentrations in anoxic sediments, *Geochimica et Cosmochimica Acta*, 62, 1745-1756.

Hoehler, TM, and MJ Alperin (1996), Anaerobic methane oxidation by a methanogen-sulfate reducer consortium: geochemical evidence and biochemical considerations, In: *Microbial Growth on C-1 Compounds*, Lidstrom and Tabita (eds), pp. 326-333, Kluwer Academic Publishers, Dordrecht, The Netherlands.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (1994), Field and laboratory studies of methane oxidation in an anoxic marine sediment: evidence for a methanogen-sulfate reducer consortium, *Global Biogeochem. Cycles, 8*, 451-463.

Alperin, MJ, NE Blair, DB Albert, and TM Hoehler (1993), The carbon isotope biogeochemistry of methane production in anoxic sediments: 2. A laboratory experiment, In: *Biogeochemistry of Global Change: Radiatively Active Trace Gases*, RS Oremland (editor), Chapman and Hall, New York, N.Y., pp 594-605.

Alperin, MJ, NE Blair, DB Albert, TM Hoehler, and CS Martens (1992), Factors that control the stable carbon isotopic composition of methane produced in an anoxic marine sediment, *Global Biogeochem. Cycles, 6*, 271-291.

*(Denotes authorship by student or postdoctoral advisee)

Professional Service

Convener, Second International Workshop on Microbial Life Under Extreme Energy Limitation, Aarhus, Denmark, May 2012.

Chair, Exobiology and Evolutionary Biology Review Panel, 2009 and 2010

Science Organizing Committee, Astrobiology Science Conference, 2008 (Vice Chair), 2010, 2012

Panelist, NASA Education and Outreach Review Panel, 2010, 2011

Astrobiology Representative, Mars Exploration Payload Analysis Group (MEPAG) Goals Committee

Local Organizing Committee, 2008 Astrobiology Science Conference

Convener, International Workshop on "Microbial Life under Extreme Energy Limitation", Aarhus, Denmark, October 2007.

Guest editor, "A 'follow the energy' approach to astrobiology" special issue, *Astrobiology*, publication in fall 2007.

Science adviser for Earth & Sky Radio, 2006-present.

Organizer/chair, special session on "Follow the Energy", 2006 Astrobiology Science Conference.

Program organizing committee and session organizer/chair, 2005 Biennial Meeting of the NASA Astrobiology Institute.

Organizer, special session on "Energetic considerations for the emergence and proliferation of life in extreme environments", 2005 Goldschmidt Conference.

Chair, Energy & Theory working group, for the "Dark Energy: The Deep Oceanic Biosphere" workshop, Woods Hole Oceanographic Institution, 2004.

Organizer/chair, special session on "Energy in the Subsurface", Astrobiology Science Conference, 2004.

NASA Office of Biological and Physical Research workshop on "Microbiology in the Human Space Flight Program", 2004.

NASA exobiology and evolutionary biology grant review panel, 2003.

NASA Astrobiology Institute strategic planning workshop, 2003.

Organizer/chair, special session on "Diversity, ecology, and biogeochemistry of microbial mats and stromatolites", Aquatic Sciences Meeting, 2003.

Reviewer for: American Journal of Science; Applied and Environmental Microbiology; Aquatic Microbial Ecology; Astrobiology; Biogeochemistry; Chemical Geology; Environmental Microbiology; Geobiology; Geochemistry, Geophysics, Geosystems; Geochimica et Cosmochimica Acta; Global Biogeochemical Cycles; GSA Bulletin; International Journal of Astrobiology; Limnology & Oceanography; Marine Chemistry; NASA; National Science Foundation; Nature; Nature Geoscience; Nederlandse Organisatie voor Wettenschappelijk Onderzoek (Dutch NSF); Ocean Drilling Program, Organic Geochemistry; Petroleum Research Fund; Proceedings of the National Academy of Sciences; Science.

Public Outreach

Science Adviser for "Life: A Cosmic Story" planetarium show (Winner, Best Full Dome Program, 2011 Jackson Hole Wildlife Film Festival)

Public lecture, "What is life? (and how should we look for it?)", *Cosmic Explorations* lecture series, Lunar and Planetary Institute, 2010

Panelist in Discover Magazine public panel event and feature story, "Quest for a Living World", 2010

Featured lecturer/panelist at Chabot Planetarium "ExoParty" – a night of events surrounding exoplanet science.

