Jessica Furrer Chau

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EDUCATION:

Ph.D., Environmental Engineering, August 2009
University of Connecticut, Storrs, CT. **GPA:** 4.0/4.0
Dissertation: Bacterial Diversity in Soil as a Function of Soil Texture

M.S., Environmental Engineering, May 2006
University of Connecticut, Storrs, CT. **GPA:** 3.95/4.0
Thesis: Lattice Boltzmann Modeling of Diffusion Processes in Unsaturated Porous Media

B.S., Mathematics, May 1999
Muhlenberg College, Allentown, PA
Graduated Magna Cum Laude, with concentration in Secondary Education

RESEARCH FOCUS:

Soil microbial ecology: Microbial community structure in soil is impacted by numerous physical, chemical, and biological factors. I focus on how the pore-scale hydrologic regime, mediated by the physical architecture of soil, impacts microbial interactions.

Vadose zone hydrology and pore-scale fluid modeling: Water flow in unsaturated soil is spatially and temporally dynamic. I use lattice Boltzmann modeling (LBM) to investigate and visualize pore-scale fluid behavior.

> ***Applications:*** *Interactions between soil microbes and pore-scale hydrology mediate biogeochemical cycles from pore- through global-scale, and impact critical environmental challenges including water quality and soil fertility.*

Other interests: biogeography of microbial eukaryotes, groundwater modeling, groundwater storage as climate change indicator.

ACADEMIC APPOINTMENTS:

Jan. 2010- present Post-doctoral Research Associate, Department of Chemical, Materials and Biomolecular Engineering, University of Connecticut.
Supervisor: Leslie M. Shor.

Jan.-May 2010 Adjunct Professor, Department of Civil and Environmental Engineering, University of Connecticut.

2003-2009 Graduate Research Assistant, Department of Civil and Environmental Engineering, University of Connecticut.

Ph.D. Advisory Committee:
- Amvrossios C. Bagtzoglou, Civil & Environmental Engineering
- Michael R. Willig, Ecology & Evolutionary Biology
- Kenneth Noll, Molecular & Cell Biology
- Maria Chrysochoou, Civil & Environmental Engineering

M.S. Advisory Committee: (Civil & Environmental Engineering)
- Dani Or
- Amvrossios C. Bagtzoglou
- Michael C. Sukop

2006-2008 Graduate Teaching Assistant, Department of Civil and Environmental Engineering. Supervisors: Amvrossios Bagtzoglou and Guiling Wang.

2002-2003 Graduate Teaching Assistant, Mathematics Department, University of Connecticut. Supervisor: Kinestu Abe.

2000-2002 High School Mathematics Teacher, Terryville High School, Plymouth, CT.

PUBLICATIONS:

Peer Reviewed:

Chau, J.F. and D. Or, 2006. Linking Drainage Front Morphology with Gaseous Diffusion in Unsaturated Porous Media- a Lattice Boltzmann Study, *Physical Review E*, 056304.

Chau, J.F., D. Or, and M.C. Sukop, 2005. Simulation of Gaseous Diffusion in Partially Saturated Porous Media Under Variable Gravity with Lattice Boltzmann Methods, *Water Resources Research*, 41, W08410.

Accepted for Publication:

Chau, J.F., A.C. Bagtzoglou, M. Willig. Bacterial Richness Assessed by T-RFLP Varies with Soil Texture, *Environmental Forensics*.

In Preparation:

Chau, J.F. and A.C. Bagtzoglou. Modeling Isolated Bacterial Microhabitats in Unsaturated Soil.

Chau, J.F. and G. Robbins. Long-term Trends in Groundwater Levels in the Northeast US, 1940-2005.

Proceedings and Technical Reports:

Kram, M., G. Robbins, **J.F. Chau**, A.C. Bagtzoglou, D. Eng and N. Jones, 2008. "Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GEOVIS", Technical Report TR-2291-ENV, Engineering Service Center, Naval Facilities Engineering Command, pp. 360 (peer reviewed by DOD & EPA).

