UNIVERSITY of HOUSTON | ENGINEERING

Department of Biomedical Engineering

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Date Friday, November 14, 2025
Time 12:00 to 1:00 PM
Location SEC 203

Title: *Synthetic Biology for Psychiatric Therapeutics: Engineered Microbial Production of Psilocybin Antidepressants*

Abstract: Depression affects over 280 million individuals globally and remains a leading cause of disability and suicide. Amid growing interest in psychedelic-assisted therapies, psilocybin—a psychoactive compound derived from magic mushrooms—has emerged as a promising antidepressant, demonstrating rapid and sustained efficacy in clinical trials for major depressive disorder, PTSD, and treatment-resistant depression. However, scalable production of psilocybin and its active metabolite, psilocin, remains a major bottleneck due to low natural abundance and complex chemical synthesis.

In this seminar, I will introduce my research program in synthetic biology, with a focus on microbial biomanufacturing of pharmaceutically relevant compounds. I will present our recent work on engineering E. coli for de novo biosynthesis of psilocybin and psilocin, bypassing key enzymatic limitations in the native fungal pathway. Through rational pathway design, metabolic rewiring, and fermentation optimization, we achieved record titers of 2.00 g/L psilocybin in fed-batch cultures—surpassing existing microbial platforms in both yield and productivity.

This work not only demonstrates the power of synthetic biology for scalable production of complex natural products but also lays the groundwork for next-generation delivery strategies, including in situ biosynthesis via engineered gut microbiota. By bridging microbial engineering with psychiatric medicine, this project exemplifies the translational potential of synthetic biology within biomedical engineering and opens new avenues for interdisciplinary collaboration in therapeutic development.

Bio: Dr. Yuheng Lin is a tenure-track Assistant Professor in the Department of Engineering Technology at the University of Houston. He earned his Ph.D. in Biological Engineering from the University of Georgia in 2014. Before joining UH, he was the co-founder and Chief Scientist of BiotecEra Inc, where he advanced microbial technologies for industrial applications. Dr. Lin's research focuses on developing synthetic biology tools for metabolic regulation and building innovative microbial platforms for the biomanufacturing of high-value chemicals. He has published more than 35 peer-reviewed articles in leading journals, including Nature Communications, Metabolic Engineering, Biotechnology Advances, Current Opinion in Biotechnology, and ACS Synthetic Biology, etc. He is also a major inventor of seven patents. His work has been cited about 2,500 times on Google Scholar, with an h-index of 23, reflecting both the impact and influence of his contributions to biotechnology and synthetic biology.