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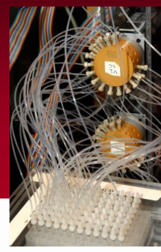
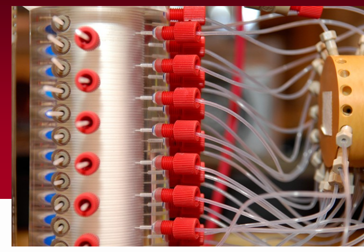


The Gene and Linda Voiland School of

Chemical Engineering and Bioengineering

2015 Seminar Series

Monday, April 27, 2015

12:10 p.m. Wegner G1

Radhakrishanan Mahadevan
Associate Professor
Chemical Engineering & Applied Chemistry
University of Toronto

Krishna Mahadevan is an Associate Professor in the Departments of Chemical Engineering & Applied Chemistry, and Institute of Biomaterials and Biomedical Engineering at the University of Toronto. He obtained his B. Tech from Indian Institute of Technology, Madras in Chemical Engineering in 1997 and then obtained his Ph.D. degree from the University of Delaware in Chemical Engineering in 2002. He was a research scientist at Genomatica Inc., San Diego from 2002–06 and has also held appointments as a visiting scholar and a guest lecturer at the Department of Bioengineering in the University of California, San Diego, and in the Department of Microbiology, University of Massachusetts, Amherst. His research interests are in the area of modeling, analysis and optimization of metabolism for applications in bioremediation, biochemicals production and medicine. He has received David W. Smith Jr. Best Paper Award in 2006, the Jay Bailey Young Investigator Award in Metabolic Engineering in 2010, the Society of Industrial Microbiology and Biotechnologys' Young Investigator Award in 2012, University of Toronto FASE Research Leaders Award in 2013, the Alexander von Humboldt Fellowship in 2014 and the Syncrude Innovation Award in 2014.

Model-based Strategies for Improving Bioprocess Yield, Productivity and Robustness

Bioprocess development for biofuels and biochemicals typically requires several rounds of metabolic engineering to meet process targets including product yield, titer and productivity, all of which impact the process economics. Similar advances in computational modeling techniques have allowed the development of genome-scale models of metabolism in several organisms. In this talk, the use of such models for metabolic engineering will be presented. In the first part, a rational approach based on bi-level optimization to enhance bioprocess productivity by forcing co-utilization of substrates will be shown. Experimental results from the application of this approach to enforce substrate co-utilization in Escherichia coli will be discussed. In addition, we will present a synthetic biology approach for dynamic control of metabolism to improve productivity. In the next part of the talk, a novel nested nonlinear optimization method for metabolic engineering resulting in hundreds of different strain design strategies for biochemicals production will be presented. We will also examine the role of redundant production pathways from a design perspective and present computational results on how these pathways are valuable for robust design.