J.F. Chau and G. Robbins, 2007, Trends in Groundwater Levels in Connecticut, USA,1940-2005, in *Earth: Our Changing Planet. Proceedings of IUGG XXIV General Assembly Perugia, Italy 2007,* Abstract # 4551.

Chau, J.F., and A.C. Bagtzoglou, 2007, "Report on Development and Testing of Groundwater Flow and Tracer Transport Models", Technical Report, Project N47408-04-C-7514, pp.16.

Robbins, G.A., **J.F. Chau**, and A.C. Bagtzoglou, 2006, "Rhodamine Tracer Test Simulation for Port Hueneme Test Site", Technical Report, Project N47408-04-C-7514, pp.18.

GRANTS:

Multidisciplinary Research Grant, *Physical Constraints on Bacterial Diversity in Soils*, UConn Connecticut Center for Environmental Science and Engineering (CESE), $5000, 5/31/07-8/31/07.

AGU Travel Grant, to attend International Union of Geodesy and Geophysics (IUGG) General Assembly XXIV, Perugia, Italy. July 2007, $1500.

AWARDS AND HONORS:

- **Doctoral Dissertation Fellowship Award**, UConn Graduate School, 2008.
- **Summer 2007 Fellowship Award**, UConn Environmental Engineering Program.
- **Pre-Doctoral Fellowship**, UConn Environmental Engineering Program, 2007.

PRESENTATIONS:

Oral Presentations

(upcoming) **Chau, J.F.**, G. Bouchillon, and L.M. Shor. *Linking Form, Function and Molecular Taxonomy: Microfluidic Trap Arrays to Study Protozoan Biogeography*, American Society for Microbiology, May 2011, New Orleans, LA.

Chau, J.F., A.C. Bagtzoglou, and D. Or. *Simulating Isolated Bacterial Microhabitats in Unsaturated Soil*, Computational Methods in Water Resources (CMWR) XVII International Conference, July 2008, San Francisco, CA.

Chau, J.F. (invited) *A Textural Journey Through Connecticut: Linking Bacterial Diversity With Soil Texture*, University of Connecticut Environmental Engineering Seminar, October 2007, Storrs, CT.

Chau, J.F. and D. Or. *Impact of Drainage Front Morphology on Gas Diffusion in Unsaturated Porous Media,* AGU Fall Meeting, December 2005, San Francisco, CA.

Chau, J.F. (invited) *Impact of Drainage Front Morphology on Gas Diffusion in Unsaturated Porous Media: A Lattice Boltzmann Study*, University of Connecticut Environmental Engineering Seminar, November 2005, Storrs, CT.

Other Presentations

Chau, J.F., G. Bouchillon, and L.M. Shor. *Microfluidic Trap Arrays for In Situ Determination of Microbial Carbon Cycling*, American Chemical Society, March 2011, Anaheim, CA.

Chau, J.F., G. Bouchillon, and L.M. Shor. *Linking Form, Function and Genetics: Microfluidic Trap Arrays for Microbial Eukaryotes*, Ecological Genomics Symposium, November 2010, Kansas City, MO.

Chau, J.F., A.C. Bagtzoglou, and M. Willig. *Effect of Soil Texture on Bacterial Diversity and Richness in Soil,* ASM General Meeting, May 2009, Philadelphia, PA.

Bagtzoglou, A.C., **J.F. Chau**, M. Kram, G. Robbins. *Evaluation of High- Resolution Piezocone Methods for Site Characterization and Groundwater Modeling*, CMWR XVII International Conference, July 2008, San Francisco.

Chau, J.F., A.C. Bagtzoglou, and D. Or. *Relating Bacterial Diversity to Soil Texture*, ASM General Meeting, June 2008, Boston, MA.

Chau, J.F. , A.C. Bagtzoglou, and M. Willig. *Measuring Soil Bacterial Diversity Across a Range of Soil Textures,* Connecticut Conference on Natural Resources, March 2008, Storrs, CT.

