2025 Tsuan Hua Feng Distinguished Lecture

Hosted by the Department of Civil and Environmental Engineering

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Retooling anaerobic digestion to maximize waste carbon conversion in a circular bioeconomy

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Abstract:
Biomanufacturing of chemicals using waste streams has the potential to dramatically reduce greenhouse gas emissions from current fossil-based inputs while enabling carbon recycling towards a circular economy. Anaerobic microbial communities (microbiomes) maintained in bioreactors can serve as the foundation to achieve these goals. Engineering anaerobic microbiomes to achieve specified functions remains challenging, and widely deploying anaerobic microbiomes at scale will require bioreactor innovations to maintain microbiome stability amid non-sterile waste streams and economic bioreactor operational strategies with high biomass retention. Dynamic membrane bioreactors (DMBRs) are an emerging class of bioreactors that use a dynamic membrane consisting of a biological cake layer formed on an inexpensive mesh support with submillimeter pores to accomplish biomass separation. The dynamic membrane allows the decoupling of the solids retention time and hydraulic retention time while minimizing membrane fouling challenges that limit the use of conventional membrane bioreactors for wet organic waste streams with high solids levels. The dynamic membrane also supports the growth of microorganisms that contribute to waste conversion. We have demonstrated the benefits of using anaerobic DMBRs for the high-rate conversion of different waste streams to a range of valuable products. This presentation will showcase diverse applications of this innovative anaerobic biotechnology, including mainstream treatment of municipal wastewater to renewable natural gas and producing medium-chain fatty acids from food waste and other organic waste streams.

Bio:
Lutgarde (Lut) Raskin is the Vernon L. Snoeyink Distinguished University Professor of Environmental Engineering and the Altarum/ERIM Russell O'Neal Professor of Engineering at the University of Michigan, where she has been a professor since 2005. Before this, she was a professor at the University of Illinois at Urbana-Champaign for 12 years. She received Bachelor's and Master's degrees in Bioscience Engineering and in Economics from KU Leuven, Belgium. Her PhD degree is in Environmental Engineering from the University of Illinois. Dr. Raskin is a pioneer in molecular microbial ecology applied to engineered water systems. She and her team are developing anaerobic bioprocesses for resource recovery from waste streams and studying microbial aspects of urban water systems to assist drinking water utilities. She has a strong interest in graduate education and mentoring and has advised approximately 20 postdocs and 100 graduate students, including about 30 Ph.D. students. She is an elected Fellow of the American Academy of Microbiology, the International Water Association, the Water Environment Federation, and the Association of Environmental Engineering and Science Professors. Past honors include the International Society for Microbial Ecology-International Water Association BioCluster Award, the Association of Environmental Engineering and Science Professors Frontier Award in Research, and the Water Research Foundation Paul L. Busch Award for Innovation in Applied Water Quality Research. She was elected to the U.S. National Academy of Engineering in 2021.

Thursday, October 2, 2025
2:30 PM

Bernie Dallas Room, Goodell Hall, UMass Amherst
Free and open to all. Reception to immediately follow the lecture.