Ran Mei

JSPS Postdoctoral Fellow

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

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EDUCATION

2020 Ph.D., Environmental Engineering, **University of Illinois Urbana-Champaign**, USA

Dissertation: Investigating the roles of microbial immigration in wastewater treatment processes

Advisor: Professor Wen-Tso Liu

2015 M.S., Environmental Engineering, **University of Illinois Urbana-Champaign**, USA

Thesis: Microbial community responses of an anaerobic enrichment to temperature shocks

Advisor: Professor Wen-Tso Liu

2013 B.S., Energy and Resources Engineering, **Peking University**, China

Thesis: Identification, function evaluation, and genome analysis of a novel bacterial species isolated from Daqing oil field

Advisor: Professor Xiaolei Wu

PROFESSIONAL EXPERIENCE

2023-now Postdoctoral Fellow, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan

2021-2023 Postdoctoral Fellow, National Institute of Advanced Industrial Science and Technology (AIST), Japan

HONORS AND AWARDS

2023 CSP New Investigator Award, Joint Genome Institute, USA Department of Energy

2022 Postdoctoral Fellowship for Research in Japan, Japan Society for the Promotion of Science

2021 Jacobs Engineering Group/AEESP Outstanding Doctoral Dissertation Award, Association of Environmental Engineering and Science Professors

2020 Outstanding Self-financed Students Abroad, China Scholarship Council

2020 Engelbrecht Fellowship, University of Illinois Urbana-Champaign

2019 Warren W. Yee Memorial Fellowship, University of Illinois Urbana-Champaign

2013 Civil & Environmental Engineering Department Fellowship, University of Illinois Urbana-Champaign

2012 Yihai Kerry Scholarship, Peking University

2011 Kwang-Hua Scholarship, Peking University

RESEARCH INTERESTS

Microbial genomics, ecology, and evolution; water and wastewater treatment; methanogenesis; anaerobic cultivation

FUNDED RESEARCH

2023-2026 Community Sequencing Program New Investigator Award, Joint Genome Institute, Department of Energy, USA

Unraveling the interplay between sediment microorganisms in biomass consumption (in-kind sequencing of 3 TB genomic data, ~60k USD equivalent)

Principal Investigator (co-PI: Dr. Masaru K. Nobu; Dr. Hiroyuki Imachi)

2022-2024 Grant-in-Aid for JSPS Fellow, Japan Society for the Promotion of Science, Japan

Global gene cataloguing-based reconstruction of the evolutionary transition from simple to complex cells (2.2 mil JPY, ~15k USD).

Foreign Research Fellow (Host researcher: Dr. Masaru K. Nobu)

PUBLICATIONS

*Peer-reviewed journal articles (*Corresponding author, †Co-first authors)*

1. Hirakata, Y., **Mei, R.**, Morinaga K., Katayama T., Tamaki H., Meng X.Y., Watari T., Yamaguchi T., Hatamoto M., & Nobu, M.K.*, 2023. Discovery of anaerobic bacterial scavengers of dead cells. ***The ISME Journal***, in press. 10.1038/s41396-023-01538-2
2. **Mei, R.**, Kaneko, M., Imachi, H., & Nobu, M.K.*, 2023. The origin and evolution of methanogenesis and *Archaea* are intertwined. ***PNAS Nexus***, 2 (2). 10.1093/pnasnexus/pgad023
3. **Mei, R.** & Liu, W.T.*, 2022. Meta-omics supervised characterization of respiration activities associated with microbial immigration in anaerobic digestion. ***Environmental Science & Technology***, 56 (10). 10.1021/acs.est.2c01029
4. Kim, J.†, **Mei, R.†**, Wilson, F.P., Yuan, H., Bocher, B.T.W., & Liu, W.T.*, 2020. Ecogenomics-based mass balance model reveals the effects of fermentation conditions on microbial activity. ***Frontiers in Microbiology***, 11. 10.3389/fmicb.2020.595036
5. Nobu, M.K.†, Narihiro, T.†, **Mei, R.**, Kamagata, Y., Lee, P.H., Lee, P.K., McInerney, M.J., & Liu, W.T.*, 2020. Catabolism and interactions of uncultured organisms shaped by eco-thermodynamics in methanogenic bioprocesses. ***Microbiome***, 8. 10.1186/s40168-020-00885-y
6. Ye, L.*, **Mei, R.**, Liu, W.T., Ren H., & Zhang, X.X.*, 2020. Machine learning-aided analyses of thousands of draft genomes reveal specific features of activated sludge processes. ***Microbiome***, 8. 10.1186/s40168-020-0794-3
7. **Mei, R.**, Nobu, M.K., Narihiro, T., & Liu, W.T.*, 2020. Metagenomic and metatranscriptomic analyses revealed uncultured *Bacteroidales* populations as the dominant proteolytic amino acid degraders in anaerobic digesters. ***Frontiers in Microbiology***, 11. 10.3389/fmicb.2020.593006
8. Lam, Y.C.†, **Mei, R.†**, Wu, Z., Lee, P.K., Liu, W.T.*, & Lee, P.H.*, 2020. Superior resolution characterization of microbial diversity in anaerobic digesters using full-length 16S rRNA gene amplicon sequencing. ***Water Research***, 178. 10.1016/j.watres.2020.115815
9. **Mei, R.**, Nobu, M.K., & Liu, W.T.*, 2020. Identifying anaerobic amino acids degraders through the comparison of short-term and long-term enrichments. ***Environmental Microbiology Reports***, 12 (2). 10.1111/1758-2229.12821
10. Sun, H., **Mei, R.**, Zhang, X.X., Ren H., Liu, W.T., & Ye, L.*, 2019. Bacterial enrichment in highly selective acetate-fed bioreactors and its application in rapid biofilm formation. ***Water Research***, 170. 10.1016/j.watres.2019.115359

