

## **Katherine Dora McMahon**

Assistant Professor

Department of Civil and Environmental Engineering  
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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**

Co-director, Women in Science and Engineering Residential College (2007 – current)  
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**

Campus Class of 1955 Distinguished Teaching Award 2008  
NSF CAREER Award 2006-2011  
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)  
International Society for Microbial Ecology (ISME)  
American Society of Limnology and Oceanography (ASLO)

## MANUSCRIPTS SUBMITTED AND IN PREPARATION

- Peterson, S. B., F. Warnecke, J. Madejska, **K. D. McMahon**, P. Hugenholtz. "Environmental distribution and population biology of 'Candidatus Accumulibacter', a primary agent of biological phosphorus removal." In review.
- Hinckley, G. T., C. J. Johnson, K. H. Jacobson, C. Bartholomay, **K. D. McMahon**, D. McKenzie, J. M. Aiken, J. A. Pedersen. "Persistence of pathogenic prion protein during simulated wastewater treatment processes." In review.
- Jones, S. E., T. K. Kratz, C.-Y. Chiu, **K. D. McMahon**. "Typhoon disturbance patterns drive annual CO<sub>2</sub> flux to the atmosphere from a sub-tropical, humic lake." In revision.
- He, S., V. Kunin, M. Haynes, H. Garcia Martin, N. Ivanova, F. Rohwer, P. Hugenholtz, **K. D. McMahon** "Metatranscriptomic analysis of 'Candidatus Accumulibacter'-enriched enhanced biological phosphorus removal sludge" 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.
- Seyfried, E. E., R. J. Newton, K. F. Rubert IV, J. A. Pedersen, **K. D. McMahon**. "Diversity of tetracycline resistance genes in aquaculture facilities with varying use of oxytetracycline" In review.

## PUBLICATIONS

1. Jones, S.E., R. J. Newton, **K. D. McMahon**. "Potential for atmospheric deposition of bacteria to influence bacterioplankton communities." *FEMS Microbiology Ecology*, in press.
2. Jones, S. E., C.-Y. Chiu, T. K. Kratz, J.-T. Wu, A. Shade, **K. D. McMahon**. (2008) "Typhoons initiate predictable change in aquatic bacterial communities" *Limnology and Oceanography*, in press.
3. Kunin, V., S. He, F. Warnecke, S. B. Peterson, H. Garcia Martin, M. Haynes, N. Ivanova, L. L. Blackall, M. Breitbart, F. Rohwer, **K. D. McMahon**, P. Hugenholtz. (2008) "A bacterial metapopulation adapts locally to phage predation despite global dispersal" *Genome Research*, 18:293-297.
4. Shade, A., S. E. Jones, **K. D. McMahon**. (2008) "Habitat heterogeneity as a driver of aquatic bacterial community structure and dynamics." *Environmental Microbiology*, in press.
5. Cho, Y. K., T. J. Donohue, I. Tejedor, M. A. Anderson, **K. D. McMahon**, D. R. Noguera. (2008) "Development of a solar powered microbial fuel cell" *Journal of Applied Microbiology*, 104:640-650.
6. He, S., A. Z. Gu, **K. D. McMahon**. (2008) "Progress towards understanding the distribution of Accumulibacter among full-scale enhanced biological phosphorus removal systems" *Microbial Ecology*, 55(2):229-236.
7. **McMahon, K. D.**, S. Yilmaz, S. He, D. L. Gall, D. Jenkins, J. D. Keasling. (2007) "Polyphosphate kinase genes from full-scale activated sludge plants" *Applied Microbiology and Biotechnology*, 77(1):167-173.
8. Newton, R. J., S. E. Jones, M. R. Helmus, **K. D. McMahon** (2007) "The phylogenetic ecology of the freshwater acI lineage." *Applied and Environmental Microbiology*, 73(22):7169-7176.
9. He, S., D. L. Gall, **K. D. McMahon**. (2007) "Accumulibacter population structure in enhanced biological phosphorus removal sludges revealed by polyphosphate kinase genes." *Applied and Environmental Microbiology*, 73(18):5865-5874.
10. **McMahon, K. D.**, H. Garcia Martin, P. Hugenholtz. (2007) "Integrating ecology into biotechnology" *Current Opinion in Biotechnology*. 18(3):287-292.

11. 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):38-47.
12. 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.
13. Carpenter, S. R., B. J. Benson, R. Biggs, J. W. Chipman, J. A. Foley, S.A. Golding, R.B. Hammer, P. C. Hanson, P. T. J. Johnson, A. M. Kamarainen, T. K. Kratz, R. C. Lathrop, **K. D. McMahon**, B. Provencher, J. A. Rusak, C. T. Solomon, E. H. Stanley, M.G. Turner, M. J. Vander Zanden, C.-H. Wu and H. Yuan. (2007). "Understanding regional change: Comparison of two lake districts." *BioScience*. 57:323-335.
14. 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.
15. 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.
16. 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.
17. Garcia Martin, H., 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.
18. 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.
19. 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.
20. 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.
21. **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.
22. **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.
23. **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.
24. 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.

25. 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.
26. **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.
27. 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.
28. **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.
29. 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)**

*Collaborative Research: Microbial Observatory: Drivers of microbial community diversity and composition in humic lakes*

Total: \$1,500,00      UW Share: \$812,669

September 2007 – September 2012

UW-PIs: Katherine McMahon (lead), Timothy Kratz, Linda Graham, Barbara Benson, Joel Pedersen, Chin Wu

UIUC-PIs: Angela Kent and Rachel Whitaker

*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

*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 2008

Madison Metropolitan Sewerage District (Madison, WI)

PIs: Katherine McMahon (lead) and Chin Wu