Katherine Dora McMahon

Assistant Professor
Department of Civil and Environmental Engineering
University of Wisconsin – Madison, 3204 Engineering Hall
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EDUCATION

Ph.D., Environmental Engineering 12/2002
Minors: Chemical Engineering and Microbial Biology.
University of California, Berkeley
Dissertation: "Microbial ecology of enhanced biological phosphorous removal systems." *Advisors: David Jenkins and Jay Keasling.*

M.S., Environmental Engineering 10/1997
University of Illinois at Urbana-Champaign
Thesis title: "Syntrophic and methanogenic population dynamics during the anaerobic codigestion of municipal solid waste and sewage sludge." *Advisor: Lutgarde Raskin*.

B.S., Civil Engineering 5/1995
University of Illinois at Urbana-Champaign
Highest Honors and Bronze Tablet Distinction

EXPERIENCE

Assistant Professor, Environmental Engineering 1/2003 - present
University of Wisconsin – Madison

Research Fellow, Civil and Environmental Engineering 1998-2002
University of California, Berkeley

Research Fellow, Civil and Environmental Engineering 1995-1997
University of Illinois at Urbana-Champaign

PROGRAM AFFILIATIONS AT UW-MADISON

Environmental Chemistry and Technology Program
Microbiology Doctoral Training Program
Limnology and Marine Science Program
Biotechnology Training Program
Gaylord Nelson Institute for Environmental Studies
Biomedical Engineering

RESEARCH INTERESTS

The broad objective of my research program is to improve our capacity to predict and model microbial behavior, while searching for novel biologically mediated transformations that can be harnessed for engineering applications. Specific areas of current interest include microbial ecology and biogeochemistry in freshwater systems; the links between microbial community structure and function, and process performance during biological wastewater treatment; and microbial communities as antibiotic resistance reservoirs in agricultural environments.

SYNERGISTIC ACTIVITIES

Editorial Board, Applied and Environmental Microbiology (2006 – current)
Scientific Advisory Board, CAMERA project funded by Gordon and Betty Moore Foundation (2006-current)
Management Committee, Activated Sludge Population Dynamics IWA Specialty Group (2005-current)
Mentor, Madison Metropolitan School District, High School Science Internship Program (Summer '05)
Presenter/Discussion Leader, Delta Roundtable dinner (sponsored by CIRTL) at UW-Madison (Sp '05)
Group leader, Instructional Materials Development Seminar, organized by the NSF-funded Center for the Integration of Research, Teaching, and Learning (CIRTL) at UW-Madison (Spring 2004)
Faculty Mentor, UW-Madison Bacteriology Department REU program (Summer 2004)
Faculty Mentor, UW-Madison College of Engineering. SURE-REU program (Summer 2003)
Faculty Trainer, UW-Madison Microbiology Doctoral Training Program (Fall 2004-current)
Faculty Trainer, UW Biotechnology Training Program (2003-current)
Fellow, ExCEEd Excellence in Civil Engineering Education Workshop (Summer 2003)
Founding member (1999) and chair (2001), UC-Berkeley Microbiology Graduate Student Group

SPECIAL TRAINING

Workshop on Molecular Evolution — Summer 2000
Marine Biological Laboratory, Woods Hole, Massachusetts.

Excellence in Civil Engineering Education Teaching Workshop — Summer 2003
Sponsored by the American Society of Civil Engineers

AWARDS AND HONORS

Science to Achieve Results (STAR) Graduate Fellowship, US EPA.	2000-2003
Robert A. Canham Scholarship, Water Environment Federation.	1999
National Science Foundation Graduate Fellowship.	1996-1999
David Owens Scholarship, National Association of Water Companies.	1995
Grant H. Flint Scholarship, Solid Waste Association of North America.	1995
Melih T. Dural Undergraduate Research Award, Civil Engineering Dept., UIUC.	1995
Ira O. Baker Prize, Civil Engineering Department, UIUC.	1995
A. Epstein Award, Civil Engineering Department, UIUC.	1995
Langlier Scholarship for Achievement in the study of water and wastewater treatment, Civil Engineering Department, UIUC.	1994
Sandberg Scholarship, Civil Engineering Department, UIUC.	1994
Barry M. Goldwater Excellence in Education Scholarship.	1993-1995
Morrow Award, Civil Engineering Department, UIUC.	1993

MEMBERSHIP AND ACTIVITY IN PROFESSIONAL SOCIETIES

American Society for Microbiology (ASM)
International Water Association (IWA)
Water Environment Federation (WEF)
American Society of Civil Engineers (ASCE)
Ecological Society of America (ESA)
International Society for Microbial Ecology (ISME)
American Society of Limnology and Oceanography (ASLO)

MANUSCRIPTS SUBMITTED AND IN PREPARATION

Newton, R. J., S. E. Jones, M. R. Helmus, **K. D. McMahon** "Phylogenetic analyses reveal factors structuring the freshwater Actinobacterial clade acI community composition in lakes" In preparation.