11. **Mei, R.** & Liu, W.T.*, 2019. Quantifying the contribution of microbial immigration in engineered water systems. ***Microbiome***, 7. 10.1186/s40168-019-0760-0
12. **Mei, R.**, Kim, J., Wilson, F.P., Bocher, B.T.W., & Liu, W.T.*, 2019. Coupling growth kinetics model and machine learning quantifies microbial immigration impacts and identifies key environmental parameters in a biological wastewater treatment process. ***Microbiome***, 7. 10.1186/s40168-019-0682-x
13. Yuan, H., **Mei, R.**, Liao, J., & Liu, W.T.*, 2019. Nexus of stochastic and deterministic processes on microbial community assembly in biological systems. ***Frontiers in Microbiology***, 10. 10.3389/fmicb.2019.01536
14. Zealand, A. M., **Mei, R.**, Papachristodoulou, P., Roskilly, A. P., Liu, W. T., & Graham, D. W.*, 2019. Molecular microbial ecology of stable versus failing rice straw anaerobic digesters. ***Microbial Biotechnology***, 12 (5). 10.1111/1751-7915.13438
15. **Mei, R.**, Nobu, M.K., Narihiro, T., Yu, J., Sathyagal, A., Willman, E., & Liu, W.T.*, 2018. Novel *Geobacter* species and diverse methanogens contribute to enhanced methane production in media-added methanogenic reactors. ***Water Research***, 147. 10.1016/j.watres.2018.10.026
16. Narihiro, T.†, Nobu, M.K.†, Bocher, B.T.W., **Mei, R.**, & Liu, W.T.*, 2018. Co-occurrence network analysis reveals thermodynamics-driven microbial interactions in methanogenic bioreactors. ***Environmental Microbiology Reports***, 10 (6). 10.1111/1758-2229.12689
17. Zealand, A. M., **Mei, R.**, Papachristodoulou, P., Roskilly, A. P., Liu, W. T., & Graham, D. W.*, 2018. Microbial community composition and diversity in rice straw digestion bioreactors with and without dairy manure. ***Applied Microbiology and Biotechnology***, 102 (19). 10.1007/s00253-018-9243-7
18. Nobu, M.K.†, Narihiro, T.†, Liu, M.M., Kuroda, K., **Mei, R.**, & Liu, W.T.*, 2017. Thermodynamically diverse syntrophic aromatic compound catabolism. ***Environmental Microbiology***, 19 (11). 10.1111/1462-2920.13922
19. **Mei, R.**, Nobu, M.K., Narihiro, T., Kuroda, K., Sierra, J., Wu, Z.Y., Ye, L., Lee, P.K.H., Lee, P.H., van Lier,. J.B., McInerney, M.J., Kamagata, Y., & Liu, W.T.*, 2017. Operation-driven heterogeneity and overlooked feed-associated populations in anaerobic digester microbiome. ***Water Research***, 124. 10.1016/j.watres.2017.07.050
20. Kuroda, K.†, Nobu, M.K.†, **Mei, R.**, Narihiro, T., Bocher, B.T., Yamaguchi, T., & Liu, W.T.*, 2016. A single-granule-level approach reveals ecological heterogeneity in an upflow anaerobic sludge blanket reactor. ***PLOS ONE***, 11 (12). 10.1371/journal.pone.0167788
21. **Mei, R.**, Narihiro, T., Nobu, M.K., & Liu, W.T.*, 2016. Effects of heat shocks on microbial community structure and microbial activity of a methanogenic enrichment degrading benzoate. ***Letters in Applied Microbiology***, 63 (5). 10.1111/lam.12629
22. Nobu, M.K., Narihiro, T., Kuroda, K., **Mei, R.**, & Liu, W.T.*, 2016. Chasing the elusive Euryarchaeota class WSA2: genomes reveal a uniquely fastidious methyl-reducing methanogen. ***The ISME Journal***, 10 (10). 10.1038/ismej.2016.33
23. **Mei, R.**, Narihiro, T., Nobu, M.K., Kuroda, K., & Liu, W.T.*, 2016. Evaluating digestion efficiency in full-scale anaerobic digesters by identifying active microbial populations through the lens of microbial activity. ***Scientific Reports***, 6. 10.1038/srep34090
24. Pan, X.C.†, Geng, S., Lv, X.L.†, **Mei, R.**, Jiangyang, J.H., Wang, Y.N., Xu, L., Liu, X.Y., Tang, Y.Q., Wang, G.J., & Wu, X.L.*, 2015. *Defluviimonas alba* sp. nov.,

