

Last update on March 13, 2013

CURRICULUM VITAE - MARK ALEXANDER LEVER

Education:

Postdoctoral Scientist, Center for Geomicrobiology, Biology Institute, Aarhus University, Denmark, January 2009-present.

Ph.D. in Marine Sciences, Dept. of Marine Sciences, University of North Carolina in Chapel Hill, USA, 2002-2008.

Masters of Arts in Marine Biology, Boston University Marine Program, Woods Hole, USA, 1999-2002.

Bachelors of Arts in Biology with Minor in Music, Boston University, Boston, USA, 1996-1999.

Research Interests:

Geomicrobiology; microbial ecology; biogeochemistry; ecosystem ecology; testing and developing ecological theory in microbial systems; controls on structure, metabolism, activity, and evolution of microbial communities; development of molecular tools to study microbial populations, energy and nutrient cycling; metabolic strategies under extreme energy limitation; extraction of extracellular (fossil) DNA and use of extracellular DNA as a genetic archive of past environmental change; anaerobic carbon cycling; organic carbon degradation; chemosynthesis; photosynthesis; freshwater to coastal to deep sea sediments; deep biosphere; oceanic crustal habitats; role of microbes and their activities in global elemental cycles.

Awards:

Aarhus University Research Foundation (AUFF) Project Development, "Revealing the identity and function of carbon cycling microbes in the seabed by stable isotope probing- targeted metagenomics", 2012, 400,000 DKK (~54,000 €) (Kasper U. Kjeldsen and Mark A. Lever).

Census of Deep Life, "Investigating microbial community transitions at the sediment basement interface", free pyrosequencing provided by Josephine Bay Paul Center at MBL, Woods Hole, USA (Beth N. Orcutt, Mark A. Lever, and Katrina J. Edwards).

Marie Curie Intra-European Fellowship, Research Executive Agency, European Union, Seventh Framework Programme, 2010-2012, 218,241 € (Mark A. Lever).

University of North Carolina at Chapel Hill – Dissertation Completion Fellowship, August 2007– May 2008, \$13,000 (Mark A. Lever).

NSF-East Asia and Pacific Summer Institute fellowship, 2007, \$8,000 (Mark A. Lever).

Schlanger Ocean Drilling Fellowship, IODP, U.S. Science Support Program, 2006-2007, \$28,000 (Mark A. Lever).

IODP Expedition 301 Post-cruise Funding, U.S. Science Support Program, 2004, \$23,663 (Mark A. Lever and Andreas P. Teske).

NSF Scholarship for participation in Microbial Diversity at Marine Biological Laboratory, Woods Hole, MA, 2002, \$2,000 (Mark A. Lever).

Sounds Conservancy Grant, Québec-Labrador Foundation, 2001, \$1,000 (Mark A. Lever).

Manuscripts accepted or published:

Lloyd KG, Schreiber L, Petersen DG, Kjeldsen KU, Lever MA, Stepanauskas R, Richter M, Kleindienst S, Lenk S, Schramm A, Jørgensen BB. Predominant archaea in sediment degrade detrital proteins, *Nature*, accepted.

Lever MA, Rouxel OJ, Alt J, Shimizu N, Ono S, Coggon RM, Shanks WC, Lapham L, Elvert M, Prieto-Mollar X, Hinrichs KU, Inagaki F, Teske AP. Evidence for microbial carbon and sulfur cycling in deeply buried ridge flank basalt, *Science*, in press (in print on March 15, 2013).

Lever MA (2013) Functional Gene Surveys from Ocean Drilling Expeditions – A Review and Perspective, *FEMS Microbiol Ecol.* 84:1-23.

Langerhuus AT, Røy H, Lever MA, Morono Y, Inagaki F, Jørgensen BB, Lomstein BA (2012) Endospore abundance and D:L amino acid modeling of bacterial turnover in Holocene marine sediment (Aarhus Bay). *Geochim Cosmochim Acta* 99:87-99.

Lever MA (2012) Acetogenesis in the energy-starved deep biosphere – a paradox? *Frontiers in Microbiology* 2:1-18.

