



College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

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Zoom: <https://lsu.zoom.us/j/92841028849?pwd=dIU2N1Z3S1E5ZFV1dTJYYUtuRHB0Zz09>

Synergizing ¹³C-fingerprinting and metabolic pathway engineering

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Our group is mainly focused on the metabolic engineering of microbial cell factories as well as utilizing systems and synthetic biology approaches for the sustainable production of biofuels, pharmaceuticals, and value-added chemicals. The metabolic pathways in microbes are very complicated, consisting of thousands of highly regulated reactions. Therefore, even minimal engineering of a microbe's metabolic pathway without considering its systems level impact imposes burden on the cell physiology and may offset its benefit to bioproduction. These burdens arise due to cofactor imbalance, metabolic imbalance, or due to the redirection of key intermediates. Herein, ¹³C-fingerprinting experiments can be used to rigorously map the intracellular network within microbes and to throw light on their cellular metabolism. Feeding microbial cell factories with ¹³C-labeled substrates results in unique isotopic patterns amongst the cellular metabolites (isotopic fingerprints), which can provide functional characterization of metabolic pathways. In addition, ¹³C-metabolic flux analysis (¹³C-MFA) which derives its constraints from ¹³C-fingerprinting can be employed to quantify carbon and energy (ATP, NADH and NADPH) fluxes through the central metabolism. In this presentation, I will discuss the metabolic pathway engineering applications of ¹³C-fingerprinting mainly in the context of lignin valorization, CO₂ recycling, and biofuel production.

*Dr. Arul Mozhy Varman leads the synthetic and systems biology laboratory at Arizona State University. He got his research training as a Ph.D. student at Washington University in St. Louis and then as a Postdoctoral researcher at Sandia National Laboratories. Prior to joining WashU for his Ph.D., he had worked as a Scientific Officer at Bhabha Atomic Research Centre in India. He earned his B.Tech. in Chemical Engineering from Pondicherry Technological University and his M.Tech. in Chemical Engineering from Indian Institute of Technology Bombay. He is the recipient of the Department of Atomic Energy fellowship at IIT Bombay and the James M. McKelvey fellowship and a Departmental Graduate Student Research Award at Washington University in St. Louis. He has 3 patents and 4 pending patent applications and invention disclosures. He received the NSF Career Award in 2022.