Shade, A., S. E. Jones, **K. D. McMahon** "The influence of disturbance history and habitat heterogeneity on aquatic bacterial community dynamics" In preparation.

Gu, A. Z, S. He, **K. D. McMahon**, J. B. Neethling "Comparison of A2O and UCT operation mode at full-scale EBPR processes – performance, kinetics, and PAO population" In preparation.

He, S., A. Z. Gu, **K. D. McMahon** "Progress towards explaining differences in distribution of Accumulibacter among full-scale enhanced biological phosphorus removal systems" Submitted.

McMahon, K. D., S. Yilmaz, S. He, D. L. Gall, D. Jenkins, J. D. Keasling. "A census of polyphosphate kinase genes from full-scale biological phosphorus removal activated sludge plants." Submitted.

Jones, S. E., L. E. Graham, **K. D. McMahon**. "Bacterial responses to autotrophy and heterotrophy by unitrophic and mixotrophic protists in a humic lake." Submitted.

Kunin, V., H. G. Martin, F. Warnecke, S. B. Peterson, N. Ivanova, L. L. Blackall, **K. D. McMahon**, P. Hugenholtz. "Analysis of a bacterial metapopulation reveals high global dispersal rates and ecosystem vulnerability" Submitted.

PUBLICATIONS

Kent, A. D., A. C. Yannarell, J. A. Rusak, E. W. Triplett, **K. D. McMahon**. (2007) "Synchrony in aquatic microbial community dynamics." *The ISME Journal*. 1(1):XXX.

Jones, S. E., A. Shade, **K. D. McMahon**, A. D. Kent (2007) "Comparison of primer sets for use in automated ribosomal intergenic spacer analysis (ARISA) of aquatic bacterial communities: An ecological perspective" *Applied and Environmental Microbiology*. 73(2):659-662.

Auerbach, E. A., E. E. Seyfried, and **K. D. McMahon**. (2007) "Tetracycline resistance genes in activated sludge wastewater treatment plants." *Water Research*. 41:1143-1151.

Shade, A., A. D. Kent, S. E. Jones, R. J. Newton, E. W. Triplett, **K. D. McMahon**. (2007) "Inter-annual dynamics and phenology of bacterial communities in a eutrophic lake." *Limnology and Oceanography*. 52(2):487-494.

Balser, T. C., **K. D. McMahon**, D. Bronson, D. R. Coyle, N. Craig, M. L. Flores-Mangual, K. Forshay, S. E. Jones, A. D. Kent, A. L. Shade (2006) "Bridging the gap between micro- and macro-scale perspectives on the role of microbial communities in global change ecology" *Plant and Soil*. 289(1-2):59-70.

Martin, H. G., N. Ivanova, V. Kunin, F. Warnecke, K. Barry, A. C. McHardy, C. Yeates, S. He, A. Salamov, E. Szeto, E. Dalin, N. Putnam, H. Shapiro, J. L. Pangilinan, I. Rigoutsos, N. C. Kyrpides, L. L. Blackall, **K. D. McMahon**, P. Hugenholtz. (2006) "Metagenomic analysis of phosphorus removing sludge communities." *Nature Biotechnology*. 24:1263-1269.

Kent, A. D., S. E. Jones, G. H. Lauster, J. M. Graham, R. J. Newton, **K. D. McMahon**. (2006) "Experimental manipulations of microbial food web interactions in a humic lake: shifting drivers of bacterial community structure" *Environmental Microbiology*. 8(8):1448-1459.

Newton, R. J., A. D. Kent, E. W. Triplett, and **K. D. McMahon**. (2006) "Microbial community dynamics in a humic lake: Differential persistence of common freshwater phylotypes." *Environmental Microbiology*. 8(6):956-970.

He, S., A. Gu, and **K. D. McMahon**. (2006) "Fine-scale phylogenetic structure in *Accumulibacter*-like populations performing enhanced biological phosphorus removal." *Water Science and Technology*. 54(1):111-117.