isolated from an oilfield. ***International Journal of Systematic and Evolutionary Microbiology***, 65 (6). 10.1099/ijs.0.000181

25. Narihiro, T., Kim, N.K., **Mei, R.**, Nobu, M.K., & Liu, W.T.*, 2015. Microbial community analysis of anaerobic reactors treating soft drink wastewater. ***PLOS ONE***, 10 (3). 10.1371/journal.pone.0119131
26. Geng, S., Pan, X.C., **Mei, R.**, Wang, Y.N., Liu, X.Y., Wang, X.B., Tang, Y.Q., & Wu, X.L.*, 2015. *Glycocaulis alkaliphilus* sp. nov., a dimorphic prosthecate bacterium isolated from crude oil. ***International Journal of Systematic and Evolutionary Microbiology***, 65 (3). 10.1099/ijs.0.000023
27. Geng, S., Pan, X.C., **Mei, R.**, Wang, Y.N., Sun, J.Q., Liu, X.Y., Tang, Y.Q., & Wu, X.L.*, 2015. *Paradevosia shaoguanensis* gen. nov., sp. nov., isolated from a coking wastewater. ***Current Microbiology***, 70 (1). 10.1007/s00284-014-0689-2
28. Pan, X.C., Geng, S., **Mei, R.**, Wang, Y.N., Cai, H., Liu, X.Y., Tang, Y.Q., Nie, Y., Ye, S.Y., & Wu, X.L.*, 2014. *Nitratireductor shengliensis* sp. nov., isolated from an oil-polluted saline soil. ***Current Microbiology***, 69 (4). 10.1007/s00284-014-0624-6
29. Geng, S., Pan, X.C., **Mei, R.**, Wang, Y.N., Sun, J.Q., Liu, X.Y., Tang, Y.Q., & Wu, X.L.*, 2014. *Ottowia shaoguanensis* sp. nov., isolated from coking wastewater. ***Current Microbiology***, 68 (3). 10.1007/s00284-013-0481-8

Book chapter

1. Narihiro, T., Nobu, M.K., **Mei, R.**, & Liu, W.T., 2015. Microbial community involved in anaerobic purified terephthalic acid treatment process. *Anaerobic Biotechnology: Environmental Protection and Resource Recovery. Imperial College Press, London*. 10.1142/9781783267910_0003

Unsubmitted manuscript

1. **Mei, R.**, Imachi, H., & Nobu, M.K. Archaea gene encyclopedia unveils critical branching points from simple to complex cells. In preparation.
2. Leng, L., **Mei, R.**, Qiu, Y.L., Leu, S.Y., Liu, W.T., & Nobu, M.K. Contemporary and ancient evolutionary paths behind bacteria eating plastics waste. In preparation.

PRESENTATIONS

1. The origin and evolution of methanogenesis and Archaea are intertwined. Oral presentation at 2023 AEESP Research & Education Conference, Boston, USA, 2023
2. The origin and evolution of methanogenesis and Archaea are intertwined. Oral and poster presentation at ASM Microbe, Houston, USA, 2023
3. Elucidating the diversification Archaea using comparative genomics. Invited talk at Japan Collection of Microorganisms, Tsukuba, Japan, 2023
4. Investigate microbial immigration using eco-genomics. Invited talk at Chinese Academy of Science, Beijing, China, 2022
5. Culture-dependent and independent investigation of anaerobic amino acid degraders. Invited talk at Zhejiang University, Hangzhou, China, 2021
6. Genomics-based investigation of microbial immigration in engineered ecosystems. Invited talk at Nanjing University, Nanjing, China, 2021
7. Coupling growth kinetics modeling with machine learning reveals Microbial immigration impacts and identifies key environmental parameters in a biological wastewater treatment process. Oral presentation at IWA MEWE Specialist Conference, Hiroshima, Japan, 2019
8. Identifying anaerobic amino acids degraders through the comparison of short-

term and long-term enrichments. Poster presentation at IWA MEWE Specialist Conference, Hiroshima, Japan, 2019

