

YenJung (Sean) Lai, Ph. D

Biodesign Swette Center for Environmental Biotechnology
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Education

University of Maryland- College Park, USA, 2005- 2010
Ph.D. Environmental Science and Technology

National Tsinghua University, Taiwan, 2002
M.S. Biomedical Engineering and Environmental Science

National TsingHua University, Taiwan, 2000
B.S. Biomedical Engineering and Environmental Science

Professional Experiences

Assistant research scientist, 2015-Present

Biodesign Swette Center for Environmental Biotechnology, Arizona State University

Postdoctoral research associate, 2011-2015

Biodesign Swette Center for Environmental Biotechnology, Arizona State University
The Hamner Institute for Health Sciences, NC

Civil, Construction and Environmental Engineering, North Carolina State University

Research assistant, 2010-2011

Environmental Science and Technology, University of Maryland, College Park, MD

Graduate teaching/research assistant, 2005-2010

Environmental Science and Technology, University of Maryland, College Park, MD

Research associate, 2004-2005

Center for Environmental Safety & Health Technology Development, Industrial Technology
Research Institute, Taiwan

Research Interests

Integration of upstream and downstream processes toward energy for sustainability

Microbial electrochemical cells for emerging contaminant remediation and biofuel recovery

Disinfectant-induced antibiotic resistance

Gas transfer via hollow-fiber membrane technologies for carbon capture and bioremediation

Zero-valent metals for contaminant remediation

Funded/Pending Research Projects (as co-PI)

NSF CBET 1702445 (Current), Enhancing biodegradation of quaternary ammonium compounds (QAC). PI: Drs. Bruce E Rittmann and **YenJung Lai** (Co-PI); 2017-2020 (\$ 329,738)

NSF CBET 1509933 (Current), Targeted saturated fatty acids synthesis by microbial biohydrogenation and its superior extraction from microalgae biomass through selective fermentation. PI: Drs. Bruce E Rittmann and **YenJung Lai** (Co-PI); 2015-2018 (\$ 309,443)

LightWorks (Current), ASU: Growth conditions affecting biomass competition for calcifying *Emiliania huxleyi* in a direct membrane-carbonation photobioreactor. PI: Drs. Bruce Rittmann, Kevin Redding, **YenJung Sean Lai**, Greg Orf; 2017-2018 (\$25,000)

LightWorks (completed), ASU: Integration of cationic surfactant for harvesting and lipid extraction on microalga biomass. PI: Drs. Bruce E Rittmann, **YenJung Sean Lai**, Yung Chang and Tong Fu; 2016-2017 (\$20,000)

NSF CBET 1702445 Supplement (pending), Enhancing biodegradation of quaternary ammonium compounds (QAC). PI: Drs. Bruce E Rittmann and **YenJung Lai** (Co-PI); 2017-2020 (\$65,200)

DoE Control No. 1908-1536 (pending): Membrane Carbonation for 100% Efficient Delivery of Industrial CO₂ Gases: Dr. Bruce E Rittmann (PI) and other co-PI: Drs. Rosa Krajmalnik-Brown, John McGowen, and **YenJung Lai**; 2018-2021(\$2,490,973)

Ongoing Research Project

DoE (Control No. 1162-1627), Atmospheric CO₂ Capture and Membrane Delivery PI: Drs. Bruce E Rittmann and Klaus Lackner (co-PI).

Awards

Outstanding graduate student, University of Maryland, College Park, Environmental Science and Technology, 2008

Graduate fellowship, University of Maryland, College Park, Maryland Water Resources Research Center, Summer Fellowship Award, 2008

Outstanding student award, Taiwan Water Supply Corporation, Scholarship for Outstanding Student, Taiwan, 1997-2001