Co-Organizer, "Evolution in Science and Technology" public lecture series, 2009.

Guest lecturer at SciTECC 2008, a public-academic lecture series webcast to 47 affiliates throughout the Spanish-speaking world (principally Latin America)

California Academy of Sciences (ongoing): Principal astrobiology content expert for development of museum exhibits (e.g., "Life Beyond Earth") and web content.

Lunar and Planetary Institute: Instructor, lecturer, and field guide for an annual series of week-long, intensive, astrobiology- and planetary geology-themed workshops for high school and middle school science teachers. Served in this capacity in 2002, 2003, 2005, and 2007.

Yellowstone National Park: Microbiology/astrobiology content developer and reviewer for the park's "Resources and Information Manual", for the development of 9 wayside exhibits, and for physical exhibits and web-based content for the Old Faithful Visitor Education Center.

"Are We Alone?" and "Big Picture Science" SETI Radio Programs: featured guest on the segments, "Food for Thought", "Slime Worlds", "Skeptic Check: They're Baack!"

National Public Radio "Science Friday" broadcast: participated as one of three panelists in a live, nationally broadcast, hour-long segment on the habitability of Mars.

NASA Quest and NASA Educator Astronaut Program: Developed web-based content and scripted and presented an hour-long web cast on microbial mats, which reached middle school students nationwide.

Disney/Walden Media: Astrobiology consultant for the IMAX film "Aliens of the Deep". Principal content developer and reviewer for a series of educational materials (including teacher training materials, lessons, and hands-on science activities) that were developed around the film and distributed to schools nationwide.

TERC: Contributor and content reviewer for development of a textbook and teachers guide, "Astrobiology: An integrated science approach".

Adviser for Student Interns: Foothill/DeAnza College Intern Program; NASA Astrobiology Academy; Northern Kentucky University science intern; SHARPS high school science intern program.

Public Talks for: American Chemical Society of Northern California, NASA Astrobiology Academy, Bay Area Schools for Excellence in Education (BASEE); Hewlett Packard Corporation; Jason Project; NASA Earth to Sky workshops; NASA Education Workshop for Science, Mathematics, and Technology Teachers; NASA

Explorer Schools Program; San Mateo County Schools; STELLAR science teachers workshops.

Interviews/Commentary/Coverage in Scientific and Popular Press: *Television:* British Broadcasting Corporation (appeared in the series "Cell City"), CBS News "Sunday Morning", Norwegian Public Television (feature story on the program "Schroedinger's Katt"), Tech TV. *Radio:* Earth & Sky Radio, National Public Radio, SETI Radio program "Are We Alone?". *Print & Web:* Astronews; Astronomy magazine, Berlingske Tidende (national Danish newspaper); Chemical and Engineering News; Cosmiverse; Discover magazine; McClatchy newspapers US-nationwide; The Dallas Morning News; Nature; ORF (Austrian national news network); San Francisco Chronicle; San Jose Mercury News; Science; Silicon Valley/San Jose Business Journal; Space.com, Spektrum (German news website); Toronto Sun; United Press International; Yahoo News; The Washington Post.

Invited Lectures Since 2000

"One-carbon (bio?)geochemistry in the subsurface waters of the serpentinizing Coast Range Ophiolite", 2011 Fall AGU meeting.

"The importance of water for high fidelity information processing and for life", 2011 Fall AGU meeting.

"Energetic constraints on subsurface life: A case study of methanogenesis in serpentinizing systems" **Keynote Lecture**, International Society for Subsurface Microbiology, Garmisch, Germany, 2011.

"Physicochemical characteristics and biological potential of aqueous environments beyond Earth", Max Planck Symposium on Life Under Extreme Conditions, Berlin, Germany, 2011.

"Deep biosphere sediment microbiology: Equating energy with biological potential", Dark Energy Biosphere Institute, 2011.

"Physical and chemical toeholds for exoplanet bioastronomy", Astronomy & Astrophysics Colloquium, California Institute of Technology, 2011.

"Energy in the Environment: Supply and Demand in the Power Dimension", University of California at Santa Cruz, 2010.

"Compound extremes and energy limitation in aqueous environments on Mars: A case-study of methanogenesis in serpentinizing systems", **Keynote Lecture**, Extremophiles 2010, Azores, Portugal.

"Modeling energy flow at the cellular level", 2010 International Society for Microbial Ecology Meeting, Seattle, Washington.

"Life's Requirements", Revisiting the Habitable Zone workshop, University of Washington, 2010.