McMahon, K. D., D. Zheng, A. J. M. Stams, D. Boone, R. I. Mackie and L. Raskin. (2004) "Microbial population dynamics during startup and overload conditions of anaerobic digesters treating municipal solid waste and sewage sludge." *Biotechnology and Bioengineering*. **87**(7):823-834.

McMahon, K. D. M. A. Dojka, N. R. Pace, D. Jenkins, J. D. Keasling. (2002) "Polyphosphate kinase from activated sludge performing enhanced biological phosphorus removal." *Applied and Environmental Microbiology*. **68** (10):4971-4978.

McMahon, K. D., D. Jenkins, J. D. Keasling. (2002) "Polyphosphate kinase genes from activated sludge carrying out enhanced biological phosphorus removal" *Water Science and Technology*, **46** (1-2):155-162.

Renninger, N., **K. D. McMahon**, R. Knopp, H. Nitsche, D. S. Clark, and J. D. Keasling. (2002) "Uranyl precipitation by biomass from an enhanced biological removal reactor" *Biodegradation*, **12**:401-410.

Stroot, P. G., **K. D. McMahon**, R. I. Mackie, L. Raskin, (2001) "Anaerobic co-digestion of municipal solid waste and biosolids under various mixing conditions – I. Performance Data" *Water Research*. **35** (7):1804-1816.

McMahon, K. D., P. G. Stroot, R. I. Mackie, L. Raskin, (2001) "Anaerobic co-digestion of municipal solid waste and biosolids under various mixing conditions – II. Microbial population dynamics" *Water Research*. **35** (7):1817-1827.

Keasling, J. D., S. J. Van Dien, P. Trelstad, N. Renninger, **K. McMahon**, (2000) "Application of polyphosphate metabolism to environmental and biotechnological problems." *Biochemistry (Moscow)*. **65** (3): 324-331.

McMahon, K. D., D. A. Stahl, L. Raskin, (1998) "A comparison of in vitro transcribed rRNA and native rRNA for the quantification of microorganisms in the environment." *Microbial Ecology*. **36** (3): 362-371.

Griffin, M. E., **K. D. McMahon**, R. I. Mackie, L. Raskin, (1998) "Methanogenic population dynamics during startup of anaerobic digesters treating municipal solid waste and biosolids." *Biotechnology and Bioengineering*. **57** (3): 342-355.

SUPPORTED PROJECTS (CURRENT ONLY)

CAREER: Microbes and phosphorus: integrating engineering principles, ecology, and student learning to study eutrophication of freshwater lakes ($400,000)
May 2007 – April 2012
National Science Foundation, Environmental Engineering and Sustainability
PI: Katherine McMahon

SGER: An autonomous microbial genosensor for freshwater microbial ecology ($77,236)
July 2006 – June 2007
National Science Foundation, Division of Biological Infrastructure.
PIs: Katherine McMahon (lead), Julianne Dyble (Great Lakes Environmental Research Laboratory), David Fries and Matthew Smith (University of South Florida)

SGER: The enhanced biological phosphorus removal metaproteome ($70,000)
June 2006 – May 2007
National Science Foundation, Biological and Environmental Systems.
PIs: Katherine McMahon (lead), Vincent Martin (Concordia University, Montreal)

Use of human and bovine adenovirus for fecal source tracking ($70,031)
July 2006 – June 2008
Wisconsin Groundwater Coordinating Council
PIs: Joel Pedersen (lead), Katherine McMahon, Sharon Kluender (Wisconsin State Lab of Hygiene)

Fate and transport of treated effluent and predicted effects on microbial phosphorus cycling in Lake Mendota ($35,000)
January 2006 – December 2007
Madison Metropolitan Sewerage District (Madison, WI)
PIs: Katherine McMahon (lead) and Chin Wu

Evaluation of on-site wastewater treatment as a source of antibiotic resistance genes in groundwater ($42,972)
July 2005-June 2007
Groundwater Coordinating Council
PIs: Katherine McMahon

Collaborative Research: Mechanism of Enhanced Biological Phosphorus Removal
Total: $500,000 UW share: $256,884
November 2003 – October 2007
National Science Foundation, Biological and Environmental Systems.
UW-PI: Katherine McMahon (lead)
UC-Berkeley-PIs: David Jenkins and Jay D. Keasling.

Tetracycline Resistance Genes in Aquaculture Environments: Genotypic Diversity and Potential Resistance Reservoirs ($285,000)
July 2004 – June 2007
Wisconsin Sea Grant
PIs: Katherine McMahon (lead) and Joel Pedersen