Michelle N. Young, Ph.D.

Assistant Research Scientist

Biodesign Swette Center for Environmental Biotechnology, Arizona State University

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Google Scholar: <https://scholar.google.com/citations?user=LBpMsyMAAAAJ&hl=en&inst=18144035176119790715>

**EDUCATION**

**Ph.D., Environmental Engineering**, Arizona State University, 2018

**M.S., Environmental Engineering,** Arizona State University, 2011

**B.S.E., Chemical Engineering,** Arizona State University, 1997

**PROFESSIONAL APPOINTMENTS**

**Assistant Research Scientist,** Biodesign Swette Center of Environmental Biotechnology (BSCEB), Arizona State University (ASU), 7/2020-present

**Post-Doctoral Researcher,** BSCEB, ASU, PI Bruce Rittmann**,** 10/2018-6/2020

**Graduate Research Assistant Post-Doctoral Researcher**, School of Sustainable Engineering and the Built Environment, ASU, Advisor Bruce Rittmann, 1/2010-9/2018

**RESEARCH FOCUS**

1. **Increasing understanding of wastewater systems through mathematical modeling:** Developing various mathematical models for holistic wastewater treatment plant modeling, novel technologies, and coupling of metabolic models with stoichiometric kinetics for niche bacteria.
2. **Improving transformation of waste streams to valuable products:** Exploring important mechanisms for successful pretreatment of waste streams using physical, chemical, and biological processes to improve bioavailability of COD during anaerobic digestion.
3. **Understanding the environmental impacts of wastewater treatment and greenhouse gas emissions:** Developing mathematical models to identify sources of greenhouse gas and pollutant emissions from wastewater treatment plants including carbon dioxide, methane, nitrous oxide, and nitric oxide.

**PROPOSALS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Title | Sponsor | Total | PI | Co-PIs | Status |
| Improved Prediction of Nitrous Oxide Emissions by Ammonium-Oxidizing Bacteria Using a Metabolism-Based Kinetic Model (2022) | Water Research Foundation | $50K | B. Rittmann | M. Young | Submitted |
| Improved Prediction of Methane Emissions from Coupled Kinetic and Neural Networks Models (2022) | Water Research Foundation | $50K | B. Rittmann | M. Young/A. Marcus | Submitted |
| Grant Extension: An Assessment of Anaerobic Digester Centrate Suitability for Algae Cultivation (2022) | US Department of Energy, BETO | $150K | B. Rittmann | E. Eustace/ M. Young | Not funded |
| PROPOSALS con’t |  |  |  |  |  |
| Analytical Development for Quantifying Agricultural Byproducts and Food Wastes Containing Lignin Interferences (2021) | US Department of Energy, BETO | $688K | E. Rockafellow (Archer Daniels Midland) | L. Whittaker (City of Mesa) | Funded |
| Optimizing alkaline DAC gravity-fed reactors to improve microalgal production (2021) | US Department of Energy, BETO | $4M | B. Rittmann | E. Eustace | Not funded |
| Improving Lignocellulose Degradation for Energy and Chemicals Production Using Microbial Enrichments (2019) | Arizona State University Lightworks | $25K | Young | R. Krajmalnik-Brown | Funded |
| A Bench-scale Study of Co-digestion of Food Waste and Fats, Oils, and Grease (FOG) in Local Municipal Wastewater Treatment Plants (2018) | City of Tempe, AZ | $60K | B. Rittmann | M. Young | Funded |
| Production of medium-chain fatty acids from wet organic wastes (2020) | US Department of Energy, BETO | $3M | A. Degado | C. Torres, B. Rittmann | Not funded |

**TECHNICAL SKILLS**

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| --- | --- |
| **Mathematical Modeling:**   * Steady and non-steady-state batch, chemostat and biofilm modeling * MATLAB, COMSOL, Sumo, Excel   **Analytical Equipment:**   * High performance liquid chromatography * Gas chromatography * Ion chromatography * Spectrophotometry * CHN(O) elemental analysis * Potentiostat operations | **Life Cycle Assessment Software:**   * Simapro, ecoinvent   **Environmental Engineering:**   * Biochemical methane potential assays (BMPs) * TSS/VSS and TS/VS * TCOD/SCOD * Hach kits * Alkalinity/pH * Jar test * BOD5 tests * Carbohydrates/proteins/lipids analysis |