Refereed Journal Publications

1. **Lai YS**, Zhou Y, Eustance E, Straka L, Wang Z, Rittmann BE. 2018. Cell disruption by cationic surfactants affects bioproduct recovery from *Synechocystis* sp. PCC 6803. *Algal Research* 34:250-255.
2. Zhou Y, Eustance E, Straka L, **Lai YS**, Xia S, Rittmann BE. 2018. Quantification of heterotrophic bacteria during the growth of *Synechocystis* sp. PCC 6803 using fluorescence activated cell sorting and microscopy. *Algal Research* 30:94-100.
3. Zhou Y, **Lai YS**, Eustance E, Straka L, Zhou C, Xia S, Rittmann BE. 2017. How myristyltrimethylammonium bromide enhances biomass harvesting and pigments extraction from *Synechocystis* sp. PCC 6803. *Water Research* 126 (Supplement C):189-196.
4. **Lai YS**, Ontiveros-Valencia A, Ilhan ZE, Zhou Y, Miranda E, Maldonado J, Krajmalnik-Brown

- R, and Rittmann BE. 2017. Enhancing biodegradation of C16-alkyl quaternary ammonium compounds using an oxygen-based membrane biofilm reactor. *Water Research* 123: 825-833.
5. Zhou Y, Nguyen BT, Zhou C, Straka L, **Lai YS**, Xia S, Rittmann BE. 2017. The distribution of phosphorus and its transformations during batch growth of *Synechocystis*. *Water Research* 122:355-362.
6. Zhou Y, Zhang J, Zhang Z, Zhou C, **Lai YS**, Xia S. 2017. Enhanced performance of short-time aerobic digestion for waste activated sludge under the presence of cocoamidopropyl betaine. *Chemical Engineering Journal* 320:494-500.
7. **Lai YS**, Zhou Y, Martarella R, Wang Z, Rittmann BE. 2017. Synergistic Integration of C12-C16 Cationic Surfactants for Flocculation and Lipid Extraction from *Chlorella* Biomass. *ACS Sustainable Chemistry & Engineering* 5(1):752-757.
8. Zhou Y, Nguyen B, **Lai YS**, Zhou C, Xia S, Rittmann BE. 2016 Using flow cytometry to evaluate thermal extraction of EPS from *Synechocystis* sp. PCC 6803. *Algal Research* 20:276-281.
9. **Lai YS**, McCaw A, Ontiveros-Valencia A, Shi Y, Parameswaran P, Rittmann BE. 2016. Multiple synergistic benefits of selective fermentation of *Scenedesmus* biomass for fuel recovery via wet-biomass extraction. *Algal Research* 17:253-260.
10. **Lai YS**, Francesco FD, Aguinaga A, Parameswaran P, Rittmann BE. 2016. Improving lipid recovery from *Scenedesmus* wet biomass by surfactant-assisted disruption. *Green Chemistry* 18(5):1319-1326.
11. Borden RC, **Lai YS**, Overmeyer J, Yuncu B, Allen JP. 2016. *In Situ* pH Adjustment with Colloidal Mg(OH)₂. *Environmental Engineer and Scientist: Applied Research and Practice* 17:28-32.
12. Lansing S, Bowen H, Gregoire K, Klavon K, Moss A, Eaton A, **Lai YJ**, Iwata K. 2016. Methane production for sanitation improvement in Haiti. *Biomass and Bioenergy* 91:288-295.
13. **Lai YS**, Parameswaran P, Li A, Aguinaga A, Rittmann BE. 2015. Selective fermentation of carbohydrate and protein fractions of *Scenedesmus*, and biohydrogenation of its lipid fraction for enhanced recovery of saturated fatty acids. *Biotechnology and Bioengineering* 113(2):320-329.
14. Cuellar-Bermudez SP, Romero-Ogawa MA, Vannela R, **Lai YS**, Rittmann BE, Parra-Saldivar R. 2015. Effects of light intensity and carbon dioxide on lipids and fatty acids produced by *Synechocystis* sp. PCC6803 during continuous flow. *Algal Research* 12:10-16.
15. **Lai YS**, Parameswaran P, Li A, Baez M, Rittmann BE. 2014. Effects of pulsed electric field treatment on enhancing lipid recovery from the microalga, *Scenedesmus*. *Bioresource Technology* 173(0):457-461.
16. Huang, D, **Lai YJ**, Becker JG. 2014. Impact of initial conditions on extant microbial kinetic parameter estimates: application to chlorinated ethene dehalorespiration. *Applied Microbiology and Biotechnology* 98 (5): 2279-2288.
17. **Lai YJ** and Becker JG. 2013. Compounded Effects of Chlorinated Ethene Inhibition on Ecological Interactions and Population Abundance in a *Dehalococcoides* - *Dehalobacter* Coculture. *Environmental Science & Technology* 47: 1518-1525.
18. Doong RA and **Lai YL** 2006. Effect of metal ions and humic acid on the dechlorination of

