

# Purdue University

## SCHOOL OF CHEMICAL ENGINEERING GRADUATE SEMINAR SERIES

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### “Understanding and harnessing microbial metabolism: the role of systems biology and metabolic engineering”

September 14, 2010  
3:30 - 4:30 p.m.  
FRNY G140

#### ABSTRACT:

Although microorganisms are intrinsically capable of producing a wide range of useful molecules, their synthesis is determined and controlled by a complex network of transport, enzymatic, and regulatory processes. Our laboratory has been working on the development and implementation of an integrated, system-level approach to elucidate the underlying mechanisms involved in these metabolic and regulatory networks. The knowledge base created by such studies has then been used to design and implement novel metabolic engineering strategies that support the creation of microbial catalysts for the efficient production of fuels and chemicals from renewable sources. This talk will discuss our recent work in this area with emphasis on: i) systems analysis of the fermentative carbon metabolism in *Escherichia coli*; ii) engineering of *E. coli* as a platform for the production of fuels and chemicals from glycerol; and iii) engineering of a respiro-fermentative metabolic mode for the use of fatty acids/bio-oils as a feedstock for the production of fuels and chemicals.

#### References

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5. Clomburg and Gonzalez, 2010, *App. Microbiol. Biotechnol. 86 (2): 419-434*.
6. Murarka et al. 2010, *Microbiology-SGM 156 (6): 1860 - 1872*.
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#### BIO:

Ramon Gonzalez is the William W. Akers Assistant Professor in the Departments of Chemical & Biomolecular Engineering and Bioengineering at Rice University. Dr. Gonzalez leads the Metabolic Engineering and Synthetic & Systems Biology Laboratory with the long-term goal of understanding microbial and cellular metabolism and harnessing it for the production of biofuels, biochemicals, and other important products. His research embraces three general areas: metabolic engineering & synthetic biology, functional genomics & systems biology, and microbial & cellular metabolism. Current projects

include the understanding and engineering of microbial fermentation of glycerol, the efficient metabolism of lignocellulosic sugars and their conversion to fuels and chemicals, and the use of fatty acid-rich feedstocks in the production of fuels and chemicals. One of the main contributions of Professor Gonzalez laboratory has been the discovery that the bacterium *Escherichia coli* can anaerobically ferment glycerol, a previously unknown metabolic capability of this organism. This fundamental discovery laid the foundation for the development of a platform of technologies to convert glycerol to higher-value products, thus establishing a new path to the production of biofuels and biochemicals. In 2007, Dr. Gonzalez received the prestigious National Science Foundation Faculty Early Career (CAREER) award to conduct research in this area.

More recently, Dr. Gonzalez received the 2010 SDA/NBB Glycerine Innovation Research Award from the American Oil Chemists' Society. The award recognizes outstanding achievement for research into new applications for glycerine.

Dr. Gonzalez received a Ph.D. in Chemical Engineering from the University of Chile, a M.S. in Biochemical Engineering from the Pontifical Catholic University of Valparaíso (Chile), a B.S. in Chemical Engineering from the Central University of Las Villas (Cuba), and Postdoctoral training at the University of Florida. He is also a licensed professional engineer. Dr. Gonzalez holds several editorial positions, including Senior Editor of the Journal of Industrial Microbiology & Biotechnology and Member of the Editorial Board of Applied & Environmental Microbiology, Applied Biochemistry & Biotechnology, and Food Biotechnology.