**PEER-REVIEWED PUBLICATIONS**

* **Young, M.N.,** Boltz, J.P., Rittmann, B.E., Al-Omrai, A., Jiminez, J.A., Takacs, I., Marcus. A.K. A Thermodynamic Analysis of Intermediary Metabolic Steps and Nitrous Oxide Production in Ammonium-Oxidizing Bacteria. *Environmental Science & Technology*. *Under review*.
* **Young, M.N.,** Hart, S.G., Parameswaran, P., Rittmann, B.E., Torres, C.I. The Effects of Pre-Treatment on the Digestibility Kinetics of Waste-Activated Sludge Anaerobic Batch Digestion. *Environmental Engineering Science*. *Under review*.
* Xiong, J., **Young, M.N.,** Marcus, A.K., Van Ginkel, S.W., Rittmann, B.E., 2020. Mathematical Modeling and Analysis of Wastewater Treatment Plant using the Cannibal® Process. *Journal of Environmental Science*, 146(2): 4019108-1-9.
* Wu et al., 2019. Global diversity and biogeography of bacterial communities in wastewater treatment plants. *Nature Microbiology*, 4:1183-1195.
* Van Ginkel, S.W., Miceli, J.M., Kim, B., Yang, Z., **Young, M.N.,** Marcus, A.K., Rittmann, B.E., 2018. Determining the mechanism for low sludge yields in the Cannibal® Solids Reduction System. *Water Environment Research*, 90(1): 42-47.
* **Young, M.N.,** Chowdhury, N., Garver, E., Evans, P.E., Popat, S.C., Rittmann, B.E., Torres, C.I., 2017. Understanding the Impact of Operational Conditions on Performance of Microbial Peroxide Producing Cells. *Journal of Power Sources,* 356(17): 448-458*.*
* Hobbs, S.R., Landis, A.E., Rittmann, B.E., **Young, M.N.,** Parameswaran, P., 2018. Enhancing anaerobic digestion of food waste through Biochemical Methane Potential Assays at different substrate: inoculum ratios. *Waste Management*, 71:612-617.
* **Young, M.N.,** Links, M.J., Popat, S.C., Rittmann, B.E., Torres, C.I., 2016. Tailoring microbial electrochemical cells for production of hydrogen peroxide at high concentrations and efficiencies. *ChemSusChem*, 9(23): 3345-3352.
* Popat, S.C., Ki, D., **Young, M.N.,** Rittmann, B.E., Torres, C.I., 2014. Buffer pKa and Transport Govern the Concentration Overpotential in Electrochemical Oxygen Reduction at Neutral pH. *ChemElectroChem*, 1(11): 1909-1915.
* **Young, M.N.,** Krajmalnik-Brown, R., Liu, W., Doyle, M.L., Rittmann, B.E., 2013. The role of anaerobic sludge recycle in improving anaerobic digester performance. *Bioresource Technology*, 128, 731-737.
* **Young, M.N.,** Marcus, A.K., Rittmann, B.E., 2013. A Combined Activated Sludge Anaerobic Digestion Model (CASADM) to understand the role of anaerobic sludge recycling in wastewater treatment plant performance. *Bioresource Technology*, 136: 196-204.

**PEER-REVIEWED PUBLICATIONS in preparation**

* **Young, M.N.,** Boltz, J.P., Al-Omrai, A., Jiminez, J.A., Takacs, I., Marcus. A.K, Rittmann, B.E. Rethinking Nitrous Oxide Production and Metabolism Models in Ammonium-Oxidizing Bacteria.
* JI, Y., **Young, M.N.,** Rittmann, B.E. Using Mathematical Modeling to Identify Causes of Souring During Food Waste Anaerobic Co-Digestion.
* **Young, M.N.,** Kupferer, R., Rittmann, B.E. Bicarbonate Alkalinity Is Essential for Food Waste Anaerobic Co-Digester Stability.
* Pittman, S., **Young, M.N.,** Krajmalnik-Brown, R., Rittmann, B.E. More Methane and Less Landfilling? Rethinking the Case for Anaerobic Co-Digestion of Yard Waste.
* **Young, M.N.,** Giles, E., Lamb, S., Krajmalnik-Brown, R. Differences in Fecal and Cecotrophic Microbial Communities of Healthy and Megacolon Rabbits.