Yanagawa K, Sunamura M, Lever MA, Morono Y, Hiruta A, Matsumoto R, Urabe T, Inagaki F (2011) Niche separation of methanotrophic Archaea (ANME-1 and -2) in cold seep sediments off of Joetsu, Japan Sea. *Geomicrobiol J* 28:118-129.

Steinsbu BO, Thorseth IH, Nakagawa S, Inagaki F, Lever MA, Engelen B, Øvreas L, Pedersen RB (2010) *Archaeoglobus sulfaticallidus* sp. nov., a novel thermophilic and facultative lithoautotrophic sulfate-reducer isolated from black rust exposed to hot ridge flank crustal fluids, in press, *Int J Syst Evol Microbiol* 60:2745-2752.

Lever MA, Heuer V, Morono Y, Masui N, Schmidt F, Alperin MJ, Inagaki F, Hinrichs K-U, Teske A (2010) Acetogenesis in deep seafloor sediments of the Juan de Fuca Ridge Flank: a synthesis of geochemical, thermodynamic, and gene-based evidence. *Geomicrobiol J* 27:183-211.

Joye SB, Samarkin VA, Orcutt BN, MacDonald IR, Hinrichs K-U, Elvert M, Teske AP, Lloyd KG, Lever MA, Montoya JP, Meile CD (2009) Metabolic variability in

seafloor brines revealed by carbon and sulphur dynamics. *Nature-Geosciences* 2:349-354.

Lever MA (2008) Anaerobic carbon cycling pathways in the subseafloor investigated via functional genes, chemical gradients, stable carbon isotopes, and thermodynamic calculations. PhD thesis, Dep. Marine Sciences, Univ. of N. Carolina, Chapel Hill.

Engelen B, Zieglmüller K, Wolf L, Köpke B, Gittel A, Treude T, Nakagawa S, Inagaki F, Lever MA, Steinsbu BO, Cypionka H (2008) Fluids from the ocean crust support microbial activities within deep biosphere. *Geomicrobiol J* 25:56-66.

Nakagawa S, Inagaki F, Suzuki Y, Steinsbu BO, Lever MA, Takai K, Engelen B, Sako Y, Wheat CG, Horikoshi K (2006) Microbial community in black rust exposed to hot ridge flank crustal fluids. *Appl Environ Microbiol* 72:6789-6799.

Lever MA, Alperin MJ, Engelen B, Inagaki F, Nakagawa S, Steinsbu B, Teske A (2006) Trends in basalt and sediment core contamination during IODP Expedition 301. *Geomicrobiol J* 23:517-530.

Inagaki F, Nunoura T, Nakagawa S, Teske A, Lever M, Lauer A, Suzuki M, Takai K, Delwiche M, Colwell FS, Nealson KH, Horikoshi K, D'Hondt SL, Jørgensen BB (2006) Biogeographical distribution and diversity of microbes in methane hydrate-bearing deep marine sediments, on the Pacific Ocean Margin. *Proc Nat Acad Sci, USA* 103:2815-2820.

Biddle JF, Lipp JS, Lever MA, Lloyd K, Sørensen K, Anderson R, Fredricks HF, Elvert M, Kelly TJ, Schrag DP, Sogin ML, Brenchley JE, Teske A, House CH, Hinrichs K-U (2006) Heterotrophic Archaea dominate sedimentary subsurface ecosystems off Peru. *Proc Natl Acad Sci USA* 103:3846-3851.

Fisher AT, Urabe T, Klaus A and the Expedition 301 Scientists (2005) The hydrogeologic architecture of basaltic oceanic crust: compartmentalization, anisotropy, microbiology, and crustal-scale properties on the eastern flank. *Proc IODP 301*.

Dhillon A, Lever M, Lloyd K, Sogin ML, Teske A (2005) Methanogen diversity evidenced by molecular characterization of methyl coenzyme M reductase A (*mcrA*) genes in hydrothermal sediments of the Guaymas Basin. *Appl Environ Microbiol* 71:4592-4601.

Lever MA, Valiela I (2005) Response of microphytobenthic biomass to experimental nutrient enrichment and grazer exclusion at different land-derived nitrogen loads. *Mar Ecol Prog* 294:117-129.