"A 'Follow the Energy' Approach in Astrobiology", Director's Colloquium, Ames Research Center, 2010.

"What is Life? (and how should we look for it?)", Public Lecture, *Cosmic Explorations* lecture series, Lunar and Planetary Institute, 2010.

"Life and Energy flow: The importance of power", Lunar and Planetary Institute, 2010.

"Life and Energy flow: The importance of power", **The Gussenhoven Lecture**, University of North Carolina at Chapel Hill, 2010.

"MEPAG Goal 1: Determine if Life Ever Arose on Mars", Mars Exploration Program Analysis Group (MEPAG) meeting, 2010.

"Energy flow and life: A thermodynamic-kinetic view of life in its relationship with the environment. NASA Astrobiology Institute Director's Seminar, 2010.

"Life and Energy: The importance of power", UC Berkeley, 2010.

"Life in Serpentinizing Systems", Meeting of the Committee on the Origin and Evolution of Life (COEL), 2010.

"Moving beyond "follow the water" toward a more comprehensive approach for Mars exploration", Gordon Research Conference on the Origin of Life, 2010.

"Life at the Common Denominator: Mechanistic and Quantitative Biology for the Earth and Space Sciences", **The Carl Sagan Lecture**, American Geophysical Union Fall Meeting (2009)

"The view from space: What ocean drilling can tell us about habitability, life's limits, and the possibilities for life beyond Earth", **Keynote address**, IODP New Ventures in Exploring Scientific Targets, Bremen, Germany (2009)

"Bioenergetics and the boundaries of life", Northwestern University (2009)

"Energy as a constraint on habitability in the subsurface", American Geophysical Union Fall Meeting (2008)

"Quantifying Habitability as Organism-Environment Energy Balance", University of Washington (2008)

"Quantifying the habitability of ancient Mars surface environments", SciTECC (2008)

"Slime World", Public lecture, Astrobiology Science Conference (2008)

"Energy as a constraint on habitability", Astrobiology Science Conference (2008)

"Biological energy requirements as boundary conditions for subsurface life", Oregon State University (2008)

"The energetics of habitability", Carl Sagan Center / SETI Institute (2008)

"An energy balance concept of habitability", University of Colorado at Boulder (2008)

"An energy-based concept of biosignatures", NASA Astrobiology Institute workshop on Remote Sensing of Microbial Communities (2008)

"The energetics of habitability", National Academy of Sciences "Kavli Frontiers of Science" Symposium (2007).

"Microbial minimum free energy requirements in natural systems", First International Workshop on Microbial Life under Extreme Energy Limitation, Aarhus, Denmark (2007)

"Energetic concepts for habitability and biosignatures", University of Arizona LAPLACE Center (2007).

"A follow the energy approach for Mars exploration", Annual Meeting of the American Association for the Advancement of Science (2007).

"Energetic habitability: constraints on life in the subsurface", Smithsonian Museum of Natural History (2007).

"An energy balance concept of habitability", Carnegie Institution of Washington (2007).

"Possible atmospheric microbial biosignatures". Pale Blue Dot III Workshop, Chicago, IL (2006).

"Habitability and the deep biosphere", **Keynote Address.** International Ocean Drilling Program "Deep Ocean Biosphere" workshop, Vancouver, Canada (2006).

"A follow the energy approach for astrobiology", Microbial Systems Exploration Initiative (MSEI) workshop, Chicago, IL (2005).

"Back-yard astrobiology: How North Carolina mud will help us search for life on other worlds", US Geologic Survey, Menlo Park, CA, (2004).

"Temperature regulation of H_2 concentrations in anoxic sediments: Implications for interspecies transfer processes", Federation of European Microbiological Societies Workshop on Cold Adaption of Aquatic Microorganisms, Bremen, Germany (2003).

"Energetic habitability: Boundary conditions for life-as-we-know-it", Astrobiology Seminar Series, University of Washington (2003).

"Thermodynamics at the geology-biology interface: Bioenergetic boundary conditions for subsurface life", Lunar and Planetary Institute (2003).

"Current and future directions in geobiology", School of Earth Sciences, Stanford University (2002).

"Thermodynamics at the geology-biology interface: Bioenergetic boundary conditions for subsurface life", School of Earth Sciences, Stanford University (2002).

"The physical chemistry of bugs in stones: Thermodynamic constraints on the metabolism of lithotrophic microorganisms", 15^{th} Kongsbergseminar: The Physics of Geological Processes, Oslo, Norway (2002).