**PROFESSIONAL WHITE PAPERS/REPORTS**

* Rittmann, B.E., **Young, M.N.,** 2020. A Feasibility Study of Food Waste and Fats/Oils/Grease (FOG) Co-Digestion at City of Mesa’s Northwest Water Reclamation Plant.
* **Young, M.N.,** Arizona State University Repository, 2014. A Life Cycle Assessment of Alternative Wastewater Treatment Processes at Forward Operation Bases (FOBs). http://repository.asu.edu/attachments/135309/content/ASU-SSEBE-CESEM-2014-CPR-008.pdf
* Rittmann, B.E., Krajmalnik-Brown, R., **Young, M.N.,** Park, S. Scarpellini, G., 2011. Mathematical Modeling and Mass Balance Analysis of a Biosorption and Anaerobic Digestion Hybrid Process – Final Report.

**TEACHING EXPERIENCE/CLASS LECTURER**

* Teaching assistant at Arizona State University for CEE 361: Introduction to Environmental Engineering. Spring 2012 and Fall 2017. Responsibilities included lecturing on air quality, quiz and homework design, grading, assisting students with questions and concerns, and developing laboratory experiments on water and wastewater treatments and air pollution.
* “The Nitrogen Cycle, Nitrification, and Denitrification.” February 2021. 2 lectures, CEE598: Biotransformations, Arizona State University.
* “Wastewater to Valuable Resources to Greenhouse Gases? Understanding and Mitigating Wastewater Treatment's Impact on Climate Change.” October 2020. Department of Environmental and Global Health Seminar Series, University of Florida.
* “A Perspective on Mathematical Modeling in Environmental Engineering.” September 2019 and September 2020. BDE 598: Biological Design Seminar, Arizona State University.
* “Wastewater Treatment Fundamentals.” November 2018. 2 lectures, EVE302: Fundamentals of Environmental Microbiology, Arizona State University.
* “Introduction to COMSOL.” 3 lectures, CHE 231: Introduction to Fluid Mechanics, Arizona State University.
* “Introduction to Navier-Stokes.” 3 lectures, CHE 231: Introduction to Fluid Mechanics, Arizona State University.
* “Using Overpotential Concepts to Model Fuel Cells.” October 2016. CHE 598: Fuel Cells and Biofuel Cells, Arizona State University.
* “Continuous Hydrogen Peroxide Production Using Microbial Electrochemical Cells.” January 2016. CEE 591: Environmental Engineering Seminar, Arizona State University.
* “Microbial fuels cells as biosensors to detect differences in pretreatments for waste activated sludge.” March 2015. CEE 591: Environmental Engineering Seminar, Arizona State University.
* “An Overview of Wastewater Treatment.” October 2013. CEE 557: Geoenvironmental Engineering, Arizona State University.
* “Extracellular Polymeric Substances and Soluble Microbial Products.” October 2012. CEE 565: Advanced Environmental Biotechnology, Arizona State University.
* “Mathematical Modeling of Siemens Water Technologies’ Hybrid Process.” October 2011. CEE 591: Environmental Engineering Seminar, Arizona State University.
* “Siemens Water Technologies’ Hybrid Process: Green, Sustainable Wastewater Treatment?” April 2011. CEE 591: Environmental Engineering Seminar, Arizona State University.

