Northeastern University
College of Engineering

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Distinguished Seminar Speaker

The "Root" of the Nexus: Soil-Based Biotechnology for a Sustainable Future

Leslie McCabe Shor

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Abstract: The function of any biological system depends on local environmental conditions. For bacterial systems, micro-scale structures including the chemical properties and physical topography of surfaces, micro-scale chemical gradients, and patterns of biological distribution impact the diversity, abundance, and activity of microbial communities. However, conventional microbial culture systems do not faithfully emulate microbial habitats; thus, also cannot reflect realistic functionality of microbial systems. The Shor lab designs, builds, and operates emulated microbial habitats to better understand microbial system function. Recent applications include soil-emulating micromodels to accelerate the development of agriculture biotechnology. Emulated soil micromodels (ESMs) systematically replicate physical, chemical, and biological features while at the same time enabling direct, real-time observation of biological responses. ESMs enable systematic hypothesis-driven research of rhizosphere processes and make the development of agriculture biotechnology less time-consuming, expensive, and difficult. Our work has shown that the microbe-extracellular matrix system in porous media can double evaporative resistance and dramatically improve system resiliency, but this functionality is only realized in realistic pore-scale geometries. We have also used ESMs to screen microbes for sustainable agriculture applications and shown viable performance in subsequent full-scale testing. With the loom of climate change and its increasing demands on our water and food systems, there will be rapidly-increasing demand for more productive and cost-effective sustainable agriculture technology, including food production technology that also provides reliable and safe terrestrial carbon sequestration. This talk will illustrate how fundamental chemical engineering concepts and methods applied to soils can make important contributions towards a more sustainable future.

Biography: Leslie Shor mentors an interdisciplinary team working at the intersection of chemical engineering, microbiology, and advanced manufacturing. The focus of her research work is developing biotechnology based on soil microbes to enhance sustainable food production.

She is the PI of an EFRI project on separation and elimination of microplastics from treated wastewater effluent. She is active in education, mentoring, and outreach initiatives aimed at increasing diversity in STEM and enhancing human welfare through high-tech innovation. Shor earned her BA in Environmental Sciences and Chemistry (double-major) from the University of Virginia, and her PhD in Chemical and Biochemical Engineering from Rutgers University. Prior to coming to UConn, she was a research assistant professor at Vanderbilt University. In 2018 she spent six months at the University of Adelaide in South Australia as a visiting faculty member in the School of Chemical Engineering.

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