Lever MA (2002) Controls of microphytobenthic biomass in Waquoit Bay, MA: the importance of nutrients, grazers and seasonality, Masters thesis, Boston University Marine Program, Woods Hole.

Novak M, Lever M, Valiela I (2001) Top-down vs. bottom-up controls of microphytobenthic standing crop: role of mud snails and nitrogen supply in the littoral of Waquoit Bay estuaries. *Biol Bull* 201:292-294.

Manuscripts in prep or submitted:

Orcutt BN, Lever MA, Baquiran J-P, Edwards KJ, Haddad AG, Fisher AT. Microbial community transitions across the deep sediment-basement interface, *Frontiers Microbiol.*, submitted.

Lever MA, Rogers K, Lloyd KG, Overmann JO, Schink B, Thauer RK, Hoehler TM, Jørgensen BB. Microbial life under extreme energy limitation: a synthesis of laboratory-based experiments and in-situ evidence from the deep biosphere, *FEMS Microbiology Reviews*, in prep.

Lever MA, Teske AP. Diversity of methane-cycling Archaea in hydrothermal surface sediments of the Guaymas Basin investigated by general and group-specific 16S rRNA and *mcrA* PCR primers, in prep. for submission to *Frontiers Microbiol.*

Lever MA, Torti A, Morono Y, Inagaki F, Jørgensen BB. A new DNA extraction method for seafloor and subseafloor samples, in prep. for *Limnol & Oceanogr Meth.*

Chen X, Lever MA, Jørgensen BB. Controls on relative abundances of Bacteria and Archaea in coastal sediments: the importance of bioturbation and carbon to nitrogen ratios, in prep. for submission to *ISME J*.

Lever MA, Hinrichs K-U, Teske AP. Zonation of the active methane-cycling community in deep subsurface sediments of the Peru Trench, in prep. for submission to *PNAS*.

Lever MA, Heuer V, Morono Y, Masui N, Hinrichs K-U, Inagaki F, Teske AP. Community structure, zonation, and in situ energy yields of methane-cycling Archaea in ridge flank sediment, in prep. for submission to *Nature Geosci.*

Lever MA, Morono Y, Hoshino T, Inagaki F. Drilling fluid contamination during riser ocean drilling evaluated by chemical and molecular tracers, in prep. for submission to *Geomicrobiol J*.

Biddle JF, Lever MA, Teske AP. Distribution of Subseafloor Life: Biomass, Activity and Genetic Diversity, invited contribution to "Earth and Life Processes Discovered from Subseafloor Environment - A Decade of Science Achieved by the Integrated Ocean Drilling Program (IODP)", eds. Stain R, Blackman D, Larsen HC, in prep.

Piil K, Langerhuus AT, Lever MA, Røy H, and Lomstein BA. Response of microbial communities to addition of high quality organic matter evaluated by unique

bacterial and endospore markers and qPCR, in prep.

Ijiri A, Toki T, Yamaguchi YT, Kawagucci S, Hattori S, Morono Y, Lever MA, Yoshida N, Tsunogai U, Nakamura K, Takai K, Ashi J, Inagaki F. Biogeochemical study in mud-volcano sediments from the Kumano forearc basin, Japan, in prep.

Ertefai T, Lever MA, Haeckel M, Teske AP, Hinrichs K-U. Methanogenic community changes and the relation to sorbed methane in Black Sea sediments, in prep. for submission to *Geobiology*.

Blair J, Lever MA, Teske A. High diversity of Planktomycetes in surface sediments of the Chilean shelf: molecular evidence for anaerobic ammonia oxidation, in prep.

Published Commentaries:

Oren A (2012) There must be an acetogen somewhere. Commentary on "Lever MA. Acetogenesis in the energy-starved deep biosphere – a paradox?" *Frontiers in Microbiol* 3:1-2.

Abstracts:

Lever MA, Morono Y, Hoshino T, Inagaki F and Expedition 337 Scientists (2012) Drilling fluid contamination during riser drilling quantified by chemical and molecular tracers. American Geophysical Union, Fall Meeting, December 3-7, San Francisco, USA. Poster presentation.

Lever MA (2012) Life in the oceanic subseafloor: organisms, energy sources, and metabolic strategies. Session: Geosphere-biosphere interaction on and below the seafloor, Geologische Vereinigung 2012 Annual Meeting, Hamburg, Germany.