**CONFERENCE ORAL PRESENTATIONS (Presenter is highlighted)**

* ***Scheduled to present 4 oral presentations and 5 poster presentations in 2022***
* **M. Young**, D.W. Ki, B.E. Rittmann, C.I. Torres. “Mathematical modeling to predict microbial electrochemical cell (MxC) performance using primary sludge feedstock.” The North America Meeting of the International Society of Microbial Electrochemistry and Technologies (ISMET). October 2018.
* **M. Young**, N. Chowdhudy, S.C. Popat, B.E. Rittmann, C.I. Torres. “Continuous Hydrogen Peroxide Production in Microbial Electrochemical Cells.” International Water Association Leading Edge Technologies Conference. June 2016.
* M. Young, D. Ki, M. Stadie, J. Thompson, N. Chowdhury, **S. Popat**, B. Rittmann, and C. I. Torres. “Tailoring Microbial Fuel Cells for Production of Hydrogen Peroxide.” The Electochemical Society’s (ECS) 229th Meeting. June 2016.
* **M. Young**, N. Chowdhudy, S.C. Popat, B.E. Rittmann, C.I. Torres. “Hydrogen Peroxide Production using Microbial Electrochemical Cells.” Arizona Water Association Annual Conference. May 2016.
* **M. Bogosh**, P. Richards, P. Evans, T. Nguyen, E. Guven, M. Young, C. Torres, and B. Logan. “Life Cycle Environmental and Cost Assessment of Microbial Electrochemical Cells and Conventional Technologies for Wastewater Treatment at Forward Operating Bases.” WEF Water and Energy. June 2015.
* **M. Young**, P. Parameswaran, C.I. Torres, B.E. Rittmann. “Application of Microbial Electrochemical Cells (MXCs) as real-time sensors of bioavailability from sludge pretreatment technologies.” WEF Water and Energy. June 2015.
* **M. Bogosh**, P. Richards, P. Evans, T. Nguyen, E. Guven, M. Young, C. Torres, and B. Logan. “Life Cycle Environmental and Cost Assessment of Microbial Electrochemical Cells and Conventional Technologies for Wastewater Treatment at Forward Operating Bases.” Battelle Third International Symposium on Bioremediation and Sustainable Environmental Technologies. May 2015.
* **M. Young**, F. Brown-Munoz, B.E. Rittmann, C.I. Torres, P. Parameswaran. “Microbial Fuel Cells Detect Differences in Waste Activated Sludge Pretreatment Technologies.” ASU’s School of Sustainable Engineering and the Built Environment’s 4th Annual Graduate Research Symposium. March 2015.
* **M. Young**, R. Krajmalnik-Brown, B.E. Rittmann. Arizona Water Association Annual Conference. "The Role of Anaerobic Digester SRT in Siemens Water Technologies' Hybrid Process." May 2012.
* **J.A. McIlwain**, A. Ontiveros-Valencia, M. Young, B.E. Rittmann. “Mathematical Modeling of Anaerobic Membrane Bioreactors (AnMBR) to Determine Its Viability for Municipal Wastewater Treatment.” AWWA/AMTA MTC 12 Conference and Expo. March 2012.

**CONFERENCE POSTER PRESENTATIONS**

* **M. Young**, R. Kupferer, N. Curley, T. Sheber, E. Auerbach, B. Bubela, and B.E. Rittmann. “Greening Municipal Waste Treatment: A Case Study of Using Food Waste and Fats, Oils, and Grease (FOG) to Improve Biogas Recovery from the City of Mesa’s Northwest Water Reclamation Plant.” Association of Environmental Engineering and Science Professors (AEESP) 2019 Research and Education Conference. May 2019.
* **M. Young**, S.C. Popat, B.E. Rittmann, C.I. Torres. “Continuous hydrogen peroxide production in microbial electrochemical cells.” FUSION 2016 – A Biodesign Institute Event. March 2016.

**CONFERENCE POSTER PRESENTATIONS con’t**

* **M. Young**, F. Brown-Munoz, B.E. Rittmann, C.I. Torres, P. Parameswaran. “Microbial electrolysis cells (MECs) detect differences in waste-activated sludge pretreatment technologies.” The 5th International Meeting of the International Society of Microbial Electrochemistry and Technologies (ISMET). October 2015.
* **M. Young**, S.C. Popat, B.E. Rittmann, C.I. Torres. “Continuous hydrogen peroxide production in microbial electrochemical cells.” The 5th International Meeting of the International Society of Microbial Electrochemistry and Technologies (ISMET). October 2015.
* **M. Young**, F. Brown-Munoz, B.E. Rittmann, C.I. Torres, P. Parameswaran. “Microbial Fuel Cells Detect Differences in Waste Activated Sludge Pretreatment Technologies.” Arizona Water Reuse Symposium. July 2015.
* **M. Young**, S.C. Popat, B.E. Rittmann, C.I. Torres. “Continuous hydrogen peroxide production in microbial electrochemical cells.” WEF Water and Energy. June 2015.
* **M. Young**, F. Brown-Munoz, B.E. Rittmann, C.I. Torres, P. Parameswaran. “Microbial Fuel Cells Detect Differences in Waste Activated Sludge Pretreatment Technologies.” Arizona Water Association Annual Conference. May 2015.
* **M. Young**, F. Brown-Munoz, B.E. Rittmann, C.I. Torres, P. Parameswaran. “Microbial Fuel Cells Detect Differences in Waste Activated Sludge Pretreatment Technologies.” ASU’s School of Sustainable Engineering and the Built Environment’s 4th Annual Graduate Research Symposium. March 2015.
* **M. Young**, A.K. Marcus, B.E. Rittmann. "Understanding the Role of Anaerobic Digester Sludge Recycle in WWTPs Using the Combined Activated Sludge-Anaerobic Digestion Model (CASADM)." Arizona Water Association Annual Conference. May 2013.