tetrachloroethylene by zerovalent iron. *Chemosphere*. 64: 371-378.

19. Doong RA and **Lai YJ** 2005. Dechlorination of tetrachloroethylene by palladized iron in the presence of humic acid. *Water Research* 39: 2309-2318.

Manuscripts submitted or in preparation:

20. Zhou Y, Marcus AK, Straka L, Eustance E, **Lai YS**, Xia S, Rittmann BE. 2017. Adsorption of phosphate by *Synechocystis* sp. PCC 6803 in dark conditions (under review)

21. Zhou Y, **Lai YS**, Eustance E, Xia SQ, Rittmann BE. How phosphate depletion affects lipids and heterotrophic bacteria accumulation in the batch growth of *Synechocystis* sp. PCC 6803. (under review)

22. Liu Y, **Lai YS**, Barbosa TS, Chandra R, Parameswaran P, Rittmann BE. 2018. Electro-Selective Fermentation to enhance lipid extraction and biohydrogenation of *Scenedesmus acutus* biomass (under review)

23. **Lai YS**, Ontiveros-Valencia A, Coskun T, Zhou C, Rittmann BE. 2018 Electron acceptor loadings affect chloroform dechlorination in a hydrogen-based membrane biofilm reactor (manuscript submitted)

24. Zhou Y, **Lai YS***, Eustance E, Rittmann BE. 2018. Promoting *Synechocystis* sp. PCC 6803 Harvesting by Cationic Surfactants: Alkyl-Chain Length and Dose Control Extracellular Polymeric Substances Releasing and Biomass Aggregation (draft in preparation)

25. **Lai YS**, Eustance E, Shesh T, Rittmann BE. 2018. Compatibility of Membrane Carbonation with various CO₂ conditions: a case study of *Scenedesmus* biomass (draft in preparation)

26. **Lai YS**, Ontiveros-Valencia A, McCaw A, Shi Y, Parameswaran P, Rittmann BE. 2018. Microbial communities driving synergistic effect of selective fermentation of *Scenedesmus* biomass for downstream biofuel recovery (draft in preparation)

27. **Lai YS**, Ontiveros-Valencia A, Eustance E, Shi Y, Parameswaran P, Rittmann BE. 2018 Effect of growth stages on selective fermentation and its lipid recovery (draft in preparation)

28. **Lai YS**, Zhou Y, Eustance E, Rittmann BE. 2018. Growth stages affecting synergistic process for *Scenedesmus* biomass using cationic surfactants (draft in preparation)

Technical Reports

Lai, YJ. 2004. Application of Nanoparticles for Remediation of Groundwater due to Chlorinated Contamination. *Technical Report, Groundwater Contamination and Remediation*, No. 45, Industrial Technology Research Institute, Taiwan.

Lai, YJ. 2004. Profitable Waste. *Technical Report, Groundwater Contamination and Remediation*, No. 45, Industrial Technology Research Institute, Taiwan.

Lai, YJ. 2004. The History of Metal-Reducing Bacteria. *Technical Report, Groundwater Contamination and Remediation*, No. 45, Industrial Technology Research Institute, Taiwan.

Seminar Presentations

Lai, YS. Downstream application of *Scenedesmus* biomass through fermentation. Biodesign Swette Center for Environmental Biotechnology, ASU, Sept. 2014.

Lai, YS. Downstream application of *Scenedesmus* biomass through surfactant treatment & fermentation. Biodesign Swette Center for Environmental Biotechnology, ASU, April. 2015.