Chau, J.F. and G. Robbins. *Trends in Groundwater Levels in Connecticut, USA,1940-2005,* IUGG XXIV General Assembly, July 2007, Perugia, Italy.

Kram, M., G. Robbins, A.C. Bagtzoglou, **J.F. Chau**, and M. Metcalf: (Oral presentation) *Detailed Hydraulic Assessment Using a High-Resolution Piezocone and 3-D Conceptual Models*, Groundwater Resources Association of California, November 2006, Long Beach, CA.

Chau, J.F. and D. Or. *Linking Drainage Front Morphology with Gas Diffusion in Unsaturated Porous Media,* Gordon Conference on Flow and Transport in Permeable Media, July 2006, Andover, NH.

J.F. Chau and D. Or. *Impact of Capillary Number on Front Morphology and Resulting Gas Diffusion in Unsaturated Porous Media*, AGU Joint Assembly, May 2005, New Orleans, LA.

J.F. Chau, D. Or, S.B. Jones, and M. C. Sukop. *Lattice Boltzmann Modeling of Gaseous Diffusion in Unsaturated Porous Media Under Variable Gravity Conditions,* AGU Joint Assembly, May 2004, Montreal, Canada.

RESEARCH PROJECTS

Biogeography of Microbial Eukaryotes, 2010 (current). Funding source: NSF

- Design experiments to investigate effects of habitat heterogeneity on environmental microbes using microfluidic devices. Develop protocols for isolation and genetic analysis of microbial eukaryotes (ciliates). Fabricate microfluidic devices. Present results in at least 4 conferences in 2010-2011. Two manuscripts in preparation.
- Assist PI in starting up and managing her new laboratory. Identify and order necessary equipment, consulting with vendors and current users. Develop biosafety protocols and ensure compliance for university and Connecticut Department of Public Health certification. Supervise undergraduates and graduate students in research activities.
- Assist PI in researching and writing funding proposals. Perform literature reviews, assist in designing experiments, draft budgets and text, compile results, and seek out potential funding opportunities.

Soil Bacterial Diversity as Impacted by Pore-Scale Hydrology, Ph.D. dissertation project, 2005- 2009. Funding sources: University of Connecticut, Center for Environmental Sciences and Engineering (CESE), Department of Civil and Environmental Engineering (TA and fellowship support).

- Designed, obtained funding for, and conducted a study to assess trends in bacterial diversity as a function of soil texture. Identified and applied for external and internal funding sources for supplies and salary. Designed and conducted soil sampling campaign utilizing Natural Resources Conservation Service (NRCS) soil maps. Performed physical

analysis of soil and molecular analysis of bacterial communities. Presented results at 1 regional and 3 international conferences. Prepared and submitted manuscript to a peer-reviewed journal.

- Performed lattice Boltzmann pore-scale modeling study to elucidate mechanisms behind observed experimental trends in bacterial diversity. Wrote Fortran and Matlab programs for construction and packing of simulated soils, modeling of fluid topology, and analyzing fluid connectivity. One manuscript is currently in preparation.

Pore-scale Modeling of Gas Diffusion Under Reduced Gravity in Unsaturated Porous Media, M.S. thesis project, 2003-2005. Funding source: NASA

- Modeled gas diffusion in porous media to inform development of artificial plant-growth media for NASA. Developed Fortran and Matlab codes to perform lattice Boltzmann pore-scale fluid dynamics modeling and visualize results. Compared modeling results with theoretical predictions from the soil physics literature. Presented findings at 4 international conferences. First author of 2 manuscripts published in peer-reviewed journals (*Water Resources Research* and *Physical Review E*).

Assessment of High-Resolution Piezocone Site Characterization Methods, 2006-2007. Funding source: Naval Facilities Engineering Service Center

- Constructed GMS/MODFLOW model of groundwater tracer test conducted at Port Hueneme Naval Base in California; assessed efficacy of various site-characterization methods. Presented research at 1 international conference; contributed to 1 additional conference presentation and 3 technical reports.