Invited keynote speaker.

Lever MA (2012) A potential niche for acetogens under extreme energy limitation. International Workshop on Microbial Life under Extreme Energy Limitation, May 6-9, 2012. Aarhus University, Aarhus, Denmark. Oral presentation.

Lever MA (2012) The apparent paradox of acetogenesis in the energy-starved subseafloor. The Deep-Sea & Sub-Seafloor Frontier Conference, March 11-14, 2012, Barcelona, Spain. Oral presentation.

Lever MA, Lloyd KG (2011) Contamination control, nucleic acid isolation, amplification, and quantification. Dark Energy Biosphere Institute – Research Coordination Network (DEBI-RCN), Workshop at University of North Carolina at Chapel Hill, March 6-9, 2011, Chapel Hill, North Carolina, USA. Invited Speaker.

Lever MA, Rouxel O, Alt J, Shimizu N, Ono S, Inagaki F, Teske A (2010) Functional gene and ^{34}S -isotopic evidence of microbial methane and sulfur cycling in 3.5 million-year-old buried ridge flank basalt. International Society of Microbial Ecology, The 13th International Symposium on Microbial Ecology, August 20-26, Seattle, Washington, USA. Oral presentation, A1585305).

Lever MA, Rouxel O, Alt J, Shimizu N, Ono S, Inagaki F, Teske A (2009) Functional gene and ^{34}S -isotopic evidence of microbial methane and sulfur cycling in 3.5 million-year-old buried ridge flank basalt. Dark Energy Biosphere Institute – Subseafloor Ocean Biosphere and Borehole Observatory Science, Workshop at Fairmont Orchid, Mauna Lani Resort, Hawaii, October 19-21, 2009. Poster presentation).

Lever MA. High metabolic diversity in single organisms as a survival strategy under extreme energy limitation: the case of acetogens. (Goldschmidt 2009 – "Challenges to our volatile planet", June 21-26, 2009, Davos, Switzerland. Oral presentation, A747).

Lever MA, Inagaki F, Morono Y, Masui N, Teske A (2008) Ubiquitous distribution of methanogens and anaerobic methanotrophs in subseafloor sediments and basalts. (Goldschmidt 2008 – "from Sea to Sky", Vancouver, Canada, July 13-18, 2008. Oral presentation. *Geochim Cosmochim Acta* 72:A538-A538).

Lever MA, Alperin MJ, Teske (2007) Life at the thermodynamic limit: the methanogen and methanotroph community of the Peru Trench (International workshop on minimum energy requirements of life, Aarhus, Denmark, October 21-24, 2007. Poster presentation).

Lever MA, Inagaki F (2007) Vertical distribution of methane-producing Archaea in sediment and underlying basalt of the Juan de Fuca Ridge Flank (NSF-East Asia and Pacific Summer Institute, Japan, 2007. Poster presentation).

Lever MA, Teske A (2007) Vertical distribution of methanogens, methanotrophs, and active Archaea in deep subsurface sediments of the Peru Trench as evaluated from functional genes (*mcrA*) and 16S rRNA profiles (Aquatic Sciences Meeting of American Society of Limnology and Oceanography, Santa Fe, NM, February 4-9, 2007, Oral Presentation, Abstract #5407).

Lever MA, Teske A (2006) Trends in basalt and sediment core contamination during IODP Expedition 301 (NASA Astrobiology Science Conference, Washington, DC, March 26-31, 2006, Oral presentation, Abstract #95).

Lever MA, Teske A (2005) Deep marine subsurface microbial communities of the Peru Trench: sulfate reducers, methanogens, and unknowns. *Astrobiol* 5:259 (Biennial Meeting of NASA Astrobiology Institute, Boulder, CO, April 10-14, 2005, Poster,

Abstract #558).

Teaching experience:

Graduate student mentor:

Ph.D. students: Hyunsoo Na (2009-present), Xihan Chen (2010-present), Andrea Torti (2011-present).

Masters students: Laura Merit Piepgras (2012, lab rotation), Lorenzo Lagostina (2011-2012), Thomas Evans (2011-2012).