"Thermodynamics of microbial hydrogen metabolism in anoxic sediments", Marine Geology & Geophysics departmental seminar, Woods Hole Oceanographic Institution (2002).

"Hydrogen production by Earth's early photosynthetic biosphere: implications for global biogeochemistry", Geology Colloquium, Yale University (2002).

"H_2 production by microbial mats: biogeochemical implications", Department of Geology & Planetary Sciences, California Institute of Technology (2001).

"Thermodynamics of H_2 in marine sediments: quantitative chemistry at the biology-environment interface", **Biogeochemistry Keynote Address**, Ninth International Symposium on Microbial Ecology, Amsterdam, Netherlands (2001).

"Quantitative aspects of H_2 biogeochemistry in anaerobic microbial ecosystems", Earth Sciences Department, Utrecht University, Netherlands (2001).

"Hydrogen cycling in hypersaline microbial mats", Max Planck Institute for Marine Microbiology, Bremen, Germany (2000).

"Biogeochemistry of H_2 in anaerobic and phototrophic ecosystems", Danish Center for Earth System Sciences, Odense University, Denmark (2000).

"Biogeochemistry of H_2 in anaerobic and phototrophic ecosystems", Environment and Resources Department, Technical University of Denmark (2000).

"Thermodynamic controls on H_2 concentrations in anoxic sediments", Max Planck Institute for Marine Microbiology, Bremen, Germany (2000).

"CO, CH_4, and H_2 production in microbial mats: implications for early Earth biogeochemistry", Geology and Geophysics Department, University of Hawaii at Manoa (2000).

"Thermodynamics of H_2 in marine sediments: quantitative chemistry at the biology-environment interface", Geology and Geophysics Department, University of Hawaii at Manoa (2000).

Abstracts as First Author Since 2000

Hoehler, TM, T McCollom, M Schrenk, and D Cardace (2011) One-carbon (bio?)geochemistry in the subsurface waters of the serpentinizing Coast Range Ophiolite. [*Invited*] *EOS Trans. AGU*, 92(53), Fall Meet. Suppl., B22A-04.

Hoehler, TM and A Pohorille (2011) The importance of water for high fidelity information processing and for life. [*Invited*] *EOS Trans. AGU*, 92(53), Fall Meet. Suppl., P24B-02.

Hoehler, TM (2011) Energetic constraints on subsurface life: A case study of methanogenesis in serpentinizing systems. [*Invited*] Abstracts of the 2011 International Society for Subsurface Microbiology Meeting.

Hoehler, TM, MJ Alperin, TM McCollom, and KL Rogers (2010) Compound extremes and energy limitation in aqueous environments on Mars: A case-study of methanogenesis in serpentinizing systems. [*Invited*] Abstracts of the Extremophiles 2010 Meeting.

Hoehler, TM, MJ Alperin, TM McCollom, and KL Rogers (2010) Modeling energy flow at the cellular level. [*Invited*] Abstracts of the 13th International Society for Microbial Ecology Meeting.

Hoehler, TM, MJ Alperin, TM McCollom, and KL Rogers (2010) An energy balance model for the habitability of serpentinizing systems. Abstracts of the 2010 Astrobiology Science Conference

Hoehler, TM (2009) Life at the Common Denominator: Mechanistic and Quantitative Biology for the Earth and Space Sciences [*Invited*]. *EOS Trans. AGU*, 90(52), Fall Meet. Suppl., P32B-01.

Hoehler, T (2008) Energy as a constraint on habitability in the subsurface [*Invited*]. *EOS Trans. AGU*, 89(53), Fall Meet. Suppl., B52B-01.

Hoehler, TM, MJ Alperin, TM McCollom, and KL Rogers (2008) Habitability of serpentinizing systems for methanogenic microorganisms: an energy balance model. *Geochimica et Cosmochimica Acta* 72(12), Supplement 1, A383.

Hoehler, TM (2008) Energy as a constraint on habitability. Abstracts of the 2008 Astrobiology Science Conference.

Hoehler, TM (2007) Microbial minimum free energy requirements in natural systems. Abstracts of the First International Workshop on Microbial Life under Extreme Energy Limitation.

Hoehler, TM (2007) A follow the energy approach for Mars exploration. Abstracts of the 2007 Meeting of the American Association for the Advancement of Science.