Long-term Analysis of USGS Groundwater Level Records, 2005-2007.

- Obtained and analyzed trends in groundwater well records of ≥25 years to investigate effects of increasing precipitation over the U.S. Northeast. Presented findings at 1 international conference after obtaining an AGU travel grant; one publication in preparation.

Prototype Testing and Analysis for a Novel Hydropower Design, 2008-2009. Funding source: E-Gen LLC, Groton, CT (local renewable energy company)

- Performed fluid dynamics-based dimensional analysis and assisted in testing of prototype of novel energy-generation project. Compared prototype performance with theoretical predictions for a variety of operating conditions. One publication is in preparation.

TEACHING EXPERIENCE:

Department of Civil and Environmental Engineering, University of Connecticut

Environmental Modeling, Spring 2010. (Adjunct Professor)
Taught Environmental Modeling, an undergraduate course on modeling of environmental processes in water, soil and air. Introduced methodologies, instructed students in development of simple models in Matlab and Excel. Held hands-on programming and laboratory sessions in connection with class project assignments.

Fundamentals of Engineering, Spring 2007. (Graduate Teaching Assistant)
Developed the curriculum for and taught 4-week environmental module of Fundamentals of Engineering. Taught quantitative skills (Excel and Matlab programming) in the context of relevant environmental problems. Curriculum was used by CEE faculty (Guiling Wang) in subsequent years. Was the instructor of record for this module. Supervised one student in extra research/programming project for honors credit.

Fluid Mechanics, Fall 2008, 2007, 2006. (Graduate Teaching Assistant)
Taught 3 weeks of lecture for faculty on maternity leave (Guiling Wang, Fall 2008).
As teaching assistant, developed computational project for the course and held training sessions on Bentley WaterGems hydraulic modeling software for students. Graded exams and homeworks and held office hours (Fall 2006 and 2007).

Mathematics Department, University of Connecticut

Mathematical Modeling, Spring 2003. (Graduate Teaching Assistant)
Taught an interdisciplinary course using pre-calculus mathematics to describe natural phenomena (e.g., groundwater flow, pollutant dispersion). Explored impact of environmental issues on students' lives. This course was pivotal in developing my interest in Environmental Engineering. Was the instructor of record for this course.

Problem Solving, Fall 2002. (Graduate Teaching Assistant)
Taught introductory math course for non-majors. Was the instructor of record for this course.

Terryville High School, Plymouth, CT, Aug. 2000-June 2002. (Mathematics Teacher)

Taught ***Algebra I and II, Remedial Mathematics, Physical Science,*** grades 9-12.
Successfully completed state-mandated teaching portfolio for licensure.

Peace Corps Volunteer, Solomon Islands, Nov. 1999- June 2000.

Taught Math, English, Home Economics at rural vocational school with very limited resources. Peace Corps service cut short by military coup in Solomon Islands (May 2000).

SERVICE:

Supervising and Mentoring

Post-doctoral position, current: Manage 2 graduate and 4 undergraduate researchers in Leslie Shor's lab. Provide direction on lab tasks and presentation of research results.

Teaching assistant position, Spring 2007: Supervised one undergraduate student in extra research and programming project for honors credit in Fundamentals of Engineering.

University Volunteering

Open House and E2K Programs, UConn School of Engineering, yearly, 2004-2008.
Performed lab demonstrations to stimulate high school student interest in environmental engineering.

Grad Night, UConn Civil and Environmental Engineering, yearly, 2006-2008.
Give presentations and discuss opportunities with department undergraduates interested in attending graduate school.

Reviewerships

Transport in Porous Media
Microbial Ecology
Journal of Hydrologic Engineering

Professional Society Memberships

American Society for Microbiology (ASM)
American Geophysical Union (AGU)
American Chemical Society (ACS)
American Association of University Women (AAUW)