Lai, YS. Downstream application of *Scenedesmus* biomass via selective fermentation. Biodesign Swette Center for Environmental Biotechnology, ASU, Nov. 2015.

Lai, YS. Synergistic integration of downstream application for *Scenedesmus* and *Chlorella* microalgae. Biodesign Swette Center for Environmental Biotechnology, ASU, Jan. 2016.

Lai, YS. Efficient quaternary ammonium compounds (QACs) degradation by oxygen-based membrane biofilm reactor (O₂-MBfR). Biodesign Swette Center for Environmental Biotechnology, ASU, Nov. 2016.

Lai, YS. Synergistic integration of upstream and downstream application for microalga biofuel recovery. Environmental Engineering Seminar, School of Sustainable Engineering and the Built Environment, ASU, Nov. 2017.

Oral and poster presentations

1. Liu Y, **Lai YS**, Barbosa T, Chandra R, Parameswaran P, Bruce E. Rittmann. Electro-selective fermentation enhances lipid extraction and biohydrogenation of *Scenedesmus acutus* biomass. 8th International Conference on Algal Biomass, Biofuels and Bioproducts, June 11 - 13, 2018, Seattle, WA.

2. Eustance E, **Lai YS**, Shesh T, Rittmann BE. Utilization of Membrane Carbonation in Algal Cultivation to Improve Carbon Capture Efficiency. Algal Biomass Summit 11th, Salt Lake, UT, Oct 29- Nov 1, 2017.

3. **Lai YS**, Zhou Y, Rittmann BE. Synergistic integration of C12 to C16 cationic surfactants for flocculation and lipid extraction from *Chlorella* and *Scenedesmus* biomass. Algal Biomass Biofuels & Bioproducts 7th International Conference, Miami, FL, June 18-21, 2017.

4. **Lai YS**, Ontiveros-Valencia A, McCaw A, Shi Y, Parameswaran P, Rittmann BE. Microbial communities driving synergistic effect of selective fermentation of *Scenedesmus* biomass for downstream biofuel recovery. Algal Biomass Summit 10th, Phoenix, AZ, Oct 23- 26, 2016.

5. **Lai YS**, Aguinaga, A., Parameswaran, P., Rittmann, B. E. Feasibility of selective fermentation of the non-lipid fractions of *Scenedesmus* biomass coupled with biohydrogenation to produce saturated fatty acids. Algal Biomass, Biofuels & Bioproducts. San Diego, CA, June, 7-10, 2015.

6. Parameswaran, P., **Lai YS**, Rosov, T., McGowen, J., Rittmann, B. E. Cell size of microalgae influences the positive impact of pulsed electric field treatment for lipid recovery. Bioelectrics 2014, Columbia, MI, October 11-14, 2014.

7. **Lai YS**, Parameswaran, P., Baez, M., Rosov, T., McGowen, J., Rittmann Superior FAME Recovery from *Scenedesmus* sp. through Pulsed Electric Field Pre-Treatment. Algal Biomass Summit 8th annual, San Diego, CA, Sept 29-Oct 2, 2014.

8. Yoon M, Yang Y, **Lai Y**, Sumner SJ, Snyder, RW, Pitzer J., Brown JM., Fennell TR, and Clewell HJ. Development of a PBPK model for C60 fullerene disposition during gestation and lactation in the rat. 51st Annual Meeting & ToxExpo, SOT, San Francisco, CA, March 11-15, 2012.

9. **Lai YJ**, Alperin Ed., and Borden R. Physical-Chemical Treatment of Metals and Radionuclides in the Saturated Zone Using Colloidal Buffers. Waste Management Symposia, Phoenix, Arizona,

February 26-March 1, 2012.

10. Yoon, MY, **Lai YJ**, Clewell, H. Application of the General PBPK/PD Modeling Platform to Consortium Nanomaterials: Extension of the C60 model to the Whole body PBPK model for Silver Nanoparticles. NIEHS Main Campus, RTP, North Carolina, January 26-27, 2012.

