NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Civil and Environmental Engineering

CEE Research Seminar

# Application of Quantum Information Science to Surpass Classical Limitations in Environmental Engineering and Drive Net Zero Waste Biorefinery


Speaker: **Prof TAN Giin Yu Amy**
City University of Hong Kong

Venue: CEE Seminar Room A (N1-B1b-06)
Time: 22 Nov 2022 (Tue) 2-3 pm

## Abstract

In the modern world, humans have been extremely successful at deploying biotechnologies to address environmental challenges related to climate change, pollution, water and energy crisis. Yet many of these biotechnologies are approaching classical biochemical limits. Big data analytics hold immense potential to revolutionize technology and engineering. However, sheer data volume, increasing complexity of problems and non-classical nature of certain biological phenomena such as gene regulation are reaching the computational limit of classical computers. The application of non-classical quantum information science and computation to environmental microbiology and engineering could surpass these limitations, creating new paradigm shifts in engineering, and further our efforts toward net zero waste biorefinery.

This presentation will illustrate how quantum information science and computation can be applied to environmental engineering and the wider engineering field. Specific findings and new research directions pertaining to microbial waste treatment and bioresource production will be presented.

**About the Speaker**

Dr. Amy Tan is an Assistant Professor in the Department of Architecture and Civil Engineering at The City University of Hong Kong (CityU). She holds a PhD degree in Civil and Environmental Engineering and a Bachelor degree in Biological Sciences from Nanyang Technological University (NTU), Singapore.

Deeply passionate about the subject of environmental microbiology, Amy works at the interface of biology, engineering and quantum information science to harness the knowledge and power of microbes for waste-to-energy and waste-to-bioresource applications. Her team focuses on biological phenomena such as, electron transfer/tunnelling/hopping and gene regulation, and the coupled use of non-classical modelling and meta-omics techniques to surpass classical biochemical limitations for sustainable waste and wastewater management. Some of her current research topics include 1) electron transfer between microbe and conductive materials for enhanced bioenergy production, 2) nutrients stress regulation of bioplastic production, and 3) microbial electron oxygen reduction reaction for recalcitrant waste bioremediation.

Amy's research has led to more than 25 research publications in peer-reviewed journals including Water Research, Nature Scientific Report and Waste Management. She has also received several awards including the Environmental Paper Award from The Hong Kong Institution of Engineers in 2019 and The Outstanding Mentor Award from The Ministry of Education, Singapore, in 2012.

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