9. Metabolic partitioning among microbial dark matter across anaerobic digesters. Poster presentation at JGI Annual Meeting, Walnut Creek, USA, 2018
10. Distribution of populations associated with known syntrophs and methanogens in the global anaerobic digester microbiome. Oral presentation at Anaerobic Microbial Syntrophy Forum, Chengdu, China, 2017
11. Operation-driven heterogeneity and overlooked feed-associated populations in anaerobic digester microbiome. Poster presentation at IWA International Conference on AD, Beijing, China, 2017
12. Operation-driven heterogeneity and overlooked feed-associated populations in anaerobic digesters. Poster presentation at JGI Annual Meeting, Walnut Creek, USA, 2017
13. Microbiome of anaerobic digesters in 51 municipal wastewater reclamation plants. Poster presentation at The ISME Symposia, Montreal, Canada, 2016
14. Microbiome of anaerobic digesters in 51 municipal wastewater treatment plants. Poster presentation at JGI Annual Meeting, Walnut Creek, USA, 2016
15. Microbial community response of a mesophilic methanogenic enrichment to temperature perturbations. Poster presentation at ASM Microbe, New Orleans, USA, 2015

TEACHING EXPERIENCES

Teaching

2019 Guest lecture. CEE444, Biological Principles in Environmental Engineering, UIUC

Topic: Introduction of phylogenetic analysis and microbial systematics

2018 New course development and instruction. CEE540, Remediation Design, UIUC

Topic: Application of thermodynamics, microbial phylogeny, microbial ecology, bioinformatics, and reactor kinetics in bioremediation.

2017 Guest lecture. CEE538, Water Quality Control Process II, UIUC

Topic: Nitrogen cycle in wastewater treatment

2016 Guest lecture. CEE437, Water Quality Engineering, UIUC

Topic: Overview of microbial processes in wastewater treatment

Mentoring

2018-2020 Tzu-Yu Lin, Ph.D. student

Mentored on: Ph.D. dissertation research on application of meta-omics technologies to reveal microbial ecology in anaerobic digestion.

Current position: Postdoctoral Associate at the Department of Energy, Environmental and Chemical Engineering, Washington University in St. Louis.

2018-2019 Gabriella Morales, M.S. student

Mentored on: M.S. thesis research on bioreactor-based investigation of microbial immigration.

Current position: Environmental Engineer at Idaho National Laboratory.

2016-2018 Jinha Kim, M.S. student

Mentored on: M.S. thesis research on solid waste reduction in petrochemical wastewater treatment process.

Current position: Ph.D. student at the Department of Civil and Environmental Engineering, Texas A&M University.

2016-2018 Bridget Ladell, M.S. student

Mentored on: M.S. thesis research on silver carp microbial community dynamics.

Current position: Research Specialist at the DNA Sequencing Facility at University of Wisconsin-Madison.

2015-2017 Junhui Liao, M.S. student

Mentored on: M.S. thesis research on microbial ecology of a reactor treating high strength wastewater.

Current position: Environmental Engineer at Jacobs.

2016 Qiuye (Jenny) Si, M.S. student

Mentored on: Independent research on the enhancement of biogas production from soft drink wastewater.

Current position: Environmental Engineer at Stantec.

2015 Lucas Rocha Melogno, visiting undergraduate student

Mentored on: Internship research on the effects of conductive materials on biological methane production.

Current position: Senior Health Scientist at ICF.

2014 Lama Aoudi, undergraduate student

Mentored on: The Research Experiences for Undergraduates program to test the digestibility of food waste by anaerobic digestion.

Current position: Data Scientist at Carbon Arc.

2014 Theodore Chan, undergraduate student

Mentored on: The Research Experiences for Undergraduates program to compile data obtained from wastewater treatment plants from around the world.

Current position: Civil Engineering at SoCore Energy.

ACTIVITIES

Journal Editor

Letters in Applied Microbiology, Junior Editor, 2023-now

Journal Reviewer

Bioengineering, Bioresource Technology, Biotechnology Reports, BMC Microbiology, Chemical Engineering Journal, Engineering, Environment International, Environmental Microbiology Reports, Environmental Science & Technology, Frontiers in Microbiology, iMeta, Journal of Hazardous Materials, mSphere, PLOS ONE, Science of the Total Environment, Water Research

Professional Memberships

American Society of Microbiology (ASM), Applied Microbiology International (AMI), Association of Environmental Engineering and Science Professors (AEESP), Chinese-American Professors in Environmental Engineering and Science (CAPEES), Japan Society of Microbial Ecology (JSME)