11. Yoon MY, Yang YC, **Lai YJ**, Clewell H. Developing a General PBPK/PD Modeling Platform to Assess Systemic Effects of Nanomaterials with a Focus on Sensitive Life Stages: PBPK Modeling of C60 Fullerene. NIEHS Main Campus, RTP, North Carolina, January 26-27, 2012.

12. **Lai YJ** and Becker JG. Experimental and Mathematical Evaluation of the Interactions between Two Hydrogenotrophic Dehalorespirers (*Dehalococcoides ethenogenes* and *Dehalobacter restrictus*). Bioremediation and Sustainable Environmental Technologies Symposium, Reno, Nevada, June 27-30, 2011.

13. **Lai YJ** and Becker JG. Mathematical Simulation of the Interactions between *Geobacter lovleyi* and *Dehalococcoides* Strains and the Implications for Detoxification of Tetrachloroethene (PCE) In Situ. Bioremediation and Sustainable Environmental Technologies Symposium, Reno, Nevada, June 27-30, 2011.

14. **Lai YJ** and Lansing S. Dynamic mathematical simulation of the effect of sulfate and iron reducing bacteria on methane production in anaerobic digestion. 11th Annual Meeting of the American Ecological Engineering Society (AEES), Asheville, North Carolina, May 23-25, 2011.

15. **Lai YJ** and Becker JG. Monod and Inhibition kinetic parameters for Hydrogenotrophic Dehalorespiring *Dehalococcoides* and *Dehalobacter* strains and Implications for Bioremediation. 10th International In Situ and On-Situ Bioremediation Symposium, Baltimore, Maryland, May 5-8, 2009.

16. **Lai YJ**, Huang DY, and Becker JG. The effects of microbial kinetics in competing microbial strains on the extent of tetrachloroethene transformation during bioremediation. Northeast Agricultural/Biological Engineering Conference (NABEC), Clarion Hotel, Aberdeen, Maryland. July 27-30, 2008.

17. **Lai YJ** and Doong RA. Effect of humic acid and quinones on the reductive dechlorination of tetrachloroethylene in bimetallic system. The Strait-Cross Environmental Protection 8th Conference, p. 829 – 834, Hsinchu, Taiwan 300, R.O.C. October 14-18, 2002.

18. Maithree RA, Doong RA, and **Lai YJ**. Reduction of chlorinated hydrocarbons in the presence of ferrihydrite using cysteine as an electron carrier. 223rd ACS Meeting, Orlando, FL. USA, April 7 – 11, 2002.

Professional memberships

Algal Biomass Organization

Professional service

Ad hoc Reviewer for journals: Algal research, Bioresource Technology, Green Chemistry, Journal of Environmental Management, Marine Pollution Bulletin.

Algae Biomass Summit Engineering & Analysis Abstract review committee, 2017

Organizing Committee Member of the International Society for Microbial Electrochemistry and Technology (ISMET) Meeting, Tempe, AZ, Fall, 2015.

Community service

Coordinator for Photobioenergy team, Swette Center for Environmental Biotechnology, Night of Open Door, Biodesign Institute, Tempe, ASU, February 2017

Student Advising

Graduate students

Yuanzhe Liu, Ph. D. student, 2015-now

Thiago Stangherlin Barbosa, Ph. D student, 2015-now

Tarun Shesh, M.S. student, Chemical Engineering, 2016-now

Rebecca Martarella, M.S. Chemical Engineering, 2014-2015

Undergraduate students

Maria Baez (Chemical Engineering), 2013

Alyssa Aguinaga (Microbiology), 2014

Allison McCaw (High School Teacher Summer Intern), 2014, 2016

Visiting scholars Advising

Dr. Ang Li, Harbin Institute of Technology, China, 2012-2013

Dr. Yue Shi, Harbin Engineering University, China, 2014-2015

Federica De Francesco, M.S. student, Politecnico di torino, Corso Duca degli Abruzzi, Italy, 2015

Dr. Sen Qian, Dalian University of Technology, China, 2015-2016

Yun Zhou, Tongji University, China, 2015-2017

Dr. Kun Zhang, Harbin Engineering University, China, 2017-2018