



University at Buffalo

Research and Education in eEnergy,
Environment and Water (RENEW)

Development of Biological Processes for Nutrient Recovery and Renewable Energy Production from Waste Streams in the 21st Century

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Jarvis 223

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Abstract: We are facing unprecedented challenges in water and wastewater treatment due to variability in the quantity and quality of freshwater resources, the deterioration of surface waters resulting from excess nutrient loading, and the decreased resiliency of ecosystems due to climate change. As we seek to upgrade aging and energy-intensive treatment infrastructure, there is a unique opportunity to re-envision waste streams as resource-rich flows. In particular, phototrophic (e.g., microalgal) systems have the potential to offer low-cost, resource-efficient nitrogen and phosphorus recovery with effluent nutrient concentrations below the current limit-of-technology, while simultaneously producing carbon-rich biomass that may be used for bioproducts or bioenergy feedstock. Despite this potential, current systems are operated empirically and suffer from unpredictable and unmeasured microbial community dynamics that hinder system performance. This seminar will present experimental work performed with pure culture and mixed communities of microalgae to explore how design and operational parameters influence community structure, nutrient, and stored carbon (i.e., carbohydrate and lipid) dynamics in order to engineer systems that achieve reliable and predictive behavior for nutrient recovery and renewable energy generation. In order to overcome a core barrier to innovation in algal technology development, the development of 18S rRNA gene specific primers to accurately examine microalgal communities through next generation sequencing techniques will also be addressed, which is an area that has broad interdisciplinary impacts beyond traditional environmental process engineering and advances the current understanding of eukaryotic sequencing across the fields of environmental engineering, limnology, and oceanography.

Biography: Ian Bradley is a Deuchler Fellow and Ph.D. Candidate in Environmental Engineering at the University of Illinois at Urbana-Champaign. He earned a B.S. degree in Industrial and Enterprise Systems Engineering and M.S. degrees in both Civil and Environmental Engineering, all from the University of Illinois. Ian's current research focuses on microalgal wastewater treatment for nutrient recovery and biofuel feedstock production, with an emphasis on bioprocess design and microbial community analysis. He is interested in engineered and natural biological systems in the developed and developing world for addressing solutions in water, energy, and health.