**PROFESSIONAL MEMBERSHIPS**

* American Water Works Association
* AZ Water Association
* Association of Environmental Engineering & Science Professors
* International Society for Microbial Electrochemistry and Technology
* International Water Association
* Water Environment Federation

**ADVISEMENT/MENTORING**

* **Graduate:** Rick Kupferer III, 2020, Environmental Engineering (Chair: Bruce Rittmann); Maheen Mahmoud, Environmental Engineering
* **Undergraduate:** Honors thesis committee member for 6 undergraduate researchers
* **Mentored** > 15 graduate and > 20 undergraduate researchers, including 3 Biodesign Swette Interns and 6 Fulton Undergraduate Research Initiative/Grand Challenges scholars
* **Diversity rating:** > 70% women, minorities, or LGBTQ+ -identifying individuals

**COMMUNITY INVOLVEMENT**

* 2017-2018: Founding member and graduate committee chair for Activities and Engagement for the Society of Water and Environmental Leaders (SWEL)
* 2017: Graduate and Professional Students Association (Arizona State University) grant reviewer
* 2017: Future Cities Regional Competition Society Judge
* 2016: INTEL International Science and Engineering Fair Grand Awards Judge
* 2016: Safety incident investigation lead and ASU investigation team member
* 2015: Organizing committee member of the International Society for Microbial Electrochemistry and Technology (ISMET) Meeting, Tempe, AZ
* 2014-2017: ASU’s Open Door education event coordinator and volunteer for the Biodesign Swette Center
* 2013: Engineering Projects in Communities mentor for water project to supply water to an orphanage in Kenya
* 2013: Water Section Co-coordinator for Chandler middle school environmental awareness outreach
* Active reviewer for the following journals: *Advanced Materials, ChemSusChem, Current Biochemical Engineering, Environmental Pollution, Environmental Science & Technology, Journal of Environmental Informatics, Sustainability*
* Website developer for Biodesign Swette Center for Environmental Biotechnology and Dr. Bruce E. Rittmann

**HONORS/AWARDS**

* Graduate and Professional Student Association Completion Fellowship (2017)
* ARCS Scholarship (2016)
* Phoenix/Scottsdale Groundwater Contamination Scholarship for Environmental Science (2015)
* Best Poster -- The 5th International Meeting of the International Society of Microbial Electrochemistry and Technologies (ISMET). (October 2015)
* Graduate and Professional Student Association (ASU) Travel Award (2015, 2017)
* Arizona Water Association Scholarship recipient (2013-2015)
* Arizona Water Association Annual Conference Poster Presentation 2nd place (May 2013)
* Graduated Magna Cum Laude in Chemical Engineering (1997)

**OTHER PROFESSIONAL/MANAGEMENT EXPERIENCE**

**Raw Materials Manager** 7/2005-9/2008

Frito-Lay North America Casa Grande, AZ

* Led raw materials purchasing, supply and inventory team for 100M lbs plant, including all commodity and packaging raw materials
* Set and achieved change management projects for new product and cost savings initiatives, new supplier qualifications and special production runs
* Coordinated and executed exceptional improvements in department budget, labor and forecast to end 2007 at +$477K to budget plan
* Organized cross-functional teams to troubleshoot production and raw material usage issues, including improvements in carton reuse from 6.61 to 14.5 carton trip average and machinery efficiency improvement of 2%
* Developed and empowered hourly personnel to make daily business decisions with the company’s success in mind, including service, safety, quality and cost decisions

**Operations Group Manager, Packaging Lines and Warehouse** 8/2002 – 11/2004

Anheuser-Busch, Incorporated Fort Collins, CO

* Managed daily activities of production areas, including filling and shipping areas
* Restructured plant’s hold process, improving employee ownership of hold and damaged beer
* Generated lasting process improvement teams to address hold beer management and warehouse on-time load completion rate
* Strengthened initiatives to improve loading completion rates prior required shipping time
* Committed to providing a safe work environment by driving or providing solutions to various safety issues in the plant

**R&D Packaging Engineer/Project Manager II**  3/1998 – 9/2001

The Clorox Company Pleasanton, CA

* Managed R&D activities as part of $5MM strategic sourcing packaging conversion to the streamline Clorox Bleach bottles
* Headed strategic supplier change completed in 1 month for a $250M cost savings
* Designed and implemented new packaging designs and modifications to existing packages for $3M to $250M in cost savings
* Developed and communicated design and process specifications for new packaging start-ups
* Trained plant personnel with new analytical instruments and product specifications
* Supervised the packaging testing and qualification processes, process troubleshooting and on-site startups for various forms of packaging