Undergraduate student: Simon Jensen (2010-11), Duke Cheston (2007), Justin Blair (2006-08).

Guest lecturer for course Molecular Microbial Ecology at Institute of Biological Sciences, Aarhus University (2010, 2011).

Mentor of visiting Masters students Daniela Kalhöfer and Laura Wehrmann (ICBM, Oldenburg Germany) on summer project at University of North Carolina in Chapel Hill, June-August 2005.

Teaching assistant for Marine Ecology course under Prof. John F. Bruno at University of North Carolina in Chapel Hill, spring semester, 2003.

Mentor of Research Experience for Undergraduates summer student Melissa Novak at Boston University Marine Program, Marine Biological Laboratory, Woods Hole, Summer 2001.

International experience:

Center for Dark Energy Biosphere Investigations (C-DEBI) Network Speaker, April 4 2013.

Shorebased participant on DARCSEAS II expedition with R/V Poseidon in Western Mediterranean Sea (chief proponent: Kai-Uwe Hinrichs), April 2013.

Shipboard participant on Integrated Ocean Drilling Program Expedition 337, "Deep Coalbed Biosphere off Shimokita", July 31-September 21, 2012.

Shorebased participant on Chikyu drilling Expedition to Kumano Mud Volcano, July 2012.

Shorebased participant in Integrated Ocean Drilling Program Expedition 327, "Juan de Fuca Hydrogeology", July 5-September 5, 2010.

Three-week research visit at Japanese Agency for Marine-Earth Sciences and Technology working with Fumio Inagaki in Kochi, Japan, June 2010.

Shipboard participant in research cruise AT15-40 to Guaymas Basin on RV Atlantis, November 22-December 6, 2009.

Shorebased participant in Integrated Ocean Drilling Program Expedition 323, "Bering Sea Paleooceanography", July 5-September 4, 2009.

Shipboard participant in Benguela Upwelling Area Cruise on RV Meteor, April 13-May 14, 2008.

Participant in NSF-East Asia and Pacific Summer Institute, Japan, at Japanese Agency for Marine-Earth Sciences and Technology working with Fumio Inagaki in Kochi, Japan, 2007.

Shipboard participant in NSF/OCE/ODP-cruise "Life in seafloor sediments of the South Pacific Gyre", December 16, 2006 – January 27, 2007.

Shipboard participant in Integrated Ocean Drilling Program Expedition 301, "Juan de Fuca Ridge Hydrogeology", June 28-August 21, 2004.

Editorial experience:

Associate editor, *Frontiers in Extreme Microbiology* (accepted invitation, November 2012).

Review editor, *Frontiers in Microbiological Chemistry* (2011-present).

Journals: referee for *Science*, *ISME Journal*, *Nature Communications*, *Geochimica et Cosmochimica Acta*, *Biogeosciences*, *Organic Geochemistry*, *FEMS Microbial Ecology*, *Systematic and Applied Microbiology*, *Aquatic Microbial Ecology*, *Geomicrobiology Journal*, *Microbial Ecology*, *Applied Microbiology and Biotechnology*, and *Estuarine, Coastal and Shelf Sciences*.

Grant proposal reviewer for National Science Foundation (NSF), Deutsche Forschungsgemeinschaft (DFG), Center for Dark Energy Biosphere Investigations (C-DEBI; <http://www.darkenergybiosphere.org/>), and Faroese Research Council.

Synergistic activities:

Session convener "The Deep Biosphere - Recent progress in life in the deep subsurface" together with Drs. Beth Orcutt, Brandi Kiel Reese, and Heath Mills. American Geophysical Union, Fall Meeting, December 3-7, San Francisco, USA.

Coordination and teaching of "Exercises in sequence analysis" together with Drs. Karen G. Lloyd and Jennifer F. Biddle at Dark Energy Biosphere Institute Research Coordination Network (DEBI-RCN) meetings "Deep Biosphere Sediment Microbiology", March 6-9, 2011 in Chapel Hill, USA.

Invited participant and secretary at international conference "What makes a 'green' university in Vietnam – Defining Tri Viet University's Green Ambition",

December 3-4, 2011, Ho Chi Minh City, Viet Nam.