Hoehler, TM, DB Albert, and DJ Des Marais (2006) An energy balance model to predict chemical partitioning in a photosynthetic microbial mat. 2006 Astrobiology Science Conference. *Astrobiology* 6, 187.

Hoehler, TM (2006) Habitability and the deep biosphere. Abstracts of the IODP workshop on Microbial Life in the Deep Subsurface.

Hoehler, TM (2006) Possible atmospheric microbial biosignatures. Abstracts of the Pale Blue Dot III meeting.

Hoehler, TM (2005) An energy criterion for habitability. 2005 Biennial Meeting of the NASA Astrobiology Institute, Boulder, CO. *Astrobiology*, 5: 222.

Hoehler, TM, DM Ward, B Blumberg, DJ Des Marais, J Farmer, NW Hinman, RL Mancinelli, LJ Rothschild, and CJ Tsairides (2005) Astrobiology outreach education in Yellowstone National Park. 2005 Biennial Meeting of the NASA Astrobiology Institute, Boulder, CO. Astrobiology, 5: 278.

Hoehler, TM (2005) Energetic consequences of physical and chemical gradients. Abstracts of Papers, First International Workshop on Gradients in Biogeochemistry, Tubingen, Germany.

Hoehler, TM (2005) Biological energy requirements as constraints on habitability. Abstracts of the 2005 Exobiology Principal Investigators Science Conference.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2004) Energy requirements of hydrogen-utilizing microbes: boundary conditions for subsurface life. Abstracts of Papers, Dark Energy: The Deep Oceanic Biosphere, Woods Hole, MA.

Hoehler, TM, DB Albert, BM Bebout, and DJ Des Marais (2004) Cycling of fermentation products in hypersaline microbial mats. Abstracts of the Tenth International Symposium for Microbial Ecology.

Hoehler, TM, DB Albert, BM Bebout, KA Turk, and DJ Des Marais (2004) Quantitative relationships between photosynthetic, nitrogen fixing, and fermentative H_2 metabolism in a photosynthetic microbial mat. Abstracts of the 2004 Astrobiology Science Conference.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2003), Energy requirements of H2-utilizing microbes: a boundary condition for subsurface life. Abstracts of the 2003 Exobiology Principal Investigator Conference.

Hoehler, TM, DB Albert, BM Bebout, and DJ Des Marais (2003), Mechanisms and biogeochemical implications of H_2 cycling in microbial mats. Abstracts of the 2003 Exobiology Principal Investigator Conference.

Hoehler, TM (2003), Temperature regulation of H_2 concentrations in anoxic sediments: Implications for interspecies transfer processes". Abstracts of the FEMS Inaugural Workshop on Cold Adaption of Aquatic Microorganisms.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2002), Energy requirements of H_2-utilizing microbes: a boundary condition for subsurface life. Abstracts of the 2002 Astrobiology Science Conference.

Hoehler, TM, BM Bebout, and DJ Des Marais (2002), A large-magnitude biological source of H_2 to the Archaean atmosphere? Abstracts of the 2002 Astrobiology Science Conference.

Hoehler, TM (2002), The physical chemistry of bugs in stones: Thermodynamic constraints on the metabolism of lithotrophic microoganisms. Abstracts of the Fifteenth Kongsbergseminar, Oslo, Norway.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2001), Thermodynamics of H_2 in marine sediments: quantitative chemistry at the biology-environment interface. Abstracts of the Ninth International Symposium on Microbial Ecology, Amsterdam, Netherlands.

Hoehler, TM, BM Bebout, and DJ Des Marais (2001), Hydrogen fluxes from photosynthetic communities: implications for early Earth biogeochemistry. Abstracts of the 2001 American Society for Limnology and Oceanography meeting.

Hoehler, TM, BM Bebout, and DJ Des Marais (2001), Large-magnitude biological input of H_2 to the Archaean atmosphere. Ames Research and Technology Reports.

Hoehler, TM, MJ Alperin, DB Albert, and CS Martens (2000), Minimum energy requirements for sustained microbial activity in anoxic sediments. Abstracts of the 2000 Fall AGU meeting.

Hoehler, TM, BM Bebout, DB Albert, PT Visscher, and DJ Des Marais (2000), Dynamics of molecular hydrogen in hypersaline microbial mats. Abstracts of the First Astrobiology Science Conference.

Hoehler, TM, BM Bebout, and DJ Des Marais (2000), Biogeochemistry of early Earth photosynthetic ecosystems: production of hydrogen and carbon monoxide. Ames Research and Technology Reports.